DOWNES CONSTRUCTION PROJECT MANUAL

ADDITIONS & ALTERATIONS TO:

OLD GREENWICH SCHOOL

285 Sound Beach Avenue
Old Greenwich, CT 06870

INVITATION TO BID #01

Greenwich Public Schools Project #2494-24

November 01, 2024

Includes the following Bid Package Scopes of Work:

Bid Package	Description
Bid Package #1.26.1	Early Release Electrical Equipment

All bidders whose bids exceed $1,000,000.00 shall hold a current DAS Contractor Prequalification Certificate (not a predetermination letter) from the Department of Administrative Services of the State of Connecticut according to Connecticut General Statutes Section 4a-100, 4b-101 and 4b-91. Bidders shall submit with their bids a current Update (bid) Statement. Failure to submit this item with the bid subjects your bid to disqualification. If you have any questions regarding these requirements, contact the State of CT.DAS, at telephone number 860-713-5280 or visit their web site at www.das.state.ct.us

Refer to Legal Notice and Invitation to Bid for Bid due Date and Pre-Bid Walk-Through Dates and Times

ADDITIONS & ALTERATIONS TO: OLD GREENWICH SCHOOL FOR THE TOWN OF GREENWICH

GREENWICH PUBLIC SCHOOLS
PROJECT # 2494-24
EARLY RELEASE ELECTRICAL EQUIPMENT
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DOWNES PROJECT MANUAL
INVITATION TO BID #01

NOVEMBER 01, 2024

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2. Table of Contents for the Downes Project Manual;
3. Town of Greenwich, Old Greenwich School Legal Notice;
4. Downes Invitation To Bid dated November 01, 2024;
5. AIA Document A701 Instructions to Bidders;
6. General Items All Trade Packages;
7. Bid Form (Bound in DCC Project Manual);
8. Scopes of Work for the following Bid Packages:

Bid Package	Description
Bid Package #26.1	Early Release Electrical Equipment

9. Acknowledgement of Surety;
10. Non-collusion affidavit form;
11. Sample Performance and Payment Bond Forms (BONDS CANNOT BE SUBMITTED ON AIA A311 or A312 FORMS);
12. AIA Document A305 – 2020 – Contractor's Qualification Statement;
13. Prevailing Wage Rates (Bound in DCC Project Manual);
14. Downes Construction Company Supplemental Instructions dated March 2022;
15. Construction Phasing and Schedule dated 10/31/2024;
16. Drawing List dated 10/24/24;
17. Specification List dated 10/24/24;
18. AIA Document A401– 2017 – Standard Form of Agreement between Contractor and Subcontractor;
19. AIA Document A133 – 2019 Standard Form of Agreement Between Owner and Construction Manager as Constructor;
20. AIA Document A201 - 2017 - General Conditions of the Contract for Construction
21. Site Logistics Plan SL-1 dated 10/31/2024
22. Downes Sample Forms
    A. Sample Insurance Accord Form
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TOWN OF GREENWICH

LEGAL NOTICE

GREENWICH PUBLIC SCHOOLS

REQUEST FOR BIDS

BIDDING – INVITATION TO BID #01

ADDITIONS & ALTERATIONS TO OLD GREENWICH SCHOOL
285 SOUND BEACH AVENUE
OLD GREENWICH, CT 06870
BP #1.26.1 – EARLY RELEASE ELECTRICAL EQUIPMENT
GREENWICH PUBLIC SCHOOLS PROJECT #2494-24

1. Downes Construction Company, LLC acting as Construction Manager at Risk (CMR) will receive sealed bid proposals in **Duplicate** on behalf of the Old Greenwich School Building Committee at the Board of Education of The Town of Greenwich, Havemeyer Building located at 290 Greenwich Ave, Greenwich, CT 06830 until **11:00 AM EST** on **November 22, 2024** for the individual bid packages identified in the Contract Documents and as indicated below for the Additions and Alterations to the Old Greenwich School at 285 Sound Beach Avenue, Old Greenwich, CT 06870.

Bid Package	Description
Bid Package #26.1	Early Release Electrical Equipment

2. ALL bidders will be required to furnish a 10% Bid Bond along with their bid. Performance and Payment Bonds (100%) will be required. SET-SIDE subcontractors will not be required to provide Bid Bonds or Performance and Payment Bonds.
3. A VOLUNTARY PRE-BID CONFERENCE will be held via ZOOM on Tuesday, November 12, 2024 at 11:00 AM. Bidder attendance is STRONGLY encouraged but not mandatory.
4. THE PLANS, SPECIFICATIONS AND THE PROJECT MANUAL – Plans, Specifications and Instructions to Bidders may be obtained by contacting Downes Construction at OGSbid@downesco.com only. Documents are expected to be available on or before Monday, November 4, 2024. A SmartBid electronic mail link will be provided to the documents. Those bidders receiving the documents in this manner will receive Addenda as they are issued.
5. BIDDING REQUESTS FOR INFORMATION (RFI) REGARDING THE ABOVE TRADE PACKAGES - All questions regarding bidding procedures, bidding documents and construction procedures are to be directed in RFI form to the Construction Manager Downes Construction Company at OGSbid@downesco.com. All answers will be published by written Addendum. Extension of the RFI deadline may only be revised by written addendum. Questions received verbally will not be answered. The RFI submission deadline is five (5) business days prior to the bid due date at 12 noon EST. RFI submission deadline may be extended by addenda at the CM's discretion.
6. ALL BIDS will be received at the Board of Education of The Town of Greenwich **until 11:00 AM** as noted above and opened publicly and read aloud on **November 22, 2024** at the Board of Education of The Town of Greenwich, 290 Greenwich Ave, Greenwich, CT 06830 after which time no further bids will be accepted. All bidders must include the Greenwich Public Schools Project Number 2494-24, Project Name and Bid Package Number & Description (Example – GPS #2494-24 – Old Greenwich School – BP# 1.26.1 – Early Release Switchgear / Generator). A link to the web-based bid opening will be provided via Addendum.
7. This project is being performed under the Construction Management form of construction. With respect to this project, the Construction Manager is a representation of the Owner. Each Trade Contractor's contract shall be with the Construction Manager.
8. All bidders whose bids exceed $1,000,000.00 shall hold a current DAS Contractor Prequalification Certificate (not a predetermination letter) from the Department of Administrative Services of the State of Connecticut according to Connecticut General Statutes Section 4a-100, 4b-101 and 4b-91. Bidders shall submit with their bids a current Update (bid) Statement. Failure to submit this item with the bid subjects your bid to disqualification**.** If you have any questions regarding these requirements contact the State of CT.DAS, at telephone number 860-713-5280 or visit their web site at www.das.state.ct.us
9. The State of Connecticut Department of Labor and all associated statutes and regulations shall govern labor wages on this project. The successful bidder shall comply with applicable state and local laws and the State of Connecticut requirements.

10. Bidders are reminded that the Owner is exempt from Federal Excise Taxes as well as State of Connecticut Sales Tax to the extent allowed by law.
11. The “Supplemental Instructions” and “General Items – All Trade Packages” and all other special instructions shall be strictly followed by bidders.
12. The Trade Packages will be awarded to the lowest responsible bidder. However, the Construction Manager and Owner reserve the right to reject any and all bids or to waive any informalities, irregularities, omissions, or technical defects in the bids if deemed in the best interest of the project.
13. No bid shall be accepted from any person/company who is in arrears to the Construction Manager (or its subsidiaries and partners) and/or Owner upon debt, or contract, or who is a defaulter as surety or otherwise upon obligations to the Construction Manager and/or Owner.
14. All bids shall be held open by bidders for a period of ninety (90) days. No bidder may withdraw their bid during that period.
15. Downes Construction Company, LLC, the Town of Greenwich, Greenwich Public Schools and Old Greenwich School Building Committee are an Affirmative Action Equal Opportunity Employer. Minority/Women’s Business Enterprises are encouraged to participate.

ADDITIONS & ALTERATIONS TO:
OLD GREENWICH SCHOOL
GPS #2494-24
285 SOUND BEACH AVENUE
OLD GREENWICH, CT 06870

INVITATION TO BID #01

ADDITIONS & ALTERATIONS TO:
OLD GREENWICH SCHOOL
BOARD OF EDUCATION OF THE TOWN OF GREENWICH
GREENWICH, CT 06870

GREENWICH PUBLIC SCHOOLS PROJECT # 2494-24

November 01, 2024

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1. Downes Construction Company, LLC acting as Construction Manager on behalf of the Old Greenwich School Building Committee at the Board of Education of The Town of Greenwich will receive one original and one copy of bids for the individual bid packages identified in the Contract Documents and as indicated below for the Additions and Alterations to the Old Greenwich School at 285 Sound Beach Avenue, Old Greenwich, CT 06870. Sealed proposals will be received at the Board of Education of The Town of Greenwich, Havemeyer Building, located at 290 Greenwich Ave, Greenwich, CT 06830 **until 11:00 AM EST on Friday, November 22, 2024.**

Bid Package	Description
Bid Package #1.26.1	Early Release Electrical Equipment

All bidders whose bids exceed $1,000,000.00 shall hold a current DAS Contractor Prequalification Certificate (not a predetermination letter) from the Department of Administrative Services of the State of Connecticut according to Connecticut General Statutes Section 4a-100, 4b-101 and 4b-91. Bidders shall submit with their bids a current Update (bid) Statement. Failure to submit this item with the bid subjects your bid to disqualification. If you have any questions regarding these requirements contact the State of CT.DAS, at telephone number 860-713-5280 or visit their web site at www.das.state.ct.us

2. **THE PLANS, SPECIFICATIONS AND THE PROJECT MANUAL** – Plans, Specifications and Instructions to Bidders may be obtained by contacting Downes Construction at OGSbid@downesco.com only. Documents are expected to be available on or before Monday, November 4, 2024. A SmartBid electronic mail link will be provided to the documents. Those bidders receiving the documents in this manner will receive Addenda as they are issued.

3. **QUALIFICATION STATEMENT –** Any subcontractor bidding on this scope of work shall provide sufficient evidence of completion of at least (3) similar size/scope of municipal or state projects within the past 5 years in order to be eligible to submit pricing for the scope of work described within. Provide sufficient documentation and a project list attached to your bid form for documentation purposes to ensure your firm is capable of completing this scope of work. Failure to do so could result in possible rejection of your bid(s). Refer to AIA A305 form for inclusion as part of your bid.

4. **A PRE-BID CONFERENCE** will be held via ZOOM on Tuesday, November 12, 2024 at 11:00 AM for the Old Greenwich School at 285 Sound Beach Avenue, Old Greenwich, CT 06870.; The Pre-Bid Zoom Conference is NOT mandatory but is strongly encouraged. Bidders are encouraged to visit the site location at their convenience. Do not interfere with existing businesses or vehicular traffic while visiting the future site.

5. **ALL BIDS FOR ALL BID PACKAGES ARE TO BE SUBMITTED VIA HAND DELIVERY IN SEALED ENVELOPES IN DUPLICATE** by the date and time indicated, after which time no further bids will be accepted. All bidders must include the Project Name and Bid Package Number & Description on the envelopes (Example – GPS #2494-24 – Old Greenwich School – BP# 1.26.1 – Early Release Switchgear / Generator). Bids received will subsequently be publicly opened and read aloud at the Board of Education of The Town of Greenwich, Havemeyer Building, located at 290 Greenwich Ave, Greenwich, CT 06830 until **11:00 AM EST** on **Friday, November 22, 2024.**

6. **BIDDING REQUESTS FOR INFORMATION (RFI)** -
   All questions regarding bidding procedures, bidding documents and construction procedures are to be directed in RFI form to the Construction Manager Downes Construction Company at OGSbid@downesco.com. All answers will be published by written Addendum. Extension of the RFI deadline may only be revised by written addendum. Questions received verbally will not be answered. The RFI submission deadline is five (5) business days prior to the bid due date at 12 noon EST. RFI submission deadline may be extended by addenda at the CM's discretion.

7. **PROJECT LABOR AGREEMENT** (NOT APPLICABLE).

8. **EEO/LOCAL EMPLOYMENT GOALS** (NA – See CHRO Requirements

9. **LIQUIDATED DAMAGES** – Liquidated Damages per section 6.1.6 AIA133 – 2019 will be assessed per schedule phases. Individual trade partners will be held accountable for any slippage that will hold up millstones & completion as shown on the schedule. It is imperative that all documents required are turnover in a timely manner as to not allow missed dates on the phased schedules. These include but are not limited to the following: Contract execution, COI's, Submittals, RFI's, Fabrication timeline, attending meetings & manpower.

10. **ESCALATION -** All Subcontractors shall include the cost of future escalation in their lump sum bids based on the construction schedule. This includes but may not be limited to labor and material increases along with equipment operating expenses. Escalation in costs during the construction period will not be grounds for change order requests.

11. Downes Construction is the Construction Manager for this project therefore there is no "GC" or General Contractor. The work assigned to "by GC", "contractor" or "subcontractor" in the various contract documents is assigned to Trade Packages by Downes Construction.

12. Scope Exclusions to the bid are not acceptable. No partial bids will be accepted. Scope of Work items which have inadvertently been duplicated in more than one bid package must be included in the bid amount for each package containing the duplication. Do not assume Scope of Work items will be provided by the other bid package(s). Notify the Construction Manager immediately upon discovery of a duplicated item. Should the Construction Manager request a credit for the duplicated item after the bid, claims of omission of pricing in the bid due to the duplicate item in another bid package will not be acceptable.

13. **BID FORM –** All bids for all bid packages are to be submitted by mail or via hand delivery, with all spaces filled in. Faxed bids will be rejected. Those bidders who are bidding more than one Bid Package Scope of Work should submit their bids on separate Bid Forms in separate, sealed envelopes unless they are submitting combined bids for which a space has been provided. The Bid Form must be accompanied by the following:
    A. Bid Security in the amount of Ten Percent (10%) of the Base Bid Sum (Bid Bond or Certified Check) for any bid for work.
    B. Substitution Listing (As Applicable);
    C. Workman's Compensation Experience Modification Factor (EMR) form from insurer;

D. Non-Collusion Affidavit;
E. Acknowledgement of Surety;
F. Contractor's Qualification Statement (AIA Document A305, 1986 Edition), provide past experience with projects of a similar nature and scope within the past 5 years;
G. Proof of Insurance in accordance with Contract Requirements on Sample Accord Form;

14. **COMBINED BIDS** - Combination bids for any combination of bid packages will be accepted, provided the Bidder submits a bid for the individual packages to be combined. Combination bids are allowed only for bids due at the same time. Bid Combination offers should be submitted on a separate bid form indicating "Combination Bid for Bid Packages (BP No. & Description)" in bid form. A separate bid bond is not required for the combination bid. Bid Bonds for the individual bids are required.

15. **All Bids shall remain in effect for ninety (90) calendar days from bid due date**. No Bidder may withdraw their bid during that period.

16. **BID BONDS** – Bid Security in the amount of Ten Percent (10%) of the Base Bid Sum (Bid Bond or Certified Check) for any bid for work. A bid bond is not required for (SA) and (SA/PLA) packages.

17. **PERFORMANCE AND PAYMENT BONDS** – The successful bidders will be required to provide 100% Performance and Labor and Material Payment Bonds. Bidders are requested to indicate the added cost to the base bid of 100% Performance and Labor and Material Payment Bonds in the appropriate space on the bid form. The owner must be included as a "dual obligee" on all bonds. Surety companies providing performance and payment bond(s) must be licensed to do business in Connecticut and be approved as sureties on Government contract pursuant to U.S. Treasury Circular No. 570, published annually in the Federal Register. 100% Performance and Labor and Material Payment Bonds not required for (SA) and (SA/PLA) packages.

18. **PREVAILING WAGE RATES** - The State of Connecticut Department of Labor and all associated statutes and regulations shall govern labor wages on this project.

19. **DAS PREQUALIFICATION** – State law requires a minimum of twenty-five (25%) percent of the state-funded portion of the contract for award to subcontractors holding current certification from the Connecticut Department of Administrative Services ("DAS") under the provisions of CONN. GEN. STAT. § 4a-60g. (25% of the work with DAS certified Small and Minority owned businesses and 25% of that work with DAS certified Minority, Women and/or Disabled owned businesses.) The contractor must demonstrate good faith effort to meet the 25% set- aside goals.

H. **COMMISSION ON HUMAN RIGHTS AND OPPORUNITIES (CHRO) –** The Subcontractors who are selected to perform this State project must comply with CONN. GEN. STAT. §§ 4a-60, 4a-60a, 4a-60g, and 46a-68b through 46a-68f, inclusive, as amended by June 2015 Special Session Public Act 15-5. An Affirmative Action Plan must be filed with and approved by the Commission on Human Rights and Opportunities prior to the commencement of construction. State law requires a minimum of twenty-five (25%) percent of the state-funded portion of the contract for award to subcontractors holding current certification from the Connecticut Department of Administrative Services ("DAS") under the provisions of CONN. GEN. STAT. § 4a-60g, as amended. (25% of the work with DAS certified Small and Minority owned businesses and 25% of that work with DAS certified Minority, Women and/or Disabled owned businesses.) The contractor must demonstrate good faith effort to meet the 25% set-aside goals. For municipal public works contracts and quasi-public agency projects, the contractor must file a written or electronic non-discrimination certification with the Commission on Human Rights and Opportunities. Forms can be found at http://www.ct.gov/opm/cwp/view.asp?a=2982&q=390928&opmNav_GID=1806

20. **CONNECTICUT HIGH PERFORMANCE STANDARDS** – All Subcontractors are responsible for complying with the Specifications Section on Sustainable Design Requirements as it relates to completing their scopes of work in support of complying with Connecticut High Performance Standards (HPBS). Review and coordinate with all related Specifications Sections, provide all submittals associated with compliance and complete work in a manner to achieve compliance. Also refer to the Downes Construction CT HPBS Management Plan contained within the Downes Project Manual.

21. **TAX EXEMPT** - This project is tax-exempt. Reference Supplemental Instructions paragraph C.

22. **CERTIFIED PAYROLL –**All Subcontractors shall note the following in regards to WEEKLY certified payrolls:
    - As this is a Prevailing Wage project, each Contractor must follow all the rules, guidelines and regulations set forth by the CT Department of Labor. Please read and adhere to all of the contents pertaining to Prevailing Wage as set forth in this document.
    - A reminder that Prevailing wages are updated (changed) every July 1st by the State Department of Labor. Each Contractor is responsible to find out the new rates and to make the appropriate changes on its first payroll after July 1st. Each Subcontractor is responsible for assuming and including wage increases in their lump sum bids accordingly. No change orders will be entertained as they relate to periodic prevailing wage rate increases.
    - Each contractor must send Certified Payroll submissions to *Certified Paychecks via email.* No hard copy originals will be required to be submitted to the consultant or Downes. The current email is payroll@certifiedpaycheck.com. (Contact is Kathy Wimmer at kwimmer@certifiedpaycheck.com).
    - Certified payrolls must be completely filled out Weekly basis and must be received by Thursday of the following week, otherwise no payment will be allowed without correct receipt of certified payrolls (obviously all appropriate standard State of CT forms must be used). Employee's Social Security numbers should not appear on the payrolls.
    - Each Contractor must send its completed Monthly Employment Utilization Report Form for the Commission on Human Rights and Opportunities. to *Certified Paychecks via email.* No hard copy originals will be required to be submitted to the consultant or Downes. The current email is payroll@certifiedpaycheck.com. (Contact is Kathy Wimmer at kwimmer@certifiedpaycheck.com). THESE REPORTS MUST BE SUBMITTED ALONG WITH THE CERTIFIED PAYROLLS.
    - It is a state law that all private employees and apprentices who perform manual labor for a Contractor on a public building project must have completed the 10-hour Outreach Course in accordance with federal OSHA Training Institute standards, and for telecommunications workers, a 10-hour training course in accordance with federal OSHA standards, 29 CFR 1910.268. A Certification card is not compliant if it is more than 5 years old.
    - Each Contractor must affix a copy of the construction safety course completion card to the first certified payroll submitted to the *Certified Paychecks* in accordance with Connecticut General Statue 31-53(f) on which such employee's name first appears.

23. **EXPERIENCE MODIFICATION RATE** - All bidders shall indicate their company's worker's compensation Experience Modification Rate (EMR) in the appropriate space on the bid form. Downes Construction and the owner reserve the right to reject a bid if the bidders EMR rate is greater than 1.0**.**

24. **INSURANCE** – The successful bidder will be required to provide insurance in accordance with the limits set forth in Section 4 of Downes Supplemental Instructions or those indicated elsewhere in the Contract Documents. Whichever coverage may be higher. The successful bidder shall procure at their own expense Workmen's Compensation, Comprehensive General Liability, Automobile Liability and other insurance with coverage and limits as defined in the Contract Documents. Certificates of Insurance with the above coverage must be submitted before starting work on the project. Thirty (30) days notice is required before cancellation.

25. **CHANGE ORDERS –** All change orders will be held to strict scrutiny by the CM. This Subcontractor is required to perform time and material work (T&M), as directed by the Construction Manager and adhere to the T&M procedures set forth in Downes Supplemental Instructions booklet section G. All change orders will be required to be substantiated with labor rate breakdowns (ie: rate, fringes, taxes, insurance and OH&P), equipment substantiation and material substantiation. For all change orders no more than 10% OH&P will be allowed on labor, equipment and materials and 5% OH&P for subs subcontract work. The above mentioned OH&P shall include all home office expense, supervision (PE's & PM's, Acct, etc.). Bond cost will be adjusted accordingly once the final contract amount is determined and agreed upon with a receipted invoice from the bonding company. The rate should be the same as the "break out" compared to the value of the lump sum bid.

26. **UNIT PRICES** – All unit prices are to be inclusive of all insurance, travel, safety, home office expense, overhead & profit, labor and equipment rates, fringes, taxes, reimbursables, consumables etc.. In the spaces provided on the Bid Form, indicate the Unit Pricing with extensions, as requested. (Unit prices will be used to add or deduct from contract price based on project requirements).

27. **BACKGROUND INVESTIGATIONS** - The successful bidder will be required and agrees that before deploying any employee, agent or subcontractor ("Deployed Person") to perform any portion of the Project, the successful bidder will Verify the Deployed Person's applicable and appropriate professional degrees, licenses and/or certifications as claimed by the Deployed Person. To the extent permitted by applicable law, the successful bidder shall perform a commercially reasonable criminal background check. The successful bidder agrees not to knowingly deploy such a person without first notifying the Owner and OPM of any criminal background. Notwithstanding the above provisions, the successful bidder agrees that it will not knowingly deploy any person to provide work or services to the Owner or OPM who has been convicted of any criminal felony involving dishonesty or a breach of trust or that such person has been convicted of any offense under 18 U.S.C Section 1033 of the Violent Crime Control and Law Enforcement Act of 1994, which section is captioned "Crimes by or Affecting Persons Engaged in the Business of Insurance Whose Activities Affect Interstate Commerce." Such offenses include, by way of illustration and not of limitation, activities by persons in the insurance industry who willfully and materially overvalue any land, property or securities; embezzlement or misappropriation of insurance premiums and other funds; the making of false entries or statements in reports with the intent to deceive another person engaged in the insurance industry; or the use of threat or force in an attempt to corrupt or obstruct administrative proceedings related to the insurance industry. The successful bidder represents that at all times it will comply with all state and federal laws and regulations with respect to maintaining a drug-free workforce and that it will disclose its drug testing procedures to the Owner and OPM upon request. Please refer to the "Instructions to Subcontractors" Section 2.RR and Section 10 for the Background Check Compliance Agreement. This agreement is a Contractual requirement and must be returned to the OPM prior to the execution of this Subcontractors contract.

28. **PROJECT MANAGEMENT SYSTEMS** – Refer to General Items – All Trade Packages for mandatory systems to be utilized on this project and associated fees to be included base bid.

29. A Construction Schedule and Site Logistics Plan are included with the Bid Packages, for bidding purposes. It is intended to give the bidders an idea as to when their scope of work will take place. Changes to this schedule as the project progresses will not constitute grounds for a change order.

30. The successful bidder will enter into a contract with Downes Construction that will be based on the Contract Documents for their Bid Package Scope of Work utilizing the AIA A401 2017 Standard Form of Agreement Contractor (Downes) and Subcontractor (Trade Packages) as amended to be job specific with the provided A201 WITHOUT ALTERATION OR QUALIFICATION. All contracts will be issued for signature via DocuSign.

31. The successful bidder will comply with all applicable local, State and Federal licensing, zoning, building, health, fire and safety regulations or ordinances, as well as standards and criteria of pertinent and State and Federal authorities and all owner requirements.

32. All Bidders are reminded that, in accordance with Connecticut Statutes Section §12-430(7)c, it is required to report names of nonresident (out of state) Contractors to the State of Connecticut, Department of Revenue Services (DRS) to ensure that all applicable business taxes are being paid by Contractors. Upon award of contract in excess of $250,000, all nonresident contractors must furnish proof to the CM, within two weeks of award, that they have obtained current status as a "verified contractor" with DRS. Reference Supplemental Instructions paragraph C.

33. By submitting a bid you are agreeing to adhere to the "Supplemental Instructions" and "General Items – All Trade Packages" issued by Downes Construction that accompanies this Invitation to Bid.

34. The project will be awarded to the lowest responsive and responsible bidder, provided the bid price is reasonable and in the best interest of Downes Construction Company, LLC and the City of Hartford to accept it. However, the Construction Manager (CMR) and the Owner reserve the right to reject any and all bids or to waive any informalities, irregularities, omissions, or technical defects in the bids. Downes Construction in conjunction with the Owner also reserve the right:
    A. To award the project based on the lowest responsible bid including combination bids along with the acceptance of any alternates in any order.
    B. To reject a bid from any company who has not completed projects of a similar size and scope as this project.
    C. To reject a bid from any person/company who is in arrears to the Construction Manager or Owner upon debt, or contract, or who is a defaulter as surety or otherwise upon obligations to the Owner.
    D. To reject any or all bids and to waive any informality in bids received whenever such rejection or waiver is deemed in the Owner's or Construction Manager's best interest.
    E. To reject any or all nonconforming, non-responsive, or unbalanced bids.
    F. To reject the bid of a bidder who has previously failed to perform properly or complete on time contracts.
    G. To consider the qualifications of bidder, whether or not the bids comply with the prescribed requirements, and such alternates, unit prices, and other data, as may be requested in the Form of Bid or prior to Notice of Award when evaluating the bids.
    H. To reject any bid received from a contractor who is in any litigation when the Owner and CM determine it is in the best interest of the project.

35. Bidders are to identify if they or any proposed subcontractors have been debarred in the past or are currently debarred from participating in any public works project, for the local, state or federal governments. If so, provide details of such debarment. Contractors who are currently debarred are unacceptable.

36. The bidder making the proposed bid affirms that the bid is not made in the interest of, or on behalf of, any undisclosed person, partnership, company, association, organization, or corporation; that the bid is genuine and not collusive or sham; that the bidder has not directly or indirectly induced or solicited any other bidder to put in a false or sham bid; and has not directly or indirectly colluded, conspired, connived, or agreed with any bidder or anyone else to put in a sham bid, or that anyone shall refrain from bidding; that the bidder has not in any manner directly or indirectly, sought by agreement, communication, or conference with anyone to fix the bid price of the bid or any other bid, or to fix any overhead, profit, or cost element of the bid price, or of that of any other bidder, or to secure any advantage against the public body awarding the contract of anyone interested in the proposed contract; that all statements contained in the bid are true; and, further, that the bidder has not,

directly or indirectly, submitted his or her bid price or any breakdown thereof, or the contents thereof, or divulged information or data relative thereto, or paid, and will not pay, any fee to any corporation, partnership, company association, organization, bid depository, or to any member or agent thereof to effectuate a collusive or sham bid.

37. This Invitation to Bid or any of its contents does not commit Downes nor the owner to pay any costs incurred in the preparation of a bid or to procure or contract for services or supplies**.**

38. Downes Construction and the Town of Greenwich, Greenwich Public Schools and Old Greenwich School Building Committee Affirmative Action / Equal Opportunity Employer. Small/Minority/Women's Business Enterprises are highly encouraged to submit bids.

END INVITATION TO BID #01

AIA® Document A701® – 2018

Instructions to Bidders

for the following Project:
(Name, location, and detailed description)

ADDITIONS & ALTERATIONS TO: OLD GREENWICH SCHOOL
GREENWICH, CT

THE OWNER:
(Name, legal status, address, and other information)

OLD GREENWICH SCHOOL BUILDING COMMITTEE
TOWN OF GREENWICH
101 FIELD POINT ROAD
GREENWICH, CT

THE ARCHITECT:
(Name, legal status, address, and other information)

SILVER PETRUCELLI & ASSOCIATES
3190 WHITNEY AVE - BUILDING 2
HAMDEN, CT

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ADDITIONS AND DELETIONS:
The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes added information as well as revisions to the standard form text is available from the author and should be reviewed. A vertical line in the left margin of this document indicates where the author has added necessary information and where the author has added to or deleted from the original AIA text.

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

FEDERAL, STATE, AND LOCAL LAWS MAY IMPOSE REQUIREMENTS ON PUBLIC PROCUREMENT CONTRACTS. CONSULT LOCAL AUTHORITIES OR AN ATTORNEY TO VERIFY REQUIREMENTS APPLICABLE TO THIS PROCUREMENT BEFORE COMPLETING THIS FORM.

It is intended that AIA Document G612™–2017, Owner's Instructions to the Architect, Parts A and B will be completed prior to using this document.

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ARTICLE 1 DEFINITIONS

§ 1.1 Bidding Documents include the Bidding Requirements and the Proposed Contract Documents. The Bidding Requirements consist of the advertisement or invitation to bid, Instructions to Bidders, supplementary instructions to bidders, the bid form, and any other bidding forms. The Proposed Contract Documents consist of the unexecuted form of Agreement between the Owner and Contractor and that Agreement's Exhibits, Conditions of the Contract (General, Supplementary and other Conditions), Drawings, Specifications, all Addenda, and all other documents enumerated in Article 8 of these Instructions.

§ 1.2 Definitions set forth in the General Conditions of the Contract for Construction, or in other Proposed Contract Documents apply to the Bidding Documents.

§ 1.3 Addenda are written or graphic instruments issued by the Architect, which, by additions, deletions, clarifications, or corrections, modify or interpret the Bidding Documents.

§ 1.4 A Bid is a complete and properly executed proposal to do the Work for the sums stipulated therein, submitted in accordance with the Bidding Documents.

§ 1.5 The Base Bid is the sum stated in the Bid for which the Bidder offers to perform the Work described in the Bidding Documents, to which Work may be added or deleted by sums stated in Alternate Bids.

§ 1.6 An Alternate Bid (or Alternate) is an amount stated in the Bid to be added to or deducted from, or that does not change, the Base Bid if the corresponding change in the Work, as described in the Bidding Documents, is accepted.

§ 1.7 A Unit Price is an amount stated in the Bid as a price per unit of measurement for materials, equipment, or services, or a portion of the Work, as described in the Bidding Documents.

§ 1.8 A Bidder is a person or entity who submits a Bid and who meets the requirements set forth in the Bidding Documents.

§ 1.9 A Sub-bidder is a person or entity who submits a bid to a Bidder for materials, equipment, or labor for a portion of the Work.

ARTICLE 2 BIDDER'S REPRESENTATIONS

§ 2.1 By submitting a Bid, the Bidder represents that:

- **.1** the Bidder has read and understands the Bidding Documents;
- **.2** the Bidder understands how the Bidding Documents relate to other portions of the Project, if any, being bid concurrently or presently under construction;
- **.3** the Bid complies with the Bidding Documents;
- **.4** the Bidder has visited the site, become familiar with local conditions under which the Work is to be performed, and has correlated the Bidder's observations with the requirements of the Proposed Contract Documents;
- **.5** the Bid is based upon the materials, equipment, and systems required by the Bidding Documents without exception; and
- **.6** the Bidder has read and understands the provisions for liquidated damages, if any, set forth in the form of Agreement between the Owner and Contractor.

ARTICLE 3 BIDDING DOCUMENTS

§ 3.1 Distribution

§ 3.1.1 Bidders shall obtain complete Bidding Documents, as indicated below, from the issuing office designated in the advertisement or invitation to bid, for the deposit sum, if any, stated therein.
(Indicate how, such as by email, website, host site/platform, paper copy, or other method Bidders shall obtain Bidding Documents.)

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§ 3.1.2 Any required deposit shall be refunded to Bidders who submit a bona fide Bid and return the paper Bidding Documents in good condition within ten days after receipt of Bids. The cost to replace missing or damaged paper documents will be deducted from the deposit. A Bidder receiving a Contract award may retain the paper Bidding Documents, and the Bidder's deposit will be refunded.

§ 3.1.3 Bidding Documents will not be issued directly to Sub-bidders unless specifically offered in the advertisement or invitation to bid, or in supplementary instructions to bidders.

§ 3.1.4 Bidders shall use complete Bidding Documents in preparing Bids. Neither the Owner nor Architect assumes responsibility for errors or misinterpretations resulting from the use of incomplete Bidding Documents.

§ 3.1.5 The Bidding Documents will be available for the sole purpose of obtaining Bids on the Work. No license or grant of use is conferred by distribution of the Bidding Documents.

§ 3.2 Modification or Interpretation of Bidding Documents

§ 3.2.1 The Bidder shall carefully study the Bidding Documents, shall examine the site and local conditions, and shall notify the Architect of errors, inconsistencies, or ambiguities discovered and request clarification or interpretation pursuant to Section 3.2.2.

§ 3.2.2 Requests for clarification or interpretation of the Bidding Documents shall be submitted by the Bidder in writing and shall be received by the Architect at least seven days prior to the date for receipt of Bids.
(Indicate how, such as by email, website, host site/platform, paper copy, or other method Bidders shall submit requests for clarification and interpretation.)

§ 3.2.3 Modifications and interpretations of the Bidding Documents shall be made by Addendum. Modifications and interpretations of the Bidding Documents made in any other manner shall not be binding, and Bidders shall not rely upon them.

§ 3.3 Substitutions

§ 3.3.1 The materials, products, and equipment described in the Bidding Documents establish a standard of required function, dimension, appearance, and quality to be met by any proposed substitution.

§ 3.3.2 Substitution Process

§ 3.3.2.1 Written requests for substitutions shall be received by the Architect at least ten days prior to the date for receipt of Bids. Requests shall be submitted in the same manner as that established for submitting clarifications and interpretations in Section 3.2.2.

§ 3.3.2.2 Bidders shall submit substitution requests on a Substitution Request Form if one is provided in the Bidding Documents.

§ 3.3.2.3 If a Substitution Request Form is not provided, requests shall include (1) the name of the material or equipment specified in the Bidding Documents; (2) the reason for the requested substitution; (3) a complete description of the proposed substitution including the name of the material or equipment proposed as the substitute, performance and test data, and relevant drawings; and (4) any other information necessary for an evaluation. The request shall include a statement setting forth changes in other materials, equipment, or other portions of the Work, including changes in the work of other contracts or the impact on any Project Certifications (such as LEED), that will result from incorporation of the proposed substitution.

§ 3.3.3 The burden of proof of the merit of the proposed substitution is upon the proposer. The Architect's decision of approval or disapproval of a proposed substitution shall be final.

§ 3.3.4 If the Architect approves a proposed substitution prior to receipt of Bids, such approval shall be set forth in an Addendum. Approvals made in any other manner shall not be binding, and Bidders shall not rely upon them.

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§ 3.3.5 No substitutions will be considered after the Contract award unless specifically provided for in the Contract Documents.

§ 3.4 Addenda

§ 3.4.1 Addenda will be transmitted to Bidders known by the issuing office to have received complete Bidding Documents.

(Indicate how, such as by email, website, host site/platform, paper copy, or other method Addenda will be transmitted.)

§ 3.4.2 Addenda will be available where Bidding Documents are on file.

§ 3.4.3 Addenda will be issued no later than two days prior to the date for receipt of Bids, except an Addendum withdrawing the request for Bids or one which includes postponement of the date for receipt of Bids.

§ 3.4.4 Prior to submitting a Bid, each Bidder shall ascertain that the Bidder has received all Addenda issued, and the Bidder shall acknowledge their receipt in the Bid.

ARTICLE 4 BIDDING PROCEDURES

§ 4.1 Preparation of Bids

§ 4.1.1 Bids shall be submitted on the forms included with or identified in the Bidding Documents.

§ 4.1.2 All blanks on the bid form shall be legibly executed. Paper bid forms shall be executed in a non-erasable medium.

§ 4.1.3 Sums shall be expressed in both words and numbers, unless noted otherwise on the bid form. In case of discrepancy, the amount entered in words shall govern.

§ 4.1.4 Edits to entries made on paper bid forms must be initialed by the signer of the Bid.

§ 4.1.5 All requested Alternates shall be bid. If no change in the Base Bid is required, enter "No Change" or as required by the bid form.

§ 4.1.6 Where two or more Bids for designated portions of the Work have been requested, the Bidder may, without forfeiture of the bid security, state the Bidder's refusal to accept award of less than the combination of Bids stipulated by the Bidder. The Bidder shall neither make additional stipulations on the bid form nor qualify the Bid in any other manner.

§ 4.1.7 Each copy of the Bid shall state the legal name and legal status of the Bidder. As part of the documentation submitted with the Bid, the Bidder shall provide evidence of its legal authority to perform the Work in the jurisdiction where the Project is located. Each copy of the Bid shall be signed by the person or persons legally authorized to bind the Bidder to a contract. A Bid by a corporation shall further name the state of incorporation and have the corporate seal affixed. A Bid submitted by an agent shall have a current power of attorney attached, certifying the agent's authority to bind the Bidder.

§ 4.1.8 A Bidder shall incur all costs associated with the preparation of its Bid.

§ 4.2 Bid Security

§ 4.2.1 Each Bid shall be accompanied by the following bid security:

(Insert the form and amount of bid security.)

§ 4.2.2 The Bidder pledges to enter into a Contract with the Owner on the terms stated in the Bid and shall, if required, furnish bonds covering the faithful performance of the Contract and payment of all obligations arising thereunder. Should the Bidder refuse to enter into such Contract or fail to furnish such bonds if required, the amount of the bid security shall be forfeited to the Owner as liquidated damages, not as a penalty. In the event the Owner fails to comply with Section 6.2, the amount of the bid security shall not be forfeited to the Owner.

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§ 4.2.3 If a surety bond is required as bid security, it shall be written on AIA Document A310™, Bid Bond, unless otherwise provided in the Bidding Documents. The attorney-in-fact who executes the bond on behalf of the surety shall affix to the bond a certified and current copy of an acceptable power of attorney. The Bidder shall provide surety bonds from a company or companies lawfully authorized to issue surety bonds in the jurisdiction where the Project is located.

§ 4.2.4 The Owner will have the right to retain the bid security of Bidders to whom an award is being considered until (a) the Contract has been executed and bonds, if required, have been furnished; (b) the specified time has elapsed so that Bids may be withdrawn; or (c) all Bids have been rejected. However, if no Contract has been awarded or a Bidder has not been notified of the acceptance of its Bid, a Bidder may, beginning days after the opening of Bids, withdraw its Bid and request the return of its bid security.

§ 4.3 Submission of Bids

§ 4.3.1 A Bidder shall submit its Bid as indicated below:
(Indicate how, such as by website, host site/platform, paper copy, or other method Bidders shall submit their Bid.)

§ 4.3.2 Paper copies of the Bid, the bid security, and any other documents required to be submitted with the Bid shall be enclosed in a sealed opaque envelope. The envelope shall be addressed to the party receiving the Bids and shall be identified with the Project name, the Bidder's name and address, and, if applicable, the designated portion of the Work for which the Bid is submitted. If the Bid is sent by mail, the sealed envelope shall be enclosed in a separate mailing envelope with the notation "SEALED BID ENCLOSED" on the face thereof.

§ 4.3.3 Bids shall be submitted by the date and time and at the place indicated in the invitation to bid. Bids submitted after the date and time for receipt of Bids, or at an incorrect place, will not be accepted.

§ 4.3.4 The Bidder shall assume full responsibility for timely delivery at the location designated for receipt of Bids.

§ 4.3.5 A Bid submitted by any method other than as provided in this Section 4.3 will not be accepted.

§ 4.4 Modification or Withdrawal of Bid

§ 4.4.1 Prior to the date and time designated for receipt of Bids, a Bidder may submit a new Bid to replace a Bid previously submitted, or withdraw its Bid entirely, by notice to the party designated to receive the Bids. Such notice shall be received and duly recorded by the receiving party on or before the date and time set for receipt of Bids. The receiving party shall verify that replaced or withdrawn Bids are removed from the other submitted Bids and not considered. Notice of submission of a replacement Bid or withdrawal of a Bid shall be worded so as not to reveal the amount of the original Bid.

§ 4.4.2 Withdrawn Bids may be resubmitted up to the date and time designated for the receipt of Bids in the same format as that established in Section 4.3, provided they fully conform with these Instructions to Bidders. Bid security shall be in an amount sufficient for the Bid as resubmitted.

§ 4.4.3 After the date and time designated for receipt of Bids, a Bidder who discovers that it made a clerical error in its Bid shall notify the Architect of such error within two days, or pursuant to a timeframe specified by the law of the jurisdiction where the Project is located, requesting withdrawal of its Bid. Upon providing evidence of such error to the reasonable satisfaction of the Architect, the Bid shall be withdrawn and not resubmitted. If a Bid is withdrawn pursuant to this Section 4.4.3, the bid security will be attended to as follows:
(State the terms and conditions, such as Bid rank, for returning or retaining the bid security.)

ARTICLE 5 CONSIDERATION OF BIDS

§ 5.1 Opening of Bids

If stipulated in an advertisement or invitation to bid, or when otherwise required by law, Bids properly identified and received within the specified time limits will be publicly opened and read aloud. A summary of the Bids may be made available to Bidders.

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§ 5.2 Rejection of Bids
Unless otherwise prohibited by law, the Owner shall have the right to reject any or all Bids.

§ 5.3 Acceptance of Bid (Award)
§ 5.3.1 It is the intent of the Owner to award a Contract to the lowest responsive and responsible Bidder, provided the Bid has been submitted in accordance with the requirements of the Bidding Documents. Unless otherwise prohibited by law, the Owner shall have the right to waive informalities and irregularities in a Bid received and to accept the Bid which, in the Owner's judgment, is in the Owner's best interests.

§ 5.3.2 Unless otherwise prohibited by law, the Owner shall have the right to accept Alternates in any order or combination, unless otherwise specifically provided in the Bidding Documents, and to determine the lowest responsive and responsible Bidder on the basis of the sum of the Base Bid and Alternates accepted.

ARTICLE 6 POST-BID INFORMATION

§ 6.1 Contractor's Qualification Statement
Bidders to whom award of a Contract is under consideration shall submit to the Architect, upon request and within the timeframe specified by the Architect, a properly executed AIA Document A305™, Contractor's Qualification Statement, unless such a Statement has been previously required and submitted for this Bid.

§ 6.2 Owner's Financial Capability
A Bidder to whom award of a Contract is under consideration may request in writing, fourteen days prior to the expiration of the time for withdrawal of Bids, that the Owner furnish to the Bidder reasonable evidence that financial arrangements have been made to fulfill the Owner's obligations under the Contract. The Owner shall then furnish such reasonable evidence to the Bidder no later than seven days prior to the expiration of the time for withdrawal of Bids. Unless such reasonable evidence is furnished within the allotted time, the Bidder will not be required to execute the Agreement between the Owner and Contractor.

§ 6.3 Submittals
§ 6.3.1 After notification of selection for the award of the Contract, the Bidder shall, as soon as practicable or as stipulated in the Bidding Documents, submit in writing to the Owner through the Architect:

.1 a designation of the Work to be performed with the Bidder's own forces;
.2 names of the principal products and systems proposed for the Work and the manufacturers and suppliers of each; and
.3 names of persons or entities (including those who are to furnish materials or equipment fabricated to a special design) proposed for the principal portions of the Work.

§ 6.3.2 The Bidder will be required to establish to the satisfaction of the Architect and Owner the reliability and responsibility of the persons or entities proposed to furnish and perform the Work described in the Bidding Documents.

§ 6.3.3 Prior to the execution of the Contract, the Architect will notify the Bidder if either the Owner or Architect, after due investigation, has reasonable objection to a person or entity proposed by the Bidder. If the Owner or Architect has reasonable objection to a proposed person or entity, the Bidder may, at the Bidder's option, withdraw the Bid or submit an acceptable substitute person or entity. The Bidder may also submit any required adjustment in the Base Bid or Alternate Bid to account for the difference in cost occasioned by such substitution. The Owner may accept the adjusted bid price or disqualify the Bidder. In the event of either withdrawal or disqualification, bid security will not be forfeited.

§ 6.3.4 Persons and entities proposed by the Bidder and to whom the Owner and Architect have made no reasonable objection must be used on the Work for which they were proposed and shall not be changed except with the written consent of the Owner and Architect.

ARTICLE 7 PERFORMANCE BOND AND PAYMENT BOND

§ 7.1 Bond Requirements
§ 7.1.1 If stipulated in the Bidding Documents, the Bidder shall furnish bonds covering the faithful performance of the Contract and payment of all obligations arising thereunder.

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§ 7.1.2 If the furnishing of such bonds is stipulated in the Bidding Documents, the cost shall be included in the Bid. If the furnishing of such bonds is required after receipt of bids and before execution of the Contract, the cost of such bonds shall be added to the Bid in determining the Contract Sum.

§ 7.1.3 The Bidder shall provide surety bonds from a company or companies lawfully authorized to issue surety bonds in the jurisdiction where the Project is located.

§ 7.1.4 Unless otherwise indicated below, the Penal Sum of the Payment and Performance Bonds shall be the amount of the Contract Sum.
(If Payment or Performance Bonds are to be in an amount other than 100% of the Contract Sum, indicate the dollar amount or percentage of the Contract Sum.)

§ 7.2 Time of Delivery and Form of Bonds
§ 7.2.1 The Bidder shall deliver the required bonds to the Owner not later than three days following the date of execution of the Contract. If the Work is to commence sooner in response to a letter of intent, the Bidder shall, prior to commencement of the Work, submit evidence satisfactory to the Owner that such bonds will be furnished and delivered in accordance with this Section 7.2.1.

§ 7.2.2 Unless otherwise provided, the bonds shall be written on AIA Document A312, Performance Bond and Payment Bond.

§ 7.2.3 The bonds shall be dated on or after the date of the Contract.

§ 7.2.4 The Bidder shall require the attorney-in-fact who executes the required bonds on behalf of the surety to affix to the bond a certified and current copy of the power of attorney.

ARTICLE 8 ENUMERATION OF THE PROPOSED CONTRACT DOCUMENTS
§ 8.1 Copies of the proposed Contract Documents have been made available to the Bidder and consist of the following documents:

.1 AIA Document A101™–2017, Standard Form of Agreement Between Owner and Contractor, unless otherwise stated below.
(Insert the complete AIA Document number, including year, and Document title.)

.2 AIA Document A101™–2017, Exhibit A, Insurance and Bonds, unless otherwise stated below.
(Insert the complete AIA Document number, including year, and Document title.)

.3 AIA Document A201™–2017, General Conditions of the Contract for Construction, unless otherwise stated below.
(Insert the complete AIA Document number, including year, and Document title.)

.4 AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, dated as indicated below:
(Insert the date of the E203-2013.)

.5 Drawings

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Number	Title	Date

.6 Specifications

Section	Title	Date	Pages

.7 Addenda:

Number	Date	Pages

.8 Other Exhibits:
(Check all boxes that apply and include appropriate information identifying the exhibit where required.)

[ ] AIA Document E204™–2017, Sustainable Projects Exhibit, dated as indicated below:
(Insert the date of the E204-2017.)

[ ] The Sustainability Plan:

Title	Date	Pages

[ ] Supplementary and other Conditions of the Contract:

Document	Title	Date	Pages

.9 Other documents listed below:
(List here any additional documents that are intended to form part of the Proposed Contract Documents.)

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GENERAL ITEMS – ALL TRADE PACKAGES

BIDDING AND CONTRACT REQUIREMENTS
CONSTRUCTION MANAGER PROJECT MANUAL
ADDITIONS & ALTERATIONS TO: OLD GREENWICH SCHOOL
FOR THE BOARD OF EDUCATION OF THE TOWN OF GREENWICH
GREENWICH, CT

The following items should be considered inclusive to all Bid Packages:

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1. **CONTRACT DOCUMENTS** - The Contract Documents for this Bid Package include but are not limited to:
   - A. SP+A Project Manual, Specifications and Supplementary Information for Additions and Alterations to Old Greenwich School, (Volume I) dated August 29, 2024 and its complete contents;
   - B. SP+A Project Manual, Specifications and Supplementary Information for Additions and Alterations to Old Greenwich School, (Volume 2) dated August 29, 2024 and its complete contents;
   - C. SP+A Project Manual, Specifications and Supplementary Information for Additions and Alterations to Old Greenwich School, (Volume 3) dated August 29, 2024 and its complete contents; including Appendices – Geotechnical Engineering Study as prepared by Langan dated May 24, 2023 and the Revised Limited NESHAP Pre-Renovation Hazardous Materials Survey Report as prepared by Langan dated September 13, 2023;
   - D. SP+A complete set of drawings (Volume 1) for Additions and Alterations to Old Greenwich School dated August 29, 2024 (See complete drawing sets);
   - E. SP+A complete set of drawings (Volume 2) for Additions and Alterations to Old Greenwich School dated August 29, 2024 (See complete drawing sets);
   - F. Downes Construction's Project Manual / Bidding and Contract Requirements for Invitation To Bid #01 and its complete contents dated November 1, 2024;
   - G. Invitation To Bid dated November 1, 2024 (Bound in Downes Project Manual);
   - H. AIA Document A701 – 2018 – Instructions to Bidders
   - I. This General Items – All Trade Packages (Bound in Downes Project Manual);
   - J. Scopes of Work (Bound in Downes Project Manual);
   - K. Bid Form (Bound in Downes Project Manual);
   - L. Acknowledgment of Surety (Bound in Downes Project Manual);
   - M. Non-Collusion Affidavit (Sample Form) (Bound in Downes Project Manual);
   - N. Insurance Accord Form (Sample Bound in Downes Project Manual);
   - O. AIA Document A305 – 2020 – Contractor's Qualification Statement
   - P. Prevailing Wage Rates (Bound in Downes Project Manual);
   - Q. Downes Supplemental Instructions (Bound in Downes Project Manual);
   - R. Construction Phasing / Schedule (Bound in Downes Project Manual);
   - S. Drawing & Specification Log (Bound in Downes Project Manual);
   - T. AIA Document A401 – 2017 - Agreement between Contractor and Subcontractor (Sample Bound in Downes Project Manual);
   - U. Downes Sample Forms (Bound in Downes Project Manual):
     - A. Sample Insurance Accord Form
     - B. Partial Waiver of Lien
     - C. Final Lien Waiver
     - D. Stored Material Sample Forms

E. Submittal Cover Sheet Forms
F. Sample Warranty / Guarantee
G. Change Order Proposal Form
H. Background Check Compliance Agreement
I. Subcontractor Orientation

V. AIA Document A133 – 2019 Standard Form of Agreement Between Owner and Construction Manager as Constructor;
W. AIA Document A201 - 2017 - General Conditions of the Contract for Construction
X. Site Logistics Plan SL-1 (Located in combined plans)
Y. Addenda and/or supplementary information as may be issued within the bid period.;

2. **TAX** - This project is tax exempt. Reference Supplemental Instructions Paragraph C.

3. **SUPPLEMENTAL INSTRUCTIONS -** All components within the Downes Construction Supplemental Instructions shall apply to all subcontractors. All subcontractors are reminded to review the Downes Supplemental Instructions thoroughly prior to submitting their bid as they will be strictly enforced after contract award. The Downes Supplemental Instructions includes the following sections for references purposes:

Intent
Section 1 - Definitions
Section 2 - General Requirements
A. Contract
B. Performance and Payment Bonds
C. Sales Tax Bond
D. Insurance Requirements
E. Billing & Payment Procedures
F. Certified Payrolls & Monthly Employment Utilization Reports
G. Submittal Procedures
H. Hourly Rates
I. Change Order Proposals
J. Time and Material Work
K. Requests for Information (RFI)
L. Daily Reports.
M. Construction Progress Meetings
N. Preconstruction/Pre-Installation Meetings
O. Foreman Meetings
P. MEP Coordination Process
Q. Project Schedule and Progress
R. Safety and HAZCOM
S. Pedestrian/Vehicular Traffic Control
T. Document Distribution
U. Permits

Section 2 - General Requirements (cont.)
V. Noisy Operations
W. Working Hours
X. Parking
Y. Delivery and Storage of Materials
Z. Trailers
AA. Use of Equipment
BB. Temporary Construction Fence
CC. Security
DD. Temporary Utilities and Services
EE. Protection of Existing Utilities and Services
FF. Existing Conditions
GG. Hoisting
HH. Survey & Layout
II. Cleanup
JJ. Material Furnished by others
KK. Cutting and Patching
LL. Firestopping
MM. Responsibility for Notification
NN. Subcontractor's experience and coordination with other trades
OO. Quality
PP. Project Closeout
QQ. Personal Conduct
RR. Background Investigations
SS. Temporary Workers

TT. Project Management Software

Continued in column to the right

4. **PANDEMIC PROCEDURES –** All Subcontractors are responsible for providing and maintaining a PANDEMIC safety and protection plan for their own employees that is up to date with current guidelines from the local and federal government. This Safety & Protection plan shall be provided to Downes Construction prior to site mobilization. Furthermore, all Subcontractors are responsible for providing their employees with the proper PPE to be in compliance with local and federal recommendations and mandates in addition to PPE required due to standard construction work. Social distancing shall be maintained and appropriate face coverings shall be used during the course of work activities on this site. All subcontractors are required to notify the CM of any workers who have tested positive or are considered a close contact so we may determine the required actions per the current CDC guidelines at that time to ensure a safe workplace and worker safety at all times.

5. **QUALIFICATION STATEMENT –** Any subcontractor bidding on this scope of work shall provide sufficient evidence of completion of (3) similar size/scope of municipal or state projects within the past 5 years in order to be eligible to submit pricing for the scope of work described within. Provide sufficient documentation and a project list attached to your bid form for documentation purposes to ensure your firm is capable of completing this scope of work. Failure to do so could result in possible rejection of your bid(s). Refer to AIA A305 form for inclusion as part of your bid.

6. **CONSTRUCTION IMPACT ON ADJACENT STREETS AND PROPERTY** -All Subcontractors must pay special attention to pedestrian and vehicular activity that will occur adjacent to construction activities and the jobsite. Vehicles and equipment shall not be left unattended at any time and shall not interfere with pedestrian and vehicular traffic. Deliveries must be closely coordinated with the Construction Manager. Due to the close proximity of adjacent buildings and structures construction means and methods may have to be adjusted to prevent damage and disruption of business activities.

7. **PERSONNEL CONDUCT** - There will be a strict policy of absolutely **NO CONTACT OR FRATERNIZATION WITH TOWN PERSONNEL** and NO use of foul or offensive language on the jobsite. In addition, there is NO SMOKING allowed on the jobsite. Immediate and permanent dismissal will result for failure to abide by these policies. See Supplemental Instructions Paragraph QQ and RR for additional information.

8. **CONSTRUCTION INDOOR AIR QUALITY MANAGEMENT PLAN –** All Subcontractors are responsible for submitting a complete Construction Indoor Air Quality Management Plan during construction.

9. **INSURANCE** - ALL Subcontractors and their lower tier Subcontractors must submit insurance certificates to Downes Construction prior to starting work. Insurance coverage shall be in complete accordance with Attachment “A” and the Supplemental Instructions paragraph D. Those contractors generating and disposing of possible or confirmed polluted, contaminated or hazardous materials shall carry Pollution Liability Coverage.

10. **JOBSITE SAFETY TRAINING AND IDENTIFICATION -** Downes will hold a jobsite safety and orientation meeting for all subcontractors. Each and every one of the Subcontractors employees must understand, acknowledge and fully execute the orientation form. “Safety Trained Hard Hat Label Identification” stickers will be distributed and logged at that time. These stickers shall be placed on the individual’s hard hat in a prominent location. See Supplemental Instructions Paragraph R for additional information.

11. **STORED MATERIALS** – All Subcontractors should note that payment of stored materials will be acceptable in accordance with Supplemental Instructions Paragraph E. There will be no long-term storage of equipment or materials available on the jobsite.

12. **BACKGROUND CHECKS AND BADGING** – As per Invitation To Bid.

13. **SCAFFOLDING USE PROGRAM** – Each Subcontractor is responsible for complying with the Downes Scaffolding Use Program. Copy available upon request.

14. **PERIMETER FALL PROTECTION** - Each Subcontractor shall check and maintain protection of all slab openings and perimeter fall protection when executing their work. Each Subcontractor shall provide all temporary protection and/or barricades per OSHA requirements in all areas as required in completing this scope of work. Each subcontractor is also responsible for maintaining and/or removing this same protection until completion of this scope and/or safety is assumed by another subcontractor. Safety measures CANNOT be removed by any Subcontractor because it interferes with a part of their scope of work without providing an acceptable revised system. If the work is completed and these safety measures are no longer required per OSHA or to establish safe working conditions for all trades, then the Subcontractor who installed them shall remove them in their entirety.

15. **DAILY CLEANUP** - Each Subcontractor is responsible for their own cleanup including food and beverage containers, trash and debris generated by this subcontractor, as outlined in the Supplemental Instructions Paragraph II. Cleanup will take place daily. In addition to the aforementioned cleanup requirements, each Subcontractor shall include at a minimum three (3) labor hours each week they are on site to provide project cleanup, as directed by Downes . Disposal of trash and debris will be in the assigned dumpster provided by Downes , unless noted otherwise within this scope of work. Cleanup by this trade will be monitored accordingly by Downes . If this subcontractor is non-compliant Downes reserves the right to supplement cleanup for this subcontractor 24 hours after written notice of non-compliance. All associated costs for supplemented labor is the responsibility of this Subcontractor and will be at no additional cost to the Owner or Downes .

16. **SCHEDULE** – The schedule included with the bidding documents is provided to give the bidder a general time frame as to when their scope of work will take place. Changes to this schedule during construction will not be grounds for any change orders or claims. This Subcontractor is responsible for providing the Construction Manager a detailed schedule including submittals, deliveries, and man-loading. **This Subcontractor is to understand that this project is a "fast-track" project and they will be held in strict compliance with the time frames included in the preliminary baseline schedule. "Time is of the essence" in approaching work.**
    If, in the opinion of the Construction Manager, any construction activity completion date, milestone and/or substantial completion dates are in jeopardy of being met as a result of a Trade Contractors performance, then upon three days' notice from the Construction Manager, the Trade Contractor agrees to work overtime, add manpower, and do whatever is necessary to meet said construction activity, milestone and substantial completion dates at no additional cost to the Owner. The Trade Contractor shall be responsible for any additional costs incurred by others, (including supervision by the Construction Manager) for this overtime work. If, in the opinion of the Construction Manager, the Trade Contractor has failed to take sufficient action to meet the referenced dates, after receiving the three-

day notice, the Construction Manager may take whatever action it deems necessary to attempt to meet the construction activity, milestone and/or substantial completion dates. The cost of such action shall be the responsibility of the Trade Contractor and deducted from the contract if sufficient monies remain. If insufficient funds remain to be paid, the Trade Contractor shall pay the Construction Manager or the Owner. The Construction Manager, by taking action under this paragraph shall not assume responsibility for meeting the referenced dates, or responsibility for the work. Such responsibilities shall remain with the Trade Contractor and the Trade Contractor's Bonding Company. The costs referenced in this paragraph are not in substitution of or in lieu of liquidated damages, which may be assessed pursuant to other provisions of this contract.

WORK HOURS TO BE INCLUDED IN BASE BID: All Subcontractors are required to work a six (6) day work week. Full crews are to be included. At the conclusion of the work day Friday, if there is work still to be performed by the Trade Contractor, then that contractor will be required to work Saturday. Associated premium time is to be included in the base bid.

17. **PROJECT MANAGEMENT SYSTEMS** (Subscription fee to be included in bid)
    a. All Subcontractors will be required to use GCPay. GCPay is a cloud collaboration platform managing the entire construction project application, assessment and payment process. GCPay automates construction payment management processes, specifically invoicing, lien waivers, compliance and electronic payments, for both general contractors and subcontractors. Instruction will be provided.
    b. All Subcontractors will be required to use PROCORE. PROCORE is a cloud-based construction management virtual data room (VDR) application that will increase project efficiency and accountability by providing streamlined project communication and documentation.
        I. Through PROCORE, trade contractors will:
            - Submit and receive all project communications
            - Submit RFIs and review responses
            - Submit trade contractor daily reports
            - Submit all shop drawings, product data, close-out documentation and other required submittals
            - Respond to Observations, Safety Concerns
            - Other as directed by CM
        II. Each Subcontractor (Trade Bid Package) is responsible for a lump sum subscription fee to be paid directly to Downes in the first billing cycle. The Subscription fee for GC Pay is calculated as 0.56% of the trade contract value (i.e. Trade Contract Value *X* .0056). This fee will be deducted from the Subcontractor's initial Application for Payment and includes other software that will be used in the completion of this project. In addition, there will be a flat fee of $15 per approved application for GCPay. Other than the Subscription fee, there are no other licensing or monthly service fees for using PROCORE for the life of the project.
        III. Each Subcontractor will be responsible to have a full-time on-site representative who is equipped with a tablet device with internet access along with the PROCORE APP downloaded to it. Each trade contractor shall be responsible for updating/upgrading their tablet device to ensure that all functions of PROCORE can be utilized. Subcontractors are able to manage their projects from any web-connected mobile device, tablet, laptop, or desktop.
        IV. All Subcontractors must have a valid e-mail address to access PROCORE in the field and they will receive an e-mail notification when an observation, RFI, submittal etc. has been assigned or is pertinent to their company via PROCORE. Trade contractors are required to respond to all items

within PROCORE by the due date specified for each particular issue. Issues that are not resolved by the specified due date will be assessed as they relate to progress billings for the assigned trade contractor.

V. The use of PROCORE will ensure high-quality work with minimized corrections which, in turn, will shorten the project close-out and expedite the release of retainage payments to trade contractors. Failure to actively participate with PROCORE will lead to delayed payment and a longer closeout period.

18. This Subcontractor is responsible for all Contract Drawing Notes, Key Notes and General Notes, as they relate to this Subcontractors scope of work.

19. This Subcontractor is responsible for all related specifications as they relate to this scope of work, regardless of whether or not the Specification is noted above.

20. The General Building Permit will be obtained by others. All MEFP Subcontractors shall file, pay for (unless fee is waived by owner) and obtain all required permits/licenses for this scope of work beyond the general building permit. All Subcontractors must provide copies of all permits/licenses before commencing with work. In addition, all inspections, filings, fees and certificates required by the City and state authorities having jurisdiction for approval of this work is the responsibility of this Subcontractor.

21. This Subcontractor is responsible for all Owner requirements and to follow all local and state building codes.

22. If required by the Architect/Engineer, this Subcontractor shall sign any required release and pay for any CAD/Revit files to be utilized for coordination or any other purpose.

23. This Subcontractor will be required to make multiple mobilizations in order to meet the project schedule. No additional compensation will be issued for multiple mobilizations.

24. This Subcontractor is required to familiarize themselves with existing conditions and items to remain prior to commencing with this scope of work. Every effort is expected to be made NOT to damage the existing conditions. This Subcontractor will be responsible for repair and/or replacement of any damage attributable to this scope of work.

25. This Subcontractor shall provide 3rd party monitoring and testing as a means to verify ground accelerations during construction activities that may lead to adverse effects on adjacent properties, structures and or utilities. Work methods shall be revised to bring accelerations within acceptable tolerances.

26. This Subcontractor is responsible for all layout by a licensed surveyor, all field engineering, field layout, field measuring, surveying, verification of field dimensions required to execute this scope of work. This Subcontractor will establish all line and grade for the performance of this scope of work and shall coordinate with other Subcontractors on site. Downes or a designated contractor will provide horizontal and vertical control points for layout/engineering purposes for this Subcontractor to execute this scope of work.

27. This Subcontractor is responsible to refer to the Site Logistics plan for access, temporary fence and notes. Downes reserves the right to change any aspect of phasing and/or site logistics in the best interests of the Owner. This Subcontractor is responsible to provide and maintain access to the new and existing buildings for all trades, throughout the course of construction.

28. Unless assigned in the bid package scope of work; furnishing, Installing and Maintaining the construction temporary chain link fence is by others, except where removal, relocation, installation of additional temporary fence is needed to facilitate this Subcontractors Scope of Work.

29. **PARKING** There shall be NO subcontractor parking on school grounds unless specifically authorized by DCC and Town of Greenwich Board of Education. All Subcontractor employees shall utilize appropriate legal parking and not park in adjacent residential roadways. Employee parking is the responsibility of the employer (subcontractor) and provisions shall be included in the base bid for any conveyance to and from the site. DCC shall not be responsible for and loss related to, on or offsite parking.

30. If any items are duplicated, the greater of the two shall be carried unless an RFI is asked before a letter of intent or contract.

31. **Liquidated Damages** per section 6.1.6 AIA133 – 2019 will be assessed per schedule phases. Individual trade partners will be held accountable for any slippage that will hold up millstones & completion as shown on the schedule. It is imperative that all documents required are turnover in a timely manner as to not allow missed dates on the phased schedules. These include but are not limited to the following: Contract execution, COI's, Submittals, RFI's, Fabrication timeline, attending meetings & manpower.

END GENERAL ITEMS – ALL TRADE PACKAGES

BID FORM

PROJECT: **ADDITIONS & ALTERATIONS TO:**
OLD GREENWICH SCHOOL
285 SOUND BEACH AVENUE
GREENWICH, CT

DATE: _____

TO: Board of Education of The Town of Greenwich
Havemeyer Building
290 Greenwich Ave, Greenwich, CT 06830

Pursuant to and in compliance with the "**Invitation to Bid #01"** dated **November 01, 2024** the undersigned,

_____

_____

(Name of Firm)

having visited the site, familiarized him/ herself with the conditions present and carefully examined all Contract Documents (Invitation To Bid, Bid Package Scope of Work, Downes Supplemental Instructions, complete Specifications and Drawings together with all Addenda) issued and received prior to closing time for receipt of bids as prepared by Downes Construction Company, LLC (Construction Manager), Silver Petrucelli & Associates (Architect) and their consultants hereby offers and agrees as follows:
To provide all labor, materials, equipment, tools, transportation, supervision, appurtenances and services required to diligently perform all work in connection with the above referenced project to the satisfaction of the Architect, Engineer Consultants, Construction Manager and Owner, specifically including the following Bid Package for the lump sum price as follows:

BID PACKAGE # AND DESCRIPTION:	
The undersigned hereby states that all work will be completed for the lump sum of:	
Lump Sum Bid in Words (Including bonds):	(Bid in words)
Lump Sum Bid Numerically (Including bonds):	**$** (Bid in numbers)
Breakout cost for 100% Performance and Labor and Material Payment Bonds Numerically:	**$** (Bond breakout in numbers)

BID FORM

Use the following section for **COMBINED BIDS ONLY**. Indicate N/A or leave blank if submitting a bid on only one package above or are electing not to submit a combined bid. Combination bids for any combination of bid packages will be accepted, provided the Bidder submits a bid for the individual packages to be combined. Combination bids are allowed only for bids due at the same time. Bid Combination offers should be submitted by letter in separate envelope marked "Combination Bid for Bid Packages (BP No. & Description)". The letter must be on a business letterhead and bear the signature of the individual signing the bid. A separate bid bond is not required for the combination bid. Bid Bonds for the individual bids are required.

COMBINED BIDS FOR BID PACKAGE #(s) AND DESCRIPTION(s): (Fill in to right)	
The undersigned hereby states that all work for the above COMBINED bid packages will be completed for the lump sum of:	
Lump Sum Bid in words (Including bonds):	
Lump Sum Bid Numerically (Including bonds):	**$** (Bid in numbers)
Breakout cost for 100% Performance and Labor and Material Payment Bonds Numerically:	**$** (Bond breakout in numbers)

We further agree that this price is all-inclusive and that all contract documents have been reviewed and that every question, conflict or issue has been addressed to our satisfaction. Therefore, no change orders will be issued unless unforeseen conditions are encountered or the owner or owner's representatives revise the scope of the work.

All bidders are required to provide line item values for the items identified below. Values can be provided with the bid submission or optionally at the scope review meeting. Bidders may add line items.

The following is a breakdown of our lump sum bid as requested in the bid package scope of work:

BID BREAKDOWN:				
PRODUCT ID	**PRODUCT ID**	**QUANTITY**	**LEADTIME** (PROVIDED BY BIDDER)	**TOTAL ($)** (PROVIDED BY BIDDER)
Submittals/Shop Drawings		Lump Sum		

BID FORM

Delivery/Storage		Lump Sum		
Delivery/Rigging to Site		Lump Sum		
Generator with Level 2 Sound Attenuated Enclosure	Generator	1		
ATS-E	Transfer Switches	1		
ATS-S	Transfer Switches	1		
SWBD-1 - 480-volt w/CT & Main Switch and utility meter enclosure	Switchboard	1		
SWBD-2 - 208-volt	Switchboard	1		
TX-1	Transformer	1		
TX-1E	Transformer	1		
TX-S1	Transformer	1		
DP-E2	Panelboard	1		
DP-S1	Panelboard	1		
DP-S2	Panelboard	1		
RP-SW (Wing D)	Panelboard	1		
SPP-1D (Wing D)	Panelboard	1		
60A Fused Disconnect Switch	Switches	1		
Testing/Startup		Lump Sum		
O&M/Spare Parts/Training		Lump Sum		
Clean-up		Lump Sum		
Closeout (O&Ms)		Lump Sum		
Other (Be specific on bid form)				
			Lump Sum Bid Total:	**$ Provided by bidder. Fill in on bid form.**

BID FORM

A. The bid includes the Addenda listed below:

Addendum #	Dated

Addendum #	Dated

B. Alternate pricing is proposed as follows: Indicate N/A in any blank spaces. Accepted alternates in addition to the base bid may affect the lowest responsible bidder. **- NOT APPLICABLE**

Section 012300-3

Alt. #	Description	Alternate Bid (Including Bonds)
1		
2		

C. Allowances <u>are included in the base bid</u> as follows as requested in the Bid Package Scope of Work. The undersigned bidder acknowledges that OH&P for these allowances are NOT included in the allowance but rather in the base bid separately. Unit Prices that may be used to arrive at allowances shall be valid for the life of the project. Un-used portions of allowances will be credited by deduct change order a project conclusion. Indicate N/A for those allowances that are not applicable to the bidders bid package or if none are requested in the bid package. Bidder to complete all calculations for allowances for their bid packages. Exclusion of allowances is NOT permissible. (**Refer to individual Bid Package Scopes of Work for allowances to be included in the lump sum bid) - NOT APPLICABLE**

BP X.X.X:				
Allowance 1	**ALLOWANCE - X**			
	Description	**Quantity**	**Unit Price**	**Amount**
A				
			Total Allowance 1 Included in Base Bid (Bidder to calculate):	**NA**
BP #X.X.X – Confirm by checking the following box that all of the <u>above</u> allowances are included in the Base Bid as directed. Confirmed ☐ Exclusion of allowances is NOT compliant with the bid documents.				

BID FORM

D. Unit pricing is proposed as follows: Unit Prices shall remain valid for the life of project. Include all costs for a complete installation and/or removal. All unit prices will be used for Adds or Deducts from the contract price and are to include all overhead, profit, insurance, bonds, etc. Indicate N/A in any blank spaces. (Refer to Bid Package Scope of Work for additional information**) – NOT APPLICABLE**

No.	Description	Unit Price	Unit

E. Labor rates are proposed as follows: Indicate N/A in any blank spaces. (Rates shall be valid for the life of the project and be inclusive of insurance, fringes, taxes & OH&P etc) (Attach Separate Breakdown Sheet)

Labor Classification / Trade	Straight Time	Time & one half	Double Time
****PROVIDE SEPARATE ATTACHMENT****			

F. Equipment rates are proposed as follows: Indicate N/A in any blank spaces. (Rates shall be valid for the life of the project and be inclusive of insurance, fringes, taxes & OH&P etc)

Equipment Rates	Straight Time	Time & one half	Double Time
****PROVIDE SEPARATE ATTACHMENT****			

G. TIME OF COMPLETION: We agree that the Work of the Contract shall begin within ten (10) calendar days after receipt of Notice of Intent to Award. Scheduling and allocation of manpower to accomplish the work shall be in conformance with the Phasing Diagrams, Site Logistics and the Contract Documents.

H. BID ACCEPTANCE: We agree that this proposal shall not be withdrawn for a period of 90 calendar days after the date of submittal. We understand that the owner reserves the right to accept or reject any or all bids and to waive any informality on the bidding process.

I. CONTRACT EXECUTION: Upon notification of acceptance of this proposal, we shall execute a formal contract (AIA) within ten (10) calendar days of the receipt of the agreement at a contract signing meeting at Downes Construction's main office.

We shall furnish a Performance Bond and Labor and Material Payment Bond in the full amount of the Contract with ten (10) days of receiving a notice to proceed/letter of intent <u>if requested</u>.

BID FORM

J. OTHER REQUIREMENTS:

It is understood that the Owner reserves the right to accept or reject any and all bids that the Owner deems to be in his best interest.

By submission of this proposal, the undersigned acknowledges that they have read their bid package scope of work, all drawings, all specifications, understand the schedule requirements and agrees to provide sufficient staff and organization and to select subcontractors and suppliers to comply with the requirements for submittals, delivery dates, work periods and completion dates as specified.

In accordance with Public Act 03-215 (an act concerning State construction contracts) and Public Act 04-141, for any contracts estimated in value to be greater than $1,000,000, bidders must be pre-qualified for the classification of work that they are bidding on. Each bidder shall provide a pre-qualification certificate issued by the State of Connecticut, Department of Administrative Services, which clearly shows their pre-qualification status. Each bidder shall also complete the Department of Administrative Services Contractor Pre-qualification Update Statement.

1. Provide the names of the Project Manager and Field Superintendent/Foreman the Contractor will use on this Project. On a separate sheet briefly summarize their experience.

Project Manager: _____

Field Superintendent/Foreman: _____

2. State the name of your insurance carrier and the A.M. Best & Company rating of your insurance carrier.

Insurance Carrier: _____

Rating: _____

3. State the general liability rate of your firm in the interstate and intrastate workers' compensation experience modification rate for your firm for the three (3) years.

General liability rate: _____

Workers' Compensation Experience Modification Rate: _____

BID FORM

K. ENCLOSURES:

Included with this proposal are the following:

1. Non-Collusion Affidavit;
2. Proof of Insurance in accordance with Contract Requirements;
3. Acknowledgement of Surety
4. Workman's Compensation Experience Modification Factor (EMR) form from insurer;
5. Contractor's Qualification Statement (AIA Document A305, 1986 Edition or similar);

The undersigned hereby certifies that he/she is able to furnish all labor, material and equipment necessary to complete the work as directed and/or described in the Contract Documents and to work in harmony with all other elements of labor employed or to be employed on the work.

_____	_____
Bidders Company Name	Individual
_____	_____
Business Address	Title
_____	_____
City, State, Zip	Signature
_____	
	Date

The Bidder is a/an (individual)(partnership)(corporation). Names and titles of other officers or partners are:

_____
_____
_____

(for corporation, give the State of Incorporation and affix the corporate seal)

Scope of Work:

BID PACKAGE #1.26.1 – EARLY RELEASE SWITCH GEAR/GENERATOR

1. This Bid Package Scope of work includes performing all **PRE-PURCHASE OF MAIN ELECTRICAL DISTRIBUTION EQUIPMENT, SWITCHBOARDS, TRANSFORMERS, DISCONNECT SWITCHES, PANELBOARDS, OVERCURRENT PROTECTIVE SHORT-CIRCUIT STUDY, ENCLOSED TRANSFER SWITCHES, ENGINE GENERATOR, AND ALL ASSOCIATED WORK** in accordance with the Contract Documents enumerate herein prepared by Silver Petrucelli + Associates, Inc. (Architect), their consultants, and Downes Construction (Construction Manager).

2. Furnish all labor, material and equipment necessary to complete all work that is described in the following Sections of the Specifications, or is shown on the drawings and relates to one of the following Specification Sections but is not referenced in a Specification Section.

Division / Specs. Sections	Description	Dated
Division 00 / Sections:	**PROCUREMENT & CONTRACT REQUIREMENTS**	
All Sections:	This Subcontractor is responsible for the Downes Project Manual and its complete contents as it relates to completing this scope of work.	TBD
Division 01 / Sections:	**GENERAL REQUIREMENTS**	
All Sections:	This Subcontractor is responsible for all sections in this division as it relates to completing this scope of work.	8/29/2024
Division 26 / Sections:	**ELECTRICAL**	
260500	Common Work Results for Electrical	8/29/2024
260548	Vibration and Seismic Controls for Electrical Systems*	8/29/2024
260553	Identification for Electrical Systems*	8/29/2024
260572	Overcurrent Protective Short-Circuit Study	8/29/2024
260573	Overcurrent Protective Device Coordination Study	8/29/2024
262200	Low Voltage Transformers*	8/29/2024
262413	Switchboards	8/29/2024
262416	Panelboards*	8/29/2024
262813	Fuses*	8/29/2024
262816	Enclosed Switches and Circuit Breakers*	8/29/2024
263213	Engine Generators	8/29/2024

263600	Transfer Switches	8/29/2024

Asterisk * = Limited scope under this package. See below for details

GENERAL

See separate document titled **GENERAL ITEMS – ALL TRADE PACKAGES**

SPECIFIC

3. **PRE-PURCHASE ELECTRICAL MAIN DISTRIBUTION EQUIPMENT & GENERATOR INTENT:**
   This Subcontractor will be assigned responsibility to pre-purchase the following:

   a) Switchboard #1 (SWBD-1) 480-volt w/CT & Main Switch and utility meter enclosure
   b) Switchboard #2 (SWBD-2) 208-volt
   c) Transformer TX-1
   d) Generator with Level 2 Sound Attenuated Enclosure
   e) ATS-E
   f) 60 amp Fused Disconnect Switch
   g) Transformer TX-1E
   h) Panel DP-E2
   i) ATS-S
   j) Panel DP-S1
   k) Transformer TX-S1
   l) Panel DP-S2
   m) Panel RP-SW (Wing D)
   n) Panel SPP-1D (Wing D)

4. This Subcontractor shall assume they will manage the process to ensure timely delivery of the new electrical main distribution equipment until such time the Phase 2 BP #2.26.1 Electrical Subcontractor (EC) is hired. At that time, the BP #2.26.1 – Electrical Subcontractor will take the responsibility for receiving and installing the equipment.

5. This Subcontractor shall Furnish & Deliver the switchboard and distribution panelboards as indicated in the contract documents. Multiple deliveries to the project site or to EC's rigging yard (assumed no greater than 30 miles from site) to maintain project schedule will be required.

6. This Subcontractor shall be responsible for Freight on Board (FOB) to the jobsite or rigging yard. This Subcontractor is responsible for protection while in transit from weather.

7. This Subcontractor shall be responsible for all rigging hoisting and crane setups as required to complete this scope of work. Crane pick plans in accordance with OSHA will be required prior to mobilizing on the project site.

8. This Subcontractor will be responsible for coordinating the delivery of equipment to the project site with the Construction Manager and the Electrical Subcontractor that will be performing the installation.

9. This Subcontractor is responsible for all submittals, shop drawings, overcurrent protection device coordination study as indicated in the contract documents.

10. This Subcontractor shall be responsible for all factory testing, O&M and as-built data, spare parts and maintenance materials.

11. This Subcontractor shall be responsible for providing all technical representative services on-site for QC/QA compliance meetings, installation supervision, startup, field testing, functional testing, NFPA 110 Acceptance test, load test, sound level testing, NETA test, witness trip & relay settings, inspect equipment prior to energizing and owner training.

12. This Subcontractor shall be responsible for the Switchboard/Panelboard Warranty as indicated in the contract documents.

13. The following items will be by others:

    a) The Generator, ATS, Switchboard and panelboard <u>installation</u> and <u>final connections</u>
    b) All wiring
    c) Feeder connections
    d) Grounding
    e) Engraved Labeling
    f) Cleaning
    g) Coordination drawings with other trades

14. This Subcontractor shall Furnish and Deliver the engine generator with Level 2 Sound Attenuated Enclosure and Automatic Transfer Switches, including load bank as indicated in the contract documents.

15. This Subcontractor shall assume multiple deliveries to the site or to EC's rigging yard (assumed no greater than 30 miles from site) to maintain project schedule:
    a) Delivery 1 – Remote Annunciator Panel and Remote Emergency Stop for installation by others prior to generator delivery.
    b) Delivery 2 – ATS-E & ATS-S
    c) Delivery 3 – Generator and remaining components

16. This Subcontractor shall be responsible for replacing the air, oil and fuel filters between acceptance test and Substantial Completion.

17. This Subcontractor shall be responsible for the engine generator & ATS full service and maintenance for one-year from date of Owner Acceptance.

18. This Subcontractor is responsible for the special Five-year manufacturer warranty as indicated in the contract documents.

19. This Subcontractor is required to provide mockups as required, in accordance with the Specifications and Architect, Owner or Downes requests.

20. All products shall meet the warranty requirements as set forth in the relevant specification sections. Written warranties shall be signed by the Manufacturer, Installer, and by this Subcontractor.

21. This Subcontractor is required to touch-up all factory finished surfaces which are scratched, bare or become rusty due to shop coating errors, inadequate protection or storage, careless erection procedures, etc., all to the satisfaction of the Architect, Construction Manager and Owner.

22. **GUARANTEE/WARRANTEE PERIOD –** This Subcontractor shall provide full maintenance and warranties for this Scope of Work for **EIGHTEEN (18) MONTHS** from the substantial completion date. Signed Agreements are to be made with the Owner. Substantial Completion will be signified by the issuance of an AIA G704 form. In addition:
    1. The above mentioned 18-month warranty is in addition to all Special Warranties identified in the Contract Documents.
    2. This Subcontractor shall warranty that the equipment, materials and workmanship are of good quality and new and that the work shall be free from defects not inherent in the quality required or permitted and that the Work confirms to the Contract Documents.
    3. Provide all necessary extended maintenance agreements, warranties, and guarantees to account for the time period from start-up to substantial completion. This is in addition to the contractually required maintenance agreements, warranties and guarantees.
    4. The Owner's warranty (including all warranties specified) shall be exactly as specified and shall not commence until the final acceptance date.
    5. All materials and equipment are to be "like new" prior to turnover to Owner. Signed Agreements are to be made with the Owner, if applicable.
    6. If the project is Phased and if agreeable to the Architect and Owner, a partial Substantial Completion for the phases will be established signifying the start of Guarantees/Warrantees.
    7. Provide additional and special Guarantees/Warrantees as may be required per the Specifications.
    8. This Subcontractor is responsible to provide maintenance for all materials and equipment installed under this scope of work until the project substantial completion date.
    9. This Subcontractor is responsible to present the Owner with all special maintenance contracts/agreements required and specified within the Contract Documents prior to substantial completion.
    10. This Subcontractor acknowledges they will provide a full investigation of any warranty claim made by the Owner and shall provide any means / methods required in the field to review such claims at no additional cost.
    11. This Subcontractor is required to participate in any collaborative effort required with other trades in regards to warranty claims made by the Owner at no additional cost.

23. In reference to the Specifications Sections marked with asterisk (*) under Item #2 above please find the following scope clarifications:

24. This Subcontractor shall specifically **EXCLUDE** the following: None

25. The above listed items are NOT intended to be an all-inclusive listing of the scope of work required to be performed by this Subcontractor but merely to highlight major items of work. It is this Subcontractor's sole

responsibility to review all drawings, specifications and other contract documents in order include a complete scope.

26. **BID BREAKDOWN** - This Subcontractor shall provide the following breakdown of their bid in the designated spaces on the Bid Form:

BID BREAKDOWN:				
PRODUCT ID	**PRODUCT ID**	**QUANTITY**	**LEADTIME** (PROVIDED BY BIDDER)	**TOTAL ($)** (PROVIDED BY BIDDER)
Submittals/Shop Drawings		Lump Sum		
Delivery/Storage		Lump Sum		
Delivery/Rigging to Site		Lump Sum		
Generator with Level 2 Sound Attenuated Enclosure	Generator	1		
ATS-E	Transfer Switches	1		
ATS-S	Transfer Switches	1		
SWBD-1 - 480-volt w/CT & Main Switch and utility meter enclosure	Switchboard	1		
SWBD-2 - 208-volt	Switchboard	1		
TX-1	Transformer	1		
TX-1E	Transformer	1		
TX-S1	Transformer	1		
DP-E2	Panelboard	1		
DP-S1	Panelboard	1		
DP-S2	Panelboard	1		
RP-SW (Wing D)	Panelboard	1		
SPP-1D (Wing D)	Panelboard	1		
60A Fused Disconnect Switch	Switches	1		
Testing/Startup		Lump Sum		
O&M/Spare Parts/Training		Lump Sum		
Clean-up		Lump Sum		
Closeout (O&Ms)		Lump Sum		
Other (Be specific on bid form)				
			Lump Sum Bid Total:	**$ Provided by bidder. Fill in on bid form.**

1. **STARTUP CHECKLIST** - This Subcontractor will not be allowed to begin work on the project until the following items have been submitted: Executed Contract, Performance and Payment Bonds, Certificate of Insurance in accordance with the contract documents, Project Specific Safety Plan including SDS sheets, Job Hazard Analysis and other such information requested by the Downes or required by the contract documents. Downes Construction is not responsible for any associated costs incurred prior submission and/or execution of these items.

2. **SUBMITTALS** – Reference Supplemental Instructions Paragraph G.

3. **SCHEDULE** – The schedule included with the bidding documents is provided to give the bidder a general time frame as to when their scope of work will take place. Changes to this schedule during construction will not be grounds for any change orders or claims. This Subcontractor is responsible for providing the Construction Manager a detailed schedule including submittals, deliveries, and man-loading. **This Subcontractor is to understand that this project is a "fast-track" project and they will be held in strict compliance with the time frames included in the preliminary baseline schedule.**

   WORK HOURS TO BE INCLUDED IN BASE BID: All Subcontractors are required to work a six (6) day work week. Full crews are to be included. At the conclusion of the work day Friday, if there is work still to be performed by the Trade Contractor, then that contractor will be required to work Saturday. Associated premium time is to be included in the base bid.

4. **CHANGE ORDERS –** Reference Supplemental Instructions Paragraph I.

5. **LABOR AND EQUIPMENT RATES** – Reference Supplemental Instructions Paragraph H.

6. **Liquidated Damages** per section 6.1.6 AIA133 – 2019 will be assessed per schedule phases. Individual trade contractors will be held accountable for any slippage that will hold up milestones & completion as shown on the schedule. It is imperative that all documents required are turned over in a timely manner as to not allow missed dates on the phased schedules. These include but are not limited to the following: Contract execution, COI's, Submittals, RFI's, Fabrication timeline, attending meetings & manpower.

7. **ALLOWANCES** – This Subcontractor shall include the following allowances in their lump sum bids. *(All allowances are to only be used when specifically indicated by the Construction Manager and it is this Subcontractors responsibility to document usage via T&M tickets submitted to the Downes Field Superintendent. Allowance expenditure submissions are required to follow the same procedures as Change Order Requests/Proposals. However, overhead and profit for allowances shall be included in the base bid and cannot be added to expenditure submissions.)* Fill in and complete allowances in the appropriate spaces on the bid form.

Allowance				
1.26.1 Allowance 1				
	Description	**Quantity**	**Unit Price**	**Amount**
			Total Allowance:	Calculate and Fill in On Bid Form)

8. **UNIT PRICES** – In the spaces provided on the Bid Form, indicate the following Unit Pricing requested. (Unit prices will be used to add or deduct from contract price based on project requirements). Also, reference Specifications for additional information:

No.	Description	Unit Price	Unit
See Above	**Unit prices as applicable**	Provided by bidder. Fill in on bid form.	Provided by bidder. Fill in on bid form.

9. **ALTERNATE BIDS** – See Specifications Sections and as further elaborated and amended below. In the spaces on the bid form, indicate the following alternate pricing as may be applicable to your scope of work. Also, reference Specifications for additional information:

No.	Description	Price
See Specs.	Alternate bids as applicable to this Scope of Work as requested and itemized in Specifications.	Provided by bidder. Fill in on bid form.

END BID PACKAGE #1.26.1 – EARLY RELEASE SWITCH GEAR/GENERATOR

ACKNOWLEDGEMENT OF SURETY TEMPLATE

Name of Surety Here:

Date:

Obligee Address

Re Contractor:

Project:

Bid Date:

To Whom It May Concern:

Please be advised that in the event, Contractor is awarded and agrees to enter into a contract for the captioned project, XYZ Bonding Company, subject to a satisfactory review of the contract, bond forms and financing arrangement is prepared to execute Performance and Payment Bonds for the project.

Signed, sealed, and dated this day of ,

XYZ Bonding Company , Surety

By:_____, Seal

, Attorney-in-Fact

Acknowledged:

, Principal

By:_____ , Seal

DOWNES CONSTRUCTION

NON-COLLUSION AFFIDAVIT

State of _____

County of _____

Being fully sworn deposes and says:

That he/she is (a partner or officer of the firm of, etc.), the party making the foregoing proposal or bid; that such proposal or bid is genuine and not collusive or sham; that said bidder has not colluded, conspired, or connived or agreed, directly or indirectly, with any bidder or person to put in a sham bid or to refrain from bidding, and has not in any manner, directly or indirectly, sought by agreement or collusion or communication or conference with any person, to fix the bid price or affiant or any other bidder, or to fix any overhead, profit, or cost element of said price or of that of any other bidder, or to secure any advantage against the owner or any other person interested in the proposed contract and that all statements in said proposal or bid are true.

_____
FIRM NAME

_____
BY

Subscribed & Sworn before me this _____ day of

_____, 20 _____.

My commissions expires

_____.

_____
Signature of Bidder if the Bidder is an individual

_____
Signature of Bidder if the Bidder is a partnership

_____
Signature of Bidder if the Bidder is a corporation

SUBCONTRACT PERFORMANCE BOND FORM A

Sample

KNOW ALL MEN BY THESE PRESENTS: That

as Principal,

(Here insert the name and address, or legal title, of the Subcontractor)

hereinafter called Principal, and

, as Surety, hereinafter called Surety, are held and firmly bound unto

(Here insert the name and address, or legal title of the General Contractor)

as Obligee, hereinafter called Obligee, in the amount of

for the payment whereof Principal and Surety bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS, Principal has by written agreement dated:

entered into a subcontract with Obligee for

in accordance with drawings and specifications prepared by

(Here insert full name and title)

which subcontract is by reference made a part hereof, and is hereinafter referred to as the subcontract. NOW, THEREFORE, THE CONDITION OF THIS OBLIGATION is such that, if Principal shall promptly and faithfully perform said subcontract, then this obligation shall be null and void; otherwise it shall remain in full force and effect.

Whenever Principal shall be, and be declared by Obligee to be in default under the subcontract, the Obligee having performed Obligee's obligations thereunder:

(1) Surety may promptly remedy the default subject to the provisions of paragraph 3 herein, or;

(2) Obligee after reasonable notice to Surety may, or Surety upon demand of Obligee may arrange for the performance of Principal's obligation under the subcontract subject to the provisions of paragraph 3 herein;

(3) The balance of the subcontract price, as defined below, shall be credited against the reasonable cost of completing performance of the subcontract. If completed by the Obligee, and the reasonable cost exceeds the balance of the subcontract price the Surety shall pay the Obligee such excess, but in no event shall the aggregate liability of the Surety exceed the amount of this bond. If the Surety arranges completion or remedies the default, that portion of the balance of the subcontract price as may be required to complete the subcontract or remedy the default and to reimburse the Surety for its outlays shall be paid to the Surety at the times and in the manner as said sums would have been payable to Principal had there been no default under the subcontract. The term "balance of the subcontract price," as used in this paragraph, shall mean the total amount payable by Obligee to Principal under the subcontract and any amendments thereto, less the amounts heretofore properly paid by Obligee under the subcontract.

Any suit under this bond must be instituted before the expiration of two years from date on which final payment under the subcontract falls due.

No right of action shall accrue on this bond to or for the use of any person or corporation other than the Obligee named herein or the heirs, executors, administrators or successors of the Obligee.

Signed and sealed this day of , 2011 .

IN THE PRESENCE OF:

_____ Seal)
Principal

By: _____ (Seal)

_____ (Seal)

By _____
, Attorney-in-Fact

SUBCONTRACT LABOR AND MATERIAL PAYMENT BOND

Sample

KNOW ALL MEN BY THESE PRESENTS: That

as Principal,

(Here insert the name and address, or legal title, of the Subcontractor)

hereinafter called Principal, and , with its

, hereinafter called Surety, are held and firmly bound unto

(Here insert the name and address, or legal title of the General Contractor)

as Obligee, hereinafter called Obligee, in the amount of

for the payment whereof Principal and Surety bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.
entered into a subcontract with Obligee for

in accordance with drawings and specifications prepared by

(Here insert full name and title)

which subcontract is by reference made a part hereof, and is hereafter referred to as the subcontract. NOW, THEREFORE, THE CONDITION OF THIS OBLIGATION is such that if the Principal shall promptly make payments to all claimants as hereinafter defined, for all labor and material used or reasonably required for use in the performance of the subcontract, then this obligation shall be void; otherwise it shall remain in full force and effect subject, however, to the following conditions:

(1) A claimant is defined as one having a direct contract with the Principal for labor, material, or both, used or reasonably required for use in the performance of the contract, labor and material being construed to include that part of water, gas, power, light, heat, oil, gasoline, telephone service or rental of equipment directly applicable to the subcontract.

(2) The above-named Principal and Surety hereby jointly and severally agree with the Obligee that every claimant as herein defined, who has not been paid in full before the expiration of a period of ninety (90) days after the date on which the last of such claimant's work or labor was done or performed, or materials were furnished by such claimant, may sue on this bond for the use of such claimant, prosecute the suit to final judgment for such sum or sums as may be justly due claimant, and have execution thereon. The Obligee shall not be liable for the payment of any costs or expenses of any such suit.

(3) No suit or action shall be commenced hereunder by any claimant,

(a) After the expiration of one (1) year following the date on which Principal ceased work on said subcontract it being understood, however, that if any limitation embodied in this bond is prohibited by any law controlling the construction hereof such limitation shall be deemed to be amended so as to be equal to the minimum period of limitation permitted by such law.

(b) Other than in a state court of competent jurisdiction in and for the county or other political subdivision of the state in which the project, or any part thereof, is situated, or in the United States District Court for the district in which the project, or any part thereof, is situated, and not elsewhere.

(4) The amount of this bond shall be reduced by and to the extent of any payment or payments made in good faith hereunder.

Signed and sealed this day of , 2011 .

IN THE PRESENCE OF:

_____ (Seal)
(Principal)

By: _____ (Seal)

_____ (Seal)

Subcontract Labor and Material Payment Bond.
This bond is issued simultaneously with another bond in favor of the general contractor conditioned for the full and faithful performance of the contract.

By _____
, Attorney-in-Fact

Revised to March, 1960.
SB5716X(2)
S-2324-3 (07-97)

DUAL OBLIGEE RIDER

Sample

This Rider is to be attached to and forms a part of Performance Bond No. issued by , (hereinafter referred to as "Surety"), as Surety, on the day of , 20 (hereinafter referred to as "Bond").

WHEREAS, on or about the day of , 20 , (hereinafter called the "Principal"), entered into a written agreement with (hereinafter called the "Primary Obligee") for the construction of the (hereinafter called the "Contract"); and

WHEREAS, the Principal and the Surety executed and delivered to said Primary Obligee the Bond in connection with the Contract; and

WHEREAS, the Primary Obligee has requested the Principal and the Surety to execute and deliver this Rider.

NOW, THEREFORE, the undersigned hereby agree and stipulate that shall be added to said bond as a named obligee (hereinafter referred to as "Additional Obligee"), subject to the conditions set forth below:

1. The Surety shall not be liable under the Bond to the Primary Obligee, the Additional Obligee, or any of them, unless the Primary Obligee, the Additional Obligee, or any of them, shall make payments to the Principal (or in the case the Surety arranges for completion of the Contract, to the Surety) strictly in accordance with the terms of said Contract as to payments and shall perform all other obligations to be performed under said Contract at the time and in the manner therein set forth.

2. The aggregate liability of the Surety under the Bond, to any or all of the obligees (Primary and Additional Obligees), as their interests may appear, is limited to the penal sum of the Bond; the Additional Obligee's rights hereunder are subject to the same defenses Principal and/or Surety have against the Primary Obligee, and the total liability of the Surety shall in no event exceed the amount recoverable from the Principal by the Primary Obligee under the Contract. At the Surety's election, any payment due under the performance bond may be made by joint check payable to one or more of the obligees.

3. The Surety may, at its option, make any payments under said Performance Bond by check issued jointly to all of the obligees.

Except as herein modified, the Bond shall be and remains in full force and effect.

Signed this day of , 20 .

(Principal)

By: _____

,

(Primary Obligee)

By: _____

,

Surety Company

By: _____

, Attorney-in-Fact

AIA® Document A305™ – 2020

Contractor's Qualification Statement

THE PARTIES SHOULD EXECUTE A SEPARATE CONFIDENTIALITY AGREEMENT IF THEY INTEND FOR ANY OF THE INFORMATION IN THIS A305-2020 TO BE HELD CONFIDENTIAL.

SUBMITTED BY:
(Organization name and address.)

SUBMITTED TO:
(Organization name and address.)

TYPE OF WORK TYPICALLY PERFORMED
(Indicate the type of work your organization typically performs, such as general contracting, construction manager as constructor services, HVAC contracting, electrical contracting, plumbing contracting, or other.)

THIS CONTRACTOR'S QUALIFICATION STATEMENT INCLUDES THE FOLLOWING:
(Check all that apply.)

[ ] Exhibit A – General Information
[ ] Exhibit B – Financial and Performance Information
[ ] Exhibit C – Project-Specific Information
[ ] Exhibit D – Past Project Experience
[ ] Exhibit E – Past Project Experience (Continued)

CONTRACTOR CERTIFICATION
The undersigned certifies under oath that the information provided in this Contractor's Qualification Statement is true and sufficiently complete so as not to be misleading.

_____ _____
Organization's Authorized Representative Signature **Date**

_____
Printed Name and Title

NOTARY
State of:
County of:
Signed and sworn to before me this day of

_____
Notary Signature

My commission expires:

ADDITIONS AND DELETIONS:
The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes added information as well as revisions to the standard form text is available from the author and should be reviewed. A vertical line in the left margin of this document indicates where the author has added necessary information and where the author has added to or deleted from the original AIA text.

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Additions and Deletions Report for

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Certification of Document's Authenticity

AIA® Document D401™ – 2003

I, , hereby certify, to the best of my knowledge, information and belief, that I created the attached final document simultaneously with its associated Additions and Deletions Report and this certification at 00:46:23 ET on 10/22/2022 under Order No. 2114358661 from AIA Contract Documents software and that in preparing the attached final document I made no changes to the original text of AIA® Document A305™ – 2020, Contractor's Qualification Statement, as published by the AIA in its software, other than those additions and deletions shown in the associated Additions and Deletions Report.

_____

(Signed)

_____

(Title)

_____

(Dated)

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AIA® Document A305™ – 2020 Exhibit A

General Information

This Exhibit is part of the Contractor's Qualification Statement, submitted by and dated the day of in the year
(In words, indicate day, month and year.)

§ A.1 ORGANIZATION
§ A.1.1 Name and Location
§ A.1.1.1 Identify the full legal name of your organization.

§ A.1.1.2 List all other names under which your organization currently does business and, for each name, identify jurisdictions in which it is registered to do business under that trade name.

§ A.1.1.3 List all prior names under which your organization has operated and, for each name, indicate the date range and jurisdiction in which it was used.

§ A.1.1.4 Identify the address of your organization's principal place of business and list all office locations out of which your organization conducts business. If your organization has multiple offices, you may attach an exhibit or refer to a website.

§ A.1.2 Legal Status
§ A.1.2.1 Identify the legal status under which your organization does business, such as sole proprietorship, partnership, corporation, limited liability corporation, joint venture, or other.

.1 If your organization is a corporation, identify the state in which it is incorporated, the date of incorporation, and its four highest-ranking corporate officers and their titles, as applicable.

.2 If your organization is a partnership, identify its partners and its date of organization.

.3 If your organization is individually owned, identify its owner and date of organization.

ADDITIONS AND DELETIONS:
The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes added information as well as revisions to the standard form text is available from the author and should be reviewed. A vertical line in the left margin of this document indicates where the author has added necessary information and where the author has added to or deleted from the original AIA text.

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.4 If the form of your organization is other than those listed above, describe it and identify its individual leaders:

§ A.1.2.2 Does your organization own, in whole or in part, any other construction-related businesses? If so, identify and describe those businesses and specify percentage of ownership.

§ A.1.3 Other Information

§ A.1.3.1 How many years has your organization been in business?

§ A.1.3.2 How many full-time employees work for your organization?

§ A.1.3.3 List your North American Industry Classification System (NAICS) codes and titles. Specify which is your primary NAICS code.

§ A.1.3.4 Indicate whether your organization is certified as a governmentally recognized special business class, such as a minority business enterprise, woman business enterprise, service disabled veteran owned small business, woman owned small business, small business in a HUBZone, or a small disadvantaged business in the 8(a) Business Development Program. For each, identify the certifying authority and indicate jurisdictions to which such certification applies.

§ A.2 EXPERIENCE

§ A.2.1 Complete Exhibit D to describe up to four projects, either completed or in progress, that are representative of your organization's experience and capabilities.

§ A.2.2 State your organization's total dollar value of work currently under contract.

§ A.2.3 Of the amount stated in Section A.2.2, state the dollar value of work that remains to be completed:

§ A.2.4 State your organization's average annual dollar value of construction work performed during the last five years.

§ A.3 CAPABILITIES

§ A.3.1 List the categories of work that your organization typically self-performs.

§ A.3.2 Identify qualities, accreditations, services, skills, or personnel that you believe differentiate your organization from others.

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§ A.3.3 Does your organization provide design collaboration or pre-construction services? If so, describe those services.

§ A.3.4 Does your organization use building information modeling (BIM)? If so, describe how your organization uses BIM and identify BIM software that your organization regularly uses.

§ A.3.5 Does your organization use a project management information system? If so, identify that system.

§ A.4 REFERENCES

§ A.4.1 Identify three client references:
(Insert name, organization, and contact information)

§ A.4.2 Identify three architect references:
(Insert name, organization, and contact information)

§ A.4.3 Identify one bank reference:
(Insert name, organization, and contact information)

§ A.4.4 Identify three subcontractor or other trade references:
(Insert name, organization, and contact information)

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Additions and Deletions Report for

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There are no differences.

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AIA® Document A305™ – 2020 Exhibit B

Financial and Performance Information

This Exhibit is part of the Contractor's Qualification Statement, submitted by and dated the day of in the year
(In words, indicate day, month and year.)

ADDITIONS AND DELETIONS:
The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes added information as well as revisions to the standard form text is available from the author and should be reviewed. A vertical line in the left margin of this document indicates where the author has added necessary information and where the author has added to or deleted from the original AIA text.

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

§ B.1 FINANCIAL

§ B.1.1 Federal tax identification number:

§ B.1.2 Attach financial statements for the last three years prepared in accordance with Generally Accepted Accounting Principles, including your organization's latest balance sheet and income statement. Also, indicate the name and contact information of the firm that prepared each financial statement.

§ B.1.3 Has your organization, its parent, or a subsidiary, affiliate, or other entity having common ownership or management, been the subject of any bankruptcy proceeding within the last ten years?

§ B.1.4 Identify your organization's preferred credit rating agency and identification information.
(Identify rating agency, such as Dun and Bradstreet or Equifax, and insert your organization's identification number or other method of searching your organization's credit rating with such agency.)

§ B.2 DISPUTES AND DISCIPLINARY ACTIONS

§ B.2.1 Are there any pending or outstanding judgments, arbitration proceedings, bond claims, or lawsuits against your organization, its parent, or a subsidiary, affiliate, or other entity having common ownership or management, or any of the individuals listed in Exhibit A, Section 1.2, in which the amount in dispute is more than $75,000?
(If the answer is yes, provide an explanation.)

§ B.2.2 In the last five years has your organization, its parent, or a subsidiary, affiliate, or other entity having common ownership or management:
(If the answer to any of the questions below is yes, provide an explanation.)

.1 failed to complete work awarded to it?

.2 been terminated for any reason except for an owners' convenience?

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.3 had any judgments, settlements, or awards pertaining to a construction project in which your organization was responsible for more than $75,000?

.4 filed any lawsuits or requested arbitration regarding a construction project?

§ B.2.3 In the last five years, has your organization, its parent, or a subsidiary, affiliate, or other entity having common ownership or management; or any of the individuals listed in Exhibit A Section 1.2:
(If the answer to any of the questions below is yes, provide an explanation.)

.1 been convicted of, or indicted for, a business-related crime?

.2 had any business or professional license subjected to disciplinary action?

.3 been penalized or fined by a state or federal environmental agency?

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AIA® Document A305™ – 2020 Exhibit C

Project Specific Information

This Exhibit is part of the Contractor's Qualification Statement, submitted by and dated the day of in the year
(In words, indicate day, month and year.)

PROJECT:
(Name and location or address.)

CONTRACTOR'S PROJECT OFFICE:
(Identify the office out of which the contractor proposes to perform the work for the Project.)

TYPE OF WORK SOUGHT
(Indicate the type of work you are seeking for this Project, such as general contracting, construction manager as constructor, design-build, HVAC subcontracting, electrical subcontracting, plumbing subcontracting, etc.)

CONFLICT OF INTEREST
Describe any conflict of interest your organization, its parent, or a subsidiary, affiliate, or other entity having common ownership or management, or any of the individuals listed in Exhibit A Section 1.2, may have regarding this Project.

§ C.1 PERFORMANCE OF THE WORK

§ C.1.1 When was the Contractor's Project Office established?

§ C.1.2 How many full-time field and office staff are respectively employed at the Contractor's Project Office?

§ C.1.3 List the business license and contractor license or registration numbers for the Contractor's Project Office that pertain to the Project.

§ C.1.4 Identify key personnel from your organization who will be meaningfully involved with work on this Project and indicate (1) their position on the Project team, (2) their office location, (3) their expertise and experience, and (4) projects similar to the Project on which they have worked.

ADDITIONS AND DELETIONS:
The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes added information as well as revisions to the standard form text is available from the author and should be reviewed. A vertical line in the left margin of this document indicates where the author has added necessary information and where the author has added to or deleted from the original AIA text.

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

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§ C.1.5 Identify portions of work that you intend to self-perform on this Project.

§ C.1.6 To the extent known, list the subcontractors you intend to use for major portions of work on the Project.

§ C.2 EXPERIENCE RELATED TO THE PROJECT

§ C.2.1 Complete Exhibit D to describe up to four projects performed by the Contractor's Project Office, either completed or in progress, that are relevant to this Project, such as projects in a similar geographic area or of similar project type. If you have already completed Exhibit D, but want to provide further examples of projects that are relevant to this Project, you may complete Exhibit E.

§ C.2.2 State the total dollar value of work currently under contract at the Contractor's Project Office:

§ C.2.3 Of the amount stated in Section C.2.2, state the dollar value of work that remains to be completed:

§ C.2.4 State the average annual dollar value of construction work performed by the Contractor's Project Office during the last five years.

§ C.2.5 List the total number of projects the Contractor's Project Office has completed in the last five years and state the dollar value of the largest contract the Contractor's Project Office has completed during that time.

§ C.3 SAFETY PROGRAM AND RECORD

§ C.3.1 Does the Contractor's Project Office have a written safety program?

§ C.3.2 List all safety-related citations and penalties the Contractor's Project Office has received in the last three years.

§ C.3.3 Attach the Contractor's Project Office's OSHA 300a Summary of Work-Related Injuries and Illnesses form for the last three years.

§ C.3.4 Attach a copy of your insurance agent's verification letter for your organization's current workers' compensation experience modification rate and rates for the last three years.

§ C.4 INSURANCE

§ C.4.1 Attach current certificates of insurance for your commercial general liability policy, umbrella insurance policy, and professional liability insurance policy, if any. Identify deductibles or self-insured retentions for your commercial general liability policy.

§ C.4.2 If requested, will your organization be able to provide property insurance for the Project written on a builder's risk "all-risks" completed value or equivalent policy form and sufficient to cover the total value of the entire Project on a replacement cost basis?

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§ C.4.3 Does your commercial general liability policy contain any exclusions or restrictions of coverage that are prohibited in AIA Document A101-2017, Exhibit A, Insurance A.3.2.2.2? If so, identify.

§ C.5 SURETY

§ C.5.1 If requested, will your organization be able to provide a performance and payment bond for this Project?

§ C.5.2 Surety company name:

§ C.5.3 Surety agent name and contact information:

§ C.5.4 Total bonding capacity:

§ C.5.5 Available bonding capacity as of the date of this qualification statement:

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AIA® Document A305™ – 2020 Exhibit D

Contractor's Past Project Experience

	1	2	3	4
PROJECT NAME				
PROJECT LOCATION				
PROJECT TYPE				
OWNER				
ARCHITECT				
CONTRACTOR'S PROJECT EXECUTIVE				
KEY PERSONNEL (include titles)				
PROJECT DETAILS	Contract Amount Completion Date % Self-Performed Work	Contract Amount Completion Date % Self-Performed Work	Contract Amount Completion Date % Self-Performed Work	Contract Amount Completion Date % Self-Performed Work
PROJECT DELIVERY METHOD	☐ Design-bid-build ☐ Design-build ☐ CM constructor ☐ CM advisor ☐ Other:	☐ Design-bid-build ☐ Design-build ☐ CM constructor ☐ CM advisor ☐ Other:	☐ Design-bid-build ☐ Design-build ☐ CM constructor ☐ CM advisor ☐ Other:	☐ Design-bid-build ☐ Design-build ☐ CM constructor ☐ CM advisor ☐ Other:
SUSTAINABILITY CERTIFICATIONS				

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AIA® Document A305™ – 2020 Exhibit E

Contractor's Past Project Experience, Continued

	1	2	3	4
PROJECT NAME				
PROJECT LOCATION				
PROJECT TYPE				
OWNER				
ARCHITECT				
CONTRACTOR'S PROJECT EXECUTIVE				
KEY PERSONNEL (include titles)				
PROJECT DETAILS	Contract Amount Completion Date % Self-Performed Work	Contract Amount Completion Date % Self-Performed Work	Contract Amount Completion Date % Self-Performed Work	Contract Amount Completion Date % Self-Performed Work
PROJECT DELIVERY METHOD	☐ Design-bid-build ☐ Design-build ☐ CM constructor ☐ CM advisor ☐ Other:	☐ Design-bid-build ☐ Design-build ☐ CM constructor ☐ CM advisor ☐ Other:	☐ Design-bid-build ☐ Design-build ☐ CM constructor ☐ CM advisor ☐ Other:	☐ Design-bid-build ☐ Design-build ☐ CM constructor ☐ CM advisor ☐ Other:
SUSTAINABILITY CERTIFICATIONS				

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DEPARTMENT OF ADMINISTRATIVE SERVICES (DAS)
Office of School Construction Grants & Review (OSCG&R)

CURRENT PREVAILING WAGE RATES

FORM SCG-6000

IN COMPLIANCE WITH SECTION 31-53 OF THE CONNECTICUT GENERAL STATUTES (C.G.S.)

SHALL BE INSERTED

PRIOR TO RELEASE OF DOCUMENTS For BID or PROCUREMENT

ANNUAL ADJUSTMENT OF WAGE RATES

WILL BE AS REQUIRED

PER C.G.S. SECTION 31-55a

If you have questions regarding wages and workplace standards refer to the Department of Labor website: http://www.ctdol.state.ct.us or call 860-263-6000

SUPPLEMENTAL INSTRUCTIONS

Intent

These Supplemental Instructions are intended to provide the bidder/subcontractor a list of additional terms, conditions and expectations related to working on or providing goods and/or services for a Downes Construction Company (DCC) construction project. By submitting a bid and/or proposal, the Contractor is agreeing to abide by the terms and conditions of these Supplemental Instructions along with all other Contract Documents.

Where elsewhere in the Contract Documents require compliance with more than one requirement with respect to any aspect of the project, the better quality or more stringent requirement is intended.

Section 1 - Definitions

Where in the Contract Documents the title "Construction Manager", "Design Builder", "Contractor", "Trade Contractor", "Subcontractor" or "Respective Contractor" is used it means the entity normally responsible for the work referenced. That entity will be assigned the scope of work term "Subcontractor" when entering into a contract with DCC.

Section 2 - General Requirements

A. Contract

The Subcontractor (Trade Contractor, Contractor, Respective Contractor, Vendor) will enter into an agreement with DCC in complete accordance with the terms described in the AIA Document A401 – 2007 Standard Form of Agreement Between Contractor and Subcontractor or such other form or with such other entity specifically described elsewhere in the Contract Documents. The Subcontractor is solely responsible for the scope of work assigned.

B. Performance and Payment Bonds

Unless indicated elsewhere in the Contract Documents, the Subcontractor shall furnish DCC with 100% Performance and Labor and Material Payment bonds, in the amount of 100% of the Contract amount with a "dual oblige". Surety companies providing performance and payment bond(s) must be licensed to do business in Connecticut and be approved as sureties on Government contract pursuant to U.S. Treasury Circular No. 570, published annually in the Federal Register. All Performance Bonds, and Labor and Material Payment Bonds submitted to DCC must use a Subcontractor Performance Bond Form A, or some facsimile thereof. Bonds should **not** be submitted on an AIA Document A311 or A312. Subcontractors are to include the cost of said bonds in their lump sum base bid and indicate the "break out" cost of the bonds in the appropriate space on the bid form.

A generic form for the Dual Obligee is acceptable.

C. State Sales Tax Bond

Non-resident Subcontractors will furnish the Commissioner of Revenue Services in Connecticut a guarantee bond equal to 5% of their contract amount to secure payment of the Connecticut State Sales Tax payable with respect to tangible personal property used or consumed to carry out such contract. The Subcontractor will forward the bond to DCC within two (2) weeks of notice to proceed.

D. Insurance Requirements (Referenced as Attachment "A" in all agreements)

The Subcontractor along with its entire lower tier Subcontractors will provide insurance in complete accordance with the following:

The following is applicable to all required insurance policies (See attached sample ACCORD form for additional clarification and specific requirements):

Insurer – All insurers must have an A.M. Best rating of A- VII or better and admitted to conduct business in the state.

Additional Insured –DCC, Owner, Program Manager/Owner's Representative (if required) the Project Architect and other such entity(s) required by DCC, shall be named Additional insured's under your policies, as well as, other parties which are required by the contract. Coverage's must be written on a primary and non-contributory basis and a Waiver of Subrogation provision must be included, with respect to all parties concerned.

Waiver of Subrogation – All policies must include a Waiver of Subrogation whereby the insured waives the right to subrogate against all the Additional insured's as well as their subsidiaries, employees, volunteers, directors and officers.

Other Insurance Clause – This clause must state that the contractor's/subcontractor's policy is Primary and (Non-contributory) the insurer will not seek contribution from other insurance available to all the Additional insured's.

Notice of Cancellation – **Non-Renewal or Material Change** – All policies shall be endorsed to require at least a 30 day written notice by the insurer of cancellation, non-renewal, or material change, except for a ten day notice for non-payment of premium. This notice shall be sent to the Project Manager at DCC.

Deductibles/Self-Insured Retention – It is agreed that all deductibles and/or self-insured retentions are the responsibility of the contractor's/subcontractor's, including all claim handling and legal expenses.

Exclusions/Restrictions – All exclusion or restrictions of coverage not found in standard policies must be clearly identified.

Certificates of Insurance – Must be forwarded to the Project Manager at DCC at least five days prior to commencing work or delivery of goods. Renewal Certificates of Insurance must be provided ten days prior to the expiration of required coverage. A copy of all your policy's Additional insured's Endorsements must be attached to the certificate.

Terms of Coverage – All insurance must adhere to requirements stipulated herein and be effective on or before work commences and remain in effect until final completion and acceptance of the work.
Also Subcontractors must maintain Commercial General Liability (CGL) including Completed Operations (Products – Comp/Op AGG) coverage of $1,000,000 per occurrence and $2,000,000 aggregate for itself and each Additional insured's for a minimum of three (3) years after final acceptance and closeout of said project.
Pollution Liability – Any company who performs environmental (abatement) work must maintain Pollution Liability coverage as stipulated on page 3, Item #6, including mold coverage as necessitated by its scope of work.
EIFS Work – Commercial General Liability coverage cannot contain an EIFS exclusion for those companies doing this type of work. In addition, Pollution Liability, including mold coverage, must be carried. Minimum limits of $1,000,000 per occurrence (see Item #6 on page 3).
Subcontractors – It is a requirement of the project and is the responsibility of the subcontractor to be sure that their entire subcontractor's procure and maintain the same insurance required of the contractor.

1) **Commercial General Liability (CGL) with Limits of Insurance of Not Less <u>Than $1,000,000 Each Occurrence/$2,000,000 Annual Aggregate</u>**
   a) If the CGL coverage contains a General Aggregate limit, such General Aggregate shall apply separately to each project.
   b) CGL coverage shall be written on ISO Occurrence Form CG 00 01 1093 or a substitute form providing equivalent coverage and shall cover liability arising from premises, operations, independent contractors, products/completed operations, and personal and advertising injury.
   c) DCC, the Owner and All Other parties required of DCC shall be included as insured's on the CGL using ISO Additional insured's Endorsement Form CG 20 10 11 85 or CG 20 10 10 93 and CG 20 37 10 01 or CG 20 33 10 01 and CG 20 37 10 01 or an endorsement providing equivalent coverage to the Additional insured's. This insurance for the Additional insured's shall be as broad as the coverage provided for the named insured subcontractor. It shall apply as Primary Insurance before any other insurance or self-insurance, including any deductible maintained by or provided to the Additional Insured. (A copy of the appropriate forms listed above must be completely filled out appropriately and attached to your Certificate of Insurance).
   d) Subcontractors shall maintain CGL coverage for itself and all Additional insured's for the duration of the project according to contract documents and specification requirements; also Subcontractors must maintain Commercial General Liability (CGL) including Completed Operations (Products – Comp/Op AGG) coverage of $1,000,000 per occurrence and $2,000,000 aggregate for itself and each Additional insured's for a minimum of three (3) years after final acceptance and closeout of said project.
   e) Coverage must be on an occurrence basis.

f) If project involves residential construction, the CGL policy cannot contain a residential exclusion.

2) <u>Automobile Liability</u>

a) Business Auto Liability with limits of at least $1,000,000 each accident.
b) Business Auto coverage must include coverage for liability arising out of all owned, leased, hired, and non-owned automobiles.
c) DCC the Owner, and all other parties required of the DCC shall be included as insured's on the auto policy.

3) <u>Commercial Umbrella</u>

a) Umbrella limits must be at least $5,000,000.
b) Umbrella coverage must include as insured's all entities that are Additional insured's on the CGL.
c) Umbrella coverage for such Additional insured's shall apply as primary before any other insurance or self-insurance, including any deductible, maintained by or provided to the Additional Insured's other than the CGL, Auto Liability and Employer's Liability coverage's maintained by the Subcontractor.
d) Coverage must be on an occurrence basis.

4) <u>Workers' Compensation and Employer's Liability at least $500,000 each accident</u>

a) Employers' Liability insurance limits of at least $500,000 each accident for bodily injury by accident and $500,000 each employee for injury by disease.
b) Where applicable, U.S. Longshore and Harborworkers Compensation Act Endorsement (USL&H) shall be attached to the policy.
c) The Employer's Liability limit may be met via an Umbrella policy, however, the combined limit must be a minimum of $5,000,000.

5) <u>Professional Liability</u> *(if required by scope of work) at Least $1,000,000 each occurrence limit*

a) DCC, et al. shall be included as an Additional Insureds on a primary and noncontributory basis.
b) Subcontractor is responsible for any self-insured retention/deductibles, including all claim handling and legal expenses.
c) DCC, et al. shall be indemnified for loss and defense.

6) <u>Pollution Liability</u> *(if required by scope of work) at least $1,000,000 each occurrence*

a) Pollution Liability for transit to be included.
b) Any subcontract which includes EIFS work must carry Pollution Liability, including mold coverage.
c) Subcontractor is responsible for any self-insured retention/deductibles, including all claim handling and legal expenses.
d) DCC, et al. shall be indemnified for loss and defense.
e) DCC, et al. shall be included as additional insured on a primary and noncontributory basis.

<u>Hold Harmless Agreement –</u>

Subject only to the limitations set forth below and to the fullest extent permitted by law, the subcontractor shall indemnify, and hold harmless, and defend the Owner, DCC, Architect, Consultants and the agents and employees of any of them from and against any and all injuries, claims, damages, losses, expenses, fines penalties and liabilities including but not limited to personnel related cost, attorneys' and experts' fees, court costs, and all other claim-related expenses, directly or indirectly arising out of or resulting from performance, or negligent acts of the Subcontractor's Work under this Subcontract, provided that such claim, damage, loss or expense is attributable to bodily injury, sickness, disease or death, or to injury or destruction of tangible property (other than the Work itself), but only if the claim, damage, loss or expense is caused by, connected with, arising out of or resulting from an act or omission of the Subcontractor, the Subcontractor's sub-subcontractors, anyone directly or indirectly employed by any of them or anyone for whose acts they may be liable.

The Subcontractor shall not be required by this agreement to indemnify a party for that portion of any loss that is directly attributable to the negligence of the party to whom indemnification is owed, except to the extent such indemnification is permitted by law. Such obligation shall not be construed to negate, abridge, or otherwise reduce any other right or obligation of indemnity which would otherwise exist as to any party or person described in this clause.

To the fullest extent permitted by law, the Subcontractor agrees to assume the defense of the Owner, DCC the Architect, Consultants, and the agents and employees of any of them, in any claim, proceeding, lawsuit, and/or litigation arising out of any accident, incident, or occurrence that is caused by, connected with, arising out of, or resulting from the performance of the Subcontractor's work under this contract.

The Subcontractor agrees that the obligation to defend commences when a claim is made against the Owner, DCC, Architect, Consultants, and/or the agents and employees of any of them, even if the Subcontractor disputes its obligation to indemnify and hold harmless. The party being defended shall have the right to choose its own counsel. The Subcontractor agrees to pay for defense of the Owner, DCC, Architects, Consultants, and the agents and employees of any of them with counsel chosen by the party to be defended, upon demand.

The Subcontractor agrees to be bound to DCC by the terms and conditions of DCC agreement with the Owner, a copy of said agreement being available for inspection at DCC's office. The Subcontractor further agrees that all conditions and requirements imposed, or to be imposed, upon DCC by its contract with the owner shall be performed by the Subcontractor insofar as applicable to the work under the subcontract, and the Subcontractor hereby assumes toward DCC all obligations and responsibilities that DCC, by contract, has assumed or will assume toward the owner with respect to said work.

To the fullest extent permitted by law, the Subcontractor shall reimburse the Owner and DCC and the agents and employees of either of them, and any other party DCC is contractually required to indemnify, for any costs or expenses, including but not limited to attorney's fees, expended in seeking the Subcontractor's compliance with the above stated duties to defend, indemnify and hold harmless.

The Subcontractor's indemnity, hold harmless, and defense obligations set forth in this agreement shall cover the claim while this contract is in force, shall extend to such claims occurring after this agreement expires or is otherwise terminated, and shall continue until such claim is adjudicated and any and all actions against the Owner and DCC and the agents and employees of either of them are settled, terminated, dismissed or concluded.

E. Billing & Payment Procedures

All Subcontractors will be required to use GCPay. GCPay is a cloud collaboration platform managing the entire construction project application, assessment and payment process. GCPay automates construction payment management processes, specifically invoicing, lien waivers, compliance and electronic payments, for both general contractors and subcontractors. Instruction will be provided. See General Items All Trade Packages for additional information and subscription fees.

A schedule of values on form AIA G703 will be submitted to the DCC Project Manager for approval within two (2) weeks of notice to proceed and/or notice of intent to award. The Subcontractor's schedule of values (SOV) shall be broken down by labor and material for each work line item, phases (if applicable), areas of the project, specific scope of work items, and other requirements as requested by DCC. The SOV shall also include a line for permit (if applicable), submittals, clean-up, coordination drawings (if applicable), safety, bonds, warranties, O&M manuals, as-builts, mobilization, demobilization, attic stock (if applicable), commissioning (if applicable) and other close-out documents. Closeout, as-builts, warranties, operations and maintenance manuals should not be less than 1% of the total amount of the Subcontractors contract value. If the SOV contains a General Conditions/General Requirements line item it shall be further broken down as directed by DCC. This breakdown must be approved by the DCC Project Manager prior to submittal of the first application for payment.

All invoices and requisitions for payment shall be submitted on AIA Document G-702 and G-703 or such other forms as may be required by the Owner. A "draft" copy of the requisition for payment must be submitted to the DCC Project Manager **by the 20th** of the month for approval. After the "draft" copy of the requisition has been approved and returned by the DCC Project Manager, the monthly billing will be submitted with five (5) originals to DCC by the 31st (or last business day) of the month for work expected to be complete through the end of the month. Should the Subcontractor fail to submit their approved Application for Payment by the 31st (or last business day) of the month, they will miss the billing cycle and have to wait until the following month.

Retainage for the project is set at five (5) percent unless specifically stated otherwise in the contract documents. Release (partial or otherwise) will not be entertained by DCC until after substantial completion of the entire project.

The Subcontractor along with its entire lower tier Subcontractors, vendors and suppliers will be required to sign a Partial Waiver of Lien prior to receiving payment each month provided by DCC.

If authorized by DCC, it is agreed that progress payments may be made for materials stored in a secure off-site location (**90% of the material value**) based upon the DCC receipt of the following documentation:

1. Bill of Sale Form (DDVJ form will be provided);
2. Invoice(s) from supplier(s) with the full value of the item(s) being requested;
3. Photographs documenting the materials labeled with the job name and description clearly visible;
4. Owner's Right of Entry Form (DCC form will be provided);
5. Security Agreement (DCC form will be provided);
6. Certificate of Insurance with Purchaser's Loss Payable Clause specifically listing the full value of the store material items plus 10%, stating specifically what the material is and where it is stored, as listed on the application for payment;
7. UCC-1 Financing Statement and addendum must be filled out and mailed with fee to the Secretary of State. UCC-1 can also be filled out online at www.ct.gov/SOTS. Copy of the acceptance letter must be sent to the Owner and/or DCC with the stored material paperwork. For articles in storage outside of the State of Connecticut, this form must be filed with the Secretary of State of the state in question;
8. If the Subcontractor has provided a 100% Performance and Payment Bond, a Consent of Surety to authorize payments for materials stored off-site must be obtained; this Consent of Surety form will be sent to DCC immediately upon receipt of the above noted documentation.

A physical inspection of the stored materials should be arranged with DCC, prior to the approval of this request.

F. Certified Payrolls & Monthly Employment Utilization Reports

The Subcontractor along with its entire lower tier Subcontractors shall submit certified payrolls electronically, if required by the project. Failure to do so will jeopardize the payment of monthly requisitions. Payments will be held until all certified payrolls and monthly utilization reports are up to date. All Subcontractors shall note the following in regards to electronic WEEKLY certified payrolls and monthly utilization reports:

- Each Contractor must follow all the rules, guidelines and regulations set forth by the CT Department of Labor. Please read and adhere to all of the contents pertaining to Prevailing Wage as set forth in this document.
- A reminder that Prevailing wages are updated (changed) every July 1st by the State Department of Labor. Each Contractor is responsible to find out the new rates and to make the appropriate changes on its first payroll after July 1st. Each Subcontractor is responsible for assuming and including wage increases in their lump sum bids accordingly. No change orders will be entertained as they relate to periodic prevailing wage rate increases.
- Each contractor must send Certified Payroll submissions to *Certified Paychecks via email.* No hard copy originals will be required to be submitted to the consultant or Downes. The current email is payroll@certifiedpaycheck.com. (Contact is Kathy Wimmer at kwimmer@certifiedpaycheck.com).

- Certified payrolls must be completely filled out Weekly basis and must be received by Thursday of the following week. Otherwise no payment will be allowed without correct receipt of certified payrolls (obviously all appropriate standard State of CT forms must be used). Employee's Social Security numbers should not appear on the payrolls.
- Each Contractor must send its completed Monthly Employment Utilization Report Form for the Commission on Human Rights and Opportunities. to *Certified Paychecks via email.* No hard copy originals will be required to be submitted to the consultant or Downes. The current email is payroll@certifiedpaycheck.com. (Contact is Kathy Wimmer at kwimmer@certifiedpaycheck.com). THESE REPORTS MUST BE SUBMITTED ALONG WITH THE CERTIFIED PAYROLLS.
- It is a state law that all private employees and apprentices who perform manual labor for a Contractor on a public building project must have completed the 10-hour Outreach Course in accordance with federal OSHA Training Institute standards, and for telecommunications workers, a 10-hour training course in accordance with federal OSHA standards, 29 CFR 1910.268. A Certification card is not compliant if it is more than 5 years old.
- Each Contractor must affix a copy of the construction safety course completion card to the first certified payroll submitted to the *Certified Paychecks* in accordance with Connecticut General Statue 31-53(f) on which such employee's name first appears.

G. Submittal Procedures

All Subcontractors will be required to use PROCORE. PROCORE is a cloud-based construction management virtual data room (VDR) application that will increase project efficiency and accountability by providing streamlined project communication and documentation.

The Subcontractor within five (5) working days of receipt of a Notice to Proceed shall provide a schedule of submittals to the DCC Project Manager for review and approval. This schedule shall include a complete listing of all shop drawings, samples, manufacturer's data, lead times, warranties/guarantees, O&M Manuals, etc. required by the specifications to be submitted for review. The Subcontractor shall also include a target submission date for each item listed which will be consistent with the project milestone schedule requirements. Failure to provide a satisfactory schedule shall result in all payment applications being held in abeyance until such time as the satisfactory schedule is submitted and accepted by DCC.

Critical submittals are due to DCC within ten (10) working days of receipt of the Limited Notice to Proceed and/or Letter of Intent. All other submittals are due in the office of DCC within thirty (30) working days of receipt of the Notice to Proceed/ Letter of Intent. **Failure to complete the submittal process within this time frame will result in a $1000 fine each week until all submittals are completed.**

It is the Subcontractors responsibility to make submittals in a timely fashion in order to ensure procurement, installation and coordination with other Trades, in accordance with the Project Schedule. Subcontractors will be responsible for any delays to other Subcontractors and DCC as a result of delayed or incorrect materials being delivered or installed.

H. Hourly Rates

Labor Rates – All Subcontractors are required to submit their proposed labor rates with proper substantiation and breakdown with their bid. Overhead & profit, bond, consumables, reimbursables, equipment costs, sustenance, travel, safety and/or parking etc. are NOT to be included in the hourly rate, but shall be a separate line item offered (subject to DCC approval) on your Change Order Request breakdown at that time. All rates are subject to thorough analysis and adjustment if deemed necessary by DCC. All approved rates will be valid for the life of the project.

Equipment Rates - Will be mutually agreed upon between the Subcontractor and DCC as may be applicable to their work. Equipment rates shall be submitted within one (1) week of verbal award. All approved rates will be valid for the life of the project.

I. Change Order Proposals

If the Subcontractor receives any drawings, RFIs, submittal review, specifications, and/or instructions that it believes to be inconsistent with the Contract Documents for their scope of work, The Subcontractor will submit a Change Order Proposal (COP) complying with the following:

1. The Subcontractor will submit to the DCC Project Manager a detailed labor and material breakdown for all Change Order Proposals within seven (7) calendar days of receipt, three (3) calendar days for receipt of an RFI answer. DCC reserves the right to dictate the format and to what extent Change Order Requests should be broken down. Only approved labor and equipment rates shall be used in the development of the Change Order Request.

   Change Order Proposals shall be submitted with a minimum of the following breakdown:

   a) Direct labor rates as approved
   b) Direct material costs
   c) Direct equipment costs
   d) Subtotal (a+b+c)
   e) Subcontractor allowable mark-up
   f) Lower-Tier Subcontractor costs (including back-up)
   g) Subtotal (e+f)
   h) Total (d+g)

2. The Subcontractor will include all substantiating documentation, including but not limited, to quotes from vendors/suppliers, quantity breakdowns, etc. There will be no exception for any trade in providing physical quotes from vendors/suppliers along with their Change Order Proposal.
3. The Subcontractor is allowed ten percent (10%) markup on work performed by his/her own forces and five percent (5%) markup on his/her subcontractors unless otherwise specifically stated in the Contract Documents will be allowed. Mark-up will not exceed 15% by all subcontractors involved, regardless of specifications. This OH&P shall include all home office expenses and supervision, including but not limited to, principals, project managers, project engineers, general superintendents,

accounting personnel, small tools, safety, parking, travel, reimbursables, consumables, etc.

4. Foreman hours, if applicable, shall not exceed 10% of total estimated hours for entire Change Order Proposal.
5. All Subcontractors shall note that when preparing change orders, all costs for small tools are included in the overhead and profit percentages allowed by contract. Small tool allowance is not to be added as a separate percentage. Any specific equipment rented for the time and material work can be billed based on invoices for the rental of the equipment. A small tool shall be defined as a tool with a replacement value of $1,000.00 or less and shall consist of tools used on a daily basis in the normal performance of their work and shall include items such as extension cords, ladders, hoses, etc.
6. The added Bond cost should be included as a line item in the individual change order proposals but will be adjusted accordingly once the final contract amount is determined and agreed upon with a receipted invoice from the bonding company. The percentage rate for the bond increase should be the same as the "break out" compared to the value of the lump sum bid. Additional overhead and profit will not be allowed.
7. If unit prices are applicable to changes in the scope of work, compensation for the changes shall be based on the Unit Prices received at bid time for adding and deducting to the contract sum. DCC reserves the right to execute unit prices.
8. DCC will assume that the Subcontractors failure to provide a Change Order Proposal within seven (7) calendar days, three (3) calendar days for receipt of an RFI answer, will mean that there is no cost impact and no change to the contract time. Change Order Proposals submitted after the completion of the work item will be rejected in full.
9. Change Order Proposals submitted by <u>Mechanical and Fire Protection Trades</u> shall also note the following additional parameters:
    - Commodity materials, equipment and fixtures shall be listed and quantities indicated.
    - Pricing of materials (commodities) shall not exceed 50% of Harrison Publishing manufacturer list price (i.e.: pipe, fittings, valves, hangers, etc.). Furnish current book to DCC.
    - Consumables, tools and equipment shall be listed separately and industry standards shall be adhered to. Equipment rentals rates based on Mechanical Contractors Association America (MCAA)
    - Quotations from vendors for such equipment as PLMG/HVAC equipment, PLMG/ HVAC specialties, PLMG/HVAC accessories, etc., will be required.

    Labor:
    - All Labor Units shall adhere to the most recent Mechanical Contractors Association America (MCAA) Manual of Labor Units. Furnish current book to DCC.
    - Net labor units shall not exceed 65% of MCAA will only be considered for abnormal situations as listed in the "Introduction" and the "Labor Units Defined" Sections of the MCAA Manual.

- Foreman hours shall not exceed 10% of total estimated hours for entire Change Order Proposal.
- General Foreman hours shall not be considered until crew size exceeds 10 workers in field.
- Drafting and As-Builts shall not exceed 4% of estimated hours, if applicable.
- Safety shall not exceed 2.5% of estimated hours for entire Change Order Proposal.
- Project Management is included in Overhead and Profit.
- Additional manhours for daily clean-up will not be accepted.

Note:

- The Subcontractor will be allowed 10% markup on work performed by his/her own forces and 5% markup on his/her subcontractors unless otherwise specifically stated in the Contract Documents. Markup will not exceed 15% by all Subcontractors involved, regardless of Specifications.
- Any and all credits listed in Change Order Proposals shall adhere to the same format, material pricing and Labor Units as applicable to additions to the scope of work.
- Quotation for low tier subcontractors i.e. insulation, controls and sheetmetal shall follow same format. NECA, SMACNA and Ottaviano Estimator labor units considered.

10. Change Order Proposals submitted by <u>Electrical Trades</u> shall also note the following additional parameters:

Material:

- Commodity materials, equipment and fixtures shall be listed and quantities indicated.
- Pricing of materials (commodities) shall not exceed 80% of Low Column Trade Service (i.e.: pipe, wire, devices, etc.). Furnish current book to DCC.
- Consumables, tools and equipment shall be listed separately and industry standards shall be adhered to.
- Quotations from vendors for such equipment as light fixtures, switchgear/overcurrent protection, fire alarm, security systems, sound systems, etc., will be required.

Labor:

For Electrical changes in the work the contractor or subcontractor shall use the lowest unit prices for productivity for “Daily Output” and “Labor Hours” utilized in the National Electrical Contractors Association (NECA) Manual of Labor Units, most current edition, for pricing indicated in Column 1 with no add-ons or additional burdens allowed. For labor unit pricing utilize a sliding scale, a multiplier rate of .85 and .90 based on the total cost of the change excluding subcontractor costs. A change in the Electrical Work with a direct value between $1 and $10,000 shall use a multiplier rate of .90 and for a direct value greater than $10,000 the multiplier rate shall be .85.

Note:

All Changes- Overhead and profit (O&P) shall include all costs for home office support, as built drawings, project management, estimating, safety, small tools, pick

up trucks, travel, on site (includes foreman's time unless the foreman is performing the task) and off site supervision. Foreman's hourly rates shall be set by the actual rate verified by certified payroll. Foreman's time cannot be added on to any change proposal or time and material ticket (including allowance work) and is chargeable only if the foreman is directly working on the change or time and material work (including allowance work). For projected changes, the foreman's hours shall not exceed ten percent (10%) of the total labor hours directly attributable to the change and shall be part of the hours attributable to the change. Allowable combined overhead and profit on self performed trade contractor or self performed subcontractor is 10%.

Overhead and profit shall not be applied to lower tier mark ups. When both additions and credits covering related Work are involved in a change, the allowance for overhead and profit shall be figured on the basis of net increase, if any. For work performed by a subcontractor the trade contractor mark up for combined overhead and profit shall be five percent (5%) of the net cost of the work. The total mark up to the Owner, excluding the Construction Manager's mark up, shall not exceed fifteen percent (15%) of the net cost of the work. Change proposals shall indicate the number of additional calendar days, if any, which are required to complete the change. If no additional time is indicated it will be assumed that no additional time is required. The Trade Con-tractor shall, when requested, promptly furnish in a form satisfactory to the Construction Manager, itemized statements of the cost of the Work so ordered, including, but not limited to certified payrolls and copies of accounts and subcontracts, bills and vouchers to substantiate the above estimates. Estimated bond costs may be shown on each change proposal request, but not included in the total. Additional bond fees actually incurred will be reconciled at the end of the Project upon presentation of an invoice from the Trade Contractor's bonding company. Contractor O&P is not allowed on bond costs. Change orders issued to Trade Contractors shall be executed and returned to the Construction Manager within seven (7) days. Failure to return change orders in the prescribed time will result in withheld payments to the Trade Contractors.

11. DCC may direct a Subcontractor to proceed on a "Not to exceed" Time & Material basis if agreement cannot be made as to the total cost of a Change Order Proposal or if it is deemed in the best interest of the project and/or owner.

DCC reserves the right to reject any change order proposal not submitted within all the criteria noted above.

J. Time and Material Work (T&M)

Subcontractors are required and obligated to perform time and material work (T&M) if directed to do so by DCC. The Subcontractor is required to complete Time & Material work following all terms and conditions of the original agreement (contract). Time & Material worksheets shall be submitted to the DCC Field Superintendent for verification on a daily basis. Foreman shall provide appropriate descriptions of work performed and locations of work performed via screen shots of plan sheets etc., as well as, photo

documentation before and after. Time verification shall be supported by daily labor reports. Failure to do so may affect acceptance and reimbursement of the work. T&M work shall be submitted in the form of a Change Order Proposal in accordance with the Change Order Proposal section of these supplemental instructions no more than 10 business days after the completion of the work. Failure to comply with the aforementioned requirements may affect payment and is grounds for complete rejection if it is determined by DCC there is no way to verify the work was completed.

K. Requests for Information (RFI)

All Subcontractors will be required to use PROCORE. PROCORE is a cloud-based construction management virtual data room (VDR) application that will increase project efficiency and accountability by providing streamlined project communication and documentation.

The Subcontractor will submit questions regarding construction issues in an industry standard RFI format as agreed to with DCC. Due to the assumption of a Subcontractors expertise in their scope of work, a proposed solution will accompany the RFI.

L. Daily Reports

Daily construction reports will be submitted by Foremen by 9:30 AM of each workday for all work completed on the previous day to the DCC Field Superintendent, providing the following information:

1 - The names and number of employees at the site, broken down by trade and lower tier subcontractors (if applicable).

2 - Description of the type of work being performed and the location.

3 - Equipment on site and any material deliveries, waste management paperwork, any and all LEED/High Performance Building required documentation.

If there are EEO hiring goals associated with the project, additional forms may require to be submitted on a daily basis to document workforce participation.

M. Construction Progress Meetings

DCC conducts progress meeting weekly to discuss project safety, review project progress, outline, discuss and coordinate upcoming scheduled work activities, and address quality and other matters affecting the project. Subcontractor representation by a person familiar with and responsible for project activities, and authorized to speak for and make binding commitments on the behalf of their firm, is mandatory for these meetings. All subcontractors currently onsite, on the 4 week look ahead schedule, have open RFIs, incomplete submittals, coordination required with others trades, etc…. are required to attend these meetings. **Failure to attend a Construction Progress Meeting without prior consent from DCC will result in a $500 fine per missed meeting.**

N. Preconstruction / Pre-installation Meetings

DCC will schedule mandatory Pre-construction/Pre-installation Meetings prior to commencement of work. Subcontractors will be prepared to address work schedule, manpower, safety, site logistics, submittals and delivery of materials. Subcontractors will also provide a list of key personnel with addresses and telephone numbers for

emergency situations. **Failure to attend Preconstruction / Pre-installation Meetings without prior consent from DCC will result in a $500 fine per missed meeting.**

O. Foreman Meetings

The DCC Field Superintendent will hold weekly foreman meetings to be attended by the Foreman from each respective trade on the jobsite. The Foreman should be prepared to address work schedule, manpower, safety, site logistics, submittals and delivery of materials. **Failure to attend Foreman's Meetings without prior consent from DCC will result in a $500 fine per missed meeting.**

P. MEP Coordination Process

Representatives from all MEP trades must attend periodic MEP Coordination Meetings**. Failure to attend MEP Coordination Meetings without prior consent from DCC will result in a $500 fine per missed meeting.**

DCC will oversee the coordination process between the MEP Subcontractors. If the contract design documents were created/drawn in a three dimensional REVIT Model, then the MEP coordination process will be constructed in a 3D "BIM" environment using the latest version of REVIT software and the latest version of Auto-Cad or Auto-Cad compatible 3D software. The HVAC or Mechanical Subcontractor will take the lead and will be the "Gate Keeper" for the entire process. The sheet metal ductwork subcontractor shall initiate the coordination drawing process by providing the approved sheet metal ductwork drawings in CAD to the other trades. Each trade shall incorporate their systems electronically using a CAD specific drawing that is REVIT model convertible. DCC will hold an initial "kick-off" meeting to review the process with all MEP Subcontractors and to establish a regular meeting schedule. If "GoToMeetings" are requested the Mechanical/HVAC Subcontractor will be responsible to host, coordinate and pay for this service. At these meetings the MEP Subcontractors are expected to resolve all conflicts, assure accessibility and serviceability, coordinate sequences and make adjustment to the layout to achieve the Architectural/Engineering intent of spaces, ceiling heights, accessibility, and to maximize headroom clearances. DCC will request Architect/Engineers assistance relative to acceptability of installations and for input on un-resolved conflicts. DCC will issue meeting minutes with action items following each meeting. Coordination drawings are not to be considered as piping or duct shop drawings and will not be reviewed as such. The Subcontractors are required to submit piping and ductwork shop drawings for review by the Engineer as part of the standard submittal process. Piping and ductwork shop drawings shall follow the design intent of the contract documents.

Process:

1. As soon as practical and in no case starting later than 10 business days unless noted otherwise after the award of contract or notice to proceed the sheet metal subcontractor shall prepare layout drawings of all his equipment and ducted systems. The Mechanical/HVAC Subcontractor is responsible to create the base coordination drawings, including but not limited to, as-built (field measure/draw) all existing conditions (structural/architectural elements to

remain, verify and draw all new structural and architectural components (ie: soffit framing, ceilings, walls, Owner supplied FF&E, misc. steel, etc…)

2. If required or applicable to the specific project requirements the MEP Subcontractors should As soon as practical and in no case starting later than 10 business days after award of contract or notice to proceed all MEP Subcontractors are responsible to as-built (field measure/draw) their own existing systems currently in place in order to properly coordinate new work around existing systems depicted in the Contract Documents (Ie: Occupied Construction Phasing)
3. Electronic drawing format: Latest and most current version of REVIT w/NAVISWORKS Clash/Collision detection along with the latest and most current AUTO-CAD version or the latest AUTO-CAD compatible three dimensional model space software. Background files may be obtained from the Architect and Engineer as a REVIT Model. The MEP subcontractors will be required to sign waivers to obtain the CAD files from the Architect / Engineer and to pay any fees associated with obtaining the files. Converting, stripping the information for coordination will be initiated by the Mechanical/HVAC Subcontractor along with their sheetmetal/ductwork subcontractor. All other MEP Subcontractors are responsible to extract or convert REVIT information as necessary.
4. All MEP Subcontractors will be responsible to provide necessary in house or provide outsourced consultant services - CAD MEP Coordination capable with a minimum experience of (3) past projects with similar size and scope in a 3D BIM environment using REVIT/NAVISWORKS and with the Auto-CAD compatible software.
5. All MEP Subcontractors will be responsible to upload their own drawings to the latest uploaded REVIT Model updated and posted to do their own collision detection to mitigate clash issue before coordination meetings. The Mechanical/HVAC Subcontractor is responsible for generating the clash/collision detection reports for the coordination meetings.
6. Electronic file organization/sharing: DCC will provide web access to its Citrix Sharefile “Cloud” storage service or similar for background file access and Subcontractor file sharing capabilities. A link and password will be provided at the initial MEP Coordination meeting.
7. The Mechanical/HVAC Subcontractor is required to provide and install the most current and up to date REVIT w/NAVISWORKS and Auto-Cad software, wall mounted 55” LED smart HDTV with a 1920x1080 full HD resolution and USB port, complete with all cables mounting, splitters and hardware, etc. for complete connectivity with laptop computers. All items to be turned over to DCC at the end of the project.
8. Prepare coordination drawings and sections clearly showing how the work is to be installed in relation to the work of other trades. The subcontractor shall prepare coordination drawings at a scale no less than 3/8” = 1’-0”, showing the work of all trades, including but not limited to, the following: proposed ductwork installation in detail, including ceiling heights, duct heights, access doors, light fixtures, cable tray, J-hooks, special systems conduit, tele/data conduits and

equipment, registers and diffusers, sprinkler piping, electrical distribution conduits and equipment, wires, mechanical equipment, fixtures, panels and any other electrical work which may conflict with the sheet metal ducts or piping, waste and vent piping, water piping, and rain leaders, etc….

9. The sheet metal ductwork drawings will be created and coordinated with architectural and structural drawings. Once created will be submitted to Engineer for review. Drawings must be returned from Engineer either "Approved", "Reviewed" or "Furnish as corrected" prior to being used as basis for coordination drawings. At the same time, all trades will coordinate structural framed opening and support framing dimension information for structural subcontractors. Separate drawings will be created and sent to structural trades, including but not limited to, RTU/fan curbs, MEP dunnage frames, roof drains, duct and pipe hanger supports, flue stacks, foundation and wall sleeves, cored or square hole opening and etc.
10. After sheet metal ductwork drawings have been created and sent to the Engineer for review, The sheet metal ductwork subcontractor shall post to the CITRIX Sharefile site for other trades to coordinate in the following sequence for the inclusion of their work:
    a. Plumbing subcontractor
    b. Mechanical piping
    c. Sprinkler piping
    d. Electrical work, along with Fire Alarm, Technology
    e. Special Systems
    f. Other
11. Prior to inclusion of sprinkler piping and equipment, subcontractor shall have submitted sprinkler plans and calculations to engineer for review and to rating Bureau for review. After all trades have included their work on the coordination drawing and noted conflicts, all trades shall meet to resolve conflicts and agree to acceptable solutions. Each subcontractor shall sign coordination drawings. Items not shown on coordination drawing are responsibility of omitting subcontractor and subcontractor is subject to back charge of additional costs incurred by other trades due to omission.
12. Submit final signed coordination drawing to Engineer for review. Engineer will review accordingly.
13. All work fabricated or installed prior to sign off by all trades is the sole responsibility of MEP Subcontractor performing work and is at risk of removal/re-working at their expense. Each MEP Subcontractor (mentioned above) is responsible for the coordination of his or her lower tier subcontractors.
14. The record copies of final composite MEP Coordination drawings shall be retained by DCC and each MEP Subcontractor as working reference. Each MEP Subcontractor is required to provide electronic 3D & 2D Auto-Cad as-builts and the Mechanical/HVAC Subcontractor is required to electronically turn over the as-built model. All shop drawings, prior to their submittal to the Architect/Engineer, shall be compared with the composite drawings and developed accordingly by the trade responsible. Any revisions to the composite

drawings which may become necessary during the progress of the work shall be noted by all trades and shall be neatly and accurately recorded on the record copies. Each trade shall be responsible for the up to date maintenance of his record copies of the composite drawings and to keep one copy available at the site. The composite drawings and any subsequent changes thereto, shall be utilized by the MEP Subcontractors in the development of his "as-built" drawings.

Q. Project Schedule and Progress

This Subcontractor is responsible to meet the requirements of the Preliminary/Milestone Construction Schedule included in the Contract Documents. This includes providing the appropriate manpower, equipment and materials. The Subcontractor will be responsible for all overtime and costs associated with meeting this schedule.

The intent of the Preliminary/Milestone Construction Schedule is to define the construction performance period(s). Changes to this schedule during construction will not be grounds for any change orders or claims. The Preliminary/Milestone Construction Schedule included in the Contract Documents shall represent the major activities of work and the duration of time allocated to those activities, also referred to hereinafter as the assigned construction performance period(s). It is the responsibility of the Subcontractor to develop a detailed construction schedule of activities and plan their work within the assigned construction performance period(s) provided by the Preliminary/Milestone Construction Schedule. The Subcontractor by providing a Bid acknowledges and accepts the defined assigned construction performance period(s) to complete their work and further agrees to provide detailed information to DCC for the development of a detailed Construction Schedule.

A more detailed Construction Schedule will be prepared and issued during the project by DCC. Within twenty (20) working days of receipt of a Notice to Proceed, each Subcontractor shall provide detailed scheduling information for the creation of the detailed Construction Schedule. This information is to include, at a minimum, a man loaded construction schedule with detailed itemizations, durations, procurement and sequences of all work activities including predecessor/successor relationships and designation of manpower required to achieve the schedule in accordance with the assigned construction performance period(s) as outlined in the Preliminary/Milestone Construction Schedule. Failure to submit required schedule information to the DCC as outlined in this section forfeits the Subcontractor's opportunity for any adjustment to durations, sequence, or logic of specific tasks. Further to this, as this scheduling information is critical to the successful execution of the project, any delay in providing such information will cause all payments due the Subcontractor to be held until such time as the information is submitted and approved by DCC.

All Subcontractors are obligated to comply with the Construction Schedule. The Construction Schedule will be updated throughout the project to incorporate changes in work, changes in sequence and changes in logic, all of which are recognized and anticipated as common in the construction industry and with this project. As such, all Subcontractors shall comply with the appropriate adjustments to their manpower and

material and equipment deliveries to accommodate the schedule changes without additional compensation from DCC or Owner.

In the event the Owner or DCC determines the Subcontractor is behind schedule and/or will not be able to meet milestone dates at the current rate of progress, the Owner or DCC may direct the Subcontractor to increase its workforce and should the Subcontractor at any time refuse or neglect to supply a sufficiency of properly skilled workmen, or materials of the proper quality and quantity, or become insolvent or unable to pay its obligations as they mature, or in the opinion of the Owner or DCC, fail in any respect to prosecute the work with sufficient promptness and diligence to insure its completion within the time herein provided, or fail in the performance of any of the agreements on its part herein contained, the Owner or DCC shall be at liberty, after two (2) business days of written notice to the Subcontractor, delivered personally or mailed to or left at its place of business to default the Subcontractor. In the event the Owner or DCC declares Subcontractor in default, Owner or DCC may (1) terminate this Contract in whole or in part or (2) supplement the Subcontractors forces and may use any materials implements, equipment, or tools furnished by or belonging to Subcontractor. In the event the Owner or DCC itself, or by another subcontractor, or both, furnishes labor and material to complete Subcontractor's work, Owner or DCC may offset the cost thereof and any expenses therefore including overhead and profit against any money due or to become due under this Contract. Subcontractor shall be liable for any excess costs and expenses over the Contract amount for completion of Subcontractor work. In the event the costs and expenses of completing Subcontractors work are less than the amount remaining on this Contract, the Subcontractor shall be entitled to the differential. In addition to the costs and expenses of completing Subcontractor's work as set forth herein, Owner or DCC shall be entitled to reasonable legal fees to enforce the terms of this Contract. Notwithstanding DCC' use of its own forces and/or utilizing forces of another subcontractor in performing in whole or in part the work of the Subcontractor, the Subcontractor shall remain fully responsible for the timely completion of the work which is the subject of this Contract.

If the Subcontractor fails to staff the job adequately to meet the milestone or completion dates, the Owner/DCC reserves the right to assume possession of the material and complete the installation with the Owner's forces or other Subcontractors under the direction of DCC or to require the Subcontractor to work second shift and/or weekends. The Subcontractor shall be responsible for any additional costs incurred by other contractors and/or DCC resulting from the Subcontractor working overtime, Saturday and/or Sunday to remedy the delay.

The Owner and each Subcontractor agree that time is of the essence to the Contract Documents and all obligations thereunder. The Subcontractor acknowledges and agrees that the Owner will sustain damage and loss as a result of the Subcontractor's failure to meet the contract time schedules. All Subcontractors are responsible for scheduling its labor and material procurement within the time periods set forth in Contract Documents. The Subcontractor is also required to perform its work in such a manner so as to not interfere with or prohibit other Subcontractors from completing their work within the time periods set forth in the Contract Documents. In the event the Subcontractor does not meet the time requirements set forth in the Construction

Schedule and time periods outlines, the Subcontractor will be responsible for monetary sustained damage and loss to the Owner.

R. Safety and HAZCOM

Safety is the first priority on the job site. Subcontractors shall conduct their operation in accordance with all applicable regulations and requirements of Local, State and Federal Laws, which include regulations of the Occupational Safety and Health Administration (OSHA).

- DCC will hold a jobsite safety orientation meeting for all subcontractors. Each and every one of the Subcontractors employees must understand, acknowledge and fully execute the orientation form and/or be accompanied by a competent person. "Safety Trained Hard Hat Label Identification" stickers will be distributed and logged at that time. These stickers shall be placed on the individual's hard hat in a prominent location.
- Satisfactory evidence of OSHA 10 and/or OSHA 30 training certification for all employees on the jobsite must be provided to DCC no later than five (5) business days PRIOR to work start.
- DCC will hold a safety meeting on a periodic basis with on-site personnel from each trade currently performing work at the site. At least one representative (foreman or above) shall attend safety meetings and be continually alert for safety hazards and report them to the DCC immediately.
- Each Subcontractor must furnish the DCC Field Superintendent with two (2) copies of his/her own project specific Safety and Hazardous Communication Program including all SDS sheets (Safety Data Sheets) no later than five (5) business days PRIOR to work start. Each Subcontractor is required by OSHA regulations to institute a hazard communication program. Under said program, Subcontractor must inform both the Construction Manager and all other Subcontractors on the site of any hazardous chemicals being used by Subcontractor's employees on this project. Each Subcontractor shall provide DCC and all other Subcontractors, copies of the SDS sheets. They also must warn other Subcontractors in Subcontractor's work area of the existence of hazardous chemicals, must insure that any containers containing hazardous chemicals are properly labeled and stored, and must maintain an inventory of any such chemicals.
- A Job Hazard Analysis (JHA) must be submitted to the DCC Field Superintendent no later than five (5) business days PRIOR to work start. Sample forms are available from DCC.
- Any and all accidents must be reported to DCC immediately and accident reports submitted within five (5) business days of the incident.
- All workers are required to follow all applicable OSHA regulations regarding daily construction activities (approved footwear, shirts, pants, etc.). In addition, all workers must be provided by their employer and where at all times all proper Personal Protective Equipment (PPE). This includes but may not be limited to Hard Hats, Safety Glasses, Ear Protection, High Visibility clothing etc. **Failure to**

wear Hard Hats and all other PPE as determined by the JHA will result in a $100 fine. The third violation will result in immediate and permanent dismissal of the individual from the site.

- Each Subcontractor will provide any fire watch necessary in the performance of "hot work" activities. In addition, a certified fire extinguisher needs to be placed in the general vicinity of the "hot work". A "hot work" permit will be issued by DCC. **Failure to obtain the proper "hot work" permit will result in a $100 fine.**
- The Subcontractor will provide all lifts, staging, scaffolding and hoisting required to complete this scope of work in accordance OSHA and DCC' "Scaffold Use Program". (Copy available upon request).
- Use of scaffolding shall be in accordance DCC' "Scaffold Use Program". This requires a scaffold release, insurance indemnification closure, designated competent person, scaffold user qualification and daily inspection log as well as compliance with all applicable OSHA regulations. If man and/or material lifts are required for this project similar requirements will exist.
- Each Subcontractor shall check and maintain protection of all slab openings and perimeter fall protection when executing their work. This Subcontractor shall provide all temporary protection and/or barricades per OSHA requirements in all areas as required in completing this scope of work. Each subcontractor is also responsible for maintaining and/or removing this same protection until completion of this scope and/or safety is assumed by another subcontractor. Safety measures CANNOT be removed by any Subcontractor because it interferes with a part of their scope of work without providing an acceptable revised system. If the work is completed and these safety measures are no longer required per OSHA or to establish safe working conditions for all trades, then the Subcontractor who installed them shall remove them in their entirety.
- The Subcontractor is responsible for any and all lead in Construction work necessary to execute this scope of work. All applicable OSHA rules, regulations and guidelines are applicable.

S. Pedestrian/Vehicular Traffic Control

The Subcontractor is responsible for all pedestrian and vehicular traffic control management as required for the execution of their scope of work. The Subcontractor will provide local police officers, traffic control devices, flagmen, signage, barricades, temporary road plates, permits, fees, etc. as may require by the same authorities and/or DCC. All work affecting public roadways will be performed in a manner to maintain safe traffic patterns and to minimize disruption to traffic and pedestrian flow. The Subcontractor will avoid obstructing vehicular and pedestrian traffic into and out of adjacent facilities. The Subcontractor shall provide a complete logistics plan at least two (2) weeks prior to work start for approval by DCC and local authorities.

T. Document Distribution

All Subcontractors will be required to use PROCORE. PROCORE is a cloud-based construction management virtual data room (VDR) application that will increase project

efficiency and accountability by providing streamlined project communication and documentation.
During the course of construction, most information including the issuance of Bulletins, ASIs, SKs, new and/or revised drawings will be transmitted via PROCORE/Email by DCC. It shall be assumed that hardcopies will NOT be provided. The Subcontractor will be responsible for providing and paying for any and all hardcopies they desire.

U. Permits

DCC will be responsible for obtaining the General Building Permit. All other permits shall be obtained by and paid for by the respective Subcontractor, i.e. Fire Protection, Plumbing, HVAC, Electrical, Fence, Curb Cuts, Elevator, Food Service, Water/Fire/Sanitary Services, Storm Water Pollution/Discharge, Signage, and any other permit other than the General Building Permit. Copies of permits must be submitted to the DCC immediately upon receipt.

V. Noisy Operations

Heavy machinery start-up/warm-up cannot occur prior to 7:00 AM. Any loud operations cannot occur prior to 7:00 AM. All operations that involve excessive noise and may disturb the owner's activities or the neighborhood will be scheduled weekly at the DCC' Field Coordinating Meeting. These items include but are not limited to; jack hammering, hammer drilling, vibratory compaction, etc. These operations will also be monitored on a daily basis. If the operations cause any disruption of the owner's activities, they will be stopped and rescheduled at a time convenient to both the owner and subcontractor. If a time cannot be scheduled during regular working hours then the subcontractor will work off hours at no added cost to the owner. There will be no charges to the Owner or DCC for any work stoppages.

W. Working Hours

Unless stated otherwise elsewhere in the Contract Documents, working hours for the project are 7:00 AM to 3:30 PM. Late starting or early stopping of work will not be tolerated. All trades will work common eight-hour days Monday through Friday. There will be a coffee break in the morning only at the assigned time of 9:00 AM. All trades will celebrate the agreed upon Holidays specified. Any subcontractor working beyond the normal hours of 7:00 AM to 3:30 PM shall notify the DCC by 1:30 PM of his intention to work overtime to allow sufficient time for arrangement of any support services and/or personnel which will be at the Subcontractor's expense. Saturday work shall not be considered a means of maintaining the schedule in lieu of providing sufficient manpower during the regular workweek. If necessary and approved by DCC, all trades may work until 5:30 PM each weekday at their own expense if required to maintain the schedule.
There will be no work on Saturdays or Sundays without direction and approval by DCC.

X. Parking

DCC will designate construction employee parking as available. If parking is not clearly designated by DCC, the Subcontractor should assume they are responsible for their own

parking and any associated costs. Three shall be NO contractor employee parking allowed on school grounds.

Y. Delivery and Storage of Materials

The storage of materials and equipment anywhere around or within the job site shall be permitted only as approved in advance by DCC. Each Subcontractor is responsible to review for approval the on-site storage of all flammable materials with the Fire Marshal and/or Local Authorities having Jurisdiction (AHJ). If material and/or equipment are stored in a manner which obstructs the progress of any portion of the work without the DCC' approval, the Subcontractor shall remove or relocate as directed by DCC immediately upon notification and without reimbursement of cost. All deliveries will be made to the main construction gate as indicated on the site logistics plan for this project. Due to lack of space inherent on most jobsites, every effort shall be made to deliver material only as progress demands and avoid unnecessary and/or long term stockpiling. Subcontractors are required to schedule all deliveries of material and equipment with DCC at least 48 hours in advance. DCC reserves the right to turn away any truck not scheduled without reimbursement cost.

The Subcontractor shall be responsible for maintenance, care and insurance, for any loss or damage to all equipment or materials, regardless of location and cause.

This Subcontractor is responsible for the storage, handling and distributing materials (onsite and offsite) throughout the project, as required, along with protection of material from damage during delivery, handling, storage and installation. Specifically the movement of onsite stored material required to changing job conditions. All storage accommodations will be on an as needed basis and approved by DCC.

Z. Trailers

DCC will designate the location of jobsite field office trailers <u>if available</u>. All trailer quantities, sizes, locations, and duration's will be subject to the approval of the Project Superintendent for DCC. No offices, locker rooms or tool rooms are to be built within the building without the approval of DCC.

All temporary facilities are to be constructed utilizing fire resistant materials. Each of these must be equipped with an ABC type fire extinguisher furnished by the Subcontractor and shall conform to applicable codes. Subcontractors may be required to relocate their trailers during the progress of the job at the Subcontractor's expense. Any electrical power, data and phone requirements shall be the responsibility of each Subcontractor.

AA. Use of Equipment

No gasoline or diesel driven equipment will be allowed inside buildings. Material handling equipment shall either be hand operated (moved by human beings) or propane propelled. However, the use of propane propelled equipment is strictly forbidden when the building is being occupied for its intended purpose. When propane propelled is used, the subcontractor shall provide ventilation to remove exhaust fumes. The Subcontractor shall also be responsible for any repairs, replacement, or deleterious effects to all flooring and other construction that this equipment comes in contact with.

BB. Temporary Construction Fence

Subcontractors must seek permission from DCC prior to dismantling or relocating the perimeter fence in any way. Any Subcontractor that creates breeches, gaps or dismantles the perimeter construction fence for his work access, deliveries or operations will be responsible for resetting it immediately after use.

CC. Security

Refer to project Specifications for specific security requirements as they may vary based on the given project. The Subcontractor is responsible for any and all costs associated with obtaining the proper security clearance.

DD. Temporary Utilities and Services

Unless otherwise specifically stated elsewhere in the Contract Documents, the Owner will pay for the cost of water and electrical energy usage necessary for construction activities. Those activities will NOT include the use of hoists, cranes, welders, jobsite trailers and unusual trade specific power (including "hook up").

- **Toilets** – Will be provided by the DCC and maintained for the use of all workers. The owner's facilities are NOT to be used by any Subcontractor. **Anyone observed using these facilities will be removed from the job permanently.**
- **Fire Protection** – Will be the responsibility of everyone on site. Adequate numbers of portable ABC extinguishers will be located within the work areas by DCC or the Fire Protection Subcontractor. Any Subcontractor performing cutting, grinding, burning, welding, or other heat, spark or flame generating type of work will also provide adequate number of portable ABC extinguishers in the vicinity of the work. A fire watch must be performed during the activity and for a minimum of one hour after completion. Any work that may affect the fire protection and fire alarm systems shall be planned, coordinated, and approved in advance by the Owner and DCC. This includes dust generating work affecting smoke detectors, ceiling tile removals where smoke/heat detectors or sprinkler heads are mounted at the ceiling, and the shutdown of sprinkler or fire alarm systems.
- **Drinking Water** – Each Subcontractor will be responsible for providing drinking water for their employees and forces, including containers, ice and cups, regardless of Specifications, also reference OSHA CFR 1926.51 (a)(2) Sanitation……..Employer shall supply potable drinking water, etc… The owner's facilities are NOT to be used by any subcontractor. **Anyone observed using these facilities will be removed from the job permanently.**

EE. Protection of Existing Utilities and Services

The Subcontractor shall locate and mark the exact locations of the utilities and services utilizing a utility locating company and adequately protect them from damage during the work. In the event that any are accidentally disturbed, the Subcontractor shall

repair or replace such damage immediately and restore service as promptly as possible at the Subcontractor's expense.

FF. Existing Conditions

The Subcontractor is required to familiarize themselves with the existing conditions and items to remain prior to commencing with this scope of work. Every effort is expected to be made not to damage the existing conditions. The Subcontractor is responsible to protect, repair and/or replace and damage attributable to the execution of their scope of work.

GG. Hoisting

Each Subcontractor will be responsible for the hoisting of their own material, equipment and personnel. Some projects may contain provisions for material and manlifts.

HH. Survey & Layout

The Subcontractor is responsible for providing a qualified person or licensed surveyor to perform all field engineering, field layout, surveying, verification of field dimensions layout and field measuring required to properly locate and perform his/her work. DCC will provide control line and grade or coordinates for layout/engineering purposes. The Subcontractor is responsible for all layout, lines, grades required to perform their scope of work and coordinate with other Trades.

Regardless of Specifications, the Structural Steel Subcontractor will be responsible for providing a location survey of the anchor bolts installed by the Concrete Scope of Work Subcontractor ten (10) business days prior to start of the erection to allow sufficient time for review and corrections if necessary.

II. Cleanup

The job site shall be kept clean at all times. A clean jobsite promotes a safe work environment for all. It is the responsibility of each Subcontractor to conduct his operations in the cleanest manner possible. Project cleanup and cleanliness for each Subcontractor is to include but not limited to the following requirements:

1.) Each day the Subcontractor, at his own cost, will collect and place debris related to his operation into containers provided by others unless specifically stated elsewhere in the Contract Documents.
2.) Disposal of trash and debris will be in the assigned dumpster provided by DCC unless otherwise stated in the Contract Documents.
3.) The Sitework Subcontractor is responsible to maintain and keep all paved and hardscape areas swept clean at a minimum weekly, or as directed by DCC, throughout the duration of the Project.
4.) Reference specific Bid Package for general building cleanup and broom sweeping, this Bid Package does not relieve the all other Subcontractors from their daily cleanup responsibilities.
5.) Each Subcontractor is responsible to sort their trash and debris in trash barrels and/or dumpsters provided by Others (unless otherwise noted in the Contract Documents), in accordance with Sustainable Design Requirements and

Construction Waste Management Plan. All proper disposal documentation for any of the above items shall be provided to DCC monthly and/or with the monthly requisition billing cycle. Sorting of all construction waste/debris will be in accordance with LEED on-site requirements. Failure to comply with this item will result in the Subcontractor being responsible for all costs to rectify the issue.

6.) Cleanup by each Subcontractor will be monitored accordingly by DCC. If this Subcontractor is non-compliant the DCC reserves the right to supplement cleanup for this subcontractor 24 hours after written notice of non-compliance. All associated costs for supplemented labor is the responsibility of this Subcontractor and will be at no additional cost to the Owner or DCC.
7.) If any general debris is left behind, such as soda cans, juice bottles, paper products, banding material, snippets of wire, cardboard boxes, tools, equipment, etc., DCC will clean the debris and proportionately back charge every Subcontractor on the site. If the work is complete but the area is not cleaned and debris or equipment is not removed, DCC/Owner shall have the right to prepare the area for occupancy with his own forces. All associated will be the responsibility of this Contractor and will be at no additional cost to the Owner or DCC.
8.) The Subcontractor who fails to comply with any of the above mentioned "cleanup" items, in addition to being responsible for the direct corrective costs will be fined $250/per incident.

JJ. Material Furnished by Others

Where material is specified to be furnished by others or furnish and delivered only, it shall be understood that such materials are to be furnished and delivered F.O.B. Jobsite. The receiving, unloading, inventory, handling and storage of materials furnished by others, including security for such stored materials, is the responsibility and obligation of the Subcontractor to whom the materials are delivered.

KK. Cutting and Patching

Each Subcontractor shall be responsible for all cutting and patching which may be required for this scope of work or in connection with the installation of his/her work properly unless noted otherwise in the Contract Documents.

LL. Fire stopping

The Subcontractor is responsible for fire caulking/fire stopping/smoke stopping of penetrations through rated assemblies, at all new or existing partitions, at the perimeter of all work covered under this scope of work, all joints in or between fire resistance rated constructions cleaning and protection, horizontal and vertical assemblies as it relates to their scope of work. All Subcontractor's shall note that any opening that must be drilled / cored into any existing wall, floor, ceiling or roof deck for the passage of mechanical or electrical ducts, pipes or conduits shall be drilled / cored, fire stopped and smoke stopped as required by the subcontractor requiring the opening. Furthermore this Subcontractor agrees that they will comply with utilizing a standard firestopping

and smoke stopping manufacturer agreed to by all pertinent trades, as it relates to the execution of this scope of work.

MM. Responsibility for Notification

Considering the Subcontractor's skills and knowledge of their specialty, it shall be his/her responsibility upon discovery of errors, omissions, discrepancies and non-compliance, or any work that does not fit or properly function if installed as indicated in the Contract Documents to notify DCC immediately, in writing.

NN. Subcontractor's experience and coordination with other trades.

Each Subcontractor is required to have qualified supervision capable of making decisions on-site full time with proper communication skills and the ability to work with others. DCC reserves the right to request a subcontractor provide a non-working supervisor. Each Subcontractor is expected to be experienced and familiar with the requirements and conditions during the construction of similar buildings. Sequencing of work shall include phasing of the construction cycle to accommodate the installation of the work of all Subcontractors in a logical and orderly fashion, including all necessary temporary blackouts, connections, coordination, framing, and supports, etc….. as required for the work of others.

All work shall be coordinated with DCC and other trades prior to commencement.

OO. Quality

Each Subcontractor understands that Quality Control and Quality Assurance is a specific commitment and attitude required during the implementation of the work. The focus required to establish a quality level, by developing in place mock-ups, by providing skilled supervision and by monitoring daily production quality are all expected to be carried out during the execution of this Contract. This Subcontractor is required to provide mockups, in accordance with the Specifications or as requested by DCC.

The Subcontractor shall include the cost of providing tests and reports for the material they intend to use and as required by local governing agencies and authorities having jurisdiction such as pressure testing of pipe lines. Subsequent to approval of materials, the Owner will provide and pay for all testing services as described in the Contract Documents.

PP. Project Closeout

"Project Close-out begins with Project Startup," the following close-out procedures shall be implemented:

a. The Subcontractor shall forward all Warranties and Guarantees as applicable to the DCC within two (2) weeks following substantial completion. (Reference Sample Warranty included in the Contract Documents) All manufacturer's equipment and product warranties must reference the Project name, location and commencement of warranty.
b. The Subcontractor shall furnish a minimum of four (4) copies and one (1) electronic copy of all Operating & Maintenance Manuals prior to Substantial Completion unless

noted otherwise in the project Specifications. The Subcontractor may be asked to furnish one (1) Operating & Maintenance Manual prior to their final submission for review and approval by the Architect/Engineer.

c. The Subcontractor shall complete all Demonstration and Training to properly explain and train the Owner and Owner's representative as called for in the project Specifications or otherwise requested. The Subcontractor is responsible to employ a professional videographer to video all Owners training, demonstrations and closeout procedures. Furthermore, this Subcontractor agrees to coordinate with all pertinent trade to utilize the same videographer. Detailed agenda's shall be developed and given to DCC at least forty-eight (48) hours prior to the scheduled training day. The agendas should clearly outline the intent of the demonstration and training and what the owner can expect to have learned during the session.
d. The Subcontractor shall forward all As-Built Drawings as applicable to DCC within ten (10) business days following Substantial Completion. Four (4) sets of As-Builts (hard copy) and four (4) sets of As-Built (electronic CAD/3D Model file) are to be forwarded accordingly. DCC will periodically review the preparation of As-Builts throughout the course of the Project. Payments will be delayed if it is found that As-Builts are not being kept up to date.
e. The Subcontractor shall complete all punch list work within two (2) weeks (or sooner as directed by DCC) of formal issuance of the punch list. Failure to complete the punch list within this time frame may result in DCC completing the work by alternate means. The Subcontractor will be back charged accordingly for the completion of the punch list.
f. All Subcontractors are required to acknowledge non-emergency warranty items within twenty-four (24) hours of notice and provide corrective action/repair within forty-eight (48) hours. For all emergency related warranty items, the Subcontractor is required to acknowledge within the hour of notice and provide corrective action/repair immediately.
g. Each Subcontractor will be responsible for the reimbursement of all direct costs associated to complete any of the above mentioned items, if the requirements are not met.

Final payment will not be made until all of the above items (a, b, c, d, e & f) and any other project close-out requirements are completed.

QQ. Personnel Conduct

There shall be no fraternization or interference with the owner's staff, by any construction workers on or near the site. No foul language, smoking, drinking or radios. Any complaints by the owner with regard to this matter will result in the immediate and permanent dismissal of the said employee from the project site.

No foul or abusive language will be tolerated or allowed. Also, there is no smoking or drinking, and radios or amplified music playing devices are not allowed on the site. Any infraction will result in immediate and permanent dismissal.

RR. Background Investigations

The Subcontractor will be required and agrees that before deploying any employee, agent or subcontractor ("Deployed Person") to perform any portion of the Project, the Subcontractor will:

Verify the Deployed Person's applicable and appropriate professional degrees, licenses and/or certifications as claimed by the Deployed Person.

To the extent permitted by applicable law, the Subcontractor shall perform a commercially reasonable criminal background check. The Subcontractor agrees not to knowingly deploy such a person without first notifying the Owner and DCC of any criminal background.

Notwithstanding the above provisions, the Subcontractor agrees that it will not knowingly deploy any person to provide work or services to the Owner or DCC who has been convicted of any criminal felony involving dishonesty or a breach of trust or that such person has been convicted of any offense under 18 U.S.C Section 1033 of the Violent Crime Control and Law Enforcement Act of 1994, which section is captioned "Crimes by or Affecting Persons Engaged in the Business of Insurance Whose Activities Affect Interstate Commerce." Such offenses include, by way of illustration and not of limitation, activities by persons in the insurance industry who willfully and materially overvalue any land, property or securities; embezzlement or misappropriation of insurance premiums and other funds; the making of false entries or statements in reports with the intent to deceive another person engaged in the insurance industry; or the use of threat or force in an attempt to corrupt or obstruct administrative proceedings related to the insurance industry.

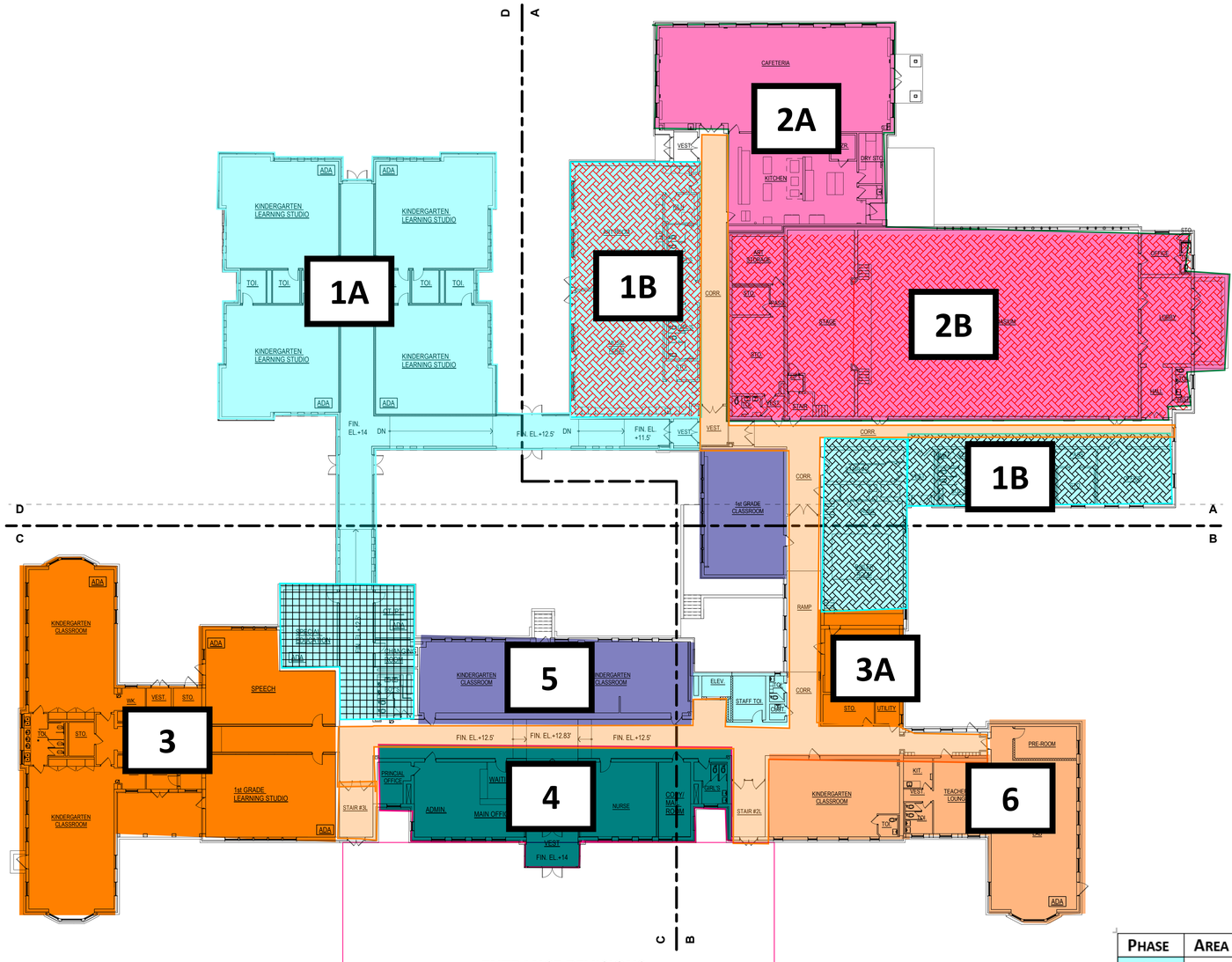
The Subcontractor represents that at all times it will comply with all state and federal laws and regulations with respect to maintaining a drug free workforce and that it will disclose its drug testing procedures to the Owner and DCC upon request. Please refer to the agreement provided with the bid documents. This agreement is a Contractual requirement and must be returned to the Construction Manager prior to the execution of this Subcontractors contract.

SS. Temporary Workers – The Subcontractor shall not employ third party temporary workers to complete the work without approval by the Construction Manager.

TT. Project Management Software – This Subcontractor will be directed and required to use certain construction software systems to facilitate Project Management and Billing. See General Items All Trade Packages for additional information and subscription fees to be included base bid.

END SUPPLEMENTAL INSTRUCTIONS

SCHEDULE - APPROX. SUMMER 2025 THROUGH DECEMBER 2027



PHASE	AREA	START - COMPLETION
1A	NEW KINDERGARTEN ADDITION	JULY 2025 – AUGUST 2026
1B	MUSIC AND ART ROOMS	JULY 2025 – OCTOBER 2025
2A	CAFETERIA / KITCHEN	JUNE 2026 – OCTOBER 2026
2B	GYMNASIUM	JUNE 2026 – SEPTEMBER 2026
3	PRE-K THRU 3RD GRADE	JULY 2026 – DECEMBER 2026
3A	SWING SPACE	JULY 2026 – AUGUST 2026
4	ADMIN / RESOURCE / MATH / ACCELERATED LEARNING / 4TH GRADE	JANUARY 2027 – AUGUST 2027
5	BAND/ORCHESTRA / 1ST GRADE / LITERACY / ACCELERATED LEARNING / 4TH GRADE	JULY 2027 – SEPTEMBER 2027
6	1ST GRADE / STAFF / SCIENCE / MEDIA CENTER / 4TH & 5TH GRADES	JULY 2027 – DECEMBER 2027

KEY PLAN

Project Title:
ADDITIONS & ALTERATION TO:
Old Greenwich Elementary School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

DOWNES CONSTRUCTION COMPANY

CONSTRUCTION PHASING / SCHEDULE DRAWING

Date: Issue Date 10/31/2024

Drawing Number: CPS-1

5/19/2023 2:09:18 PM

OLD GREENWICH SCHOOL
285 SOUND BEACH AVE
OLD GREENWICH, CT 06870

DOWNES CONSTRUCTION COMPANY

DRAWING LIST **THE FOLLOWING DRAWINGS ARE PROVIDED FOR BID PURPOSES:** Date: 10/24/2024

DWG. NO.	TITLE	REVISION	DATE
VOLUME 1			
GENERAL DRAWINGS			
GV1	COVER SHEET		8/29/2024
G000	DRAWING LIST		8/29/2024
G001	BUILDING CODE PLANS & INFORMATION		8/29/2024
G002	TYPICAL ACCESSORY MOUNTING HEIGHTS AND LOCATIONS		8/29/2024
G010	1st FLOOR LIFE SAFETY CODE PLAN		8/29/2024
G020	2nd FLOOR LIFE SAFETY CODE PLAN		8/29/2024
G030	3rd FLOOR LIFE SAFETY CODE PLAN		8/29/2024
G040	ATTIC FLOOR LIFE SAFETY CODE PLAN		8/29/2024
ENVIRONMENTAL DRAWINGS			
HBM-01	FIRST FLOOR HAZARDOUS BUILDING MATERIALS ABATEMENT PLAN - PART A		8/29/2024
HBM-02	FIRST FLOOR HAZARDOUS BUILDING MATERIALS ABATEMENT PLAN - PART B		8/29/2024
HBM-03	FIRST FLOOR HAZARDOUS BUILDING MATERIALS ABATEMENT PLAN - PART C		8/29/2024
HBM-04	SECOND FLOOR HAZARDOUS BUILDING MATERIALS ABATEMENT PLAN - PART B		8/29/2024
HBM-05	SECOND FLOOR HAZARDOUS BUILDING MATERIALS ABATEMENT PLAN - PART C		8/29/2024
HBM-06	THIRD FLOOR HAZARDOUS BUILDING MATERIALS ABATEMENT PLAN - PART B		8/29/2024
HBM-07	THIRD FLOOR HAZARDOUS BUILDING MATERIALS ABATEMENT PLAN - PART C		8/29/2024
CIVIL DRAWINGS			
VB101	BOUNDARY & TOPOGRAPHIC SURVEY		8/29/2024
CD101	DEMOLITION PLAN		8/29/2024
CS101	SITE PLAN		8/29/2024
CS501	SITE DETAILS I		8/29/2024
CS502	SITE DETAILS II		8/29/2024
CS503	SITE DETAIL III		8/29/2024
CS504	SITE DETAILS IV		8/29/2024
CG101	GRADING AND DRAINAGE PLAN		8/29/2024
CG501	GRADING AND DRAINAGE DETAILS I		8/29/2024
CG502	GRADING AND DRAINAGE DETAILS II		8/29/2024
CU101	UTILITY PLAN		8/29/2024
CU501	UTILITY DETAILS		8/29/2024
CU502	UTILITY DETAILS II		8/29/2024
CE101	SOIL EROSION & SEDIMENT CONTROL PLAN		8/29/2024
CE501	SOIL EROSION AND SEDIMENT CONTROL DETAILS		8/29/2024
LD101	TREE DEMOLITION PLAN		8/29/2024
LP101	PLANTING PLAN		8/29/2024
LP501	PLANTING DETAILS		8/29/2024
STRUCTURAL DRAWINGS			
S100	GENERAL NOTES		8/29/2024
S110	OVERALL FOUNDATION AND FIRST FLOOR PLAN		8/29/2024
S111	FOUNDATION PLAN - PART "A"		8/29/2024
S112	FOUNDATION PLAN - PART "B"		8/29/2024
S113	FOUNDATION PLAN - PART "C"		8/29/2024
S114	FOUNDATION PLAN - PART "D"		8/29/2024
S120	OVERALL SECOND FLOOR FRAMING PLAN		8/29/2024
S122	SECOND FLOOR FRAMING PLAN - PART "B"		8/29/2024
S123	SECOND FLOOR FRAMING PLAN - PART "C"		8/29/2024
S124	SECOND FLOOR AND LOW ROOF FRAMING PLAN-AREA D		8/29/2024
S130	OVERALL THIRD FLOOR FRAMING PLAN		8/29/2024
S132	THIRD FLOOR FRAMING PLAN - PART "B"		8/29/2024
S133	THIRD FLOOR FRAMING PLAN - PART "C"		8/29/2024
S140	OVERALL ROOF FRAMING PLAN		8/29/2024
S141	ATTIC FRAMING PLAN - PART "A"		8/29/2024
S142	ATTIC AND ROOF FRAMING PLAN - PART "B"		8/29/2024
S143	ATTIC AND ROOF FRAMING PLAN - PART "C"		8/29/2024
S144	ROOF FRAMING PLAN - PART "D"		8/29/2024
S200	COLUMN SCHEDULE AND DETAILS		8/29/2024
S300	FOUNDATION SECTIONS		8/29/2024

OLD GREENWICH SCHOOL
285 SOUND BEACH AVE
OLD GREENWICH, CT 06870

DOWNES CONSTRUCTION COMPANY

DRAWING LIST **THE FOLLOWING DRAWINGS ARE PROVIDED FOR BID PURPOSES:** Date: 10/24/2024

DWG. NO.	TITLE	REVISION	DATE
S400	FLOOR SECTIONS		8/29/2024
S500	ROOF SECTIONS		8/29/2024
S600	TYPICAL DETAILS		8/29/2024
S601	TYPICAL DETAILS		8/29/2024
S602	TYPICAL DETAILS		8/29/2024
ARCHITECTURAL DRAWINGS			
A000	ARCHITECTURAL GENERAL INFORMATION		8/29/2024
A001	FIRST FLOOR EXISTING CONDITIONS PLAN		8/29/2024
A002	SECOND FLOOR EXISTING CONDITIONS PLAN		8/29/2024
A003	THIRD FLOOR EXISTING CONDITIONS PLAN		8/29/2024
A004	OVERALL ROOF EXISTING CONDITIONS PLAN		8/29/2024
A011	FIRST FLOOR DEMOLITION PLAN - PART "A"		8/29/2024
A012	FIRST FLOOR DEMOLITION PLAN - PART "B"		8/29/2024
A013	FIRST FLOOR DEMOLITION PLAN - PART "C"		8/29/2024
A022	SECOND FLOOR DEMOLITION PLAN - PART "B"		8/29/2024
A023	SECOND FLOOR DEMOLITION PLAN - PART "C"		8/29/2024
A032	THIRD FLOOR DEMOLITION PLAN - PART "B"		8/29/2024
A033	THIRD FLOOR DEMOLITION PLAN - PART "C"		8/29/2024
A041	ATTIC DEMOLITION PLAN - PART "A"		8/29/2024
A042	ATTIC DEMOLITION PLAN - PART "B"		8/29/2024
A043	ATTIC DEMOLITION PLAN - PART "C"		8/29/2024
A051	ROOF DEMOLITION PLAN - PART "A"		8/29/2024
A052	ROOF DEMOLITION PLAN - PART "B"		8/29/2024
A053	ROOF DEMOLITION PLAN - PART "C"		8/29/2024
A060	OVERALL EXISTING EXTERIOR ELEVATIONS		8/29/2024
A061	EXTERIOR DEMOLITION ELEVATIONS - PART "A"		8/29/2024
A062	EXTERIOR DEMOLITION ELEVATIONS - PART "B"		8/29/2024
A063	EXTERIOR DEMOLITION ELEVATIONS - PART "C"		8/29/2024
A064	EXTERIOR DEMOLITION ELEVATIONS - PART "D"		8/29/2024
A101	FIRST FLOOR - NEW SLAB INFILL CONDITION - PART "A"		8/29/2024
A102	FIRST FLOOR - NEW SLAB INFILL CONDITION - PART "B & C"		8/29/2024
A103	SECOND FLOOR - NEW SLAB INFILL CONDITION - PART "B & C"		8/29/2024
A104	THIRD FLOOR - NEW SLAB INFILL CONDITION - PART "B & C"		8/29/2024
A110	OVERALL FIRST FLOOR PLAN		8/29/2024
A111	FIRST FLOOR PLAN - PART "A"		8/29/2024
A112	FIRST FLOOR PLAN - PART "B"		8/29/2024
A113	FIRST FLOOR PLAN - PART "C"		8/29/2024
A114	FIRST FLOOR PLAN - PART "D"		8/29/2024
A120	OVERALL SECOND FLOOR PLAN		8/29/2024
A121	SECOND FLOOR PLAN - PART "A & B"		8/29/2024
A123	SECOND FLOOR PLAN - PART "C"		8/29/2024
A130	OVERALL THIRD FLOOR PLAN		8/29/2024
A132	THIRD FLOOR PLAN - PART "B & C"		8/29/2024
A142	ATTIC FLOOR PLAN - PART "B & C"		8/29/2024
A150	OVERALL ROOF PLAN		8/29/2024
A151	ROOF PLAN - PART "A"		8/29/2024
A152	ROOF PLAN - PART "B"		8/29/2024
A153	ROOF PLAN - PART "C"		8/29/2024
A154	ROOF PLAN - PART "D"		8/29/2024
A211	FINISH PLAN - FIRST FLOOR - PART "A"		8/29/2024
A212	FINISH PLAN - FIRST FLOOR - PART "B"		8/29/2024
A213	FINISH PLAN - FIRST FLOOR - PART "C"		8/29/2024
A214	FINISH PLAN - FIRST FLOOR - PART "D"		8/29/2024
A215	FINISH PLAN - SECOND FLOOR - PART "A & B"		8/29/2024
A216	FINISH PLAN - SECOND FLOOR - PART "C"		8/29/2024
A217	FINISH PLAN - THIRD FLOOR - PART "B & C"		8/29/2024
A233	FF&E PLAN - FIRST FLOOR - PART "C"		8/29/2024
A234	FF&E PLAN - FIRST FLOOR - PART "D"		8/29/2024
A251	FIRST FLOOR REFLECTED CEILING PLAN - PART "A"		8/29/2024
A252	FIRST FLOOR REFLECTED CEILING PLAN - PART "B"		8/29/2024

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DRAWING LIST **THE FOLLOWING DRAWINGS ARE PROVIDED FOR BID PURPOSES:** Date: 10/24/2024

DWG. NO.	TITLE	REVISION	DATE
A253	FIRST FLOOR REFLECTED CEILING PLAN - PART "C"		8/29/2024
A254	FIRST FLOOR REFLECTED CEILING PLAN - PART "D"		8/29/2024
A255	SECOND FLOOR REFLECTED CEILING PLAN - PART "A - C"		8/29/2024
A256	THIRD FLOOR REFLECTED CEILING PLAN - PART "A - C"		8/29/2024
A260	CEILING DETAILS		8/29/2024
A300	OVERALL EXTERIOR ELEVATIONS		8/29/2024
A301	EXTERIOR ELEVATIONS		8/29/2024
A302	EXTERIOR ELEVATIONS		8/29/2024
A303	EXTERIOR ELEVATIONS		8/29/2024
A304	EXTERIOR ELEVATIONS		8/29/2024
A305	EXTERIOR ELEVATIONS		8/29/2024
A400	BUILDING SECTIONS		8/29/2024
A401	BUILDING SECTIONS		8/29/2024
A402	BUILDING SECTIONS		8/29/2024
A403	BUILDING SECTIONS		8/29/2024
A420	WALL SECTIONS		8/29/2024
A421	WALL SECTIONS		8/29/2024
A422	WALL SECTIONS		8/29/2024
A423	WALL SECTIONS		8/29/2024
A440	ENLARGED ELEVATOR PLANS AND DETAILS		8/29/2024
A441	ELEVATOR DETAILS		8/29/2024
A442	HANDRAIL AND GUARDRAIL DETAILS		8/29/2024
A443	STAIR AND LIFT DETAILS		8/29/2024
A530	TYPICAL ROOF DETAILS		8/29/2024
A600	EXTERIOR & INTERIOR STOREFRONT, CURTAIN WALL & WINDOWS ELEVATIONS		8/29/2024
A601	EXTERIOR & INTERIOR STOREFRONT, CURTAIN WALL & WINDOWS ELEVATIONS		8/29/2024
A602	EXTERIOR & INTERIOR STOREFRONT, CURTAIN WALL & WINDOWS ELEVATIONS		8/29/2024
A610	TYPICAL WINDOW DETAILS		8/29/2024
A700	ENLARGED TOILET PLANS		8/29/2024
A701	PARTIAL ENLARGED PLANS		8/29/2024
A702	PARTIAL ENLARGED PLANS		8/29/2024
A710	TOILET ROOM ELEVATIONS		8/29/2024
A711	TOILET ROOM ELEVATIONS		8/29/2024
A712	TOILET ROOM ELEVATIONS		8/29/2024
A713	TOILET ROOM ELEVATIONS		8/29/2024
A714	TOILET ROOM ELEVATIONS		8/29/2024
A730	INTERIOR ELEVATIONS		8/29/2024
A731	INTERIOR ELEVATIONS		8/29/2024
A732	INTERIOR ELEVATIONS		8/29/2024
A733	INTERIOR ELEVATIONS		8/29/2024
A734	INTERIOR ELEVATIONS		8/29/2024
A735	INTERIOR ELEVATIONS		8/29/2024
A736	INTERIOR ELEVATIONS		8/29/2024
A737	INTERIOR ELEVATIONS		8/29/2024
A738	INTERIOR ELEVATIONS		8/29/2024
A800	CASEWORK DETAILS		8/29/2024
A801	CASEWORK DETAILS		8/29/2024
A802	CASEWORK DETAILS		8/29/2024
A803	CASEWORK DETAILS		8/29/2024
A900	PARTITION TYPES		8/29/2024
A901	PARTITION TYPES		8/29/2024
A910	DOOR SCHEDULE		8/29/2024
A911	DOOR SCHEDULE		8/29/2024
A920	DOOR DETAILS		8/29/2024
A921	DOOR DETAILS		8/29/2024
A925	DOOR DETAILS		8/29/2024
A960	FINISH SCHEDULE		8/29/2024
VOLUME 2			**8/29/2024**
FIRE PROTECTION DRAWINGS			
FP000	FIRE PROTECTION COVER SHEET		8/29/2024

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DWG. NO.	TITLE	REVISION	DATE
FP101	FIRST FLOOR PLAN - PART A - FIRE PROTECTION		8/29/2024
FP102	FIRST FLOOR PLAN - PART B - FIRE PROTECTION		8/29/2024
FP103	FIRST FLOOR PLAN - PART C - FIRE PROTECTION		8/29/2024
FP104	FIRST FLOOR PLAN - PART D - FIRE PROTECTION		8/29/2024
FP110	SECOND FLOOR - PART A, B & C - FIRE PROTECTION		8/29/2024
FP120	THIRD FLOOR PLAN - PART B & C - FIRE PROTECTION		8/29/2024
FP130	ATTIC LEVEL PLAN - FIRE PROTECTION		8/29/2024
FP300	FIRE PROTECTION DETAILS		8/29/2024
FP301	FIRE PROTECTION DETAILS		8/29/2024
PLUMBING DRAWINGS			
P001	NOTES, ABBREVIATIONS & LEGEND - PLUMBING		8/29/2024
P011	FIRST FLOOR DEMOLITION PLAN PART A - PLUMBING		8/29/2024
P012	FIRST FLOOR DEMOLITION PLAN PART B - PLUMBING		8/29/2024
P013	FIRST FLOOR DEMOLITION PLAN PART C - PLUMBING		8/29/2024
P022	SECOND FLOOR DEMOLITION PLAN PART B & C - PLUMBING		8/29/2024
P032	THIRD FLOOR DEMOLITION PLAN PARTS B & C - PLUMBING		8/29/2024
P033	ATTIC DEMOLITION PLAN - PLUMBING		8/29/2024
P100	OVERALL UNDERSLAB PLAN - PLUMBING		8/29/2024
P101	FIRST FLOOR PLAN PART A - PLUMBING		8/29/2024
P102	FIRST FLOOR PLAN PART B - PLUMBING		8/29/2024
P103	FIRST FLOOR PLAN PART C - PLUMBING		8/29/2024
P104	FIRST FLOOR PLAN PART D - PLUMBING		8/29/2024
P111	SECOND FLOOR PLAN PARTS B & C - PLUMBING		8/29/2024
P122	THIRD FLOOR PLAN PARTS B & C - PLUMBING		8/29/2024
P123	ATTIC PLAN - PLUMBING		8/29/2024
P130	OVERALL ROOF PLAN - PLUMBING		8/29/2024
P200	MECHANICAL ROOM PART PLANS - PLUMBING		8/29/2024
P201	FIRST FLOOR B PART PLANS - PLUMBING		8/29/2024
P202	FIRST FLOOR C PART PLANS - PLUMBING		8/29/2024
P203	FIRST FLOOR D PART PLAN - PLUMBING		8/29/2024
P204	2ND & 3RD PART PLANS B - PLUMBING		8/29/2024
P205	2ND & 3RD PART PLANS C - PLUMBING		8/29/2024
P206	PART B & C RISER ISO VIEWS - PLUMBING		8/29/2024
P300	DETAILS - PLUMBING		8/29/2024
P301	DETAILS - PLUMBING		8/29/2024
P302	DETAILS - PLUMBING		8/29/2024
P400	SCHEDULES - PLUMBING		8/29/2024
MECHANICAL DRAWINGS			
M001	GENERAL MECHANICAL NOTES, LEGENDS AND ABBREVIATIONS		8/29/2024
M010	MECHANICAL DEMOLITION PLAN - 1st FLOOR		8/29/2024
M020	MECHANICAL DEMOLITION - 2nd FLOOR		8/29/2024
M030	MECHANICAL DEMOLITION PLAN - 3rd FLOOR		8/29/2024
M040	MECHANICAL DEMOLITION PART PLANS		8/29/2024
M101	FIRST FLOOR HVAC PLAN PART 'A'		8/29/2024
M102	FIRST FLOOR HVAC PLAN PART 'B'		8/29/2024
M103	FIRST FLOOR HVAC PLAN PART 'C'		8/29/2024
M104	FIRST FLOOR HVAC PLAN PART 'D'		8/29/2024
M110	SECOND FLOOR HVAC PLAN PART 'A'		8/29/2024
M120	SECOND FLOOR HVAC PLAN PART 'B'		8/29/2024
M130	SECOND FLOOR HVAC PLAN PART 'C'		8/29/2024
M140	THIRD FLOOR HVAC PLANT PART ' B'		8/29/2024
M150	THIRD FLOOR HVAC PLAN PART 'C'		8/29/2024
M160	ATTIC PLAN HVAC PART 'B		8/29/2024
M180	ROOF PLAN PART 'A'		8/29/2024
M190	ROOF PLAN PART 'C'		8/29/2024
M191	ROOF PLAN PART 'D'		8/29/2024
M301	MECHANICAL DETAILS		8/29/2024
M302	MECHANICAL DETAILS		8/29/2024
M303	MECHANICAL DETAILS		8/29/2024

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DWG. NO.	TITLE	REVISION	DATE
M304	MECHANICAL DETAILS		8/29/2024
M305	MECHANICAL DETAILS		8/29/2024
M400	MECHANICAL SCHEDULES		8/29/2024
M401	MECHANICAL SCHEDULES		8/29/2024
M402	MECHANICAL SCHEDULES		8/29/2024
M403	MECHANICAL SCHEDULES		8/29/2024
M404	MECHANICAL SCHEDULES		8/29/2024
M500	MECHANICAL REFRIGERANT SYSTEMS		8/29/2024
M501	MECHANICAL REFRIGERANT SYSTEMS		8/29/2024
M502	MECHANICAL REFRIGERANT SYSTEMS		8/29/2024
M503	MECHANICAL REFRIGERANT SYSTEMS		8/29/2024
M504	MECHANICAL REFRIGERANT SYSTEMS		8/29/2024
M505	MECHANICAL REFRIGERANT SYSTEMS		8/29/2024
M506	MECHANICAL REFRIGERANT SYSTEMS		8/29/2024
M507	MECHANICAL REFRIGERANT SYSTEMS		8/29/2024
M508	MECHANICAL REFRIGERANT SYSTEMS		8/29/2024
M509	MECHANICAL REFRIGERANT SYSTEMS		8/29/2024
M510	MECHANICAL REFRIGERANT SYSTEMS		8/29/2024
M600	MECHANICAL CONTROLS SYSTEMS		8/29/2024
M601	MECHANICAL CONTROLS SYSTEMS		8/29/2024
M-602	MECHANICAL CONTROLS SYSTEMS		8/29/2024
ELECTRICAL DRAWINGS			
E001	SYMBOLS, NOTES & ABBREVIATIONS - ELECTRICAL		8/29/2024
E002	LIGHT FIXTURE SCHEDULES		8/29/2024
E003	ELECTRICAL DRAWING LIST, DEMOLITION NOTES & FIRE ALARM RISER DIAGRAM		8/29/2024
E011	FIRST FLOOR LIGHTING DEMOLITION PLAN - PART 'A'		8/29/2024
E012	FIRST FLOOR LIGHTING DEMOLITION PLAN - PART 'B'		8/29/2024
E013	FIRST FLOOR LIGHTING DEMOLITION PLAN - PART 'C'		8/29/2024
E021	SECOND FLOOR LIGHTING DEMOLITION PLAN - PART 'A', 'B' & 'C'		8/29/2024
E031	THIRD FLOOR LIGHTING DEMOLITION PLAN - PART 'A', 'B' & 'C'		8/29/2024
E041	ATTIC LIGHTING DEMOLITION PLAN - 'B' & 'C'		8/29/2024
E051	FIRST FLOOR POWER DEMOLITION PLAN - PART 'A'		8/29/2024
E052	FIRST FLOOR POWER DEMOLITION PLAN - PART 'B'		8/29/2024
E053	FIRST FLOOR POWER DEMOLITION PLAN - PART 'C'		8/29/2024
E061	SECOND FLOOR POWER DEMOLITION PLAN - PART 'A', 'B' & 'C'		8/29/2024
E071	THIRD FLOOR POWER DEMOLITION PLAN - PART 'A', 'B' & 'C'		8/29/2024
E081	ATTIC POWER DEMOLITION PLAN - PART 'B' & 'C'		8/29/2024
E091	ROOF DEMOLITION POWER PLAN - PART 'A'		8/29/2024
E101	FIRST FLOOR LIGHTING PLAN - PART 'A'		8/29/2024
E102	FIRST FLOOR LIGHTING PLAN - PART 'B'		8/29/2024
E103	FIRST FLOOR LIGHTING PLAN - PART 'C'		8/29/2024
E104	FIRST FLOOR LIGHTING PLAN - PART 'D'		8/29/2024
E110	SECOND FLOOR LIGHTING PLAN - PART 'A', 'B' & 'C'		8/29/2024
E120	THIRD FLOOR LIGHTING PLAN - PART 'A', 'B' & 'C'		8/29/2024
E130	ATTIC LIGHTING PLAN - PART 'B' & 'C'		8/29/2024
E140	ELECTRICAL SITE PLAN		8/29/2024
E201	FIRST FLOOR POWER PLAN - PART 'A'		8/29/2024
E202	FIRST FLOOR POWER PLAN - PART 'B'		8/29/2024
E203	FIRST FLOOR POWER PLAN - PART 'C'		8/29/2024
E204	FIRST FLOOR POWER PLAN - PART 'D'		8/29/2024
E210	SECOND FLOOR POWER PLAN - PART 'A', 'B' & 'C'		8/29/2024
E230	ATTIC POWER PLAN - PART 'B' & 'C'		8/29/2024
E241	ROOF POWER PLAN - PART 'A'		8/29/2024
E242	ROOF POWER PLAN - PART 'D'		8/29/2024
E401	EXISTING ONE LINE DIAGRAM - NORTH SIDE - ELECTRICAL DEMOLITION		8/29/2024
E402	EXISTING ONE LINE DIAGRAM - SOUTH SIDE - ELECTRICAL DEMOLITION		8/29/2024
E403	ELECTRICAL ONE LINE DIAGRAM - NORTH SIDE		8/29/2024
E404	ELECTRICAL ONE LINE DIAGRAM - SOUTH SIDE		8/29/2024
E501	ELECTRICAL PANEL SCHEDULES - FIRST FLOOR PART 'A'		8/29/2024
E502	ELECTRICAL PANEL SCHEDULES - FIRST FLOOR PART 'A' & 'B'		8/29/2024

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DWG. NO.	TITLE	REVISION	DATE
E503	ELECTRICAL PANEL SCHEDULES - FIRST FLOOR PART 'B' & 'C'		8/29/2024
E504	ELECTRICAL PANEL SCHEDULES - SECOND FLOOR		8/29/2024
E505	ELECTRICAL PANEL SCHEDULES - THIRD FLOOR		8/29/2024
E506	ELECTRICAL PANEL SCHEDULES - PART 'A' THRU 'D'		8/29/2024
E601	ELECTRICAL DETAILS		8/29/2024
E602	ELECTRICAL DETAILS		8/29/2024
TECHNOLOGY DRAWINGS			
T001	TECH-SEC-AV SYMBOL LEGEND AND GENERAL NOTES		8/29/2024
T010	TECH-SEC-AV OVERALL FIRST FLOOR DEMO PLAN		8/29/2024
T011	TECH-SEC-AV FIRST FLOOR PLAN DEMO - PART "A"		8/29/2024
T012	TECH-SEC-AV FIRST FLOOR PLAN DEMO - PART "B"		8/29/2024
T013	TECH-SEC-AV FIRST FLOOR PLAN DEMO - PART "C"		8/29/2024
T020	TECH-SEC-AV OVERALL SECOND FLOOR PLAN DEMO		8/29/2024
T021	TECH-SEC-AV SECOND FLOOR PLAN DEMO - PART "A"		8/29/2024
T022	TECH-SEC-AV SECOND FLOOR PLAN DEMO - PART "B"		8/29/2024
T023	TECH-SEC-AV SECOND FLOOR PLAN DEMO - PART "C"		8/29/2024
T030	TECH-SEC-AV OVERALL THIRD FLOOR PLAN DEMO		8/29/2024
T032	TECH-SEC-AV THIRD FLOOR PLAN DEMO - PART "B"		8/29/2024
T033	TECH-SEC-AV THIRD FLOOR PLAN DEMO - PART "C"		8/29/2024
T110	TECH-SEC-AV OVERALL FIRST FLOOR PLAN		8/29/2024
T111	TECH-SEC-AV FIRST FLOOR PLAN - PART "A"		8/29/2024
T112	TECH-SEC-AV FIRST FLOOR PLAN - PART "B"		8/29/2024
T113	TECH-SEC-AV FIRST FLOOR PLAN - PART "C"		8/29/2024
T114	TECH-SEC-AV FIRST FLOOR PLAN - PART "D"		8/29/2024
T120	TECH-SEC-AV OVERALL SECOND FLOOR PLAN		8/29/2024
T121	TECH-SEC-AV SECOND FLOOR PLAN - PART "A"		8/29/2024
T122	TECH-SEC-AV SECOND FLOOR PLAN - PART "B"		8/29/2024
T123	TECH-SEC-AV SECOND FLOOR PLAN - PART "C"		8/29/2024
T130	TECH-SEC-AV OVERALL THIRD FLOOR PLAN		8/29/2024
T132	TECH-SEC-AV THIRD FLOOR PLAN - PART "B"		8/29/2024
T133	TECH-SEC-AV THIRD FLOOR PLAN - PART "C"		8/29/2024
T200	TECH - DATA ROOM #1008A & 2006B DETAILS		8/29/2024
T300	TECH-SEC-AV - DETAILS		8/29/2024
T301	TECH-SEC-AV - DETAILS		8/29/2024
T302	TECH-SEC-AV - DETAILS		8/29/2024
T400	TECH - WIRING DIAGRAMS		8/29/2024
T401	TECH - WIRING DIAGRAMS		8/29/2024

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SPECIFICATIONS LIST

DIVISION / SPEC. SECTIONS	DESCRIPTION	DATE
DIVISION 00 / SECTIONS:	**PROCUREMENT AND CONTRACTING REQUIREMENTS**	
Volume 1	Drawing List	8/29/2024
Volume 2	Project Manual - Volume 2 of 4 (Table of Contents)	8/29/2024
Volume 3	Project Manual - Volume 3 of 4 (Table of Contents)	8/29/2024
Volume 4	Project Manual - Volume 4 of 4 (Table of Contents)	8/29/2024
DIVISION 01 / SECTIONS:	**GENERAL REQUIREMENTS**	
012100	Allowances	8/29/2024
012200	Unit Prices	8/29/2024
012300	Alternates	8/29/2024
012500	Substitution Procedures	8/29/2024
012600	Contract Modification Procedures	8/29/2024
012900	Payment Procedures	8/29/2024
013100	Project Management and Coordination	8/29/2024
013200	Construction Progress Documentation	8/29/2024
013233	Photographic Documentation	8/29/2024
013300	Submittal Procedures	8/29/2024
014000	Quality Requirements	8/29/2024
014200	References	8/29/2024
015000	Temporary Facilities and Controls	8/29/2024
016000	Product Requirements	8/29/2024
017300	Execution	8/29/2024
017419	Construction Waste Management and Disposal	8/29/2024
017700	Closeout Procedures	8/29/2024
017823	Operation and Maintenance Data	8/29/2024
017839	Project Record Documents	8/29/2024
017900	Demonstration and Training	8/29/2024
018113	Sustainable Design Requirements	8/29/2024
	Compliance Checklist - Schools	
019100	Commissioning of MEP-FA-FP Systems	8/29/2024
DIVISION 02 / SECTIONS:	**EXISTING CONDITIONS**	
020100	Protection of Existing Utilities	8/29/2024
022113	Project Surveying and Layout	8/29/2024
024113	Site Demolition	8/29/2024
024119	Selective Demolition	8/29/2024
028200	Selective Hazardous Building Materials Abatement Demolition	8/29/2024
028213	Asbestos Abatement	8/29/2024
028313	Lead-Based Paint Awareness	8/29/2024
028416	Universal Waste Removal and Recycling	8/29/2024
028432	PCB Remediation	8/29/2024
DIVISION 03 / SECTIONS:	**CONCRETE**	
033000	Cast-In-Place Concrete	8/29/2024
033001	Site Cast-In-Place Concrete	8/29/2024
033543	Polished Concrete Finishing	8/29/2024
034500	Precast Architectural Concrete	8/29/2024

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SPECIFICATIONS LIST

DIVISION / SPEC. SECTIONS	DESCRIPTION	DATE
034800	Precast Concrete	8/29/2024
035416	Hydraulic Cement Underlayment	8/29/2024
DIVISION 04 / SECTIONS:	**MASONRY**	
040120.64	Maintenance of Unit Masonry	8/29/2024
040140.62	Stone Repointing	8/29/2024
042000	Unit Masonry	8/29/2024
042300	Glass Unit Masonry	8/29/2024
047200	Cast Stone Masonry	8/29/2024
DIVISION 05 / SECTIONS:	**METALS**	
051200	Steel Framing	8/29/2024
053100	Steel Decking	8/29/2024
054000	Cold-Formed Metal Framing	8/29/2024
055000	Metal Fabrications	8/29/2024
055200	Metal Railings	8/29/2024
055213	Pipe and Tube Railings	8/29/2024
DIVISION 06 / SECTIONS:	**WOOD, PLASTICS AND COMPOSITES**	
061000	Rough Carpentry	8/29/2024
061600	Sheathing	8/29/2024
062013	Exterior Finish Carpentry	8/29/2024
062023	Interior Finish Carpentry	8/29/2024
064116	Plastic-Laminate-Clad Architectural Cabinets	8/29/2024
DIVISION 07 / SECTIONS:	**THERMAL AND MOISTURE PROTECTION**	
070150.19	Preparation for Reroofing	8/29/2024
071113	Bituminous Dampproofing	8/29/2024
071326	Self-Adhering Sheet Waterproofing	8/29/2024
071416	Cold Fluid-Applied Waterproofing	8/29/2024
072100	Thermal Insulation	8/29/2024
072713	Modified Bituminous Sheet Air Barriers	8/29/2024
072726	Fluid-Applied Membrane Air Barriers	8/29/2024
073113	Asphalt Shingles	8/29/2024
074293	Soffit Panels	8/29/2024
075423	Thermoplastic Polyolefin (TPO) Roofing	8/29/2024
076200	Sheet Metal Flashing and Trim	8/29/2024
077100	Roof Specialties	8/29/2024
077129	Manufactured Roof Expansion Joints	8/29/2024
077200	Roof Accessories	8/29/2024
078413	Penetration Firestopping	8/29/2024
079200	Joint Sealants	8/29/2024
079500	Expansion Control	8/29/2024
DIVISION 08 / SECTIONS:	**OPENINGS**	
081213	Hollow Metal Frames	8/29/2024
081416	Flush Wood Doors	8/29/2024
083113	Access Doors and Frames	8/29/2024
084113	Aluminum-Framed Entrances and Storefronts	8/29/2024

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DIVISION / SPEC. SECTIONS	DESCRIPTION	DATE
084333.13	Security Entrances and Storefronts	8/29/2024
084413	Glazed Aluminum Curtain Walls	8/29/2024
085113	Aluminum Windows	8/29/2024
085653	Security Windows	8/29/2024
087100	Door Hardware	8/29/2024
088000	Glazing	8/29/2024
088300	Mirrors	8/29/2024
089000	Louvers and Vents	8/29/2024
DIVISION 09 / SECTIONS:	**FINISHES**	
090000	Schedule of Finishes	8/29/2024
092216	Non-Structural Metal Framing	8/29/2024
092513.13	Acrylic Plaster Finish	8/29/2024
092900	Gypsum Board	8/29/2024
093000	Tiling	8/29/2024
095113	Acoustical Panel Ceilings	8/29/2024
096513	Resilient Base and Accessories	8/29/2024
096516	Resilient Sheet Flooring	8/29/2024
096519	Resilient Tile Flooring	8/29/2024
096813	Tile Carpeting	8/29/2024
098433	Sound-Absorbing Wall Units	8/29/2024
098436	Sound-Absorbing Ceiling Units	8/29/2024
099113	Exterior Painting	8/29/2024
099123	Interior Painting	8/29/2024
099600	High-Performance Coatings	8/29/2024
DIVISION 10 / SECTIONS:	**SPECIALTIES**	
101100	Visual Display Units	8/29/2024
101146	Visual Display Fabrics	8/29/2024
101400	Signage	8/29/2024
101419	Dimensional Letter Signage	8/29/2024
102113.19	Plastic Toilet Compartments	8/29/2024
102123	Cubicle Curtains and Track	8/29/2024
102600	Wall and Door Protection	8/29/2024
102800	Toilet, Bath, and Laundry Accessories	8/29/2024
104300	Emergency Aid Specialties	8/29/2024
104413	Fire Protection Cabinets	8/29/2024
104416	Fire Extinguishers	8/29/2024
105113	Metal Lockers	8/29/2024
DIVISION 11 / SECTIONS:	**EQUIPMENT**	
113100	Residential Appliances	8/29/2024
115213	Projection Screens	8/29/2024
116800	Play Equipment	8/29/2024
DIVISION 12 / SECTIONS:	**FURNISHINGS**	
122413	Roller Window Shades	8/29/2024
123661.16	Solid Surfacing Countertops	8/29/2024

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123661.19	Quartz Agglomerate Countertops	8/29/2024
124813	Entrance Floor Mats and Frames	8/29/2024
DIVISION 14 / SECTIONS:	**CONVEYING EQUIPMENT**	
142123	Machine Room-less Electric Traction Passenger Elevators	8/29/2024
144200	Wheelchair Lifts	8/29/2024
DIVISION 21 / SECTIONS:	**FIRE SUPPRESSION**	
210100	General Conditions for Fire Protection Trade	8/29/2024
210517	Sleeves and Sleeve Seals for Fire-Suppression Piping	8/29/2024
210518	Escutcheons for Fire-Suppression Piping	8/29/2024
210523	General-Duty Valves for Fire Protection Piping	8/29/2024
210548	Vibration and Seismic Controls for Fire-Suppression Piping and Equipment	8/29/2024
210553	Identification for Fire-Suppression Piping and Equipment	8/29/2024
210800	Commissioning of Fire Protection Systems	8/29/2024
211100	Facility Fire-Suppression Water-Service Piping	8/29/2024
211119	Fire Department Connections	8/29/2024
211200	Fire-Suppression Standpipes	8/29/2024
211313	Wet-Pipe Sprinkler Systems	8/29/2024
211316	Dry-Pipe Sprinkler Systems	8/29/2024
DIVISION 22 / SECTIONS:	**PLUMBING**	
220100	General Conditions for Plumbing Trade	8/29/2024
220513	Common Motor Requirements for Plumbing Equipment	8/29/2024
220516	Expansion Fittings and Loops for Plumbing Piping	8/29/2024
220517	Sleeves and Sleeve Seals for Plumbing Piping	8/29/2024
220518	Escutcheons for Plumbing Piping	8/29/2024
220519	Meters and Gages for Plumbing Piping	8/29/2024
220523.12	Ball Valves for Plumbing Piping	8/29/2024
220523.13	Butterfly Valves for Plumbing Piping	8/29/2024
220523.14	Check Valves for Plumbing Piping	8/29/2024
220529	Hangers and Supports for Plumbing Piping and Equipment	8/29/2024
220533	Heat Tracing for Plumbing Piping	8/29/2024
220548	Vibration and Seismic Controls for Plumbing Piping and Equipment	8/29/2024
220553	Identification for Plumbing Piping and Equipment	8/29/2024
220719	Plumbing Piping Insulation	8/29/2024
220800	Commissioning of Plumbing Systems	8/29/2024
221116	Domestic Water Piping	8/29/2024
221119	Domestic Water Piping Specialties	8/29/2024
221123	Domestic Water Pumps	8/29/2024
221316	Sanitary Waste and Vent Piping	8/29/2024
221319	Sanitary Waste Piping Specialties	8/29/2024
221319.13	Sanitary Drains	8/29/2024
221323	Sanitary Waste Interceptors	8/29/2024
221416	Storm Drainage Piping	8/29/2024
221423	Storm Drainage Piping Specialties	8/29/2024
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224213.13	Commercial Water Closets	8/29/2024
224213.16	Commercial Urinals	8/29/2024
224216.13	Commercial Lavatories	8/29/2024
224216.16	Commercial Sinks	8/29/2024
224716	Pressure Water Coolers	8/29/2024
DIVISION 23 / SECTIONS:	**HEATING, VENTILATING, and AIR CONDITIONING (HVAC)**	
230000	Basic Mechanical Requirements	8/29/2024
230513	Common Motor Requirements for HVAC Equipment	8/29/2024
230516	Expansion Fittings and Loops for HVAC Piping	8/29/2024
230517	Sleeves and Sleeve Seals for HVAC Piping	8/29/2024
230519	Meters and Gages for HVAC Piping	8/29/2024
230523	General-Duty Valves for HVAC Piping	8/29/2024
230529	Hangers and Supports for HVAC Piping and Equipment	8/29/2024
230548	Vibration and Seismic Controls for HVAC Piping and Equipment	8/29/2024
230553	Identification for HVAC Piping and Equipment	8/29/2024
230593	Testing, Adjusting, and Balancing for HVAC	8/29/2024
230713	Duct Insulation	8/29/2024
230719	HVAC Piping Insulation	8/29/2024
230800	Commissioning for HVAC Systems	8/29/2024
230900	Instrumentation and Control for HVAC	8/29/2024
230993	Sequence of Operation	8/29/2024
232113	Hydronic Piping	8/29/2024
232123	Hydronic Pumps	8/29/2024
232300	Refrigerant Piping	8/29/2024
233113	Metal Ducts	8/29/2024
233423	HVAC Power Ventilators	8/29/2024
233713	Diffusers, Registers, and Grilles	8/29/2024
235100	Breechings, Chimneys and Stacks	8/29/2024
235216	Condensing Boilers	8/29/2024
237416.13	Packaged, Large Capacity, Rooftop Air-Conditioning Units	8/29/2024
237423	Indirect-Fuel-Fired, Outdoor, Heating-Only Make-Up Air Units	8/29/2024
238126	Split-System Air-Conditioners	8/29/2024
DIVISION 26 / SECTIONS:	**ELECTRICAL**	
260500	Common Work Results for Electrical	8/29/2024
260509	Electrical Demolition Requirements	8/29/2024
260519	Low-Voltage Electrical Power Conductors and Cables	8/29/2024
260523	Control-Voltage Electrical Power Cables	8/29/2024
260526	Grounding and Bonding for Electrical Systems	8/29/2024
260529	Hangers and Supports for Electrical Systems	8/29/2024
260533	Raceway and Boxes for Electrical Systems	8/29/2024
260543	Underground Ducts and Raceways for Electrical Systems	8/29/2024
260548	Vibration and Seismic Controls for Electrical Systems	8/29/2024
260553	Identification for Electrical Systems	8/29/2024

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260572	Overcurrent Protective Short-Circuit Study	8/29/2024
260573	Overcurrent Protective Device Coordination Study	8/29/2024
260574	Overcurrent Protective Device Arc-Flash Study	8/29/2024
260800	Commissioning of Electrical Systems	8/29/2024
260923	Lighting Control Devices	8/29/2024
262200	Low-Voltage Transformers	8/29/2024
262413	Switchboards	8/29/2024
262416	Panelboards	8/29/2024
262713	Electricity Metering	8/29/2024
262726	Wiring Devices	8/29/2024
262813	Fuses	8/29/2024
262816	Enclosed Switches and Circuit Breakers	8/29/2024
262913	Enclosed Controllers	8/29/2024
263213	Engine Generators	8/29/2024
263600	Transfer Switches	8/29/2024
264313	Transient-Voltage Suppression for Low-Voltage Electrical Power Circuits	8/29/2024
265119	LED Interior Lighting	8/29/2024
265219	Emergency and Exit Lighting	8/29/2024
265600	Exterior Lighting	8/29/2024
DIVISION 27 / SECTIONS:	**COMMUNICATIONS**	
271000	Structured Cabling	8/29/2024
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275116	Public Address System	8/29/2024
275313	Clock System	8/29/2024
DIVISION 28 / SECTIONS:	**ELECTRONIC SAFETY AND SECURITY**	
280800	Commissioning of Fire Alarm Systems	8/29/2024
280500	Security Conductor Cables	8/29/2024
280528	Pathways for Security Systems	8/29/2024
281300	Access Control System	8/29/2024
281600	Intrusion Detection	8/29/2024
282300	Video Surveillance System	8/29/2024
283111	Digital, Addressable Fire Alarm System	8/29/2024
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311100	Clearing and Grubbing	8/29/2024
312113	Radon Mitigation	8/29/2024
312316	Excavation, Backfill, and Subgrade Preparation for Pavement	8/29/2024
312319	Dewatering	8/29/2024
312333	Trench Excavation and Backfill for Utilities	8/29/2024
312500	Soil Erosion and Sediment Control	8/29/2024
DIVISION 32 / SECTIONS:	**EXTERIOR IMPROVEMENTS**	
321216	Asphalt Concrete Paving	8/29/2024
321313	Portland Cement Concrete Paving	8/29/2024
321613	Concrete Curb and Sidewalks	8/29/2024

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321723	Pavement Markings	8/29/2024
323100	Chain Link Fences	8/29/2024
329000	Planting	8/29/2024
329100	Planting Soils	8/29/2024
329200	Lawns and Grasses	8/29/2024
329353	Landscape Maintenance	8/29/2024
329400	Arboriculture	8/29/2024
DIVISION 33 / SECTIONS:	**UTILITIES**	
331116	Site Water	8/29/2024
333000	Site Sanitary Sewers	8/29/2024
334100	Storm Sewer Systems	8/29/2024
APPENDICES		
Appendice 1	Geotechnical Engineering Study	8/29/2024
Appendice 2	Revised Limited NESHAP Pre-Renovation Hazardous Building Materials Survey Report, September 2023	8/29/2024

DRAFT

AIA® Document A401™ – 2017

Standard Form of Agreement Between Contractor and Subcontractor

AGREEMENT made as of the **XX** day of «**August**» in the year **Two Thousand Twenty-Four**
(In words, indicate day, month and year.)

BETWEEN the Contractor:
(Name, legal status, address and other information)

Downes Construction Company, LLC
200 Stanley Street
New Britain, CT 06051

and the Subcontractor:
(Name, legal status, address and other information)

ABC Construction
123 Street Road
Anywhere, CT 06000

BP #XX.X – SOME WORK

The Contractor has made a contract for construction (hereinafter, the Prime Contract) dated: **9/22/2023**

with the Owner:
(Name, legal status, address and other information)

Board of Education of the Town of Greenwich
acting by and through the Old Greenwich School Building Committee
290 Greenwich Avenue
Greenwich, CT 06830

for the following Project:
(Name, location and detailed description)

Additions and Alterations to Old Greenwich School
285 Sound Beach Road
Old Greenwich, CT 06870

The Prime Contract provides for the furnishing of labor, materials, equipment and services in connection with the construction of the Project. A copy of the Prime Contract, consisting of the Agreement Between Owner and Contractor (from which compensation amounts may be deleted), the General Conditions thereto and the other Contract Documents enumerated or incorporated therein or made Exhibits thereto, have been made available to the Subcontractor. The Prime Contract, including the General Conditions thereto, is hereby expressly incorporated by reference herein, in its entirety, and is expressly made a part hereof as of restated herein. As a courtesy to Subcontractor, Contractor may, in the text of this Subcontract, direct Subcontractor's attention to certain sections and provisions of the Prime Contract. Such direction is not intended to be in lieu

ADDITIONS AND DELETIONS: The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes added information as well as revisions to the standard form text is available from the author and should be reviewed.

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

AIA Document A201™–2017, General Conditions of the Contract for Construction, is adopted in this document by reference.

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of Subcontractor's review of and compliance with the entirety of the Prime Contract and General Conditions thereto.

The Architect for the Project:
(Name, legal status, address and other information)

Silver Petrucelli & Associates, Inc.
31980 Whitney Avenue
Hamden, CT 06518

The Contractor and the Subcontractor agree as follows.

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1 THE SUBCONTRACT DOCUMENTS

2 MUTUAL RIGHTS AND RESPONSIBILITIES

3 CONTRACTOR

4 SUBCONTRACTOR

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6 CLAIMS AND DISPUTES

7 TERMINATION, SUSPENSION OR ASSIGNMENT OF THE SUBCONTRACT

8 THE WORK OF THIS SUBCONTRACT

9 DATE OF COMMENCEMENT AND SUBSTANTIAL COMPLETION

10 SUBCONTRACT SUM

11 PAYMENTS

12 INSURANCE AND BONDS

13 TEMPORARY FACILITIES, SERVICES, EQUIPMENT AND WORKING CONDITIONS

14 MISCELLANEOUS PROVISIONS

15 ENUMERATION OF SUBCONTRACT DOCUMENTS

ARTICLE 1 THE SUBCONTRACT DOCUMENTS

§ 1.1 The Subcontract Documents consist of (1) this Agreement; (2) the Prime Contract, consisting of the Agreement between the Owner and Contractor (as amended by Amendment No.A1 dated 8/15/2021, the General Conditions thereto and the other Contract Documents enumerated therein; (3) Modifications and Amendments to the Prime Contract, whether issued before or after the execution of this Agreement, in accordance with the provisions of Article 5; (4) other documents listed in Article 15 of this Agreement; and (5) Modifications to this Subcontract issued after execution of this Agreement, in accordance with the provisions of Article 5. These documents form the Subcontract and are as fully a part of the Subcontract as if attached to this Agreement or repeated herein. The Subcontract, Prime Contract and the other Contract Documents are intended to supplement and complement each other and shall, where possible, be thus interpreted. If, however, any provision of the Subcontract irreconcilably conflicts with a provision of the Prime Contract or the other Contract Documents, the provision imposing the greater duty or obligation on the Subcontractor shall govern and apply.

Subcontractor acknowledges that delays resulting from changes in the work, extreme or unusual weather, changes to the sequencing of the work, material shortages, transportation, strikes, and other causes are inherent in the construction process. Subcontractor acknowledges that it has accounted for potential and/or actual delays in its bid price(s) and agrees it shall not assert, make or bring claims for money damages as a result of any delay or

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hindrance it incurs or encounters. In the event that Subcontractor claims that it has been delayed or hindered, it shall submit a request for a time extension to Contractor in the manner and pursuant to the time periods set forth in the Prime Contract and in the Contract Documents. If it is determined that Subcontractor has been delayed or hindered through no fault of its own, conditioned expressly upon the approval of the Owner, the time for performance hereunder will be extended and the extension of time shall be Subcontractor's sole remedy for the delay. Under no circumstances shall the Contractor or Owner be liable to the Subcontractor for money damages resulting from any delays or hindrances.

§ 1.2 The Subcontract Documents form the Subcontract for Construction. The Subcontract represents the entire and integrated agreement between the parties hereto and supersedes prior negotiations, representations, or agreements, either written or oral. An enumeration of the Subcontract Documents, other than Modifications to the Prime Contract or Modifications to this Subcontract issued subsequent to the execution of this Agreement, appears in Article 15.

§ 1.3 Except to the extent of a conflict with a specific term or condition contained in the Subcontract Documents, the General Conditions governing this Subcontract shall be the AIA Document A201™–2017, General Conditions of the Contract for Construction, as modified.

§ 1.4 The Subcontract may be amended or modified only by a Modification to this Subcontract. A Modification to this Subcontract is a written amendment to this Agreement signed by both parties, or as otherwise described in, and in accordance with the provisions of, Article 5.

§ 1.5 The Subcontract Documents shall not be construed to create a contractual relationship of any kind (1) between the Architect and the Subcontractor, (2) between the Owner and the Subcontractor, or (3) between any persons or entities other than the Contractor and Subcontractor. Subcontractor shall not be deemed an intended or unintended third-party beneficiary of the Prime Contract.

§ 1.6 The Contractor has made the Subcontract Documents available to the Subcontractor prior to execution of this Agreement, and thereafter, upon written request. The Contractor may charge the Subcontractor for the reasonable cost to reproduce the Subcontract Documents provided to the Subcontractor.

ARTICLE 2 MUTUAL RIGHTS AND RESPONSIBILITIES

The Contractor and Subcontractor shall be mutually bound by the terms of this Agreement and, to the extent that the provisions of AIA Document A201–2017 apply to this Agreement pursuant to Section 1.3 and provisions of the Prime Contract apply to the Work of the Subcontractor, the Contractor shall assume toward the Subcontractor all obligations and responsibilities that the Owner, under such documents, assumes toward the Contractor, and the Subcontractor shall assume toward the Contractor all obligations and responsibilities that the Contractor, under such documents, assumes toward the Owner and the Architect. The Contractor shall have the benefit of all rights, remedies, and redress against the Subcontractor that the Owner, under such documents, has against the Contractor, and the Subcontractor shall have the benefit of all rights, remedies, and redress against the Contractor that the Contractor, under such documents, has against the Owner, insofar as applicable to this Subcontract. Where a provision of such documents is inconsistent with a provision of this Agreement, this Agreement shall govern.

ARTICLE 3 CONTRACTOR

§ 3.1 General

§ 3.1.1 The Contractor is Downes Construction and is referred to throughout the Subcontract Documents as if singular in number. The Contractor shall designate in writing a representative who shall have express authority to bind the Contractor with respect to all Project matters requiring the Contractor's approval or authorization. The term "Contractor" means the Contractor or the Contractor's authorized representative.

§ 3.1.2 The Contractor shall render decisions in a timely manner and in accordance with the Contractor's construction schedule.

§ 3.2 Services Provided by the Contractor

§ 3.2.1 The Contractor shall cooperate with the Subcontractor in scheduling and performing the Contractor's Work to avoid conflicts or interference in the Subcontractor's Work and shall review, and expedite written responses to, submittals made by the Subcontractor in accordance with Section 4.2.3 and Article 5. Promptly after execution of

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this Agreement, the Contractor shall provide the Subcontractor with copies of the Contractor's construction schedule and schedule of submittals, together with such additional scheduling details as will enable the Subcontractor to plan and perform the Subcontractor's Work properly. The Contractor shall promptly notify the Subcontractor of subsequent changes in the construction and submittal schedules and additional scheduling details.

§ 3.2.2 The Contractor shall provide suitable areas for storage of the Subcontractor's materials and equipment during the course of the Work. Except as previously agreed upon, additional costs to the Subcontractor resulting from relocation of such storage areas at the direction of the Contractor shall be reimbursed by the Contractor.

§ 3.3 Communications

§ 3.3.1 The Contractor shall promptly make available to the Subcontractor information, including information received from the Owner, that affects the performance of this Subcontract and that becomes available to the Contractor subsequent to execution of this Subcontract. The Subcontractor shall respond promptly to communications received from Contractor.

§ 3.3.2 The Contractor shall not give instructions or orders directly to the Subcontractor's employees or to the Subcontractor's Sub-subcontractors or suppliers unless such persons are designated as authorized representatives of the Subcontractor.

§ 3.3.3 Deleted.

§ 3.3.4 If hazardous materials or substances are being used on the site by the Contractor, a subcontractor, or anyone directly or indirectly employed by them (other than the Subcontractor), and they are a type of hazardous material or substance of which an employer is required by law to notify its employees, the Contractor shall, prior to delivery to the Project site or exposure of the Subcontractor's employees to such material or substance, give notice of the chemical composition thereof to the Subcontractor in sufficient detail and time to permit the Subcontractor's compliance with such laws.

§ 3.3.5 The Contractor shall promptly notify the Subcontractor of any fault or defect in the Work under this Subcontract or nonconformity with the Subcontract Documents.

§ 3.3.6 Deleted – public property, no lien rights.

§ 3.3.7 If the Contractor asserts a Claim against, or defends a Claim by, the Owner that relates to the Work of the Subcontractor, the Contractor shall promptly make available to the Subcontractor all information relating to the portion of the Claim that relates to the Work of the Subcontractor.

§ 3.4 Claims by the Contractor

§ 3.4.1 Liquidated damages, if provided for in the Prime Contract, shall be assessed against the Subcontractor only to the extent caused by the Subcontractor or any person or entity for whose acts the Subcontractor may be liable, and in no case for delays or causes arising outside the scope of this Subcontract.

§ 3.4.2 The Contractor's Claims for the costs of services or materials provided due to the Subcontractor's failure to execute the Work shall require:

.1 three days' notice prior to the Contractor's providing services or materials, except in an emergency; and

.2 written compilations to the Subcontractor of services and materials provided by the Contractor and charges for such services and materials no later than the fifteenth day of the month following the Contractor's providing such services or materials.

§ 3.4.3 The Subcontractor agrees that it shall not be entitled to nor claim any cost reimbursement, compensation or damages for any delay, obstruction, acceleration, hindrance or interference to the Work except to the extent that Contractor has actually recovered corresponding cost reimbursement, compensation or damages from the Owner under the Contract Documents for such delay, obstruction hindrance or interference, and then only to the extent of the amount, if any, which Contractor on behalf of the Subcontractor, actually received from the Owner on account of such delay, obstruction, hindrance or interference. Notwithstanding any term or provision herein to the contrary, Subcontractor expressly waives and releases all claims or rights to recover lost income and/or profit (except for profit on work actually performed), recovery of overhead (including home office overhead), and any other indirect

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damages, costs or expenses in any way arising out of or related to the Agreement, including the breach thereof by Contractor, consequential and incidental damages, damages for delays, idle equipment, suspension, delays, charges, acceleration, loss of efficiency or productivity disruptions and interferences with the performance of the work. The no damages for delay and no damages for impact provisions set forth in the Prime Contract are also expressly incorporated herein. The limitations on damages for delay and related damages set forth in §8.3 of the General Conditions to the Construction Manager's Agreement with the Owner are also expressly incorporated herein.

It shall be an express condition precedent to any obligation on the part of Contractor to make payment of any such cost, reimbursement, compensation or damages to the Subcontractor hereunder that Contractor shall first be determined to be entitled to such compensation on behalf of the Subcontractor and then receive such payment from Owner, and Subcontractor expressly acknowledges that Contractor is not obligated or required to pursue Subcontractor claims as against Owner if Contractor, in its sole discretion, after review of Subcontractor's claim, has deemed the claim to lack merit or be contractually barred in whole or in part. Subcontractor also agrees that any claim for, arising from, related to or due to concealed or unknown conditions shall be made in strict accordance with and governed by 3.7.4 of the General Conditions to the Prime Contract. Failure of Subcontractor to comply with 3.7.4 of the General Conditions to the Prime Contract shall be deemed a waiver of Subcontractor's claim.

§ 3.5 Contractor's Remedies

If the Subcontractor defaults or neglects to carry out the Work in accordance with this Agreement and fails within five (5) calendar days after receipt of notice from the Contractor to commence and continue correction of such default or neglect with diligence and promptness, the Contractor may, without prejudice to other remedies the Contractor may have, remedy such default or neglect and withhold, in accordance with Section 11.1.7.2, the reasonable cost thereof from current or future payments due the Subcontractor. If payments due to the Subcontractor are not sufficient to cover such amounts, the Subcontractor shall pay the difference to the Contractor. Should the Subcontractor at any time, whether before or after final payment, refuse or neglect to supply a sufficiency of skilled workers or materials of the proper quality and quantity, or fail in any respect to prosecute the Work with promptness and diligence, or cause by any act or omission the stoppage, impede, obstruct, hinder or delay of or interference with or damage to the work of Contractor or of any other contractors or subcontractors on the Project, or fail in the performance of any of the terms and provisions of this Agreement or of the other Contract Documents, or should the Architect determine that the work or any portion thereof is not being performed in accordance with the Contract Documents, or should there be filed by or against the Subcontractor a petition in bankruptcy or for an arrangement or reorganization, or should the Subcontractor become insolvent or be adjudicated a bankrupt or go into liquidation or dissolution, either voluntarily or involuntarily or under a court order, or make a general assignment for the benefit of creditors, or otherwise acknowledge insolvency, then in any of such events, each of which shall constitute a default hereunder on the Subcontractor's part, Contractor shall have the right, in addition to any other rights and remedies provided by this Agreement and the other Contract Documents or by law, after five (5) working days written notice to the Subcontractor mailed or delivered to the last known address of the latter, (a) to perform and furnish through itself or through others any such labor or materials for the Work and to deduct the cost thereof from any monies due or to become due to the Subcontractor under this Agreement, and/or (b) to terminate the employment of the Subcontractor for all or any portion of the Work, enter upon the premises and take possession, for the purpose of completing the Work, of all materials, equipment, scaffolds, tools, appliances and other items thereon, all of which the Subcontractor hereby transfers, assigns and sets over to Contractor for such purpose, and to employ any person or persons to complete the Work and provide all the labor, services, materials, equipment and other items required therefore. In case of such termination of the employment of the Subcontractor, the Subcontractor shall not be entitled to receive any further payment under this Agreement until the Work shall be wholly completed to the satisfaction of Contractor and the Architect and shall have been accepted by then, at which time, if the unpaid balance of the amount to be paid under this Agreement shall exceed the cost and expense incurred by Contractor in completing the Work, such excess shall be paid by Contractor to the Subcontractor; but if such cost and expense shall exceed such unpaid balance, then the Subcontractor and its surety, if any, shall pay the difference to Contractor. Such cost and expense shall include, not only the cost of completing the Work to the satisfaction of Contractor and the Architect and of performing and furnishing all labor, services, materials, equipment, and other items required therefore, but also all losses, damages, costs and expenses (including legal fees and disbursements incurred in connection with re-procurement, in defending claims arising from such default and in seeking recovery of all such cost and expense from the Subcontractor and/or its surety), and disbursements sustained, incurred or suffered by reason of or resulting from the Subcontractor's default. Should Contractor take action by effectuating the provisions of this paragraph, and should it subsequently be determined that a termination effectuated by the terms of this Article was improper, such termination shall be treated as a termination for convenience.

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Subcontractor, in addition to any other rights available to and duties/obligations owed by Subcontractor to Contractor hereunder, agrees to indemnify, hold harmless and defend Contractor from and against any and all claims, demands, suits, damages, judgments, liabilities, costs and expenses (including legal fees and disbursements) arising out of or related to Subcontractor's breach of any term of the Subcontract.

Under no circumstances shall Subcontractor communicate directly with or contract directly with the Owner. Any such communications or contracting constitutes intentional interference with Contractor's contractual relations with the Owner and Subcontractor acknowledges that such conduct would constitute a material breach of the Subcontract.

ARTICLE 4 SUBCONTRACTOR

§ 4.1 General

The Subcontractor is the person or entity identified as such in this Agreement and is referred to throughout the Subcontract Documents as if singular in number. The Subcontractor shall be lawfully licensed, if required in the jurisdiction where the Project is located. The Subcontractor shall designate in writing a representative who shall have express authority to act on the Subcontractor's behalf with respect to the Project. The term "Subcontractor" means the Subcontractor or the Subcontractor's authorized representative.

§ 4.2 Execution and Progress of the Work

§ 4.2.1 For all Work the Subcontractor intends to subcontract, the Subcontractor shall enter into written agreements with Sub-subcontractors performing portions of the Work of this Subcontract by which the Subcontractor and the Sub-subcontractor are mutually bound, to the extent of the Work to be performed by the Sub-subcontractor, assuming toward each other all obligations and responsibilities that the Contractor and Subcontractor assume toward each other and having the benefit of all rights, remedies and redress each against the other that the Contractor and Subcontractor have by virtue of the provisions of this Agreement.

§ 4.2.2 The Subcontractor shall supervise and direct the Subcontractor's Work, and shall cooperate with the Contractor in scheduling and performing the Subcontractor's Work to avoid conflict, delay in, or interference with the Work of the Contractor, other subcontractors, the Owner, or Separate Contractors.

§ 4.2.3 Submittals

§ 4.2.3.1 The Subcontractor shall submit Shop Drawings, Product Data, Samples, and similar submittals required by the Subcontract Documents with reasonable promptness and in such sequence as to cause no delay in the Work or in the activities of the Contractor or other subcontractors.

§ 4.2.3.2 By submitting Shop Drawings, Product Data, Samples, and similar submittals, the Subcontractor represents to the Contractor that the Subcontractor has (1) reviewed and approved them; (2) determined and verified materials, field measurements, and field construction criteria related thereto, or will do so; and (3) checked and coordinated the information contained within such submittals with the requirements of the Work and of the Subcontract Documents.

§ 4.2.4 The Subcontractor shall furnish to the Contractor periodic progress reports on the Work of this Subcontract as mutually agreed, including information on the status of materials and equipment that may be in the course of preparation, manufacture, or transit.

§ 4.2.5 The Subcontractor agrees that the Contractor and the Architect each have the authority to reject Work of the Subcontractor that does not conform to the Prime Contract. The Architect's decisions on matters relating to aesthetic effect shall be final and binding on the Subcontractor if consistent with the intent expressed in the Prime Contract.

§ 4.2.6 The Subcontractor shall pay for all materials, equipment, and labor used in connection with the performance of this Subcontract through the period covered by previous payments received from the Contractor, and shall furnish satisfactory evidence, when requested by the Contractor, to verify compliance with the above requirements.

§ 4.2.7 The Subcontractor shall take necessary precautions to properly protect the work of the Contractor, Separate Contractors, and other subcontractors from damage caused by operations under this Subcontract.

§ 4.2.8 The Subcontractor shall cooperate with the Contractor, other subcontractors, the Owner, and Separate Contractors whose work might affect the Subcontractor's Work. The Subcontractor shall participate in the preparation of coordinated drawings in areas of congestion, if required by the Prime Contract, specifically noting

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and advising the Contractor of potential conflicts between the Work of the Subcontractor and that of the Contractor, other subcontractors, the Owner, or Separate Contractors.

§ 4.3 Permits, Fees, Notices, and Compliance with Laws

§ 4.3.1 The Subcontractor shall give notices and comply with applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities bearing on performance of the Work of this Subcontract. The Subcontractor shall secure and pay for permits, fees, licenses, and inspections by government agencies necessary for proper execution and completion of the Subcontractor's Work, the furnishing of which is required of the Contractor by the Prime Contract.

§ 4.3.2 Without limiting the Subcontractor's obligations to comply with all applicable laws, regulations and ordinances the Subcontractor shall comply with Federal, state, and local tax laws; social security acts; unemployment compensation acts; and workers' compensation acts, insofar as applicable to the performance of this Subcontract. Subcontractor shall comply with prevailing wage laws and §15.4.8 of the General Conditions to the Prime Contract.

§ 4.3.3 The Subcontractor's attention is especially directed to the Equal Employment requirements set forth in the Prime Contract and the statutory requirements listed therein, including those promulgated pursuant to Connecticut Public Act 15-5. The foregoing are not intended and shall not be deemed to be an all-inclusive or exhaustive list of applicable legal requirements but are expressly applicable to the Project. The Project is funded by the state of Connecticut. The Subcontractor agrees and warrants that in the performance of the contract, it will not discriminate or permit discrimination against any person or group of persons on the grounds of race, color, religious creed, age, marital status, national origin, ancestry, sex, gender identity or expression, status as a veteran, intellectual disability, mental disability or physical disability, including, but not limited to, blindness, unless it is shown by Subcontractor that such disability prevents performance of the work involved, in any manner prohibited by the laws of the United States or of the state of Connecticut; and the Subcontractor further agrees to take affirmative action to ensure that applicants with job-related qualifications are employed and that employees are treated when employed without regard to their race, color, religious creed, age, marital status, national origin, ancestry, sex, gender identity or expression, status as a veteran, intellectual disability, mental disability or physical disability, including, but not limited to, blindness, unless it is shown by Subcontractor that such disability prevents performance of the work involved.

Subcontractor agrees to provide each labor union or representative of workers with which Subcontractor has a collective bargaining agreement or other contract or understanding and each vendor with which Subcontractor has a contract or understanding, a notice to be provided by the Commission on Human Rights and Opportunities advising the labor union or workers' representative of the Subcontractor's commitments under this section, and to post copies of the notice in conspicuous places available to employees and applicants for employment.

Subcontractor agrees to comply with each provision of Chapter 58 of the Connecticut General Statutes, including section 4a-60 and sections 46a-68e and 46a-68f and with each regulation or relevant order issued by the CHRO pursuant to sections 46a-56, 46a-68e, 46a-68f and 46a-86.

Subcontractor agrees to provide the Commission on Human Rights and Opportunities with such information requested by the Commission, and permit access to pertinent books, records and accounts, concerning the employment practices and procedures of Subcontract as relates to the provisions of C.G.S. sections 4a-60 and 46a-56. Subcontractor shall retain project records in accordance with §15.4.5 of the General Conditions to the Prime Contract.

§ 4.4 Safety Precautions and Procedures

§ 4.4.1 The Subcontractor shall take reasonable safety precautions with respect to performance of this Subcontract. The Subcontractor shall comply with safety measures initiated by the Contractor and with applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities, for the safety of persons and property, in accordance with the requirements of the Prime Contract. The Subcontractor shall notify the Contractor immediately of an injury to an employee or agent of the Subcontractor which occurred at the site. Subcontractor acknowledges that the Work will be performed in a public school building and that public health, safety and security are of the utmost importance. Subcontractor shall, at all times, treat all information obtained by Subcontractor in connection with the Work and the Project as highly confidential and shall not disclose, divulge or otherwise share

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such information with any third parties without the prior express written approval of Owner. Subcontractor shall also take such actions as are necessary to protect the health, safety and security of the occupants and users of the subject building in connection with the Work and the Project.

§ 4.4.2 If hazardous materials or substances are being used on the site by the Subcontractor, the Subcontractor's Sub-subcontractors, or anyone directly or indirectly employed by them, and they are a type of hazardous material or substance of which an employer is required by law to notify its employees, the Subcontractor shall, prior to delivery to the Project site or exposure of the Contractor, other subcontractors, and other employers on the site to such material or substance, give notice of the chemical composition thereof to the Contractor in sufficient detail and time to permit compliance with the laws by the Contractor, other subcontractors, and other employers on the site.

§ 4.4.3 If reasonable precautions will be inadequate to prevent foreseeable bodily injury or death to persons resulting from a hazardous material or substance, including but not limited to asbestos or polychlorinated biphenyl (PCB), encountered on the site by the Subcontractor, the Subcontractor shall, upon recognizing the condition, immediately stop Work in the affected area and promptly report the condition to the Contractor in writing. When the material or substance has been rendered harmless, the Subcontractor's Work in the affected area shall resume upon written agreement of the Contractor and Subcontractor. The Subcontract Time shall be extended appropriately and the Subcontract Sum shall be increased in the amount of the Subcontractor's reasonable additional direct costs of demobilization and remobilization, which adjustments shall be accomplished as provided in Article 5 of this Agreement.

§ 4.4.4 To the fullest extent permitted by law, the Contractor shall indemnify and hold harmless the Subcontractor, the Subcontractor's Sub-subcontractors, and agents and employees of any of them from and against claims, damages, losses, and expenses, including but not limited to attorneys' fees, arising out of or resulting from performance of the Work in the affected area if in fact the material or substance presents the risk of bodily injury or death as described in Section 4.4.3 and has not been rendered harmless, provided that such claim, damage, loss, or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself) except to the extent that such damage, loss, or expense is due to the fault or negligence of the party seeking indemnity.

§ 4.4.5 The Subcontractor shall reimburse the Contractor for the cost and expense the Contractor incurs (1) for remediation of a hazardous material or substance brought to the site and negligently handled by the Subcontractor or (2) where the Subcontractor fails to perform its obligations under Section 4.4.3, except to the extent that the cost and expense are due to the Contractor's fault or negligence.

§ 4.4.6 Subcontractor acknowledges that public health, safety, and security are of the utmost importance in connection with its performance of the Work. Subcontractor shall, at all times, implement and maintain commercially reasonable safety, health, and security protocol with respect to its personnel on site, including implementing best practices as defined by the United States Centers for Disease Control and state and local public health agencies to avoid exposure to and protection against severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) aka COVID-19. Subcontractor shall also take such actions as are necessary to protect the health, safety and security of the occupants and users of the subject property in connection with the Work and the Project, including adherence to sector guidelines, rules and Executive Orders promulgated by the State of Connecticut applicable to the construction industry.

The Owner and the Subcontractor expressly agree, notwithstanding any provision in this Agreement to the contrary, that: (i) a COVID-19 pandemic exists worldwide (including a formally declared public health emergency in Connecticut) as of the execution date of this Agreement; (ii) the existence of such pandemic, and its effects, now, and for the duration of Subcontractor's performance under the Agreement, including, without limitation, effects upon pricing, schedule, quantities, or specifications, if any, shall not be cause for Subcontractor to rely upon, invoke, or avail itself to, any rights or remedies under this Agreement, at law, or
in equity, for a claim, or an adjustment to the price, schedule, quantities, specifications, or other material terms of this Agreement; (iii) the material terms of this Agreement, particularly terms relating to price, schedule, quantities, availability and specifications, take into consideration, and fully account for, the existence of such pandemic and its effects, now, and for the duration of Contractor's performance under the Agreement; and (iv) such pandemic shall not render Subcontractor unable to fulfill any of its obligations under the Agreement, and Subcontractor shall not have any claim, action or cause of action against the Owner in connection with such pandemic, including any claim

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for frustration of purpose, change in circumstances, economic balance, or impossibility. This provision shall survive the completion or earlier termination of this Agreement.

§ 4.5 Cleaning Up

§ 4.5.1 The Subcontractor shall keep the premises and surrounding area free from accumulation of waste materials or rubbish caused by operations performed under this Subcontract. The Subcontractor shall not be held responsible for conditions caused by other contractors or subcontractors. Subcontractor's attention is directed to the requirements set forth in §§3.3.13 – 3.3.20 and 3.15 of the General Conditions to the Prime Contract, with respect to cleaning and related obligations. Subcontractor shall comply with these requirements at all times.

§ 4.5.2 As provided under Section 3.4.2, if the Subcontractor fails to clean up as provided in the Subcontract Documents, the Contractor may charge the Subcontractor for the Subcontractor's appropriate share of cleanup costs.

§ 4.6 Warranty

§ 4.6.1 The Subcontractor warrants to the Owner, Architect, and Contractor that materials and equipment furnished under this Subcontract will be of good quality and new unless the Subcontract Documents require or permit otherwise. The Subcontractor further warrants that the Work will conform to the requirements of the Subcontract Documents and will be free from defects, except for those inherent in the quality of the Work the Subcontract Documents require or permit. Work, materials, or equipment not conforming to these requirements may be considered defective. The Subcontractor's warranty excludes remedy for damage or defect caused by abuse, alterations to the Work not executed by the Subcontractor, improper or insufficient maintenance, improper operation, or normal wear and tear under normal usage. If required by the Architect and Contractor, the Subcontractor shall provide satisfactory evidence as to the kind and quality of materials and equipment furnished or to be furnished. Subcontractor's attention is directed to the warranty requirements set forth in §3.5 of the General Conditions to the Prime Contract. Subcontractor acknowledges that it has reviewed the aforementioned requirements and will comply with same in their entirety.

§ 4.6.2 All material, equipment, or other special warranties required by the Subcontract Documents shall be issued in the name of the Owner, or shall be transferable to the Owner, and shall commence in accordance with the Subcontract Documents.

§ 4.7 Indemnification

§ 4.7.1 To the fullest extent permitted by law and in strict compliance with the terms and conditions of the Prime Contract (Subcontractor's attention is directed to §3.18 of the General Conditions to the Prime Contract), the Subcontractor shall indemnify, defend and hold harmless the Owner, Contractor, Architect, Architect's consultants, and agents and employees of any of them from and against claims, damages, losses, and expenses, including but not limited to attorney's fees, arising out of or resulting from performance of the Subcontractor's Work under this Subcontract, provided that any such claim, damage, loss, or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself), but only to the extent caused by the negligent acts or omissions of the Subcontractor, the Subcontractor's Sub-subcontractors, anyone directly or indirectly employed by them, or anyone for whose acts they may be liable, regardless of whether or not such claim, damage, loss, or expense is caused in part by a party indemnified hereunder. Such obligation shall not be construed to negate, abridge, or otherwise reduce other rights or obligations of indemnity which would otherwise exist as to a party or person described in this Section 4.7.

§ 4.7.2 In claims against any person or entity indemnified under this Section 4.7 by an employee of the Subcontractor, the Subcontractor's Sub-subcontractors, anyone directly or indirectly employed by them, or anyone for whose acts they may be liable, the indemnification obligation under Section 4.7.1 shall not be limited by a limitation on the amount or type of damages, compensation or benefits payable by or for the Subcontractor, or the Subcontractor's Sub-subcontractors under workers' compensation acts, disability benefit acts, or other employee benefit acts.

§ 4.8 Remedies for Nonpayment

If the Contractor does not pay the Subcontractor through no fault of the Subcontractor, within seven days from the time payment should be made as provided in this Agreement, the Subcontractor may, without prejudice to any other available remedies, upon seven additional days' notice to the Contractor, stop the Work of this Subcontract until

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payment of the amount owing has been received. The Subcontract Sum shall, by appropriate Modification, be increased by the amount of the Subcontractor's direct costs of demobilization and remobilization.

§ 4.9 Professional Services Provided by Subcontractor

§ 4.9.1 The Subcontractor shall not be required to provide professional services that constitute the practice of architecture or engineering unless such services are specifically required by the Subcontract Documents or unless the Subcontractor is required to provide such services in order to carry out the Subcontractor's responsibilities for its own construction means, methods, techniques, sequences, and procedures. The Subcontractor shall not be required to provide professional services in violation of applicable law.

§ 4.9.2 If professional design services or certifications by a design professional related to systems, materials, or equipment are specifically required of the Subcontractor by the Subcontract Documents, the Contractor will provide all performance and design criteria that such services must satisfy to the extent the Contractor has received such performance and design criteria from the Owner and Architect under the terms of the Prime Contract.

§ 4.9.3 If professional design services or certifications by a design professional are required because of means, methods, techniques, sequences, or procedures required by the Contractor and related to the Work of the Subcontractor, the Contractor will provide all performance and design criteria that such services must satisfy.

§ 4.9.4 The Subcontractor shall be entitled to rely upon the adequacy, accuracy, and completeness of the performance and design criteria received from the Contractor under this Section 4.9.

§ 4.9.5 The Subcontractor shall cause the professional services performed under this Section 4.9 to be provided by a properly licensed design professional, whose signature and seal shall appear on all drawings, calculations, specifications, certifications, Shop Drawings, and other submittals prepared by such professional. Shop drawings and other submittals related to the Work designed by such design professional shall bear the professional's written approval when submitted to the Contractor. The Contractor shall be entitled to rely upon the adequacy, accuracy, and completeness of the services, certifications, and approvals performed or provided by the design professionals, provided the Contractor has provided to the Subcontractor all performance and design criteria required by this Section 4.9.

ARTICLE 5 CHANGES IN THE WORK

§ 5.1 The Owner may make changes in the Work by issuing Modifications to the Prime Contract. Upon receipt of a Modification to the Prime Contract issued subsequent to the execution of this Agreement, the Contractor shall promptly notify the Subcontractor of such Modification. Unless otherwise directed by the Contractor, the Subcontractor shall not thereafter order materials or perform Work that would be inconsistent with the changes made by the Modification to the Prime Contract. Subcontractor is directed to closely review and adhere to Article 7 of the General Conditions of the Prime Contract.

§ 5.2 The Subcontractor may be ordered in writing by the Contractor, without invalidating this Subcontract, to make changes in the Work within the general scope of this Subcontract consisting of additions, deletions, or other revisions, including those required by Modifications to the Prime Contract issued subsequent to the execution of this Agreement, with the Subcontract Sum and the Subcontract Time adjusted accordingly. The Subcontractor, prior to the commencement of such changed or revised Work, shall submit promptly to the Contractor written copies of a Claim for adjustment to the Subcontract Sum and Subcontract Time for such revised Work in a manner consistent with requirements of the Subcontract Documents. Subcontractor shall, without delay and upon receipt of written direction from Contractor, prosecute the changed Work and document the adjustments to the Subcontract Sum and Subcontract Time contemporaneously.

§ 5.3 The Subcontractor shall make all Claims promptly (and in no event, not later than the time required by the Prime Contract) to the Contractor for additional cost, extensions of time and damages for delays, or other causes in accordance with the Subcontract Documents. A Claim which will affect or become part of a Claim which the Contractor is required to make under the Prime Contract within a specified time period or in a specified manner shall be made in sufficient time to permit the Contractor to satisfy the requirements of the Prime Contract. Such Claims shall be received by the Contractor not less than two working days preceding the time by which the Contractor's Claim must be made. Failure of the Subcontractor to make such a timely Claim shall bind the Subcontractor to the same consequences as those to which the Contractor is bound.

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ARTICLE 6 CLAIMS AND DISPUTES

§ 6.1 Mediation

§ 6.1.1 Claims, disputes, or other matters in controversy arising out of or related to this Subcontract, except those waived as provided for in Sections 6.4 and 11.3.2, shall be presented and submitted in accordance with the General Conditions to the Prime Contract and shall be subject to mediation as a condition precedent to binding dispute resolution.

§ 6.1.2 Any Claims, disputes or other matters in question between Contractor and Subcontractor that are not resolved via mediation shall be resolved as provided in the Prime Contract unless Contractor expressly opts to litigate such disputes.
The parties shall endeavor to resolve their Claims by mediation which, unless the parties mutually agree upon a mediator, shall be administered by the American Arbitration Association in accordance with its Construction Industry Mediation Procedures in effect on the date of the Agreement. A request for mediation shall be made in writing, delivered to the other party to this Subcontract and filed with the person or entity administering the mediation. The request may be made concurrently with the filing of binding dispute resolution proceedings but, in such event, mediation shall proceed in advance of binding dispute resolution proceedings, which shall be stayed pending mediation for a period of 60 days from the date of filing, unless stayed for a longer period by agreement of the parties or court order. If an arbitration is stayed pursuant to this Section 6.1.2, the parties may nonetheless proceed to the selection of the arbitrators(s) and agree upon a schedule for later proceedings.

§ 6.1.3 The parties shall share the mediator's fee and any filing fees equally. The mediation shall be held in the place where the Project is located, unless another location is mutually agreed upon. Agreements reached in mediation shall be enforceable as settlement agreements in any court having jurisdiction thereof.

§ 6.2 Binding Dispute Resolution

For any Claim subject to, but not resolved by mediation pursuant to Section 6.1, the method of binding dispute resolution shall be as follows:
(Check the appropriate box.)

[«X »] Arbitration pursuant to Section 6.3 of this Agreement, unless Contractor expressly opts to litigate a dispute in Connecticut Superior Court.

[« »] Litigation in a court of competent jurisdiction

[« »] Other: *(Specify)*

§ 6.3 Arbitration

§ 6.3.1 If the Contractor and Subcontractor have selected arbitration as the method of binding dispute resolution in Section 6.2, any Claim subject to, but not resolved by, mediation shall be subject to arbitration which, unless the parties mutually agree otherwise, shall be administered by the American Arbitration Association in accordance with its Construction Industry Arbitration Rules in effect on the date of this Agreement. The arbitration should be conducted in the place where the Project is located, unless another location is mutually agreed upon. A demand for arbitration shall be made in writing, delivered to the other party to the Subcontract, and filed with the person or entity administering the arbitration. The party filing a notice of demand for arbitration must assert in the demand all Claims then known to that party on which arbitration is permitted to be demanded.

§ 6.3.2 A demand for arbitration shall be made no earlier than concurrently with the filing of a request for mediation but in no event shall it be made after the date when the institution of legal or equitable proceedings based on the Claim would be barred by the applicable statute of limitations. For statute of limitations purposes, receipt of a written demand for arbitration by the person or entity administering the arbitration shall constitute the institution of legal or equitable proceedings based on the Claim.

§ 6.3.3 The award rendered by the arbitrator or arbitrators shall be final, and judgment may be entered upon it in accordance with applicable law in any court having jurisdiction thereof. The award shall be in writing, contain findings and fact and conclusions of law, and apply Connecticut law.

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§ 6.3.4 The foregoing agreement to arbitrate, and other agreements to arbitrate with an additional person or entity duly consented to by parties to the Agreement, shall be specifically enforceable under applicable law in any court having jurisdiction thereof.

§ 6.3.5 Consolidation or Joinder

§ 6.3.5.1 Subject to the rules of the American Arbitration Association or other applicable arbitration rules, either party may consolidate an arbitration conducted under this Agreement with any other arbitration to which it is a party provided that (1) the arbitration agreement governing the other arbitration permits consolidation; (2) the arbitrations to be consolidated substantially involve common questions of law or fact; and (3) the arbitrations employ materially similar procedural rules and methods for selecting arbitrator(s).

§ 6.3.5.2 Subject to the rules of the American Arbitration Association or other applicable arbitration rules, either party may include by joinder persons or entities substantially involved in a common question of law or fact whose presence is required if complete relief is to be accorded in arbitration, provided that the party sought to be joined consents in writing to such joinder. Consent to arbitration involving an additional person or entity shall not constitute consent to arbitration of a Claim, dispute, or other matter in question not described in the written consent.

§ 6.3.5.3 The Contractor and Subcontractor grant to any person or entity made a party to an arbitration conducted under this Section 6.3, whether by joinder or consolidation, the same rights of joinder and consolidation as the Contractor and Subcontractor under this Agreement.

§ 6.4 Waiver of Claims for Consequential Damages

The Contractor and Subcontractor waive claims against each other for consequential damages arising out of or relating to this Subcontract, including without limitation, any consequential damages due to either party's termination in accordance with Article 7. Nothing contained herein shall be deemed to preclude an award of liquidated damages pursuant to §8.6 of the General Conditions to the Prime Contract. Subcontractor acknowledges that to the extend Owner assesses liquidated damages against Contractor due to delays caused by Subcontractor, Subcontractor shall be liable for such liquidated damages or its proportionate share of same. Subcontractor waives any and all claims for lost profits, lost opportunities, displaced labor, and consequential or incidental damages of any kind or nature which claims are expressly, knowingly, and intentionally waived by Subcontractor and its suppliers.

Subcontractor expressly agrees, notwithstanding any provision in this Agreement to the contrary, that: (i) a COVID-19 pandemic exists worldwide as of the execution date of this Agreement; (ii) the existence of such pandemic, and its effects, now, and for the duration of Subcontractor's performance under the Agreement, including, without limitation, effects upon pricing, schedule, quantities, or specifications, if any, shall not be cause for Subcontractor to rely upon, invoke, or avail itself to, any rights or remedies under this Agreement, at law, or in equity, for a claim, or an adjustment to the price, schedule, quantities, specifications, or other material terms of this Agreement; (iii) the material terms of this Agreement, particularly terms relating to price, schedule, quantities, availability and specifications, take into consideration, and fully account for, the existence of such pandemic and its effects, now, and for the duration of Subcontractor's performance under the Agreement; and (iv) such pandemic shall not render Subcontractor unable to fulfill any of its obligations under the Agreement, and Subcontractor shall not have any claim, action or cause of action against the Contractor or Owner in connection with such pandemic, including any claim for frustration of purpose change in circumstances, economic balance, or impossibility. This provision shall survive the completion or earlier termination of this Agreement.

ARTICLE 7 TERMINATION, SUSPENSION OR ASSIGNMENT OF THE SUBCONTRACT

§ 7.1 Termination by the Subcontractor

The Subcontractor may terminate the Subcontract for the same reasons and under the same circumstances and procedures with respect to the Contractor as the Contractor may terminate with respect to the Owner under the Prime Contract, or for nonpayment of amounts due under this Subcontract for 60 days or longer from the date such payments are due. In the event of such termination by the Subcontractor for any reason which is not the fault of the Subcontractor, the Subcontractor's Sub-subcontractors, or their agents or employees or other persons or entities performing portions of the Work under contract with the Subcontractor, the Subcontractor shall be entitled to recover from the Contractor payment for direct costs for Work executed.

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§ 7.2 Termination by the Contractor

§ 7.2.1 Termination for Cause

If the Subcontractor repeatedly fails or neglects to carry out the Work in accordance with the Subcontract Documents or otherwise to perform in accordance with this Subcontract and fails within a ten-day period after receipt of notice to commence and continue correction of such default or neglect with diligence and promptness, the Contractor may, by notice to the Subcontractor and without prejudice to any other remedy the Contractor may have, terminate the Subcontract and finish the Subcontractor's Work by whatever method the Contractor may deem expedient. If the unpaid balance of the Subcontract Sum exceeds the expense of finishing the Subcontractor's Work and other damages incurred by the Contractor and not expressly waived, such excess shall be paid to the Subcontractor. If such expense and damages exceed the unpaid balance of the Subcontract Sum, the Subcontractor shall pay the difference to the Contractor.

§ 7.2.2 Termination for Convenience

§ 7.2.2.1 If the Owner terminates the Prime Contract for the Owner's convenience, the Contractor shall promptly deliver notice to the Subcontractor.

§ 7.2.2.2 In case of such termination for the Owner's convenience, the Subcontractor shall be entitled to receive payment for Work properly executed.

§ 7.2.2.3 Upon receipt of notice of termination, the Subcontractor shall

- **.1** cease operations as directed by the Contractor in the notice;
- **.2** take actions necessary, or that the Contractor may direct, for the protection and preservation of the Work; and
- **.3** except for Work directed to be performed prior to the effective date of termination stated in the notice, terminate all existing Sub-subcontracts and purchase orders and enter into no further Sub-subcontracts and purchase orders.

§ 7.3 Suspension by the Contractor for Convenience

§ 7.3.1 The Contractor may, without cause, order the Subcontractor in writing to suspend, delay, or interrupt the Work of this Subcontract in whole or in part for such period of time as the Contractor may determine. In the event of suspension ordered by the Contractor, the Subcontractor shall be entitled to an equitable adjustment of the Subcontract Time and Subcontract Sum (direct costs only). No consequential or incidental damages shall be claimed by or paid to Subcontractor.

§ 7.3.2 The Subcontract Time and Subcontract Sum shall be adjusted for increases in the direct cost and time caused by suspension as described in Section 7.3.1. Adjustment of the Subcontract Sum shall include profit on the increased cost of performance, if in fact it is proven to the Contractor's satisfaction that the cost of performance increased through no fault of the Subcontractor, caused by suspension. No adjustment shall be made to the extent that

- **.1** performance is, was or would have been so suspended, delayed, or interrupted by another cause for which the Subcontractor is responsible; or
- **.2** an equitable adjustment is made or denied under another provision of this Subcontract. No consequential or incidental damages shall be claimed by or paid to Subcontractor.

§ 7.4 Assignment of the Subcontract

§ 7.4.1 In the event the Owner terminates the Prime Contract for cause, this Subcontract is assigned to the Owner pursuant to Section 5.4 of AIA Document A201–2017 provided the Owner accepts the assignment by notifying the Contractor and Subcontractor. Subcontractor's attention is directed to §5.2.9 of the General Conditions to the Prime Contract.

§ 7.4.2 Without the Contractor's written consent, the Subcontractor shall not assign the Work of this Subcontract, subcontract the whole of this Subcontract, or subcontract portions of this Subcontract.

ARTICLE 8 THE WORK OF THIS SUBCONTRACT

The Subcontractor shall execute the following portion of the Work described in the Subcontract Documents, including all labor, materials, equipment, services and other items required to complete such portion of the Work, except to the extent specifically indicated in the Subcontract Documents to be the responsibility of others.

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(Insert a precise description of the Work of this Subcontract, referring where appropriate to numbers of Drawings, sections of Specifications and pages of Addenda, Modifications, and accepted alternates.)

This Subcontractor is responsible for the complete Bid Package

INSERT SPEC SECTION TABLE

CONTRACT DOCUMENTS - The Contract Documents for this Bid Package include but are not limited to:

A. SP+A Project Manual, Specifications and Supplementary Information for Additions and Alterations to Old Greenwich School, (Volume I) dated August 29, 2024 and its complete contents;
B. SP+A Project Manual, Specifications and Supplementary Information for Additions and Alterations to Old Greenwich School, (Volume 2) dated August 29, 2024 and its complete contents;
C. SP+A Project Manual, Specifications and Supplementary Information for Additions and Alterations to Old Greenwich School, (Volume 3) dated August 29, 2024 and its complete contents; including Appendices – Geotechnical Engineering Study as prepared by Langan dated May 24, 2023 and the Revised Limited NESHAP Pre-Renovation Hazardous Materials Survey Report as prepared by Langan dated September 13, 2023;
D. SP+A complete set of drawings (Volume 1) for Additions and Alterations to Old Greenwich School dated August 29, 2024 (See complete drawing sets);
E. SP+A complete set of drawings (Volume 2) for Additions and Alterations to Old Greenwich School dated August 29, 2024 (See complete drawing sets);
F. Downes Construction's Project Manual / Bidding and Contract Requirements for Invitation To Bid #01 and its complete contents dated November 1, 2024;
G. Invitation To Bid dated November 1, 2024 (Bound in Downes Project Manual);
H. AIA Document A701 – 2018 – Instructions to Bidders
I. This General Items – All Trade Packages (Bound in Downes Project Manual);
J. Scopes of Work (Bound in Downes Project Manual);
K. Bid Form (Bound in Downes Project Manual);
L. Acknowledgment of Surety (Bound in Downes Project Manual);
M. Non-Collusion Affidavit (Sample Form) (Bound in Downes Project Manual);
N. Insurance Accord Form (Sample Bound in Downes Project Manual);
O. AIA Document A305 – 2020 – Contractor's Qualification Statement
P. Prevailing Wage Rates (Bound in Downes Project Manual);
Q. Downes Supplemental Instructions (Bound in Downes Project Manual);
R. Phasing and Schedule (Bound in Downes Project Manual);
S. Drawing & Specification Log (Bound in Downes Project Manual);
T. AIA Document A401 – 2017 - Agreement between Contractor and Subcontractor (Sample Bound in Downes Project Manual);
U. Downes Sample Forms (Bound in Downes Project Manual):
    A. Sample Insurance Accord Form
    B. Partial Waiver of Lien
    C. Final Lien Waiver
    D. Stored Material Sample Forms
    E. Submittal Cover Sheet Forms

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F. Sample Warranty / Guarantee
G. Change Order Proposal Form
H. Background Check Compliance Agreement
I. Subcontractor Orientation

V. AIA Document A133 – 2019 Standard Form of Agreement Between Owner and Construction Manager as Constructor;
W. AIA Document A201 - 2017 - General Conditions of the Contract for Construction
X. Site Logistics Plan SL-1 (Located in combined plans)
Y. Addenda and/or supplementary information as may be issued within the bid period.;

ARTICLE 9 DATE OF COMMENCEMENT AND SUBSTANTIAL COMPLETION

§ 9.1 The date of commencement of the Subcontractor's Work, shall be:
(Check one of the following boxes.)

[« »] The date of this Agreement.

[« X »] A date set forth in a notice to proceed issued by the Contractor. **Letter of Intent/Notice to Proceed was issued on XX/XX/2024**

[« »] Established as follows:
(Insert a date or a means to determine the date of commencement of the Subcontractor's Work.)

If a date of commencement of the Subcontractor's Work is not selected, then the date of commencement shall be the date of this Agreement.

§ 9.2 Subcontract Time

§ 9.2.1 The Subcontract Time is the period of time, including authorized adjustments, allotted in the Subcontract Documents for Substantial Completion of the Work described in the Subcontract Documents. The Subcontract Time shall be measured from the date of commencement of the Subcontractor's Work. TIME IS OF THE ESSENCE WITH REGARD TO THE SUBCONTRACTOR'S PERFORMANCE OF THE WORK. Subcontractor's attention is directed to §§8.3.4, 8.3.5 and 8.3.6 of the General Conditions to the Prime Contract, pertaining to time of performance.

§ 9.2.2 Subject to adjustments of the Subcontract Time as provided in the Subcontract Documents, the Subcontractor shall achieve substantial completion of the Subcontractor's Work:
(Check one of the following boxes and complete the necessary information.)

[« »] Not later than « » (« ») calendar days from the date of commencement of the Subcontractor's Work.

[« X »] By the following date: **Note: Progress schedule and completion of the work is to be in conformance with Attachment B – Project Construction Schedule, Downes Supplemental Instructions, Phasing Plan as may be applicable, and other Subcontract Documents pertaining to or referencing the completion of work.**

§ 9.2.3 Subject to adjustments of the Subcontract Time as provided in the Subcontract Documents, if portions of the Subcontractor's Work are to be completed prior to substantial completion of the Subcontractor's Work, then the Subcontractor shall achieve earlier substantial completion of such portions by the following dates.
(List all portions of the Subcontractor's Work required to achieve substantial completion of the Subcontractor's Portion of the Work.)

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Portion of Work **Substantial Completion**

§ 9.2.4 If the Subcontractor fails to achieve substantial completion as provided in this Section 9.2, liquidated damages, if any, shall be assessed as set forth in Section 3.4. The Prime Contract, which has been expressly incorporated herein and made a part hereof, contains a liquidated damages provision in Article 8.6 The liquidated damages provision of the Prime Contract applies to this Subcontract.

§ 9.3 With respect to the obligations of both the Contractor and the Subcontractor, including the Subcontractor's time of performance, TIME IS OF THE ESSENCE of this Subcontract. Subcontractor's attention is directed to "Attachment B," which is attached to and made a part of this agreement. Subcontractor shall comply, in all respects, with the requirements of this Schedule, as well as with updated schedules provided to it by Contractor. If Subcontractor claims it has been delayed through no fault of its own, Subcontractor shall substantiate and document the existence of an event for an excusable delay and need for a specific extension of time. If the Owner finds a delay alleged by Subcontractor to be unsubstantiated and backcharges the Contractor for the time and costs associated with reviewing and addressing the alleged delay, the Contractor shall, in turn, have the absolute right to backcharge the Subcontractor for all of such costs, as well as for Contractor's related costs. Any and all requests for an extension of time shall be prepared and submitted in strict compliance with and shall be subject to §3.7.6 of the General Conditions to the Prime Contract.

§ 9.4 No extension of time will be valid without the Contractor's written consent after a Claim is made by the Subcontractor in accordance with Section 5.3. The Subcontractor shall commence the Work when notified to do so by Contractor and shall diligently and continuously prosecute and complete the Work and coordinate the Work with the other work being performed on the Project, in accordance with those project schedules as may be issued from time to time during the performance of the Work, and any other scheduling requirements listed in this Agreement, so as not to delay, impede, obstruct, hinder or interfere with the commencement, progress or completion of the whole or any part of the Work or other work on the Project. Subcontractor must attend all Project meetings scheduled by Contractor.

The Subcontractor shall participate and cooperate in the development of schedules and other efforts to achieve timely completion of the Work providing information for the scheduling of the times and sequence of operations required for its Work to meet Contractor's overall schedule requirements, shall continuously monitor the project schedule so as to be fully familiar with the timing, phasing and sequence of operations of the Work and of other work on the Project, and shall execute the Work in accordance with the requirements of the project schedule including any revisions thereto.

Should the progress of the Work or of the Project be delayed, disrupted, hindered, obstructed, or interfered with by any fault or neglect or act or failure to act of the Subcontractor or any of its officers, agents, servants, employees, subcontractors or suppliers so as to cause any additional cost, expense, liability or damage to Contractor including legal fees and disbursements incurred by Contractor (whether incurred in defending claims or in seeking reimbursement and indemnity from the Subcontractor and its surety hereunder or otherwise) or to the Owner or any damages or additional costs or expenses for which Contractor or the Owner may or shall become liable, the Subcontractor and its surety shall and does hereby agree to compensate Contractor and the Owner for an indemnify them against all such costs, expenses, damages and liability.

Contractor, if it deems necessary, may direct the Subcontractor to work overtime and, if so directed, the Subcontractor shall work said overtime and, provided that the Subcontractor is not in default under any of the terms or provisions of this Agreement or of any of the other Contract Documents, Contractor will pay the Subcontractor for such actual additional wages paid, if any, at rates which have been approved by Contractor plus taxes imposed by law on such additional wages, plus workers' compensation insurance, liability insurance and levies on such

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additional wages if required to be paid by the Subcontractor to comply with Subcontractor's obligations under this Agreement.

If, however, the progress of the Work or of the Project are delayed by any fault or neglect or act or failure to act of the Subcontractor or any of its officers, agents, servants, employees, subcontractors or suppliers, then the Subcontractor shall, in addition to all of the other obligations imposed by this Agreement upon the Subcontractor in such case, and at its own cost and expense, work such overtime as may be necessary to make up for all time lost in the completion of the Work and of the Project due to such delay. Should the Subcontractor fail to make up for the time lost by reason of such delay, Contractor shall have the right to cause other Subcontractors to work overtime and to take whatever other action it deems necessary to avoid delay in the completion of the Work and of the Project, and the cost and expense of such overtime and/or such other action shall be borne by the Subcontractor.

ARTICLE 10 SUBCONTRACT SUM

§ 10.1 The Contractor shall pay the Subcontractor the Subcontract Sum in current funds received from the Owner for the Subcontractor's performance of the Subcontract. The Subcontract Sum shall be » ($), subject to additions and deductions as provided in the Subcontract Documents. Subcontractor's attention is directed to §6.8 of the Prime Contract, which sets forth Costs Not to Be Reimbursed by Owner. Contractor shall have no liability to Subcontractor for Costs not reimbursed by Owner.

Determination of Contract Sum:		Total

§ 10.2 Alternates

§ 10.2.1 Alternates, if any, included in the Subcontract Sum:

Item	Price

§ 10.2.2 Subject to the conditions noted below, the following alternates may be accepted by the Contractor following execution of this Agreement. Upon acceptance, the Contractor shall issue a Modification to this Subcontract:
(Insert below each alternate and the conditions that must be met for the Contractor to accept the alternate.)

Item	Price	Conditions for Acceptance

§ 10.3 Unit prices, if any:
(Identify and state the unit price, and quantity limitations, if any, to which the unit price will be applicable.)

Once the following unit prices are agreed upon, they may be used for adds or deducts from contract price based on project requirements for the life of the project and will be included as part of the contract:

- **Unit Prices as applicable for Allowances;**

Labor & Equipment Rates: Labor & Equipment rates indicated on the Subcontractors Bid Form are not accepted under this Agreement. The Subcontractor agrees that labor & equipment rates shall be established and agreed upon in accordance with the Subcontract Documents which states Overhead & Profit, consumables, reimbursables, insurance, small tools, equipment costs, travel, safety and/or parking etc. are

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NOT included in the hourly rate. Rates are subject to approval by the Owner.

Bond cost reconciliation will be made at the end of the project with a receipted invoice from the Bonding Company. Bond percentage will not be allowed on individual change order proposals.

Equipment Rates: Proper substantiation is required prior to acceptance.

Receipt of labor & equipment rates will be a prerequisite to the first month's payment

§ 10.4 Allowances, if any, included in the Subcontract Sum:
(Identify allowance and state exclusions, if any, from the allowance price.)
Subcontractor has included the following allowances, above and beyond the described Work in this scope of Work. All allowances are to be, as directed by the Contractor, and it is this Subcontractor's responsibility to document usage with daily accounting of T&M tickets. Overhead and profit for any and all allowances listed shall be included in this Subcontractor's base bid. Overhead and profit will NOT be reconciled with change order submissions drawing off of allowances. Allowance quantities, unit prices and/or dollar values will not be adjust for deducts to this Bid Package. Also, reference Specifications for additional information:

Insert allowances here

The above-mentioned allowance(s) are to be used as directed by the Construction Manager. The value of these allowance(s) will be adjusted accordingly based on project requirements, utilizing agreed upon labor, equipment, material and/or unit price rates. The above-mentioned unit prices are to be inclusive of all labor, material, equipment, tools, transportation and services, etc.… necessary to perform the above-mentioned work.

ARTICLE 11 PAYMENTS

§ 11.1 Progress Payments

§ 11.1.1 Based upon Applications for Payment submitted to the Contractor by the Subcontractor, corresponding to Applications for Payment submitted by the Contractor to the Architect, and Certificates for Payment issued by the Architect, the Contractor shall make progress payments on account of the Subcontract Sum to the Subcontractor as provided below and elsewhere in the Subcontract Documents. The obligation of Contractor to make a payment under this Subcontract, whether a progress payment or the final payment, or for extra work or change orders or for Claims of any type, is and shall at all times be subject to the express condition precedent of payment by the Owner. Subcontractor knowingly accepts the risk of non-payment by Owner and is not dependent upon payment from Contractor in the absence of Contractor's receipt of payment from Owner. Unless the Contractor provides the Owner with a payment bond in the full penal sum of the Contract Sum, payments received by the Contractor and Subcontractor for Work properly performed by their contractors and suppliers shall be held by the Contractor and Subcontractor for those contractors or suppliers who performed Work or furnished materials, or both, under contract with the Contractor or Subcontractor for which payment was made to the Contractor by the Owner or to the Subcontractor by the Contractor, as applicable. Nothing contained herein shall require money to be placed in a separate account and not commingled with money of the Contractor or Subcontractor, shall create any fiduciary liability or tort liability on the part of the Contractor or Subcontractor for breach of trust, or shall entitle any person or entity to an award of punitive damages against the Contractor or Subcontractor for breach of the requirements of this provision.

§ 11.1.2 The period covered by each Application for Payment shall be one calendar month ending on the last day of the month, or as follows:

« »

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§ 11.1.3 Provided an Application for Payment is received by the Contractor not later than the **20th** day of a month, the Contractor shall include the Subcontractor's Work covered by that application in the next Application for Payment which the Contractor is entitled to submit to the Architect. The Contractor shall pay the Subcontractor each progress payment no later than seven working days after the Contractor receives payment from the Owner. If the Architect does not issue a Certificate for Payment or the Contractor does not receive payment for any cause which is not the fault of the Subcontractor, the Contractor shall pay the Subcontractor, on demand, a progress payment computed as provided in Sections 11.1.7, 11.1.8, 11.1.9 and 11.2. Per §7.1.3, payment from the Owner to Contractor are due forty-five (45) days after the Architect receives the adjusted Payment Application.

§ 11.1.4 If the Subcontractor's Application for Payment is received by the Contractor after the application date fixed above, the Subcontractor's Work covered by it shall be included by the Contractor in the next Application for Payment submitted to the Architect.

§ 11.1.5 The Subcontractor shall submit to the Contractor a schedule of values prior to submitting the Subcontractor's first Application for Payment. Each subsequent Application for Payment shall be based upon the most recent schedule of values submitted by the Subcontractor in accordance with the Subcontract Documents. The schedule of values shall allocate the entire Subcontract Sum among the various portions of the Subcontractor's Work and be prepared in such form and supported by such data to substantiate its accuracy as the Contractor may require, and unless objected to by the Contractor, shall be used as a basis for reviewing the Subcontractor's Applications for Payment. Subcontractor shall submit, with each Application for Payment, the items required herein and pursuant to §7.1.4 of the Prime Contract and §9.3.1 – 9.3.4 of the General Conditions to the Prime Contract.

§ 11.1.6 Applications for Payment submitted by the Subcontractor shall indicate the percentage of completion of each portion of the Subcontractor's Work as of the end of the period covered by the Application for Payment.

§ 11.1.7 Subject to the provisions of the Subcontract Documents, the amount of each progress payment shall be computed as follows:

§ 11.1.7.1 The amount of each progress payment shall first include:

.1 That portion of the Subcontract Sum properly allocable to completed Work:

.2 That portion of the Subcontract Sum properly allocable to materials and equipment delivered and suitably stored at the site by the Subcontractor for subsequent incorporation in the Subcontractor's Work or, if approved by the Contractor, suitably stored off the site at a location agreed upon in writing; and

.3 The amount, if any, for changes in the Work that are not in dispute and have been properly authorized by the Contractor, to the same extent provided in the Prime Contract, pending a final determination by the Contractor of the cost of changes in the Subcontractor's Work, even though the Subcontract Sum has not yet been adjusted.

§ 11.1.7.2 The amount of each progress payment shall then be reduced by:

.1 The aggregate of previous payments made by the Contractor;

.2 The amount, if any, for Work that remains uncorrected and for which the Contractor has previously withheld a Certificate for Payment as provided in Article 9 of AIA Document A201-2017 for a cause that is the fault of the Subcontractor;

.3 For Work performed or defects discovered since the last payment application, any amount for which the Contractor may withhold payment in whole or in part, as provided in Article 9 of AIA Document A201-2017, for a cause that is the fault of the Subcontractor;

.4 Retainage withheld pursuant to Section 11.1.8 of this Agreement;

.5 the amount the Owner reduces payment to Contractor for Subcontractor's Work, per §9.5.1 of the General Conditions to the Prime Contract.

§ 11.1.8 Retainage

§ 11.1.8.1 For each progress payment made prior to substantial completion of the Subcontractor's Work, the Contractor may withhold the following amounts as retainage from the payment otherwise due:
(Insert a percentage or amount to be withheld as retainage from each Application for Payment. The amount of retainage may be limited by governing law.)

Retainage shall be held in the amount of five percent (5%) of each progress payment. An Additional 2% retainage

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shall be withheld until such time that the Subcontractor's requirements are fulfilled and approved by the Commission on Human Rights and Opportunities (CHRO) for the State of Connecticut for a total retainage of 7%.

§ 11.1.8.1.1 The following items are not subject to retainage:
(Insert any items not subject to the withholding of retainage, such as general conditions, insurance, etc.)

« »

§ 11.1.8.2 Reduction or limitation of retainage, if any, shall be as follows:
(If the retainage established in Section 11.1.8.1 is to be modified prior to substantial completion of the entire Work, including modifications for substantial completion of portions of the Subcontractor's Work as provided in Section 9.2.3, insert provisions for such modification.)

Any reduction of retainage must be approved by the Construction Manager, Owner, State of Connecticut and Architect.

§ 11.1.9 Upon the partial or entire disapproval by the Contractor of the Subcontractor's Application for Payment, the Contractor shall provide notice to the Subcontractor. If the Subcontractor disputes the Contractor's decision regarding a Subcontractor's Application for Payment in whole or in part, the Subcontractor may submit a Claim in accordance with Article 6. When the basis for the disapproval has been remedied, the Subcontractor shall be paid the amounts withheld.

§ 11.1.10 Provided the Contractor has fulfilled its payment obligations under the Subcontract Documents, the Subcontractor shall defend and indemnify the Contractor and Owner from all loss, liability, damage, or expense, including reasonable attorney's fees and litigation expenses, arising out of any lien claim or other claim for payment by any of the Subcontractor's subcontractors, suppliers, or vendors of any tier. Upon receipt of notice of such lien claim or other claim for payment, the Contractor shall notify the Subcontractor. If approved by the applicable court, when required, the Subcontractor may substitute a surety bond for the property against which the lien or other claim for payment has been asserted.

§ 11.2 Substantial Completion

When the Subcontractor's Work or a designated portion thereof is substantially complete and in accordance with the requirements of the Prime Contract (see §9.8 of the General Conditions to the Prime Contract), the Contractor shall, upon application by the Subcontractor, make prompt Application for Payment for such Work. Within 30 days following issuance by the Architect of the Certificate for Payment covering such substantially completed Work, the Contractor shall, to the full extent allowed in the Prime Contract, make payment to the Subcontractor, deducting any portion of the funds for the Subcontractor's Work withheld in accordance with the certificate to cover costs of items to be completed or corrected by the Subcontractor. Such payment to the Subcontractor shall be the entire unpaid balance of the Subcontract Sum if a full release of retainage is allowed under the Prime Contract for the Subcontractor's Work prior to the completion of the entire Project. If the Prime Contract does not allow for a full release of retainage, then such payment shall be an amount which, when added to previous payments to the Subcontractor, will reduce the retainage on the Subcontractor's substantially completed Work to the same percentage of retainage as that on the Contractor's Work covered by the certificate.

§ 11.3 Final Payment

§ 11.3.1 Final payment, constituting the entire unpaid balance of the Subcontract Sum, shall be made by the Contractor to the Subcontractor when the Subcontractor's Work is fully performed in accordance with the requirements of the Subcontract Documents, the Architect has issued a Certificate for Payment covering the Subcontractor's completed Work, all conditions precedent to final payment as set forth in the General Conditions of the Prime Contract (see §9.10) have been satisfied and the Contractor has received payment from the Owner. Contractor's receipt of payment from Owner is an express condition precedent to Contractor's obligation to make final payment to Subcontractor. If, for any cause which is not the fault of the Subcontractor, a Certificate for Payment is not issued or the Contractor does not receive timely payment or does not pay the Subcontractor within seven days after receipt of payment from the Owner, final payment to the Subcontractor shall be made upon demand.
(Insert provisions for earlier final payment to the Subcontractor, if applicable.)

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§ 11.3.2 Before issuance of the final payment, the Subcontractor, if required, shall submit evidence satisfactory to the Contractor that all payrolls, bills for materials and equipment, and all known indebtedness connected with the Subcontractor's Work have been satisfied. Acceptance of final payment by the Subcontractor shall constitute a waiver of claims by the Subcontractor, except those previously made in writing and identified by the Subcontractor as unsettled at the time of final Application for Payment.

ARTICLE 12 INSURANCE AND BONDS

§ 12.1 Subcontractor's Required Insurance Coverage

§ 12.1.1 The Subcontractor shall purchase and maintain the following types and limits of insurance, from a company or companies lawfully authorized to issue insurance in the jurisdiction where the Project is located, as will protect the Subcontractor from claims that may arise out of, or result from, the Subcontractor's operations and completed operations under the Subcontract:

(Specify each type of insurance, such as commercial general liability, automobile, worker's compensation, employers' liability, professional liability, and pollution, required to be carried by the Subcontractor, the limits of coverage for each type of insurance, and any other pertinent requirements.)

Type of Insurance	Limits	Other Pertinent Requirements
See attached and below		

The Subcontractor along with its entire lower tier Subcontractors will provide insurance in complete accordance with the following:

The following is applicable to all required insurance policies (See attached sample ACCORD form for additional clarification and specific requirements):

Insurer – All insurers must have an A.M. Best rating of A- VII or better and admitted to conduct business in the state.

Additional Insured –CONSTRUCTION MANAGER, Owner, Program Manager/Owner's Representative (if required) the Project Architect and other such entity(s) required by CONSTRUCTION MANAGER, shall be named Additional insured's under your policies, as well as, other parties which are required by the contract. Coverage's must be written on a primary and non-contributory basis and a Waiver of Subrogation provision must be included, with respect to all parties concerned.

Waiver of Subrogation – All policies must include a Waiver of Subrogation whereby the insured waives the right to subrogate against all the Additional insured's as well as their subsidiaries, employees, volunteers, directors and officers.

Other Insurance Clause – This clause must state that the contractor's/subcontractor's policy is Primary and (Non-contributory) the insurer will not seek contribution from other insurance available to all the Additional insured's.

Notice of Cancellation – **Non-Renewal or Material Change** – All policies shall be endorsed to require at least a 30 day written notice by the insurer of cancellation, non-renewal, or material change, except for a ten day notice for non-payment of premium. This notice shall be sent to the Project Manager at CONSTRUCTION MANAGER.

Deductibles/Self-Insured Retention – It is agreed that all deductibles and/or self-insured retentions are the responsibility of the contractor's/subcontractor's, including all claim handling and legal expenses.

Exclusions/Restrictions – All exclusion or restrictions of coverage not found in standard policies must be clearly identified.

Certificates of Insurance – Must be forwarded to the Project Manager at CONSTRUCTION MANAGER at least five days prior to commencing work or delivery of goods. Renewal Certificates of Insurance must be provided ten days prior to the expiration of required coverage. A copy of all your policy's Additional insured's Endorsements must be attached to the certificate.

Terms of Coverage – All insurance must adhere to requirements stipulated herein and be effective on or before work commences and remain in effect until final completion and acceptance of the work.

Also Subcontractors must maintain Commercial General Liability (CGL) including Completed Operations (Products – Comp/Op AGG) coverage of $1,000,000 per occurrence and $2,000,000 aggregate for itself and each Additional insured's for a minimum of three (3) years after final acceptance and closeout of said project.

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Pollution Liability – Any company who performs environmental (abatement) work must maintain Pollution Liability coverage as stipulated on page 3, Item #6, including mold coverage as necessitated by its scope of work.
EIFS Work – Commercial General Liability coverage cannot contain an EIFS exclusion for those companies doing this type of work. In addition, Pollution Liability, including mold coverage, must be carried. Minimum limits of $1,000,000 per occurrence (see Item #6 on page 3).
Subcontractors – It is a requirement of the project and is the responsibility of the subcontractor to be sure that their entire subcontractor's procure and maintain the same insurance required of the contractor.

1) Commercial General Liability (CGL) with Limits of Insurance of Not Less Than $1,000,000 Each Occurrence/$2,000,000 Annual Aggregate

a) If the CGL coverage contains a General Aggregate limit, such General Aggregate shall apply separately to each project.
b) CGL coverage shall be written on ISO Occurrence Form CG 00 01 1093 or a substitute form providing equivalent coverage and shall cover liability arising from premises, operations, independent contractors, products/completed operations, and personal and advertising injury.
c) CONSTRUCTION MANAGER, the Owner and All Other parties required of CONSTRUCTION MANAGER shall be included as insured's on the CGL using ISO Additional insured's Endorsement Form CG 20 10 11 85 or CG 20 10 10 93 and CG 20 37 10 01 or CG 20 33 10 01 and CG 20 37 10 01 or an endorsement providing equivalent coverage to the Additional insured's. This insurance for the Additional insured's shall be as broad as the coverage provided for the named insured subcontractor. It shall apply as Primary Insurance before any other insurance or self-insurance, including any deductible maintained by or provided to the Additional Insured. (A copy of the appropriate forms listed above must be completely filled out appropriately and attached to your Certificate of Insurance).
d) Subcontractors shall maintain CGL coverage for itself and all Additional insured's for the duration of the project according to contract documents and specification requirements; also Subcontractors must maintain Commercial General Liability (CGL) including Completed Operations (Products – Comp/Op AGG) coverage of $1,000,000 per occurrence and $2,000,000 aggregate for itself and each Additional insured's for a minimum of three (3) years after final acceptance and closeout of said project.
e) Coverage must be on an occurrence basis.
f) If project involves residential construction, the CGL policy cannot contain a residential exclusion.

2) Automobile Liability

a) Business Auto Liability with limits of at least $1,000,000 each accident.
b) Business Auto coverage must include coverage for liability arising out of all owned, leased, hired, and non-owned automobiles.
c) CONSTRUCTION MANAGER the Owner, and all other parties required of the CONSTRUCTION MANAGER shall be included as insured's on the auto policy.

3) Commercial Umbrella

a) Umbrella limits must be at least $10,000,000.
b) Umbrella coverage must include as insured's all entities that are Additional insured's on the CGL.
c) Umbrella coverage for such Additional insured's shall apply as primary before any other insurance or self-insurance, including any deductible, maintained by or provided to the Additional Insured's other than the CGL, Auto Liability and Employer's Liability coverage's maintained by the Subcontractor.
d) Coverage must be on an occurrence basis.

4) Workers' Compensation and Employer's Liability at least $500,000 each accident

a) Employers' Liability insurance limits of at least $500,000 each accident for bodily injury by accident and $500,000 each employee for injury by disease.
b) Where applicable, U.S. Longshore and Harborworkers Compensation Act Endorsement (USL&H) shall be attached to the policy.
c) The Employer's Liability limit may be met via an Umbrella policy, however, the combined limit must be a minimum of $5,000,000.

***5) Professional Liability** (if required by scope of work) at Least $1,000,000 each occurrence limit*

a) CONSTRUCTION MANAGER, et al. shall be included as an Additional Insureds on a primary and noncontributory basis.
b) Subcontractor is responsible for any self-insured retention/deductibles, including all claim handling and legal expenses.
c) CONSTRUCTION MANAGER, et al. shall be indemnified for loss and defense.

***6) Pollution Liability** (if required by scope of work) at least $1,000,000 each occurrence*

a) Pollution Liability for transit to be included.

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b) *Any subcontract which includes EIFS work must carry Pollution Liability, including mold coverage.*
c) *Subcontractor is responsible for any self-insured retention/deductibles, including all claim handling and legal expenses.*
d) *CONSTRUCTION MANAGER, et al. shall be indemnified for loss and defense.*
e) *CONSTRUCTION MANAGER, et al. shall be included as additional insured on a primary and noncontributory basis.*

Hold Harmless Agreement –

Subject only to the limitations set forth below and to the fullest extent permitted by law, the subcontractor shall indemnify, and hold harmless, and defend the Owner, CONSTRUCTION MANAGER, Architect, Consultants and the agents and employees of any of them from and against any and all injuries, claims, damages, losses, expenses, fines penalties and liabilities including but not limited to personnel related cost, attorneys' and experts' fees, court costs, and all other claim-related expenses, directly or indirectly arising out of or resulting from performance, or negligent acts of the Subcontractor's Work under this Subcontract, provided that such claim, damage, loss or expense is attributable to bodily injury, sickness, disease or death, or to injury or destruction of tangible property (other than the Work itself), but only if the claim, damage, loss or expense is caused by, connected with, arising out of or resulting from an act or omission of the Subcontractor, the Subcontractor's sub-subcontractors, anyone directly or indirectly employed by any of them or anyone for whose acts they may be liable.

The Subcontractor shall not be required by this agreement to indemnify a party for that portion of any loss that is directly attributable to the negligence of the party to whom indemnification is owed, except to the extent such indemnification is permitted by law. Such obligation shall not be construed to negate, abridge, or otherwise reduce any other right or obligation of indemnity which would otherwise exist as to any party or person described in this clause.

To the fullest extent permitted by law, the Subcontractor agrees to assume the defense of the Owner, CONSTRUCTION MANAGER the Architect, Consultants, and the agents and employees of any of them, in any claim, proceeding, lawsuit, and/or litigation arising out of any accident, incident, or occurrence that is caused by, connected with, arising out of, or resulting from the performance of the Subcontractor's work under this contract.

The Subcontractor agrees that the obligation to defend commences when a claim is made against the Owner, CONSTRUCTION MANAGER, Architect, Consultants, and/or the agents and employees of any of them, even if the Subcontractor disputes its obligation to indemnify and hold harmless. The party being defended shall have the right to choose its own counsel. The Subcontractor agrees to pay for defense of the Owner, CONSTRUCTION MANAGER, Architects, Consultants, and the agents and employees of any of them with counsel chosen by the party to be defended, upon demand.

The Subcontractor agrees to be bound to CONSTRUCTION MANAGER by the terms and conditions of CONSTRUCTION MANAGER's agreement with the Owner, a copy of said agreement being available for inspection at CONSTRUCTION MANAGER's office. The Subcontractor further agrees that all conditions and requirements imposed, or to be imposed, upon CONSTRUCTION MANAGER by its contract with the owner shall be performed by the Subcontractor insofar as applicable to the work under the subcontract, and the Subcontractor hereby assumes toward CONSTRUCTION MANAGER all obligations and responsibilities that CONSTRUCTION MANAGER, by contract, has assumed or will assume toward the owner with respect to said work.

To the fullest extent permitted by law, the Subcontractor shall reimburse the Owner and CONSTRUCTION MANAGER and the agents and employees of either of them, and any other party CONSTRUCTION MANAGER is contractually required to indemnify, for any costs or expenses, including but not limited to attorney's fees, expended in seeking the Subcontractor's compliance with the above stated duties to defend, indemnify and hold harmless.

The Subcontractor's indemnity, hold harmless, and defense obligations set forth in this agreement shall cover the claim while this contract is in force, shall extend to such claims occurring after this agreement expires or is otherwise terminated, and shall continue until such claim is adjudicated and any and all actions against the Owner and CONSTRUCTION MANAGER and the agents and employees of either of them are settled, terminated, dismissed or concluded.

§ 12.1.2 Coverages, whether written on an occurrence or claims-made basis, shall be maintained without interruption from the date of commencement of the Subcontractor's Work until the date of final payment and termination of any coverage required to be maintained after final payment to the Subcontractor, and, with respect to the Subcontractor's completed operations coverage, until the expiration of the period for correction of Work or for such other period for maintenance of completed operations coverage as specified in the Prime Contract.

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§ 12.1.3 If professional services are required under Section 4.9, the Subcontractor shall provide the professional liability insurance coverage required under this Section 12.1 for the following period after completion of the Work:

In accordance with contract documents and supplemental instructions.

Professional liability at least $1,000,000 each occurrence limit

a) Downes, et al. shall be included as additional insured on a primary and noncontributory basis.
b) Subcontractor is responsible for any self-insured retention / deductibles, including all claim handling and legal expenses
c) Downes, et al. shall be indemnified for loss and defense.

Include for (3) years from Date of Substantial Completion.

§ 12.1.4 Certificates of Insurance. The Subcontractor shall provide certificates of insurance acceptable to the Contractor evidencing compliance with the requirements in this Article 12 at the following times: (1) prior to commencement of the Subcontractor's Work; (2) upon renewal or replacement of each required policy of insurance; and (3) upon the Contractor's written request. An additional certificate evidencing continuation of liability coverage, including coverage for completed operations, shall be submitted with the final Application for Payment and thereafter upon renewal or replacement of such coverage until the expiration of the time required in this Article 12. The certificates shall show the Contractor and the Owner as additional insureds on the Subcontractor's Commercial General Liability and any excess or umbrella liability policy**.**

§ 12.1.5 Deductibles and Self-Insured Retentions. The Subcontractor shall disclose to the Contractor any deductible or self-insured retentions applicable to any insurance required to be provided by the Subcontractor**.**

§ 12.1.6 Additional Insured Obligations. To the fullest extent permitted by law, the Subcontractor shall cause its commercial general liability coverage to include: (1) the Contractor, the Owner, the Architect, and the Architect's consultants as additional insureds for claims caused in whole or in part by the Subcontractor's negligent acts or omissions during the Subcontractor's operations; and (2) the Contractor and Owner as additional insureds for claims caused in whole or in part by the Subcontractor's negligent acts or omissions for which loss occurs during the Subcontractor's completed operations. The additional insured coverage shall be primary and non-contributory to any of the Contractor's and Owner's general liability insurance policies and shall apply to both ongoing and completed operations. To the extent commercially available, the additional insured coverage shall be no less than that provided by Insurance Services Office, Inc. (ISO) CG 20 10 07 04, CG 20 37 07 04, and, with respect to the Architect and the Architect's consultants, CG 20 32 07 04**.**

§ 12.1.7 Notice of Cancellation or Change in Coverage. Within three (3) business days of the date the Subcontractor becomes aware of an impending or actual cancellation or expiration of any insurance required by the Subcontract Documents, the Subcontractor shall provide notice to the Contractor of such impending or actual cancellation or expiration. Upon receipt of notice from the Subcontractor, the Contractor shall, unless the lapse in coverage arises from an act or omission of the Contractor, have the right to suspend the Work in accordance with this Agreement until the lapse in coverage has been cured by the procurement of replacement coverage by the Subcontractor. The furnishing of notice by the Subcontractor shall not relieve the Subcontractor of any contractual obligation to provide any required coverage**.**

§ 12.2 Subcontractor's Required Performance Bond and Payment Bond

§ 12.2.1 The Subcontractor shall provide surety bonds, from a company or companies lawfully authorized to issue surety bonds in the jurisdiction where the Project is located, as follows:
(Specify type and penal sum of bonds.)

Performance and Payment Bonds

This Subcontractor shall furnish CONSTRUCTION MANAGER with 100% Performance and Labor and Material Payment bonds, in the amount of 100% of the Contract amount with a "dual Obligee" Rider. Contract and Owner shall be dual obligees. Surety companies providing performance and payment bond(s) must be licensed to do business in Connecticut and be approved as sureties on Government contract pursuant to U.S. Treasury Circular No. 570, published annually in the Federal Register. All Performance Bonds, and Labor and Material Payment Bonds submitted to CONSTRUCTION MANAGER must use a Subcontractor Performance Bond Form A, or an approved alternative thereof. Bonds should not be submitted on an AIA Document A311 or A312. The costs of said bonds are included in the Contract Sum.

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State Sales Tax Bond
Non Resident Contractor Bonds and Deposits
In accordance with Connecticut Statutes Section §12-430(7)c, the names of nonresident (out of state) Contractors are required to be reported to the State of Connecticut, Department of Revenue Services (DRS) to ensure that all applicable business taxes are being paid by Subcontractor. Subcontractor must, prior to execution of this Subcontract, furnish proof of its current status as a "verified contractor" with DRS.

An "unverified Contractor" with DRS must file a surety bond with DRS in an amount equal to 5% of the contract price. DRS has issued form AU-964, Surety Bond and Release, which must be used to post that bond.

Upon submission of the bond to DRS, the Subcontractor must promptly furnish to Contractor a copy of the Certificate of Compliance issued by the DRS. If the nonresident contractor fails to submit the bond to DRS and to provide to Contractor Certificate of Compliance, Contractor is required to withhold 5% of the total contract value and deposit it with DRS.

Performance Labor & Material	**100% of Subcontract Sum**	**on the contract date**	**Bond Form A**
Payment	**100% of Subcontract Sum**	**on the contract date**	**Bond Form A**

Payment and Performance Bonds shall be on forms approved by and satisfactory to Contractor.

§ 12.2.2 Upon the request of any person or entity appearing to be a potential beneficiary of bonds covering payment of obligations under this Agreement, the Subcontractor shall promptly furnish a copy of the bonds or shall permit a copy to be made.

§ 12.3 Contractor's Insurance and Bond Obligations
§ 12.3.1 The Contractor shall furnish to the Subcontractor certificates of insurance evidencing insurance coverage required of the Contractor under the Prime Contract.

§ 12.3.2 The Contractor shall promptly, upon request of the Subcontractor, furnish a copy or permit a copy to be made of any bond covering payment of obligations arising under the Subcontract.

§ 12.4 Property Insurance
§ 12.4.1 When requested in writing, the Contractor shall provide the Subcontractor with copies of the property and equipment policies in effect for the Project, to the extent copies of the policies are available to the Contractor. The Contractor shall notify the Subcontractor if the required property insurance policies are not in effect.

§ 12.4.2 If the required property insurance is not in effect for the full value of the Subcontractor's Work, then the Subcontractor shall purchase insurance for the value of the Subcontractor's Work, and the Subcontractor shall be reimbursed for the cost of the insurance by an adjustment in the Subcontract Sum.

§ 12.4.3 Property insurance for the Subcontractor's materials and equipment required for the Subcontractor's Work, stored off site or in transit and not covered by the Project property insurance, shall be paid for through the Application for Payment process.

§ 12.5 Waivers of Subrogation
The Contractor and Subcontractor waive all rights against (1) each other and any of their subcontractors, sub-subcontractors, agents, and employees, each of the other, and (2) the Owner, the Architect, the Architect's consultants, and (3) Separate Contractors, if any, and any of their subcontractors, sub-subcontractors, agents, and employees for damages caused by fire or other causes of loss to the extent those losses are covered by property insurance provided under the Prime Contract or other property insurance applicable to the Work or to property at or adjacent to the Project site, except such rights as they may have to proceeds of such insurance held by the Owner as a fiduciary. The Subcontractor shall require similar written waivers in favor of the individuals and entities

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enumerated herein from the Subcontractor's Sub-subcontractors, agents, and employees. The policies of insurance purchased and maintained by each person or entity agreeing to waive claims pursuant to this Section 12.5 shall not prohibit this waiver of subrogation, which shall be effective as to a person or entity (1) even though that person or entity would otherwise have a duty of indemnification, contractual or otherwise, (2) even though that person or entity did not pay the insurance premium directly or indirectly, or (3) whether or not the person or entity had an insurable interest in the property damaged.

ARTICLE 13 TEMPORARY FACILITIES, SERVICES, EQUIPMENT AND WORKING CONDITIONS

§ 13.1 The Contractor shall furnish and make the Contractor's temporary facilities and services available to the Subcontractor at no cost, except as noted below:

In accordance with the Contract Documents and Supplemental Instructions.

§ 13.2 The Contractor's equipment will be available to the Subcontractor only at the Contractor's discretion and on mutually satisfactory terms, except as noted below:

In accordance with the Contract Documents and Supplemental Instructions.

§ 13.3 Specific working conditions as noted below:
(Insert any specific arrangements or requirements concerning working conditions and labor matters applicable to the Subcontractor's Work.)

In accordance with the Contract Documents and Supplemental Instructions.

ARTICLE 14 MISCELLANEOUS PROVISIONS

§ 14.1 Where reference is made in this Subcontract to a provision of another Subcontract Document, the reference refers to that provision as amended or supplemented by other provisions of the Subcontract Documents.

§ 14.2 The Contractor's representative:
(Name, address, email address and other information)

Joseph Ryan
Downes Construction Company, LLC
200 Stanley Street
New Britain, CT 06051
jryan@downesco.com

§ 14.3 The Subcontractor's representative:
(Name, address, email address and other information)

Joe Somebody
ABC Construction
123 Street Road
Anywhere, CT 06000

§ 14.4 Notice

§ 14.4.1 Except as otherwise provided in Section 14.4.2, where the Subcontract Documents require one party to notify or give notice to the other party, such notice shall be provided in writing to the designated representative of the party to whom the notice is addressed and shall be deemed to have been duly served if delivered in person, by mail, by courier, or by electronic transmission if a method for electronic notice is set forth in Section 14.4.3.

§ 14.4.2 Notice of Claims shall be provided in writing, consistent with the time limits set forth herein and in 15.1.2 of the General Conditions to the Prime Contract, and shall be deemed to have been duly served only if delivered to the designated representative of the party to whom the notice is addressed by certified or registered mail, or by courier providing proof of delivery.

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§ 14.4.3 Notice in electronic format, pursuant to Section 14.4.1, may be given in accordance with AIA Document E203™–-2013, Building Information Modeling and Digital Data Exhibit, if completed, or as otherwise set forth below:
(If other than in accordance with AIA Document E203™–-2013, insert requirements for delivering notice in electronic format such as name, title, and email address of the recipient and whether and how the system will be required to generate a read receipt for the transmission.)

N/A

§ 14.5 Neither the Contractor's nor the Subcontractor's representative shall be changed without ten days' prior notice to the other party.

§ 14.6 The invalidity of any provision of the Subcontract Documents shall not invalidate the Subcontract or its remaining provisions. If it is determined that any provision of the Subcontract violates any law or is otherwise invalid or unenforceable, then that provision shall be revised to the extent necessary to make that provision legal and enforceable. In such case, the Subcontract shall be construed, to the fullest extent permitted by law, to give effect to the parties' intentions and purposes in executing the Subcontract.

§ 14.7 The parties shall agree upon protocols governing the transmission and use of Instruments of Service or any other information or documentation in digital form. The parties will use AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, to establish the protocols for the development, use, transmission, and exchange of digital data.

§ 14.7.1 Any use of, or reliance on, all or a portion of a building information model without agreement to protocols governing the use of, and reliance on, the information contained in the model and without having those protocols set forth in AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, and the requisite AIA Document G202™–2013, Project Building Information Modeling Protocol Form, shall be at the using or relying party's sole risk and without liability to the other party and its contractors or consultants, the authors of, or contributors to, the building information model, and each of their agents and employees.

§ 14.8 Retainage and any reduction thereto are as follows:

In accordance with the Owner's requirements, initial retainage will be in the amount of SEVEN Percent (7%). Once satisfactory proof of compliance with applicable CHRO requirements has been furnished and verified, retainage shall be 5% of each progress payment.

§ 14.9 As required by statute, regulation or other applicable law, Subcontractor shall monitor and track MBE and WBE, local workforce and overall labor participation, including Set Aside documentation. If this Project is funded in whole or in part by funds from the State of Connecticut, Public Act 15-5 (§§58-71 and 88) requires that, effective with all contracts executed after October 1, 2015, all solicitations for municipal public works contracts funded in whole or in part with State funds state in the notice of solicitation that the contract must comply with the set asides mandated by Public Act 15-5. The set aside requirements include a requirement that 25% of the total value of contracts in excess of $50,000.00 be set aside for exclusive bidding for "small contractors," as defined by Section 58 (a) (1), and 25% of such amount (that is, 6.25% of the total value), be set aside for "minority business enterprises," as defined by Section 58(a) (4). For contracts in excess of $50,000.00, Subcontractor must have obtained Commission approval of their Affirmative Action Plan prior to contract execution. Subcontractor is expressly directed to review Public act 15-5, sections 58-71 and 88, to familiarize itself with the requirements of such laws. The Contractor also directs Subcontractor's' attention to sections 63 and 64 (non-discrimination requirements) and 66-68 (affirmative action requirements).

§14.10 Non-Discrimination and Affirmative Action Provisions
The Subcontractor agrees and warrants that in the performance of the Contract such Subcontractor will not discriminate or permit discrimination against any person or group of persons on the grounds of race, color, religious creed, age, marital status, national origin, ancestry, sex, gender identity or expression, sexual orientation, intellectual disability, mental disability or physical disability, including, but not limited to, blindness, unless it is shown by such Subcontractor that such disability prevents performance of the work involved, in any manner prohibited by the laws of the United States or of the state of Connecticut. The Subcontractor further agrees to take affirmative action

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to insure that applicants with job-related qualifications are employed and that employees are treated when employed without regard to of race, color, religious creed, age, marital status, national origin, ancestry, sex, gender identity or expression, intellectual disability, mental disability or physical disability, including, but not limited to, blindness, unless it is shown by such Subcontractor that such disability prevents performance of the work involved; (2) the Subcontractor agrees, in all solicitations or advertisements for employees placed by or on behalf of the Subcontractor, to state that it is an ."affirmative action-equal opportunity employer" in accordance with regulations adopted by the commission; (3) the Subcontractor agrees to provide each labor union or representative of workers with which such Subcontractor has a collective bargaining agreement or other contract or understanding and each vendor with which such Subcontractor has a contract or understanding, a notice to be provided by the commission advising the labor union or workers' representative of the Subcontractor's commitments under this section, and to post copies of the notice in conspicuous places available to employees and applicants for employment; (4) the Subcontractor agrees to comply with each provision of this section and sections 46a-68e and 46a-68f and with each regulation or relevant order issued by said commission pursuant to sections 46a-56, 46a-68e,46a-68f and 46a-86; (5) the Subcontractor agrees to provide the Commission on Human Rights and Opportunities with such information requested by the commission, and permit access to pertinent books, records and accounts, concerning the employment practices and procedures of the Subcontractor as relate to the provisions of this section and section 46a-56.

Any Subcontractor who is a party to a municipal public works contract or quasi-public agency project, where any such contract is valued at less than $50,000 for each year of the contract, shall provide the Commission on Human Rights and Opportunities with a written or electronic representation that complies with the nondiscrimination agreement and warranty under subsection (A)(1) above, provided if there is any change in such representation, the Subcontractor shall provide the updated representation to the Commission not later than 30 days after such change. Any Subcontractor who is a party to a municipal public works contract or a quasi-public agency project, where any such contract is valued at $50,000 or more for any year of the contract, shall provide the Commission with any one of the following: (1) Documentation in the form of a company or corporate police adopted by resolution of the board of directors, shareholder, managers, members or other governing body of such Subcontractor that complies with the nondiscrimination agreement and warranty under subsection (A)(1) of this section; (2) Documentation in the form of a company or corporate policy adopted by a prior resolution of the board of directors, shareholders, managers, members or other governing body of such Subcontractor if (a) the prior resolution is certified by a duly authorized corporate officer of such contractor to be in effect on the date the documentation is submitted, and the executive director of the Commission on Human Rights and Opportunities or designee certifies that the prior resolution complies with the nondiscrimination agreement and warranty under subdivision (A)(1) of this section; or (3) Documentation in the form of an affidavit signed under penalty of false statement by a chief executive officer, president, chairperson or other corporate officer duly authorized to adopt company or corporate policy that certifies that the company or corporate policy of the contractor complies with the nondiscrimination agreement and warranty under subdivision (A)(1) of this section and is in effect on the date the affidavit is signed..

The Prime Contract is a municipal public works contract or a quasi-public agency project. Accordingly, the Subcontractor agrees and warrants that s/he/it will make good faith efforts to employ minority business enterprises as subcontractors and suppliers of materials on such public works project. The Subcontractor shall include the provisions of subdivision (A)(1) of this section in every subcontract or purchase order entered into to fulfill any obligation of a municipal public works contract or contract for a quasi-public agency project, and such provisions shall be binding on a subcontractor, vendor or manufacturer, unless exempted by regulations or orders of the Commission on Human Rights and Opportunities. The Subcontractor shall take such action with respect to any such subcontract or purchase order as the Commission may direct as a means of enforcing such provisions, including sanctions for noncompliance in accordance with section 46a-56; provided, if such Subcontractor becomes involved in, or is threatened with, litigation with a subcontractor or vendor as a result of such direction by the Commission regarding a state contract, the contractor may request the state of Connecticut to enter into any such litigation or negotiation prior thereto to protect the interests of the state and the state may so enter.

"Minority business enterprise" means any small contractor or supplier of materials fifty-one per cent or more of the capital stock, if any, or assets of which is owned by a person or persons: (1) Who are active in the daily affairs of the enterprise, (2) who have the power to direct the management and policies of the enterprise and (3) who are members of a minority, as such term is defined in subsection (a) of section 32-9n; and "good faith" means that degree of diligence which a reasonable person would exercise in the performance of legal duties

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and obligations. "Good faith efforts" shall include, but not be limited to, those reasonable initial efforts necessary to comply with statutory or regulatory requirements and additional or substituted efforts when it is determined that such initial efforts will not be sufficient to comply with such requirements. Determination of the Subcontractor's good faith efforts shall include, but shall not be eliminated to, the following factors: The Subcontractor's employment and subcontracting policies, patterns and practices; affirmative advertising recruitment and training; technical assistance activities and such other reasonable activities or efforts as the Commission on Human Rights and Opportunities may prescribe that are designed to ensure the participation of minority business enterprises in municipal public works contracts or quasi-public agency projects. "Municipal public works project" means that portion of an agreement entered into on or after October 1, 2015, between any individual, form or corporation and a municipality for the construction, rehabilitation, conversion, extension, demolition or repair of a public building, highway or other changes or improvements in real property, which is financed in whole or in part by the state, including, but not limited to, matching expenditures, grants, loans, insurance or guarantees but excluding any project of an alliance district, as defined in section 10-262u, finance by the state funding in an amount equal to fifty thousand dollars or less. "Quasi-public agency project" means the construction, rehabilitation, conversion, extension, demolition or repair of a building or other changes or improvements in real property pursuant to a contract entered into on or after October 1, 2015, which is financed in whole or in part by a quasi-public agency using state funds, including, but not limited to, matching expenditures, grants, loans, insurance or guarantees.

§ 14.11 The Subcontractor who is selected to perform this State funded project must comply with CONN. GEN. STAT. §§ 4a-60, 4a-60a, 4a-60g, and 46a-68b through 46a-68f, inclusive, as amended by June 2015 Special Session Public Act 15-5. An Affirmative Action Plan must be filed with and approved by the Commission on Human Rights and Opportunities prior to the commencement of construction. State law requires a minimum of twenty-five (25%) percent of the state-funded portion of the contract for award to subcontractors holding current certification from the Connecticut Department of Administrative Services ("DAS") under the provisions of CONN. GEN. STAT. § 4a-60g, as amended. (25% of the work with DAS certified Small and Minority owned businesses and 25% of that work with DAS certified Minority, Women and/or Disabled owned businesses.) The contractor must demonstrate good faith effort to meet the 25% set-aside goals. For municipal public works contracts and quasi-public agency projects, the contractor must file a written or electronic non-discrimination certification with the Commission on Human Rights and Opportunities. Forms can be found at: http://www.ct.gov/opm/cwp/view.asp?a=2982&q=390928&opmNav_GID=1806.

§ 14.12 The Subcontractor is responsible for all the CT DAS Office of Grants Administration (OGA) requirements to ensure full reimbursement of change orders to the Owner. This Subcontractor is responsible to reimburse to the Owner any lost reimbursement of change order monies, as a result of this Subcontractor's failure to be in compliance with all OGA requirements.

§ 14.13 Each Subcontractor and all their lower tier subcontractors are responsible to review, sign and adhere to the requirements of the Project Labor Agreement (PLA) governing this project. ALL Subcontractors and their subcontractors must sign the Letter of Assent (LOA), as a requirement of the Contract. This Subcontractor is required to coordinate with the Local Unions and the proper trades are to be utilized for ALL work required on this project.

§ 14.14 EEO/LOCAL EMPLOYMENT GOALS – Each Subcontractor will responsible to document a "Good Faith Effort" to employ a participating workforce comprised of:

- Twenty percent (20%) Town of Greenwich Residents
- Ten percent (10%) minority workers
- Five percent (5%) female workers
- Five percent (5%) veteran workers

Refer to the Project Labor Agreement and the Downes Implementation Plan provided for additional information and requirements.

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ARTICLE 15 ENUMERATION OF SUBCONTRACT DOCUMENTS

§ 15.1 This Agreement is comprised of the following documents:

.1 AIA Document A401™–2017, Standard Form Agreement Between Contractor and Subcontractor;

.2 Prime Agreement between the Owner and Contractor (and the General Conditions thereto), including all exhibits thereto, attached as Exhibit A (made available to Subcontractor prior to execution hereof);

.3 AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, if not included in the Prime Agreement, dated as indicated below:
(Insert the date of the E203–2013 incorporated into this Agreement.)

« »

.4 Other Exhibits incorporated into this Agreement:
(Clearly identify any other exhibits incorporated into this Agreement.)

a. Attachment A – Sample Insurance Certificate Accord
b. Attachment B – Project Construction Schedule XX-XX-2024
c. Attachment C - Bid Form – XXXXXXX.; dated X-XX-2024
d. Attachment D - Bid Package X.X – XXXXXX of Work and Audio Recording

.5 Other documents:
(List other documents, if any, forming part of the Agreement.)

a. All AIA Document A133-2009 Exhibit A, Guaranteed Maximum Price Amendments and all its attachments;
b. Downes Construction Quality Assurance and Quality Control Program
c. Downes Construction Safety and Resource Protection Plan;
d. Downes Construction Scaffold Use Program
e. Addenda #01 dated November XX, 2024;

This Agreement entered into as of the day and year first written above.

CONTRACTOR *(Signature)*	**SUBCONTRACTOR** *(Signature)*
Thomas Romagnoli, Vice President of Operations«	« »« »
(Printed name and title)	*(Printed name and title)*

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AIA® Document A133® – 2019

Standard Form of Agreement Between Owner and Construction Manager as **Constructor** *where the basis of payment is the Cost of the Work Plus a Fee with a Guaranteed Maximum Price*

AGREEMENT made as of the 22nd day of September in the year 2023
(In words, indicate day, month, and year.)

BETWEEN the Owner:
(Name, legal status, address, and other information)

Board of Education of the Town of Greenwich,
acting by and through the Old Greenwich School Building Committee
Havemeyer Building
290 Greenwich Avenue
Greenwich, CT 06830

and the Construction Manager:
(Name, legal status, address, and other information)

Downes Construction Company, LLC
200 Stanley Street
New Britain, CT 06051

for the following Project:
(Name, location, and detailed description)

Renovations and Addition to Old Greenwich School Project
285 Sound Beach Road
Old Greenwich, CT 06870

The Architect:
(Name, legal status, address, and other information)

Silver Petrucelli & Associates, Inc.
3190 Whitney Avenue
Hamden, CT 06518

The Owner and Construction Manager agree as follows:

The only part of the Work authorized by the Owner at the time of the execution of this Agreement is the Work to be performed for Preconstruction Services described in the RFP, Section 3.1 of this Agreement and elsewhere in the Contract Documents. Unless and until the Owner provides the Construction Manager with a written notice to proceed with the Work for the Bidding and Procurement Phase described in the RFP and elsewhere in the Contract Documents, the Construction Manager shall not proceed with any such Work. Unless and until the Owner provides the Construction Manager with a written notice to proceed with the Work for the Construction and Closeout Phase described in the RFP and elsewhere in the Contract Documents, the Construction Manager shall not proceed with any such Work. Any Work performed by or on behalf of the Construction Manager without such written authorization to proceed shall be performed at the sole cost and expense of the Construction Manager without any right to reimbursement from the Owner.

ADDITIONS AND DELETIONS:
The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes added information as well as revisions to the standard form text is available from the author and should be reviewed. A vertical line in the left margin of this document indicates where the author has added necessary information and where the author has added to or deleted from the original AIA text.

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

AIA Document A201™–2017, General Conditions of the Contract for Construction, is adopted in this document by reference. Do not use with other general conditions unless this document is modified.

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ARTICLE 1 INITIAL INFORMATION

§ 1.1 This Agreement is based on the Initial Information set forth in this Section 1.1.
(For each item in this section, insert the information or a statement such as "not applicable" or "unknown at time of execution.")

§ 1.1.1 The Owner's program for the Project, as described in Section 4.1.1:
(Insert the Owner's program, identify documentation that establishes the Owner's program, or state the manner in which the program will be developed.)

See Educational Specifications for the Old Greenwich School dated December 16, 2020 and attached hereto as Attachment 1.

§ 1.1.2 The Project's physical characteristics:
(Identify or describe pertinent information about the Project's physical characteristics, such as size; location; dimensions; geotechnical reports; site boundaries; topographic surveys; traffic and utility studies; availability of public and private utilities and services; legal description of the site, etc.)

See Attachment B, Owner's Request for Proposal for Construction Management Services (hereinafter "RFP 2408-23" or "RFP") dated February 23, 2023.

§ 1.1.3 The Owner's budget for the Guaranteed Maximum Price, as defined in Article 6:
(Provide total and, if known, a line item breakdown.)

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TBD

§ 1.1.4 The Owner's anticipated design and construction milestone dates:

.1 Design phase milestone dates, if any:

As described in the RFP

.2 Construction commencement date:

As described in the RFP

.3 Substantial Completion date or dates:

As described in the RFP

.4 Other milestone dates:

§ 1.1.5 The Owner's requirements for accelerated or fast-track scheduling, or phased construction, are set forth below:
(Identify any requirements for fast-track scheduling or phased construction.)

As described in the RFP

§ 1.1.6 The Owner's anticipated Sustainable Objective for the Project:
(Identify and describe the Owner's Sustainable Objective for the Project, if any.)

TBD

§ 1.1.6.1 If the Owner identifies a Sustainable Objective, the Owner and Construction Manager shall complete and incorporate AIA Document E234™–2019, Sustainable Projects Exhibit, Construction Manager as Constructor Edition, into this Agreement to define the terms, conditions and services related to the Owner's Sustainable Objective. If E234–2019 is incorporated into this agreement, the Owner and Construction Manager shall incorporate the completed E234–2019 into the agreements with the consultants and contractors performing services or Work in any way associated with the Sustainable Objective.

§ 1.1.7 Other Project information:
(Identify special characteristics or needs of the Project not provided elsewhere.)

§ 1.1.8 The Owner identifies the following representative in accordance with Section 4.2:
(List name, address, and other contact information.)

James Waters
Chair, Old Greenwich School Building Committee
Address: Havemeyer Building, 290 Greenwich Avenue, Greenwich, CT 06830
Tel: 703-528-1930
Email: james.waters.ogsbc@gmail.com

§ 1.1.9 The persons or entities, in addition to the Owner's representative, who are required to review the Construction Manager's submittals to the Owner are as follows:
(List name, address and other contact information.)

Ghassan Antonios

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The Morganti Group, Inc.
100 Reserve Road, Suite D 210
Danbury, CT 06810
Tel: Work: 203-830-3307, Cell: 203-241-6839
Email: GAntonios@morganti.com

§ 1.1.10 The Owner shall retain the following consultants and contractors: TBD
(List name, legal status, address, and other contact information.)

.1 Geotechnical Engineer:

.2 Civil Engineer:

.3 Other, if any:
(List any other consultants retained by the Owner, such as a Project or Program Manager.)

§ 1.1.11 The Architect's representative:
(List name, address, and other contact information.)

David Stein
Silver Petrucelli & Associates, Inc.
3190 Whitney Avenue
Hamden, CT 06518
Tel: Work: 203-230-9001 x201, Cell: 203-605-1930
Email: dstein@silverpetrucelli.c

§ 1.1.12 The Construction Manager identifies the following representative in accordance with Article 3:
(List name, address, and other contact information.)

Jeff Anderson
Vice President
Downes Construction Company, LLC
200 Stanley Street
New Britain, CT 06051
Tel.: Work: 860-229-3755 x217, Cell: 860-209-1805

§ 1.1.13 The Owner's requirements for the Construction Manager's staffing plan for Preconstruction Services, as required under Section 3.1.9:
(List any Owner-specific requirements to be included in the staffing plan.)

§ 1.1.14 The Owner's requirements for subcontractor procurement for the performance of the Work:

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(List any Owner-specific requirements for subcontractor procurement.)

See Article 9

§ 1.1.15 Other Initial Information on which this Agreement is based:

Downes Construction Company's Proposal dated March 23, 2023 in response to RFP 2408-23 but only to the extent that such proposal is not inconsistent or in conflict with the terms and conditions of any other Contract Document.

§ 1.2 The Owner and Construction Manager may rely on the Initial Information. Both parties, however, recognize that such information may materially change, and, in that event, the Owner and the Construction Manager shall appropriately adjust the Project schedule, the Construction Manager's services, and the Construction Manager's compensation. The Owner shall adjust the Owner's budget for the Guaranteed Maximum Price and the Owner's anticipated design and construction milestones, as necessary, to accommodate material changes in the Initial Information.

§ 1.3 Neither the Owner's nor the Construction Manager's representative shall be changed without ten days' prior notice to the other party.

ARTICLE 2 GENERAL PROVISIONS

§ 2.1 The Contract Documents

The Contract Documents consist of this Agreement, AIA Document A201-2017, General Conditions of the Contract for Construction, as modified by the Owner ("General Conditions"). Supplementary and other Conditions identified in this Agreement, Drawings, Specifications, Addenda issued prior to execution of this Agreement, other documents listed in this Agreement, and Modifications issued after execution of this Agreement, all of which form the Contract and are as fully a part of the Contract as if attached to this Agreement or repeated herein. Upon the Owner's acceptance of the Construction Manager's Guaranteed Maximum Price proposal, the Contract Documents will also include the Guaranteed Maximum Price Amendment executed by the Owner and the Construction Manager and the documents described in Section 3.2.3 and identified in the Guaranteed Maximum Price Amendment and revisions prepared by the Architect and furnished by the Owner as described in Section 3.2.8. The Contract represents the entire and integrated agreement between the parties hereto and supersedes prior negotiations, representations or agreements, either written or oral. If anything in the other Contract Documents, other than a Modification, is inconsistent with this Agreement, this Agreement shall govern. An enumeration of the Contract Documents, other than a Modification, appears in Article 15.

§ 2.2 Relationship of the Parties

The Construction Manager accepts the relationship of trust and confidence established by this Agreement and covenants with the Owner to cooperate with the Owner and the Architect and exercise the Construction Manager's skill and judgment in furthering the interests of the Owner to furnish efficient construction administration, management services, and supervision; to furnish at all times an adequate supply of workers and materials; and to perform the Work in an expeditious and economical manner consistent with the Owner's interests, all of which shall be consistent with the Construction Manager's Standard of Care (as defined below). The Owner agrees to furnish or approve, in a timely manner, information required by the Construction Manager and to make payments to the Construction Manager in accordance with the requirements of the Contract Documents.

§ 2.2.1 Construction Manager's Standard of Care

The Construction Manager shall be responsible for the performance of the Work as an independent contractor and in a good and workmanlike manner (i) consistent with the Contract Documents; (ii) consistent with the instructions, guidance and direction of the Owner and Architect; (iii) consistent with the with the prevailing applicable professional or industry standards; (iv) consistent with sound practices; (v) as expeditiously as is consistent with such professional skill and care and the orderly progress of the Work and with the Contract Documents and the instructions, guidance and direction of the Owner and Architect; and (vi) in a manner that will not exceed the Guaranteed Maximum Price as set forth in the Contract (the standards of this Section 2.2.1 shall be referred to herein as the "Construction Manager's Standard of Care"). The Construction Manager shall exercise the Construction Manager's Standard of Care in performing all aspects of the Work. All references in the Contract Documents to the knowledge, inference, reliance, awareness, determination, belief, observation, recognition or discovery of the Construction Manager or reference to any similar term shall include the constructive knowledge, inference, reliance, awareness, determination, belief, observation, recognition attributed to the Construction Manager ("constructive knowledge"). Such constructive knowledge shall include the knowledge, inference,

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reliance, awareness, determination, belief, observation and recognition the Construction Manager would have obtained upon the exercise of the Construction Manager's Standard of Care.

§ 2.2.1.1 The Construction Manager shall be responsible for the performance of the Work in accordance with the Contract Documents, the Conditions (as hereafter defined) and Applicable Laws (as hereafter defined), and the Contractor shall obtain and post all necessary permits at the site. The term "Conditions" shall mean and include all applicable laws, rules, regulations, ordinances, codes, orders, guidelines, standards and conditions of funding imposed on the Work and/or Project by the Agencies, as defined hereinafter. The term "Applicable Laws" shall mean and include the Conditions and all applicable local, state and federal laws, statutes, ordinances, codes, building codes, rules, regulations, permits, and orders enacted, promulgated, issued or ordered by any governmental body or public or quasi-public authority having jurisdiction over the Work, the Construction Manager and/ or the site of the Project.

§ 2.2.1.2 The "Agencies" are the Connecticut Department of Administrative Services ("DAS"), the Office of School Construction Grants and Review ("OSCG&R") and all other governmental authorities having regulatory or administrative jurisdiction over the Work and/or the Project and all representatives or designees of the DAS and such other governmental authorities.

§ 2.2.1.3 Notwithstanding anything to the contrary in this Agreement, the Construction Manager shall attend such meetings and site-visits, and make such submissions, as are necessary to comply with Applicable Law.

§ 2.2.1.4 Any information obtained by the Construction Manager from the Owner or Architect may not be used, published, distributed, sold or divulged by the Construction Manager, its Subcontractors, or any Sub-subcontractors for such party's own purposes or for the benefit of any person, firm, corporation or other entity other than the Owner, without the prior written consent of the Owner. Any information obtained by the Construction Manager or its Subcontractors or any Sub-subcontractors that is designated by the Owner in accordance with Applicable Law as confidential shall not be disclosed to any other parties without the prior written consent of the Owner.

§ 2.3 General Conditions

§ 2.3.1 For the Preconstruction Phase, the General Conditions shall apply as follows: Section 1.5, Ownership and Use of Documents; Section 1.7, Digital Data Use and Transmission; Section 1.8, Building Information Model Use and Reliance; Section 2.2.4, Confidential Information; Section 3.12.10, Professional Services; Section 10.3, Hazardous Materials; Section 13.1, Governing Law. The term "Contractor" as used in the General Conditions shall mean the Construction Manager.

§ 2.3.2 For the Construction Phase, the General Conditions shall apply and be incorporated herein by reference. The term "Contractor" as used in the General Conditions shall mean the Construction Manager. Where reference is made in this Agreement to a provision of the General Conditions or any other AIA document or provision, the reference refers to that document or provision as amended by the Owner and, if applicable, any other party to such document, or as amended and supplemented by other provisions of the Contract Documents.

§ 2.4 Legal Requirements

§ 2.4.1 Without limiting the responsibility of the Construction Manager under other provisions of the Contract Documents, the Construction Manager shall conduct the Work in accordance with Applicable Laws which shall mean and include, without limitation that:

.1 Construction Manager will comply with the requirements of Connecticut Regulation Sections 16a-38k-1 through 9 (High Performance Building Requirements), including any waste stream management requirements to the extent such High Performance Building Requirements are specified in the Contract Documents;

.2 Construction Manager will provide Change Orders and supporting documents and other required documentation in the form required by the DAS and any other of the Agencies, including the OSCG&R;

.3 Construction Manager will comply with bidding requirements of Section 3.1.11 herein; and

.4 Construction Manager will maintain records and reports as required by the DAS and other Agencies, including the OSCG&R.

ARTICLE 3 CONSTRUCTION MANAGER'S RESPONSIBILITIES

The Construction Manager's Preconstruction Phase responsibilities are set forth in Sections 3.1 and 3.2, and in the applicable provisions of the General Conditions referenced in Section 2.3.1. The Construction Manager's Construction

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Phase responsibilities are set forth in Section 3.3. The Owner and Construction Manager may agree, in consultation with the Architect, for the Construction Phase to commence prior to completion of the Preconstruction Phase, in which case, subject to Construction Manager's receipt of written notice from then Owner to proceed with the Construction Phase, both phases will proceed concurrently. The Construction Manager shall identify a representative authorized to act on behalf of the Construction Manager with respect to the Project which designation shall be subject to the Owner's approval and which designation may not be changed without the Owner's prior approval.

§ 3.1 Preconstruction Phase

§ 3.1.1 Extent of Responsibility

The Construction Manager shall exercise the Construction Manager's Standard of Care in performing its Preconstruction Services. The Owner and Architect shall be entitled to rely on, and shall not be responsible for, the accuracy, completeness, and timeliness of services and information furnished by the Construction Manager. The Construction Manager, however, does not warrant or guarantee estimates and schedules except as may be included as part of the Guaranteed Maximum Price. The Construction Manager is not required to ascertain that the Drawings and Specifications are in accordance with applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of public authorities, but the Construction Manager shall promptly report to the Architect and Owner any nonconformity discovered by or made known to the Construction Manager as a request for information in such form as the Architect may require.

§ 3.1.2 The Construction Manager shall provide a preliminary evaluation of the Owner's program, schedule and construction budget requirements, each in terms of the other.

§ 3.1.3 Consultation

§ 3.1.3.1 The Construction Manager shall schedule and conduct meetings with the Architect and Owner to discuss such matters as procedures, progress, coordination, and scheduling of the Work.

§ 3.1.3.2 The Construction Manager shall advise the Owner and Architect on proposed site use and improvements, selection of materials, building systems, and equipment. The Construction Manager shall also provide recommendations to the Owner and Architect, consistent with the Project requirements, on constructability; availability of materials and labor; time requirements for procurement, installation and construction; prefabrication; and factors related to construction cost including, but not limited to, costs of alternative designs or materials, preliminary budgets, life-cycle data, and possible cost reductions. The Construction Manager shall consult with the Architect regarding professional services to be provided by the Construction Manager during the Construction Phase.

§ 3.1.3.3 The Construction Manager shall assist the Owner and Architect in establishing building information modeling and digital data protocols for the Project, using AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, to establish the protocols for the development, use, transmission, and exchange of digital data.

§ 3.1.4 Project Schedule

When Project requirements in Section 4.1.1 have been sufficiently identified, the Construction Manager shall prepare and periodically update a Project schedule for the Architect's review and the Owner's acceptance. The Construction Manager shall obtain the Architect's approval for the portion of the Project schedule relating to the performance of the Architect's services. The Project schedule shall coordinate and integrate the Construction Manager's services, the Architect's services, other Owner consultants' services, and the Owner's responsibilities; and identify items that affect the Project's timely completion. The updated Project schedule shall include the following: submission of the Guaranteed Maximum Price proposal; components of the Work; times of commencement and completion required of each Subcontractor; ordering and delivery of products, including those that must be ordered in advance of construction; and the occupancy requirements of the Owner.

§ 3.1.5 Phased Construction

The Construction Manager, in consultation with the Architect, shall provide recommendations with regard to accelerated or fast-track scheduling, procurement, and sequencing for phased construction as described in the RFP. The Construction Manager shall take into consideration cost reductions, cost information, constructability, provisions for temporary facilities, and procurement and construction scheduling issues.

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§ 3.1.6 Cost Estimates

§ 3.1.6.1 Based on the preliminary design and other design criteria prepared by the Architect, the Construction Manager shall prepare, for the Architect's review and the Owner's approval, preliminary estimates of the Cost of the Work or the cost of program requirements using area, volume, or similar conceptual estimating techniques. If the Architect or Construction Manager suggests alternative materials and systems, the Construction Manager shall provide cost evaluations of those alternative materials and systems.

§ 3.1.6.2 As the Architect progresses with the preparation of the Schematic Design, Design Development and Construction Documents, the Construction Manager shall prepare and update, at appropriate intervals agreed to by the Owner, Construction Manager and Architect, an estimate of the Cost of the Work with increasing detail and refinement. The Construction Manager shall include in the estimate those costs to allow for the further development of the design, price escalation, and market conditions, until such time as the Owner and Construction Manager agree on a Guaranteed Maximum Price for the Work. The estimate shall be provided for the Architect's review and the Owner's approval. The Construction Manager shall inform the Owner and Architect in the event that the estimate of the Cost of the Work exceeds the latest approved Project budget and make recommendations for corrective action.

§ 3.1.6.3 If the Architect is providing cost estimating services as a Supplemental Service, and a discrepancy exists between the Construction Manager's cost estimates and the Architect's cost estimates, the Construction Manager and the Architect shall work together to reconcile the cost estimates.

§ 3.1.7 As the Architect progresses with the preparation of the Schematic Design, Design Development and Construction Documents, the Construction Manager shall consult with the Owner and Architect and make recommendations regarding constructability and schedules, for the Architect's review and the Owner's approval.

§ 3.1.8 The Construction Manager shall provide recommendations and information to the Owner and Architect regarding equipment, materials, services, and temporary Project facilities.

§ 3.1.9 The Construction Manager shall provide a staffing plan for Preconstruction Phase services for the Owner's review and approval.

§ 3.1.10 If the Owner identified a Sustainable Objective in Article 1, the Construction Manager shall fulfill its Preconstruction Phase responsibilities as required in AIA Document E234™–2019, Sustainable Projects Exhibit, Construction Manager as Constructor Edition, attached to this Agreement.

§ 3.1.11 Bidding for Subcontractors and Suppliers

§ 3.1.11.1 Neither the Construction Manager, nor any subsidiary, parent, company, or other related party (as defined in Section 7.8.1 of this Agreement) of the Construction Manager may perform any part of the Work with its own forces.

§ 3.1.11.2 No element of the Work may be released for bidding prior to Construction Manager's receipt of the written notice from the Owner to proceed with bidding the Work. The Owner shall also Notices to proceed with respect to each sub-phase of the Preconstruction phase as described in the RFP.

§ 3.1.11.3 The Construction Manager shall be solely responsible for assuring that the procurement and award of Subcontracts for the Work are conducted in a manner consistent with Applicable Laws and the Contract Documents. Such responsibilities shall include, without limitation, compliance with the requirements of Connecticut General Statutes Sections 4b-91, 10-287(b)(1), 4a-100, 4a-60, et seq.; 4a-60a and 46a-68c, as applicable.

§ 3.1.11.3.1

(a) **Compliance with CGS §4a-60:**

(1) The Construction Manager agrees and warrants that in the performance of the Contract such Construction Manager will not discriminate or permit discrimination against any person or group of persons on the grounds of race, color, religious creed, age, marital status, national origin, ancestry, sex, gender identity or expression, intellectual disability, mental disability or physical disability, including, but not limited to, blindness, unless it is shown by such Construction Manager that such disability prevents performance of the work involved, in any manner prohibited by the laws of the United States or of the state of Connecticut; and the Construction Manager further agrees to take affirmative action to insure that applicants with job-related qualifications are employed and that employees are treated when employed without regard to their race, color, religious creed, age, marital status, national origin, ancestry, sex, gender identity or expression,

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intellectual disability, mental disability or physical disability, including, but not limited to, blindness, unless it is shown by such Construction Manager that such disability prevents performance of the work involved;

(2) The Construction Manager agrees, in all solicitations or advertisements for employees placed by or on behalf of the Construction Manager, to state that it is an "affirmative action-equal opportunity employer" in accordance with regulations adopted by the Commission on Human Rights and Opportunities;

(3) The Construction Manager agrees to provide each labor union or representative of workers with which such Construction Manager has a collective bargaining agreement or other contract or understanding and each vendor with which such Construction Manager has a contract or understanding, a notice to be provided by the Commission on Human Rights and Opportunities advising the labor union or workers' representative of the Construction Manager's commitments under this section, and to post copies of the notice in conspicuous places available to employees and applicants for employment;

(4) The Construction Manager agrees to comply with each provision of Connection General Statutes §4a-60 and Connecticut General Statutes sections 46a-68e and §46a-68f and with each regulation or relevant order issued by said commission pursuant to Connecticut General Statutes sections 46a-56, 46a-68e, 46a-68f and 46a-86; and

(5) The Construction Manager agrees to provide the Commission on Human Rights and Opportunities with such information requested by the commission, and permit access to pertinent books, records and accounts, concerning the employment practices and procedures of the Construction Manager as relate to the provisions of Connection General Statutes §4a-60 and Connection General Statutes § 46a-56.

(b) If this Contract is a public works contract, municipal public works contract or contract for a quasi-public agency project, the Construction Manager agrees and warrants that he or she will make good faith efforts to employ minority business enterprises as subcontractors and suppliers of materials on such public works or quasi-public agency project.

(c) The Construction Manager shall include the provisions of subsections (a) and (b) of this Section 3.1.11.3.1 in every subcontract or purchase order entered into in order to fulfill any obligation of a contract with the state, and in every subcontract entered into in order to fulfill any obligation of a municipal public works contract or contract for a quasi-public agency project, and such provisions shall be binding on a subcontractor, vendor or manufacturer, unless exempted by regulations or orders of the Commission on Human Rights and Opportunities. The Construction Manager shall take such action with respect to any such subcontract or purchase order as the commission may direct as a means of enforcing such provisions, including sanctions for noncompliance in accordance with Connecticut General Statutes § 46a-56; provided, if such Construction Manager becomes involved in, or is threatened with, litigation with a subcontractor or vendor as a result of such direction by the commission regarding a state contract, the Construction Manager may request the state of Connecticut to enter into any such litigation or negotiation prior thereto to protect the interests of the state and the state may so enter.

§ 3.1.11.3.2

(a) Compliance with Connecticut General Statutes §4a-60a:

(1) The Construction Manager agrees and warrants that in the performance of the Contract the Construction Manager will not discriminate or permit discrimination against any person or group of persons on the grounds of sexual orientation, in any manner prohibited by the laws of the United States or of the state of Connecticut, and that employees are treated when employed without regard to their sexual orientation;

(2) The Construction Manager agrees to provide each labor union or representative of workers with which such Construction Manager has a collective bargaining agreement or other contract or understanding and each vendor with which the Construction Manager has a contract or understanding, a notice to be provided by the Commission on Human Rights and Opportunities advising the labor union or workers' representative of the Construction Manager's commitments under Connecticut General Statutes §4a-60a, and to post copies of the notice in conspicuous places available to employees and applicants for employment;

(3) The Construction Manager agrees to comply with each provision of Connecticut General Statutes §4a-60a and with each regulation or relevant order issued by said Commission on Human Rights and Opportunities pursuant to Connecticut General Statutes§46a-56; and

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(4) The Construction Manager agrees to provide the Commission on Human Rights and Opportunities with such information requested by the commission, and permit access to pertinent books, records and accounts, concerning the employment practices and procedures of the Construction Manager which relate to the provisions of Connecticut General Statutes §4a-60a and Connecticut General Statutes §46a-56.

(b) The Construction Manager shall include the provisions of subsection (a) of this Section 3.1.11.3.2 in every subcontract or purchase order entered into in order to fulfill any obligation of a contract with the state, and in every subcontract entered into in order to fulfill any obligation of a municipal public works contractor contract for a quasi-public agency project, and such provisions shall be binding on a subcontractor, vendor or manufacturer unless exempted by regulations or orders of the Commission on Human Rights and Opportunities. The Construction Manager shall take such action with respect to any such subcontract or purchase order as the commission may direct as a means of enforcing such provisions, including sanctions for noncompliance in accordance with Connecticut General Statutes §46a-56: provided, if such Construction Manager becomes involved in, or is threatened with, litigation with a subcontractor or vendor as a result of such direction by the commission regarding a state contract, the Construction Manager may request the state of Connecticut to enter into any such litigation or negotiation prior thereto to protect the interests of the state and the state may so enter.

§ 3.1.11.4 This contract is subject to state set-aside and contract compliance requirements. The Construction Manager must comply with Connecticut General Statutes §§ 4a-60, 4a-60a, 4a-60g, and 46a-68b through 46a-68f, inclusive, as amended by June 2015 Special Session Public Act 15-5. An Affirmative Action Plan must be filed with and approved by the Commission on Human Rights and Opportunities prior to the commencement of construction. The Construction Manager shall be required to make good faith efforts to place a minimum of twenty-five (25%) percent of the subcontracts awarded by the Construction Manager with eligible contractors holding current certification from the Connecticut Department of Administrative Services ("DAS") under the provisions of Connecticut General Statutes § 4a-60g, as amended (25% of the work with DAS-certified Small and Minority owned business(s) and 25% of that work with DAS-certified Minority, Women and/or Disabled owned businesses).

§ 3.1.11.5 The Construction Manager shall develop bidders' interest in the Project and, with the assistance of the Architect, develop bid packages for the various components of the Work. The Construction Manager shall develop, for the review and approval by the Owner, the criteria which the Construction Manager will use to determine whether a bidder is responsible and qualified. The Construction Manager shall include all such criteria as approved by the Owner in the bid packages. To the extent permitted under Applicable Laws, the Construction Manager shall not be obligated hereunder to contract with an individual or entity with which the Construction Manager has a reasonable objection.

§ 3.1.11.6 The Construction Manager shall summarize the bids received for each component of the Work in a spreadsheet format, including all analysis and adjustments necessary to permit a meaningful comparison among the bidders. The Construction Manager shall also provide, as appropriate, information concerning each bidder's financial strength, past performance, and current workload, along with Construction Manager's recommendations for award.

§ 3.1.11.7 The Construction Manager shall award the Subcontract for each component of the Work to the lowest responsible qualified bidder for such component of the Work only after a public invitation to bid, which shall be advertised in a newspaper having circulation in the town in which construction is to take place and posted on the State Contracting Portal maintained by the State of Connecticut.

§ 3.1.11.8 To the extent that the terms and conditions of this Section 3.1.11 fail to comply with the requirements of Applicable Laws, the Construction Manager shall notify the Owner and unless otherwise instructed by the Owner, shall comply with the requirements of Applicable Laws.

§ 3.1.12 Procurement

The Construction Manager shall prepare, for the Architect's review and the Owner's acceptance, a procurement schedule for items that must be ordered in advance of construction. Such schedule will take into account any pre-bid approvals required under Connecticut General Statutes Sections § 10-291 and § 10-292. The Construction Manager shall expedite and coordinate the ordering and delivery of materials that must be ordered in advance of construction.

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§ 3.1.13 Compliance with Laws

The Construction Manager shall comply with Applicable Laws with regard to its performance under this Contract, and with equal employment opportunity programs, and other programs as may be required by governmental and quasi-governmental authorities for inclusion in the Contract Documents.

§ 3.1.13.1 In addition to the forgoing, and without limiting the generality thereof, the Construction Manager's responsibilities during the Preconstruction Phase shall include those set forth in the RFP as well as the following:

.1 Estimating: Verification of the validity of Owner's and Architect's budget assumptions. Provision of full detailed estimates at the standard milestones of the completion of Preliminary Concept Design, Schematic Design, Design Development and Bid Documents.

.2 Scheduling: Development of a detailed schedule that is tracked through the Preconstruction Phase to capture all of the anticipated work activities. Continue to use the schedule through the Construction Phase to ensure timely completion of the Work.

.3 Value Engineering: Working with design professionals, develop value engineering at the appropriate milestones of design. Manage the value engineering log as appropriate.

.4 Cost Trending: In addition to the milestone estimates, tracking of the budget as design documents are produced for review and approval. Maintain a cost trending log to document the significant scope changes from estimate to estimate.

.5 Constructability Review: Development of a listing of building systems that may have constructability or sequencing issues and inform the Architect of such potential problem design areas.

.6 Site Logistics Plan: Development of a graphic site logistics plan showing lay-down areas and access in and out of the building and Project site.

.7 Quality Plan: Develop a plan to describe how quality of the Work will be ensured in the execution of the design and communicated to the subcontractors.

.8 Safety Plan: Develop a project specific safety plan; and

.9 High Performance Building Standards. Advise on the relative costs and scheduling effects of various options, as designed by the Architect, for compliance with Connecticut General Statutes Section 16a-38k and Connecticut Regulations Sections 16a-38k-1 through 9 if applicable to the Project. The Construction Manager shall participate in any collaborative sessions held pursuant to Connecticut Regulations Section 16a-38k-3(b) and shall assist the Owner and Architect in developing any request for an exemption made pursuant to Connecticut Regulations Section 16a-38k-9.

§ 3.1.14 Other Preconstruction Services

Insert a description of any other Preconstruction Phase services to be provided by the Construction Manager, or reference an exhibit attached to this document

(Describe any other Preconstruction Phase services, such as providing cash flow projections, development of a project information management system, early selection or procurement of subcontractors, etc.)

As described in the RFP and in Article 5 below.

§ 3.2 Guaranteed Maximum Price Proposal

§ 3.2.1 At a time to be mutually agreed upon by the Owner and the Construction Manager and in consultation with the Architect, the Construction Manager shall prepare a Guaranteed Maximum Price proposal for the Owner's and Architect's review, and the Owner's acceptance. The Guaranteed Maximum Price in the proposal shall be the sum of the Construction Manager's estimate of the Cost of the Work, the Construction Contingency (as defined below) and the Construction Manager's Fee (as defined below)

§ 3.2.1.1 Construction Contingency

.1 The "Construction Contingency" is an amount available to reimburse the Construction Manager for unanticipated costs provided such costs are of the type included in the definition of the Cost of the Work under Article 7 hereafter and which costs are not included in a Change Order pursuant to this Agreement. The Construction Manager shall be required to obtain the Owner's written permission in advance of incurring costs that the Construction Manager proposes be charged to the Construction Contingency. The Construction Manager's request for such consent shall be in writing and include an explanation of the reason such cost is to be incurred. The Construction Manager shall not be entitled to reimbursement of any such cost unless, prior to incurring such cost, the Owner provided such consent.

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.2 At final completion, One Hundred percent (100 %) of the unspent Construction Contingency shall inure to the benefit of the Owner.

.3 The amount of the Construction Contingency will be fixed as a component of the Guaranteed Maximum Price set forth in the Guaranteed Maximum Price Amendment after all Subcontracts have been awarded and will, under no circumstances, exceed 3% of the Cost of the Work reflected in the Guaranteed Maximum Price Amendment.

§ 3.2.2 To the extent that the Contract Documents are anticipated to require further development by the Architect, the Guaranteed Maximum Price includes the costs attributable to such further development consistent with the Contract Documents and reasonably inferable therefrom. Such further development does not include changes in scope, systems, kinds and quality of materials, finishes, or equipment, all of which, if required, shall be incorporated by Change Order or Construction Change Directive.

§ 3.2.3 The Construction Manager shall include with the Guaranteed Maximum Price proposal a written statement of its basis, which shall include the following:

.1 A list of the Drawings and Specifications, including all Addenda thereto, and the Conditions of the Contract;

.2 A list of the clarifications and assumptions made by the Construction Manager in the preparation of the Guaranteed Maximum Price proposal, including assumptions under Section 3.2.2;

.3 A statement of the proposed Guaranteed Maximum Price, including a statement of the estimated Cost of the Work organized by trade categories or systems, including allowances; the Construction Contingency; and the Construction Manager's Fee;

.4 The anticipated date of Substantial Completion upon which the proposed Guaranteed Maximum Price is based; and

.5 A period of time (of not less than forty-five (45) days after Construction Manager's submission of the Guaranteed Maximum Price proposal in accordance with the terms and conditions of this Agreement) during which such proposal may not be unilaterally modified or withdrawn by the Construction Manager (the "Proposal Period")..

§ 3.2.4 Intentionally Omitted.

§ 3.2.5 The Construction Manager shall meet with the Owner and Architect to review the Guaranteed Maximum Price proposal and the Project Schedule (as defined in Section 3.2.13.1 of this Agreement). In the event that the Owner and Architect discover any inconsistencies or inaccuracies in the information presented, they shall promptly notify the Construction Manager, who shall make appropriate adjustments to the Guaranteed Maximum Price proposal, its basis, or both, or to the Project Schedule. The risk of loss due to inconsistencies or inaccuracies in the Guaranteed Maximum Price and the Project Schedule and/or in the Guaranteed Maximum Price Amendment executed pursuant to Section 3.2.6, shall be the Construction Manager's, except to the extent any inconsistency or inaccuracy is due to the fault of the Owner or the Architect.

§ 3.2.6 If the Owner notifies the Construction Manager in writing prior to the end of the Proposal Period that the Owner has accepted the Construction Manager's Guaranteed Maximum Price proposal, the Guaranteed Maximum Price proposal shall be deemed effective without further acceptance from the Construction Manager. Following acceptance of a Guaranteed Maximum Price, the Owner and Construction Manager shall execute the Guaranteed Maximum Price Amendment amending this Agreement, a copy of which the Owner shall provide to the Architect. The Guaranteed Maximum Price Amendment shall set forth the agreed upon Guaranteed Maximum Price with the information and assumptions upon which it is based.

§ 3.2.7 The Construction Manager shall not incur any cost to be reimbursed as part of the Cost of the Work prior to the execution of the Guaranteed Maximum Price Amendment, unless the Owner provides prior written authorization for such costs. In executing this Agreement, the Construction Manager understands and agrees that the Owner reserves the right to determine at any time, in its sole discretion, whether any services beyond Preconstruction Services are to be provided by the Construction Manager. The commencement of any services by the Construction Manager beyond Preconstruction Services are dependent and expressly conditioned upon all necessary municipal approvals and the availability of funds sufficient to allocate to any such services. Accordingly, the Construction Manager shall not proceed with the performance of any services beyond Preconstruction Services without the express prior written consent of the Owner.

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§ 3.2.8 The Owner shall authorize the Architect to prepare revisions to the Contract Documents that incorporate the agreed-upon assumptions and clarifications contained in the Guaranteed Maximum Price Amendment. The Owner shall promptly furnish such revised Contract Documents to the Construction Manager. The Construction Manager shall notify the Owner and Architect of any inconsistencies between the agreed-upon assumptions and clarifications contained in the Guaranteed Maximum Price Amendment and the revised Contract Documents.

§ 3.2.9 The Construction Manager shall include in the Guaranteed Maximum Price all sales, consumer, use and similar taxes for the Work provided by the Construction Manager that are legally enacted, whether or not yet effective, at the time the Guaranteed Maximum Price Amendment is executed.

§ 3.2.10 If the Guaranteed Maximum Price proposal is unacceptable to the Owner, the Owner may, by written notice to the Construction Manager, terminate this Agreement and shall pay the Construction Manager the fee for Preconstruction Phase services to the extent earned as of the effective date of termination. In the event of termination under this subsection 3.2.10, the Owner shall not be obligated to reimburse the Construction Manager for any costs incurred by the Construction Manager except as provided in Section 5.1.1 of this Agreement.

§ 3.2.11 In the event of termination of this Agreement in accordance with the provisions of subsection 3.2.10, upon payment by the Owner of the amount obligated under subsection 3.2.10, the Owner's obligations to the Construction Manager shall be fully satisfied, and the Construction Manager shall be deemed to have fully released the Owner from any claims or liabilities. Further, the Construction Manager shall, upon request of the Owner, assign to the Owner any Subcontract, vendor contract, purchase order, letter of intent or other similar agreement that the Construction Manager has entered into in connection with the Work (any such assignment shall be subject to the terms and conditions of Section 5.4 of the General Conditions).

§ 3.2.12 By executing the Guaranteed Maximum Price Amendment pursuant to Section 3.2.6 of this Agreement, the Construction Manager represents and warrants, which representation and warrantee is hereby incorporated into such Guaranteed Maximum Price Amendment, that the Drawings and Specifications and other materials and information listed in Guaranteed Maximum Price Amendment describe the scope, construction requirements and design intent of the Work in detail sufficient to enable the Construction Manager to establish firmly the Guaranteed Maximum Price, subject to the agreed upon assumptions and clarifications. So long as the further drawings, clarifications, supplemental information, and other materials are consistent with the Contract Documents, the Construction Manager shall not be permitted to claim any adjustment in the Guaranteed Maximum Price or the Construction Schedule in connection with the completion of drawings, clarifications, supplemental information and other materials issued by the Architect or the Owner (collectively, "Supplemental Materials") after the date of Guaranteed Maximum Price Amendment, in regard to items of Work that are reasonably inferable from the Contract Documents unless otherwise provided in the Contract Documents.

§ 3.2.13 Contract Time

§ 3.2.13.1 As part of its Guaranteed Maximum Price proposal, the Construction Manager shall prepare and submit to the Owner for the Owner's review and approval a schedule for completion of the Work (as approved by the Owner, the "Project Schedule"). The Project Schedule shall: (1) provide a graphic representation of material activities and events that will occur during performance of the Work; (2) identify each phase of construction separately; (3) identify the dates applicable, permits and approvals will be sought and the expected date of receipt of such permits and approvals; (4) indicate a proposed cash flow schedule for the Project; (5) identify key dates for Owner-provided information and materials; (6) set forth dates that are critical in ensuring the timely and orderly completion of the Work in accordance with the requirements of the Contract Documents; and (7) specify the Substantial Completion Date for the purposes of this Section 3.2.13.

§ 3.2.13.2 TIME IS OF THE ESSENCE in the completion of the Work. It is acknowledged that the Construction Manager's failure to achieve Substantial Completion of the Work within the Contract Time provided by the Contract Documents will cause the Owner to incur substantial economic damages and losses of types and in amounts which are impossible to compute and ascertain with certainty as a basis for recovery by the Owner of actual damages, and that liquidated damages represent a fair, reasonable and appropriate estimate thereof. Accordingly, in lieu of actual damages for such delay, Construction Manager and Owner agree that if Construction Manager fails to achieve Substantial Completion within thirty (30) days following the Substantial Completion Date specified in the Guaranteed Maximum Price Amendment (the "Outside Completion Date"), then Owner shall be entitled to assess and recover from Construction Manager and its surety an amount equal to Three Thousand and 00/100 Dollars ($3,000.00) multiplied by the number of

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days from the Outside Completion Date to and including the date that the Construction Manager achieves Substantial Completion, as adjusted for time extensions as may have been granted pursuant to the terms and conditions of the Contract Documents, without the Owner being required to present any evidence of the amount or character of actual damages sustained by reason thereof. The total amount calculated in the manner set forth above is referred to as the "Liquidated Damages." Owner and Construction Manager agree that the Liquidated Damages calculated above constitute a reasonable estimate of the damages, costs and expenses that will be incurred by Owner in the event the Construction Manager fails to achieve Substantial Completion by the Outside Completion Date and that the same do not constitute a penalty. The Liquidated Damages provided herein are intended to reimburse Owner for only the damages it will suffer as a result of the Construction Manager's failure to achieve Substantial Completion by the time specified herein and shall not limit the obligations or liability of Construction Manager or the remedies of the Owner pursuant to any other provisions of this Agreement. Owner shall be entitled to deduct any Liquidated Damages due hereunder from the Contract Sum. Construction Manager shall not be liable for Liquidated Damages for delays caused solely by Owner or Owner's agents.

The parties understand and agree that, by including a provision for Liquidated Damages in this Agreement, or in pursuing any relief pursuant to such provision: (i) the parties do not intend to set a price for the privilege not to perform; (ii) the availability of Liquidated Damages may not be relied upon as a basis for argument that the Owner has an adequate remedy at law; (iii) the remedies available to the Owner under the Contract Documents are cumulative and not exclusive; and (iv) the Liquidated Damages shall be capped at 50% of the paid Fee.

§ 3.2.13.3 The Project shall be deemed to have achieved Substantial Completion when the terms and conditions of Section 9.8 of the General Conditions have been met.

§ 3.3 Construction Phase

§ 3.3.1 General

§ 3.3.1.1 For purposes of Section 8.1.2 of the General Conditions, the date of commencement of the Work shall mean the date of commencement of the Construction Phase.

§ 3.3.1.2 The Construction Phase shall commence upon the Owner's delivery to the Construction Manager of a Notice to Proceed with the Construction Phase. Under no circumstances shall the activities of the Construction Phase commence prior to the Construction Manager's receipt of the Owner's Notice to Proceed.

§ 3.3.2 Administration

§ 3.3.2.1 The Construction Manager shall schedule and conduct meetings to discuss such matters as procedures, progress, coordination, scheduling, and status of the Work. The Construction Manager shall prepare and promptly distribute minutes of the meetings to the Owner and Architect. The Construction Manager shall schedule and conduct progress meetings at the Project site on a bi-weekly basis (or interval appropriate for the level of jobsite activity) and in accordance with the Construction Manager's operations. Owner and Architect shall be notified of meeting dates and times and will be permitted to attend.

§ 3.3.2.2 Upon the execution of the Guaranteed Maximum Price Amendment, the Construction Manager shall prepare and submit to the Owner and Architect for approval a construction schedule for the Work (such construction schedule as approved, the "Construction Schedule") and a submittal schedule in accordance with Section 3.10 of the General Conditions. The Construction Schedule shall be incorporated into the Project Schedule.

§ 3.3.2.3 Monthly Report

The Construction Manager shall record the progress of the Project. On a monthly basis, or otherwise as agreed to by the Owner, the Construction Manager shall submit written progress reports to the Owner and Architect, showing percentages of completion and other information required by the Owner. Such reports shall also compare actual progress of the Work with the progress required under the Construction Schedule and shall describe any material deviations from the Construction Schedule or projected future deviations and the causes therefor and, where applicable, note corrective measures taken or proposed to be taken.

§ 3.3.2.4 Daily Logs

The Construction Manager shall keep, and make available to the Owner and Architect, a daily log containing a record for each day of weather, portions of the Work in progress, number of workers on site, identification of equipment on site, problems that might affect progress of the work, accidents, injuries, and other information required by the Owner.

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§ 3.3.2.5 Cost Control

The Construction Manager shall develop a system of cost control for the Work, including regular monitoring of actual costs for activities in progress and estimates for uncompleted tasks and proposed changes. The Construction Manager shall identify variances between actual and estimated costs and report the variances to the Owner and Architect, and shall provide this information in its monthly reports to the Owner and Architect, in accordance with Section 3.3.2.3 above.

ARTICLE 4 OWNER'S RESPONSIBILITIES

§ 4.1 Information and Services Required of the Owner

§ 4.1.1 The Owner shall provide information with reasonable promptness, regarding requirements for and limitations on the Project, including a written program which shall set forth the Owner's objectives, constraints, and criteria, including schedule, space requirements and relationships, flexibility and expandability, special equipment, systems, sustainability and site requirements.

§ 4.1.2 Prior to the execution of the Guaranteed Maximum Price Amendment, the Construction Manager may request in writing that the Owner provide reasonable evidence that the Owner has made financial arrangements to fulfill the Owner's obligations under the Contract. The owner shall furnish such evidence prior to the commencement of the Work.

§ 4.1.3 The Owner shall establish and periodically update the Owner's budget for the Project, including (1) the budget for the Cost of the Work as defined in Article 7, (2) the Owner's other costs, and (3) reasonable contingencies related to all of these costs. If the Owner significantly increases or decreases the Owner's budget for the Cost of the Work, the Owner shall notify the Construction Manager and Architect. The Owner and the Architect, in consultation with the Construction Manager, shall thereafter agree to an appropriate corresponding change in the Project's scope as desired by the Owner and/or necessary to accommodate such changes in the budget.

§ 4.1.4 **Structural and Environmental Tests, Surveys and Reports.** During the Preconstruction Phase, the Owner shall furnish the following information or services with reasonable promptness. The Owner shall also furnish any other information or services under the Owner's control to the extent relevant to and necessary for the Construction Manager's performance of the Work with reasonable promptness after receiving the Construction Manager's written request for such information or services. The Construction Manager shall, except to the extent otherwise advised by the Owner in writing at the time of the furnishing of the applicable information and/or services, be entitled to rely on the accuracy of such information and services furnished by the Owner but in all events the Construction Manager shall exercise proper precautions relating to the safe performance of the Work.

§ 4.1.4.1 The Owner shall furnish tests, inspections, and reports, required by law and as otherwise agreed to by the parties, such as structural, mechanical, and chemical tests, tests for air and water pollution, and tests for hazardous materials.

§ 4.1.4.2 The Owner shall furnish surveys describing physical characteristics, legal limitations and utility locations for the site of the Project, and a written legal description of the site. The surveys and legal information shall include, as applicable, grades and lines of streets, alleys, pavements and adjoining property and structures; designated wetlands; adjacent drainage; rights-of-way, restrictions, easements, encroachments, zoning, deed restrictions, boundaries and contours of the site; locations, dimensions and other necessary data with respect to existing buildings, other improvements and trees; and information concerning available utility services and lines, both public and private, above and below grade, including inverts and depths. All the information on the survey shall be referenced to a Project benchmark.

§ 4.1.4.3 The Owner, when such services are required for the completion of the Project, shall furnish services of geotechnical engineers, which may include test borings, test pits, determinations of soil bearing values, percolation tests, evaluations of hazardous materials, seismic evaluation, ground corrosion tests and resistivity tests, including necessary operations for anticipating subsoil conditions, with written reports and appropriate recommendations.

§ 4.1.5 During the Construction Phase, the Owner shall furnish information or services required of the Owner by the Contract Documents with reasonable promptness. The Owner shall also furnish any other information or services under the Owner's control and required for the Construction Manager's performance of the Work with reasonable promptness after receiving the Construction Manager's written request for such information or services.

§ 4.1.6 If the Owner identified a Sustainable Objective in Article 1, the Owner shall fulfill its responsibilities as required in AIA Document E234™–2019, Sustainable Projects Exhibit, Construction Manager as Constructor Edition, attached to this Agreement.

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§ 4.2 Owner's Designated Representative
The Owner shall identify a representative authorized to act on behalf of the Owner with respect to the Project. The Owner's representative shall render decisions promptly and furnish information expeditiously, so as to avoid unreasonable delay in the services or Work of the Construction Manager. Except as otherwise provided in Section 4.2.1 of the General Conditions, the Architect does not have such authority. The term "Owner" means the Owner or the Owner's authorized representative, including the Owner's representative identified in Section 1.1.9 where the context so requires.

§ 4.2.1 Legal Requirements. The Owner shall furnish all legal, insurance and accounting services, including auditing services, that the Owner deems necessary at any time for the Project to meet the Owner's needs and interests.

§ 4.3 Architect
The Owner shall retain an Architect to provide services, duties and responsibilities as described in the owner's agreement with the Architect including any additional services requested by the Construction Manager and that the Owner reasonably deems necessary for the Preconstruction and Construction Phase services under this Agreement. The Owner shall provide the Construction Manager with a copy of the scope of services in the executed agreement between the Owner and the Architect, and any further modifications to the Architect's scope of services in the agreement.

ARTICLE 5 COMPENSATION AND PAYMENTS FOR PRECONSTRUCTION PHASE SERVICES

§ 5.1 Compensation
§ 5.1.1 For the Construction Manager's Preconstruction Phase services described in Sections 3.1 and 3.2, the Owner shall compensate the Construction Manager as follows:
(Insert amount of, or basis for, compensation and include a list of reimbursable cost items, as applicable.)

The lump sum amount of . to be allocated as follows:

(1) For Pre-Construction services prior to Schematic Design Phase:
(2) For Schematic Design Estimate Phase:
(3) For Design Development Estimate Phase:
(4) For Construction Documents Estimate Phase:

§ 5.1.2 The hourly billing rates for Preconstruction Phase services of the Construction Manager and the Construction Manager's Consultants and Subcontractors, if any, are set forth below.
(If applicable, attach an exhibit of hourly billing rates or insert them below.)

TBD

Individual or Position	Rate

§ 5.1.2.1 Hourly billing rates for Preconstruction Phase services include all costs to be paid or incurred by the Construction Manager, as required by law or collective bargaining agreements, for taxes, insurance, contributions, assessments and benefits and, for personnel not covered by collective bargaining agreements, customary benefits such as sick leave, medical and health benefits, holidays, vacations and pensions, and shall remain unchanged unless the parties execute a Modification.

§ 5.1.3 Intentionally Omitted.

§ 5.2 Payments
§ 5.2.1 Unless otherwise agreed, payments for services shall be made monthly in proportion to services performed.

§ 5.2.2 Payments
(Paragraphs deleted)
for Preconstruction Phase Services are due and payable within forty-five days (45) after the presentation of the Construction Manager's invoice to the Architect and the certification by the Architect of amounts properly due. Amounts properly due and remaining unpaid beyond such forty-five (45) day period shall bear interest only to the extent required by Connecticut law and, if so required, at the minimum required rate.

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ARTICLE 6 COMPENSATION FOR CONSTRUCTION PHASE SERVICES

§ 6.1 Contract Sum

§ 6.1.1 The Owner shall pay the Construction Manager the Contract Sum in current funds for the Construction Manager's performance of the Contract after execution of the Guaranteed Maximum Price Amendment. The Contract Sum is the Cost of the Work as defined in Article 7 plus the Construction Manager's Fee.

§ 6.1.2 The Construction Manager's Fee:
(State a lump sum, percentage of Cost of the Work or other provision for determining the Construction Manager's Fee.)

1.55%

§ 6.1.3 The method of adjustment of the Construction Manager's Fee for changes in the Work:

The Construction Manager shall be entitled to a fee of 1.55% of the increase in the Cost of the Work attributable to the changes in the Work provided such changes were made at the request of the Owner and not necessitated by the fault of the Construction Manager, its Subcontractors, material suppliers or any other entity or person for which any of them is responsible. For changes in the Work resulting in a decrease in the Cost of the Work, such decrease shall also include a reduction of the Construction Manager's fee of 1.5%. Notwithstanding anything to the contrary in the Contract Documents, the Construction Manager's Fee shall not be assessed on the amount of any increase in material costs over the costs for such materials as is specified in the Guaranteed Maximum Price Amendment.

§ 6.1.4 Limitations, if any, on a Subcontractor's overhead and profit for increases in the cost of its portion of the Work:

As described in Section 6.3.6 below.

§ 6.1.5 Intentionally Omitted

§ 6.1.6 Liquidated damages, if any:
(Insert terms and conditions for liquidated damages, if any.)

See Section 3.2.13.2 above.

§ 6.1.7 Other:
(Insert provisions for bonus, cost savings or other incentives, if any, that might result in a change to the Contract Sum.)

§ 6.2 Guaranteed Maximum Price

The Construction Manager guarantees that the Contract Sum shall not exceed the Guaranteed Maximum Price set forth in the Guaranteed Maximum Price Amendment, subject to additions and deductions by Change Order as provided in the Contract Documents. Costs which would cause the Guaranteed Maximum Price to be exceeded shall be paid by the Construction Manager without reimbursement by the Owner. Should the final Contract Sum be less than the Guaranteed Maximum Price, all savings shall be allocated to the Owner.

§ 6.3 Changes in the Work and Overhead and Profit Limitations

§ 6.3.1 The Owner may, without invalidating the Contract, and in consultation with the Architect, order changes in the Work within the general scope of the Contract consisting of additions, deletions or other revisions. The Owner shall issue such changes in writing. The Construction Manager may be entitled to an equitable adjustment in the Contract Time as a result of changes in the Work.

§ 6.3.1.1 The Architect may order minor changes in the Work as provided in Article 7 of the General Conditions.

§ 6.3.2 Adjustments to the Guaranteed Maximum Price on account of changes in the Work subsequent to the execution of the Guaranteed Maximum Price Amendment may be determined by any of the methods listed in Article 7 of the General Conditions.

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§ 6.3.3 Adjustments to subcontracts awarded on the basis of a stipulated sum shall be determined in accordance with Article 7 of the General Conditions, as they refer to "cost" and "fee," and not by Articles 6 and 7 of this Agreement. Adjustments to subcontracts awarded with the Owner's prior written consent on the basis of cost plus a fee shall be calculated in accordance with the terms of those subcontracts.

§ 6.3.4 In calculating adjustments to the Guaranteed Maximum Price. the terms "cost" and "costs" as used in Article 7 of the General Conditions shall mean the Cost of the Work as defined in Article 7 of this Agreement and the term "fee" shall mean the Construction Manager's Fee as defined in Section 6.1.2 of this Agreement.

§ 6.3.5 Intentionally Omitted.

§ 6.3.6 Markups for profit and overhead for Work performed pursuant to Change Orders and Construction Change Directives shall be limited as follows:

(i) Markup by the Construction Manager for overhead and profit on Work performed pursuant to Change Orders and Construction Change Directives shall not exceed any adjustment in the Construction Manager's Fee permitted under Section 6.1.2 of this Agreement;

(ii) Markup by any first tier Subcontractor for overhead and profit on Work performed pursuant to Change Orders and Construction Change Directives shall not exceed Ten Percent (10%) of the sum of the actual direct costs for labor (including labor burden) and materials for such Work that is performed directly by such first tier Subcontractor;

(iii) Markup by any first tier Subcontractor for overhead and profit on Work performed by its Sub-subcontractor pursuant to Change Orders and Construction Change Directives shall not exceed Five Percent (5%) of the Sub-subcontractor's contract price for such Work that is performed directly by the Sub-subcontractor: and

(iv) Markup by any Sub-subcontractor for overhead and profit on Work performed pursuant to Change Orders and Construction Change Directives shall not exceed Ten Percent (10%) of the sum of direct cost for labor (including labor burden) and materials for Work performed directly by such Sub-subcontractor.

For change order Work that is the subject of Unit Prices under this Agreement, there will be no markup permitted on the applicable Unit Prices.

The Construction Manager shall include the markup limitations set forth in this Section 6.3.6 in all Subcontracts and require in all Subcontracts that the Subcontractors include such limitations in all lower tier Subcontracts.

The Contractor shall provide in a form satisfactory to the Owner and the Agencies, as applicable. itemized statements of the costs associated with change order work including, without limitation. certified payrolls and copies of invoices and other Supporting Documentation.

ARTICLE 7 COST OF THE WORK FOR CONSTRUCTION PHASE

§ 7.1 Costs to Be Reimbursed

§ 7.1.1 The term Cost of the Work shall mean costs necessarily incurred by the Construction Manager in the proper performance of the Work. The Cost of the Work shall include only the items set forth in Sections 7.1 through 7.7.

§ 7.1.2 Where. pursuant to the Contract Documents, any cost is subject to the Owner's prior approval, the Construction Manager shall obtain such approval in writing prior to incurring the cost. The parties shall endeavor to identify any such costs prior to executing Guaranteed Maximum Price Amendment.

§ 7.1.3 Costs shall be at rates not higher than the standard rates paid at the place of the Project. except with prior approval of the Owner.

§ 7.2 Labor Costs

§ 7.2.1 Intentionally Omitted.

§ 7.2.2 Wages or salaries of the Construction Manager's supervisory and administrative personnel when stationed at the site and performing Work. with the Owner's prior approval at the all-inclusive hourly rates shown on Schedule 1.

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§ 7.2.2.1 Wages or salaries of the Construction Manager's supervisory and administrative personnel when performing Work and stationed at a location other than the site, but only for that portion of time required for the Work at the all-inclusive hourly rates shown on Schedule 1, and limited to the personnel and activities listed below:
(Identify the personnel, type of activity and, if applicable, any agreed upon percentage of time to be devoted to the Work.)

§ 7.2.3 Wages and salaries of the Construction Manager's supervisory or administrative personnel engaged at factories, workshops or while traveling, in expediting the production or transportation of materials or equipment required for the Work, but only for that portion of their time required for the Work, in numbers approved by the Owner and at the all-inclusive hourly rates shown on Schedule 1.

§ 7.2.4 Costs paid or incurred by the Construction Manager, as required by law or collective bargaining agreements, for taxes, insurance, contributions, assessments and benefits and, for personnel not covered by collective bargaining agreements, customary benefits such as sick leave, medical and health benefits, holidays, vacations and pensions, provided such costs are based on wages and salaries included in the Cost of the Work under Sections 7.2.1 through 7.2.3.

§ 7.2.5 If agreed rates for labor costs, in lieu of actual costs, are provided in this Agreement, the rates shall remain unchanged throughout the duration of this Agreement, unless the parties execute a Modification.

§ 7.3 Subcontract Costs
Payments made by the Construction Manager to Subcontractors and suppliers in accordance with the requirements of the subcontracts and supply agreements.

§ 7.4 Costs of Materials and Equipment Incorporated in the Completed Construction
§ 7.4.1 Costs, including transportation and storage at the site, of materials and equipment incorporated, or to be incorporated, in the completed construction are to be included in Subcontract Costs described in Section 7.3.

§ 7.4.2 Intentionally Omitted.

§ 7.5 Costs of Other Materials and Equipment, Temporary Facilities and Related Items
§ 7.5.1 Costs of transportation, storage, installation, dismantling, maintenance, and removal of materials, supplies, temporary facilities, machinery, equipment and hand tools are to be included in Subcontractor Costs described in Section 7.3.

§ 7.5.2 Intentionally Omitted.

§ 7.5.3 Costs of removal of debris from the site of the Work and its proper and legal disposal is a Cost of Work item performed by sub-trade and not a General Conditions item.

§ 7.5.4 Costs of the Construction Manager's site office, including general office equipment and supplies, to the extent not included in General Conditions.

§ 7.5.5 Costs of materials and equipment suitably stored off the site at a mutually acceptable location, subject to the Owner's prior approval.

§ 7.6 Miscellaneous Costs
§ 7.6.1 Premiums for that portion of insurance and bonds required by the Contract Documents that can be directly attributed to this Contract.

§ 7.6.1.1 Costs for self-insurance, for either full or partial amounts of the coverages required by the Contract Documents, with the Owner's prior approval.

§ 7.6.1.2 Costs for insurance through a captive insurer owned or controlled by the Construction Manager, with the Owner's prior approval. If the Construction Manager is self-insured to any extent or purchases insurance coverage

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through any related party (as defined in Section 7.8.1), any such insurance arrangement must be disclosed to the Owner and approved by the Owner in writing in advance before any such insurance costs will be considered reimbursable under the terms of this Agreement. The Construction Manager's method for determining actual cost of such insurance coverage will be detailed to the Owner in writing in advance and will be subject to verification by the Owner of the representations made by the Construction Manager. Reimbursable insurance costs under any such self-insurance arrangements will be subject to agreed-upon maximums and not otherwise considered reimbursable unless advance written approval has been obtained. Actual reimbursable costs for such insurance coverage will be subject to audit verification of actual out-of-pocket insurance premium costs. The costs of such insurance premiums which are considered reimbursable will be limited to a maximum of rates not higher than normally paid to third-party insurance companies for similar coverage. Proper cost reduction consideration will be given to cost reductions available due to favorable experience modifiers, volume discounts, trade discounts, dividends, and the like.

§ 7.6.2 Sales, use, or similar taxes, imposed by a governmental authority, that are related to the Work and for which the Construction Manager is liable.

§ 7.6.3 Fees and assessments for the building permit, and for other permits, licenses, and inspections, for which the Construction Manager is required by the Contract Documents to pay.

§ 7.6.4 Fees of laboratories for tests required by the Contract Documents; except those related to defective or nonconforming Work for which reimbursement is excluded under Article 13 of the General Conditions or by other provisions of the Contract Documents, and which do not fall within the scope of Section 7.7.3.

§ 7.6.5 Royalties and license fees paid for the use of a particular design, process, or product, required by the Contract Documents.

§ 7.6.5.1 The cost of defending suits or claims for infringement of patent rights arising from requirements of the Contract Documents, payments made in accordance with legal judgments against the Construction Manager resulting from such suits or claims, and payments of settlements made with the Owner's consent, unless the Construction Manager had reason to believe that the required design, process, or product was an infringement of a copyright or a patent, and the Construction Manager failed to promptly furnish such information to the Architect as required by Article 3 of the General Conditions. The costs of legal defenses, judgments, and settlements shall not be included in the Cost of the Work used to calculate the Construction Manager's Fee or subject to the Guaranteed Maximum Price.

§ 7.6.6 Costs for communications services, electronic equipment, and software, directly related to the Work and located at the site, with the Owner's prior approval.

§ 7.6.7 Costs of document reproductions and delivery charges, to the extent not included in the General Conditions.

§ 7.6.8 Deposits lost for causes unrelated to the Construction Manager's negligence or failure to fulfill a specific responsibility in the Contract Documents.

§ 7.6.9 Legal, mediation and arbitration costs, including attorneys' fees, other than those arising from disputes between the Owner and Construction Manager, reasonably incurred by the Construction Manager after the execution of this Agreement in the performance of its responsibilities under the Contract Documents and with the Owner's prior approval, which shall not be unreasonably withheld.

§ 7.6.10 Intentionally Omitted.

§ 7.6.11 The expenses of the Construction Manager's supervisory or administrative personnel incurred while traveling in discharge of duties connected with the Work are included in the Construction Manager's Fee and shall not be reimbursable.

§ 7.7 Other Costs and Emergencies

§ 7.7.1 Other costs incurred in the performance of the Work, with the Owner's prior written approval.

§ 7.7.2 Costs incurred in taking action to prevent threatened damage, injury, or loss, in case of an emergency affecting the safety of persons and property, as provided in Article 10 of AIA Document A201–2017.

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§ 7.7.3 Costs of repairing or correcting damaged or nonconforming Work executed by the Construction Manager, Subcontractors, or suppliers, or anyone else for whose work the Construction manager is liable under the Contract Documents, provided that such damaged or nonconforming Work was not caused by the negligence of any of the same, or failure to fulfill a specific responsibility by, the Construction Manager, and only to the extent that the cost of repair or correction is not recovered by the Construction Manager from insurance, sureties, Subcontractors, suppliers, or others.

§ 7.7.4 The costs described in Sections 7.1 through 7.7 shall be included in the Cost of the Work, notwithstanding any provision of the General Conditions or other Conditions of the Contract which may require the Construction Manager to pay such costs, unless such costs are excluded by the provisions of Section 7.9.

§ 7.8 Related Party Transactions

§ 7.8.1 For purposes of this Agreement, the term "related party" shall mean (1) a parent, subsidiary, affiliate, or other entity having common ownership of, or sharing common management with, the Construction Manager; (2) any entity in which any stockholder in, or management employee of, the Construction Manager holds an equity interest in excess of ten percent in the aggregate; (3) any entity which has the right to control the business or affairs of the Construction Manager; or (4) any person, or any member of the immediate family of any person, who has the right to control the business or affairs of the Construction Manager.

§ 7.8.2 If any of the costs to be reimbursed arise from a transaction between the Construction Manager and a related party, the Construction Manager shall notify the Owner of the specific nature of the contemplated transaction, including the identity of the related party and the anticipated cost to be incurred, before any such transaction is consummated or cost incurred. If the Owner, after such notification, authorizes the proposed transaction in writing, then the cost incurred shall be included as a cost to be reimbursed, and the Construction Manager shall procure the Work, equipment, goods, or service, from the related party, as a Subcontractor, according to the terms of Article 9. If the Owner fails to authorize the transaction in writing, the Construction Manager shall procure the Work, equipment, goods, or service from some person or entity other than a related party according to the terms of Article 9.

§ 7.9 Costs Not To Be Reimbursed

§ 7.9.1 The Cost of the Work shall not include the items listed below:

.1 Salaries and other compensation of the Construction Manager's personnel stationed at the Construction Manager's principal office or offices other than the site office, except as specifically provided in Section 7.2, or as may be provided in Article 14;

.2 Bonuses, profit sharing, incentive compensation, and any other discretionary payments, paid to anyone hired by the Construction Manager or paid to any Subcontractor or vendor, unless the Owner has provided prior approval;

.3 Expenses of the Construction Manager's principal office and offices other than the site office;

.4 Overhead and general expenses, except as may be expressly included in Sections 7.1 to 7.7;

.5 The Construction Manager's capital expenses, including interest on the Construction Manager's capital employed for the Work;

.6 Notwithstanding anything to the contrary provided in Section 7.7.3, costs due to the negligent act or omission of the Construction Manager, its Subcontractor or Supplier, or anyone else conducting the Work, or due to the failure of the Construction Manager to comply with the terms of the Contract Documents and all costs arising from any Work which the Construction Manager knew did not comply with the Contract Documents or Applicable Laws;

.7 Any cost not specifically and expressly described in Sections 7.1 to 7.7;

.8 Costs, other than costs included in Change Orders approved by the Owner, that would cause the Guaranteed Maximum Price to be exceeded;

.9 Costs for services incurred during the Preconstruction Phase.

.10 Amounts required to be paid by the Construction Manager for federal, state, or local income or franchise taxes;

.11 Labor, material, and equipment costs or any other costs incurred which are recoverable from Subcontractors or Suppliers or which is included in a contract with a Subcontractor or Supplier; and

.12 Losses resulting from lost, damaged or stolen tools and equipment (other than equipment to be incorporated into the Work to the extent covered by the Owner's property insurance).

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ARTICLE 8 DISCOUNTS, REBATES, AND REFUNDS

§ 8.1 Cash discounts obtained on payments made by the Construction Manager shall accrue to the Owner if (1) before making the payment, the Construction Manager included the amount to be paid, less such discount, in an Application for Payment and received payment from the Owner, or (2) the Owner has deposited funds with the Construction Manager with which to make payments; otherwise, cash discounts shall accrue to the Construction Manager. Trade discounts, rebates, refunds, and amounts received from sales of surplus materials and equipment shall accrue to the Owner, and the Construction Manager shall make provisions so that they can be obtained. The Construction Manager shall promptly notify the Owner of potential cash discounts it is aware of to enable Owner to take advantage of same. The Construction Manager shall not obtain for its own benefit any discounts, rebates or refunds in connection with the Work prior to providing the Owner with seven (7) days prior written notice of the potential discount, rebate or refund and an opportunity to furnish funds necessary to obtain such discount, rebate or refund. The Owner's ability to take advantage of discounts, rebates or refunds is subject to the requirements and restrictions of Applicable Laws.

§ 8.2 Amounts that accrue to the Owner in accordance with the provisions of Section 8.1 shall be credited to the Owner as a deduction from the Cost of the Work.

ARTICLE 9 SUBCONTRACTS AND OTHER AGREEMENTS

§ 9.1 The Construction Manager's shall select and contract with Subcontractors and suppliers for all components of the Work in accordance with Section 3.1.11 of this Agreement. All such Subcontracts and agreements shall be between the Subcontractor or supplier and the Construction Manager in the Construction Manager's own name and not as an agent of the Owner. However, each Subcontract, supply agreement, vendor contract, purchase order, letter of intent or any similar agreement entered into by the Construction Manager in connection with the Work shall be assignable to the Owner upon demand by the Owner, subject to the provisions of Section 5.4 of the General Conditions. Each such Subcontract and agreement shall include language providing that the Owner shall be entitled, at the Owner's option, to take assignment of the Construction Manager's rights under such Subcontract or agreement, subject to Section 5.4 of the General Conditions of the Contract.

§ 9.1.1 If the Guaranteed Maximum Price has been established before the selection of all Subcontractors and suppliers pursuant to Section 3.1.11, and when, in such event, a specific bidder (1) is recommended to the Owner by the Construction Manager, (2) is qualified to perform that portion of the Work, and (3) has submitted a bid that conforms to the requirements of the Contract Documents and is consistent with the bid packet approved by the Owner pursuant to Section 3.1.11 without reservations or exceptions, and (4) award to such bidder would comply with the Contract Documents, but the Owner requires that another bid be accepted, then the Construction Manager may require that a Change Order be issued to adjust the Guaranteed Maximum Price by the difference between the bid of the person or entity recommended to the Owner by the Construction Manager and the amount of the subcontract or other agreement actually signed with the person or entity designated by the Owner.

§ 9.2 Subcontracts or other agreements shall conform to the applicable payment provisions of this Agreement, and shall not be awarded on the basis of cost plus a fee without the Owner's prior written approval. If a subcontract is awarded on the basis of cost plus a fee, the Construction Manager shall provide in the subcontract for the Owner to receive the same audit rights with regard to the Subcontractor as the Owner receives with regard to the Construction Manager in Article 10.

ARTICLE 10 ACCOUNTING RECORDS

§ 10.1 The Construction Manager shall keep full and detailed records and accounts related to the cost of the Work and exercise such controls as may be necessary for proper financial management under this Contract and to substantiate all costs incurred. The accounting and control systems shall be satisfactory to the Owner. The Owner and the Owner's auditors shall, during regular business hours and upon reasonable notice, be afforded access to, and shall be permitted to audit and copy, the Construction Manager's records and accounts, including complete documentation supporting accounting entries, books, correspondence, instructions, drawings, receipts, subcontracts, Subcontractor's proposals, purchase orders, vouchers, memoranda and other data relating to this Contract. The Construction Manager shall deliver such records to the Owner upon Substantial Completion (and update the same upon Final Completion) preserve these records for a period of three years after final payment, or for such longer period as may be required by Applicable Laws.

§ 10.2 Records to be available for audit shall include but not be limited to accounting records, written policies and procedures; contract and subcontract files (including proposals of successful and unsuccessful bidders, bid recaps, etc.); original estimates; estimating worksheets; correspondence invoices; change order files (including documentation covering negotiated settlements); back charge logs and supporting documentation; general ledger entries detailing cash

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and trade discounts earned, insurance rebates and dividends; electronic or computer data and any other supporting evidence deemed necessary to substantiate charges. These records shall be open to inspection and subject to an audit and/or reproduction to the extent necessary to adequately permit evaluation and verification of the Cost of the Work, and any invoices, change orders, payments or claims submitted by the contractor or vendor to any of his payees pursuant to the execution of this Agreement

§ 10.3 The Construction Manager shall deliver to the Owner such items as are reasonably requested by the Owner to support costs billed to the Project and shall provide any further assistance requested by the Owner during an audit of the Project.

§ 10.4 The Construction Manager shall comply with all accounting procedures and record retention policies reasonably requested by the Owner.

§ 10.5 Upon request of the Owner or the Architect, the Contractor will, at no cost to the Owner, cooperate and assist the Owner and Architect, during any audit of the Project conducted by the Owner or an Agency at any time after Substantial Completion.

ARTICLE 11 PAYMENTS FOR CONSTRUCTION PHASE SERVICES

§ 11.1 Progress Payments

§ 11.1.1 Based upon Applications for Payment submitted to the Architect by the Construction Manager, and Certificates for Payment issued by the Architect, the Owner shall make progress payments on account of the Contract Sum, to the Construction Manager, as provided below and elsewhere in the Contract Documents.

§ 11.1.2 The period covered by each Application for Payment shall be one calendar month ending on the last day of the month, or as follows:

§ 11.1.3 Provided that an Application for Payment is received by the Architect not later than the first day of a month, the Owner shall make payment of the amount certified to the Construction Manager not later than the fifteenth day of the following month. If an Application for Payment is received by the Architect after the application date fixed above, payment of the amount certified shall be made by the Owner not later than forty-five (45) days after the Architect receives the Application for Payment.

§ 11.1.4 With each Application for Payment, the Construction Manager shall submit payrolls, petty cash accounts, receipted invoices or invoices with check vouchers attached, and any other evidence required by the Owner or Architect to demonstrate that payments already made by the Construction Manager on account of the Cost of the Work equal or exceed progress payments already received by the Construction Manager, plus payrolls for the period covered by the present Application for Payment, less that portion of the progress payments attributable to the Construction Manager's Fee. Commencing with the second Application for Payment and continuing with each Application for Payment submitted thereafter, the Construction Manager and each Subcontractor shall submit properly executed lien waivers for all portions of the Work included in previous Applications for Payment and for which payment was made by the Owner.

§ 11.1.5 Each Application for Payment shall be based on the most recent schedule of values submitted by the Construction Manager in accordance with the Contract Documents. The schedule of values shall allocate the entire Guaranteed Maximum Price among: (1) the various portions of the Work; (2) any contingency for costs that are included in the Guaranteed Maximum Price but not otherwise allocated to another line item or included in a Change Order; and (3) the Construction Manager's Fee.

§ 11.1.5.1 The schedule of values shall be prepared in such form and supported by such data to substantiate its accuracy as the Architect and/or the Owner may require. The schedule of values, unless objected to by the Architect and/or the Owner, shall be used as a basis for reviewing the Construction Manager's Applications for Payment.

§ 11.1.5.2 The allocation of the Guaranteed Maximum Price under this Section 11.1.5 shall not constitute a separate guaranteed maximum price for the Cost of the Work of each individual line item in the schedule of values.

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§ 11.1.5.3 When the Construction Manager allocates costs from a contingency to another line item in the schedule of values, the Construction Manager shall submit supporting documentation to the Architect.

§ 11.1.6 Applications for Payment shall show the percentage of completion of each portion of the Work as of the end of the period covered by the Application for Payment. The percentage of completion shall be the lesser of (1) the percentage of that portion of the Work which has actually been completed, or (2) the percentage obtained by dividing (a) the expense that has actually been incurred by the Construction Manager on account of that portion of the Work and for which the Construction Manager has made payment or intends to make payment prior to the next Application for Payment, by (b) the share of the Guaranteed Maximum Price allocated to that portion of the Work in the schedule of values.

§ 11.1.7 In accordance with the General Conditions and subject to other provisions of the Contract Documents, the amount of each progress payment shall be computed as follows:

§ 11.1.7.1 The amount of each progress payment shall first include:

.1 That portion of the Guaranteed Maximum Price (net of the Construction Manager's Fee) properly allocable to completed Work as determined by multiplying the percentage of completion of each portion of the Work by the share of the Guaranteed Maximum Price (net of the Construction Manager's Fee) allocated to that portion of the Work in the most recent schedule of values;

.2 That portion of the Guaranteed Maximum Price (net of the Construction Manager's Fee) properly allocable to materials and equipment delivered and suitably stored at the site for subsequent incorporation in the completed construction or, if approved in writing in advance by the Owner, suitably stored off the site at a location agreed upon in writing;

.3 That portion of Construction Change Directives that the Architect determines, in the Architect's professional judgment, to be reasonably justified; and

.4 The Construction Manager's Fee, computed upon the Cost of the Work described in the preceding Sections 11.1.7.1.1 and 11.1.7.1.2 at the rate stated in Section 6.1.2 or, if the Construction Manager's Fee is stated as a fixed sum in that Section, an amount that bears the same ratio to that fixed-sum fee as the Cost of the Work included in Sections 11.1.7.1.1 and 11.1.7.1.2 bears to a reasonable estimate of the probable Cost of the Work upon its completion.

§ 11.1.7.2 The amount of each progress payment shall then be reduced by:

.1 The aggregate of any amounts previously paid by the Owner;

.2 The amount, if any, for Work that remains uncorrected and for which the Architect has previously withheld a Certificate for Payment as provided in Article 9 of AIA Document A201–2017;

.3 Any amount for which the Construction Manager does not intend to pay a Subcontractor or material supplier, unless the Work has been performed by others the Construction Manager intends to pay;

.4 For Work performed or defects discovered since the last payment application, any amount for which the Architect may withhold payment, or nullify a Certificate of Payment in whole or in part, as provided in Article 9 of AIA Document A201–2017;

.5 The shortfall, if any, indicated by the Construction Manager in the documentation required by Section 11.1.4 to substantiate prior Applications for Payment, or resulting from errors subsequently discovered by the Owner's auditors in such documentation; and

.6 Retainage withheld pursuant to Section 11.1.8.

§ 11.1.8 Retainage

§ 11.1.8.1 For each progress payment made prior to Substantial Completion of the Work, the Owner may withhold the following amount, as retainage, from the payment otherwise due:

(Insert a percentage or amount to be withheld as retainage from each Application for Payment. The amount of retainage may be limited by governing law.)

Five percent (5%)

§ 11.1.8.1.1 The following items are not subject to retainage:

(Insert any items not subject to the withholding of retainage, such as general conditions, insurance, etc.)

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§ 11.1.8.2 Reduction or limitation of retainage, if any, shall be as follows:
(If the retainage established in Section 11.1.8.1 is to be modified prior to Substantial Completion of the entire Work, insert provisions for such modification.)

§ 11.1.8.3 Except as set forth in this Section 11.1.8.3, upon Substantial Completion of the Work, the Construction Manager may submit an Application for Payment that includes the retainage withheld from prior Applications for Payment pursuant to this Section 11.1.8. The Application for Payment submitted at Substantial Completion shall not include retainage as follows:
(Insert any other conditions for release of retainage, such as upon completion of the Owner's audit and reconciliation, upon Substantial Completion.)

Upon Substantial Completion, an amount equal to 200% of the cost reasonably agreed to by the Architect and Construction Manager as necessary to complete "punch list" items and achieve Final Completion of the Work, shall be subtracted from the payment made pursuant to Section 9.8.5 of the General Conditions. If the Construction Manager fails to complete the items on the "punch list," the Owner may use such retainage to complete such items, and the Construction Manager shall forfeit all rights to such retainage amounts as the Owner so uses.

§ 11.1.9 If final completion of the Work is materially delayed through no fault of the Construction Manager, the Owner shall pay the Construction Manager any additional amounts in accordance with Article 9 of the General Conditions.

§ 11.1.10 Except with the Owner's prior written approval, the Construction Manager shall not make advance payments to suppliers for materials or equipment which have not been delivered and suitably stored at the site.

§ 11.1.11 The Owner and the Construction Manager shall agree upon a mutually acceptable procedure for review and approval of payments to Subcontractors, and the percentage of retainage held on Subcontracts, and the Construction Manager shall execute subcontracts in accordance with those agreements.

§ 11.1.12 In taking action on the Construction Manager's Applications for Payment the Architect shall be entitled to rely on the accuracy and completeness of the information furnished by the Construction Manager, and such action shall not be deemed to be a representation that (1) the Architect has made a detailed examination, audit, or arithmetic verification, of the documentation submitted in accordance with Section 11.1.4 or other supporting data; (2) that the Architect has made exhaustive or continuous on-site inspections; or (3) that the Architect has made examinations to ascertain how or for what purposes the Construction Manager has used amounts previously paid on account of the Contract. Such examinations, audits, and verifications, if required by the Owner, will be performed by the Owner's auditors acting in the sole interest of the Owner.

§ 11.1.13 Notwithstanding anything to the contrary contained in the Contract Documents, issuance of a Certificate for Payment by the Architect is a recommendation only; payment to the Contractor of amounts certified in a Certificate for Payment is subject to the Owner's approval.

§ 11.2 Final Payment

§ 11.2.1 Final payment, constituting the entire unpaid balance of the Contract Sum, shall be made by the Owner to the Construction Manager when

.1 the Construction Manager has fully performed the Contract, except for the Construction Manager's responsibility to correct Work as provided in Article 12 of the General Conditions, and to satisfy other requirements, if any, which extend beyond final payment;

.2 the Construction Manager has submitted a final accounting for the Cost of the Work and a final Application for Payment; and

.3 a final Certificate for Payment has been issued by the Architect in accordance with Section 11.2.2.2.

§ 11.2.2 Within 30 days of the Owner's receipt of the Construction Manager's final accounting for the Cost of the Work, the Owner shall conduct an audit of the Cost of the Work or notify the Architect that it will not conduct an audit.

§ 11.2.2.1 If the Owner conducts an audit of the Cost of the Work, the Owner shall, within 10 days after completion of the audit, submit a written report based upon the auditors' findings to the Architect.

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§ 11.2.2.2 Within seven days after receipt of the written report described in Section 11.2.2.1, or receipt of notice that the Owner will not conduct an audit, and provided that the other conditions of Section 11.2.1 have been met, the Architect will either issue to the Owner a final Certificate for Payment with a copy to the Construction Manager, or notify the Construction Manager and Owner in writing of the Architect's reasons for withholding a certificate as provided in Article 9 of the General Conditions. The time periods stated in this Section 11.2.2 supersede those stated in Article 9 of the General Conditions. The Architect is not responsible for verifying the accuracy of the Construction Manager's final accounting.

§ 11.2.2.3 If the Owner's auditors' report concludes that the Cost of the Work, as substantiated by the Construction Manager's final accounting, is less than claimed by the Construction Manager, the Construction Manager shall be entitled to request mediation of the disputed amount without seeking an initial decision pursuant to Article 15 of the General Conditions. A request for mediation shall be made by the Construction Manager within 30 days after the Construction Manager's receipt of a copy of the Architect's final Certificate for Payment. Failure to request mediation within this 30-day period shall result in the substantiated amount reported by the Owner's auditors becoming binding on the Construction Manager. Pending a final resolution of the disputed amount, the Owner shall pay the Construction Manager the amount certified in the Architect's final Certificate for Payment.

§ 11.2.3 The Owner's final payment to the Construction Manager shall be made no later than forty-five (45) days after the issuance of the Architect's final Certificate for Payment, or as follows:

§ 11.2.4 If, subsequent to final payment, and at the Owner's request, the Construction Manager incurs costs, described in Sections 7.1 through 7.7, and not excluded by Section 7.9, to correct defective or nonconforming Work, the Owner shall reimburse the Construction Manager for such costs, and the Construction Manager's Fee applicable thereto, on the same basis as if such costs had been incurred prior to final payment, but not in excess of the Guaranteed Maximum Price. If adjustments to the Contract Sum are provided for in Section 6.1.7, the amount of those adjustments shall be recalculated, taking into account any reimbursements made pursuant to this Section 11.2.4 in determining the net amount to be paid by the Owner to the Construction Manager.

§ 11.3 Interest

Payments due and unpaid under the Contract shall bear interest from the date payment is due at the rate stated below, or in the absence thereof, at the legal rate prevailing from time to time at the place where the Project is located.
(Insert rate of interest agreed upon, if any.)

%

ARTICLE 12 DISPUTE RESOLUTION

§ 12.1 Initial Decision Maker

§ 12.1.1 Any Claim between the Owner and Construction Manager shall be resolved in accordance with the provisions set forth in this Article 12 and Article 15 of the General Conditions. However, for Claims arising from or relating to the Construction Manager's Preconstruction Phase services, no decision by the Initial Decision Maker shall be required as a condition precedent to mediation or binding dispute resolution, and Section 12.1.2 of this Agreement shall not apply.

§ 12.1.2 The Architect will serve as the Initial Decision Maker pursuant to Article 15 of the General Conditions for Claims arising from or relating to the Construction Manager's Construction Phase services, unless the parties appoint below another individual, not a party to the Agreement, to serve as the Initial Decision Maker.
(Paragraphs deleted)

§ 12.2 Binding Dispute Resolution

For any Claim subject to, but not resolved by mediation pursuant to Article 15 of AIA Document A201–2017, the method of binding dispute resolution shall be as follows:
(Check the appropriate box.)

[X] Arbitration pursuant to Article 15 of the General Conditions

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[ ] Litigation in a court of competent jurisdiction

[ ] Other: *(Specify)*

§ 12.3 Liens

In the event that any Subcontractor, Supplier or other party for whom the Construction Manager is responsible establishes a lien against the Project and/or the Project site, the Construction Manager shall, upon request of the Owner and at no cost to the Owner, and provided that such lien does not arise from the Owner's failure to comply with its payment obligations under this Agreement, cause the lien to be discharged (by recording a lien discharge bond from a surety and in form acceptable to the Owner or otherwise) within thirty (30) days of the Construction Manager's receipt of the notice thereof. If the Construction Manager fails to cause such lien to be discharged within such thirty (30) day period, the Owner shall have the right to withhold the next progress payment until such lien is discharged to the satisfaction of the Owner. The Construction Manager agrees to indemnify and hold harmless the Owner from all costs and expenses incurred by the Owner in connection with such liens unless such liens result from the Owner's failure to comply with its payment obligations under the Agreement.

ARTICLE 13 TERMINATION OR SUSPENSION

§ 13.1 Termination Prior to Execution of the Guaranteed Maximum Price Amendment

§ 13.1.1 If the Owner and the Construction Manager do not reach an agreement on the Guaranteed Maximum Price, the Owner may terminate this Agreement upon not less than seven days' written notice to the Construction Manager, and the Construction Manager may terminate this Agreement, upon not less than seven days' written notice to the Owner.

§ 13.1.2 In the event of termination of this Agreement pursuant to Section 13.1.1, the Construction Manager shall be compensated for Preconstruction Phase services and Work performed prior to receipt of a notice of termination, in accordance with the terms of this Agreement. In no event shall the Construction Manager's compensation under this Section exceed the compensation set forth in Section 5.1.

§ 13.1.3 Prior to the execution of the Guaranteed Maximum Price Amendment, the Owner may terminate this Agreement upon not less than seven days' written notice to the Construction Manager for the Owner's convenience and without cause, and the Construction Manager may terminate this Agreement, upon not less than seven days' written notice to the Owner, for the reasons set forth in Article 14 of the General Conditions.

§ 13.1.4 In the event of termination of this Agreement pursuant to Section 13.1.3, the Construction Manager shall be equitably compensated for Preconstruction Phase services and Work performed prior to receipt of a notice of termination. In no event shall the Construction Manager's compensation under this Section exceed the compensation set forth in Section 5.1.

§ 13.1.5 If the Owner terminates the Contract pursuant to Section 13.1.3 after the commencement of the Construction Phase but prior to the execution of the Guaranteed Maximum Price Amendment, the Owner shall pay to the Construction Manager an amount calculated as follows, which amount shall be in addition to any compensation paid to the Construction Manager under Section 13.1.4:

.1 Take the Cost of the Work incurred by the Construction Manager to the date of termination;

.2 Add the Construction Manager's Fee computed upon the Cost of the Work to the date of termination at the rate stated in Section 6.1 or, if the Construction Manager's Fee is stated as a fixed sum in that Section, an amount that bears the same ratio to that fixed-sum Fee as the Cost of the Work at the time of termination bears to a reasonable estimate of the probable Cost of the Work upon its completion; and

.3 Subtract the aggregate of previous payments made by the Owner for Construction Phase services.

§ 13.1.6 The Owner shall also pay the Construction Manager fair compensation, either by purchase or rental at the election of the Owner, for any equipment owned by the Construction Manager that the Owner elects to retain and that is not otherwise included in the Cost of the Work under Section 13.1.5.1. To the extent that the Owner elects to take legal assignment of subcontracts and purchase orders (including rental agreements), the Construction Manager shall, as a condition of receiving the payments referred to in this Article 13, execute and deliver all such papers and take all such steps, including the legal assignment of such subcontracts and other contractual rights of the Construction Manager, as the

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Owner may require for the purpose of fully vesting in the Owner the rights and benefits of the Construction Manager under such subcontracts or purchase orders. All Subcontracts, purchase orders and rental agreements entered into by the Construction Manager will contain provisions allowing for assignment to the Owner as described above.

§ 13.1.6.1 If the Owner accepts assignment of subcontracts, purchase orders or rental agreements as described above, the Owner will reimburse or indemnify the Construction Manager for all costs arising under the subcontract, purchase order or rental agreement, if those costs would have been reimbursable as Cost of the Work if the contract had not been terminated. If the Owner chooses not to accept assignment of any subcontract, purchase order or rental agreement that would have constituted a Cost of the Work had this agreement not been terminated, the Construction Manager will terminate the subcontract, purchase order or rental agreement and the Owner will pay the Construction Manager the documented costs necessarily incurred by the Construction Manager because of such termination.

§13.1.7 Upon payment by the Owner of the amounts required under this Section 13.1, the Owner's obligations to the Construction Manager shall be fully satisfied, and the Construction Manager shall be deemed to have fully released the Owner from any claims or liabilities.

§ 13.2 Termination or Suspension Following Execution of the Guaranteed Maximum Price Amendment
§ 13.2.1 Termination
The Contract may be terminated by the Owner or the Construction Manager as provided in Article 14 of the General Conditions.

§ 13.2.2 Termination by the Owner for Cause
§ 13.2.2.1 If the Owner terminates the Contract for
(Paragraphs deleted)
reasons other than the fault of the Construction Manager or its Subcontractors after execution of the Guaranteed Maximum Price Amendment, the amount payable to the Construction Manager pursuant to Sections 14.2 and 14.4 of the General Conditions shall not exceed the amount the Construction Manager would otherwise have received pursuant to Sections 13.1.2 and 13.1.5 of this Agreement. In the case of termination by the Owner for cause, the Owner's payment obligations to the Construction Manager shall be subject to the provisions of Section 14.2.4 of the General Conditions.

§ 13.2.2.2 The Owner shall also pay the Construction Manager fair compensation, either by purchase or rental at the election of the Owner, for any equipment owned by the Construction Manager that the Owner elects to retain and that is not otherwise included in the Cost of the Work under Section 13.2.2.1.1. To the extent that the Owner elects to take legal assignment of subcontracts and purchase orders (including rental agreements), the Construction Manager shall, as a condition of receiving the payments referred to in this Article 13, execute and deliver all such papers and take all such steps, including the legal assignment of such subcontracts and other contractual rights of the Construction Manager, as the Owner may require for the purpose of fully vesting in the Owner the rights and benefits of the Construction Manager under such subcontracts or purchase orders.

§ 13.2.3 Termination by the Owner for Convenience
If the Owner terminates the Contract for convenience in accordance with Article 14 of the General Conditions, then the Owner shall pay the Construction Manager
(Paragraphs deleted)
in accordance with the provisions of said Article 14.

§ 13.3 Suspension
The Work may be suspended by the Owner as provided in Article 14 of the General Conditions; in such case, the Guaranteed Maximum Price and Contract Time shall be increased as provided in Article 14 of the General Conditions, except that the term "profit" shall be understood to mean the Construction Manager's Fee as described in Sections 6.1 and 6.3.5 of this Agreement.

ARTICLE 14 MISCELLANEOUS PROVISIONS
§ 14.1 Unless otherwise expressly defined in this Agreement, the terms in this Agreement shall have the same meaning as those in the General Conditions. Where reference is made in this Agreement to a provision of the General Conditions or another Contract Document, the reference refers to that provision as amended or supplemented by other provisions of the Contract Documents.

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§ 14.2 Successors and Assigns

§ 14.2.1 The Owner and Construction Manager, respectively, bind themselves, their partners, successors, assigns and legal representatives to covenants, agreements, and obligations contained in the Contract Documents. Except as provided in Section 14.2.2 of this Agreement, and in Section 13.2.2 of the General Conditions, neither party to the Contract shall assign the Contract as a whole without written consent of the other. If either party attempts to make an assignment without such consent, that party shall nevertheless remain legally responsible for all obligations under the Contract.

§ 14.2.2 The Owner may, without consent of the Construction Manager, assign the Contract to a lender providing construction financing for the Project, if the lender assumes the Owner's rights and obligations under the Contract Documents. The Construction Manager shall execute all consents reasonably required to facilitate the assignment.

§ 14.3 Insurance and Bonds

§ 14.3.1 Preconstruction Phase

As described in this Agreement, in Exhibit B (Insurance and Bonds) and elsewhere in the Contract Documents, the Construction Manager shall purchase and maintain the following insurance for the duration of the Preconstruction Services performed under this Agreement. If any of the requirements set forth below exceed the types and limits the Construction Manager normally maintains, the Owner shall reimburse the Construction Manager for any additional cost.

§ 14.3.1.1 Commercial General Liability with policy limits of not less than One Million Dollars ($ 1,000,000.00) for each occurrence and Two Million Dollars ($ 2,000,000.00) in the aggregate for bodily injury and property damage.

§ 14.3.1.2 Automobile Liability covering vehicles owned, and non-owned vehicles used, by the Construction Manager with policy limits of not less than One Million Dollars ($ 1,000,000.00) per accident for bodily injury, death of any person, and property damage arising out of the ownership, maintenance and use of those motor vehicles, along with any other statutorily required automobile coverage.

§ 14.3.1.3 The Construction Manager may achieve the required limits and coverage for Commercial General Liability and Automobile Liability through a combination of primary and excess or umbrella liability insurance, provided that such primary and excess or umbrella liability insurance policies result in the same or greater coverage as the coverages required under Sections 14.3.1.1 and 14.3.1.2, and in no event shall any excess or umbrella liability insurance provide narrower coverage than the primary policy. The excess policy shall not require the exhaustion of the underlying limits only through the actual payment by the underlying insurers.

§ 14.3.1.4 Workers' Compensation at statutory limits and Employers Liability with policy limits not less than Five Hundred Thousand Dollars ($ 500,000.00) each accident, Five Hundred Thousand Dollars ($ 500,000.00) each employee for disease, and Five Hundred Thousand Dollars ($ 500,000.00) policy limit coverage for disease.

§ 14.3.1.5 Professional Liability covering negligent acts, errors and omissions in the performance of professional services, with policy limits of not less than Five Million Dollars ($ 5,000,000.00) per claim and Five Million Dollars ($ 5,000,000.00) in the aggregate.

§ 14.3.1.6 Other Insurance

(List below any other insurance coverage to be provided by the Construction Manager and any applicable limits.)

Coverage	Limits
See Exhibit B (Insurance and Bonds)	

§ 14.3.1.7 Additional Insured Obligations. To the fullest extent permitted by law, the Construction Manager shall cause the primary and excess or umbrella polices for Commercial General Liability and Automobile Liability to include The Town of Greenwich, the Greenwich Board of Education, the Old Greenwich School Building Committee and the State of Connecticut as an additional insured for claims caused in whole or in part by the Construction Manager's negligent acts or omissions. The additional insured coverage shall be primary and non-contributory to any of the Owner's insurance policies and shall apply to both ongoing and completed operations.

§ 14.3.1.8 The Construction Manager shall provide certificates of insurance to the Owner that evidence compliance with the requirements in this Section 14.3.1.

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§ 14.3.2 Construction Phase
After execution of the Guaranteed Maximum Price Amendment, the Owner and the Construction Manager shall purchase and maintain insurance as set forth in Exhibit B (Insurance and Bonds) to this Agreement and elsewhere in the Contract Documents.

§ 14.3.2.1 The Construction Manager shall provide Performance, Maintenance and Payment bonds as set forth in Exhibit B, and elsewhere in the Contract Documents.

§ 14.4 Notice in electronic format, pursuant to Article 1 of AIA Document A201–2017, may be given in accordance with AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, if completed, or as otherwise set forth below:
(If other than in accordance with AIA Document E203-2013, insert requirements for delivering notice in electronic format such as name, title, and email address of the recipient and whether and how the system will be required to generate a read receipt for the transmission.)

§ 14.5 Other provisions:

§ 14.5.1 The Construction Manager's representative is designated in Section 1.1.12 of this Agreement and shall have express authority to bind the Construction Manager with respect to all matters under the Contract Documents. The term "Construction Manager" means the Construction Manager or the Construction Manager's authorized representative. Such representative may only be changed with the consent of the Owner.

§ 14.6 Submission by the Owner of a final grant application to the applicable Agencies shall not constitute a waiver of any Claims by the Owner.

§ 14.7 STATUTORY PROVISIONS
§ 14.7.1 Out of State Contractors and Subcontractors
If the Construction Manager is an "unverified contractor," as each such term as defined in Section 12-430(7)(A) of the Connecticut General Statutes, as revised, the Construction Manager shall comply fully with the provisions of Section 12-430(7)(C) and, prior to commencing the Work, shall furnish the Owner with a copy of the requisite certificate of compliance set forth in subparagraph (B) of Section 12-430(7).

§ 14.7.2 Payment of Subcontractors. The following is required pursuant to Section 49-41a of the Connecticut General Statutes. Notwithstanding, if the payment requirements set forth in Section 5.5 of the General Conditions require prompter payment, the Construction Manager shall comply with such requirement.

§ 14.7.2.1 The Construction Manager shall pay any amounts due any Subcontractor, whether for labor performed or materials furnished, within thirty (30) days of the date the Owner pays the Construction Manager for such labor or materials.

§ 14.7.2.2 The Construction Manager shall require in its agreements with each Subcontractor that such Subcontractor shall pay any amounts due any Sub-subcontractor, whether for labor performed or materials furnished, within thirty (30) days of the date the Construction Manager pays the Subcontractor for such labor or materials.

§ 14.7.3 Prevailing Wage
To the extent required under Section 31-53 of the Connecticut General Statutes, the wages paid on a hourly basis to any mechanic, laborer or workman employed upon the work herein contracted to be done and the amount of payment or contribution paid or payable on behalf of each such employee to any employee welfare fund, as defined in subsection (h) of Section 31-53 of the General Statutes of Connecticut shall be at a rate equal to the rate customary or prevailing for the same work in the same trade or occupation in the town in which such public works project is being constructed. Any contractor who is not obligated by agreement to make such payment or contribution on behalf of such employees to any such employee welfare fund shall pay to each employee as part of their wages the amount of the payment of contribution for their classification on each pay day.

§ 14.7.4 Safety Training

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To the extent required pursuant to Connecticut General Statute Section 31-53b, the Construction Manager shall furnish proof, and shall cause its Subcontractors to furnish proof, with the weekly certified payroll form for the first week each employee begins work on such project that any person performing the work of a mechanic, laborer or worker pursuant to the classifications of labor under section 31-53 on such public works project, pursuant to such contract, has completed a course of at least ten hours in duration in construction safety and health approved by the federal Occupational Safety and Health Administration or, has completed a new miner training program approved by the Federal Mine Safety and Health Administration in accordance with 30 CFR 48 or, in the case of telecommunications employees, has completed at least ten hours of training in accordance with 29 CFR 1910.268. If the date of this Agreement is on or after July 1, 2012, the Construction Manager shall also furnish proof, and shall cause its Subcontractors to furnish proof, that any plumber or electrician subject to the continuing education requirements of section 20-334d, who has completed a course of at least ten hours in duration in construction safety and health approved by the federal Occupational Safety and Health Administration five or more years prior to the date such electrician or plumber begins work on such public works project, has completed a supplemental refresher training course of at least four hours in duration in construction safety and health taught by a federal Occupational Safety and Health Administration authorized trainer.

§ 14.7.5 Local Labor

To the extent consistent with any provision regarding residence requirements contained in a collective bargaining agreement to which the Construction Manager is a party, in the employment of labor to perform the work specified herein, preference shall be given to citizens of the United States, who are, and continuously for at least three months prior to the date hereof have been, residents of the labor market area, as established by the Labor Commissioner, in which such work is to be done, and if no such qualified person is available, then to citizens who have continuously resided in the county in which the work is to be performed for at least three months prior to the date hereof, and then to citizens of the state who have continuously resided in the state at least three months prior to the date hereof. [CGS §31-52]

§ 14.7.6 Compliance with Law/School Safety

§ 14.7.6.1 Contractor shall comply with all applicable laws including, without limitation, Connecticut General Statutes Section 10-222c, as applicable.

§ 14.7.6.2 The scope of the Work does not, and will not under any circumstances, require any contact with students. The Construction Manager, its Subcontractors, and their respective employees, agents and representatives are hereby prohibited from making any verbal, physical, telephonic or electronic contact of any kind with any student or any other minor person on school property including, without limitation, the Project site, whether inside or outside of any school facility. The Construction Manager shall immediately remove any individual performing Work on the Project from school property and from the Project if it becomes known to the Construction Manager that such person may be a danger to the health or safety of the school community or its students, or at the request of the Owner, in its sole discretion. The Construction Manager shall include, and shall require its subcontractors to include, this section in all subcontracts for the Project.

§ 14.8 Background and Employment History Checks.

§ 14.8.1 To the extent permitted by law, the Contractor shall perform (or cause to be performed) as regards all of its employees, agents, and representatives (each, a "Contractor Employee"), and all of the employees, agents, and representatives of Subcontractors and Sub-subcontractors (each, a "Subcontractor Employee"), who will be physically present on the School Grounds in connection with the Project, appropriate background checks on all such Contractor Employees and Subcontractor Employees. Such background checks shall include, at a minimum and without limitation, a search of both the Connecticut Department of Emergency Services and Public Protection's sexual offender registry and the Abuse and Neglect Registry of the Connecticut Department of Children and Families. For those Contractor Employees and Subcontractor Employees who are to be physically present on the School Grounds in connection with the Project and whose current or most recent employment occurred out of state, the out-of-state equivalent of the Connecticut Department of Emergency Services and Public Protection's sexual offender registry and the Abuse and Neglect Registry of the Connecticut Department of Children and Families registry shall be checked. The Contractor shall complete (or cause to be completed) background checks as to each Contractor Employee and Subcontractor Employee prior to such Contractor Employee or Subcontractor Employee being permitted to be physically present on the School Grounds. If the Contractor receives any information indicating that any Contractor Employee or Subcontractor Employee may be registered as a sexual offender, may have a record of abuse or neglect, or is, in any other manner, unfit to perform services which could involve direct contact with minor children, or which may involve working in or near property on which minor children may be present, the Contractor shall immediately forward such information to the Owner, to the extent permitted by law, and shall immediately remove the individual from the School Grounds and from participation in the Project.

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§ 14.8.2 Contractor represents and warrants that, in its best professional judgment, each Contractor Employee and each Subcontractor Employee maintains the appropriate qualifications and is fit to perform services which could involve direct contact with minor children, or which may involve working in or near property on which minor children may be present. The Contractor shall immediately remove any Contractor Employee or Subcontractor Employee from the School Grounds and from the Project if requested to do so by the Owner (which request shall be made in the Owner's sole discretion) or if it becomes known to the Contractor that such Contractor Employee or Subcontractor Employee may be a danger to the health, safety or well-being of the school community, its students, or any minor children.

§ 14.8.3 The Contractor shall include and shall require all Subcontractors to include this Section 14.8 in all subcontracts for the Project.

§ 14.8.4 By execution of the Contract, the Contractor represents and warrants that it has fully complied with the requirements of this Section 14.8. To the extent permitted by law, the Contractor agrees that upon the Owner's request, Contractor shall promptly provide the Owner with any documentation related to such compliance, including, without limitation, the results of the background and employment history checks required by this Section 14.9. Failure by the Contractor to comply with its obligations under this Section 14.8 shall constitute a material breach of the Contract.

§ 14.9 If any provision of this Agreement or any other contracts among the Contract Documents is found to be invalid or illegal by a court of competent jurisdiction, the remaining provisions shall remain in full force and effect and the parties agree to substitute for the invalid provision the provision within the bounds of the law which most clearly effectuates the legal and economic intent of the invalid provision.

ARTICLE 15 SCOPE OF THE AGREEMENT

§ 15.1 This Agreement represents the entire and integrated agreement between the Owner and the Construction Manager and supersedes all prior negotiations, representations or agreements, either written or oral. This Agreement may be amended only by written instrument signed by both Owner and Construction Manager.

§ 15.2 The following documents comprise the Agreement and each shall be included in the Contract Documents:

.1 AIA Document A133™–2019, Standard Form of Agreement Between Owner and Construction Manager as Constructor where the basis of payment is the Cost of the Work Plus a Fee with a Guaranteed Maximum Price, as herein modified

.2 AIA Document A133™-2019, as may be modified, Exhibit A, Guaranteed Maximum Price Amendment, if executed

.3 AIA Document A133™–2019, Exhibit B, Insurance and Bonds, as modified

.4 AIA Document A201™–2017, General Conditions of the Contract for Construction, as modified

.5 Owner's Request for Proposal #2408-23 dated February 23, 2023, and Addenda (collectively, the "RFP")

.6 Construction Manager's Proposal dated March 23, 2023, in response to the RFP but only to the extent that such proposal is not inconsistent or in conflict with the terms and conditions of any other Contract Document.

.7 AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, dated as indicated below:
(Insert the date of the E203-2013 incorporated into this Agreement.)

TBD

.8 Other Exhibits:
(Check all boxes that apply.)

[ ] AIA Document E234™–2019, Sustainable Projects Exhibit, Construction Manager as Constructor Edition, dated as indicated below:
(Insert the date of the E234-2019 incorporated into this Agreement.)

[ ] Supplementary and other Conditions of the Contract:

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Document	Title	Date	Pages

.9 Other documents, if any, listed below:
(List here any additional documents that are intended to form part of the Contract Documents. AIA Document A201–2017 provides that the advertisement or invitation to bid, Instructions to Bidders, sample forms, the Construction Manager's bid or proposal, portions of Addenda relating to bidding or proposal requirements, and other information furnished by the Owner in anticipation of receiving bids or proposals, are not part of the Contract Documents unless enumerated in this Agreement. Any such documents should be listed here only if intended to be part of the Contract Documents.)

Attachment 1 – Educational Specifications
Schedule 1 – Hourly Rates

This Agreement is entered into as of the day and year first written above.

DocuSigned by:
3975930D3CA54E3...

OWNER *(Signature)*
James Waters Chairman, OGS Building Committee
(Printed name and title)

DocuSigned by:
David N Patrick
816A278665BB497...

CONSTRUCTION MANAGER *(Signature)*
David N. Patrick President
(Printed name and title)

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AIA® Document A201® – 2017

General Conditions of the Contract for Construction

for the following PROJECT:
(Name and location or address)

Renovations and Addition to Old Greenwich School Project
285 Sound Beach Road
Old Greenwich, CT 06870

THE OWNER:
(Name, legal status and address)

Board of Education of the Town of Greenwich,
acting by and through the Old Greenwich School Building Committee
Havemeyer Building
290 Greenwich Avenue
Greenwich, CT 06830

THE ARCHITECT:
(Name, legal status and address)

Silver Petrucelli & Associates, Inc.
3190 Whitney Avenue
Hamden, CT 06518

ADDITIONS AND DELETIONS:
The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes added information as well as revisions to the standard form text is available from the author and should be reviewed. A vertical line in the left margin of this document indicates where the author has added necessary information and where the author has added to or deleted from the original AIA text.

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

For guidance in modifying this document to include supplementary conditions, see AIA Document A503™, Guide for Supplementary Conditions.

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14 TERMINATION OR SUSPENSION OF THE CONTRACT

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ARTICLE 1 GENERAL PROVISIONS

§ 1.1 Basic Definitions

§ 1.1.1 The Contract Documents

The Contract Documents are enumerated in the Agreement between the Owner and Contractor (hereinafter the Agreement) and consist of the Agreement, Conditions of the Contract (General, Supplementary and other Conditions), Drawings, Specifications, Addenda and consultant and investigative reports issued prior to execution of the Contract, other documents listed in the Agreement, and Modifications issued after execution of the Contract. A Modification is (1) a written amendment to the Contract signed by both parties, (2) a Change Order, (3) a Construction Change Directive, or (4) a written order for a minor change in the Work issued by the Architect. Unless specifically enumerated in the Agreement, the Contract Documents do not include the advertisement or invitation to bid, Instructions to Bidders, sample forms, other information furnished by the Owner in anticipation of receiving bids or proposals, the Contractor's bid or proposal, or portions of Addenda relating to bidding or proposal requirements.

§ 1.1.2 The Contract

The Contract Documents form the Contract for Construction. The Contract represents the entire and integrated agreement between the parties hereto and supersedes prior negotiations, representations, or agreements, either written or oral. The Contract may be amended or modified only by a Modification. The Contract Documents shall not be construed to create a contractual relationship of any kind (1) between the Contractor and the Architect or the Architect's consultants, (2) between the Owner and a Subcontractor or a Sub-subcontractor, (3) between the Owner and the Architect or the Architect's consultants, or (4) between any persons or entities other than the Owner and the Contractor. The Architect shall, however, be entitled to performance and enforcement of obligations under the Contract intended to facilitate performance of the Architect's duties.

§ 1.1.3 The Work

The term "Work" means the construction and services required by, reasonably inferable from, and as necessary to produce the results intended by, the Contract Documents, whether performed on or off the site of the Project and whether completed or partially completed, and includes all other labor, materials, equipment, and services provided or to be provided by the Contractor, its Subcontractors, Sub-Subcontractors, material suppliers or any other entity for whom the Contractor is responsible, to fulfill the Contractor's obligations under or pursuant to the Contract Documents and, except to the extent inconsistent with the Contract Documents, such construction and services as are usually and customarily provided in conjunction with, or in furtherance of, such obligations. The Work may constitute the whole or a part of the Project.

§ 1.1.4 The Project

The Project is the total construction of which the Work performed under the Contract Documents may be the whole or a part and which may include construction by the Owner and by Separate Contractors.

§ 1.1.5 The Drawings

The Drawings are the graphic and pictorial portions of the Contract Documents showing the design, location and dimensions of the Work, generally including plans, elevations, sections, details, schedules, and diagrams.

§ 1.1.6 The Specifications

The Specifications are that portion of the Contract Documents consisting of the written requirements for materials, equipment, systems, standards and workmanship for the Work, and performance of related services.

§ 1.1.7 Instruments of Service

Instruments of Service are representations, in any medium of expression now known or later developed, of the tangible and intangible creative work performed by the Architect and the Architect's consultants under their respective professional services agreements. Instruments of Service may include, without limitation, studies, surveys, models, sketches, drawings, specifications, and other similar materials.

§ 1.1.8 Initial Decision Maker

The Initial Decision Maker is the person identified in the Agreement to render initial decisions on Claims in accordance with Section 15.2. The Initial Decision Maker shall not show partiality to the Owner or Contractor and shall not be liable for results of interpretations or decisions rendered in good faith.

§1.1.9 CONTRACTOR

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The term "Contractor" as used in these General Conditions shall mean the "Construction Manager" as defined in the Agreement.

§ 1.2 Correlation and Intent of the Contract Documents

§ 1.2.1 The intent of the Contract Documents is to include all items necessary for the proper execution and completion of the Work by the Contractor. The Contract Documents are complementary, and what is required by one shall be as binding as if required by all; performance by the Contractor shall be required only to the extent consistent with the Contract Documents and reasonably inferable from them as being necessary to produce the indicated results. If the Contractor discovers any inconsistency within or between parts of the Contract Documents or between the Contract Documents and any of the Applicable Laws (as defined in Section 2.2.1.1 of the Agreement), the Contractor shall give notice to the Owner and the Architect of such inconsistency and shall, unless otherwise ordered in writing by the Architect or the Owner, provide work or materials of the better quality, greater quantity, or that otherwise complies with applicable standards, codes or ordinances.

§ 1.2.1.1 The invalidity of any provision of the Contract Documents shall not invalidate the Contract or its remaining provisions. If it is determined that any provision of the Contract Documents violates any law, or is otherwise invalid or unenforceable, then that provision shall be revised to the extent necessary to make that provision legal and enforceable. In such case the Contract Documents shall be construed, to the fullest extent permitted by law, to give effect to the parties' intentions and purposes in executing the Contract.

§ 1.2.2 Organization of the Specifications into divisions, sections and articles, and arrangement of Drawings shall not control the Contractor in dividing the Work among Subcontractors or in establishing the extent of Work to be performed by any trade.

§ 1.2.3 Unless otherwise stated in the Contract Documents, words that have well-known technical or construction industry meanings are used in the Contract Documents in accordance with such recognized meanings.

§ 1.2.4 Where no explicit quality or standards for materials or workmanship are established for any portion of the Work, the Contractor shall perform such Work in a good and workman like manner and in a manner of good quality for the intended use and consistent with the quality of the surrounding Work and of the construction of the Project generally.

§ 1.2.5 All manufactured articles, materials and equipment shall be applied, installed, connected, erected, used, cleaned and conditioned in accordance with the manufacturer's written or printed directions and instructions unless otherwise indicated in the Contract Documents. Directions, specifications and recommendations by manufacturers for installation, handling, storing, adjustment, and operation of their materials or equipment shall be complied with, but the Contractor shall nonetheless have the responsibility for determining whether such directions, specifications, and recommendations may safely and suitably be employed in the Work, and for notifying the Architect in advance in writing of any deviation or modification necessary for installation safety or proper operation of the item

§ 1.3 Capitalization

Terms capitalized in these General Conditions include those that are (1) specifically defined, (2) the titles of numbered articles, or (3) the titles of other documents published by the American Institute of Architects.

§ 1.4 Interpretation

In the interest of brevity the Contract Documents frequently omit modifying words such as "all" and "any" and articles such as "the" and "an," but the fact that a modifier or an article is absent from one statement and appears in another is not intended to affect the interpretation of either statement.

§ 1.5 Ownership and Use of Drawings, Specifications, and Other Instruments of Service

§ 1.5.1 The Architect and the Architect's consultants shall, except to the extent otherwise provided in the agreement between the Owner and the Architect, be deemed the authors and owners of their respective Instruments of Service, including the Drawings and Specifications, and retain all common law, statutory, and other reserved rights in their Instruments of Service, including copyrights. The Contractor, Subcontractors, Sub-subcontractors, and suppliers shall not own or claim a copyright in the Instruments of Service. Submittal or distribution to meet official regulatory requirements or for other purposes in connection with the Project is not to be construed as publication in derogation of the reserved rights of the owner(s) of such Instruments of Service.

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§ 1.5.2 The Contractor, Subcontractors, Sub-subcontractors, and suppliers are authorized to use and reproduce the Instruments of Service provided to them, subject to any protocols established pursuant to Sections 1.7 and 1.8, solely and exclusively for execution of the Work. All copies made under this authorization shall bear the copyright notice, if any, shown on the Instruments of Service. The Contractor, Subcontractors, Sub-subcontractors, and suppliers may not use the Instruments of Service on other projects or for additions to the Project outside the scope of the Work without the specific written consent of the Owner, Architect, and the Architect's consultants.

§ 1.6 Notice

§ 1.6.1 Except as otherwise provided in Section 1.6.2, where the Contract Documents require one party to notify or give notice to the other party, such notice shall be provided in writing to the designated representative of the party to whom the notice is addressed and shall be deemed to have been duly served if delivered in person, by mail, by courier, or by electronic transmission if a method for electronic transmission is set forth in the Agreement.

§ 1.6.2 Notice of Claims as provided in Section 15.1.3 shall be provided in writing and shall be deemed to have been duly served only if delivered to the designated representative of the party to whom the notice is addressed by certified or registered mail, or by courier providing proof of delivery.

(Paragraphs deleted)

§ 1.6.3 Digital Data Use and Transmission

The parties shall agree upon protocols governing the transmission and use of Instruments of Service or any other information or documentation in digital form. The parties may use AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, to establish the protocols for the development, use, transmission, and exchange of digital data.

§ 1.7 CONTRACTOR'S STANDARD OF CARE

§ 1.7.1 The Contractor shall be responsible for the performance of the Work as an independent contractor and in a good and workmanlike manner (i) consistent with the Contract Documents; (ii) consistent with the instructions, guidance and direction of the Owner and Architect; (iii) consistent with the prevailing applicable professional or industry standards; (iv) consistent with sound practices; and (v) as expeditiously as is consistent with the foregoing (the standards of this Section 1.7.1 shall be referred to herein as the "Contractor's Standard of Care").

§ 1.7.2 The Contractor shall exercise the Contractor's Standard of Care in performing all aspects of the Work and its obligations under the Contract Documents. All references in the Contract Documents to the knowledge, inference, reliance, awareness, determination, belief, observation, recognition or discovery of the Contractor or reference to any similar term shall include the knowledge, inference, reliance, awareness, determination, belief, observation, recognition the Contractor would have obtained or achieved upon the exercise of the Contractor's Standard of Care

§ 1.8 Building Information Models Use and Reliance

Any use of, or reliance on, all or a portion of a building information model without agreement to protocols governing the use of, and reliance on, the information contained in the model and without having those protocols set forth in AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, and the requisite AIA Document G202™–2013, Project Building Information Modeling Protocol Form, shall be at the using or relying party's sole risk and without liability to the other party and its contractors or consultants, the authors of, or contributors to, the building information model, and each of their agents and employees.

ARTICLE 2 OWNER

§ 2.1 General

§ 2.1.1 The Owner is the person or entity identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The Owner shall designate in writing a representative who shall have express authority to bind the Owner with respect to all matters requiring the Owner's approval or authorization. Except as otherwise provided in Section 4.2.1, the Architect does not have such authority.

§ 2.1.2 The Owner shall furnish to the Contractor, within fifteen days after receipt of a written request, information necessary and relevant for the Contractor to evaluate, give notice of, or enforce mechanic's lien rights. Such information shall include a correct statement of the record legal title to the property on which the Project is located, usually referred to as the site, and the Owner's interest therein.

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§ 2.2 Evidence of the Owner's Financial Arrangements

§ 2.2.1 Intentionally Omitted.

§ 2.2.2 Intentionally Omitted.

§ 2.2.3 Intentionally Omitted

§ 2.2.4 Intentionally Omitted.

§ 2.3 Information and Services Required of the Owner

§ 2.3.1 Except for permits and related fees and filings that are the responsibility of the Contractor under the Contract Documents, including those required under Section 3.7.1, the Owner shall secure, file and pay for necessary approvals, easements, assessments and charges required for construction, use or occupancy of permanent structures or for permanent changes in existing facilities.

§ 2.3.2 The Owner shall retain an architect lawfully licensed to practice architecture, or an entity lawfully practicing architecture, in the jurisdiction where the Project is located. That person or entity is identified as the Architect in the Agreement and is referred to throughout the Contract Documents as if singular in number.

§ 2.3.3 If the employment of the Architect terminates, the Owner may employ a successor and whose status under the Contract Documents shall be that of the Architect.

§ 2.3.4 The Owner shall furnish surveys describing physical characteristics, legal limitations and utility locations for the site of the Project, and a legal description of the site to the extent required by the Contract Documents. Unless otherwise instructed by the Owner, the Contractor shall be entitled to rely on the accuracy of information furnished by the Owner but shall exercise proper precautions relating to the safe performance of the Work.

(Paragraph deleted)

§ 2.3. Intentionally Omitted.

§ 2.3.6 Unless otherwise provided in the Contract Documents, the Owner shall furnish to the Contractor one copy of the Contract Documents for purposes of making reproductions pursuant to Section 1.5.2.

§ 2.4 Owner's Right to Stop the Work

If the Contractor fails to correct Work that is not in accordance with the requirements of the Contract Documents as required by Section 12.2 or repeatedly fails to carry out Work in accordance with the Contract Documents, the Owner may issue a written order to the Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, the right of the Owner to stop the Work shall not give rise to a duty on the part of the Owner to exercise this right for the benefit of the Contractor, the Architect, or any other person or entity, except to the extent required by Section 6.1.3.

§ 2.5 Owner's Right to Carry Out the Work

If the Contractor defaults or neglects to carry out the Work in accordance with the Contract Documents and fails within a ten-day period after receipt of notice from the Owner to commence and continue correction of such default or neglect with diligence and promptness, the Owner may, without prejudice to other remedies the Owner may have, correct such default or neglect. The Architect may, pursuant to Section 9.5.1, withhold or nullify a Certificate for Payment in whole or in part, to the extent reasonably necessary to reimburse the Owner for the reasonable cost of correcting such deficiencies, including Owner's expenses and compensation for the Architect's additional services made necessary by such default, neglect, or failure. If current and future payments are not sufficient to cover such amounts, the Contractor shall pay the difference to the Owner at or prior to the date of Final Completion of the Work. The right of the Owner to so carry out such Work pursuant to this Section 2.5 shall not give rise to any duties on the part of the Owner to exercise this right for the benefit of the Contractor or any other person or entity. If the Contractor disagrees with the actions of the Owner or the Architect, or the amounts claimed as costs to the Owner, the Contractor may file a Claim pursuant to Article 15.

§ 2.6 ADDITIONAL RIGHTS

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§ 2.6.1 The rights stated in this Article 2 shall be in addition to and not in limitation of any other rights of the Owner provided in the Contract Documents, or as may be available to the Owner at law or in equity.

§ 2.6.2 Any data provided by the Owner to the Contractor concerning the physical characteristics or measurements of the components that comprise the Project site; access to the Project site or staging and storing at the Project site: present obstructions and conditions of structures on or near the Project site: locations and depths of sewers, conduits, pipes, and gas lines on or near the Project site; positions of sidewalks, curbs and pavements on or near the Project site and other data concerning the conditions of the Project site and its surroundings, have been obtained from sources the Owner believes to be reliable. Accuracy of such data, however, is not guaranteed and is furnished solely for accommodation of the Contractor. Use of such data is made at the Contractor's sole risk and Contractor releases and waives as against the Owner any claim for damages arising from any defect in or deficiency of the Contract Documents, including without limitation, the failure of the Contact Documents to comply with all Applicable Laws, it being understood and agreed that the Contractor's sole remedy will be to request a Change Order pursuant to the Contract.

ARTICLE 3 CONTRACTOR

§ 3.1 General

§ 3.1.1 The Contractor is the person or entity identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The Contractor and Subcontractors of every tier shall be lawfully licensed, if required in the jurisdiction where the Project is located. The Contractor shall designate in writing a representative who shall have express authority to bind the Contractor with respect to all matters under this Contract. The term "Contractor" means the Contractor or the Contractor's authorized representative.

§ 3.1.2 The Contractor shall be responsible for performance of the Work in accordance with the Contract Documents. The Contractor shall be responsible to the Owner for the performance, and the acts or omissions, of the Subcontractors, Sub-subcontractors and material or equipment suppliers. Any reference in the Contract Documents to the Contractor's performance, act, or omission, or reference to a similar term, shall include the performance, act, or omission of the Subcontractors, Sub-subcontractors and material or equipment suppliers.

§ 3.1.3 The Contractor shall not be relieved of its obligations to perform the Work in accordance with the Contract Documents either by activities or duties of the Architect in the Architect's administration of the Contract, or by tests, inspections or approvals required or performed by persons or entities other than the Contractor.

§ 3.1.4 The Contractor shall comply with all Applicable Laws including, without limitation, those relating to equal opportunity, labor, wages and employment.

§ 3.1.5 The Contractor shall comply, and shall cause Subcontractors of every tier to comply, with all accounting procedures and record retention policies reasonably requested by the Owner

§ 3.2 Review of Contract Documents and Field Conditions by Contractor

§ 3.2.1 Execution of the Contract by the Contractor is a representation that the Contractor has visited the site, become generally familiar with local conditions under which the Work is to be performed, and correlated personal observations with requirements of the Contract Documents. The provisions of this Section 3.2.1 shall not be construed to limit the investigative and review responsibilities of the Contractor under any other provisions of the Contract Documents.

§ 3.2.2 Because the Contract Documents are complementary, the Contractor shall, before starting each portion of the Work, carefully study and compare the various Contract Documents relative to that portion of the Work, as well as the information furnished by the Owner pursuant to Section 2.3.4, shall take field measurements of any existing conditions related to that portion of the Work, and shall observe any conditions at the site affecting it. These obligations are for the purpose of facilitating coordination and construction by the Contractor and are not for the purpose of discovering errors, omissions, or inconsistencies in the Contract Documents; however, the Contractor shall promptly report to the Owner and the Architect any errors, inconsistencies or omissions discovered by or made known to the Contractor as a request for information in such form as the Architect may require. It is recognized that the Contractor's review is made in the Contractor's capacity as a contractor and not as a licensed design professional, unless otherwise specifically provided in the Contract Documents. The execution of the Contract shall constitute a representation by the Contractor that the Contractor has carefully reviewed the Contract Documents, and that the

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Contract Documents are sufficiently detailed and complete to permit the Contractor, (i) to complete the Project for an amount not in excess of the Contact Sum, except for additional costs incurred due to changes in the Work approved by the Owner; (ii) complete the Work within the Contract Time and in accordance with the Contract Documents and all Applicable Laws. The Contractor is not required to ascertain that the Contract Documents are in accordance with all Applicable Laws, but the Contractor shall promptly report to the Owner and the Architect any nonconformity discovered by or made known to the Contractor as a request for information in such form as the Architect may require

§ 3.2.3 Execution by the Contractor of the Guaranteed Maximum Price Amendment, shall constitute a certification by the Contractor that it has taken all steps necessary to ascertain the nature and location of the Work, and the general and reasonably observable conditions which can or may affect the Work and/or the cost thereof. Failure by the Contractor to fully acquaint itself with conditions which may affect the Work and/or the cost thereof, including, but not limited to, conditions relating to transportation, handling, storage of materials, availability of labor, water, other known projects in the region, applicable provisions of law, and the character and availability of equipment and facilities needed preliminary to and during the prosecution the Work, shall not relieve the Contractor of its responsibilities under the Contract Documents and shall not constitute a basis for extension of time or any increase in the Contract Sum. Owner assumes no responsibility for any representations concerning conditions made by any of its officers, or employees or representatives, prior to the execution of the Contract, unless such representations are expressly stated in the Contract Documents. The Contractor shall not perform any construction activity it knows constitutes a recognized error, inconsistency or omission. If the Contractor performs any construction activity knowing it involves a recognized error, inconsistency or omission in the Contract Documents without reporting the error, inconsistency or omission to the Architect, the Contractor shall assume appropriate responsibility for such performance and shall bear an appropriate amount of the costs of correction.

§ 3.2.4 If the Contractor believes that additional cost or time is involved because of clarifications or instructions the Architect issues in response to the Contractor's notices or requests for information pursuant to this Article 3, the Contractor shall submit Claims as provided in Article 15. If the Contractor fails to perform the obligations of Sections 3.2.2 or 3.2.3, the Contractor shall pay such costs and damages to the Owner, subject to Section 15.1.7, as would have been avoided if the Contractor had performed such obligations. If the Contractor performs those obligations, the Contractor shall not be liable to the Owner or Architect for damages resulting from errors, inconsistencies or omissions in the Contract Documents, for differences between field measurements or conditions and the Contract Documents, or for nonconformities of the Contract Documents to Applicable Laws.

§ 3.2.5 If the Contractor fails to fulfill its obligations to report to the Architect or Owner under this Article 3, such failure shall preclude the Contractor from any subsequent Claim arising from or relating to the factors giving rise to the Contractor's obligation to make such report.

§ 3.2.6 The Contractor shall promptly inform the Owner and the Architect if the Contractor believes that a requirement of the Contract Documents is likely to have an adverse effect on the Project.

§ 3.2.7 The Owner assumes no contractual liability or responsibility for the physical condition or safety of the Project site or of any improvements thereon. Except as set forth in Section 10.3, the Contractor shall be solely responsible for providing safe conditions for the performance of the Work.

§ 3.3 Supervision and Construction Procedures

§ 3.3.1 The Contractor shall supervise and direct the Work, using the Contractor's best skill and attention. The Contractor shall be solely responsible for, and have control over, construction means, methods, techniques, sequences, and procedures, and for coordinating all portions of the Work under the Contract. If the Contract Documents give specific instructions concerning construction means, methods, techniques, sequences, or procedures, the Contractor shall evaluate the jobsite safety thereof and shall be solely responsible for the jobsite safety of such means, methods, techniques, sequences, or procedures. If the Contractor determines that such means, methods, techniques, sequences or procedures may not be safe, the Contractor shall give timely notice to the Owner and Architect, and shall propose alternative means, methods, techniques, sequences, or procedures. The Architect shall evaluate the proposed alternative solely for conformance with the design intent for the completed construction. Unless the Architect objects to the Contractor's proposed alternative, the Contractor shall perform the Work using its alternative means, methods, techniques, sequences, or procedures.

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§ 3.3.2 The Contractor shall be responsible to the Owner for acts and omissions of the Contractor's employees, Subcontractors and their agents and employees, and other persons or entities performing portions of the Work for, or on behalf of, the Contractor or any of its Subcontractors.

§ 3.3.3 The Contractor shall be responsible for inspection of portions of Work already performed to determine that such portions are in proper condition to receive subsequent Work.

§ 3.3.4 The Contractor shall schedule and perform the Work so as not to unreasonably interfere with any other related or unrelated work being performed by the Owner in or about the Project premises nor shall the Contractor unreasonably interfere with the Owner's school activities or operations on such premises. The Contractor shall coordinate its and its subcontractors' prosecution of the Work with the Owner and Owner's Designated Representative to minimize any such interference.

§ 3.3.5 The Contractor shall protect and prevent damage to all unfinished phases of the Work.

§ 3.4 Labor and Materials

§ 3.4.1 Unless otherwise provided in the Contract Documents, the Contractor shall provide and pay for labor, materials, equipment, tools, construction equipment and machinery, water, heat, utilities, transportation, and other facilities and services necessary for proper execution and completion of the Work, whether temporary or permanent and whether or not incorporated or to be incorporated in the Work.

§ 3.4.2 Except in the case of minor changes in the Work approved by the Architect in accordance with Section 3.12.8 or ordered by the Architect in accordance with Section 7.4, the Contractor may make substitutions only with the consent of the Owner, after evaluation by the Architect and in accordance with a Change Order or Construction Change Directive.

§ 3.4.3 The Contractor shall enforce strict discipline and good order among the Contractor's employees and other persons carrying out the Work. The Contractor shall not permit employment of unfit persons or persons not properly skilled in tasks assigned to them. All labor shall be performed by workmen skilled in their respective trades, and workmanship shall be of good quality so that first class work in accordance with the standards of construction set forth in the Contract Documents and the Contractor's Standard of Care will result.

§ 3.4.4 Substitutions

§ 3.4.4.1 When two or more products are specified for an item of Work, any one thereof is acceptable and the choice is left to the Contractor, with prior written notice to the Architect and the Owner. When only one product is specified and the term "or equal" is used in connection with the product, the Contractor may, if it so desires, offer a substitute product, and by so doing, Contractor shall be deemed to represent that the substitute product will completely accomplish the purpose of the Contract Documents. Requests for substitutions of products, materials or processes other than those specified shall be accompanied by evidence showing whether or not the proposed substitution:

.1 is equal in quality and serviceability to the specified item;
.2 will not entail changes in detail and construction of related Work;
.3 will be acceptable in consideration of the required design and artistic effect; and
.4 will not provide a cost disadvantage to the Owner.

The Contractor shall furnish with its request such Drawings, Specifications, samples, performance data and other information as may be required of it to assist the Architect and the Owner in determining whether the proposed substitution is acceptable. The burden of proof of the facts above stated shall be upon the Contractor, and no substitution shall be authorized except upon the prior written approval of Owner and the Architect. Nothing in this Section 3.4.4 shall limit the provisions of Sections 3.4.4.2 or 3.4.4.3.

§ 3.4.4.2 By making requests for substitutions based on Sections 3.4.2 and 3.4.4, the Contractor:

.1 represents that the Contractor has personally investigated the proposed substitute product and determines that it is equal or superior in all respects to that specified;
.2 represents that the Contractor will provide the same warranty for the substitution that the Contractor would for that specified;

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.3 certifies that the cost data presented is complete and includes all related costs under this Contract except the Architect's redesign costs, and waives all claims for additional costs related to substitution which subsequently become apparent; and

.4 shall coordinate the installation of the accepted substitution, making such changes as may be required for the Work to be complete in all respects.

§ 3.4.4.3 Approval by the Owner or Architect of any such substitution shall not relieve the Contractor of responsibility for any additional costs incurred by other trades for changes made necessary to accommodate the substituted item.

§ 3.5 Warranties

§ 3.5.1 The Contractor warrants to the Owner and Architect that materials and equipment furnished under the Contract will be of good quality and new unless the Contract Documents require or permit otherwise. The Contractor further warrants that the Work will conform to the requirements of the Contract Documents and will be free from defects, except for those inherent in the quality of the Work the Contract Documents require or permit. Work, materials, or equipment not conforming to these requirements may be considered defective. The Contractor's warranty excludes remedy for damage or defect caused by abuse, alterations to the Work not executed by the Contractor, improper or insufficient maintenance, improper operation, or normal wear and tear and normal usage. If required by the Architect, the Contractor shall furnish satisfactory evidence as to the kind and quality of materials and equipment. In the event the Work is performed in multiple phases, warranties required by the Contract documents shall commence at the completion of each such phase.

§ 3.5.2 All material, equipment, or other special warranties required by the Contract Documents shall be issued in the name of the Owner, or shall be transferable to the Owner, and shall commence in accordance with Section 9.8.4.

§ 3.5.3 The Contractor shall procure and assign to the Owner at the time of Substantial Completion of the Work any and all Subcontractor, manufacturer or supplier warranties relating to any materials and labor used in the Work. Such warranties shall supplement the warranties provided by the Contractor in Section 3.5.1.

§ 3.5.4 Substitutions not properly approved and authorized and work, materials or equipment which fail to perform under the proper use and normal wear for intended purposes shall be considered defective. If required by the Architect or the Owner, the Contractor shall furnish satisfactory evidence as to the kind and quality of materials and equipment to be incorporated in the Work.

§ 3.5.6 The warranties under this Section 3.5 shall be in addition to, and not a substitute for, any other rights of the Owner under the Contract Documents or existing in law or equity.

§3.5.6 The warranties set forth in this Section 3.5 shall survive final payment and termination of this Contract.

§ 3.6 Taxes

The Owner is a tax-exempt entity. The Contractor shall be familiar with the current regulations of the Connecticut Department of Revenue Services and the sales or use tax on materials or supplies exempted by such regulations shall not be included as part of the bid or the Contract Sum. A sales tax certificate is available upon written request.

§ 3.7 Permits, Fees, Notices and Compliance with Laws

§ 3.7.1 Unless otherwise provided in the Contract Documents, the Contractor shall secure and pay for the building permit as well as for other permits, fees, licenses, certifications and inspections by government agencies necessary for proper execution and completion of the Work that are customarily secured after execution of the Contract and required by Applicable Laws. The Contractor shall provide the Owner and Architect with reproductions of all permits, licenses, permissions, certifications and receipts for payments and, upon final completion, shall deliver all originals of such documents to the Owner with copies to the Architect.

§ 3.7.2 The Contractor shall comply with and give notices required by Applicable Laws.

§ 3.7.3 If the Contractor performs Work knowing it to be contrary to Applicable Laws, the Contractor shall assume appropriate responsibility for such Work and shall bear the costs attributable to correction.

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§ 3.7.4 Concealed or Unknown Conditions

If the Contractor encounters conditions at the site that are (1) subsurface or otherwise concealed physical conditions that differ materially from those indicated in the Contract Documents or (2) unknown physical conditions of an unusual nature that differ materially from those ordinarily found to exist and generally recognized as inherent in construction activities of the character provided for in the Contract Documents, the Contractor shall promptly provide notice to the Owner and the Architect before conditions are disturbed and in no event later than seven (7) days after first observance of the conditions. The Architect will promptly investigate such conditions and, if the Architect determines that they differ materially and cause an increase or decrease in the Contractor's cost of, or time required for, performance of any part of the Work, may recommend that an equitable adjustment be made in the Contract Sum or Contract Time, or both. If the Architect determines that the conditions at the site are not materially different from those indicated in the Contract Documents and that no change in the terms of the Contract is justified, the Architect shall promptly notify the Owner and Contractor, stating the reasons. If either party disputes the Architect's determination or recommendation, that party may submit a Claim as provided in Article 15.

§ 3.7.5 If, in the course of the Work, the Contractor encounters human remains or recognizes the existence of burial markers, archaeological sites or wetlands or other conditions that would warrant a suspicion that such matters are being encountered during the performance of the Work although they are not indicated in the Contract Documents, the Contractor shall immediately suspend any operations that would affect them and shall notify the Owner and Architect. Upon receipt of such notice, the Owner shall promptly take any action necessary to obtain governmental authorization required to resume the operations. The Contractor shall continue to suspend such operations until otherwise instructed by the Owner but shall continue with all other operations that do not affect those remains or features. Requests for adjustments in the Contract Sum and Contract Time arising from the existence of such remains or features may be made as provided in Article 15.

§ 3.8 Allowances

§ 3.8.1 The Contractor shall include in the Contract Sum all allowances stated in the Contract Documents. Items covered by allowances shall be supplied for such amounts and by such persons or entities as the Owner may direct, but the Contractor shall not be required to employ persons or entities to whom the Contractor has reasonable objection. In the event any allowance is exceeded, such excess shall be paid from the Construction Contingency.

§ 3.8.2 Unless otherwise provided in the Contract Documents,

.1 allowances shall cover the cost to the Contractor of materials and equipment delivered at the site and all required taxes, less applicable trade discounts;

.2 Contractor's costs for unloading and handling at the site, labor, installation costs, overhead, profit, and other expenses contemplated for stated allowance amounts shall, unless otherwise stated in the Contract Documents, be included in the Contract Sum but not in the allowances; and

.3 whenever costs are more than or less than allowances, the Contract Sum shall be adjusted accordingly by Change Order. The amount of the Change Order shall reflect (1) the difference between actual costs and the allowances under Section 3.8.2.1 and (2) changes in Contractor's costs under Section 3.8.2.2.

§ 3.8.3 Materials and equipment under an allowance shall be selected by the Owner with reasonable promptness.

§ 3.9 Superintendent

§ 3.9.1 The Contractor shall employ a competent superintendent and necessary assistants who shall be in attendance at the Project site during performance of the Work. The superintendent shall represent the Contractor, and communications given to the superintendent shall be as binding as if given to the Contractor.

§ 3.9.2 The Contractor, as soon as practicable after award of the Contract, shall notify the Owner and Architect of the name and qualifications of a proposed superintendent. Within 14 days of receipt of the information, the Architect may notify the Contractor, stating whether the Owner or the Architect (1) has reasonable objection to the proposed superintendent or (2) requires additional time for review. Failure of the Architect to provide notice within the 14-day period shall constitute notice of no reasonable objection.

§ 3.9.3 The Contractor shall not employ a proposed superintendent to whom the Owner or Architect has made reasonable and timely objection. The Contractor shall not change the superintendent without the Owner's prior written consent, which shall not unreasonably be withheld or delayed. The list of all supervisory personnel, including the project manager and superintendent that the Contractor intends to use on the Project and an organizational chart

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reflecting the chain of command among such personnel, shall be submitted to the Owner for approval prior to the commencement of the Work. The Contractor shall not engage supervisory personnel other than as approved by Owner in writing and shall not change such personnel without the prior written approval of the Owner.

§ 3.10 Contractor's Construction and Submittal Schedules

§ 3.10.1 The Contractor shall, as required pursuant to the Agreement, prepare and submit for the Owner's and Architect's approval a construction schedule for the Work (as approved by the Owner and the Architect, the "Construction Schedule"). The Construction Schedule (i) shall comply with all of the applicable requirements of, the Contract Documents; (ii) shall be revised (which revisions shall be subject to the approval of the Owner and the Architect) at appropriate intervals as determined by the Contractor and as required by the conditions of the Work and the Project; (iii) shall be related to the entire Project to the extent required by the Contract Documents, and (iv) shall provide for expeditious and practicable execution of the Work.

§ 3.10.2 The Contractor, promptly after being awarded the Contract and thereafter as necessary to maintain a current submittal schedule, shall submit a submittal schedule for the Architect's approval. The Architect's approval shall not be unreasonably delayed or withheld. The submittal schedule shall (1) be coordinated with the Contractor's construction schedule, and (2) allow the Architect reasonable time to review submittals. If the Contractor fails to submit a submittal schedule or fails to provide submittals in accordance with the approved submittal schedule, the Contractor shall not be entitled to any increase in Contract Sum or extension of Contract Time based on the time required for review of submittals.

§ 3.10.3 The Contractor shall perform the Work in general accordance with the most recent schedules submitted to, and approved by, the Owner and Architect.

§ 3.10.4 The Construction Schedule shall be in such detail and include such content as required by the Owner. If the Owner requires a precedence-style critical path method (CPM), the Construction Schedule shall: (i) provide a graphic representation of all activities and events that will occur during performance of the Work: (ii) identify each phase of construction and occupancy (if applicable); and (iii) set forth dates that are critical in ensuring the timely and orderly completion of the Work (hereinafter referred to as "Milestone Dates"). Upon review and acceptance by the Owner of the Milestone Dates, the Construction Schedule shall be attached to the Agreement as Schedule __TBD__. If not accepted, the Construction Schedule shall be promptly revised by the Contractor in accordance with the recommendations of the Owner and the Architect and resubmitted for acceptance. The Contractor shall monitor the progress of the Work for conformance with the requirements of the Construction Schedule and shall promptly advise the Owner of any delays or potential delays. The accepted Construction Schedule shall be updated to reflect actual conditions ("Progress Reports") as set forth in Section 3.10.1 above or as otherwise requested by the Owner. In the event any Progress Report indicates any delays, the Contractor shall propose an affirmative plan to correct the delay, including overtime and/or additional labor, if necessary. In no event shall any Progress Report constitute an adjustment in the Contract Time, any Milestone Date or the Contract Sum unless any such adjustment is agreed to by the Owner and authorized pursuant to Change Order.

§ 3.10.5 In the event the Owner determines that the performance of the Work as of a Milestone Date has not progressed or reached the level of completion required by the Contract Documents, the Owner shall have the right, but not the obligation, to order the Contractor to take corrective measures necessary to expedite the progress of construction, including, without limitation, (1) working additional shifts or overtime, (2) supplying additional manpower, equipment, and facilities, and (3) other similar measures (hereinafter referred to collectively as "Extraordinary Measures"). Such Extraordinary Measures shall continue until the progress of the Work complies with the stage of completion required by the Contract Documents. The Owner's right to require Extraordinary Measures is solely for the purposes of ensuring the Contractor's compliance with the Construction Schedule as adjusted for time extensions granted pursuant to Section 8.3. Except as provided in Section 8.3, the Contractor shall not be entitled to an adjustment in the Contract Sum in connection with Extraordinary Measures required by the Owner pursuant to this Section 3.10.5. The Owner may exercise the rights furnished the Owner under or pursuant to this Section 3.10.5 as frequently as the Owner deems necessary to ensure that that Contractor's performance of the Work will comply with any Milestone Date or the Substantial Completion Date, as the same may be extended by Change Order.

§ 3.10.6 The Owner shall have the right to direct a postponement or rescheduling of any date or time for the performance of any part of the Work that may interfere with the Owner's operations. Any postponement, rescheduling or performance of the Work under this Section 3.10.6 may be grounds for an extension of the Contract Time, if

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permitted under Section 8.3 and an equitable adjustment in the Contract Sum if: (1) the performance of the Work was properly scheduled by the Contractor in compliance with the requirements of the Contract Documents and (2) such rescheduling or postponement is requested by or required for the convenience of the Owner. Without limiting the foregoing, the Contractor will not be entitled to an extension of the Contract Time or an adjustment of the Contract Sum to the extent the interfering Work so interferes as a result of the negligent act or omission of the Contractor or its subcontractors of any tier or the failure of any of the same to perform the Work in a manner consistent with the Contract Documents, including Section 3.10.3 hereof.

§ 3.11 Documents and Samples at the Site

The Contractor shall make available, at the Project site, the Contract Documents, including Change Orders, Construction Change Directives, and other Modifications, in good order and marked currently to indicate field changes and selections made during construction, and the approved Shop Drawings, Product Data, Samples, and similar required submittals. These shall be in electronic form or paper copy, available to the Architect and Owner, and delivered to the Architect for submittal to the Owner upon completion of the Work as a record of the Work as constructed. The Contractor shall coordinate and cooperate with the Architect in the Architect's preparation of the "as constructed" electronic file for the Project.

§ 3.12 Shop Drawings, Product Data and Samples

§ 3.12.1 Shop Drawings are drawings, diagrams, schedules, and other data specially prepared for the Work by the Contractor or a Subcontractor, Sub-subcontractor, manufacturer, supplier, or distributor to illustrate some portion of the Work.

§ 3.12.2 Product Data are illustrations, standard schedules, performance charts, instructions, brochures, diagrams, and other information furnished by the Contractor to illustrate materials or equipment for some portion of the Work.

§ 3.12.3 Samples are physical examples that illustrate materials, equipment, or workmanship, and establish standards by which the Work will be judged.

§ 3.12.4 Shop Drawings, Product Data, Samples, and similar submittals are not Contract Documents. Their purpose is to demonstrate how the Contractor proposes to conform to the information given and the design concept expressed in the Contract Documents for those portions of the Work for which the Contract Documents require submittals. Review by the Architect is subject to the limitations of Section 4.2.7. Informational submittals upon which the Architect is not expected to take responsive action may be so identified in the Contract Documents. Submittals that are not required by the Contract Documents may be returned by the Architect without action.

§ 3.12.5 The Contractor shall review for compliance with the Contract Documents, approve, and submit to the Architect, Shop Drawings, Product Data, Samples, and similar submittals required by the Contract Documents, in accordance with the submittal schedule approved by the Architect or, in the absence of an approved submittal schedule, with reasonable promptness and in such sequence as to cause no delay in the Work or in the activities of the Owner or of Separate Contractors. The Contractor shall be responsible for the Owner's costs associated with the Architect's time for submittal review if any submittal must be reviewed by the Architect more than two (2) times due to the fault of the Contractor.

§ 3.12.6 By submitting Shop Drawings, Product Data, Samples, and similar submittals, the Contractor represents to the Owner and Architect that the Contractor has (1) reviewed and approved them, (2) determined and verified materials, field measurements and field construction criteria related thereto, or will do so, and (3) checked and coordinated the information contained within such submittals with the requirements of the Work and of the Contract Documents. The Contractor shall be responsible for the Owner's costs associated with the Architect's time for submittal review if any submittal must be reviewed by the Architect more than two (2) times due to the fault of the Contractor.

§ 3.12.7 The Contractor shall perform no portion of the Work for which the Contract Documents require submittal and review of Shop Drawings, Product Data, Samples, or similar submittals, until the respective submittal has been approved by the Architect.

§ 3.12.8 The Work shall be in accordance with approved submittals except that the Contractor shall not be relieved of responsibility for deviations from the requirements of the Contract Documents by the Architect's approval of Shop

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Drawings, Product Data, Samples, or similar submittals, unless the Contractor has specifically notified the Architect of such deviation at the time of submittal and (1) the Architect has given written approval to the specific deviation as a minor change in the Work, or (2) a Change Order or Construction Change Directive has been issued authorizing the deviation. The Contractor shall not be relieved of responsibility for errors or omissions in Shop Drawings, Product Data, Samples, or similar submittals, by the Architect's approval thereof.

§ 3.12.9 The Contractor shall direct specific attention, in writing or on resubmitted Shop Drawings, Product Data, Samples, or similar submittals, to revisions other than those requested by the Architect on previous submittals. In the absence of such notice, the Architect's approval of a resubmission shall not apply to such revisions.

§ 3.12.10 The Contractor shall not be required to provide professional services that constitute the practice of architecture or engineering unless such services are specifically required by the Contract Documents for a portion of the Work or unless the Contractor needs to provide such services in order to carry out the Contractor's responsibilities for construction means, methods, techniques, sequences, and procedures. The Contractor shall not be required to provide professional services in violation of Applicable Laws.

§ 3.12.10.1 If professional design services or certifications by a design professional related to systems, materials, or equipment are specifically required of the Contractor by the Contract Documents, the Owner and the Architect will specify all performance and design criteria that such services must satisfy. The Contractor shall be entitled to rely upon the adequacy and accuracy of the performance and design criteria provided in the Contract Documents. The Contractor shall cause such services or certifications to be provided by an appropriately licensed design professional that has been approved by the Owner and that carries such professional liability insurance as required by the Owner, whose signature and seal shall appear on all drawings, calculations, specifications, certifications, Shop Drawings, and other submittals prepared by such professional. Shop Drawings, and other submittals related to the Work, designed or certified by such professional, if prepared by others, shall bear such professional's written approval when submitted to the Architect. The Owner and the Architect shall be entitled to rely upon the adequacy and accuracy of the services, certifications, and approvals performed or provided by such design professionals, provided the Owner and Architect have specified to the Contractor the performance and design criteria that such services must satisfy. Pursuant to this Section 3.12.10, the Architect will review and approve or take other appropriate action on submittals only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents.

§ 3.12.10.2 If the Contract Documents require the Contractor's design professional to certify that the Work has been performed in accordance with the design criteria, the Contractor shall furnish such certifications to the Architect at the time and in the form specified by the Architect.

§ 3.13 Use of Site

The Contractor shall confine operations at the site to areas permitted by Applicable Laws and the Contract Documents and shall not unreasonably encumber the site with materials or equipment.

§ 3.14 Cutting and Patching

§ 3.14.1 The Contractor shall be responsible for cutting, fitting, or patching required to complete the Work or to make its parts fit together properly. All areas requiring cutting, fitting, or patching shall be restored to the condition existing prior to the cutting, fitting, or patching, unless otherwise required by the Contract Documents.

§ 3.14.2 The Contractor shall not damage or endanger a portion of the Work or fully or partially completed construction of the Owner or Separate Contractors by cutting, patching, or otherwise altering such construction, or by excavation. The Contractor shall not cut or otherwise alter construction by the Owner or a Separate Contractor except with written consent of the Owner and of the Separate Contractor. Consent shall not be unreasonably withheld. The Contractor shall not unreasonably withhold from the Owner or a Separate Contractor, its consent to cutting or otherwise altering the Work.

§ 3.15 Cleaning Up

§ 3.15.1 The Contractor shall keep the premises and surrounding area free from accumulation of waste materials and rubbish caused by operations under the Contract. At completion of the Work, the Contractor shall remove waste materials, rubbish, the Contractor's tools, construction equipment, machinery, and surplus materials from and about the Project and shall clean and/or remove all stains, spots, marks, blemishes, foreign matter and dirt from surfaces of

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the Work and from other surfaces not a part of the Work but where such condition resulted from the Contractor's operations.

§ 3.15.2 If the Contractor fails to clean up as provided in the Contract Documents, the Owner may do so and the Owner shall be entitled to reimbursement from the Contractor for the full cost of such clean up.

§ 3.16 Access to Work

The Contractor shall provide the Owner and Architect with access to the Work in preparation and progress wherever located.

§ 3.17 Royalties, Patents and Copyrights

The Contractor shall pay all royalties and license fees. The Contractor shall defend suits or claims for infringement of copyrights and patent rights, or failure to pay such royalty and license fees, and shall hold the Owner and Architect harmless from loss on account thereof, but shall not be responsible for defense or loss when a particular design, process, or product of a particular manufacturer or manufacturers is required by the Contract Documents, or where the copyright violations are contained in Drawings, Specifications, or other documents prepared by the Owner or Architect. However, if an infringement of a copyright or patent is discovered by, or made known to, the Contractor, the Contractor shall be responsible for such losses to the Owner unless the Contractor had furnished such information to the Owner and the Architect promptly upon obtaining such knowledge.

§ 3.18 Indemnification

§ 3.18.1 To the fullest extent permitted by law, the Contractor shall indemnify, defend and hold harmless the Owner, the Owner's Designated Representative, Architect, Architect's consultants, and the directors, officers, owners, agents and employees of any of them as well as the Building Committee appointed by the Owner for the Project, from and against claims, damages, losses, and expenses, including but not limited to attorneys' fees, arising out of or resulting from performance of the Work, provided that such claim, damage, loss, or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself), but only to the extent caused by the negligent acts or omissions of the Contractor, a Subcontractor, anyone directly or indirectly employed by them, or anyone for whose acts they may be liable, provided however that such indemnity obligations shall not include liability for damage arising out of bodily injury to person or damage to property caused by or resulting from the negligence of the indemnitee, such indemnitee's agents or employees. Such obligation shall not be construed to negate, abridge, or reduce other rights or obligations of indemnity that would otherwise exist as to a party or person described in this Section 3.18.

§ 3.18.2 In claims against any person or entity indemnified under this Section 3.18 by an employee of the Contractor, a Subcontractor, anyone directly or indirectly employed by them, or anyone for whose acts they may be liable, the indemnification obligation under Section 3.18.1 shall not be limited by a limitation on amount or type of damages, compensation, or benefits payable by or for the Contractor or a Subcontractor under workers' compensation acts, disability benefit acts, or other employee benefit acts.

§ 3.19 MEETINGS

§ 3.19.1 A qualified representative of the Contractor shall attend periodic progress meetings held at such time and as such place as the Architect or the Owner shall designate.

§ 3.19.2 The Contractor shall schedule and conduct progress meetings at the site on a bi-weekly basis (or interval appropriate for the level of jobsite activity). Attendance is required of each Subcontractor, supplier or other entity whose portion of the Work is currently the subject of concern or discussion or planning of future construction activities. Owner and Architect shall be provided with forty-eight (48) hour prior notice of each such progress meetings and be permitted to attend and participate in the meetings.

ARTICLE 4 ARCHITECT

§ 4.1 General

§ 4.1.1 The Architect is the person or entity retained by the Owner pursuant to Section 2.3.2 and identified as such in the Agreement.

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§ 4.1.2 Duties, responsibilities, and limitations of authority of the Architect as set forth in the Contract Documents shall not be restricted, modified, or extended without written consent of the Owner, Contractor, and Architect. Consent shall not be unreasonably withheld.

§ 4.2 Administration of the Contract

§ 4.2.1 The Architect will provide administration of the Contract as described in the Contract Documents and will be an Owner's representative (i) during construction; (ii) until the date that final payment under the Contract is due and payable; and (iii) with the concurrence of the Owner, during the one-year period described in Section 12.2. The Architect will have authority to act on behalf of the Owner only to the extent provided in the Contract Documents.

§ 4.2.2 The Architect will visit the site at intervals appropriate to the stage of construction, or as otherwise agreed with the Owner, to become familiar with the progress and quality of the portion of the Work completed, and to determine in general if the Work observed is being performed in a manner indicating that such portion of the Work is, and when the Work is fully completed, the entirety of the Work, will be in accordance with the Contract Documents. However, the Architect will not be required to make exhaustive or continuous on-site inspections to check the quality or quantity of the Work. The Architect will not have control over, charge of, or responsibility for the construction means, methods, techniques, sequences or procedures, or for the safety precautions and programs in connection with the Work, since these are solely the Contractor's rights and responsibilities under the Contract Documents.

§ 4.2.3 On the basis of the site visits, the Architect will keep the Owner reasonably informed about the progress and quality of the portion of the Work completed, and promptly report to the Owner (1) known deviations from the Contract Documents, (2) known deviations from the most recent construction schedule submitted by the Contractor, and (3) defects and deficiencies observed in the Work. The Architect will not be responsible for the Contractor's failure to perform the Work in accordance with the requirements of the Contract Documents. The Architect will not have control over or charge of and will not be responsible for acts or omissions of, the Contractor, Subcontractors, or their agents or employees, or any other persons or entities performing portions of the Work.

§ 4.2.4 Communications

The Owner and Contractor shall include the Architect in all communications that relate to or affect the Architect's services or professional responsibilities. The Owner shall promptly notify the Architect of the substance of any direct communications between the Owner and the Contractor otherwise relating to the Project. Communications by the Contractor with the Architect's consultants shall be through the Architect. Communications by the Architect with Subcontractors and suppliers shall be through the Contractor. Communications by and with Separate Contractors shall be through the Owner. The Contract Documents may specify other communication protocols.

§ 4.2.5 Based on the Architect's evaluations of the Contractor's Applications for Payment, the Architect will review and certify the amounts due the Contractor and will issue Certificates for Payment in such amounts.

§ 4.2.6 The Architect has authority to reject Work that does not conform to the Contract Documents. Whenever the Architect considers it necessary or advisable, the Architect will have authority to require inspection or testing of the Work in accordance with Sections 13.4.1, 13.4.2 and 13.4.3, whether or not the Work is fabricated, installed or completed. However, neither this authority of the Architect nor a decision made in good faith either to exercise or not to exercise such authority shall give rise to a duty or responsibility of the Architect to the Contractor, Subcontractors, suppliers, their agents or employees, or other persons or entities performing portions of the Work.

§ 4.2.7 The Architect will review and approve, or take other appropriate action upon, the Contractor's submittals such as Shop Drawings, Product Data, and Samples, but only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents. The Architect's action will be taken in accordance with the submittal schedule approved by the Architect or, in the absence of an approved submittal schedule, with reasonable promptness while allowing sufficient time in the Architect's professional judgment to permit adequate review. Review of such submittals is not conducted for the purpose of determining the accuracy and completeness of other details such as dimensions and quantities, or for substantiating instructions for installation or performance of equipment or systems, all of which remain the responsibility of the Contractor as required by the Contract Documents. The Architect's review of the Contractor's submittals shall not relieve the Contractor of the obligations under Sections 3.3, 3.5, and 3.12. The Architect's review shall not constitute approval of safety precautions or of any construction means, methods, techniques, sequences, or procedures that are not specified by the

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Architect or in the Contract Documents. The Architect's approval of a specific item shall not indicate approval of an assembly of which the item is a component.

§ 4.2.8 The Architect will prepare Change Orders and Construction Change Directives and may order minor changes in the Work as provided in Section 7.4. The Architect will investigate and make determinations and recommendations regarding concealed and unknown conditions as provided in Section 3.7.4.

§ 4.2.9 The Architect will conduct inspections to determine the date or dates of Substantial Completion and the date of final completion; issue Certificates of Substantial Completion pursuant to Section 9.8; receive and forward to the Owner, for the Owner's review and records, written warranties and related documents required by the Contract Documents and assembled by the Contractor pursuant to Section 9.10; and issue a final Certificate for Payment pursuant to Section 9.10.

§ 4.2.10 If the Owner and Architect agree, the Architect will provide one or more Project representatives to assist in carrying out the Architect's responsibilities at the site. The Owner shall notify the Contractor of any change in the duties, responsibilities and limitations of authority of the Project representatives.

§ 4.2.11 The Architect will interpret and decide matters concerning performance under, and requirements of, the Contract Documents on written request of either the Owner or Contractor. The Architect's response to such requests will be made in writing within any time limits agreed upon or otherwise with reasonable promptness.

§ 4.2.12 Interpretations and decisions of the Architect will be consistent with the intent of, and reasonably inferable from, the Contract Documents and will be in writing or in the form of drawings. When making such interpretations and decisions, the Architect will endeavor to secure faithful performance by both Owner and Contractor, will not show partiality to either, and will not be liable for results of interpretations or decisions rendered in good faith.

§ 4.2.13 The Architect's decisions on matters relating to aesthetic effect will be final if consistent with the intent expressed in the Contract Documents.

§ 4.2.14 The Architect will review and respond to requests for information about the Contract Documents. The Architect's response to such requests will be made in writing within any time limits agreed upon or otherwise with reasonable promptness. If appropriate, the Architect will prepare and issue supplemental Drawings and Specifications in response to the requests for information.

ARTICLE 5 SUBCONTRACTORS

§ 5.1 Definitions

§ 5.1.1 A Subcontractor is a person or entity who has a direct contract with the Contractor to perform a portion of the Work at the site. The term "Subcontractor" is referred to throughout the Contract Documents as if singular in number and means a Subcontractor or an authorized representative of the Subcontractor. The term "Subcontractor" does not include a Separate Contractor or the subcontractors of a Separate Contractor.

§ 5.1.2 A Sub-subcontractor is a person or entity who has a direct or indirect contract with a Subcontractor to perform a portion of the Work at the site. The term "Sub-subcontractor" is referred to throughout the Contract Documents as if singular in number and means a Sub-subcontractor or an authorized representative of the Sub-subcontractor.

§ 5.2 Award of Subcontracts and Other Contracts for Portions of the Work

§ 5.2.1 Unless otherwise stated in the Contract Documents, the Contractor, as soon as practicable after award of the Contract, shall notify the Owner and Architect of the persons or entities proposed for each principal portion of the Work, including those who are to furnish materials or equipment fabricated to a special design. Within 14 days of receipt of the information, the Architect may notify the Contractor whether the Owner or the Architect (1) has reasonable objection to the identity or fee proposal of any such proposed person or entity or (2) requires additional time for review. Failure of the Architect to provide notice within the 14-day period shall constitute notice of no reasonable objection.

§ 5.2.1.1 To facilitate and expedite the investigations of such proposed persons or entities, the Contractor shall, upon the Owner's request, provide to the Owner and Architect a list of the names and addresses of all prospective subcontractors and such other information as may be reasonably requested by the Owner.

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§ 5.2.2 The Contractor shall not contract with a proposed person or entity to whom the Owner or Architect has made reasonable and timely objection. The Contractor shall not be required to contract with anyone to whom the Contractor has made reasonable objection.

§ 5.2.3 If the Owner or Architect has reasonable objection to a person or entity proposed by the Contractor, the Contractor shall propose another to whom the Owner or Architect has no reasonable objection. If the proposed but rejected Subcontractor was reasonably capable of performing the Work, the Contract Sum and Contract Time shall be increased or decreased by the difference, if any, occasioned by such change, and an appropriate Change Order shall be issued before commencement of the substitute Subcontractor's Work. However, no increase in the Contract Sum or Contract Time shall be allowed for such change unless the Contractor has acted promptly and responsively in submitting names as required.

§ 5.2.4 The Contractor shall not substitute a Subcontractor, person, or entity for one previously selected if the Owner or Architect makes reasonable objection to such substitution. If the Contractor wishes to substitute a different person or entity for a person or entity previously selected and approved as a Subcontractor pursuant to this Section 5.2, the procedure set forth in Section 5.2.1 shall be followed.

§ 5.3 Subcontractual Relations

§ 5.3.1 Any part of the Work performed by a Subcontractor shall be pursuant to a written Subcontract between the Contractor and Subcontractor, which form of Subcontract shall be reasonably satisfactory to the Owner in all respects. Copies of all Subcontractor bids or proposals shall, upon request of Owner, be submitted to the Owner and Architect.

§ 5.3.2 By appropriate agreement, written where legally required for validity, the Contractor shall require each Subcontractor, to the extent of the Work to be performed by the Subcontractor, to be bound to the Contractor by terms of the Contract Documents, and to assume toward the Contractor all the obligations and responsibilities, including the responsibility for safety of the Subcontractor's Work, which the Contractor, by these Documents, assumes toward the Owner and Architect. Each subcontract agreement shall preserve and protect the rights of the Owner and Architect under the Contract Documents with respect to the Work to be performed by the Subcontractor so that subcontracting thereof will not prejudice such rights, and shall allow to the Subcontractor, unless specifically provided otherwise in the subcontract agreement, the benefit of all rights, remedies and redress against the Contractor that the Contractor, by the Contract Documents, has against the Owner. Where appropriate, the Contractor shall require each Subcontractor to enter into similar agreements with Sub-subcontractors. The Contractor shall make available to each proposed Subcontractor, prior to the execution of the subcontract agreement, copies of the Contract Documents to which the Subcontractor will be bound, and, upon written request of the Subcontractor, identify to the Subcontractor terms and conditions of the proposed subcontract agreement that may be at variance with the Contract Documents. Subcontractors will similarly make copies of applicable portions of such documents available to their respective proposed Sub-subcontractors.

§ 5.3.3 The Contractor shall be fully responsible for coordinating and expediting the work of all Subcontractors, and shall employ the necessary and qualified personnel to produce the required quality of labor and materials and to prevent delays in the progress of the Project. The Contractor shall afford each trade with all reasonable opportunities for the installation of its work and for the storage and handling of its materials.

§ 5.4 Contingent Assignment of Subcontracts

§ 5.4.1 Each subcontract agreement for a portion of the Work is assigned by the Contractor to the Owner, provided that

.1 assignment is effective only after termination of the Contract by the Owner for cause pursuant to, and in accordance with, Section 14.2 and only for those subcontract agreements that the Owner accepts by notifying the Subcontractor and Contractor; and

.2 assignment is subject to the prior rights of the surety, if any, obligated under bond relating to the Contract.

When the Owner accepts the assignment of a subcontract agreement, the Owner assumes the Contractor's rights and obligations under the subcontract.

§ 5.4.2 Upon such assignment, if the Work has been suspended for more than 30 days, the Subcontractor's compensation shall be equitably adjusted for increases in cost resulting from the suspension.

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§ 5.4.3 Upon assignment to the Owner under this Section 5.4, the Owner may further assign the subcontract to a successor contractor or other entity.

§ 5.5 Payment of Subcontractors

§ 5.5.1 After payment to Contractor by the Owner, the Contractor shall pay any amounts due any Subcontractor, whether for labor performed or materials furnished, when such labor or material has been included in a requisition submitted by such Contractor and paid by Owner. Such payments shall be made within ten (10) days after the Contractor receives payment from the Owner. The Contractor shall promptly give notice to the Owner of any claim or demand by a Subcontractor claiming that any amount is due to such Subcontractor or claiming any default by the Contractor in any of the Contractor's obligations to such Subcontractor.

§ 5.5.2 The Contractor shall include in each of the subcontracts a provision requiring each Subcontractor to pay any amounts due to any Sub-Subcontractors, whether for labor performed or materials furnished, within ten (10) days after such Subcontractor receives a payment from the Contractor which encompasses labor or materials furnished by such Sub-subcontractor and a provision requiring each Subcontractor to promptly give notice to the Contractor of any claim or demand by a Sub-subcontractor claiming that any amount is due to such Sub-Subcontractor or claiming any default by such Subcontractor in any of its obligations to such Sub-subcontractor which notice the Contractor shall promptly relay to the Owner.

ARTICLE 6 CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS

§ 6.1 Owner's Right to Perform Construction and to Award Separate Contracts

§ 6.1.1 The term "Separate Contractor(s)" shall mean other contractors retained by the Owner under separate agreements. The Owner reserves the right to perform construction or operations related to the Project with the Owner's own forces, and with Separate Contractors retained under Conditions of the Contract substantially similar to those of this Contract, including those provisions of the Conditions of the Contract related to insurance and waiver of subrogation.

§ 6.1.2 When separate contracts are awarded for different portions of the Project or other construction or operations on the site, the term "Contractor" in the Contract Documents in each case shall mean the Contractor who executes each separate Owner-Contractor Agreement.

§ 6.1.3 The Owner shall provide for coordination of the activities of the Owner's own forces and of each Separate Contractor with the Work of the Contractor, who shall cooperate with them. The Contractor shall participate with any Separate Contractors and the Owner in reviewing their construction schedules. The Contractor shall make any revisions to its construction schedule deemed necessary after a joint review and mutual agreement. The construction schedules shall then constitute the schedules to be used by the Contractor, Separate Contractors, and the Owner until subsequently revised.

§ 6.1.4 Intentionally Omitted.

§ 6.2 Mutual Responsibility

§ 6.2.1 The Contractor shall afford the Owner and Separate Contractors reasonable opportunity for introduction and storage of their materials and equipment and performance of their activities and shall connect and coordinate the Contractor's construction and operations with theirs as required by the Contract Documents.

§ 6.2.2 If part of the Contractor's Work depends for proper execution or results upon construction or operations by the Owner or a Separate Contractor, the Contractor shall, prior to proceeding with that portion of the Work, promptly notify the Architect of apparent discrepancies or defects in the construction or operations by the Owner or Separate Contractor that would render it unsuitable for proper execution and results of the Contractor's Work. Failure of the Contractor to notify the Architect of apparent discrepancies or defects prior to proceeding with the Work shall constitute an acknowledgment that the Owner's or Separate Contractor's completed or partially completed construction is fit and proper to receive the Contractor's Work. The Contractor shall not be responsible for discrepancies or defects in the construction or operations by the Owner or Separate Contractor that are not apparent.

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§ 6.2.3 The Contractor shall reimburse the Owner for costs the Owner incurs that are payable to a Separate Contractor because of the Contractor's delays, disruptions to the work of such Separate Contractor, improperly timed activities or defective construction. The Owner shall be responsible to the Contractor for costs the Contractor incurs because of a Separate Contractor's delays, disruptions to the Work, improperly timed activities, damage to the Work or defective construction.

§ 6.2.4 The Contractor shall promptly remedy damage that the Contractor wrongfully causes to completed or partially completed construction or to property of the Owner or Separate Contractor as provided in Section 10.2.5.

§ 6.2.5 The Owner and each Separate Contractor shall have the same responsibilities for cutting and patching as are described for the Contractor in Section 3.14.

§ 6.2.6 Upon the Owner's request, the Contractor shall defend any proceedings brought against the Owner by any separate contractor on account of any damage alleged to have been caused by the Contractor which arises from the Contractor's failure to comply with the terms and conditions of this Section 6.2.

§ 6.3 Owner's Right to Clean Up

If a dispute arises among the Contractor, Separate Contractors, and the Owner as to the responsibility under their respective contracts for maintaining the premises and surrounding area free from waste materials and rubbish, the Owner may clean up and the Architect will allocate the cost among those responsible.

ARTICLE 7 CHANGES IN THE WORK

§ 7.1 General

§ 7.1.1 Changes in the Work may be accomplished after execution of the Contract, and without invalidating the Contract, by Change Order, Construction Change Directive or order for a minor change in the Work, subject to the limitations stated in this Article 7 and elsewhere in the Contract Documents.

§ 7.1.2 A Change Order shall be based upon agreement among the Owner, Contractor, and Architect. A Construction Change Directive requires agreement by the Owner and Architect and may or may not be agreed to by the Contractor. An order for a minor change in the Work may be issued by the Architect alone.

§ 7.1.3 Changes in the Work shall be performed under applicable provisions of the Contract Documents. The Contractor shall proceed promptly with changes in the Work, unless otherwise provided in the Change Order, Construction Change Directive, or order for a minor change in the Work.

§ 7.2 Change Orders

§ 7.2.1 A Change Order is a written instrument prepared by the Architect and signed by the Owner, Contractor, and Architect stating their agreement upon all of the following:

.1 The change in the Work;
.2 The amount of the adjustment, if any, in the Contract Sum; and
.3 The extent of the adjustment, if any, in the Contract Time.

§ 7.2.2 A Change Order executed by the Owner and the Contractor shall constitute a final settlement of all matters relating to the subject matter of the Change Order including, without limitation, compensation to be paid in connection with any change in the Work required by the Change Order (provided that the Work that is the subject of such change is performed in a manner consistent with the provisions of the Contract Documents and the applicable Change Order), including but not limited to all direct and indirect costs, profit, overhead, extended overhead, loss of productivity and general conditions associated with such change, and any and all adjustments to the Contract Sum and to the Contract Time. In the event a Change Order affects an increase in the Contract Sum, Contractor shall include the work covered by such the Change Order in Applications for Payment for such work as if the work were originally part of the Work as set forth in the Contract Documents.

§ 7.2.3 Notwithstanding anything to the contrary set forth in these General Conditions, if the Agreement sets forth the methodology for calculating adjustments in the Contract Sum associated with a change in the Work, and if, under the terms of the Contract Documents, an adjustment in the Contract Sum would be required, then the adjustment will be

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based on such methodology unless otherwise mutually agreed by the parties. This paragraph shall be applicable in the case of a change in the Work effected by a Change Order as well as a Construction Change Directive.

§ 7.2.4 Unless otherwise instructed by the Owner, Change Orders shall be prepared on the form AIA G-701.

§ 7.3 Construction Change Directives

§ 7.3.1 A Construction Change Directive is a written order prepared by the Architect and signed by the Owner and Architect, directing a change in the Work prior to agreement on adjustment, if any, in the Contract Sum or Contract Time, or both. The Owner may by Construction Change Directive, without invalidating the Contract, order changes in the Work within the general scope of the Contract consisting of additions, deletions, or other revisions, the Contract Sum and Contract Time being adjusted accordingly.

§ 7.3.2 A Construction Change Directive shall be used in the absence of total agreement on the terms of a Change Order.

§ 7.3.3 If the Construction Change Directive provides for an adjustment to the Contract Sum, the adjustment shall be based on one of the following methods as selected by the Architect and approved by the Owner:

.1 Mutual acceptance of a lump sum properly itemized and supported by sufficient substantiating data to permit evaluation;

.2 Unit prices stated in the Contract Documents or subsequently agreed upon;

.3 Cost to be determined in a manner agreed upon by the parties and a mutually acceptable fixed or percentage fee; or

.4 As provided in Section 7.3.4.

§ 7.3.4 If the Contractor does not respond promptly or disagrees with the method for adjustment in the Contract Sum, the Architect shall determine the adjustment on the basis of reasonable expenditures and savings of those performing the Work attributable to the change, including, in case of an increase in the Contract Sum, an amount for overhead and profit as set forth in the Agreement, or if no such amount is set forth in the Agreement, a reasonable amount. In such case, and also under Section 7.3.3.3, the Contractor shall keep and present, in such form as the Architect may prescribe, an itemized accounting together with appropriate supporting data. Unless otherwise provided in the Contract Documents, costs for the purposes of this Section 7.3.4 shall be limited to the following:

.1 Costs of labor, including applicable payroll taxes, fringe benefits required by agreement or custom, workers' compensation insurance, and other employee costs approved by the Architect;

.2 Costs of materials, supplies, and equipment, including cost of transportation, whether incorporated or consumed;

.3 Rental costs of machinery and equipment, exclusive of hand tools, whether rented from the Contractor or others provided, if rented from the Contractor, such rental and the rental rates have been approved by the Owner;

.4 Costs of premiums for all bonds and insurance, permit fees, and sales, use, or similar taxes, directly related to the change; and

.5 Costs of supervision and field office personnel directly attributable to the change.

The costs described in Section 7.3.4.1 through and including 7.3.4.5 shall not include any of the following:

.1 Salaries and other compensation of the Contractor's personnel stationed at the Contractor's principal office or offices other than the site office, except as specifically approved by the Owner;

.2 Expenses of the Contractor's principal office and offices other than the site office;

.3 Overhead and general expenses, except as may be expressly included in Section 7.3.4;

.4 The Contractor's capital expenses, including interest on the Contractor's capital employed for the Work;

.5 Costs due to the negligence or failure of the Contractor, Subcontractors , material or equipment suppliers or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable to fulfill a specific responsibility of the Contract Documents; or

.6 Any cost not described in Section 7.3.4.

§ 7.3.5 If the Contractor disagrees with the adjustment in the Contract Time, the Contractor may make a Claim in accordance with applicable provisions of Article 15.

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§ 7.3.6 Upon receipt of a Construction Change Directive, the Contractor shall promptly proceed with the change in the Work involved and advise the Architect of the Contractor's agreement or disagreement with the method, if any, provided in the Construction Change Directive for determining the proposed adjustment in the Contract Sum or Contract Time.

§ 7.3.7 A Construction Change Directive signed by the Contractor indicates the Contractor's agreement therewith, including adjustment in Contract Sum and Contract Time or the method for determining them. Such agreement shall be effective immediately and shall be recorded as a Change Order.

§ 7.3.8 The amount of credit to be allowed by the Contractor to the Owner for a deletion or change that results in a net decrease in the Contract Sum shall be actual net cost as confirmed by the Architect. When both additions and credits covering related Work or substitutions are involved in a change, the allowance for overhead and profit shall be figured on the basis of net increase, if any, with respect to that change.

§ 7.3.9 Pending final determination of the total cost of a Construction Change Directive to the Owner, the Contractor may request payment for Work completed under the Construction Change Directive in Applications for Payment. The Architect will make an interim determination for purposes of monthly certification for payment for those costs and certify for payment the actual costs incurred by the Contractor as a result of such Construction Change Directive; provided, however, to the extent such Construction Change Directive is made necessary by the act or omission of the Contractor or of anyone for whom the Contractor is responsible, the Architect shall certify for payment the amount, if any, that the Architect determines, in the Architect's professional judgment, to be necessary for the Contractor to continue the Work. The Architect's interim determination of cost shall adjust the Contract Sum on the same basis as a Change Order, subject to the right of either party to disagree and assert a Claim in accordance with Article 15.

§ 7.3.10 When the Owner and Contractor agree with a determination made by the Architect concerning the adjustments in the Contract Sum and Contract Time, or otherwise reach agreement upon the adjustments, such agreement shall be effective immediately and the Architect will prepare a Change Order. Change Orders may be issued for all or any part of a Construction Change Directive.

§ 7.4 Minor Changes in the Work

The Architect may order minor changes in the Work that are consistent with the intent of the Contract Documents and do not involve an adjustment in the Contract Sum or an extension of the Contract Time. The Architect's order for minor changes shall be in writing. If the Contractor believes that the proposed minor change in the Work will affect the Contract Sum or Contract Time, the Contractor shall notify the Architect and shall not proceed to implement the change in the Work. If the Contractor performs the Work set forth in the Architect's order for a minor change without prior notice to the Architect that such change will affect the Contract Sum or Contract Time, the Contractor waives any adjustment to the Contract Sum or extension of the Contract Time.

ARTICLE 8 TIME

§ 8.1 Definitions

§ 8.1.1 Unless otherwise provided, Contract Time is the period of time, including authorized adjustments, allotted in the Contract Documents for Substantial Completion of the Work.

§ 8.1.2 The date of commencement of the Work is the date established in the Agreement.

§ 8.1.3 The date of Substantial Completion is the date Substantial Completion is achieved in accordance with Section 9.8.

§ 8.1.4 The term "day" as used in the Contract Documents shall mean calendar day unless otherwise specifically defined.

§ 8.2 Progress and Completion

§ 8.2.1 Time limits stated in the Contract Documents are of the essence of the Contract. By executing the Agreement, the Contractor confirms that the Contract Time is a reasonable period for performing the Work.

§ 8.2.2 The Contractor shall not knowingly, except by agreement or instruction of the Owner in writing, commence the Work prior to the effective date of insurance required to be furnished by the Contractor and Owner.

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§ 8.2.3 The Contractor shall proceed expeditiously with adequate forces and shall achieve Substantial Completion within the Contract Time.

§ 8.3 Delays and Extensions of Time

§ 8.3.1 If the Contractor is delayed at any time in the commencement or progress of the Work by (1) an act or neglect of the Owner or Architect, of an employee of either, or of a Separate Contractor; (2) by changes ordered in the Work; (3) by labor disputes, fire, unusual delay in deliveries, unavoidable casualties, adverse weather conditions documented in accordance with Section 15.1.6.2, or other causes beyond the Contractor's control; (4) by delay authorized by the Owner pending mediation and binding dispute resolution; or (5) by other causes that the Contractor asserts, and the Architect determines, justify delay, then the Contract Time shall be extended for such reasonable time as the Architect may determine, provided that (i) the Contractor notifies the Owner and Architect in writing of the alleged cause of such delay within ten (10) days after the Contractor became aware of the delay-precipitating event, and (ii) the Contractor demonstrates by a detailed and substantiated analysis the effects of the delay, if any, upon the construction schedule and Contract Time.

§ 8.3.2 Claims relating to time shall be made in accordance with applicable provisions of Article 15.

§ 8.3.3 This Section 8.3 does not preclude recovery of damages for delay by either party under other provisions of the Contract Documents.

ARTICLE 9 PAYMENTS AND COMPLETION

§ 9.1 Contract Sum

§ 9.1.1 The Contract Sum is stated in the Agreement and, including authorized adjustments, is the total amount payable by the Owner to the Contractor for performance of the Work under the Contract Documents.

§ 9.1.2 If unit prices are stated in the Contract Documents or subsequently agreed upon, and if quantities originally contemplated are materially changed so that application of such unit prices to the actual quantities causes substantial inequity to the Owner or Contractor, the applicable unit prices shall be equitably adjusted.

§ 9.2 Schedule of Values

Where the Contract is based on a stipulated sum or Guaranteed Maximum Price, the Contractor shall submit a schedule of values to the Architect before the first Application for Payment, allocating the entire Contract Sum to the various portions of the Work. The schedule of values shall be prepared in the form, and supported by the data to substantiate its accuracy, required by the Architect. This schedule, upon the approval of the Owner and the Architect, shall be used as a basis for reviewing the Contractor's Applications for Payment. Any changes to the schedule of values shall be submitted to the Architect and supported by such data to substantiate its accuracy as the Architect may require, and unless objected to by the Architect, shall be used as a basis for reviewing the Contractor's subsequent Applications for Payment.

§ 9.3 Applications for Payment

§ 9.3.1 At least ten days before the date established for each progress payment, the Contractor shall submit to the Architect an itemized Application for Payment prepared in accordance with the Contract Documents and the schedule of values, if required under Section 9.2, for completed portions of the Work. The application shall be notarized, if required, and supported by all data substantiating the Contractor's right to payment that the Owner, the Architect, or any person or entity providing funding for the Project, may require, such as copies of requisitions, and releases and waivers of liens from Subcontractors and suppliers, and shall reflect retainage if provided for in the Contract Documents. All Applications for Payment shall be in the form, and contain the information and supporting documentation, as required in this Section 9.3 and such additional information and documentation and as may be reasonably requested by the Owner.

§ 9.3.1.1 As provided in Section 7.3.9, such applications may include requests for payment on account of changes in the Work that have been properly authorized by Construction Change Directives, or by interim determinations of the Architect, but not yet included in Change Orders.

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§ 9.3.1.2 Applications for Payment shall not include requests for payment for portions of the Work for which the Contractor does not intend to pay a Subcontractor or supplier, unless such Work has been performed by others whom the Contractor intends to pay.

§ 9.3.2 Unless otherwise provided in the Contract Documents or prohibited by any person or entity providing funding for the Project, payments shall be made on account of materials and equipment delivered and suitably stored at the site for subsequent incorporation in the Work. If approved in advance by the Owner and not prohibited by any person or entity providing funding for the Project, payment may similarly be made for materials and equipment suitably stored off the site at a location agreed upon in writing. Payment for materials and equipment stored on or off the site shall be conditioned upon compliance by the Contractor with procedures satisfactory to the Owner to establish the Owner's title to such materials and equipment or otherwise protect the Owner's interest, and shall include the costs of applicable insurance, storage, and transportation to the site, for such materials and equipment stored off the site.

§ 9.3.3 The Contractor warrants that title to all Work covered by an Application for Payment will pass to the Owner no later than the time of payment. The Contractor further warrants that upon submittal of an Application for Payment all Work for which Certificates for Payment have been previously issued and payments received from the Owner shall, to the best of the Contractor's knowledge, information, and belief, be free and clear of liens, claims, security interests, or encumbrances, in favor of the Contractor, Subcontractors, suppliers, or other persons or entities that provided labor, materials, and equipment relating to the Work.

§ 9.3.3.1 The Contractor further expressly undertakes to defend the Owner, at the Contractor's sole cost and expense, against any actions, lawsuits, or proceedings brought against Owner as a result of liens filed against the Work, the Project site and any improvements thereon (referred to collectively as "Liens" in this Section 9.3.3), by the Contractor, any Subcontractor, Sub-subcontractor or anyone claiming by, through or under them. The Contractor hereby agrees to indemnify and hold Owner harmless against any such Liens or claims of Liens and agrees to pay any judgment or Lien resulting from any such actions, lawsuits or proceedings. The Contractor's obligations under this Section 9.3.3 are conditioned upon Owner having fulfilled its payment obligations to the Contractor with respect to the Work that is the subject of the Lien or claim and for which indemnification is sought.

§ 9.3.3.2 Commencing with the second Application for Payment, and continuing with each Application for Payment submitted thereafter, the Contractor shall furnish to the Owner a properly executed release and waiver of mechanics liens from the Contractor and each Subcontractor and material supplier whose Work was included on the previous Application for Payment for which payment by Owner was made to the Contractor.

§ 9.3.3 Applications for Payment, and invoices in support of the same, shall clearly distinguish between amounts charged for labor and amounts charged for materials.

§ 9.3.4 Unless otherwise required by the Owner, Applications for Payment shall be on AIA documents G702 and G703.

§ 9.4 Certificates for Payment

§ 9.4.1 The Architect will, within seven days after receipt of the Contractor's Application for Payment, either (1) issue to the Owner a Certificate for Payment in the full amount of the Application for Payment, with a copy to the Contractor; or (2) issue to the Owner a Certificate for Payment for such amount as the Architect determines is properly due, and notify the Contractor and Owner of the Architect's reasons for withholding certification in part as provided in Section 9.5.1; or (3) withhold certification of the entire Application for Payment, and notify the Contractor and Owner of the Architect's reason for withholding certification in whole as provided in Section 9.5.1.

§ 9.4.2 The issuance of a Certificate for Payment will constitute a representation by the Architect to the Owner, based on the Architect's evaluation of the Work and the data in the Application for Payment, that, to the best of the Architect's knowledge, information, and belief, the Work has progressed to the point indicated, the quality of the Work is in accordance with the Contract Documents, and, as a representation made by the Architect solely to the Owner, that the Contractor is entitled to payment in the amount certified. The foregoing representations are subject to an evaluation of the Work for conformance with the Contract Documents upon Substantial Completion, to results of subsequent tests and inspections, to correction of minor deviations from the Contract Documents prior to completion, and to specific qualifications expressed by the Architect. However, the issuance of a Certificate for Payment will not be a representation that the Architect has (1) made exhaustive or continuous on-site inspections to check the quality or

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quantity of the Work; (2) reviewed construction means, methods, techniques, sequences, or procedures; (3) reviewed copies of requisitions received from Subcontractors and suppliers and other data requested by the Owner to substantiate the Contractor's right to payment; or (4) made examination to ascertain how or for what purpose the Contractor has used money previously paid on account of the Contract Sum.

§ 9.4.3 Notwithstanding anything to the contrary, issuance of a Certificate for Payment by the Architect is a recommendation only and payment to the Contractor of amounts certified in a Certificate for Payment is subject to the Owner's approval.

§ 9.4.4 Certificates for Payment shall be on AIA documents G702 and G703.

§ 9.5 Decisions to Withhold Certification

§ 9.5.1 The Architect may withhold a Certificate for Payment in whole or in part, to the extent reasonably necessary to protect the Owner, if in the Architect's opinion the representations to the Owner required by Section 9.4.2 cannot be made. If the Architect is unable to certify payment in the amount of the Application, the Architect will notify the Contractor and Owner as provided in Section 9.4.1. If the Contractor and Architect cannot agree on a revised amount, the Architect will promptly issue a Certificate for Payment for the amount for which the Architect is able to make such representations to the Owner. The Architect may also withhold a Certificate for Payment or, because of subsequently discovered evidence, may nullify the whole or a part of a Certificate for Payment previously issued, to such extent as may be necessary in the Architect's opinion to protect the Owner from loss for which the Contractor is responsible, including loss resulting from acts and omissions described in Section 3.3.2, because of

.1 defective Work not remedied;
.2 third party claims filed or reasonable evidence indicating probable filing of such claims, unless security acceptable to the Owner is provided by the Contractor;
.3 failure of the Contractor to make payments properly to Subcontractors or suppliers for labor, materials or equipment;
.4 reasonable evidence that the Work cannot be completed for the unpaid balance of the Contract Sum;
.5 damage to the Owner or a Separate Contractor;
.6 reasonable evidence that the Work will not be completed within the Contract Time, and that the unpaid balance would not be adequate to cover actual or liquidated damages for the anticipated delay; or
.7 repeated failure to carry out the Work in accordance with the Contract Documents.

§ 9.5.2 When either party disputes the Architect's decision regarding a Certificate for Payment under Section 9.5.1, in whole or in part, that party may submit a Claim in accordance with Article 15.

§ 9.5.3 When the reasons for withholding a Certificate for Payment are removed, the Certificate for Payment will be issued as regards amounts previously withheld. The Owner shall not be deemed to be in default by reason of withholding payment while any of the above grounds remained uncured, nor shall any interest accrue or be payable with respect to any payments so withheld.

§ 9.5.4 If the Architect withholds certification for payment under Section 9.5.1.3, the Owner may, at its sole option, issue joint checks to the Contractor and to any Subcontractor or supplier to whom the Contractor failed to make payment for Work properly performed or material or equipment suitably delivered. If the Owner makes payments by joint check, the Owner shall notify the Architect and the Contractor shall reflect such payment on its next Application for Payment.

§ 9.6 Progress Payments

§ 9.6.1 After the Architect has issued a Certificate for Payment, the Owner shall make payment in the manner and within the time provided in the Contract Documents and shall so notify the Architect.

§ 9.6.2 The Contractor shall pay each Subcontractor, no later than seven days after receipt of payment from the Owner, the amount to which the Subcontractor is entitled, reflecting percentages actually retained from payments to the Contractor on account of the Subcontractor's portion of the Work. The Contractor shall, by appropriate agreement with each Subcontractor, require each Subcontractor to make payments to Sub-subcontractors in a similar manner.

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§ 9.6.3 The Architect will, on request, furnish to a Subcontractor, if practicable, information regarding percentages of completion or amounts applied for by the Contractor and action taken thereon by the Architect and Owner on account of portions of the Work done by such Subcontractor.

§ 9.6.4 The Owner has the right to request written evidence from the Contractor that the Contractor has properly paid Subcontractors and suppliers amounts paid by the Owner to the Contractor for subcontracted Work. If the Contractor fails to furnish such evidence within seven days, the Owner shall have the right to contact Subcontractors and suppliers to ascertain whether they have been properly paid. Neither the Owner nor Architect shall have an obligation to pay, or to see to the payment of money to, a Subcontractor or supplier, except as may otherwise be required by law.

§ 9.6.5 The Contractor's payments to suppliers shall be treated in a manner similar to that provided in Sections 9.6.2, 9.6.3 and 9.6.4.

§ 9.6.6 A Certificate for Payment, a progress payment, or partial or entire use or occupancy of the Project by the Owner shall not constitute acceptance of Work not in accordance with the Contract Documents.

§ 9.6.7 Unless the Contractor provides the Owner with a payment bond in the full penal sum of the Contract Sum, payments received by the Contractor for Work properly performed by Subcontractors or provided by suppliers shall be held by the Contractor for those Subcontractors or suppliers who performed Work or furnished materials, or both, under contract with the Contractor for which payment was made by the Owner. Nothing contained herein shall require money to be placed in a separate account and not commingled with money of the Contractor, create any fiduciary liability or tort liability on the part of the Contractor for breach of trust, or entitle any person or entity to an award of punitive damages against the Contractor for breach of the requirements of this provision.

§ 9.6.8 Provided the Owner has fulfilled its payment obligations under the Contract Documents, the Contractor shall defend and indemnify the Owner from all loss, liability, damage or expense, including reasonable attorney's fees and litigation expenses, arising out of any lien claim or other claim for payment by any Subcontractor or supplier of any tier. Upon receipt of notice of a lien claim or other claim for payment, the Owner shall notify the Contractor. If approved by the applicable court, when required, the Contractor may substitute a surety bond for the property against which the lien or other claim for payment has been asserted.

§ 9.6.9 Any provision in the Contract Documents to the contrary notwithstanding, the Owner shall not be obligated to make payment to the Contractor hereunder to the extent that the Contractor has not performed the Work or supplied the materials, for which payment is requested, in accordance with the Contract Documents.

§ 9.7 Failure of Payment

If the Architect does not issue a Certificate for Payment as required by the Contract Documents,, through no fault of the Contractor, within ten (10) days after receipt of the Contractor's Application for Payment, or if the Owner does not pay the Contractor within seven days after the date established in the Contract Documents, the amount certified by the Architect or awarded by binding dispute resolution, then the Contractor may, upon ten (10) additional days' notice to the Owner and Architect, stop the Work until payment of the amount owing has been received. The Contract Time shall be extended appropriately, and the Contract Sum shall be increased by the amount of the Contractor's reasonable costs of shutdown, delay and start-up, plus interest as provided for in the Contract Documents.

§ 9.8 Substantial Completion

§ 9.8.1 Substantial Completion is the stage in the progress of the Work when the Work or designated portion thereof is sufficiently complete in accordance with the Contract Documents so that the Owner can occupy or utilize the Work for its intended use. Substantial Completion shall not occur until: (i) the Owner's receipt of certification by the Architect that the Work is Substantially Complete in the form of a Certificate of Substantial Completion; and (ii) the Owner's receipt of a final and unconditional Certificate of Occupancy from the governmental authorities having jurisdiction that the Work has been completed in accordance with Applicable Laws.

§ 9.8.2 When the Contractor considers that the Work, or a portion thereof which the Owner agrees to accept separately, is substantially complete, the Contractor shall prepare and submit to the Architect a comprehensive list of items to be completed or corrected prior to final payment. Failure to include an item on such list does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract Documents.

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§ 9.8.3 Upon receipt of the Contractor's list, the Architect will make an inspection to determine whether the Work or designated portion thereof is substantially complete. If the Architect's inspection discloses any item, whether or not included on the Contractor's list, which is not sufficiently complete in accordance with the Contract Documents so that the Owner can occupy or utilize the Work or designated portion thereof for its intended use, the Contractor shall, before issuance of the Certificate of Substantial Completion, complete or correct such item upon notification by the Architect. In such case, the Contractor shall then submit a request for another inspection by the Architect to determine Substantial Completion.

§ 9.8.4 When the Work or designated portion thereof is substantially complete, the Architect will prepare a Certificate of Substantial Completion that shall establish the date of Substantial Completion; establish responsibilities of the Owner and Contractor for security, maintenance, heat, utilities, damage to the Work and insurance; and fix the time within which the Contractor shall finish all items on the list accompanying the Certificate. Warranties required by the Contract Documents shall commence on the date of Substantial Completion of the Work or designated portion thereof unless otherwise provided in the Certificate of Substantial Completion.

§ 9.8.5 The Certificate of Substantial Completion shall be submitted to the Owner and Contractor for their written acceptance of responsibilities assigned to them in the Certificate. Upon such acceptance, and consent of surety if any, the Owner shall make payment of retainage applying to the Work or designated portion thereof. Such payment shall be adjusted for Work that is incomplete or not in accordance with the requirements of the Contract Documents.

§ 9.9 Partial Occupancy or Use

§ 9.9.1 The Owner may occupy or use any completed or partially completed portion of the Work at any stage when such portion is designated by separate agreement with the Contractor, provided such occupancy or use is consented to by the insurer and authorized by public authorities having jurisdiction over the Project. Such partial occupancy or use may commence whether or not the portion is substantially complete, provided the Owner and Contractor have accepted in writing the responsibilities assigned to each of them for payments, retainage, if any, security, maintenance, heat, utilities, damage to the Work and insurance, and have agreed in writing concerning the period for correction of the Work and commencement of warranties required by the Contract Documents. When the Contractor considers a portion substantially complete, the Contractor shall prepare and submit a list to the Architect as provided under Section 9.8.2. Consent of the Contractor to partial occupancy or use shall not be unreasonably withheld. The stage of the progress of the Work shall be determined by written agreement between the Owner and Contractor or, if no agreement is reached, by decision of the Architect.

§ 9.9.2 Immediately prior to such partial occupancy or use, the Owner, Contractor, and Architect shall jointly inspect the area to be occupied or portion of the Work to be used in order to determine and record the condition of the Work.

§ 9.9.3 Unless otherwise agreed upon, partial occupancy or use of a portion or portions of the Work shall not constitute acceptance of Work not complying with the requirements of the Contract Documents.

§ 9.10 Final Completion and Final Payment

§ 9.10.1 Upon receipt of the Contractor's notice that the Work is ready for final inspection and acceptance and upon receipt of a final Application for Payment, the Architect will promptly make such inspection. When the Architect finds the Work acceptable under the Contract Documents and the Contract fully performed, the Architect will promptly issue a final Certificate for Payment stating that to the best of the Architect's knowledge, information and belief, and on the basis of the Architect's on-site visits and inspections, the Work has been completed in accordance with the Contract Documents and that the entire balance found to be due the Contractor and noted in the final Certificate is due and payable. The Architect's final Certificate for Payment will constitute a further representation that conditions listed in Section 9.10.2 as precedent to the Contractor's being entitled to final payment have been fulfilled. All warranties and guarantees required under or pursuant to the Contract Documents not previously delivered shall be assembled and delivered by the Contractor to the Owner and Architect as part of the final Application for Payment. The final Certificate for Payment will not be issued by the Architect until all warranties and guarantees and all other close-out deliverables (including those set forth in Section 9.10.2 below) have been received and accepted by the Owner.

§ 9.10.2 Neither final payment nor any remaining retained percentage shall become due until the Contractor submits to the Architect (1) an affidavit that payrolls, bills for materials and equipment, and other indebtedness connected with the Work for which the Owner or the Owner's property might be responsible or encumbered (less amounts withheld by Owner) have been paid or otherwise satisfied, (2) a certificate evidencing that insurance required by the Contract

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Documents to remain in force after final payment is currently in effect, (3) a written statement that the Contractor knows of no reason that the insurance will not be renewable to cover the period required by the Contract Documents, (4) consent of surety, if any, to final payment, (5) documentation of any special warranties, such as manufacturers' warranties or specific Subcontractor warranties, and (6) if required by the Owner, other data establishing payment or satisfaction of obligations, such as receipts and releases and waivers of mechanic's liens, claims, security interests, or other encumbrances arising out of the Contract, to the extent and in such form as may be designated by the Owner. If a Subcontractor refuses to furnish a release or waiver required by the Owner, the Contractor shall furnish a bond satisfactory to the Owner to indemnify the Owner against such lien, claim, security interest, or encumbrance. If no such bond is provided, the Owner may, without limiting its remedies under law, in equity, or under the Contract Documents, withhold the portion of final payment claimed to be due by the relevant Subcontractor or supplier until such lien is no longer a viable encumbrance. The Contractor shall refund to the Owner all money that the Owner may be compelled to pay in discharging the lien, claim, security interest, or encumbrance, including all costs and reasonable attorneys' fees.

§ 9.10.3 If, after Substantial Completion of the Work, final completion thereof is materially delayed through no fault of the Contractor or by issuance of Change Orders affecting final completion, and the Architect so confirms, the Owner shall, upon application by the Contractor and certification by the Architect, and without terminating the Contract, make payment of the balance due for that portion of the Work fully completed, corrected, and accepted. If the remaining balance for Work not fully completed or corrected is less than retainage stipulated in the Contract Documents, and if bonds have been furnished, the written consent of the surety to payment of the balance due for that portion of the Work fully completed and accepted shall be submitted by the Contractor to the Architect prior to certification of such payment. Such payment shall be made under terms and conditions governing final payment, except that it shall not constitute a waiver of Claims.

§ 9.10.4
(Paragraphs deleted)
Intentionally Omitted.

§ 9.10.5 Acceptance of final payment by the Contractor, a Subcontractor, or a supplier, shall constitute a waiver of claims by that payee except those previously made in writing and identified by that payee as unsettled at the time of final Application for Payment.

ARTICLE 10 PROTECTION OF PERSONS AND PROPERTY

§ 10.1 Safety Precautions and Programs

The Contractor shall be responsible for initiating, maintaining, and supervising all safety precautions and programs in connection with the performance of the Contract.

§ 10.2 Safety of Persons and Property

§ 10.2.1 The Contractor shall take reasonable precautions for safety of, and shall provide reasonable protection to prevent damage, injury, or loss to

.1 employees on the Work and other persons who may be affected thereby;

.2 the Work and materials and equipment to be incorporated therein, whether in storage on or off the site, under care, custody, or control of the Contractor, a Subcontractor, or a Sub-subcontractor; and

.3 other property at the site or adjacent thereto, such as trees, shrubs, lawns, walks, pavements, roadways, structures, and utilities not designated for removal, relocation, or replacement in the course of construction.

§ 10.2.2 The Contractor shall comply with, and give notices required by, Applicable Laws bearing on safety of persons or property or their protection from damage, injury, or loss.

§ 10.2.3 The Contractor shall implement, erect, and maintain, as required by existing conditions and performance of the Contract, reasonable safeguards for safety and protection, including posting danger signs and other warnings against hazards; promulgating safety regulations; and notifying the owners and users of adjacent sites and utilities of the safeguards. The Contractor shall also be responsible for all measures necessary to protect any property adjacent to the Project and improvements thereon. Any damage to such property or improvements shall be promptly repaired by the Contractor at its cost and expense.

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§ 10.2.4 When use or storage of explosives or other hazardous materials or equipment, or unusual methods are necessary for execution of the Work, the Contractor shall exercise utmost care and carry on such activities under supervision of properly qualified personnel.

§ 10.2.4.1 When there are indications that the use of explosives or other hazardous materials, equipment or unusual methods is necessary for execution of the Work, the Contractor shall give the Owner and Architect reasonable advance notice of the conditions.

§ 10.2.4.2 The Contractor shall be solely responsible for the handling, storage and use of explosive or other hazardous materials when their use is permitted.

§ 10.2.4.3 The Contractor shall not bring explosives onto the Project site or use such in the Work without the prior written permission of the Architect and the Owner. For such use, the Contractor shall obtain necessary permits with copies to the Architect and the Owner. The Contractor shall furnish the Owner and Architect with certificates indicating proper and adequate insurance.

§ 10.2.5 The Contractor shall promptly remedy damage and loss (other than damage or loss insured under property insurance required by the Contract Documents) to property referred to in Sections 10.2.1.2 and 10.2.1.3 caused in whole or in part by the Contractor, a Subcontractor, a Sub-subcontractor, or anyone directly or indirectly employed by any of them, or by anyone for whose acts they may be liable and for which the Contractor is responsible under Sections 10.2.1.2 and 10.2.1.3. The Contractor may make a Claim for the cost to remedy the damage or loss to the extent such damage or loss is attributable to acts or omissions of the Owner or Architect or anyone directly or indirectly employed by either of them, or by anyone for whose acts either of them may be liable, and not attributable to the fault or negligence of the Contractor. The foregoing obligations of the Contractor are separate from, in addition to, and are not to be construed as included as a part of the Contractor's obligations under Section 3.18.

§ 10.2.6 The Contractor shall designate a responsible member of the Contractor's organization at the site whose duty shall be the prevention of accidents. This person shall be the Contractor's superintendent unless otherwise designated by the Contractor in writing to the Owner and Architect.

§ 10.2.7 The Contractor shall not permit any part of the construction or site to be loaded so as to cause damage or create an unsafe condition.

§ 10.2.8 Injury or Damage to Person or Property

If either party suffers injury or damage to person or property because of an act or omission of the other party, or of others for whose acts such party is legally responsible, notice of the injury or damage, whether or not insured, shall be given to the other party within a reasonable time not exceeding 21 days after discovery. The notice shall provide sufficient detail to enable the other party to investigate the matter.

§ 10.2.9 In the event the Contractor identifies activities or conditions during performance of the Work or at the Project, which, in the Contractor's good faith opinion, pose an unreasonable risk of bodily injury or property damage, whether immediate or in the future, the Contractor shall have the right to immediately take steps to protect its personnel and Subcontractors and stop Work and remove its personnel from the affected area.

§ 10.2.10 The Contractor shall at all times provide protection against weather (rain, wind, storms or heat) so as to maintain all Work, materials, apparatus and fixtures free from damage. At the end of the day's work, all new Work likely to be damaged shall be reasonably protected against such weather.

§ 10.2.11 The Contractor shall provide adequate fire protection for all operations associated with the Work, and such protection must meet all applicable federal (including OSHA), State and municipal regulations.

§ 10.2.12 The Contractor shall remove and replace with new work, at the Contractor's own expense, any Work damaged by failure to provide protection pursuant to Sections 10.2.10 and 10.2.11.

§ 10.2.13 The Contractor shall be responsible, to the extent not covered by insurance, for damage, loss or liability due to theft or vandalism to the Work and stored materials when work is not in progress at night, on weekends or holidays.

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§ 10.2.14 The Contractor shall protect and prevent damage to all unfinished phases of the Work.

§ 10.2.15 Securing the Site

The Contractor is responsible for securing, and preventing access by unauthorized individuals to, the Project site from such date as the Contractor, it subcontractors, consultants, or agents commence the Work until the date of Final Completion, unless the Owner and Contractor agree in writing to an earlier date.

§ 10.3 Hazardous Materials and Substances

§ 10.3.1 The Contractor is responsible for compliance with any requirements included in the Contract Documents regarding any material, substance, chemical, waste, product, derivative, compound, mixture, solid, liquid, mineral or gas, whether naturally occurring or manmade, that is hazardous, toxic, or words of similar import or regulatory effect, and any petroleum or petroleum-derived products, radon, radioactive materials or wastes, asbestos in any form, lead or lead-containing materials, urea formaldehyde foam insulation, and polychlorinated biphenyls (collectively, "Hazardous Materials"). If the Contractor believes its Work will disturb or otherwise implicate any actual or suspected Hazardous Material or encounters a Hazardous Material not addressed in the Contract Documents, the Contractor shall not disturb any such Hazardous Material, immediately report the condition to the Owner and the Architect in writing and take all necessary precautions to prevent release of and exposure to the Hazardous Materials and the Contractor shall immediately report the condition to the Owner and the Architect in writing and take all necessary precautions to prevent release of and exposure to the Hazardous Materials and foreseeable bodily injury or death to persons resulting from such Hazardous Material. If such reasonable precautions will be inadequate to prevent release of and exposure to Hazardous Materials, or foreseeable bodily injury and death, the Contractor shall, upon recognizing the condition, immediately stop Work in the affected area and notify the Owner and Architect of the condition.

§ 10.3.2 Upon receipt of the Contractor's notice pursuant to Section 10.3.1of the existence of actual or suspect Hazardous Materials not addressed in the Contract Documents, the Owner shall obtain the services of a licensed laboratory to verify the presence or absence of the Hazardous Material reported by the Contractor and, in the event such Hazardous Material is found to be present, to cause it to be rendered harmless or otherwise abated. Unless otherwise required by the Contract Documents, the Owner shall furnish in writing to the Contractor and Architect the names and qualifications of persons or entities who are to perform tests verifying the presence or absence of the material or substance or who are to perform the task of removal or safe containment of the material or substance. The Contractor and the Architect will promptly reply to the Owner in writing stating whether or not either has reasonable objection to the persons or entities proposed by the Owner. If either the Contractor or Architect has an objection to a person or entity proposed by the Owner, the Owner shall propose another to whom the Contractor and the Architect have no reasonable objection. When the Hazardous Material has been rendered harmless and/or otherwise abated in accordance with Applicable Laws, Work in the affected area shall resume upon written agreement of the Owner and Contractor. By Change Order, the Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable additional costs of shutdown, delay, and start-up, except to the extent that the Hazardous Material was first encountered due to the negligence, willful or intentional misconduct, or breach of contract of the Contractor.

§ 10.3.3 To the fullest extent permitted by law, the Owner shall indemnify and hold harmless the Contractor, Subcontractors, Architect, Architect's consultants, and agents and employees of any of them from and against claims, damages, losses, and expenses, including but not limited to attorneys' fees, arising out of or resulting from performance of the Work in the affected area related to the presence or absence of any actual or suspected Hazardous Materials if in fact such Hazardous Material presents the risk of bodily injury or death as described in Section 10.3.1 and has not been rendered harmless or otherwise abated, provided that such claim, damage, loss, or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself), except to the extent that such damage, loss, or expense was caused by, or resulted from the negligence of, or the intentional or willful misconduct or breach of contract by the party seeking indemnity, or the negligence of, or intentional or willful misconduct or breach of contract by such party's agents (including Subcontractors) or employees.

§ 10.3.4 The Owner shall not be responsible under this Section 10.3 for hazardous materials or substances the Contractor, any Subcontractor or any materialman or supplier, or any entity for whom any of them is responsible, brings to the site unless such materials or substances are required by the Contract Documents. The Owner shall be responsible for hazardous materials or substances required by the Contract Documents, except to the extent of the Contractor's fault or negligence in the use and handling of such materials or substances or its failure to comply with

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the Contract Documents. The Contractor agrees not to use any fill or other materials to be incorporated into the Work which are hazardous, toxic or comprised of any items that are hazardous or toxic except to the extent required by the Contract Documents.

§ 10.3.5 To the fullest extent permitted by law, the Contractor shall indemnify, defend and hold harmless the Owner, the Owner's Designated Representative, Architect, Architect's consultants, and the directors, officers, owners, agents and employees of any of them, as well as the Building Committee appointed by the Owner for the Project, and the fee owner of the Project site (if other than the Owner) against claims, damages, losses and expenses, including but not limited to reasonable attorney's fees, resulting from an actual or suspect Hazardous Material or which the Contractor or its agents (including Subcontractors) or employees brings to the site and improperly handles, or from the Contractor's failure to perform its obligations under Section 10.3.1, except to the extent that such damage, loss or expense was caused by, or resulting from the negligence of the indemnitee.

§ 10.3.6 If, without negligence or fault on the part of the Contractor or any party for whose acts the Contractor is responsible, the Contractor is held liable by a government agency for the cost of remediation of a hazardous material or substance solely by reason of properly performing Work as required by the Contract Documents, the Owner shall reimburse the Contractor for all cost and expense thereby incurred.

§ 10.3.7 The Contractor shall perform all required procedures necessary to insure that there will be no actual or threatened release, discharge, spillage, uncontrolled loss, seepage or filtration (each a "Release") of any Hazardous Material on the site caused by its operations. The Contractor is responsible for any and all costs and liabilities associated with the investigation and remediation of any such Release, or as required by regulating authorities having jurisdiction under any of the Applicable Laws, and holds the Owner, its employees and agents, and the fee owner of the Project site (if other than the Owner), harmless against any current or future liabilities resulting from such incidents.

§ 10.3.8 All material and equipment furnished under the Contract Documents shall be free of asbestos, lead based paint, and PCBs. Unless otherwise specified in the Contract Documents, any material or equipment containing these, and any other Hazardous Materials shall be considered defective and shall be removed by the Contractor at the Contractor's sole expense.

§ 10.3.9 The Contractor, when it will be providing, using, storing, delivering or disposing of any toxic, hazardous or potentially dangerous materials, shall advise in writing, and receive the written approval of, the Owner of the use of such hazardous materials in advance of conducting any such Work and the Contractor is responsible for protecting its own employees, those of the Owner, and all of its employees and agents from the hazards associated with such materials. The Contractor shall furnish written directions, precautions or training, provided or made available from the supplier of the materials, or other acceptable source, for use by all persons who may be subjected to the hazard. The Contractor shall comply with all Applicable Laws. The Contractor shall dispose of any hazardous or toxic substances in accordance with all Applicable Laws. The Contractor shall perform all required procedures necessary to insure that there will be no discharge, spillage, uncontrolled loss, seepage or filtration of any hazardous or toxic waste on the site caused by its operations. The Contractor is responsible for any and all costs and liabilities associated with the clean-up of any such spillage, etc., or as required by regulating authorities having jurisdiction, and holds the Owner and its employees and agents harmless against any current or future liabilities resulting from such incidents.

§ 10.4 Emergencies

In an emergency affecting safety of persons or property, during which it is not feasible for the Contractor to consult with the Owner and/or the Architect, the Contractor shall act, at the Contractor's discretion, to prevent threatened damage, injury, or loss. Additional compensation or extension of time claimed by the Contractor on account of an emergency shall be determined as provided in Article 15 and Article 7. The Contractor shall promptly notify insurers as applicable, and the Architect and the Owner of the nature of the emergency. Immediately thereafter, the Contractor shall submit to the Architect and the Owner a written report including description of circumstances of the emergency and details of actions taken.

ARTICLE 11 INSURANCE AND BONDS

§ 11.1 Contractor's Insurance and Bonds

§ 11.1.1 The Contractor shall purchase and maintain insurance of the types and limits of liability, containing the endorsements, and subject to the terms and conditions, as described in the Agreement, in Exhibit B (Insurance and

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Bonds) or elsewhere in the Contract Documents. The Contractor shall purchase and maintain the required insurance from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located. The Owner, Architect, and Architect's consultants shall be named as additional insureds under the Contractor's commercial general liability policy or as otherwise described in the Contract Documents.

§ 11.1.2 The Contractor shall provide surety bonds of the types, for such penal sums, and subject to such terms and conditions as required by the Contract Documents. The Contractor shall purchase and maintain the required bonds from a company or companies lawfully authorized to issue surety bonds in the jurisdiction where the Project is located.

§ 11.1.3 Upon the request of any person or entity appearing to be a potential beneficiary of bonds covering payment of obligations arising under the Contract, the Contractor shall promptly furnish a copy of the bonds or shall authorize a copy to be furnished.

§ 11.1.4 Notice of Cancellation or Expiration of Contractor's Required Insurance. Within three (3) business days of the date the Contractor becomes aware of an impending or actual cancellation or expiration of any insurance required by the Contract Documents, the Contractor shall provide notice to the Owner of such impending or actual cancellation or expiration. Upon receipt of notice from the Contractor, the Owner shall, unless the lapse in coverage arises from an act or omission of the Owner, have the right to stop the Work until the lapse in coverage has been cured by the procurement of replacement coverage by the Contractor. The furnishing of notice by the Contractor shall not relieve the Contractor of any contractual obligation to provide any required coverage.

§ 11.2 Owner's Insurance

§ 11.2.1 The Owner shall purchase and maintain insurance of the types and limits of liability, containing the endorsements, and subject to the terms and conditions, as described in the Agreement or elsewhere in the Contract Documents. The Owner shall purchase and maintain the required insurance from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located.

§ 11.2.2 Failure to Purchase Required Property Insurance. If the Owner fails to purchase and maintain the required property insurance, with all of the coverages and in the amounts described in the Agreement or elsewhere in the Contract Documents, the Owner shall inform the Contractor in writing prior to commencement of the Work. Upon receipt of notice from the Owner, the Contractor may delay commencement of the Work and may obtain insurance that will protect the interests of the Contractor, Subcontractors, and Sub-Subcontractors in the Work. When the failure to provide coverage has been cured or resolved, the Contract Sum and Contract Time shall be equitably adjusted. In the event the Owner fails to procure coverage, the Owner waives all rights against the Contractor, Subcontractors, and Sub-subcontractors to the extent the loss to the Owner would have been covered by the insurance to have been procured by the Owner. The cost of the insurance shall be charged to the Owner by a Change Order. If the Owner does not provide written notice, and the Contractor is damaged by the failure or neglect of the Owner to purchase or maintain the required insurance, the Owner shall reimburse the Contractor for all reasonable costs and damages attributable thereto.

§ 11.2.3 Notice of Cancellation or Expiration of Owner's Required Property Insurance. Within three (3) business days of the date the Owner becomes aware of an impending or actual cancellation or expiration of any property insurance required by the Contract Documents, the Owner shall provide notice to the Contractor of such impending or actual cancellation or expiration. Unless the lapse in coverage arises from an act or omission of the Contractor: (1) the Contractor, upon receipt of notice from the Owner, shall have the right to stop the Work until the lapse in coverage has been cured by the procurement of replacement coverage by either the Owner or the Contractor; (2) the Contract Time and Contract Sum shall be equitably adjusted; and (3) the Owner waives all rights against the Contractor, Subcontractors, and Sub-subcontractors to the extent any loss to the Owner would have been covered by the insurance had it not expired or been cancelled. If the Contractor purchases replacement coverage, the cost of the insurance shall be charged to the Owner by an appropriate Change Order. The furnishing of notice by the Owner shall not relieve the Owner of any contractual obligation to provide required insurance.

§ 11.3 Waivers of Subrogation

§ 11.3.1 The Owner and Contractor waive all rights against (1) each other and any of their subcontractors, sub-subcontractors, agents, and employees, each of the other; (2) the Architect and Architect's consultants; and (3) Separate Contractors, if any, and any of their subcontractors, sub-subcontractors, agents, and employees, for damages caused by fire, or other causes of loss, to the extent those losses are covered by property insurance required by the

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Agreement or other property insurance applicable to the Project, except such rights as they have to proceeds of such insurance. The Owner or Contractor, as appropriate, shall require similar written waivers in favor of the individuals and entities identified above from the Architect, Architect's consultants, Separate Contractors, subcontractors, and sub-subcontractors. The policies of insurance purchased and maintained by each person or entity agreeing to waive claims pursuant to this section 11.3.1 shall not prohibit this waiver of subrogation. This waiver of subrogation shall be effective as to a person or entity (1) even though that person or entity would otherwise have a duty of indemnification, contractual or otherwise, (2) even though that person or entity did not pay the insurance premium directly or indirectly, or (3) whether or not the person or entity had an insurable interest in the damaged property.

§ 11.3.2 If during the Project construction period the Owner insures properties, real or personal or both, at or adjacent to the site by property insurance under policies separate from those insuring the Project, or if after final payment property insurance is to be provided on the completed Project through a policy or policies other than those insuring the Project during the construction period, to the extent permissible by such policies, the Owner waives all rights in accordance with the terms of Section 11.3.1 for damages caused by fire or other causes of loss covered by this separate property insurance.

§ 11.4 Loss of Use, Business Interruption, and Delay in Completion Insurance

The Owner, at the Owner's option, may purchase and maintain insurance that will protect the Owner against loss of use of the Owner's property, or the inability to conduct normal operations, due to fire or other causes of loss.

§ 11.5 Adjustment and Settlement of Insured Loss

§ 11.5.1 A loss insured under the property insurance required by the Agreement may be adjusted by the Owner as fiduciary and made payable to the Owner as fiduciary for the insureds, as their interests may appear, subject to requirements of any applicable mortgagee clause and of Section 11.5.2. The Owner shall pay the Architect and Contractor their just shares of insurance proceeds received by the Owner, and by appropriate agreements the Architect and Contractor shall make payments to their consultants and Subcontractors in similar manner.

§ 11.5.2 Prior to settlement of an insured loss, the Owner shall notify the Contractor of the terms of the proposed settlement as well as the proposed allocation of the insurance proceeds. The Contractor shall have 14 days from receipt of notice to object to the proposed settlement or allocation of the proceeds. If the Contractor does not object, the Owner shall settle the loss and the Contractor shall be bound by the settlement and allocation. Upon receipt, the Owner shall deposit the insurance proceeds in a separate account and make the appropriate distributions. Thereafter, if no other agreement is made or the Owner does not terminate the Contract for convenience, the Owner and Contractor shall execute a Change Order for reconstruction of the damaged or destroyed Work in the amount allocated for that purpose. If the Contractor timely objects to either the terms of the proposed settlement or the allocation of the proceeds, the Owner may proceed to settle the insured loss, and any dispute between the Owner and Contractor arising out of the settlement or allocation of the proceeds shall be resolved pursuant to Article 15. Pending resolution of any dispute, the Owner may issue a Construction Change Directive for the reconstruction of the damaged or destroyed Work.

ARTICLE 12 UNCOVERING AND CORRECTION OF WORK

§ 12.1 Uncovering of Work

§ 12.1.1 If a portion of the Work is covered contrary to the Architect's request or to requirements specifically expressed in the Contract Documents, it must, if requested in writing by the Architect, be uncovered for the Architect's examination and be replaced at the Contractor's expense without change in the Contract Time.

§ 12.1.2 If a portion of the Work has been covered that the Architect has not specifically requested to examine prior to its being covered, the Architect may request to see such Work and it shall be uncovered by the Contractor. If such Work is in accordance with the Contract Documents, the Contractor shall be entitled to an equitable adjustment to the Contract Sum and Contract Time as may be appropriate. If such Work is not in accordance with the Contract Documents, the costs of uncovering the Work, and the cost of correction, shall be at the Contractor's expense.

§ 12.2 Correction of Work

§ 12.2.1 Before Substantial Completion

The Contractor shall promptly correct Work rejected by the Architect or failing to conform to the requirements of the Contract Documents, discovered before Substantial Completion and whether or not fabricated, installed or completed. Costs of correcting such rejected Work, including additional testing and inspections, the cost of uncovering and

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replacement, and compensation for the Architect's services and expenses made necessary thereby, shall be at the Contractor's expense.

§ 12.2.2 After Substantial Completion

§ 12.2.2.1 In addition to the Contractor's obligations under Section 3.5, if, within one year after the date of Substantial Completion of the Work or designated portion thereof or after the date for commencement of warranties established under Section 9.9.1, or by terms of any applicable special warranty required by the Contract Documents, any of the Work is found to be not in accordance with the requirements of the Contract Documents, the Contractor shall correct it promptly after receipt of notice from the Owner to do so, unless the Owner has previously given the Contractor a written acceptance of such condition. The Owner shall give such notice promptly after discovery of the condition. During the one-year period for correction of Work, if the Owner fails to notify the Contractor and give the Contractor an opportunity to make the correction, the Owner waives the rights to require correction by the Contractor and to make a claim for breach of warranty. If the Contractor fails to correct nonconforming Work within a reasonable time during that period after receipt of notice from the Owner or Architect, the Owner may correct it in accordance with Section 2.5.

§ 12.2.2.2 The one-year period for correction of Work shall be extended with respect to portions of Work first performed after Substantial Completion by the period of time between Substantial Completion and the actual completion of that portion of the Work.

§ 12.2.2.3 The one-year period for correction of Work shall not be extended by corrective Work performed by the Contractor pursuant to this Section 12.2.

§ 12.2.3 The Contractor shall remove from the site portions of the Work that are not in accordance with the requirements of the Contract Documents and are neither corrected by the Contractor nor accepted by the Owner.

§ 12.2.4 The Contractor shall bear the cost of correcting destroyed or damaged construction of the Owner or Separate Contractors, whether completed or partially completed, caused by the Contractor's correction or removal of Work that is not in accordance with the requirements of the Contract Documents.

§ 12.2.5 Nothing contained in this Section 12.2 shall be construed to establish a period of limitation with respect to other obligations the Contractor has under the Contract Documents. Establishment of the one-year period for correction of Work as described in Section 12.2.2 relates only to the specific obligation of the Contractor to correct the Work, and has no relationship to the time within which the obligation to comply with the Contract Documents may be sought to be enforced, nor to the time within which proceedings may be commenced to establish the Contractor's liability with respect to the Contractor's obligations other than specifically to correct the Work.

§ 12.2.6 Audits

Upon request of the Owner, the Contractor will cooperate, and secure the cooperation of all Subcontractors and Sub-subcontractors and assist the Owner during any audit of the Project conducted by the Owner or one or more Agencies (as defined in Section 2.2.1.2 of the Agreement) at any time after Substantial Completion. Such cooperation shall include providing the Owner with access to all records related to the Project.

§ 12.3 Acceptance of Nonconforming Work

If the Owner prefers to accept Work that is not in accordance with the requirements of the Contract Documents, the Owner may do so instead of requiring its removal and correction, in which case the Contract Sum will be reduced as appropriate and equitable. Such adjustment shall be effected whether or not final payment has been made.

ARTICLE 13 MISCELLANEOUS PROVISIONS

§ 13.1 Governing Law

The Contract shall be governed by the law of the State of Connecticut.

§ 13.2 Successors and Assigns

§ 13.2.1 The Owner and Contractor respectively bind themselves, their partners, successors, assigns, and legal representatives to covenants, agreements, and obligations contained in the Contract Documents. Except as provided in Section 13.2.2, neither party to the Contract shall assign the Contract as a whole without written consent of the other.

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If either party attempts to make an assignment without such consent, that party shall nevertheless remain legally responsible for all obligations under the Contract.

§ 13.2.2 The Owner may, without consent of the Contractor, assign the Contract to a lender providing construction financing for the Project, if the lender assumes the Owner's rights and obligations under the Contract Documents. The Contractor shall execute all consents reasonably required to facilitate the assignment.

§ 13.3 Rights and Remedies

§ 13.3.1 Duties and obligations imposed by the Contract Documents and rights and remedies available thereunder shall be in addition to and not a limitation of duties, obligations, rights, and remedies otherwise imposed or available by law or in equity.

(Paragraph deleted)

§ 13.3.2 No action or failure to act by the Owner, Architect, or Contractor shall constitute a waiver of a right or duty afforded them under the Contract, nor shall such action or failure to act constitute approval of or acquiescence in a breach thereunder, except as may be specifically agreed upon in writing.

§ 13.3.3 The invalidity of any part or provision of the Contract Documents shall not impair or affect in any manner the validity, enforceability or effect of the remaining parts and provisions of the Contract Documents and the parties agree to substitute for the invalid provision the provision within the bounds of the law which most clearly effectuates the legal and economic intent of the invalid provision.

§ 13.3.4 No provision contained in the Contract Documents shall create or give to third parties any claim or right against the Owner.

§ 13.4 Tests and Inspections

§ 13.4.1 Tests, inspections, and approvals of portions of the Work shall be made as required by the Contract Documents and by Applicable Laws. Unless otherwise provided, the Contractor shall make arrangements for such tests, inspections, and approvals with an independent testing laboratory or entity acceptable to the Owner, or with the appropriate public authority, and shall bear all related costs of tests, inspections, and approvals. The Contractor shall give the Architect timely notice of when and where tests and inspections are to be made so that the Architect may be present for such procedures. The Owner shall bear costs of tests, inspections, or approvals that do not become requirements until after bids are received or negotiations concluded. The Owner shall directly arrange and pay for tests, inspections, or approvals where building codes or Applicable Laws so require.

§ 13.4.2 If the Architect, Owner, or public authorities having jurisdiction determine that portions of the Work require additional testing, inspection, or approval not included under Section 13.4.1, the Architect will, upon written authorization from the Owner, instruct the Contractor to make arrangements for such additional testing, inspection, or approval, by an entity acceptable to the Owner, and the Contractor shall give timely notice to the Architect of when and where tests and inspections are to be made so that the Architect may be present for such procedures. Such costs, except as provided in Section 13.4.3, shall be at the Owner's expense. If the inspections and tests conducted under Section 13.4.1 or this Section 13.4.2 reveal failure in a portion of the Work, the Owner may order the inspection and testing at the Contractor's expense of any and all portions of the Work that are identical or similar to the failing portion.

§ 13.4.3 If procedures for testing, inspection, or approval under Sections 13.4.1 and 13.4.2 reveal failure of the portions of the Work to comply with requirements established by the Contract Documents, all costs made necessary by such failure, including those of repeated procedures and compensation for the Architect's services and expenses, shall be at the Contractor's expense.

§ 13.4.4 Required certificates of testing, inspection, or approval shall, unless otherwise required by the Contract Documents, be secured by the Contractor and promptly delivered to the Architect.

§ 13.4.5 If the Architect is to observe tests, inspections, or approvals required by the Contract Documents, the Architect will do so promptly and, where practicable, at the normal place of testing.

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§ 13.4.6 Tests or inspections conducted pursuant to the Contract Documents shall be made promptly to avoid unreasonable delay in the Work.

§ 13.5 Interest

Payments due and unpaid under the Contract Documents shall bear interest as provided in the Agreement.

ARTICLE 14 TERMINATION OR SUSPENSION OF THE CONTRACT

§ 14.1 Termination by the Contractor

§ 14.1.1 The Contractor may terminate the Contract if the Work is stopped for a period of sixty (60) consecutive days through no act or fault of the Contractor, a Subcontractor, a Sub-subcontractor, or any of their respective agents or employees, or any other persons or entities performing portions of the Work, for any of the following reasons:

.1 Issuance of an order of a court or other public authority having jurisdiction that requires all Work to be stopped;

.2 An act of government, such as a declaration of national emergency, that requires all Work to be stopped; or

.3 Because the Architect has not issued a Certificate for Payment and has not notified the Contractor of the reason for withholding certification as provided in Section 9.4.1, or because the Owner has not made payment on a Certificate for Payment within the time stated in the Contract Documents and has not notified the Contractor of the reason for withholding payment.

§ 14.1.2 The Contractor may terminate the Contract if, through no act or fault of the Contractor, a Subcontractor, a Sub-subcontractor, or any their respective agents or employees, or any other persons or entities performing portions of the Work, repeated suspensions, delays, or interruptions of the entire Work by the Owner as described in Section 14.3, constitute in the aggregate more than 100 percent of the total number of days scheduled for completion, or 120 days in any 365-day period, whichever is less.

§ 14.1.3 If one of the reasons described in Section 14.1.1 or 14.1.2 exists, the Contractor may, upon fourteen (14) days' notice to the Owner and Architect, terminate the Contract and recover from the Owner payment for Work executed in accordance with the Contract Documents and direct costs incurred by reason of such termination.

§ 14.1.4 If the Work is stopped for a period of ninety (90) consecutive days through no act or fault of the Contractor, a Subcontractor, a Sub-subcontractor, or any of their respective agents or employees or any other persons or entities performing portions of the Work because the Owner has repeatedly failed to fulfill the Owner's obligations under the Contract Documents with respect to matters material to the progress of the Work, the Contractor may, upon fourteen (14) additional days' notice to the Owner and the Architect, terminate the Contract and recover from the Owner as provided in Section 14.1.3.

§ 14.1.5 The notice of termination delivered pursuant to Section 14.1.3 or 14.1.4 must state with specificity the means by which the Owner may cure its nonperformance, and the Contractor shall not terminate this Contract if, within the applicable fourteen (14) day period, the Owner substantially takes such curative measures.

§ 14.2 Termination by the Owner for Cause

§ 14.2.1 The Owner may, without prejudice to any other rights or remedies available to the Owner under the Contract Documents or at law or in equity, terminate the Contract if the Contractor

.1 repeatedly refuses or fails to supply enough properly skilled workers or proper materials;

.2 fails to make payment to Subcontractors or suppliers in accordance with the respective agreements between the Contractor and the Subcontractors or suppliers;

.3 repeatedly disregards Applicable Laws;

.4 otherwise is guilty of substantial breach of a provision of the Contract Documents;

.5 institutes proceedings or consent to proceedings requesting relief or arrangement under the Federal Bankruptcy Act or similar or applicable federal or state law, or a petition under any federal or state bankruptcy or insolvency law is filed against the Contractor and such petition is not dismissed within sixty (60) days from the date of said filing, or the Contractor admits in writing its inability to pay its debts as they become due, or it makes a general assignment for the benefit of its creditors, or a receiver, liquidator, trustee, or assignee is appointed, or a receiver of all or any substantial portion of the Contractor's properties is appointed;

.6 abandons the Work;

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.7 submits an Application for Payment, sworn statement, waiver of lien, affidavit or document of any nature whatsoever which is intentionally falsified;

.8 fails to make prompt payment to Subcontractors or for materials or labor in accordance with the respective subcontracts or otherwise breaches its obligations under any subcontract with a Subcontractor; or

.9 if a mechanics or materialman's lien or notice of lien is filed against any part of the Work or the Project site and not promptly bonded or insured over by the Contractor, provided the Owner has paid the Contractor for the Work which is the subject of the lien.

§ 14.2.2 When any of the reasons described in Section 14.2.1 exist, and upon certification by the Architect that sufficient cause exists to justify such action, the Owner may, without prejudice to any other rights or remedies of the Owner and after giving the Contractor and the Contractor's surety, if any, seven days' notice, terminate employment of the Contractor and may, subject to any prior rights of the surety:

.1 Exclude the Contractor from the site and take possession of all materials, equipment, tools, and construction equipment and machinery thereon owned by the Contractor;

.2 Accept assignment of subcontracts pursuant to Section 5.4; and

.3 Finish the Work by whatever reasonable method the Owner may deem expedient. Upon written request of the Contractor, the Owner shall furnish to the Contractor a detailed accounting of the costs incurred by the Owner in finishing the Work.

§ 14.2.3 When the Owner terminates the Contract for one of the reasons stated in Section 14.2.1, the Contractor shall not be entitled to receive further payment until the Work is finished.

§ 14.2.4 If the unpaid balance of the Contract Sum exceeds costs of finishing the Work, including compensation for the Architect's services and expenses made necessary thereby, and other damages incurred by the Owner and not expressly waived, such excess shall be paid to the Contractor. If such costs and damages exceed the unpaid balance of the Guaranteed Maximum Price, the Contractor shall pay the difference to the Owner. The amount to be paid to the Contractor or Owner, as the case may be, shall be certified by the Initial Decision Maker, upon application, and this obligation for payment shall survive termination of the Contract.

§ 14.3 Suspension by the Owner for Convenience

§ 14.3.1 The Owner may, without cause, order the Contractor in writing to suspend, delay or interrupt the Work, in whole or in part for such period of time as the Owner may determine.

§ 14.3.2 The Contract Sum and Contract Time shall be adjusted for increases in the cost and time caused by suspension, delay, or interruption under Section 14.3.1. Adjustment of the Contract Sum shall include profit (or, as applicable, the Contractor's Fee). No adjustment shall be made to the extent

.1 that performance is, was, or would have been, so suspended, delayed, or interrupted, by another cause for which the Contractor is responsible; or

.2 that an equitable adjustment is made or denied under another provision of the Contract.

§ 14.4 Termination by the Owner for Convenience

§ 14.4.1 The Owner may, at any time, without prejudice and without waiving any other right or remedy available to the Owner under the Contract Documents or at law or in equity, terminate the Contract for the Owner's convenience and without cause.

§ 14.4.2 Upon receipt of notice from the Owner of such termination for the Owner's convenience, the Contractor shall

.1 cease operations as directed by the Owner in the notice;

.2 take actions necessary, or that the Owner may direct, for the protection and preservation of the Work; and

.3 except for Work directed to be performed prior to the effective date of termination stated in the notice, terminate all existing subcontracts and purchase orders and enter into no further subcontracts and purchase orders.

§ 14.4.3 In case of such termination for the Owner's convenience, the Owner shall pay the Contractor for Work properly executed in accordance with the Contract Documents, and reasonably and satisfactorily documented direct costs; costs incurred by reason of the termination, including costs attributable to termination of Subcontracts.

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§ 14.5 Payment upon Termination

§ 14.5.1 Except for claims for such payments as the Owner is explicitly required to make upon termination pursuant to this Article 14, the Contractor hereby waives and forfeits all claims for payment and damages, including without limitation, anticipated profits.

§ 14.5.2 When making any payment upon termination required under this Article 14, the Owner shall be credited for (1) payment previously made to the Contractor for the terminated portion of the Work, (2) valid claims which the Owner has against the Contractor under the Contract Documents, and (3) the value of the materials, supplies, equipment or other items that are to be disposed of by the Contractor that are included in the Contract Sum.

ARTICLE 15 CLAIMS AND DISPUTES

§ 15.1 Claims

§ 15.1.1 Definition

A Claim is a demand or assertion by one of the parties seeking, as a matter of right, payment of money, a change in the Contract Time, or other relief with respect to the terms of the Contract. The term "Claim" also includes other disputes and matters in question between the Owner and Contractor arising out of or relating to the Contract. The responsibility to substantiate Claims shall rest with the party making the Claim. This Section 15.1.1 does not require the Owner to file a Claim in order to impose liquidated damages in accordance with the Contract Documents.

§ 15.1.2 Time Limits on Claims

The Owner and Contractor shall commence all Claims and causes of action against the other and arising out of or related to the Contract, whether in contract, tort, breach of warranty or otherwise, in accordance with the requirements of the binding dispute resolution method selected in the Agreement and within the period specified by Applicable Laws.

§ 15.1.3 Notice of Claims

§ 15.1.3.1 Claims by either the Owner or Contractor, where the condition giving rise to the Claim is first discovered prior to expiration of the period for correction of the Work set forth in Section 12.2.2, shall be initiated by notice to the other party and to the Initial Decision Maker with a copy sent to the Architect, if the Architect is not serving as the Initial Decision Maker. Claims by either party under this Section 15.1.3.1 shall be initiated within 21 days after occurrence of the event giving rise to such Claim or within 21 days after the claimant first recognizes the condition giving rise to the Claim, whichever is later.

§ 15.1.3.2 Claims by either the Owner or Contractor, where the condition giving rise to the Claim is first discovered after expiration of the period for correction of the Work set forth in Section 12.2.2, shall be initiated by notice to the other party. In such event, no decision by the Initial Decision Maker is required.

§ 15.1.4 Continuing Contract Performance

§ 15.1.4.1 Pending final resolution of a Claim, except as otherwise agreed in writing or as provided in Section 9.7 and Article 14, the Contractor shall proceed diligently with the performance of its obligations under the Contract Documents and the Owner shall continue to make payments in accordance with the Contract Documents.

§ 15.1.4.2 The Contract Sum and Contract Time shall be adjusted in accordance with the Initial Decision Maker's decision, subject to the right of either party to proceed in accordance with this Article 15. The Architect will issue Certificates for Payment in accordance with the decision of the Initial Decision Maker.

§ 15.1.5 Claims for Additional Cost

If the Contractor wishes to make a Claim for an increase in the Contract Sum, notice as provided in Section 15.1.3 shall be given before proceeding to execute the portion of the Work that is the subject of the Claim. Prior notice is not required for Claims relating to an emergency endangering life or property arising under Section 10.4.

§ 15.1.6 Claims for Additional Time

§ 15.1.6.1 If the Contractor wishes to make a Claim for an increase in the Contract Time, notice as provided in Section 15.1.3 shall be given. The Contractor's Claim shall include an estimate of cost and of probable effect of delay on progress of the Work. In the case of a continuing delay, only one Claim is necessary.

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§ 15.1.6.2 If adverse weather conditions are the basis for a Claim for additional time, such Claim shall be documented by data substantiating that weather conditions were abnormal for the period of time, could not have been reasonably anticipated, and had an adverse effect on the scheduled construction.

§ 15.1.7 Waiver of Claims for Consequential Damages

The Contractor and Owner waive Claims against each other for consequential damages arising out of or relating to this Contract. This mutual waiver includes

.1 damages incurred by the Owner for rental expenses, for losses of use, income, profit, financing, business and reputation, and for loss of management or employee productivity or of the services of such persons; and

.2 damages incurred by the Contractor for principal office expenses including the compensation of personnel stationed there, for losses of financing, business and reputation, and for loss of profit, except anticipated profit arising directly from the Work.

This mutual waiver is applicable, without limitation, to all consequential damages due to either party's termination in accordance with Article 14. Nothing contained in this Section 15.1.7 shall be deemed to preclude assessment of liquidated damages, when applicable, in accordance with the requirements of the Contract Documents. Notwithstanding anything to the contrary herein or in the Contract Documents, neither the Contract Sum nor the Contract Time shall be adjusted if the increased costs or delay underlying the Contractor's claim for adjustment stems from the negligent act or omission of the Contractor, its subcontractors of any tier, or of anyone for whose performance the Contractor is responsible to the Owner, or as a result of the error of any of the same or of the failure of any of the same to comply with, and fulfill their responsibilities under, the Contract Documents.

§ 15.2 Initial Decision

§ 15.2.1 Claims, excluding those where the condition giving rise to the Claim is first discovered after expiration of the period for correction of the Work set forth in Section 12.2.2 or arising under Sections 10.3, 10.4, and 11.5, shall be referred to the Initial Decision Maker for initial decision. The Architect will serve as the Initial Decision Maker, unless otherwise indicated in the Agreement. Except for those Claims excluded by this Section 15.2.1, an initial decision shall be required as a condition precedent to mediation of any Claim. If an initial decision has not been rendered within 30 days after the Claim has been referred to the Initial Decision Maker, the party asserting the Claim may demand mediation and binding dispute resolution without a decision having been rendered. Unless the Initial Decision Maker and all affected parties agree, the Initial Decision Maker will not decide disputes between the Contractor and persons or entities other than the Owner.

§ 15.2.2 The Initial Decision Maker will review Claims and within ten days of the receipt of a Claim take one or more of the following actions: (1) request additional supporting data from the claimant or a response with supporting data from the other party, (2) reject the Claim in whole or in part, (3) approve the Claim, (4) suggest a compromise, or (5) advise the parties that the Initial Decision Maker is unable to resolve the Claim if the Initial Decision Maker lacks sufficient information to evaluate the merits of the Claim or if the Initial Decision Maker concludes that, in the Initial Decision Maker's sole discretion, it would be inappropriate for the Initial Decision Maker to resolve the Claim.

§ 15.2.3 In evaluating Claims, the Initial Decision Maker may, but shall not be obligated to, consult with or seek information from either party or from persons with special knowledge or expertise who may assist the Initial Decision Maker in rendering a decision. The Initial Decision Maker may request the Owner to authorize retention of such persons at the Owner's expense.

§ 15.2.4 If the Initial Decision Maker requests a party to provide a response to a Claim or to furnish additional supporting data, such party shall respond, within ten days after receipt of the request, and shall either (1) provide a response on the requested supporting data, (2) advise the Initial Decision Maker when the response or supporting data will be furnished, or (3) advise the Initial Decision Maker that no supporting data will be furnished. Upon receipt of the response or supporting data, if any, the Initial Decision Maker will either reject or approve the Claim in whole or in part.

§ 15.2.5 The Initial Decision Maker will render an initial decision approving or rejecting the Claim, or indicating that the Initial Decision Maker is unable to resolve the Claim. This initial decision shall (1) be in writing; (2) state the reasons therefor; and (3) notify the parties and the Architect, if the Architect is not serving as the Initial Decision Maker, of any change in the Contract Sum or Contract Time or both. The initial decision shall be final and binding on

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the parties but subject to mediation and, if the parties fail to resolve their dispute through mediation, to binding dispute resolution.

§ 15.2.6 Either party may file for mediation of an initial decision at any time, subject to the terms of Section 15.2.6.1.

§ 15.2.6.1 Either party may, within 30 days from the date of receipt of an initial decision, demand in writing that the other party file for mediation. If such a demand is made and the party receiving the demand fails to file for mediation within 30 days after receipt thereof, then both parties waive their rights to mediate or pursue binding dispute resolution proceedings with respect to the initial decision.

§ 15.2.7 In the event of a Claim against the Contractor, the Owner may, but is not obligated to, notify the surety, if any, of the nature and amount of the Claim. If the Claim relates to a possibility of a Contractor's default, the Owner may, but is not obligated to, notify the surety and request the surety's assistance in resolving the controversy.

§ 15.2.8 If a Claim relates to or is the subject of a mechanic's lien, the party asserting such Claim may proceed in accordance with Applicable Laws to comply with the lien notice or filing deadlines.

§ 15.3 Mediation

§ 15.3.1 Claims, disputes, or other matters in controversy arising out of or related to the Contract, except those waived as provided for the Contract Documents, shall be subject to mediation as a condition precedent to binding dispute resolution.

§ 15.3.2 The parties shall endeavor to resolve their Claims by mediation which, unless the parties mutually agree otherwise, shall be administered by the American Arbitration Association in accordance with its Construction Industry Mediation Procedures in effect on the date of the Agreement. A request for mediation shall be made in writing, delivered to the other party to the Contract, and filed with the person or entity administering the mediation. The request may be made concurrently with the filing of binding dispute resolution proceedings but, in such event, mediation shall proceed in advance of binding dispute resolution proceedings, which shall be stayed pending mediation for a period of 60 days from the date of filing, unless stayed for a longer period by agreement of the parties or court order

§ 15.3.3 Either party may, within 30 days from the date that mediation has been concluded without resolution of the dispute or 60 days after mediation has been demanded without resolution of the dispute, demand in writing that the other party file for binding dispute resolution. If such a demand is made and the party receiving the demand fails to file for binding dispute resolution within 60 days after receipt thereof, then both parties waive their rights to binding dispute resolution proceedings with respect to the initial decision.

§ 15.3.4 The parties shall share the mediator's fee and any filing fees equally. The mediation shall be held in the place where the Project is located, unless another location is mutually agreed upon. Agreements reached in mediation shall be enforceable as settlement agreements in any court having jurisdiction thereof.

§ 15.4 Arbitration

§ 15.4.1 If the parties have selected arbitration as the method for binding dispute resolution in the Agreement, any Claim subject to, but not resolved by, mediation shall be subject to arbitration which, unless the parties mutually agree otherwise, shall be administered by the American Arbitration Association in accordance with its Construction Industry Arbitration Rules in effect on the date of the Agreement. The Arbitration shall be conducted in the place where the Project is located, unless another location is mutually agreed upon. A demand for arbitration shall be made in writing, delivered to the other party to the Contract, and filed with the person or entity administering the arbitration. The party filing a notice of demand for arbitration must assert in the demand all Claims then known to that party on which arbitration is permitted to be demanded.

§ 15.4.1.1 A demand for arbitration shall be made no earlier than concurrently with the filing of a request for mediation, but in no event shall it be made after the date when the institution of legal or equitable proceedings based on the Claim would be barred by the applicable statute of limitations. For statute of limitations purposes, receipt of a written demand for arbitration by the person or entity administering the arbitration shall constitute the institution of legal or equitable proceedings based on the Claim.

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§ 15.4.2 The award rendered by the arbitrator or arbitrators shall be final, and judgment may be entered upon it in accordance with applicable law in any court having jurisdiction thereof.

§ 15.4.3 The foregoing agreement to arbitrate and other agreements to arbitrate with an additional person or entity duly consented to by parties to the Agreement, shall be specifically enforceable under applicable law in any court having jurisdiction thereof.

§ 15.4.4 Consolidation or Joinder

§ 15.4.4.1 Subject to the rules of the American Arbitration Association or other applicable arbitration rules, either party may consolidate an arbitration conducted under this Contract with any other arbitration to which it is a party provided that (1) the arbitration agreement governing the other arbitration permits consolidation, (2) the arbitrations to be consolidated substantially involve common questions of law or fact, and (3) the arbitrations employ materially similar procedural rules and methods for selecting arbitrator(s).

§ 15.4.4.2 Subject to the rules of the American Arbitration Association or other applicable arbitration rules, either party may include by joinder persons or entities substantially involved in a common question of law or fact whose presence is required if complete relief is to be accorded in arbitration, provided that the party sought to be joined consents in writing to such joinder. Consent to arbitration involving an additional person or entity shall not constitute consent to arbitration of any claim, dispute or other matter in question not described in the written consent.

§ 15.4.4.3 The Owner and Contractor grant to any person or entity made a party to an arbitration conducted under this Section 15.4, whether by joinder or consolidation, the same rights of joinder and consolidation as those of the Owner and Contractor under this Contract.

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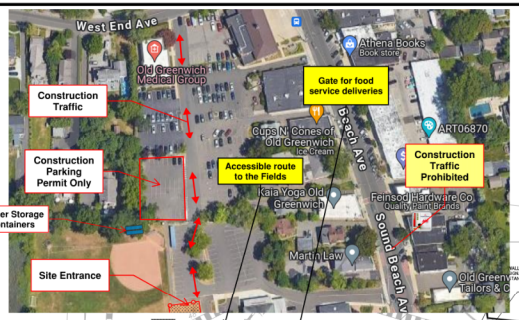
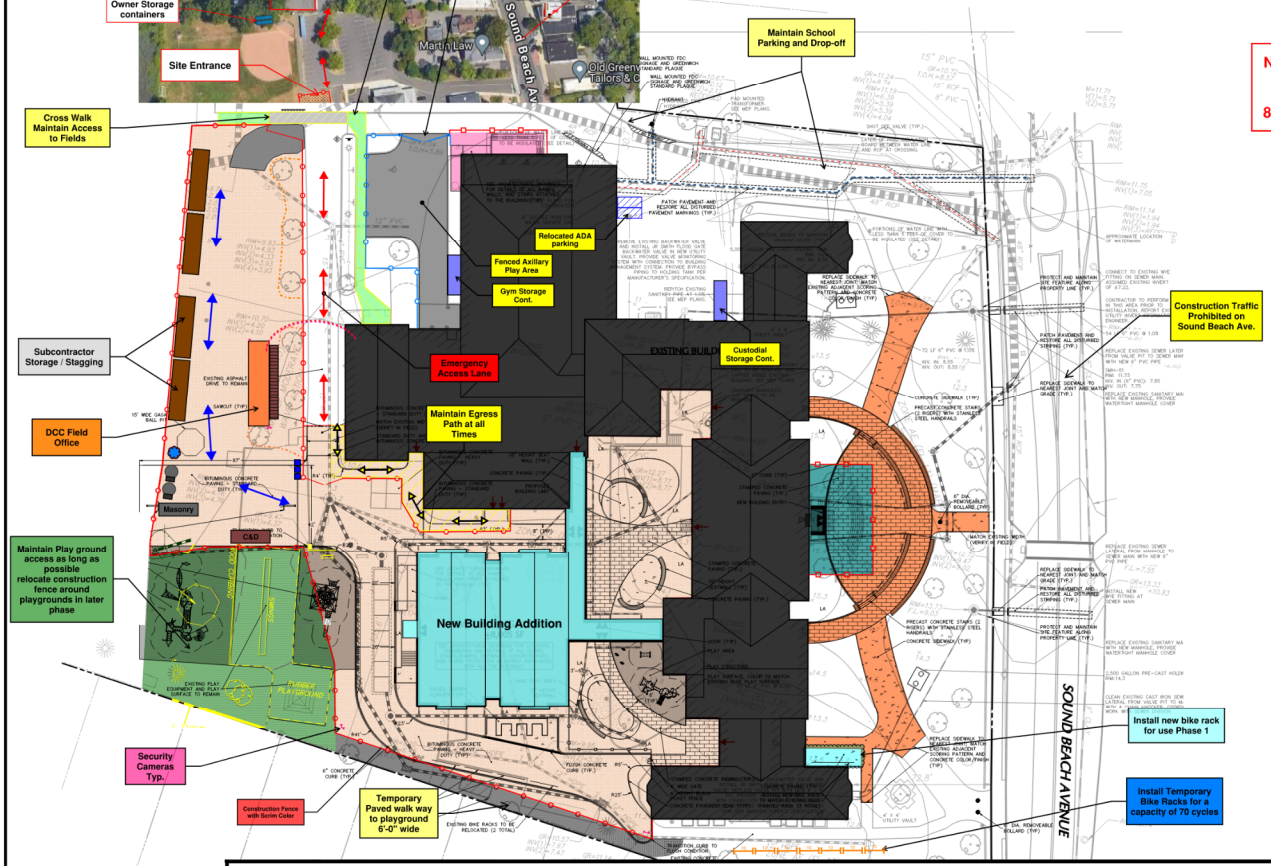
SITE LOGISTIC PLAN (SL-1)





No Construction Deliveries to be Received During Parent Drop/Pick-up Times:
8:00 - 9:00AM & 1:00 - 3:30PM

DOWNES CONSTRUCTION COMPANY

General Notes:

1 - All Workers shall In designated lot only.
2 - Confirm location of all gates and fence, with CM prior to installation.
3 - Provide anti-tracking mats at all vehicle gates.
4 - All Deliveries are to be coordinated with the Construction Manager.
5 - All material storage must be coordinated and approved by the Construction Manager.
6 - The Site work Subcontractor is responsible to coordinate and provide stable/level base for all rigging and/or pump locations.
7 - The Site work Subcontractor is responsible to maintain access points for forklifts and/or deliveries to structure.
8 - Site work Subcontractor shall provide measures to ensure cleanliness of existing parking lots and driveways. Provide street sweeping and dust control throughout construction.
9 - Protect all existing items and utilities scheduled to remain.
10 - Provide and maintain all temp. construction fence, enclosures, barricades etc. required to ensure security and separation of construction activities.
11 - Site work Subcontractor is responsible to make sure all egress pathways from the existing building are clear of obstructions at all times all times
12 -Site work Subcontractor is responsible to restore all areas disturbed by construction activity at project conclusion without exclusion.
13 - This site logistics plan should not be considered all inclusive and does not relieve the Subcontractors from complying with the Contract Documents. Refer to Division 01 General Requirements, Scopes of Work and other Specifications for additional related work required.
14 - The Site work Subcontractor is responsible to provide and maintain clean compacted gravel base access throughout the site for scaffold or lift access, free of debris and accessible at all times. Site Subcontractor to maintain through out the duration of construction activities. Use of recycle or reclaim products are prohibited for use as temporary base materials
15 - Construction fence shall have a continuous top rail, wire bottom, and diagonal bracing at all change of directions. Height 6'-0" U.O.N. Screening shall be New material. Color to be selected by Owner. Gates to have full frames and commercial hardware.
16 - Site Contractor to coordinate temp power and water to trailer compounds, mixing station etc. etc. with MEP trades.

DANGER CONSTRUCTION SITE	Site Contractor to provide install & maintain signage install at 30lf intervals on the perimeter of all construction fences Typ.	DANGER EYE PROTECTION REQUIRED IN THIS AREA	Site Contractor to provide install & maintain signage install at All Construction Gates (2set per location) Typ.	NOTICE Hard Hat, Hi-Vis Vest & Safety Glasses Required.	Site Contractor to provide install & maintain signage install at All Construction Gates (2set per location) Typ.	MUSTER POINT 1 / MUSTER POINT 2	Site Contractor to provide install & maintain Muster signage through all phases coordinate locations with CM.
DANGER HARD HAT AREA	Site Contractor to provide install & maintain signage install at 30lf intervals on the perimeter of all construction fences Typ.	THIS IS A SMOKE FREE WORKPLACE YOUR COOPERATION IS EXPECTED	Site Contractor to provide install & maintain signage install at All Construction Gates (2set per location) Typ.	NOTICE All visitors MUST report to site office.	Site Contractor to provide install & maintain signage install at All Construction Gates (2set per location) Typ.		

Sign Key

Site Contractor to coordiante design, professionally fabricate, install, and maintain All custom signage as noted on each site phasing drawing.

Site Contractor to provide all road work plans for ON and Off site work for approval by the CM and the AHJ. Provide and maintain all safety sign-age, lights, barriers etc. for the duration of work in active traffic lanes and pedestrian walkways.

Old Greenwich School

SL-1

10/31/2024	NTS

Client#: 64666 **SAMPLE** DOWCO11

ACORD™ CERTIFICATE OF LIABILITY INSURANCE

DATE (MM/DD/YYYY)

THIS CERTIFICATE IS ISSUED AS A MATTER OF INFORMATION ONLY AND CONFERS NO RIGHTS UPON THE CERTIFICATE HOLDER. THIS CERTIFICATE DOES NOT AFFIRMATIVELY OR NEGATIVELY AMEND, EXTEND OR ALTER THE COVERAGE AFFORDED BY THE POLICIES BELOW. THIS CERTIFICATE OF INSURANCE DOES NOT CONSTITUTE A CONTRACT BETWEEN THE ISSUING INSURER(S), AUTHORIZED REPRESENTATIVE OR PRODUCER, AND THE CERTIFICATE HOLDER.

IMPORTANT: If the certificate holder is an ADDITIONAL INSURED, the policy(ies) must be endorsed. If SUBROGATION IS WAIVED, subject to the terms and conditions of the policy, certain policies may require an endorsement. A statement on this certificate does not confer rights to the certificate holder in lieu of such endorsement(s).

PRODUCER	CONTACT NAME:	
AGENT NAME AGENT ADDRESS AGENT PHONE #	PHONE (A/C, No, Ext):	FAX (A/C, No):
	E-MAIL ADDRESS:	
	INSURER(S) AFFORDING COVERAGE	NAIC #
	INSURER A : Ins. Co. name & rating	
INSURED SUBCONTRACTOR NAME ADDRESS	INSURER B : (Must have AM Best rating	
	INSURER C : A-/VII or better - the	
	INSURER D : rating must be shown on	
	INSURER E : the certificate)	
	INSURER F :	

COVERAGES **CERTIFICATE NUMBER:** **REVISION NUMBER:**

THIS IS TO CERTIFY THAT THE POLICIES OF INSURANCE LISTED BELOW HAVE BEEN ISSUED TO THE INSURED NAMED ABOVE FOR THE POLICY PERIOD INDICATED. NOTWITHSTANDING ANY REQUIREMENT, TERM OR CONDITION OF ANY CONTRACT OR OTHER DOCUMENT WITH RESPECT TO WHICH THIS CERTIFICATE MAY BE ISSUED OR MAY PERTAIN, THE INSURANCE AFFORDED BY THE POLICIES DESCRIBED HEREIN IS SUBJECT TO ALL THE TERMS, EXCLUSIONS AND CONDITIONS OF SUCH POLICIES. LIMITS SHOWN MAY HAVE BEEN REDUCED BY PAID CLAIMS.

INSR LTR	TYPE OF INSURANCE	ADDL INSR	SUBR WVD	POLICY NUMBER	POLICY EFF (MM/DD/YYYY)	POLICY EXP (MM/DD/YYYY)	LIMITS	
A	[X] COMMERCIAL GENERAL LIABILITY [ ] CLAIMS-MADE [X] OCCUR GEN'L AGGREGATE LIMIT APPLIES PER: [ ] POLICY [X] PRO-JECT [ ] LOC OTHER:	Y	Y	Policy Number	MM/DD/YY	MM/DD/YY	EACH OCCURRENCE DAMAGE TO RENTED PREMISES (Ea occurrence) MED EXP (Any one person) PERSONAL & ADV INJURY GENERAL AGGREGATE PRODUCTS - COMP/OP AGG 	$1,000,000 $300,000 $5,000 $1,000,000 $2,000,000 $2,000,000 $
A	AUTOMOBILE LIABILITY [X] ANY AUTO [ ] ALL OWNED AUTOS [ ] SCHEDULED AUTOS [X] HIRED AUTOS [X] NON-OWNED AUTOS	Y	Y	Policy Number	MM/DD/YY	MM/DD/YY	COMBINED SINGLE LIMIT (Ea accident) BODILY INJURY (Per person) BODILY INJURY (Per accident) PROPERTY DAMAGE (Per accident) 	$1,000,000 $ $ $ $
A	[X] UMBRELLA LIAB [X] OCCUR EXCESS LIAB [ ] CLAIMS-MADE DED [X] RETENTION $10,000	Y	Y	Policy Number	MM/DD/YY	MM/DD/YY	EACH OCCURRENCE AGGREGATE 	$10,000,000 $10,000,000 $
A	WORKERS COMPENSATION AND EMPLOYERS' LIABILITY ANY PROPRIETOR/PARTNER/EXECUTIVE OFFICER/MEMBER EXCLUDED? Y / N [N] (Mandatory in NH) If yes, describe under DESCRIPTION OF OPERATIONS below	N / A	Y	Policy Number	MM/DD/YY	MM/DD/YY	[X] PER STATUTE [ ] OTH-ER E.L. EACH ACCIDENT E.L. DISEASE - EA EMPLOYEE E.L. DISEASE - POLICY LIMIT	 $500,000 $500,000 $500,000
B	Professional Liab Pollution Liab IF APPLICABLE			Policy Number Policy Number	MM/DD/YY MM/DD/YY	MM/DD/YY MM/DD/YY	$1,000,000 / Occ (min) $1,000,000 / Occ (min)	

DESCRIPTION OF OPERATIONS / LOCATIONS / VEHICLES (ACORD 101, Additional Remarks Schedule, may be attached if more space is required)

RE: "OLD GREENWICH SCHOOL "

Downes Construction Company, LLC, Town of Greenwich, and Silver Petrucelli + Associates are included as Additional Insured on a primary and non-contributory basis, for ongoing and completed operations, as respects general liability, automobile liability and umbrella/excess liability policies. Waiver of Subrogation applies on all policies in favor of the additional insureds. All insurance policies shall be endorsed to provide 30-Day Notice of Cancellation to the Certificate Holder.

.

CERTIFICATE HOLDER	CANCELLATION
Downes Construction Company, LLC 200 Stanley Street New Britain, CT 06051	SHOULD ANY OF THE ABOVE DESCRIBED POLICIES BE CANCELLED BEFORE THE EXPIRATION DATE THEREOF, NOTICE WILL BE DELIVERED IN ACCORDANCE WITH THE POLICY PROVISIONS. AUTHORIZED REPRESENTATIVE

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PARTIAL LIEN WAIVER AND RELEASE

The Undersigned, _____("Releasing Party"), having performed or furnished, or having caused to be performed or furnished, labor, services or materials for the benefit of **Downes Construction Company LLC** ("General Contractor") in the construction, alteration or improvement of that property of The City of Bristol (collectively, the "Owner") described as: Bristol City Hall Reno/ Addition (the "Project"), hereby certifies that the Releasing Party has been paid all the monies due it for all labor, materials or services performed on or furnished by it to the Project as of the date _____ hereof (referred to hereinafter as the "Release Date").

("Surety") has furnished a payment bond, identified as Bond No. ("Payment Bond") for the Project, for the benefit of those providing services and materials to the Project for the benefit of the General Contractor.

1. For and in consideration of payment received on this date in the amount of $_____ and inclusive of the payment made contemporaneous herewith, the Releasing Party has been paid a total of $_____for the Project, to date. The Releasing Party does hereby remise, release and forever discharge, for itself and its successors, parent companies and affiliates, the General Contractor, Surety, and Owner and their respective parent companies, subsidiaries, sureties, affiliates, agents, successors, assigns, members, owners and employees, of and from all manner of actions and
actions, cause and causes of actions, suits, liens, debts, dues, sums of money, accounts, reckonings, bonds, bills, specialties, covenants, contracts, controversies, agreements, promises, variances, trespasses, damages, judgments, extents, executions, claims and demands whatsoever in law, or in equity which the Releasing Party ever had, now has, or which it or its successors, hereafter can, shall or may have from the beginning of the world to the Release Date in connection with any and all claims of any nature whatsoever arising out of or relating to the Project.
2. Further, the Releasing Party certifies, under oath, and in accordance with all applicable statutes, laws and regulations, that all its laborers, subcontractors or materialmen, have been paid in full up to the extent of prior payments received through the Release Date for all materials, equipment, fees, licenses, insurances and taxes of every description and that there are no liens, causes for liens or claims against the Releasing Party for such items, and that all laborers, subcontractors or materialmen will be paid in full within seven days hereof for all remaining sums due them out of the additional funds received as of this date. Releasing Party shall indemnify, hold harmless, protect and defend the Owner from any and all claims, liens, demands or causes of action that may be asserted against the Owner or the Project property by any of the Releasing Party's laborers, subcontractors, materialmen, employees or suppliers, including claims, liens, demands or causes of action that may be disputed by the Releasing Party.
3. Further, the Releasing Party for value received does hereby release and discharge the Project, and the General Contractor, Surety and Owner from any and all mechanic's liens or other liens and claims of liens, equitable or legal, or claims against them, or against the Payment Bond, which the undersigned has or may have against the Project property for labor, services or materials through the Release Date.

Further, the Releasing Party warrants that no assignment of claims for payments relating to the Project has been made, and that the undersigned has the authority to execute this Release and Waiver and has performed the labor and services supplied and the materials required of the Releasing Party to the state of completion of said improvements for which payment is being applied. The undersigned has personal knowledge that the statements made herein are true and correct.

_____
(Releasing Party)

By: _____
(Authorized Party Signature)

Dated:_____ Title: _____

STATE OF _____)
)
COUNTY OF _____)

The foregoing instrument was acknowledged before me this ___ day of _____, ____, by _____, as _____ of _____ on behalf of the company. He/ she is personally known to me or has produced _____ as identification and did (did not) take an oath.

My Commission Expires:

_____
(Notary Signature)

Name: _____
(Legibly Printed)

(AFFIX OFFICIAL SEAL)
Notary Public, State of _____

FINAL LIEN WAIVER AND RELEASE

The Undersigned, _____("Releasing Party"), having performed or furnished, or having caused to be performed or furnished, labor, services or materials for the benefit of **Downes Construction Company LLC** ("General Contractor") in the construction, alteration or improvement of that property of _____ (collectively, the "Owner") described as: _____ (the "Project"), hereby certifies that the Releasing Party has been paid all the monies due it for all labor, materials or services performed on or furnished by it to the Project as of the date _____hereof (referred to hereinafter as the "Release Date").

("Surety") has furnished a payment bond, identified as Bond No. ("Payment Bond") for the Project, for the benefit of those providing services and materials to the Project for the benefit of the General Contractor.

1. For and in consideration of payment received on this date in the amount of $_____ and inclusive of the payment made contemporaneous herewith, the Releasing Party has been paid a total of $_____ for the Project, to date. The Releasing Party does hereby remise, release and forever discharge, for itself and its successors, parent companies and affiliates, the General Contractor, Surety, and Owner and their respective parent companies, subsidiaries, sureties, affiliates, agents, successors, assigns, members, owners and employees, of and from all manner of actions and actions, cause and causes of actions, suits, liens, debts, dues, sums of money, accounts, reckonings, bonds, bills, specialties, covenants, contracts, controversies, agreements, promises, variances, trespasses, damages, judgments, extents, executions, claims and demands whatsoever in law, or in equity which the Releasing Party ever had, now has, or which it or its successors, hereafter can, shall or may have from the beginning of the world to the Release Date in connection with any and all claims of any nature whatsoever arising out of or relating to the Project.
2. Further, the Releasing Party certifies, under oath, and in accordance with all applicable statutes, laws and regulations, that all its laborers, subcontractors or materialmen, have been paid in full up to the extent of prior payments received through the Release Date for all materials, equipment, fees, licenses, insurances and taxes of every description and that there are no liens, causes for liens or claims against the Releasing Party for such items, and that all laborers, subcontractors or materialmen will be paid in full within seven days hereof for all remaining sums due them out of the additional funds received as of this date. Releasing Party shall indemnify, hold harmless, protect and defend the Owner from any and all claims, liens, demands or causes of action that may be asserted against the Owner or the Project property by any of the Releasing Party's laborers, subcontractors, materialmen, employees or suppliers, including claims, liens, demands or causes of action that may be disputed by the Releasing Party.
3. Further, the Releasing Party for value received does hereby release and discharge the Project, and the General Contractor, Surety and Owner from any and all mechanic's liens or other liens and claims of liens, equitable or legal, or claims against them, or against the Payment Bond, which the undersigned has or may have against the Project property for labor, services or materials through the Release Date.

Further, the Releasing Party warrants that no assignment of claims for payments relating to the Project has been made, and that the undersigned has the authority to execute this Release and Waiver and has performed the labor and services supplied and the materials required of the Releasing Party to the state of completion of said improvements for which payment is being applied. The undersigned has personal knowledge that the statements made herein are true and correct.

_____
(Releasing Party)

By: _____
(Authorized Party Signature)

Dated:_____ Title: _____

STATE OF _____)
)
COUNTY OF _____)

The foregoing instrument was acknowledged before me this ___ day of _____, ____, by _____, as _____ of _____ on behalf of the company. He/ she is personally known to me or has produced _____ as identification and did (did not) take an oath.

My Commission Expires:

_____
(Notary Signature)

Name: _____
(Legibly Printed)

(AFFIX OFFICIAL SEAL)
Notary Public, State of _____

FINAL MECHANIC'S LIEN WAIVER AND RELEASE OF CLAIMS

The undersigned, _____ ("Releasing Party"), having performed or furnished, or having caused to be performed or furnished, labor, services or materials for the benefit of **Downes Construction Company LLC** ("General Contractor") in the construction, alteration or improvement of that property of _____(collectively, the "Owner") described as: _____ (the "Project"), hereby certifies that the Releasing Party has been paid all the monies due it for all labor, materials or services performed on or furnished by it to the Project as of the date hereof (referred to hereinafter as the "Release Date").

_____ ("Surety") has furnished a payment bond, identified as Bond No. _____ ("Payment Bond") for the Project, for the benefit of those providing services and materials to the Project for the benefit of the General Contractor.

1. For and in consideration of payment received on this date in the amount of **$**_____, as well as for prior payments received for work performed through the Release Date, the Releasing Party does hereby remise, release and forever discharge, for itself and its successors, parent companies and affiliates, the General Contractor, Surety, and Owner and their respective parent companies, subsidiaries, sureties, affiliates, agents, successors, assigns, members, owners and employees, of and from all manner of actions and actions, cause and causes of actions, suits, liens, debts, dues, sums of money, accounts, reckonings, bonds, bills, specialties, covenants, contracts, controversies, agreements, promises, variances, trespasses, damages, judgments, extents, executions, claims and demands whatsoever in law, or in equity which the Releasing Party ever had, now has, or which it or its successors, hereafter can, shall or may have from the beginning of the world to the Release Date in connection with any and all claims of any nature whatsoever arising out of or relating to the Project.

2. Further, the Releasing Party certifies, under oath, and in accordance with all applicable statutes, laws and regulations, that all its laborers, subcontractors or materialmen, have been paid in full up to the extent of prior payments received through the Release Date for all materials, equipment, fees, licenses, insurances and taxes of every description and that there are no liens, causes for liens or claims against the Releasing Party for such items, and that all laborers, subcontractors or materialmen will be paid in full within seven days hereof for all remaining sums due them out of the additional funds received as of this date. Releasing Party shall indemnify, hold harmless, protect and defend the Owner from any and all claims, liens, demands or causes of action that may be asserted against the Owner or the Project property by any of the Releasing Party's laborers, subcontractors, materialmen, employees or suppliers, including claims, liens, demands or causes of action that may be disputed by the Releasing Party.

3. Further, the Releasing Party for value received does hereby release and discharge the

Project, and the General Contractor, Surety and Owner from any and all mechanic's liens or other liens and claims of liens, equitable or legal, or claims against them, or against the Payment Bond, which the undersigned has or may have against the Project property for labor, services or materials through the Release Date.

Further, the Releasing Party warrants that no assignment of claims for payments relating to the Project has been made, and that the undersigned has the authority to execute this Final Release and Waiver and has performed the labor and services supplied and the materials required of the Releasing Party to the state of completion of said improvements for which payment is being applied. The undersigned has personal knowledge that the statements made herein are true and correct.

_____

By:_____

Dated:_____, 2022 Title:_____

STATE OF CONNECTICUT)
)
COUNTY OF)

The foregoing instrument was acknowledged before me this ____ day of _____, 2016, by _____, as _____ of _____ on behalf of the company. He/she is personally known to me or has produced _____ as identification and did (did not) take an oath.

My Commission Expires:

_____
(Signature)

Name: _____
(Legibly Printed)

(AFFIX OFFICIAL SEAL) Notary Public, State of Connecticut

BILL OF SALE

Know all men by these presents, that _____

a corporation/company having an office in the Town/City of _____ in the county of _____

in the state of _____ , hereinafter called the Seller, in consideration of payment in full in the

amount of _____

from DOWNES CONSTRUCTION CO., LLC., hereinafter called the Purchaser, does hereby bargain, sell, transfer and convey unto the said Purchaser the following articles of personal property:

DESCRIPTION: _____

_____

FOR THE USE IN CONSTRUCTION OF _____

To Have and to Hold the same to the said Purchaser DOWNES CONSTRUCTION CO., LLC, its successors, executors, administrators and assigns, forever to its and their proper use. And that. the said Seller for itself, its heirs, executors and administrators, does hereby covenant and agree with the said Purchaser to warrant and defend the said goods to the said Purchaser, against all persons whatever:

IN WITNESS WHEREOF, _____

has hereunto set its hand and seal this _____ day of _____ , Two-Thousand Two.

Signed, Sealed and delivered in the presence of:

_____ _____

(Witness) (Company Name)

_____

(Authorized Signature)

_____

(Printed Name & Title)

State of: _____

County of: _____

On this _____ day of _____ , before me _____

Notary Public, the undersigned officer, _____

known to me (or satisfactorily proven) to be the person whose name is subscribed to the within instrument and acknowledged that he executed the same for the purposes therein contained.

In Witness Whereof I hereunto set my hand and official seal.

_____

Notary Public/Commissioner of the Supreme Court

My Commission Expires: _____

AUTHORIZATION OF OWNER FOR ENTRY

The undersigned ("Seller") has in its possession at _____ (the "Premises") certain goods or materials manufactured and/or purchased for sale to DOWNES CONSTRUCTION CO., LLC. for use in the _____ project (the "Goods").

Upon receipt of the purchase price for the Goods, (i) title to the Goods shall indefensibly pass to DOWNES CONSTRUCTION CO., LLC., free and clear of all liens and security interests of Seller or any other party, (ii) DOWNES CONSTRUCTION CO., LLC.. and/or shall have the right to enter the Premises during normal business hours for the purpose of removing or inspecting any part or all of the Goods, such authority to continue for so long as any Goods remain on the Premises, and (iii) the Goods shall be clearly stenciled or marked by Seller to indicate they are the property of DOWNES CONSTRUCTION CO., LLC..

Until such time as all of the Goods have been removed by DOWNES CONSTRUCTION CO., LLC. the Seller shall store the Goods in a secure area, protected from theft, vandalism and weather conditions, and shall keep the Goods insured for the benefit of Seller and DOWNES CONSTRUCTION CO., LLC. in an amount equal to the full replacement value thereof.

_____
(Company Name)

_____
(Authorized Signature)

_____
(Printed Name & Title)

_____
(Date)

State of: _____

County of: _____

This Authorization of Owner for Entry was subscribed and sworn to before me, a Notary Public in and for said County and State, this _____ day of _____ who signed this Authorization on behalf of _____ stated he is the _____ of said _____ and that he is fully authorized to execute this Authorization for it.

In Witness Whereof I hereunto set my hand and official seal.

_____
Notary Public/Commissioner of the Supreme Court

My Commission Expires: _____

Project: **ADDITION AND ALTERATIONS TO OLD GREENWICH SCHOOL**
285 SOUND BEACH AVE, OLD GREENWICH, CT 06870

DCC Job#:

Architect:
Struct. Engineer:
MEP Engineer:
Civil Engineer:
Landscape Arch.:

Construction Manager: **Downes Construction Company, LLC**
200 Stanley Street
New Britain, CT 06050
Attn.:

Construction Manager's Stamp Area

SUBMITTAL REVIEW

DOWNES CONSTRUCTION COMPANY, LLC

☒ REVIEWED FOR SUBMISSION TO ARCHITECT / ENGINEER ☐ REJECTED

DOWNES CONSTRUCTION COMPANY'S REVIEW IS FOR GENERAL CONFORMANCE WITH THE CONTRACT DOCUMENTS. MARKINGS AND/OR COMMENTS SHALL NOT BE CONSTRUED AS RELIEVING THE TRADE CONTRACTOR FROM COMPLIANCE WITH THE CONTRACT DOCUMENTS.

BY: _____ DATE: _____
SPECS SECTION: _____ SUBMITTAL NUMBER: _____
CONTRACT DWG. NO.: ---- REVIEW NUMBER: _____

AREA TO BE COMPLETED IN FULL BY SUBCONTRACTOR:

Date: _____

Subcontractor / Vendor: _____

Submittal Description: _____

Specs. Section: _____

Page: _____

Paragraph: _____

☐ **First Submission**
Resubmission #: _____

☐ **Submitted as Specified**
Submitted as Substitution (As equal)

Other Comments: _____

Architect's Stamp Area

Engineer's Stamp Area (As Required)

Received Stamp Area

GUARANTEE / WARRANTY

PROJECT NAME
Project Address

Subcontractor ABC hereby guarantees Bid Package No. xxx to the fullest extent provided in the Plans, Specifications, General Conditions, Special Conditions, or any other Contract Documents.

We shall remove, replace and/or repair at our own expense and at the convenience of the Owner any faulty, defective or improper work, material or equipment discovered within eighteen (18) months from the Date of Substantial Completion of the above referenced project, as a whole, by the Architect and owner, or for such longer period as indicated in the Plans, Specifications, General Conditions, or any other Contract Documents. (Substantial Completion shall commence on_.)

Without limitation by the foregoing, Subcontractor ABC, shall pay in addition for all damage to the project resulting from defects in the work and all costs and expenses necessary to correct, remove, replace and/or repair the work and other property, which may be damaged in correcting, removing, replacing, or repairing the work.

Specification Sections covered under this Guarantee/Warranty:

SAMPLE

Subscribed and sworn to before me this_____day

of_____, 2022.

Subcontractor ABC
Address

Date: _____

By:_____

Notary Public: _____

Print Name: _____

My Commission Expires: _____

Title: _____

Sample Change Order Form

Proposed Change Order #

To: Downes Construction Co., LLC
From:
Date:
Ref:
CM Number:
Trade Contractor PCO Number:

Description:

Quantity	Unit	Description of Material and Equipment	Unit Cost	Total
				$ -
				$ -
				$ -
				$ -
				$ -
				$ -
Line 1		Material and Equipment Total		$ -

Crew	Labor Classification	Hours	Base Rate	FICA & Med Care	FUTA & SUTA	G/L, W/C Ins	Benefits	Total Rate	Total
		0.00	$ -	$ -	$ -	$ -	$ -	$ -	$ -
								$ -	$ -
								$ -	$ -
								$ -	$ -
								$ -	$ -
								$ -	$ -
								$ -	$ -
								$ -	$ -
								$ -	$ -
								$ -	$ -
								$ -	$ -
								$ -	$ -
								$ -	$ -
Line 2								Labor Total	$ -

Subcontractor Cost (Attach Proposals)		
Trade	Name of Subcontractor	Total
Line 3	Subcontractor Total	$ -

Line 4	Total Labor, Material, and Equipment	$ -

Contractor Overhead and Profit	Allow %	Amount	Total
Net Value of Self Performed Work (Amount = Lines 1+2)	10%	$ -	$ -
Net Value of Subcontract Work (Amount = Line 3)	5%	$ -	$ -
Line 5	Contractor Overhead and Profit Total		$ -

Line 6	Total Proposed Change Order Amount (Lines 4+5)	$ -

BACKGROUND CHECK COMPLIANCE AGREEMENT

ADDITION & ALTERATIONS TO OLD GREENWICH SCHOOL
285 SOUND BEACH AVE
OLD GREENWICH, CT 06870
GPS #2494-24

As a condition under the Standard Form of Agreement between Greenwich School Bldg.Committee and Downes Construction Company, LLC, Subcontractors are to comply with "Background Investigations" for this project. As defined in the Invitation to Bid and Instructions to Subcontractors.

PURPOSE

The Background Check compliance agreement is intended to ensure that subcontractors, assigned to this project, have or will hire qualified employees/staff to provide and maintain a safe and secure environment.

POLICY

Subcontractors shall comply with maintaining a policy and procedure in place for a background check and performing background checks, in accordance with any State and Federal laws, for any person deployed to the Betances Learning Lab Magnet School

DEFINITION OF A BACKGROUND CHECK

A background check is a process in which the specifics of an individual's past history are verified for the purposes of determining qualifications for employment/work, and it's conducted in addition to a reference check. The type of background check conducted is dependent upon a position's responsibilities and required qualifications by the contract. When conducting background checks, it is the Subcontractors responsibility to comply with any state and federal laws.

COMPLIANCE AGREEMENT

The Subcontractor hereby agrees that deployed personnel on this project have been administered a background check. To the best of the Subcontractors knowledge, the employee has a satisfactory background check in accordance and in compliance with the any State and Federal laws. The Subcontractor and its employees release Downes Construction Company, LLC, its officers and its employees from any and all liability arising out of or related in any way to such testing.

Please print and sign where noted:

SUBCONTRACTOR COMPANY NAME/ADDRESS/TELEPHONE #:

_____

_____

_____

_____

_____

PRINT NAME OF AUTHORIZED COMPANY'S REPRESENTATIVE:

_____ **TITLE:** _____

SIGNATURE OF AUTHORIZED COMPANY'S REPRESENTATIVE

_____ **DATE:** _____

DOWNES CONSTRUCTION COMPANY

Badge #: _____

SUBCONTRACTOR ORIENTATION

Date: _____

Project Name: ADDITION & RENOVATIONS TO OLD GREENWICH SCHOOL

Jobsite Address: 285 SOUND BEACH AVE, GREENWICH, CT

DCC Superintendent: _____

Subcontractor: _____

Name: _____

Drivers License #/State: _____ **Emergency Phone#** _____

Applicable Licenses #: _____

Certificates; i.e., First Aid/CPR/OSHA 10, etc. _____

NOTE: **SAFETY FIRST AND FOREMOST.**
Any violation is grounds for dismissal and removal from site.

		√ or X
1.	OSHA Regulations for Construction apply	
2.	Subcontractors Safety Program & Job Hazard Analysis must be submitted and adhered to.	
3	Hardhats, safety glasses & high vis. clothing and proper dress reqired at all times (no sneaker boots)	
4	Drugs and alcohol on site are strictly prohibited - ZERO TOLERENCE	
5	No radios, headphones or amplified audio at any time.	
6	Safety: SDS and First Aid Kit locations	
	Proper PPE required at all times.	
	AED located in DCC Field Office.	
	General Housekeeping,Coffee and Lunch Breaks.	
	Scaffold use (No one on scaffolds without DCC Taining/approval)	
7	Posession of Fire Arms is strickly prohibited. ZERO TOLLERENCE.	
8	Harassment of any type or indimidation is strictly Prohibited. ZEOR TOLLERANCE.	
9	Campus Traffic and Safety rules must be adhered to at all times.	
10	Coordination/cooperation with other trades and workers is required.	
11	No Smoking on Property. This includes electronic cigarettes.	
12	No onsite construction workers parking allowed. Parking available: _____	
13	Use proper language and behavior. This is an occupied school campus, fraternizing with school staff and students is prohibited.	
14	Subcontractors Weekly Tool Box Safety Talks	
15	Approved hot work permit is required for all open flames or welding work.	
16	Safety rails & floor opening covers removal is by the C.M. only. Advance notice is required.	
17	Perimeter Cable Adjustment or Removal DCC TO BE NOTIFIED FOR APPROVAL!!	
18	Unauthorized duplication or possesion of university keys is prohibited.	
19	DCC Parking vehicle sticker as applicable and orientation hard hat sticker must be visible at all times.	
20	Three (3) air horn blasts designate to retreat to the Primary Meeting Point	
21	Report all injuries to compenent person and DCC superintendent immediately.	
22	Report any safety concerns to competent person and DCC superintendent.	
23	Competent person for your employer Name:	

Subcontractor _____

Subcontractor Signature _____

DCC, LLC Signature _____

Municipal Improvement Application
Final Site Plan Review Set
ADDITION & ALTERATIONS TO:

Old Greenwich School

285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870



ARCHITECT
SILVER PETRUCELLI & ASSOC.
3190 WHITNEY AVENUE, HAMDEN CT 06518
311 STATE STREET NEW LONDON, CT 06320
PHONE 203 230 9007 silverpetrucelli.com

M/E/P/FP
SILVER PETRUCELLI & ASSOC.
3190 WHITNEY AVENUE, HAMDEN CT 06518
311 STATE STREET NEW LONDON, CT 06320
PHONE 203 230 9007 silverpetrucelli.com

STRUCTURAL
MICHAEL HORTON ASSOC., INC
780 EAST MAIN STREET, BRANFORD, CT 06405
PHONE 203 481 8600 mha-eng.com

LANDSCAPE/CIVIL
LANGAN
555 LONG WHARF DRIVE, 9TH FLOOR,
NEW HAVEN, CT 06107
PHONE 203.562.5771 langan.com

INTERIORS
SILVER PETRUCELLI & ASSOC.
3190 WHITNEY AVENUE, HAMDEN CT 06518
311 STATE STREET NEW LONDON, CT 06320
PHONE 203 230 9007 silverpetrucelli.com

TECHNOLOGY
D'AGOSTINO & ASSOCIATES
477 MAIN STREET SUITE 210B, MONROE, CT 06468
PHONE 203 497 3064 DA-Technology.com

NOT FOR CONSTRUCTION NOT FOR CONSTRUCTION

SILVER PETRUCELLI + ASSOCIATES

3190 WHITNEY AVENUE HAMDEN CT 06518
311 STATE STREET NEW LONDON CT 06320
203 230 9007 silverpetrucelli.com

BUILDING OFFICIAL | FIRE MARSHAL | SANITARIAN/ HEALTH INSPECTOR | ADA/504 COORIDNATOR

OFFICIALS:

Volume No. 1

8/29/2024

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P202	FIRST FLOOR C PART PLANS - PLUMBING
P203	FIRST FLOOR D PART PLAN - PLUMBING
P204	2ND & 3RD PART PLANS B - PLUMBING
P205	2ND & 3RD PART PLANS C - PLUMBING
P206	PART B & C RISER ISO VIEWS - PLUMBING
P300	DETAILS - PLUMBING
P301	DETAILS - PLUMBING
P302	DETAILS - PLUMBING
P400	SCHEDULES - PLUMBING

MECHANICAL DRAWINGS

M001	GENERAL MECHANICAL NOTES, LEGENDS AND ABBREVIATIONS
M010	MECHANICAL DEMOLITION PLAN FIRST FLOOR PLAN
M020	MECHANICAL DEMOLITION SECOND FLOOR PLAN
M030	MECHANICAL DEMOLITION THIRD FLOOR PLAN
M040	MECHANICAL DEMOLITION PART PLANS
M101	FIRST FLOOR HVAC PLAN PART 'A'
M102	FIRST FLOOR HVAC PLAN PART 'B'
M103	FIRST FLOOR HVAC PLAN PART 'C'
M104	FIRST FLOOR HVAC PLAN PART 'D'
M110	SECOND FLOOR HVAC PLAN PART 'A'
M120	SECOND FLOOR HVAC PLAN PART 'B'
M130	SECOND FLOOR HVAC PLAN PART 'C'
M140	THIRD FLOOR HVAC PLANT PART ' B'
M150	THIRD FLOOR HVAC PLAN PART 'C'
M160	ATTIC PLAN HVAC PART 'B
M180	ROOF PLAN PART 'A'
M190	ROOF PLAN PART 'C'
M191	ROOF PLAN PART 'D'
M300	MECHANICAL DETAILS
M301	MECHANICAL DETAILS
M302	MECHANICAL DETAILS
M303	MECHANICAL DETAILS
M304	MECHANICAL DETAILS
M305	MECHANICAL DETAILS
M400	MECHANICAL SCHEDULES
M401	MECHANICAL SCHEDULES
M402	MECHANICAL SCHEDULES
M403	MECHANICAL SCHEDULES
M500	MECHANICAL REFRIGERANT SYSTEMS
M501	MECHANICAL REFRIGERANT SYSTEMS
M502	MECHANICAL REFRIGERANT SYSTEMS
M503	MECHANICAL REFRIGERANT SYSTEMS
M504	MECHANICAL REFRIGERANT SYSTEMS

MECHANICAL DRAWINGS

M505	MECHANICAL REFRIGERANT SYSTEMS
M506	MECHANICAL REFRIGERANT SYSTEMS
M507	MECHANICAL REFRIGERANT SYSTEMS
M508	MECHANICAL REFRIGERANT SYSTEMS
M509	MECHANICAL REFRIGERANT SYSTEMS
M510	MECHANICAL REFRIGERANT SYSTEMS
M600	MECHANICAL CONTROLS SYSTEMS
M601	MECHANICAL CONTROLS SYSTEMS
M602	MECHANICAL CONTROLS SYSTEMS

ELECTRICAL DRAWINGS

E001	ELECTRICAL SYMBOLS, NOTES & ABBREVIATIONS
E002	LIGHT FIXTURE SCHEDULES
E003	ELECTRICAL DRAWING LIST, DEMOLITION NOTES & FIRE ALARM RISER DIAGRAM
E011	FIRST FLOOR LIGHTING DEMOLITION PLAN - PART 'A'
E012	FIRST FLOOR LIGHTING DEMOLITION PLAN - PART 'B'
E013	FIRST FLOOR LIGHTING DEMOLITION PLAN - PART 'C'
E021	SECOND FLOOR LIGHTING DEMOLITION PLAN - PART 'A', 'B' & 'C'
E031	THIRD FLOOR LIGHTING DEMOLITION PLAN - PART 'A', 'B' & 'C'
E041	ATTIC LIGHTING DEMOLITION PLAN - 'B' & 'C'
E051	FIRST FLOOR POWER DEMOLITION PLAN - PART 'A'
E052	FIRST FLOOR POWER DEMOLITION PLAN - PART 'B'
E053	FIRST FLOOR POWER DEMOLITION PLAN - PART 'C'
E061	SECOND FLOOR POWER DEMOLITION PLAN - PART 'A', 'B' & 'C'
E071	THIRD FLOOR POWER DEMOLITION PLAN - PART 'A', 'B' & 'C'
E081	ATTIC POWER DEMOLITION PLAN - PART 'B' & 'C'
E091	ROOF DEMOLITION POWER PLAN - PART 'A'
E101	FIRST FLOOR LIGHTING PLAN - PART 'A'
E102	FIRST FLOOR LIGHTING PLAN - PART 'B'
E103	FIRST FLOOR LIGHTING PLAN - PART 'C'
E104	FIRST FLOOR LIGHTING PLAN - PART 'D'
E110	SECOND FLOOR LIGHTING PLAN - PART 'A', 'B' & 'C'
E120	THIRD FLOOR LIGHTING PLAN - PART 'A', 'B' & 'C'
E130	ATTIC LIGHTING PLAN - PART 'B' & 'C'
E140	ELECTRICAL SITE PLAN
E201	FIRST FLOOR POWER PLAN - PART 'A'
E202	FIRST FLOOR POWER PLAN - PART 'B'
E203	FIRST FLOOR POWER PLAN - PART 'C'
E204	FIRST FLOOR POWER PLAN - PART 'D'
E210	SECOND FLOOR POWER PLAN - PART 'A', 'B' & 'C'
E220	THIRD FLOOR POWER PLAN - PART 'A', 'B' & 'C'
E230	ATTIC POWER PLAN - PART 'B' & 'C'
E241	ROOF POWER PLAN - PART 'A'
E242	ROOF POWER PLAN - PART 'D'
E401	EXISTING ONE LINE DIAGRAM - NORTH SIDE - ELECTRICAL DEMOLITION
E402	EXISTING ONE LINE DIAGRAM - SOUTH SIDE - ELECTRICAL DEMOLITION
E403	ELECTRICAL ONE LINE DIAGRAM - NORTH SIDE
E404	ELECTRICAL ONE LINE DIAGRAM - SOUTH SIDE
E501	ELECTRICAL PANEL SCHEDULES - FIRST FLOOR PART 'A'
E502	ELECTRICAL PANEL SCHEDULES - FIRST FLOOR PART 'A' & 'B'
E503	ELECTRICAL PANEL SCHEDULES - FIRST FLOOR PART 'B' & 'C'
E504	ELECTRICAL PANEL SCHEDULES - SECOND FLOOR
E505	ELECTRICAL PANEL SCHEDULES - THIRD FLOOR
E506	ELECTRICAL PANEL SCHEDULES - PART 'A' THRU 'D'
E601	ELECTRICAL DETAILS
E602	ELECTRICAL DETAILS

TECHNOLOGY DRAWINGS

T001	TECH-SEC-AV SYMBOL LEGEND AND GENERAL NOTES
T010	TECH-SEC-AV OVERALL FIRST FLOOR DEMO PLAN
T011	TECH-SEC-AV FIRST FLOOR PLAN DEMO - PART "A"
T012	TECH-SEC-AV FIRST FLOOR PLAN DEMO - PART "B"
T013	TECH-SEC-AV FIRST FLOOR PLAN DEMO - PART "C"
T020	TECH-SEC-AV OVERALL SECOND FLOOR PLAN DEMO
T021	TECH-SEC-AV SECOND FLOOR PLAN DEMO - PART "A"
T022	TECH-SEC-AV SECOND FLOOR PLAN DEMO - PART "B"
T023	TECH-SEC-AV SECOND FLOOR PLAN DEMO - PART "C"
T030	TECH-SEC-AV OVERALL THIRD FLOOR PLAN DEMO
T032	TECH-SEC-AV THIRD FLOOR PLAN DEMO - PART "B"
T033	TECH-SEC-AV THIRD FLOOR PLAN DEMO - PART "C"
T110	TECH-SEC-AV OVERALL FIRST FLOOR PLAN
T111	TECH-SEC-AV OVERALL FIRST FLOOR PLAN - PART "A"
T112	TECH-SEC-AV OVERALL FIRST FLOOR PLAN - PART "B"
T113	TECH-SEC-AV OVERALL FIRST FLOOR PLAN - PART "C"
T114	TECH-SEC-AV OVERALL FIRST FLOOR PLAN - PART "D"
T120	TECH-SEC-AV OVERALL SECOND FLOOR PLAN
T121	TECH-SEC-AV SECOND FLOOR PLAN - PART "A"
T122	TECH-SEC-AV OVERALL SECOND FLOOR PLAN - PART "B"
T123	TECH-SEC-AV OVERALL SECOND FLOOR PLAN - PART "C"
T130	TECH-SEC-AV OVERALL THIRD FLOOR PLAN
T132	TECH-SEC-AV OVERALL THIRD FLOOR PLAN - PART "B"
T133	TECH-SEC-AV OVERALL SECOND FLOOR PLAN - PART "C"
T200	TECH - DATA ROOM #1008A & 2006B DETAILS
T300	TECH-SEC-AV - DETAILS
T301	TECH-SEC-AV - DETAILS
T302	TECH-SEC-AV - DETAILS
T400	TECH - WIRING DIAGRAMS
T401	TECH - WIRING DIAGRAMS

Project Title:

ADDITION & ALTERATIONS TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
311 STATE STREET NEW LONDON CT 06320
203 230 9007 silverpetrucelli.com

Revision:	Description:	Date:	Revised By:

Drawing Title:

DRAWING LIST

Date: 8/29/2024
Scale: 12" = 1'-0"
Drawn By: JM
Project Number: 22-382

Drawing Number: G000

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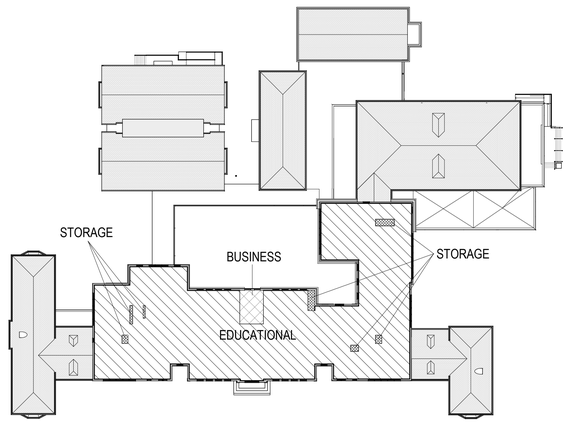
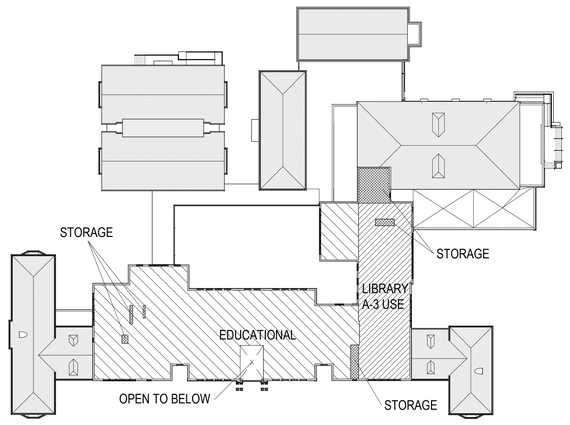


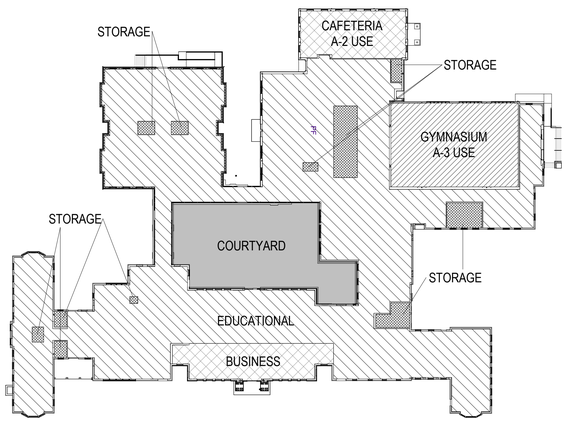
3 3rd FLOOR - OCCUPANCY TYPE PLAN

1" = 40'-0"



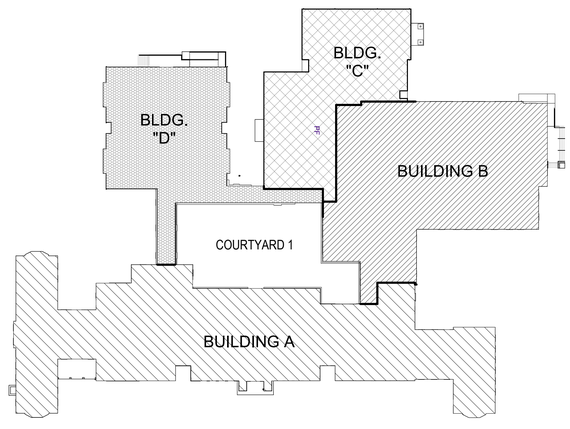
2 2nd FLOOR - OCCUPANCY TYPE PLAN

1" = 40'-0"



1 1st FLOOR - OCCUPANCY TYPE PLAN

1" = 40'-0"



5 CODE PLAN - BUILDINGS/PERIMETER

1" = 40'-0"

CODE INFORMATION

DATE OF ORIGINAL CONSTRUCTION	1902
DATE OF ADDITIONS	1949,1957,1980,1995
DATE OF PROPOSED ALTERATIONS	2025

1. GROUP CLASSIFICATION (Chapter 3)

(First Floor)	E / B / S / A2 / A3
(Second Floor)	E / B / S / A2
(Third Floor)	E / B / S

2. CONSTRUCTION TYPE (Chapter 6) — *Type **IIC** equivalent to Type **IIB**

(Existing)	**IIIB**, unprotected non-combustible, combustile (**"IIC"**, **"IIC"**), unprotected non-combustible
(Proposed new)	IIB

3. BUILDING HEIGHT (Chapter 5)

Allowable Height (story/feet)	3/75'-0"
Actual Height (story/feet)	3/45'-6"
(Stories Above Grade)	3

4. BUILDING AREA (Chapter 5)

1) Building Area (first floor level)

Existing construction	39,819.77	sq.ft.
New construction,(Kindergarten Wing)	7,635.24	sq.ft.
Total floor	47,455.01	sq.ft.

2) Building Area (2nd floor)

Existing construction	16,302.08	sq.ft.
New construction	0	sq.ft.
Total floor	16,302.08	sq.ft.

3) Building Area (3rd floor)

Existing construction	15,810.80	sq.ft.
New construction	0	sq.ft.
Total floor	15,810.80	sq.ft.

5) Building Area (all floors)

Existing construction	71,932.65	sq.ft.
New construction	7,635.24	sq.ft.
Total floors	79,567.89	sq.ft.

5. AREA MODIFICATIONS TO TABLE 503

Perimeter (P) 2,001 ft.
(perimeter of the entire building)

Total Frontage (F) 1,631 ft.
(building perimeter which fronts on a public way or open space having 30 feet open min.)

% Frontage increase (If) = 75% (.75 factor)

(As per table 506.3.3 - See also calculations on Open Perimeter Plan on this sheet)

BUSINESS:	STORAGE (S-1):	EDUCATIONAL:	ASSEMBLY:
Aa = At + (NS x If) At = 69,000 NS = 23,000 Aa = 69,000 + (23,000x.75)	Aa = At + (NS x If) At = 52,500 NS = 17,500 Aa = 52,500 + (17,500x.75)	Aa = At + (NS x If) At = 43,500 NS = 14,500 Aa = 43,500 + (14,500x.75)	Aa = At + (NS x If) At = 28,500 NS = 9,500 Aa = 28,500 + (9,500x.75)
Aa = 86,250 sq. ft. MAX.	Aa = 65,625 sq. ft. MAX.	Aa = 54,375 sq. ft. MAX.	Aa = 35,625 sq. ft. MAX.

6. CASE 1 - NONSEPARATED OCCUPANCIES (508.3) - NOT USED

7. CASE 2 - MIXED AND SEPARATED OCCUPANCIES (508.4)

(Indicating that existing areas of the Second and Third floors are not conforming with Table 506.2 of IBC and the increase for open perimeter. The proposed additions will increase the non-conformity by a minimal amount that is indicated for the purpose of requesting a code modification).

FIRST FLOOOR - USE GROUPS B & S-1 :

Actual areas per occupancy: B= 21,600 sf. S-1= 11,688 sf.

Business		Storage S-1		
21,600 / 86,250	+	11,688 / 65,625	=	.25 + .178 = .428

SECOND FLOOOR - USE GROUPS E & A :

EXISTING Actual areas for each occupancy: E= 58,432 sf. A= 6,844 sf.

Educational		Assembly		
58,432 / 54,375	+	6,844 / 35,625	=	1.075 + .192 = 1.267

PROPOSED Actual areas for each occupancy: E= 59,220 sf. A= 6,844 sf. — Decrease of .031

Educational		Assembly		Business		
53,968 / 54,375	+	6,844 / 35,625	+	4,464 / 86,250	=	.9925 + .192 + .0518= 1.236

THIRD FLOOOR - USE GROUP E :

EXISTING Actual area for each occupancy: E= 56,672 sf.

Educational		
56,672 / 54,375	=	1.042

PROPOSED Actual area for each occupancy: E= 56,805 sf. — Increase of .03

Educational		
56,805 / 54,375	=	1.045

8. FIRE-RESISTANCE RATED REQUIREMENTS FOR BUILDING ELEMENTS
(Table 601, See Code Plans for specific designations)

1 Structural frame: including columns, girders, trusses	0	Hr(s)
2 Bearing walls: Exterior (Table 602)	0	Hr(s)
Interior	0	Hr(s)
3 Nonbearing walls & partitions Exterior (Table 602)	0	Hr(s)
4 Nonbearing walls & partitions Interior	0	Hr(s)
5 Floor Construction (including supporting beams & joists)	0	Hr(s)
6 Roof Construction (including supporting beams & joists)	0	Hr(s)

9. OCCUPANCY LOAD

Design Total for 1st Floor	1,985
Total Exit Capacity for 1st Floor	5,516
Design Total for 2nd Floor	255
Total Exit Capacity for 2nd Floor	1,008
Design Total for 3rd Floor	430
Total Exit Capacity for 3rd Floor	1,008
Design Total for Building	2,670
Total Exit Capacity for Building	5,516

10. MODIFICATIONS

	Approved	Not Approved
IBC 508.4.2 -"Allowable Building Area")	XX-XX-XX	

11. ACCESSIBLE BUILDING

X	Designated
	Non Designated

12. MINIMUM PLUMBING FIXTURE COUNT (I.P.C. Chapter 4)
For each type of occupancy per entire facility

EDUCATIONAL (E) Group occupancy:
TOTAL Occupancy Load (Use E): (Design Load = 1,300)

	Required
W/C Male	13.00
W/C Female	13.00
Lavs Male	13.00
Lavs Female	13.00
D/F	13.00
Service Sink	1

ASSEMBLY (A-3) Group occupancy: (Gymnasium)
TOTAL Occupancy Load (Use A-3): (Design Load = 989)

	Required
W/C Male	3.96
W/C Female	7.61
Lavs Male	2.47
Lavs Female	2.47
D/F	1.98
Service Sink	1

ASSEMBLY (A-2) Group occupancy: (Cafeteria)
TOTAL Occupancy Load (Use A-3): (Design Load = 206)

	Required
W/C Male	1.37
W/C Female	1.37
Lavs Male	.52
Lavs Female	.52
D/F	.41
Service Sink	1

BUSINESS (B) Group occupancy:
TOTAL Occupancy Load (Use B): (Design Load = 54)

	Required
W/C Male	1.08
W/C Female	1.08
Lavs Male	.68
Lavs Female	.68
D/F	.54
Service Sink	1

STORAGE (S-1) Group occupancy:
TOTAL Occupancy Load (Use S-1): (Design Load = 15)

	Required
W/C Male	.08
W/C Female	.08
Lavs Male	.08
Lavs Female	.08
D/F	.02
Service Sink	1

TOTAL REQUIRED AND PROVIDED QUANTITY OF PLUMBING FIXTURES:
Use of unisex toilets and lavs within classrooms towards male and female count as approved by modification request no. M-xxx

	Required	Provided
W/C Male	(19.48)= 20	28
W/C Female	(23.14)= 23	24
All-Gender	----------	52
Total W/C	(42.62) = 43	52
Lavs Male	(16.74) = 17	20
Lavs Female	(16.74) = 17	19
Lavs All-Gender	----------	39
Total Lavs	(33.48) = 34	39
D/F	(15.95) = 16	19
Service Sink	5	10

13. ENTIRE BUILDING SPRINKLERED

EXISTING CONSTRUCTION Yes	EXISTING CONSTRUCTION No	NEW CONSTRUCTION Yes	NEW CONSTRUCTION No
	X		

EXISTING + NEW CONSTRUCTION FULLY SPRINKLERED: Yes X / No

14. THRESHOLD BUILDING CONDITIONS: Yes / No X

15. CODES TO WHICH THIS PROJECT WAS DESIGNED

State Building Code w/ CT Amendments	2021 IBC / 2022 CT amended
	101.4.7 - IEBC (Existing Building Portion)
State Existing Building Code w/ CT Amendments	2021 IEBC / 2022 CT amended
	301.3.1 - IEBC, Prescriptive Compliance Methods
State Fire Safety Code	2021 IFC / 2022 CT amended
State Plumbing Code w/ CT Amendments	2021 IPC / 2022 CT amended
State Mechanical Code w/ CT Amendments	2021 IMC / 2022 CT amended
State Energy Conservation Code w/ CT Amend.	2021 IECC / 2022 CT amended
State Electrical Code w/ CT Amendments	2020 NFPA 70 / 2022 CT amended
State Fire Prevention / Life Safety Code	2021 NFPA 1 & 101 / 2022 CT amended
Federal Section 504	Current
ADA Standards for Accessible Design	2010 ADA
Accessible and Usable Bldgs w/ CT Amendments	2017 ICC A117.1 / 2022 CT amended

1. CLASSIFICATION OF OCCUPANCY: E / A / B / S-1
2. CONSTRUCTION TYPE:
3. NOTIFICATION / ALARMS: YES X NO
(CFSC 2005, NFPA 72, NATIONAL FIRE ALARM CODE 2019)
4. DETECTION: YES X NO
(CFSC 2005, NFPA 72, NATIONAL FIRE ALARM CODE 2019)
5. EXTINGUISHMENT REQUIREMENTS: YES X NO
(NFPA 13, 2019)

MEANS OF EGRESS

MAXIMUM FLOOR AREA ALLOWANCES PER OCCUPANT
IBC TABLE 1004.5

USE	FLOOR AREA IN S.F. PER OCCUPANT
1. CLASSROOMS	20 S.F. NET
2. SHOPS & VOCATIONAL	50 S.F. NET
3. ASSEMBLY	
WITHOUT FIXED SEATS	7 S.F. NET
TABLES AND CHAIRS	15 S.F. NET
4. PLATFORMS	15 S.F. NET
5. LIBRARY	
READING ROOMS	50 S.F. NET
STACK AREA	100 S.F. GROSS
6. LOCKER ROOMS	50 S.F. GROSS
7. MECHANICAL AREAS	300 S.F. GROSS
8. STORAGE	300 S.F. GROSS
9. BUSINESS AREAS	150 S.F. GROSS

MAXIMUM LENGTH OF EXIT TRAVEL
1. I.B.C. TABLE 1017.2: 250 feet & 300 feet (B Use)

16. BUILDING AREAS FOR GRANT CALCULATION (ENTIRE FACILITY)
Per State Building Code Definition "Area, Building"
(to interior face of exterior walls, including openings and areas under projections)

Existing construction prior to this project	71,932.65	sq.ft.
Existing being demolished and removed	0	sq.ft.
New construction (Security vestibule and elevator)	7,635.24	sq.ft.
Total Building Area of entire facility	79,567.89	sq.ft.

Total Building Area (to interior face of exterior walls)

ENTIRE FACILITY:

	Existing	Demo	New	Total	Not in this phase	
						sq.ft.
1st Floor Level	39,819.77	0	7,635.24	47,455.01		sq.ft.
2nd Floor Level	16,302.08	0	0	16,302.08		sq.ft.
3rd Floor Level	15,810.80	0	0	15,810.80		sq.ft.
Total area (all floors)	71,932.65	0	0	79,567.89		sq.ft.

Total net area (reduced by spaces not in this phase): 0 sq.ft.

Areas of exterior canopies which are not included in the building areas:

Existing Canopy to be demolished	155.85	sq.ft.
New Canopies	191.35	sq.ft.

Total constructed building area (to exterior face of exterior walls - "contractor area")

ENTIRE FACILITY:

ENTIRE FACILITY:

	Existing	Demo	New	Total	Not in this phase	
						sq.ft.
1st Floor Level	39,819.77	0	7,635.24	47,455.01		sq.ft.
2nd Floor Level	16,302.08	0	0	16,302.08		sq.ft.
3rd Floor Level	15,810.80	0	0	15,810.80		sq.ft.
Total area (all floors)	71,932.65	0	0	79,567.89		sq.ft.

Total net area (reduced by spaces not in this phase): 0 sq.ft.

ROOF NOTE:
AS PER 2021 IECC, TABLE C402.1.3, CONTINUOUS INSULATION ON ROOF DECKS OVER ENCLOSED SPACES SHALL BE R-30 MINIMUM.

PROVIDE POLYISOCYANURATE RIGID INSULATION, 5" THICK BASE AND TAPERED STARTING AT 1/2" MIN. THICKNESS AT TOP. MINIMUM TOTAL THICKNESS SHALL BE 5 1/2" = R- ± 31.5

Project Title:

ADDITION & ALTERATIONS TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
311 STATE STREET NEW LONDON CT 06320
203 230 9007 silverpetrucelli.com

Revision: | Description: | Date: | Revised By:

Drawing Title:
BUILDING CODE PLANS & INFORMATION

Date: 8/29/2024
Scale: As indicated
Drawn By: JM
Project Number: 22-382
Drawing Number: G001

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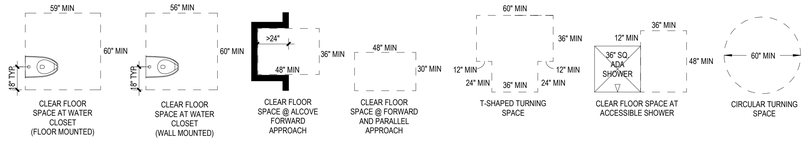
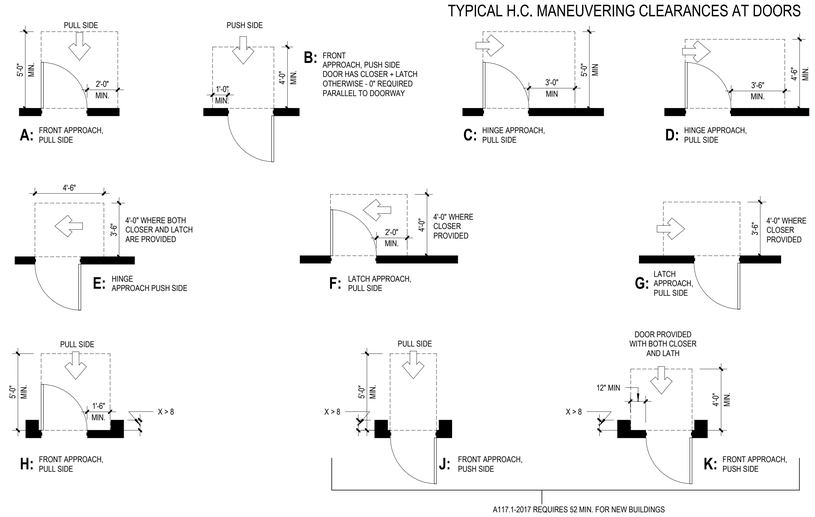
ADA - BUILDING BLOCKS FOR ACCESSIBLE CLEARANCES

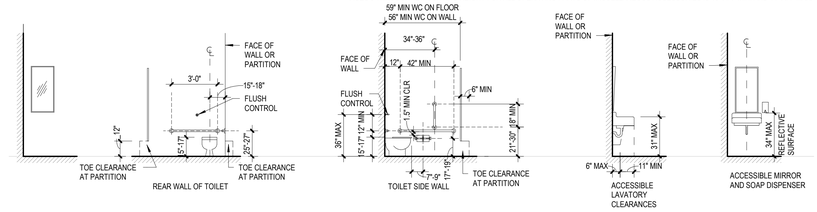


TYPICAL H.C. MANEUVERING CLEARANCES AT DOORS



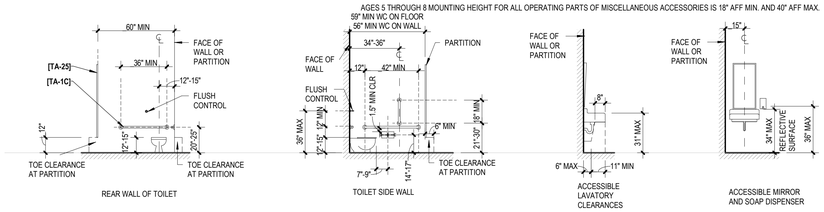
ADA - CHILDREN MOUNTING HEIGHTS AGES 9-12

AGES 9 THROUGH 12 MOUNTING HEIGHT FOR ALL OPERATING PARTS OF MISCELLANEOUS ACCESSORIES IS 16" AFF MIN. AND 44" AFF MAX.



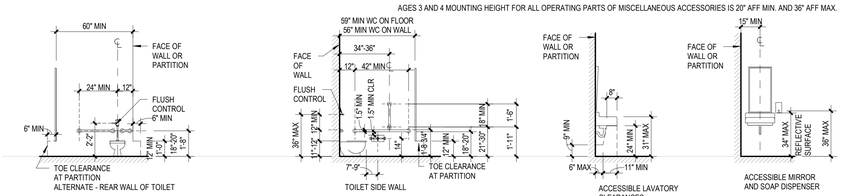
ADA - KINDERGARTEN MOUNTING HEIGHTS AGES 5-8

AGES 5 THROUGH 8 MOUNTING HEIGHT FOR ALL OPERATING PARTS OF MISCELLANEOUS ACCESSORIES IS 18" AFF MIN. AND 40" AFF MAX.

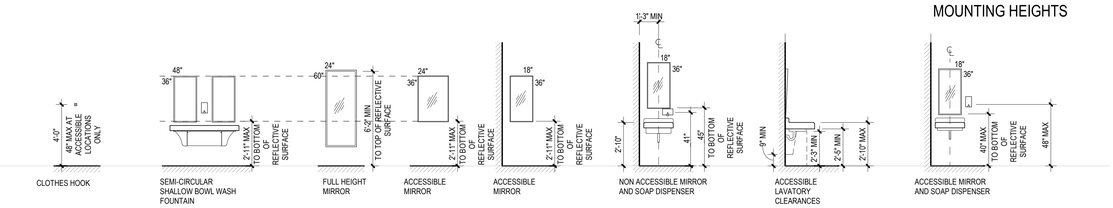


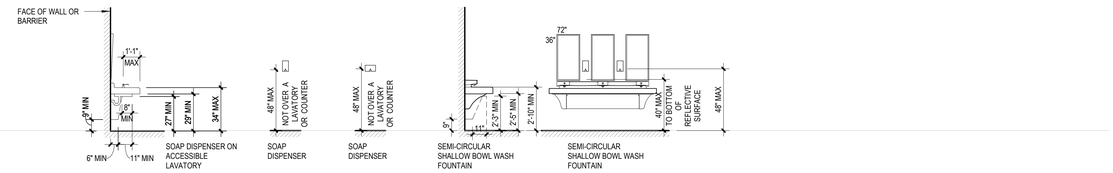
ADA - PRE-K MOUNTING HEIGHTS AGES 3-4

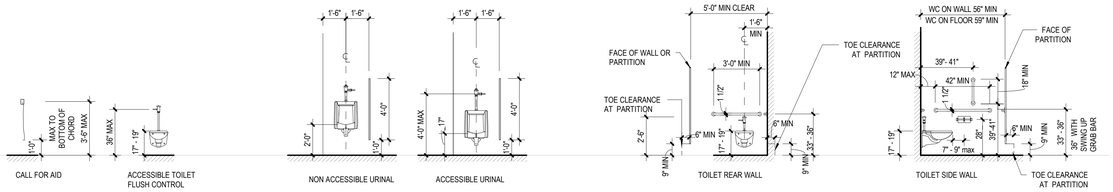
AGES 3 AND 4 MOUNTING HEIGHT FOR ALL OPERATING PARTS OF MISCELLANEOUS ACCESSORIES IS 20" AFF MIN. AND 36" AFF MAX.



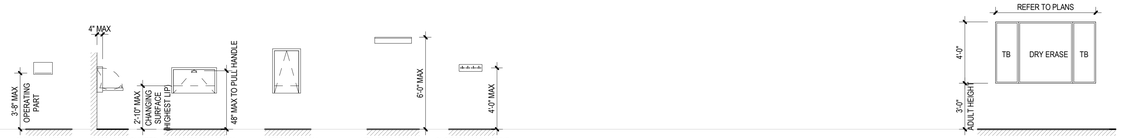
MOUNTING HEIGHTS

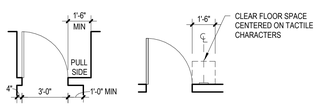


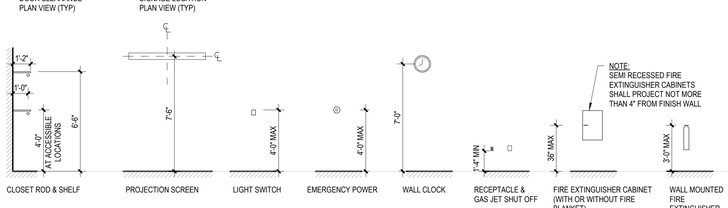












NOTES

1. WASTE AND HOT WATER PIPING TO BE INSULATED AT ACCESSIBLE LAVATORIES AND SINKS
2. ADULT FLUSH CONTROLS FOR WATER CLOSETS AND URINALS SHALL BE MOUNTED ON THE OPEN / WIDE SIDE OF THE WATER CLOSET.
3. ADULT MOUNTING HEIGHT FOR ALL OPERATING PARTS OF MISCELLANEOUS ADULT ACCESSORIES IS 15" AFF MIN. AND 48" AFF MAX. (FIRE ALARMS, SECURITY, THERMOSTATS, ETC.)
4. PROVIDE CONCEALED SOLID BLOCKING IN STUD WALLS FOR ACCESSORY MOUNTING.
5. REFER TO PLANS AND ELEVATIONS FOR REQUIRED ACCESSORIES.
6. ALL "MIN" DIMENSIONS FOR ACCESSORY MOUNTING HEIGHTS ARE TO BE CONSIDERED CLEAR DIMENSIONS TO FINISH SURFACE, UNLESS INDICATED OTHERWISE
7. ALL DIMENSIONS SHOWN ON THIS SHEET ARE TYPICAL, UNLESS OTHERWISE NOTED ELSEWHERE IN THIS DOCUMENT SET
8. ALL DIMENSIONS TO HORIZONTAL GRAB BARS ARE TO THE TOP OF THE GRIPPING SURFACE FROM THE FINISHED FLOOR.

Project Title:

ADDITION & ALTERATIONS TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
311 STATE STREET NEW LONDON CT 06320
203 230 9007 silverpetrucelli.com

Revision:	Description:	Date:	Revised By:

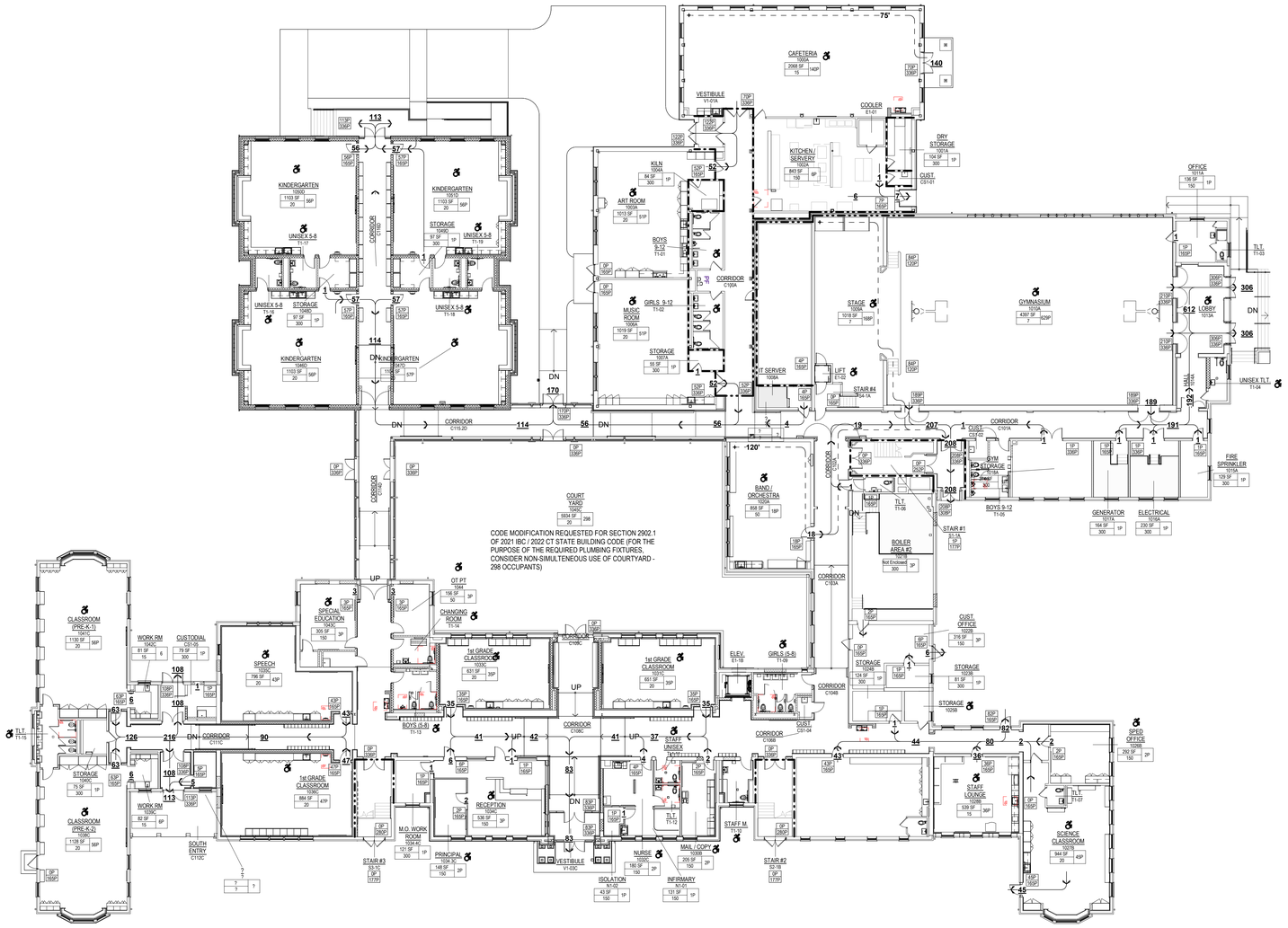
Drawing Title:

TYPICAL ACCESSORY MOUNTING HEIGHTS AND LOCATIONS

Date: 8/29/2024
Scale: 1/4" = 1'-0"
Drawn By: JM
Project Number: 22-382

Drawing Number: G002

8/30/2024 7:37:31 AM



CODE REFERENCE PLAN LEGEND

OFFICE 2345C	ROOM NAME & NUMBER
875 / 20 = 43P	ROOM OCCUPANCY LOAD AREA IN SQUARE FEET / OCCUPANCY LOAD FACTOR = ROOM OCCUPANCY LOAD (PEOPLE)
B | 200 — 20,000SF / 150	USE GROUP | ALLOWABLE OCCUPANT LOAD AREA IN SQUARE FEET/ LOAD FACTOR IN SQUARE FEET
	EXIT CAPACITY
1P / 165P	ACTUAL EGRESS OCCUPANCY OF DOOR / STAIR MAX. ALLOWABLE EGRESS OCCUPANCY OF DOOR OR STAIR OR RAMP
150 → 200 / 50 →	DIRECTION OF TRAVEL WITH ACCUMULATED OCCUPANCY LOAD
200' T.D.	MAXIMUM TRAVEL DISTANCE (T.D.) FROM FURTHEST POINT
	ACCESSIBLE AREA OR EXIT
	FLUSH CONDITION - 1/2" MAXIMUM ELEVATION CHANGE
	1 HOUR FIRE RATED WALL TIGHT TO DECK ABOVE (SMOKE TIGHT)
	2 HOUR FIRE RATED WALL TIGHT TO DECK ABOVE (SMOKE TIGHT)
	SMOKE TIGHT TO DECK ABOVE. SEAL AROUND ALL PENETRATIONS TO ACHIEVE SMOKE TIGHT CONSTRUCTION
F.E.(C)	FIRE EXTINGUISHER (CABINET)
AOR	AREA OF REFUGE
(R)	REQUIRED EXTERIOR EXIT

DOOR CLEAR EGRESS WIDTHS

0P / 165P	3'-0" DOOR (33" CLR.)
0P / 195P	3'-6" DOOR (39" CLR.)
0P / 225P	4'-0" DOOR (45" CLR.)
0P / 336P	6'-0" DOOR (68" CLR.)
0P / 326P	6'-0" DOOR WITH 2" REMOVABLE MULLION (66" CLR.)
0P / 396P	7'-0" DOOR (80" CLR.)
0P / 386P	7'-0" DOOR WITH 2" REMOVABLE MULLION (78" CLR.)

TRAVEL DISTANCE + COMMON PATH

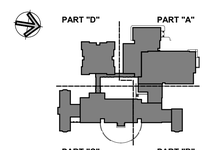
EDUCATION (E) AND ASSEMBLY (A) WITH SPRINKLER SYSTEM
- COMMON PATH OF EGRESS TRAVEL = 75'-0"
- TRAVEL DISTANCE = 250'-0"

BUSINESS (B) WITH SPRINKLER SYSTEM
- COMMON PATH OF EGRESS TRAVEL = 100'-0"
- TRAVEL DISTANCE = 300'-0"

STORAGE (S) WITH SPRINKLER SYSTEM
- COMMON PATH OF EGRESS TRAVEL = 100'-0"
- TRAVEL DISTANCE = 400'-0"

MAXIMUM FLOOR AREA PER OCCUPANT

EDUCATIONAL	
CLASSROOMS	20 NET
SHOPS AND OTHER VOCATIONAL	50 NET
ASSEMBLY	
CHAIRS ONLY	7 NET
TABLE AND CHAIRS	15 NET
STAGES AND PLATFORMS	15 NET
BUSINESS	150 GROSS
STORAGE AND MECHANICAL AREAS	300 GROSS



KEY PLAN

Project Title:

ADDITION & ALTERATIONS TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
311 STATE STREET NEW LONDON CT 06320
203 230 9007 silverpetrucelli.com

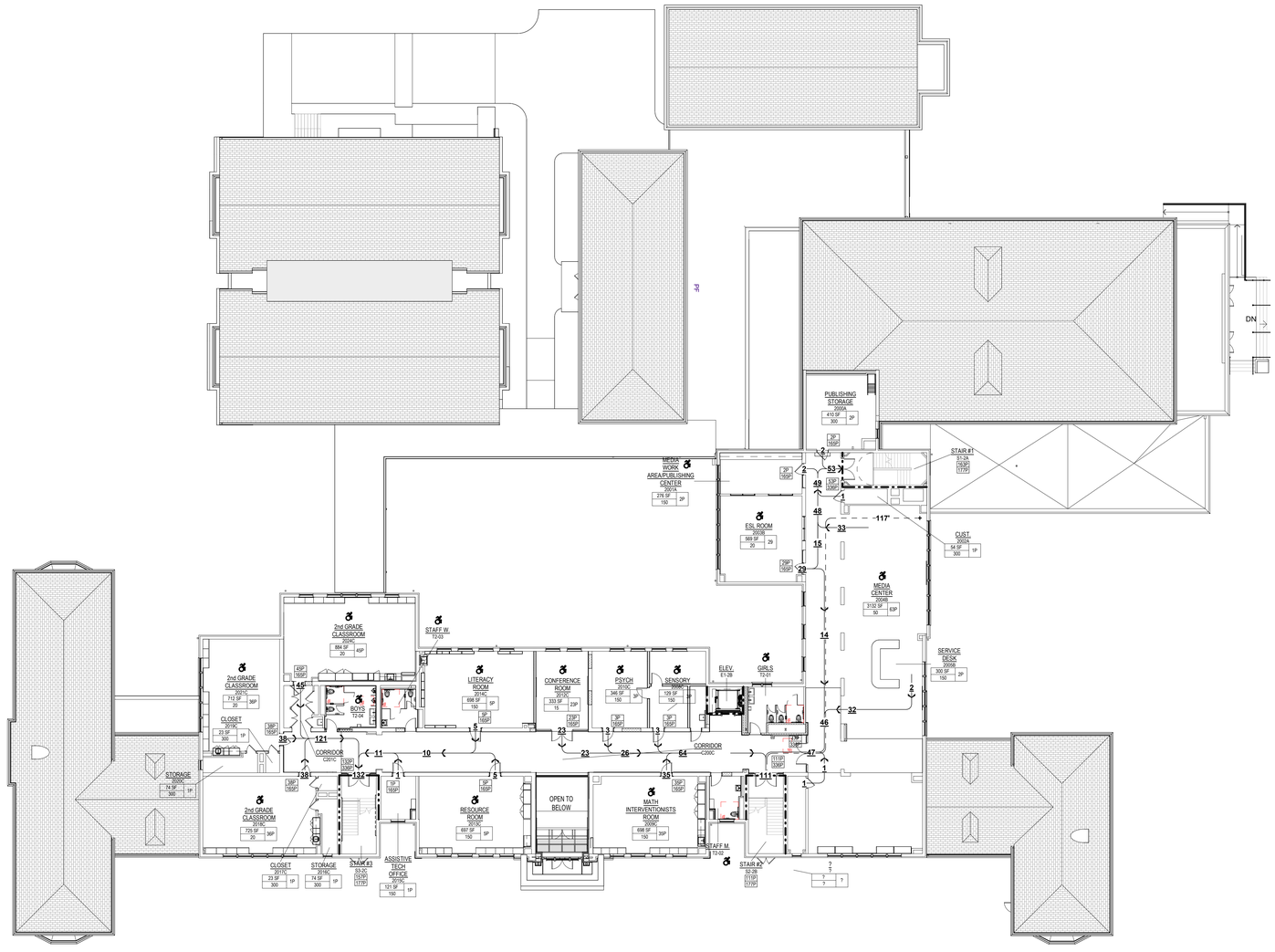
Revision:	Description:	Date:	Revised By:

Drawing Title: 1st FLOOR LIFE SAFETY CODE PLAN

Date: 8/29/2024
Scale: 1/16" = 1'-0"
Drawn By: JM
Project Number: 22-382

Drawing Number: G010

8/30/2024 7:37:42 AM



CODE REFERENCE PLAN LEGEND

OFFICE 2345C	ROOM NAME & NUMBER
	ROOM OCCUPANCY LOAD
875 / 20 = 43P	AREA IN SQUARE FEET / OCCUPANCY LOAD FACTOR = ROOM OCCUPANCY LOAD (PEOPLE)
B | 200 — 20,000SF/ 150	USE GROUP | ALLOWABLE OCCUPANT LOAD — AREA IN SQUARE FEET/ LOAD FACTOR IN SQUARE FEET
	EXIT CAPACITY
1P / 165P	ACTUAL EGRESS OCCUPANCY OF DOOR / STAIR — MAX. ALLOWABLE EGRESS OCCUPANCY OF DOOR OR STAIR OR RAMP
150 / 50 / 200	DIRECTION OF TRAVEL WITH ACCUMULATED OCCUPANCY LOAD
200' T.D.	MAXIMUM TRAVEL DISTANCE (T.D.) FROM FURTHEST POINT
	ACCESSIBLE AREA OR EXIT
	FLUSH CONDITION - 1/2" MAXIMUM ELEVATION CHANGE
	1 HOUR FIRE RATED WALL TIGHT TO DECK ABOVE (SMOKE TIGHT)
	2 HOUR FIRE RATED WALL TIGHT TO DECK ABOVE (SMOKE TIGHT)
	SMOKE TIGHT TO DECK ABOVE. SEAL AROUND ALL PENETRATIONS TO ACHIEVE SMOKE TIGHT CONSTRUCTION
F.E.(C)	FIRE EXTINGUISHER (CABINET)
AOR	AREA OF REFUGE
R	REQUIRED EXTERIOR EXIT

DOOR CLEAR EGRESS WIDTHS

0P / 165P	3'-0" DOOR (33" CLR.)
0P / 195P	3'-6" DOOR (39" CLR.)
0P / 225P	4'-0" DOOR (45" CLR.)
0P / 336P	6'-0" DOOR (68" CLR.)
0P / 326P	6'-0" DOOR WITH 2" REMOVABLE MULLION (66" CLR.)
0P / 396P	7'-0" DOOR (80" CLR.)
0P / 386P	7'-0" DOOR WITH 2" REMOVABLE MULLION (78" CLR.)

TRAVEL DISTANCE + COMMON PATH

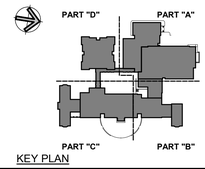
EDUCATION (E) AND ASSEMBLY (A) WITH SPRINKLER SYSTEM
- COMMON PATH OF EGRESS TRAVEL = 75'-0"
- TRAVEL DISTANCE = 250'-0"

BUSINESS (B) WITH SPRINKLER SYSTEM
- COMMON PATH OF EGRESS TRAVEL = 100'-0"
- TRAVEL DISTANCE = 300'-0"

STORAGE (S) WITH SPRINKLER SYSTEM
- COMMON PATH OF EGRESS TRAVEL = 100'-0"
- TRAVEL DISTANCE = 400'-0"

MAXIMUM FLOOR AREA PER OCCUPANT

EDUCATIONAL	
CLASSROOMS	20 NET
SHOPS AND OTHER VOCATIONAL	50 NET
ASSEMBLY	
CHAIRS ONLY	7 NET
TABLE AND CHAIRS	15 NET
STAGES AND PLATFORMS	15 NET
BUSINESS	150 GROSS
STORAGE AND MECHANICAL AREAS	300 GROSS



KEY PLAN

Project Title:

ADDITION & ALTERATIONS TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
311 STATE STREET NEW LONDON CT 06320
203 230 9007 silverpetrucelli.com

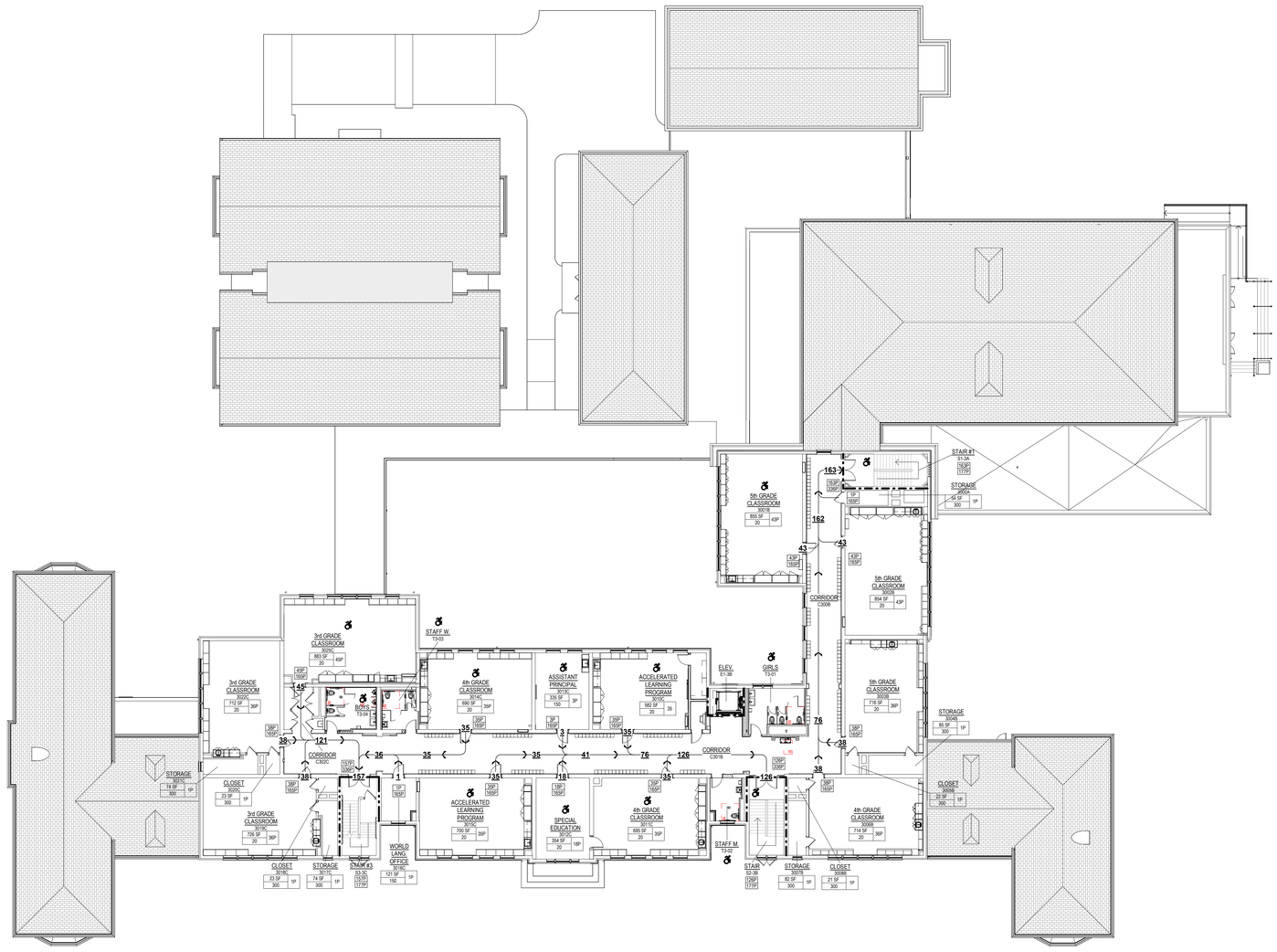
Revision:	Description:	Date:	Revised By:

Drawing Title: 2nd FLOOR LIFE SAFETY CODE PLAN

Date: 8/29/2024
Scale: 1/16" = 1'-0"
Drawn By: JM
Project Number: 22-382

Drawing Number: G020

8/30/2024 7:37:51 AM



CODE REFERENCE PLAN LEGEND

OFFICE 2345C	ROOM NAME & NUMBER
875 / 20 = 43P	ROOM OCCUPANCY LOAD AREA IN SQUARE FEET / OCCUPANCY LOAD FACTOR = ROOM OCCUPANCY LOAD (PEOPLE)
B | 200 — 20,000SF/ 150	USE GROUP | ALLOWABLE OCCUPANT LOAD AREA IN SQUARE FEET/ LOAD FACTOR IN SQUARE FEET
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200' T.D.	MAXIMUM TRAVEL DISTANCE (T.D.) FROM FURTHEST POINT
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	FLUSH CONDITION - 1/2" MAXIMUM ELEVATION CHANGE
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	2 HOUR FIRE RATED WALL TIGHT TO DECK ABOVE (SMOKE TIGHT)
	SMOKE TIGHT TO DECK ABOVE. SEAL AROUND ALL PENETRATIONS TO ACHIEVE SMOKE TIGHT CONSTRUCTION
F.E.(C)	FIRE EXTINGUISHER (CABINET)
AOR	AREA OF REFUGE
R	REQUIRED EXTERIOR EXIT

DOOR CLEAR EGRESS WIDTHS

0P / 165P	3'-0" DOOR (33" CLR.)
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0P / 396P	7'-0" DOOR (80" CLR.)
0P / 386P	7'-0" DOOR WITH 2" REMOVABLE MULLION (78" CLR.)

TRAVEL DISTANCE + COMMON PATH

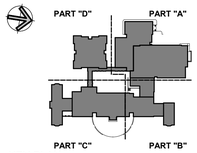
EDUCATION (E) AND ASSEMBLY (A) WITH SPRINKLER SYSTEM
- COMMON PATH OF EGRESS TRAVEL = 75'-0"
- TRAVEL DISTANCE = 250'-0"

BUSINESS (B) WITH SPRINKLER SYSTEM
- COMMON PATH OF EGRESS TRAVEL = 100'-0"
- TRAVEL DISTANCE = 300'-0"

STORAGE (S) WITH SPRINKLER SYSTEM
- COMMON PATH OF EGRESS TRAVEL = 100'-0"
- TRAVEL DISTANCE = 400'-0"

MAXIMUM FLOOR AREA PER OCCUPANT

EDUCATIONAL	
CLASSROOMS	20 NET
SHOPS AND OTHER VOCATIONAL	50 NET
ASSEMBLY	
CHAIRS ONLY	7 NET
TABLE AND CHAIRS	15 NET
STAGES AND PLATFORMS	15 NET
BUSINESS	150 GROSS
STORAGE AND MECHANICAL AREAS	300 GROSS



KEY PLAN

Project Title:

ADDITION & ALTERATIONS TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
311 STATE STREET NEW LONDON CT 06320
203 230 9007 silverpetrucelli.com

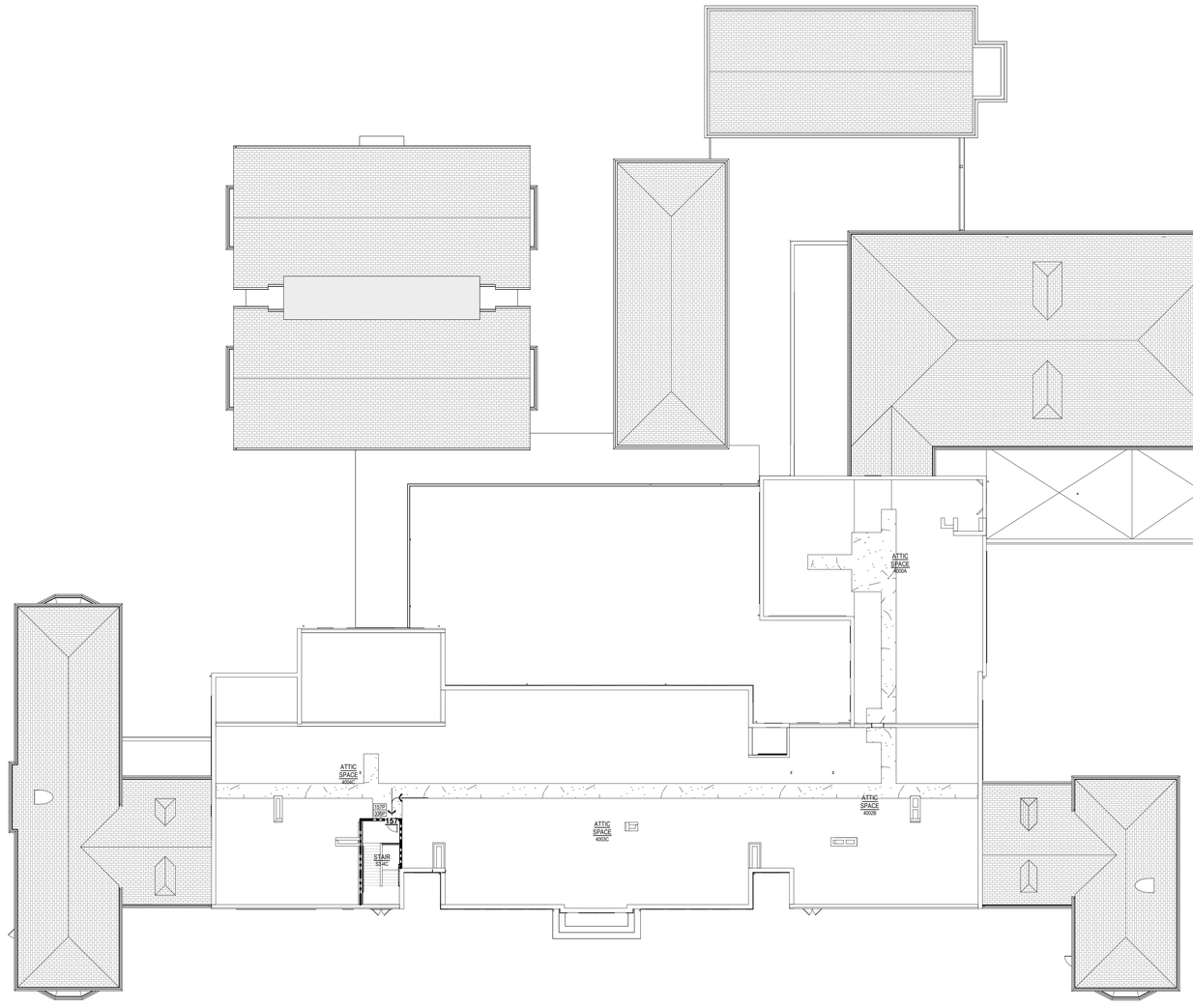
Revision:	Description:	Date:	Revised By:

Drawing Title: 3rd FLOOR LIFE SAFETY CODE PLAN

Date: 8/29/2024
Scale: 1/16" = 1'-0"
Drawn By: JM
Project Number: 22-382

Drawing Number: G030

8/30/2024 7:37:59 AM



CODE REFERENCE PLAN LEGEND

OFFICE 2345C	ROOM NAME & NUMBER
	ROOM OCCUPANCY LOAD
875 / 20 = 43P	AREA IN SQUARE FEET / OCCUPANCY LOAD FACTOR = ROOM OCCUPANCY LOAD (PEOPLE)
B | 200 / 20,000SF @ 150	USE GROUP | ALLOWABLE OCCUPANT LOAD / AREA IN SQUARE FEET/ LOAD FACTOR IN SQUARE FEET
	EXIT CAPACITY
1P / 165P	ACTUAL EGRESS OCCUPANCY OF DOOR / STAIR / MAX. ALLOWABLE EGRESS OCCUPANCY OF DOOR OR STAIR OR RAMP
150 → 50 → 200	DIRECTION OF TRAVEL WITH ACCUMULATED OCCUPANCY LOAD
200' T.D.	MAXIMUM TRAVEL DISTANCE (T.D.) FROM FURTHEST POINT
	ACCESSIBLE AREA OR EXIT
	FLUSH CONDITION - 1/2" MAXIMUM ELEVATION CHANGE
	1 HOUR FIRE RATED WALL TIGHT TO DECK ABOVE (SMOKE TIGHT)
	2 HOUR FIRE RATED WALL TIGHT TO DECK ABOVE (SMOKE TIGHT)
	SMOKE TIGHT TO DECK ABOVE. SEAL AROUND ALL PENETRATIONS TO ACHIEVE SMOKE TIGHT CONSTRUCTION
F.E.(C)	FIRE EXTINGUISHER (CABINET)
AOR	AREA OF REFUGE
R	REQUIRED EXTERIOR EXIT

DOOR CLEAR EGRESS WIDTHS

0P / 165P	3'-0" DOOR (33" CLR.)
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0P / 336P	6'-0" DOOR (68" CLR.)
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0P / 386P	7'-0" DOOR WITH 2" REMOVABLE MULLION (78" CLR.)

TRAVEL DISTANCE + COMMON PATH

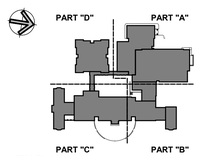
EDUCATION (E) AND ASSEMBLY (A) WITH SPRINKLER SYSTEM
- COMMON PATH OF EGRESS TRAVEL = 75'-0"
- TRAVEL DISTANCE = 250'-0"

BUSINESS (B) WITH SPRINKLER SYSTEM
- COMMON PATH OF EGRESS TRAVEL = 100'-0"
- TRAVEL DISTANCE = 300'-0"

STORAGE (S) WITH SPRINKLER SYSTEM
- COMMON PATH OF EGRESS TRAVEL = 100'-0"
- TRAVEL DISTANCE = 400'-0"

MAXIMUM FLOOR AREA PER OCCUPANT

EDUCATIONAL	
CLASSROOMS	20 NET
SHOPS AND OTHER VOCATIONAL	50 NET
ASSEMBLY	
CHAIRS ONLY	7 NET
TABLE AND CHAIRS	15 NET
STAGES AND PLATFORMS	15 NET
BUSINESS	150 GROSS
STORAGE AND MECHANICAL AREAS	300 GROSS



KEY PLAN

Project Title:

ADDITION & ALTERATIONS TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
311 STATE STREET NEW LONDON CT 06320
203 230 9007 silverpetrucelli.com

Revision:	Description:	Date:	Revised By:

Drawing Title:

ATTIC FLOOR LIFE SAFETY CODE PLAN

Date: 8/29/2024
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Drawn By: JM
Project Number: 22-382

Drawing Number: G040

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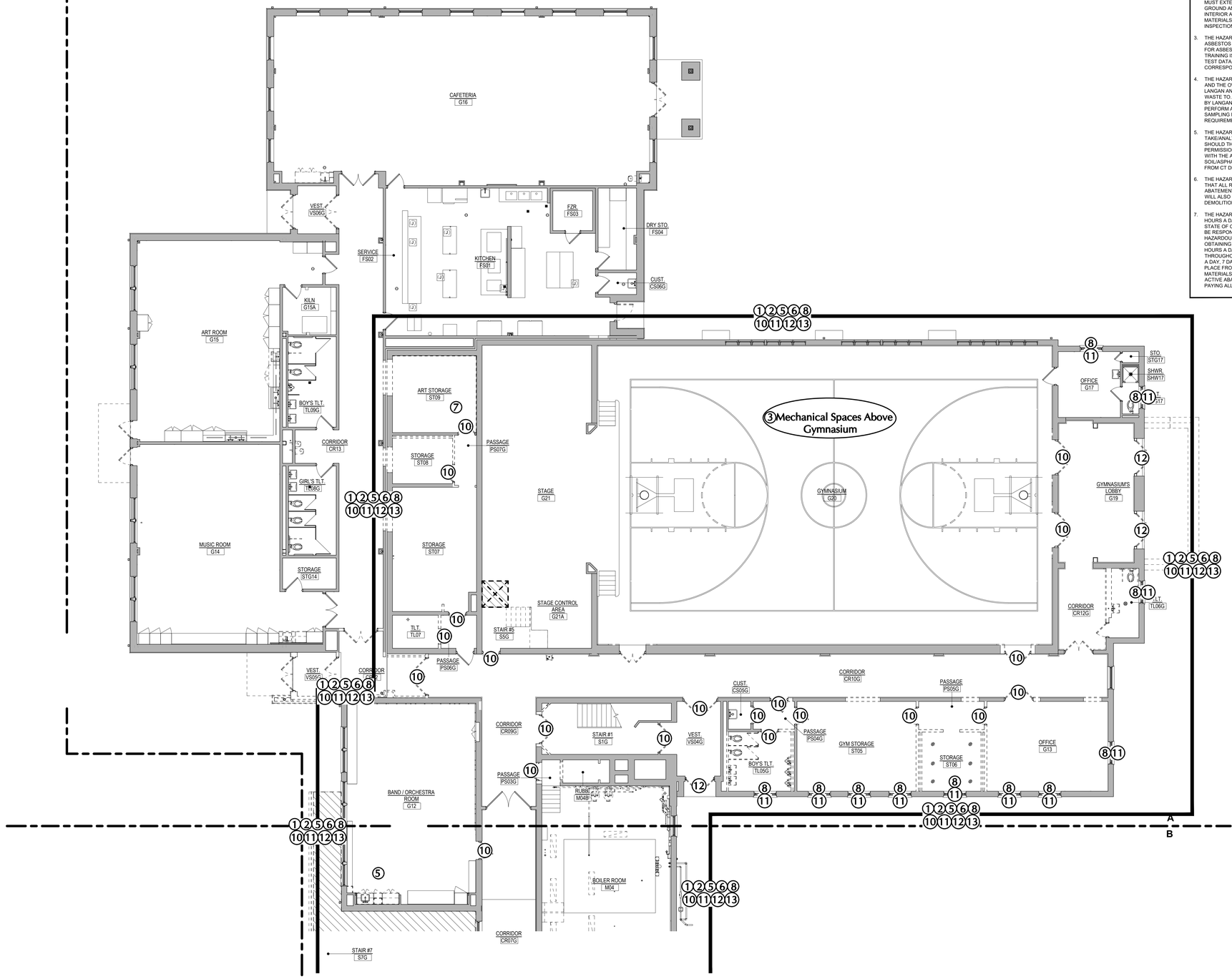


1 1st FLOOR HAZARDOUS BUILDING MATERIALS ABATEMENT PLAN - PART "A"

GENERAL NOTES:

1. THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR IS RESPONSIBLE FOR THE VERIFICATION OF ALL EXISTING CONDITIONS, QUANTITIES, AND FOR NOTIFYING THE CONSULTANT OF ANY DISCREPANCIES PRIOR TO FINALIZING BID.

2. ABATEMENT AND REMEDIATION IN ALL AREAS WILL START WITH SELECTIVE DEMOLITION AND REMOVING MATERIALS AT THE CEILING LEVEL AND END WITH THE MATERIALS AT THE FLOORING LEVEL. THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR WILL COORDINATE AND PERFORM ENOUGH SELECTIVE DEMOLITION/DEMOLITION TO IDENTIFY/LOCATE AND ACCESS ALL MATERIALS TO BE REMOVED/ABATED/REMEDIATED. THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR SHALL OPEN UP WALLS, AND CEILINGS TO CHECK FOR HIDDEN PIPING, DUCT, ETC. AS WELL AS DEMOLISHING MILLWORK, CABINETRY, NON-MOVEABLE OBJECTS, LAYER(S) OF FLOORING, WALLS, MATERIALS ATTACHED TO WALLS, ETC. TO LOCATE KNOWN AND POTENTIAL ASBESTOS AND ASSUMED PCB CONTAINING MATERIALS. INTERIOR AND EXTERIOR SELECTIVE DEMOLITION/DEMOLITION AND PROBING MUST OCCUR THROUGHOUT THE WORK AREAS BEFORE CONTAINMENT CONSTRUCTION AND ABATEMENT CAN START. ASSUME THE ABATEMENT WORK WILL INCLUDE FULL CONTAINMENTS THROUGHOUT THE ENTIRE INTERIOR OF THE BUILDING EXCEPT THE 1995 ADDITION. EXTERIOR ABATEMENT/REMEDIATION WILL BE EITHER PERFORMED IN CONTAINMENT (INTERIOR) OR THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR WILL INSTALL POLYETHYLENE SHEETING ON THE INTERIOR OF THE BUILDING AND REMOVE MATERIALS FROM THE EXTERIOR. ALL GROUND AND ROOF SURFACES MUST ALSO BE PROTECTED WITH TARPS, PLYWOOD AND TWO LAYERS OF 10-MIL REINFORCED POLYETHYLENE SHEETING. THIS GROUND PROTECTION MUST EXTEND AT LEAST 20 FEET AWAY FROM THE BUILDING FOUNDATION (OR FARTHER - ENOUGH TO PREVENT BUILDING MATERIALS FROM TOUCHING UNPROTECTED GROUND AND FLOOR SURFACES). THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR WILL PAY FOR ALL CONTAMINATION/REMEDIATION/ABATEMENT OF INTERIOR AND EXTERIOR SURFACES, INCLUDING GROUND SURFACES IF LANGAN DEEMS THEY HAVE CONTAMINATED THESE SURFACES. THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR WILL SUPPLY LIFTS, SCAFFOLDING, STAGING, ETC. TO LANGAN IN AREAS OF REMEDIATION/ABATEMENT UNTIL ALL VISUAL INSPECTIONS HAVE PASSED. THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR WILL PROVIDE TEMPORARY SHORING IN AREAS THAT REQUIRE IT.

3. THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR/DEMOLITION CONTRACTOR SHALL ONLY USE HEAVY EQUIPMENT OPERATORS THAT HAVE PROPER ASBESTOS AND/OR HAZWOPER TRAINING WHEN DISTURBING/REMOVING/MOVING AND LOADING ASBESTOS, LEAD, AND PCB CONTAINING MATERIALS. ACCEPTABLE TRAINING FOR ASBESTOS CAN BE 32 OR 40 HOUR ASBESTOS WORKER/SUPERVISOR WITH ANNUAL REFRESHER TRAINING. 40 HOUR HAZWOPER TRAINING AND ANNUAL REFRESHER TRAINING IS REQUIRED FOR OPERATORS HANDLING LEAD AND/OR PCB CONTAINING/CONTAMINATED MATERIALS. ALL OPERATORS MUST ALSO HAVE CURRENT MEDICAL, FIT TEST DATA, AND WEAR RESPIRATORS DURING WORK. ALL CONTRACTORS MUST COMPLY WITH ALL APPLICABLE OSHA LEAD REGULATIONS AND THIS WORK (AND ALL CORRESPONDING OSHA REGULATION COMPLIANCE) IS INCLUDED IN THE BASE BID.

4. THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR, THEIR SUBCONTRACTORS, WASTE TRANSPORTERS MUST SUBMIT LANDFILL INFORMATION TO LANGAN AND THE OWNER PRIOR TO THE SHIPMENT OF ANY WASTE. THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR(S)/HAULER(S) CANNOT SHIP WASTE UNTIL LANGAN AND THE OWNER HAVE APPROVED THE LANDFILL THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR/HAULER IS/ARE PROPOSING TO SHIP THE WASTE TO. ALL PCB TCLP SAMPLING OF THE WASTE MUST BE PERFORMED BY THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR (IF TESTING IS APPROVED BY LANGAN AND THE OWNER) WITH LANGAN PRESENT AND THE RESULTS MADE AVAILABLE TO LANGAN AND THE OWNER PRIOR TO WASTE SHIPMENT. LANGAN MAY PERFORM ADDITIONAL TCLP SAMPLING TO CONFIRM THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR'S RESULTS. LANGAN WILL PERFORM THE LEAD TCLP SAMPLING FOR CLASSIFICATION OF THE DEMOLITION AND ABATEMENT WASTE. PLEASE SEE THE ASBESTOS, PCB, AND LEAD-BASED PAINT SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS AND CONTRACTORS LIABILITY.

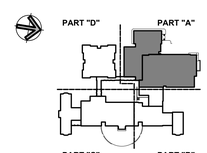
5. THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR, THEIR SUBCONTRACTORS, WASTE TRANSPORTERS AND/OR LANDFILL(S) DO NOT HAVE PERMISSION TO TAKE/ANALYZE BUILDING MATERIALS FOR PCB CONTENT/ CONCENTRATIONS WITHOUT WRITTEN PERMISSION FROM THE BUILDING OWNER PRIOR TO SUCH SAMPLING. SHOULD THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR OR OTHER PARTIES LISTED ABOVE TAKE/ANALYZE PCB SAMPLES WITHOUT THE OWNER'S PERMISSION AND PCB'S ARE FOUND TO BE >1 PPM, THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR WILL BE RESPONSIBLE FOR ALL COSTS ASSOCIATED WITH THE ABATEMENT/ REMEDIATION/REPLACEMENT OF ALL THE INTERIOR/EXTERIOR BUILDING MATERIALS AND ADJACENT SURFACES, INCLUDING SOIL/ASPHALT/CONCRETE/ETC. AS WELL AS ALL COSTS ASSOCIATED WITH PROJECT DELAYS, ATTORNEY FEES FOR ALL PARTIES AFFECTED AND ALL COSTS RESULTING FROM CT DEEP/EPA REQUIREMENTS THAT MAY OCCUR AS A RESULT.

6. THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR WILL BE RESPONSIBLE FOR HIRING AN ENGINEER AND OTHER APPROPRIATE PERSONNEL TO ENSURE THAT ALL REQUIRED SELECTIVE DEMOLITION AND DEMOLITION ACTIVITIES ARE SAFE TO PERFORM FOR ALL PERSONNEL ON SITE. THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR(S) WILL BE FINANCIALLY RESPONSIBLE FOR ANY DAMAGE THAT MAY OCCUR TO THE SITE, ON-SITE PERSONNEL, FINES, PENALTIES, ETC. THEY WILL ALSO BE RESPONSIBLE FOR PAYING/REIMBURSING ALL LEGAL FEES/COSTS FOR ALL PARTIES INVOLVED WITH THE PROJECT SHOULD SELECTIVE DEMOLITION OR DEMOLITION ACTIVITIES CAUSE INJURY OR DEATH TO ANY PERSONS ON SITE.

7. THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR IS RESPONSIBLE FOR PROVIDING TEMPORARY WATER, POWER, AND HEAT AS NEEDED AT THE SITE (24 HOURS A DAY). TEMPORARY LIGHTING WITHIN THE WORK AREAS MUST BE CONNECTED TO GROUND FAULT CIRCUIT INTERRUPTER (GFCI) POWER PANELS INSTALLED BY A STATE OF CONNECTICUT LICENSED ELECTRICIAN AND LOCATED OUTSIDE OF THE WORK AREAS. THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR SHALL BE RESPONSIBLE FOR PAYING FOR THE USE OF POWER AND WATER UNLESS THE OWNER AGREES IN WRITING TO PAY FOR THESE UTILITIES. IT SHALL ALSO BE THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR'S RESPONSIBILITY TO PROVIDE ALL FIXED AND TEMPORARY CONNECTIONS AND HOOK-UPS AS WELL AS OBTAINING PERMITS AND PAYING ALL FEES FOR MAKING SUCH SERVICES AVAILABLE FOR HIS WORK AS IS NECESSARY. ALL POWER AND WATER MUST BE SUPPLIED 24 HOURS A DAY THROUGHOUT THE ABATEMENT PROJECT. CT DPH WILL BE NOTIFIED IMMEDIATELY IF ACTIVE CONTAINMENTS DO NOT HAVE SUFFICIENT NEGATIVE PRESSURE THROUGHOUT THE ABATEMENT PROCESS UNTIL ACCEPTABLE REOCCUPANCY AIR RESULTS ARE RECEIVED. THE USE OF PORTABLE GENERATORS WILL REQUIRE 24 HOURS A DAY, 7 DAYS A WEEK CONTINUOUS OPERATION IF NEGATIVE AIR MACHINES IN CONTAINMENTS ARE POWERED BY THEM. THIS CONTINUOUS OPERATION MUST REMAIN IN PLACE FROM THE TIME THE PRE-ABATEMENT VISUAL IS COMPLETED UP UNTIL CLEARANCE RE-OCCUPANCY SAMPLING RESULTS HAVE PASSED. THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR WILL PAY THE OWNER A $2,500 PENALTY SHOULD THE POWER BE FOUND TO NOT BE RUNNING THE NEGATIVE AIR MACHINES IN ACTIVE ABATEMENT CONTAINMENTS. THIS PENALTY WILL APPLY DAILY AND THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR IS ALSO RESPONSIBLE FOR PAYING ALL CT DPH FINES THAT MAY BE IMPOSED ON THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR AND OWNER.

HAZARDOUS BUILDING MATERIALS ABATEMENT NOTES (SEE ASBESTOS ABATEMENT SPECIFICATION AND PCB REMEDIATION SPECIFICATIONS FOR ADDITIONAL INFORMATION NOT INCLUDED ON DRAWINGS)

1. THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR SHALL REMOVE AND DISPOSE OF ASBESTOS CONTAINING FLOOR TILES AND/OR BLACK MASTIC AS ACM.
2. THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR SHALL REMOVE AND DISPOSE OF ASBESTOS CONTAINING PIPE, PIPE FITTING, PIPE HANGER AND ROOF DRAIN INSULATION AS ACM.
3. THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR SHALL REMOVE AND DISPOSE OF ASBESTOS CONTAINING DUCT INSULATION AS ACM.
4. THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR SHALL REMOVE AND DISPOSE OF ASBESTOS CONTAINING CEILING AND WALL PLASTER AS ACM.
5. THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR SHALL REMOVE AND DISPOSE OF ASBESTOS CONTAINING SINK UNDERCOATING AND SINK COUNTERTOP CAULKING COMPOUNDS AS ACM. CAULKING COMPOUNDS MUST BE DISPOSED OF AS ASSUMED >50 PPM PCB BULK PRODUCT WASTE ALSO.
6. THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR SHALL REMOVE AND DISPOSE OF ASBESTOS CONTAINING BULLETIN BOARD, "CHALK" BOARD, MIRROR AND OTHER WALL ADHESIVES/GLUE DAUBS AS ACM.
7. THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR SHALL REMOVE AND DISPOSE OF ASBESTOS CONTAINING CERAMIC WALL TILE ADHESIVE AS ACM.
8. THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR SHALL REMOVE AND DISPOSE OF ASBESTOS CONTAINING WALL BLACK DAMP-PROOFING MATERIALS AS ACM.
9. THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR SHALL REMOVE AND DISPOSE OF ASBESTOS CONTAINING EXTERIOR FOUNDATION DAMP-PROOFING TAR/MATERIALS AS ACM.
10. THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR SHALL REMOVE AND DISPOSE OF ASBESTOS AND ASSUMED PCB >50 PPM CONTAINING INTERIOR DOOR CAULKING COMPOUNDS, DOOR WINDOW GLAZING COMPOUNDS, WINDOW CAULKING AND GLAZING COMPOUNDS AS ACM AND PCB BULK PRODUCT WASTE.
11. THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR SHALL REMOVE AND DISPOSE OF ASBESTOS AND ASSUMED PCB >50 PPM CONTAINING EXTERIOR/INTERIOR WINDOW CAULKING/GLAZING/LINTEL CAULKING COMPOUNDS AS ACM AND PCB BULK PRODUCT WASTE.
12. THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR SHALL REMOVE AND DISPOSE OF ASBESTOS AND ASSUMED PCB >50 PPM CONTAINING EXTERIOR/INTERIOR DOOR AND DOOR/WINDOW CAULKING COMPOUNDS (GLAZING COMPOUNDS ALSO AT MAIN FRONT ENTRY AND GYM ENTRY), DOOR WINDOW GLAZING COMPOUNDS AS ACM AND PCB BULK PRODUCT WASTE.
13. THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR SHALL REMOVE AND DISPOSE OF ASBESTOS AND ASSUMED PCB >50 PPM CONTAINING EXTERIOR VENT CAULKING COMPOUNDS AS ACM AND PCB BULK PRODUCT WASTE.



KEY PLAN

Project Title:
ADDITION & ALTERATIONS TO:
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285 SOUND BEACH AVENUE
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Revision:	Description:	Date:	Revised By:
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Drawing Title:
FIRST FLOOR HAZARDOUS BUILDING MATERIALS ABATEMENT PLAN - PART "A"

Date: 08/29/2024
Drawing Number: HBM-01
Scale: N.T.S.
Drawn By: HHG/MM
Project Number: 22-382

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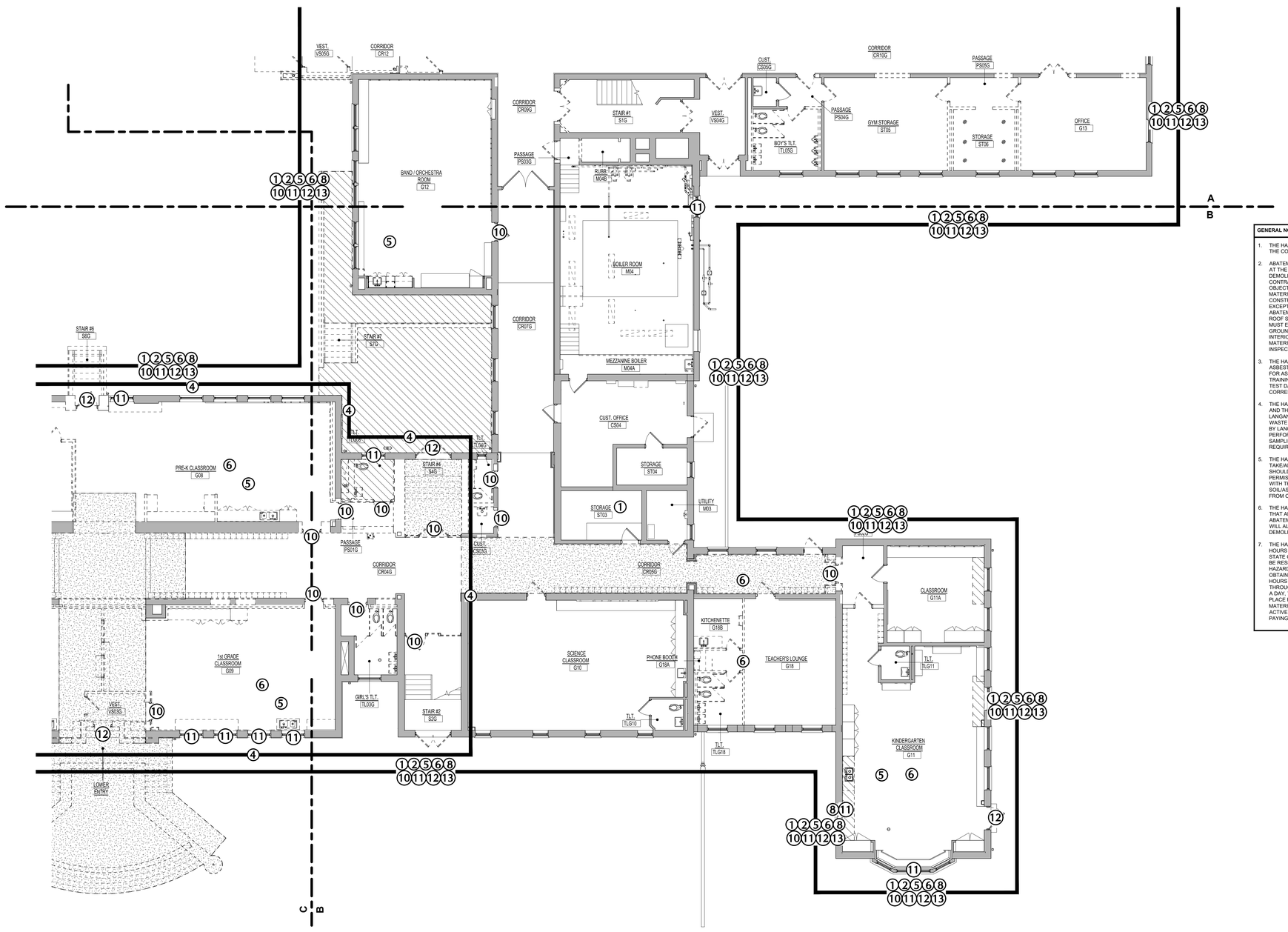
Filename: \\langan.com\data\NH\data6\140265802\Project Data\Specifications\CAD\First Floor HBMAP.dwg Date: 8/19/2024 Time: 18:21 User: hgriesbach Style Table: Langan.stb Layout: HBM-01



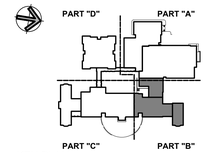
1 1st FLOOR HAZARDOUS BUILDING MATERIALS ABATEMENT PLAN - PART "B"

HAZARDOUS BUILDING MATERIALS ABATEMENT NOTES (SEE ASBESTOS ABATEMENT SPECIFICATION AND PCB REMEDIATION SPECIFICATIONS FOR ADDITIONAL INFORMATION NOT INCLUDED ON DRAWINGS)

1. THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR SHALL REMOVE AND DISPOSE OF ASBESTOS CONTAINING FLOOR TILES AND/OR BLACK MASTIC AS ACM.
2. THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR SHALL REMOVE AND DISPOSE OF ASBESTOS CONTAINING PIPE, PIPE FITTING, PIPE HANGER AND ROOF DRAIN INSULATION AS ACM.
3. THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR SHALL REMOVE AND DISPOSE OF ASBESTOS CONTAINING DUCT INSULATION AS ACM.
4. THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR SHALL REMOVE AND DISPOSE OF ASBESTOS CONTAINING CEILING AND WALL PLASTER AS ACM.
5. THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR SHALL REMOVE AND DISPOSE OF ASBESTOS CONTAINING SINK UNDERCOATING AND SINK COUNTERTOP CAULKING COMPOUNDS AS ACM. CAULKING COMPOUNDS MUST BE DISPOSED OF AS ASSUMED >50 PPM PCB BULK PRODUCT WASTE ALSO.
6. THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR SHALL REMOVE AND DISPOSE OF ASBESTOS CONTAINING BULLETIN BOARD, "CHALK" BOARD, MIRROR AND OTHER WALL ADHESIVES/GLUE DAUBS AS ACM.
7. THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR SHALL REMOVE AND DISPOSE OF ASBESTOS CONTAINING CERAMIC WALL TILE ADHESIVE AS ACM.
8. THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR SHALL REMOVE AND DISPOSE OF ASBESTOS CONTAINING WALL BLACK DAMP-PROOFING MATERIALS AS ACM.
9. THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR SHALL REMOVE AND DISPOSE OF ASBESTOS CONTAINING EXTERIOR FOUNDATION DAMP-PROOFING TAR/MATERIALS AS ACM.
10. THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR SHALL REMOVE AND DISPOSE OF ASBESTOS AND ASSUMED PCB >50 PPM CONTAINING INTERIOR DOOR CAULKING COMPOUNDS, DOOR WINDOW GLAZING COMPOUNDS, WINDOW CAULKING AND GLAZING COMPOUNDS AS ACM AND PCB BULK PRODUCT WASTE.
11. THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR SHALL REMOVE AND DISPOSE OF ASBESTOS AND ASSUMED PCB >50 PPM CONTAINING EXTERIOR/INTERIOR WINDOW CAULKING/GLAZING/LINTEL CAULKING COMPOUNDS AS ACM AND PCB BULK PRODUCT WASTE.
12. THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR SHALL REMOVE AND DISPOSE OF ASBESTOS AND ASSUMED PCB >50 PPM CONTAINING EXTERIOR/INTERIOR DOOR AND DOOR/WINDOW CAULKING COMPOUNDS (GLAZING COMPOUNDS ALSO AT MAIN FRONT ENTRY AND GYM ENTRY), DOOR WINDOW GLAZING COMPOUNDS AS ACM AND PCB BULK PRODUCT WASTE.
13. THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR SHALL REMOVE AND DISPOSE OF ASBESTOS AND ASSUMED PCB >50 PPM CONTAINING EXTERIOR VENT CAULKING COMPOUNDS AS ACM AND PCB BULK PRODUCT WASTE.

GENERAL NOTES:

1. THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR IS RESPONSIBLE FOR THE VERIFICATION OF ALL EXISTING CONDITIONS, QUANTITIES, AND FOR NOTIFYING THE CONSULTANT OF ANY DISCREPANCIES PRIOR TO FINALIZING BID.
2. ABATEMENT AND REMEDIATION IN ALL AREAS WILL START WITH SELECTIVE DEMOLITION AND REMOVING MATERIALS AT THE CEILING LEVEL AND END WITH THE MATERIALS AT THE FLOORING LEVEL. THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR WILL COORDINATE AND PERFORM ENOUGH SELECTIVE DEMOLITION/DEMOLITION TO IDENTIFY,LOCATE AND ACCESS ALL MATERIALS TO BE REMOVED/ABATED/REMEDIATED. THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR SHALL OPEN UP WALLS, AND CEILINGS TO CHECK FOR HIDDEN PIPING, DUCT, ETC. AS WELL AS DEMOLISHING MILLWORK, CABINETRY, NON-MOVEABLE OBJECTS, LAYER(S) OF FLOORING, WALLS, MATERIALS ATTACHED TO WALLS, ETC. TO LOCATE KNOWN AND POTENTIAL ASBESTOS AND ASSUMED PCB CONTAINING MATERIALS. INTERIOR AND EXTERIOR SELECTIVE DEMOLITION/DEMOLITION AND PROBING MUST OCCUR THROUGHOUT THE WORK AREAS BEFORE CONTAINMENT CONSTRUCTION AND ABATEMENT CAN START. ASSUME THE ABATEMENT WORK WILL INCLUDE FULL CONTAINMENTS THROUGHOUT THE ENTIRE INTERIOR OF THE BUILDING EXCEPT THE 1995 ADDITION. EXTERIOR ABATEMENT/REMEDIATION WILL BE EITHER PERFORMED IN CONTAINMENT (INTERIOR) OR THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR WILL INSTALL POLYETHYLENE SHEETING ON THE INTERIOR OF THE BUILDING AND REMOVE MATERIALS FROM THE EXTERIOR. ALL GROUND AND ROOF SURFACES MUST ALSO BE PROTECTED WITH TARPS, PLYWOOD AND TWO LAYERS OF 10-MIL REINFORCED POLYETHYLENE SHEETING. THIS GROUND PROTECTION MUST EXTEND AT LEAST 20 FEET AWAY FROM THE BUILDING FOUNDATION (OR FARTHER - ENOUGH TO PREVENT BUILDING MATERIALS FROM TOUCHING UNPROTECTED GROUND AND FLOOR SURFACES). THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR WILL PAY FOR ALL CONTAMINATION/REMEDIATION/ABATEMENT OF INTERIOR AND EXTERIOR SURFACES, INCLUDING GROUND SURFACES IF LANGAN DEEMS THEY HAVE CONTAMINATED THESE SURFACES. THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR WILL SUPPLY LIFTS, SCAFFOLDING, STAGING, ETC. TO LANGAN IN AREAS OF REMEDIATION/ABATEMENT UNTIL ALL VISUAL INSPECTIONS HAVE PASSED. THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR WILL PROVIDE TEMPORARY SHORING IN AREAS THAT REQUIRE IT.
3. THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR/DEMOLITION CONTRACTOR SHALL ONLY USE HEAVY EQUIPMENT OPERATORS THAT HAVE PROPER ASBESTOS AND/OR HAZWOPER TRAINING WHEN DISTURBING/REMOVING/MOVING AND LOADING ASBESTOS, LEAD, AND PCB CONTAINING MATERIALS. ACCEPTABLE TRAINING FOR ASBESTOS CAN BE 32 OR 40 HOUR ASBESTOS WORKER/SUPERVISOR WITH ANNUAL REFRESHER TRAINING. 40 HOUR HAZWOPER TRAINING AND ANNUAL REFRESHER TRAINING IS REQUIRED FOR OPERATORS HANDLING LEAD AND/OR PCB CONTAINING/CONTAMINATED MATERIALS. ALL OPERATORS MUST ALSO HAVE CURRENT MEDICAL, FIT TEST DATA, AND WEAR RESPIRATORS DURING WORK. ALL CONTRACTORS MUST COMPLY WITH ALL APPLICABLE OSHA LEAD REGULATIONS AND THIS WORK (AND ALL CORRESPONDING OSHA REGULATION COMPLIANCE) IS INCLUDED IN THE BASE BID.
4. THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR, THEIR SUBCONTRACTORS, WASTE TRANSPORTERS MUST SUBMIT LANDFILL INFORMATION TO LANGAN AND THE OWNER PRIOR TO THE SHIPMENT OF ANY WASTE. THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR(S)/HAULER(S) CANNOT SHIP WASTE UNTIL LANGAN AND THE OWNER HAVE APPROVED THE LANDFILL THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR/HAULER IS/ARE PROPOSING TO SHIP THE WASTE TO. ALL PCB TCLP SAMPLING OF THE WASTE MUST BE PERFORMED BY THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR (IF TESTING IS APPROVED BY LANGAN AND THE OWNER) WITH LANGAN PRESENT AND THE RESULTS MADE AVAILABLE TO LANGAN AND THE OWNER PRIOR TO WASTE SHIPMENT. LANGAN MAY PERFORM ADDITIONAL TCLP SAMPLING TO CONFIRM THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR'S RESULTS. LANGAN WILL PERFORM THE LEAD TCLP SAMPLING FOR CLASSIFICATION OF THE DEMOLITION AND ABATEMENT WASTE. PLEASE SEE THE ASBESTOS, PCB, AND LEAD-BASED PAINT SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS AND CONTRACTORS LIABILITY.
5. THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR, THEIR SUBCONTRACTORS, WASTE TRANSPORTERS AND/OR LANDFILL(S) DO NOT HAVE PERMISSION TO TAKE/ANALYZE BUILDING MATERIALS FOR PCB CONTENT/ CONCENTRATIONS WITHOUT WRITTEN PERMISSION FROM THE BUILDING OWNER PRIOR TO SUCH SAMPLING. SHOULD THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR OR OTHER PARTIES LISTED ABOVE TAKE/ANALYZE PCB SAMPLES WITHOUT THE OWNER'S PERMISSION AND PCB'S ARE FOUND TO BE >1 PPM, THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR WILL BE RESPONSIBLE FOR ALL COSTS ASSOCIATED WITH THE ABATEMENT/ REMEDIATION/REPLACEMENT OF ALL THE INTERIOR/EXTERIOR BUILDING MATERIALS AND ADJACENT SURFACES, INCLUDING SOIL/ASPHALT/CONCRETE/ETC. AS WELL AS ALL COSTS ASSOCIATED WITH PROJECT DELAYS, ATTORNEY FEES FOR ALL PARTIES AFFECTED AND ALL COSTS RESULTING FROM CT DEEP/EPA REQUIREMENTS THAT MAY OCCUR AS A RESULT.
6. THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR WILL BE RESPONSIBLE FOR HIRING AN ENGINEER AND OTHER APPROPRIATE PERSONNEL TO ENSURE THAT ALL REQUIRED SELECTIVE DEMOLITION AND DEMOLITION ACTIVITIES ARE SAFE TO PERFORM FOR ALL PERSONNEL ON SITE. THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR(S) WILL BE FINANCIALLY RESPONSIBLE FOR ANY DAMAGE THAT MAY OCCUR TO THE SITE, ON-SITE PERSONNEL, FINES, PENALTIES, ETC. THEY WILL ALSO BE RESPONSIBLE FOR PAYING/REIMBURSING ALL LEGAL FEES/COSTS FOR ALL PARTIES INVOLVED WITH THE PROJECT SHOULD SELECTIVE DEMOLITION OR DEMOLITION ACTIVITIES CAUSE INJURY OR DEATH TO ANY PERSONS ON SITE.
7. THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR IS RESPONSIBLE FOR PROVIDING TEMPORARY WATER, POWER, AND HEAT AS NEEDED AT THE SITE (24 HOURS A DAY). TEMPORARY LIGHTING WITHIN THE WORK AREAS MUST BE CONNECTED TO GROUND FAULT CIRCUIT INTERRUPTER (GFCI) POWER PANELS INSTALLED BY A STATE OF CONNECTICUT LICENSED ELECTRICIAN AND LOCATED OUTSIDE OF THE WORK AREAS. THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR SHALL BE RESPONSIBLE FOR PAYING FOR THE USE OF POWER AND WATER UNLESS THE OWNER AGREES IN WRITING TO PAY FOR THESE UTILITIES. IT SHALL ALSO BE THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTORS RESPONSIBILITY TO PROVIDE ALL FIXED AND TEMPORARY CONNECTIONS AND HOOK-UPS AS WELL AS OBTAINING PERMITS AND PAYING ALL FEES FOR MAKING SUCH SERVICES AVAILABLE FOR HIS WORK AS IS NECESSARY. ALL POWER AND WATER MUST BE SUPPLIED 24 HOURS A DAY THROUGHOUT THE ABATEMENT PROJECT. CT DPH WILL BE NOTIFIED IMMEDIATELY IF ACTIVE CONTAINMENTS DO NOT HAVE SUFFICIENT NEGATIVE PRESSURE THROUGHOUT THE ABATEMENT PROCESS UNTIL ACCEPTABLE REOCCUPANCY AIR RESULTS ARE RECEIVED. THE USE OF PORTABLE GENERATORS WILL REQUIRE 24 HOURS A DAY, 7 DAYS A WEEK CONTINUOUS OPERATION IF NEGATIVE AIR MACHINES IN CONTAINMENTS ARE POWERED BY THEM. THIS CONTINUOUS OPERATION MUST REMAIN IN PLACE FROM THE TIME THE PRE-ABATEMENT VISUAL IS COMPLETED UP UNTIL CLEARANCE RE-OCCUPANCY SAMPLING RESULTS HAVE PASSED. THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR WILL PAY THE OWNER A $2,500 PENALTY SHOULD THE POWER BE FOUND TO NOT BE RUNNING THE NEGATIVE AIR MACHINES IN ACTIVE ABATEMENT CONTAINMENTS. THIS PENALTY WILL APPLY DAILY AND THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR IS ALSO RESPONSIBLE FOR PAYING ALL CT DPH FINES THAT MAY BE IMPOSED ON THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR AND OWNER.



KEY PLAN

Project Title:

ADDITION & ALTERATIONS TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

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Revision:	Description:	Date:	Revised By:
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Drawing Title:
FIRST FLOOR HAZARDOUS BUILDING MATERIALS ABATEMENT PLAN - PART "B"

Date: 08/29/2024
Scale: N.T.S.
Drawn By: HHG/MM
Project Number: 22-382
Drawing Number: HBM-02

12/29/2023 11:23:24 PM

Filename: \\langan.com\data\NH\data8\140265802\Project Data\Specifications\CAD\First Floor HBMAP.dwg Date: 8/19/2024 Time: 18:35 User: hgriesbach Style Table: Langan.stb Layout: HBM-02

GENERAL NOTES:

1. THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR IS RESPONSIBLE FOR THE VERIFICATION OF ALL EXISTING CONDITIONS, QUANTITIES, AND FOR NOTIFYING THE CONSULTANT OF ANY DISCREPANCIES PRIOR TO FINALIZING BID.

2. ABATEMENT AND REMEDIATION IN ALL AREAS WILL START WITH SELECTIVE DEMOLITION AND REMOVING MATERIALS AT THE CEILING LEVEL AND END WITH THE MATERIALS AT THE FLOORING LEVEL. THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR WILL COORDINATE AND PERFORM ENOUGH SELECTIVE DEMOLITION/DEMOLITION TO IDENTIFY/LOCATE AND ACCESS ALL MATERIALS TO BE REMOVED/ABATED/REMEDIATED. THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR SHALL OPEN UP WALLS, AND CEILINGS TO CHECK FOR HIDDEN PIPING, DUCT, ETC. AS WELL AS DEMOLISHING MILLWORK, CABINETRY, NON-MOVEABLE OBJECTS, LAYER(S) OF FLOORING, WALLS, MATERIALS ATTACHED TO WALLS, ETC. TO LOCATE KNOWN AND POTENTIAL ASBESTOS AND ASSUMED PCB CONTAINING MATERIALS. INTERIOR AND EXTERIOR SELECTIVE DEMOLITION/DEMOLITION AND PROBING MUST OCCUR THROUGHOUT THE WORK AREAS BEFORE CONTAINMENT CONSTRUCTION AND ABATEMENT CAN START. ASSUME THE ABATEMENT WORK WILL INCLUDE FULL CONTAINMENTS THROUGHOUT THE ENTIRE INTERIOR OF THE BUILDING EXCEPT THE 1995 ADDITION. EXTERIOR ABATEMENT/REMEDIATION WILL BE EITHER PERFORMED IN CONTAINMENT (INTERIOR) OR THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR WILL INSTALL POLYETHYLENE SHEETING ON THE INTERIOR OF THE BUILDING AND REMOVE MATERIALS FROM THE EXTERIOR. ALL GROUND AND ROOF SURFACES MUST ALSO BE PROTECTED WITH TARPS. PLYWOOD AND TWO LAYERS OF 10-MIL REINFORCED POLYETHYLENE SHEETING. THIS GROUND PROTECTION MUST EXTEND AT LEAST 20 FEET AWAY FROM THE BUILDING FOUNDATION (OR FARTHER - ENOUGH TO PREVENT BUILDING MATERIALS FROM TOUCHING UNPROTECTED GROUND AND FLOOR SURFACES). THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR WILL PAY FOR ALL CONTAMINATION/REMEDIATION/ABATEMENT OF INTERIOR AND EXTERIOR SURFACES, INCLUDING GROUND SURFACES IF LANGAN DEEMS THEY HAVE CONTAMINATED THESE SURFACES. THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR WILL SUPPLY LIFTS, SCAFFOLDING, STAGING, ETC. TO LANGAN IN AREAS OF REMEDIATION/ABATEMENT UNTIL ALL VISUAL INSPECTIONS HAVE PASSED. THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR WILL PROVIDE TEMPORARY SHORING IN AREAS THAT REQUIRE IT.

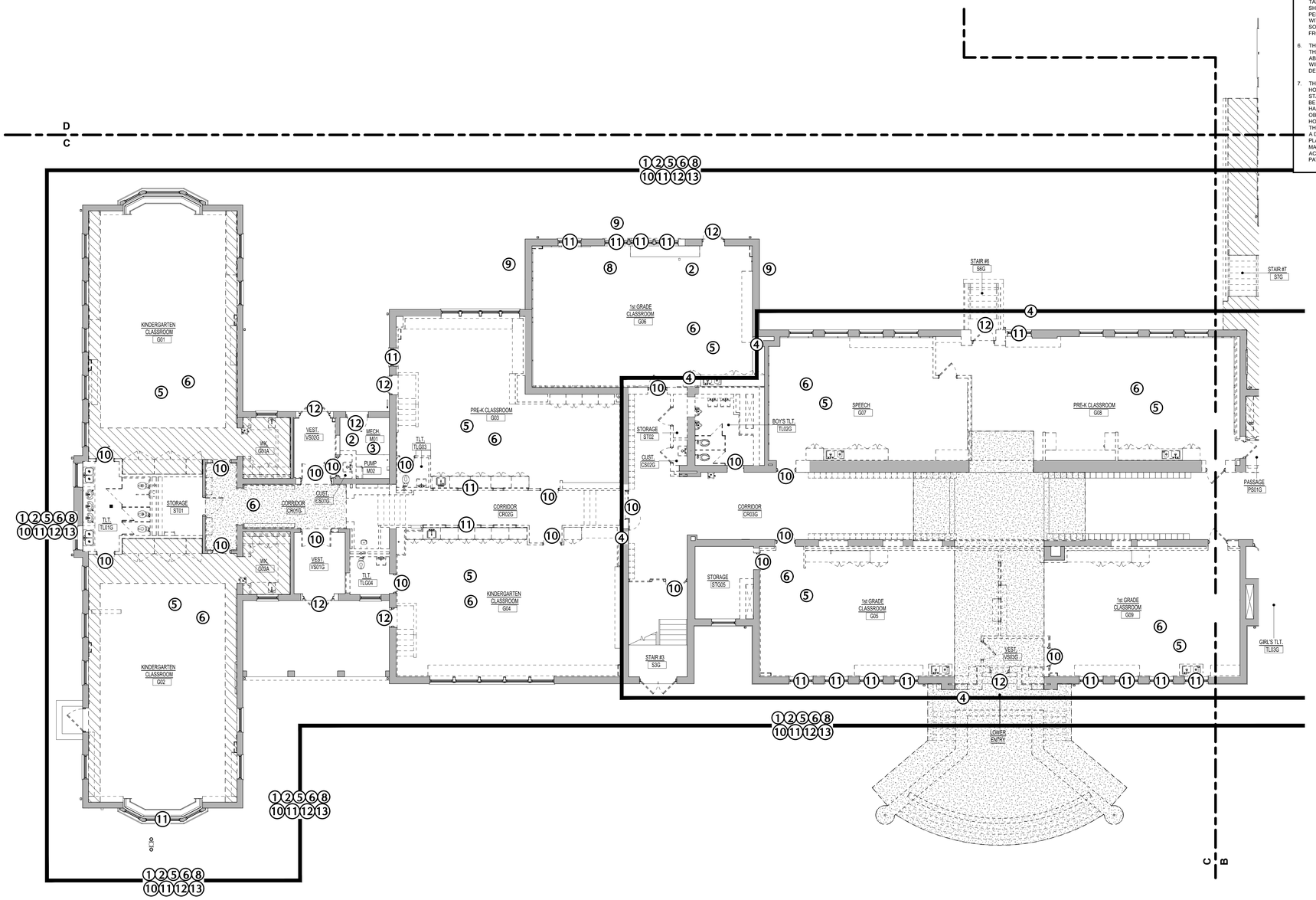
3. THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR/DEMOLITION CONTRACTOR SHALL ONLY USE HEAVY EQUIPMENT OPERATORS THAT HAVE PROPER ASBESTOS AND/OR HAZWOPER TRAINING WHEN DISTURBING/REMOVING/MOVING AND LOADING ASBESTOS, LEAD, AND PCB CONTAINING MATERIALS. ACCEPTABLE TRAINING FOR ASBESTOS CAN BE 32 OR 40 HOUR ASBESTOS WORKER/SUPERVISOR WITH ANNUAL REFRESHER TRAINING. 40 HOUR HAZWOPER TRAINING AND ANNUAL REFRESHER TRAINING IS REQUIRED FOR OPERATORS HANDLING LEAD AND/OR PCB CONTAINING/CONTAMINATED MATERIALS. ALL OPERATORS MUST ALSO HAVE CURRENT MEDICAL, FIT TEST DATA, AND WEAR RESPIRATORS DURING WORK. ALL CONTRACTORS MUST COMPLY WITH ALL APPLICABLE OSHA LEAD REGULATIONS AND THIS WORK (AND ALL CORRESPONDING OSHA REGULATION COMPLIANCE) IS INCLUDED IN THE BASE BID.

4. THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR, THEIR SUBCONTRACTORS, WASTE TRANSPORTERS MUST SUBMIT LANDFILL INFORMATION TO LANGAN AND THE OWNER PRIOR TO THE SHIPMENT OF ANY WASTE. THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR(S)/HAULER(S) CANNOT SHIP WASTE UNTIL LANGAN AND THE OWNER HAVE APPROVED THE LANDFILL THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR/HAULER IS/ARE PROPOSING TO SHIP THE WASTE TO. ALL PCB TCLP SAMPLING OF THE WASTE MUST BE PERFORMED BY THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR (IF TESTING IS APPROVED BY LANGAN AND THE OWNER) WITH LANGAN PRESENT AND THE RESULTS MADE AVAILABLE TO LANGAN AND THE OWNER PRIOR TO WASTE SHIPMENT. LANGAN MAY PERFORM ADDITIONAL TCLP SAMPLING TO CONFIRM THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR'S RESULTS. LANGAN WILL PERFORM THE LEAD TCLP SAMPLING FOR CLASSIFICATION OF THE DEMOLITION AND ABATEMENT WASTE. PLEASE SEE THE ASBESTOS, PCB, AND LEAD-BASED PAINT SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS AND CONTRACTORS LIABILITY.

5. THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR, THEIR SUBCONTRACTORS, WASTE TRANSPORTERS AND/OR LANDFILL(S) DO NOT HAVE PERMISSION TO TAKE/ANALYZE BUILDING MATERIALS FOR PCB CONTENT/ CONCENTRATIONS WITHOUT WRITTEN PERMISSION FROM THE BUILDING OWNER PRIOR TO SUCH SAMPLING. SHOULD THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR OR OTHER PARTIES LISTED ABOVE TAKE/ANALYZE PCB SAMPLES WITHOUT THE OWNER'S PERMISSION AND PCB'S ARE FOUND TO BE >1 PPM, THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR WILL BE RESPONSIBLE FOR ALL COSTS ASSOCIATED WITH THE ABATEMENT/ REMEDIATION/REPLACEMENT OF ALL THE INTERIOR/EXTERIOR BUILDING MATERIALS AND ADJACENT SURFACES, INCLUDING SOIL/ASPHALT/CONCRETE/ETC, AS WELL AS ALL COSTS ASSOCIATED WITH PROJECT DELAYS, ATTORNEY FEES FOR ALL PARTIES AFFECTED AND ALL COSTS RESULTING FROM CT DEEP/EPA REQUIREMENTS THAT MAY OCCUR AS A RESULT.

6. THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR WILL BE RESPONSIBLE FOR HIRING AN ENGINEER AND OTHER APPROPRIATE PERSONNEL TO ENSURE THAT ALL REQUIRED SELECTIVE DEMOLITION AND DEMOLITION ACTIVITIES ARE SAFE TO PERFORM FOR ALL PERSONNEL ON SITE. THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR(S) WILL BE FINANCIALLY RESPONSIBLE FOR ANY DAMAGE THAT MAY OCCUR TO THE SITE, ON-SITE PERSONNEL, FINES, PENALTIES, ETC. THEY WILL ALSO BE RESPONSIBLE FOR PAYING/REIMBURSING ALL LEGAL FEES/COSTS FOR ALL PARTIES INVOLVED WITH THE PROJECT SHOULD SELECTIVE DEMOLITION OR DEMOLITION ACTIVITIES CAUSE INJURY OR DEATH TO ANY PERSONS ON SITE.

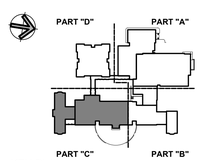
7. THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR IS RESPONSIBLE FOR PROVIDING TEMPORARY WATER, POWER, AND HEAT AS NEEDED AT THE SITE (24 HOURS A DAY). TEMPORARY LIGHTING WITHIN THE WORK AREAS MUST BE CONNECTED TO GROUND FAULT CIRCUIT INTERRUPTER (GFCI) POWER PANELS INSTALLED BY A STATE OF CONNECTICUT LICENSED ELECTRICIAN AND LOCATED OUTSIDE OF THE WORK AREAS. THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR SHALL BE RESPONSIBLE FOR PAYING FOR THE USE OF POWER AND WATER UNLESS THE OWNER AGREES IN WRITING TO PAY FOR THESE UTILITIES. IT SHALL ALSO BE THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR'S RESPONSIBILITY TO PROVIDE ALL FIXED AND TEMPORARY CONNECTIONS AND HOOK-UPS AS WELL AS OBTAINING PERMITS AND PAYING ALL FEES FOR MAKING SUCH SERVICES AVAILABLE FOR HIS WORK AS IS NECESSARY. ALL POWER AND WATER MUST BE SUPPLIED 24 HOURS A DAY THROUGHOUT THE ABATEMENT PROJECT. CT DPH WILL BE NOTIFIED IMMEDIATELY IF ACTIVE CONTAINMENTS DO NOT HAVE SUFFICIENT NEGATIVE PRESSURE THROUGHOUT THE ABATEMENT PROCESS UNTIL ACCEPTABLE REOCCUPANCY AIR RESULTS ARE RECEIVED. THE USE OF PORTABLE GENERATORS WILL REQUIRE 24 HOURS A DAY, 7 DAYS A WEEK CONTINUOUS OPERATION IF NEGATIVE AIR MACHINES IN CONTAINMENTS ARE POWERED BY THEM. THIS CONTINUOUS OPERATION MUST REMAIN IN PLACE FROM THE TIME THE PRE-ABATEMENT VISUAL IS COMPLETED UP UNTIL CLEARANCE RE-OCCUPANCY SAMPLING RESULTS HAVE PASSED. THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR WILL PAY THE OWNER A $2,500 PENALTY SHOULD THE POWER BE FOUND TO NOT BE RUNNING THE NEGATIVE AIR MACHINES IN ACTIVE ABATEMENT CONTAINMENTS. THIS PENALTY WILL APPLY DAILY AND THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR IS ALSO RESPONSIBLE FOR PAYING ALL CT DPH FINES THAT MAY BE IMPOSED ON THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR AND OWNER.



1 1st FLOOR HAZARDOUS BUILDING MATERIALS ABATEMENT PLAN - PART "C"

HAZARDOUS BUILDING MATERIALS ABATEMENT NOTES (SEE ASBESTOS ABATEMENT SPECIFICATION AND PCB REMEDIATION SPECIFICATIONS FOR ADDITIONAL INFORMATION NOT INCLUDED ON DRAWINGS)

1. THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR SHALL REMOVE AND DISPOSE OF ASBESTOS CONTAINING FLOOR TILES AND/OR BLACK MASTIC AS ACM.
2. THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR SHALL REMOVE AND DISPOSE OF ASBESTOS CONTAINING PIPE, PIPE FITTING, PIPE HANGER AND ROOF DRAIN INSULATION AS ACM.
3. THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR SHALL REMOVE AND DISPOSE OF ASBESTOS CONTAINING DUCT INSULATION AS ACM.
4. THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR SHALL REMOVE AND DISPOSE OF ASBESTOS CONTAINING CEILING AND WALL PLASTER AS ACM.
5. THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR SHALL REMOVE AND DISPOSE OF ASBESTOS CONTAINING SINK UNDERCOATING AND SINK COUNTERTOP CAULKING COMPOUNDS AS ACM. CAULKING COMPOUNDS MUST BE DISPOSED OF AS ASSUMED >50 PPM PCB BULK PRODUCT WASTE ALSO.
6. THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR SHALL REMOVE AND DISPOSE OF ASBESTOS CONTAINING BULLETIN BOARD, "CHALK" BOARD, MIRROR AND OTHER WALL ADHESIVES/GLUE DAUBS AS ACM.
7. THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR SHALL REMOVE AND DISPOSE OF ASBESTOS CONTAINING CERAMIC WALL TILE ADHESIVE AS ACM.
8. THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR SHALL REMOVE AND DISPOSE OF ASBESTOS CONTAINING WALL BLACK DAMP-PROOFING MATERIALS AS ACM.
9. THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR SHALL REMOVE AND DISPOSE OF ASBESTOS CONTAINING EXTERIOR FOUNDATION DAMP-PROOFING TAR/MATERIALS AS ACM.
10. THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR SHALL REMOVE AND DISPOSE OF ASBESTOS AND ASSUMED PCB >50 PPM CONTAINING INTERIOR DOOR CAULKING COMPOUNDS, DOOR WINDOW GLAZING COMPOUNDS, WINDOW CAULKING AND GLAZING COMPOUNDS AS ACM AND PCB BULK PRODUCT WASTE.
11. THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR SHALL REMOVE AND DISPOSE OF ASBESTOS AND ASSUMED PCB >50 PPM CONTAINING EXTERIOR/INTERIOR WINDOW CAULKING/GLAZING/LINTEL CAULKING COMPOUNDS AS ACM AND PCB BULK PRODUCT WASTE.
12. THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR SHALL REMOVE AND DISPOSE OF ASBESTOS AND ASSUMED PCB >50 PPM CONTAINING EXTERIOR/INTERIOR DOOR AND DOOR/WINDOW CAULKING COMPOUNDS (GLAZING COMPOUNDS ALSO AT MAIN FRONT ENTRY AND GYM ENTRY), DOOR WINDOW GLAZING COMPOUNDS AS ACM AND PCB BULK PRODUCT WASTE.
13. THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR SHALL REMOVE AND DISPOSE OF ASBESTOS AND ASSUMED PCB >50 PPM CONTAINING EXTERIOR VENT CAULKING COMPOUNDS AS ACM AND PCB BULK PRODUCT WASTE.



KEY PLAN

Project Title:
ADDITION & ALTERATIONS TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

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Revision:	Description:	Date:	Revised By:
	95% Construction Documents		

Drawing Title:
FIRST FLOOR HAZARDOUS BUILDING MATERIALS ABATEMENT PLAN - PART "C"

Date: 08/29/2024
Scale: N.T.S.
Drawn By: HHG/MM
Project Number: 22-382
Drawing Number: HBM-03

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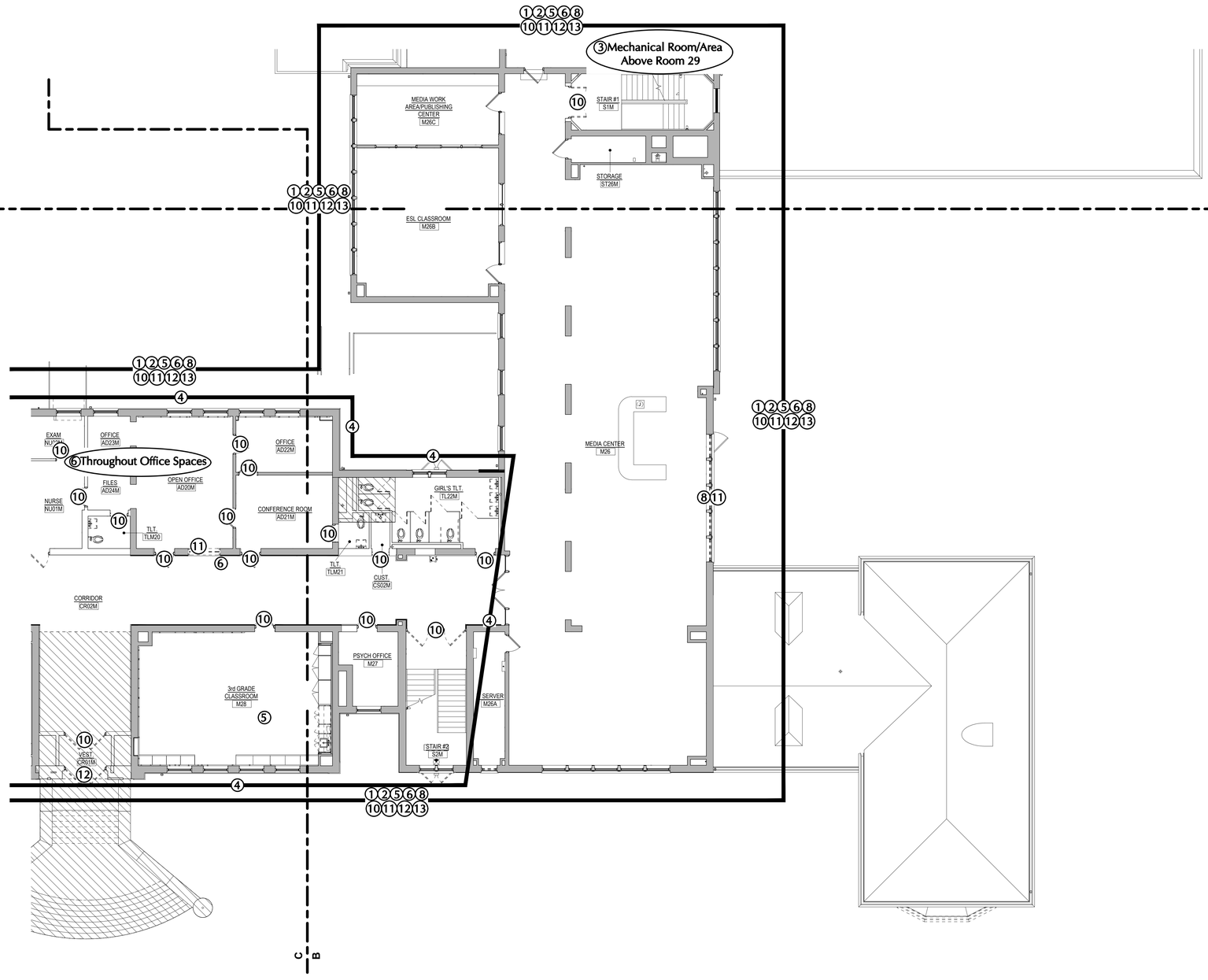
Filename: \\langan.com\data\NH\data\t\140265\02\Project Data\Specifications\CAD\First Floor HBMAP.dwg Date: 8/19/2024 Time: 18:47 User: hgriesbach Style Table: Langan.stb Layout: HBM-03



1 2nd FLOOR HAZARDOUS BUILDING MATERIALS ABATEMENT PLAN - PART "B"

GENERAL NOTES:

1. THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR IS RESPONSIBLE FOR THE VERIFICATION OF ALL EXISTING CONDITIONS, QUANTITIES, AND FOR NOTIFYING THE CONSULTANT OF ANY DISCREPANCIES PRIOR TO FINALIZING BID.
2. ABATEMENT AND REMEDIATION IN ALL AREAS WILL START WITH SELECTIVE DEMOLITION AND REMOVING MATERIALS AT THE CEILING LEVEL AND END WITH THE MATERIALS AT THE FLOORING LEVEL. THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR WILL COORDINATE AND PERFORM ENOUGH SELECTIVE DEMOLITION/DEMOLITION TO IDENTIFY/LOCATE AND ACCESS ALL MATERIALS TO BE REMOVED/ABATED/REMEDIATED. THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR SHALL OPEN UP WALLS, AND CEILINGS TO CHECK FOR HIDDEN PIPING, DUCT, ETC. AS WELL AS DEMOLISHING MILLWORK, CABINETRY, NON-MOVEABLE OBJECTS, LAYER(S) OF FLOORING, WALLS, MATERIALS ATTACHED TO WALLS, ETC. TO LOCATE KNOWN AND POTENTIAL ASBESTOS AND ASSUMED PCB CONTAINING MATERIALS. INTERIOR AND EXTERIOR SELECTIVE DEMOLITION/DEMOLITION AND PROBING MUST OCCUR THROUGHOUT THE WORK AREAS BEFORE CONTAINMENT CONSTRUCTION AND ABATEMENT CAN START. ASSUME THE ABATEMENT WORK WILL INCLUDE FULL CONTAINMENTS THROUGHOUT THE ENTIRE INTERIOR OF THE BUILDING EXCEPT THE 1995 ADDITION. EXTERIOR ABATEMENT/REMEDIATION WILL BE EITHER PERFORMED IN CONTAINMENT (INTERIOR) OR THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR WILL INSTALL POLYETHYLENE SHEETING ON THE INTERIOR OF THE BUILDING AND REMOVE MATERIALS FROM THE EXTERIOR. ALL GROUND AND ROOF SURFACES MUST ALSO BE PROTECTED WITH TARPS, PLYWOOD AND TWO LAYERS OF 10-MIL REINFORCED POLYETHYLENE SHEETING. THIS GROUND PROTECTION MUST EXTEND AT LEAST 20 FEET AWAY FROM THE BUILDING FOUNDATION (OR FARTHER - ENOUGH TO PREVENT BUILDING MATERIALS FROM TOUCHING UNPROTECTED GROUND AND FLOOR SURFACES). THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR WILL PAY FOR ALL CONTAMINATION/REMEDIATION/ABATEMENT OF INTERIOR AND EXTERIOR SURFACES, INCLUDING GROUND SURFACES IF LANGAN DEEMS THEY HAVE CONTAMINATED THESE SURFACES. THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR WILL SUPPLY LIFTS, SCAFFOLDING, STAGING, ETC. TO LANGAN IN AREAS OF REMEDIATION/ABATEMENT UNTIL ALL VISUAL INSPECTIONS HAVE PASSED. THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR WILL PROVIDE TEMPORARY SHORING IN AREAS THAT REQUIRE IT.
3. THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR/DEMOLITION CONTRACTOR SHALL ONLY USE HEAVY EQUIPMENT OPERATORS THAT HAVE PROPER ASBESTOS AND/OR HAZWOPER TRAINING WHEN DISTURBING/REMOVING/MOVING AND LOADING ASBESTOS, LEAD, AND PCB CONTAINING MATERIALS. ACCEPTABLE TRAINING FOR ASBESTOS CAN BE 32 OR 40 HOUR ASBESTOS WORKER/SUPERVISOR WITH ANNUAL REFRESHER TRAINING. 40 HOUR HAZWOPER TRAINING AND ANNUAL REFRESHER TRAINING IS REQUIRED FOR OPERATORS HANDLING LEAD AND/OR PCB CONTAINING/CONTAMINATED MATERIALS. ALL OPERATORS MUST ALSO HAVE CURRENT MEDICAL, FIT TEST DATA, AND WEAR RESPIRATORS DURING WORK. ALL CONTRACTORS MUST COMPLY WITH ALL APPLICABLE OSHA LEAD REGULATIONS AND THIS WORK (AND ALL CORRESPONDING OSHA REGULATION COMPLIANCE) IS INCLUDED IN THE BASE BID.
4. THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR, THEIR SUBCONTRACTORS, WASTE TRANSPORTERS MUST SUBMIT LANDFILL INFORMATION TO LANGAN AND THE OWNER PRIOR TO THE SHIPMENT OF ANY WASTE. THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR(S)/HAULER(S) CANNOT SHIP WASTE UNTIL LANGAN AND THE OWNER HAVE APPROVED THE LANDFILL THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR/HAULER IS/ARE PROPOSING TO SHIP THE WASTE TO. ALL PCB TCLP SAMPLING OF THE WASTE MUST BE PERFORMED BY THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR (IF TESTING IS APPROVED BY LANGAN AND THE OWNER) WITH LANGAN PRESENT AND THE RESULTS MADE AVAILABLE TO LANGAN AND THE OWNER PRIOR TO WASTE SHIPMENT. LANGAN MAY PERFORM ADDITIONAL TCLP SAMPLING TO CONFIRM THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR'S RESULTS. LANGAN WILL PERFORM THE LEAD TCLP SAMPLING FOR CLASSIFICATION OF THE DEMOLITION AND ABATEMENT WASTE. PLEASE SEE THE ASBESTOS, PCB, AND LEAD-BASED PAINT SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS AND CONTRACTORS LIABILITY.
5. THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR, THEIR SUBCONTRACTORS, WASTE TRANSPORTERS AND/OR LANDFILL(S) DO NOT HAVE PERMISSION TO TAKE/ANALYZE BUILDING MATERIALS FOR PCB CONTENT/ CONCENTRATIONS WITHOUT WRITTEN PERMISSION FROM THE BUILDING OWNER PRIOR TO SUCH SAMPLING. SHOULD THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR OR OTHER PARTIES LISTED ABOVE TAKE/ANALYZE PCB SAMPLES WITHOUT THE OWNER'S PERMISSION AND PCB'S ARE FOUND TO BE >1 PPM, THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR WILL BE RESPONSIBLE FOR ALL COSTS ASSOCIATED WITH THE ABATEMENT/ REMEDIATION/REPLACEMENT OF ALL THE INTERIOR/EXTERIOR BUILDING MATERIALS AND ADJACENT SURFACES, INCLUDING SOIL/ASPHALT/CONCRETE/ETC. AS WELL AS ALL COSTS ASSOCIATED WITH PROJECT DELAYS, ATTORNEY FEES FOR ALL PARTIES AFFECTED AND ALL COSTS RESULTING FROM CT DEEP/EPA REQUIREMENTS THAT MAY OCCUR AS A RESULT.
6. THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR WILL BE RESPONSIBLE FOR HIRING AN ENGINEER AND OTHER APPROPRIATE PERSONNEL TO ENSURE THAT ALL REQUIRED SELECTIVE DEMOLITION AND DEMOLITION ACTIVITIES ARE SAFE TO PERFORM FOR ALL PERSONNEL ON SITE. THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR(S) WILL BE FINANCIALLY RESPONSIBLE FOR ANY DAMAGE THAT MAY OCCUR TO THE SITE, ON-SITE PERSONNEL, FINES, PENALTIES, ETC. THEY WILL ALSO BE RESPONSIBLE FOR PAYING/REIMBURSING ALL LEGAL FEES/COSTS FOR ALL PARTIES INVOLVED WITH THE PROJECT SHOULD SELECTIVE DEMOLITION OR DEMOLITION ACTIVITIES CAUSE INJURY OR DEATH TO ANY PERSONS ON SITE.
7. THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR IS RESPONSIBLE FOR PROVIDING TEMPORARY WATER, POWER, AND HEAT AS NEEDED AT THE SITE (24 HOURS A DAY). TEMPORARY LIGHTING WITHIN THE WORK AREAS MUST BE CONNECTED TO GROUND FAULT CIRCUIT INTERRUPTER (GFCI) POWER PANELS INSTALLED BY A STATE OF CONNECTICUT LICENSED ELECTRICIAN AND LOCATED OUTSIDE OF THE WORK AREAS. THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR SHALL BE RESPONSIBLE FOR PAYING FOR THE USE OF POWER AND WATER UNLESS THE OWNER AGREES IN WRITING TO PAY FOR THESE UTILITIES. IT SHALL ALSO BE THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR'S RESPONSIBILITY TO PROVIDE ALL FIXED AND TEMPORARY CONNECTIONS AND HOOK-UPS AS WELL AS OBTAINING PERMITS AND PAYING ALL FEES FOR MAKING SUCH SERVICES AVAILABLE FOR HIS WORK AS IS NECESSARY. ALL POWER AND WATER MUST BE SUPPLIED 24 HOURS A DAY THROUGHOUT THE ABATEMENT PROJECT. CT DPH WILL BE NOTIFIED IMMEDIATELY IF ACTIVE CONTAINMENTS DO NOT HAVE SUFFICIENT NEGATIVE PRESSURE THROUGHOUT THE ABATEMENT PROCESS UNTIL ACCEPTABLE REOCCUPANCY AIR RESULTS ARE RECEIVED. THE USE OF PORTABLE GENERATORS WILL REQUIRE 24 HOURS A DAY, 7 DAYS A WEEK CONTINUOUS OPERATION IF NEGATIVE AIR MACHINES IN CONTAINMENTS ARE POWERED BY THEM. THIS CONTINUOUS OPERATION MUST REMAIN IN PLACE FROM THE TIME THE PRE-ABATEMENT VISUAL IS COMPLETED UP UNTIL CLEARANCE RE-OCCUPANCY SAMPLING RESULTS HAVE PASSED. THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR WILL PAY THE OWNER A $2,500 PENALTY SHOULD THE POWER BE FOUND TO NOT BE RUNNING THE NEGATIVE AIR MACHINES IN ACTIVE ABATEMENT CONTAINMENTS. THIS PENALTY WILL APPLY DAILY AND THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR IS ALSO RESPONSIBLE FOR PAYING ALL CT DPH FINES THAT MAY BE IMPOSED ON THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR AND OWNER.

HAZARDOUS BUILDING MATERIALS ABATEMENT NOTES (SEE ASBESTOS ABATEMENT SPECIFICATION AND PCB REMEDIATION SPECIFICATIONS FOR ADDITIONAL INFORMATION NOT INCLUDED ON DRAWINGS)

1. THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR SHALL REMOVE AND DISPOSE OF ASBESTOS CONTAINING FLOOR TILES AND/OR BLACK MASTIC AS ACM.
2. THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR SHALL REMOVE AND DISPOSE OF ASBESTOS CONTAINING PIPE, PIPE FITTING, PIPE HANGER AND ROOF DRAIN INSULATION AS ACM.
3. THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR SHALL REMOVE AND DISPOSE OF ASBESTOS CONTAINING DUCT INSULATION AS ACM.
4. THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR SHALL REMOVE AND DISPOSE OF ASBESTOS CONTAINING CEILING AND WALL PLASTER AS ACM.
5. THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR SHALL REMOVE AND DISPOSE OF ASBESTOS CONTAINING SINK UNDERCOATING AND SINK COUNTERTOP CAULKING COMPOUNDS AS ACM. CAULKING COMPOUNDS MUST BE DISPOSED OF AS ASSUMED >50 PPM PCB BULK PRODUCT WASTE ALSO.
6. THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR SHALL REMOVE AND DISPOSE OF ASBESTOS CONTAINING BULLETIN BOARD, "CHALK" BOARD, MIRROR AND OTHER WALL ADHESIVES/GLUE DAUBS AS ACM.
7. THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR SHALL REMOVE AND DISPOSE OF ASBESTOS CONTAINING CERAMIC WALL TILE ADHESIVE AS ACM.
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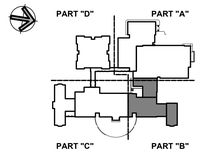
9. THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR SHALL REMOVE AND DISPOSE OF ASBESTOS CONTAINING EXTERIOR FOUNDATION DAMP-PROOFING TAR/MATERIALS AS ACM.
10. THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR SHALL REMOVE AND DISPOSE OF ASBESTOS AND ASSUMED PCB >50 PPM CONTAINING INTERIOR DOOR CAULKING COMPOUNDS, DOOR WINDOW GLAZING COMPOUNDS, WINDOW CAULKING AND GLAZING COMPOUNDS AS ACM AND PCB BULK PRODUCT WASTE.
11. THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR SHALL REMOVE AND DISPOSE OF ASBESTOS AND ASSUMED PCB >50 PPM CONTAINING EXTERIOR/INTERIOR WINDOW CAULKING/GLAZING/LINTEL CAULKING COMPOUNDS AS ACM AND PCB BULK PRODUCT WASTE.
12. THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR SHALL REMOVE AND DISPOSE OF ASBESTOS AND ASSUMED PCB >50 PPM CONTAINING EXTERIOR/INTERIOR DOOR AND DOOR/WINDOW CAULKING COMPOUNDS (GLAZING COMPOUNDS ALSO AT MAIN FRONT ENTRY AND GYM ENTRY), DOOR WINDOW GLAZING COMPOUNDS AS ACM AND PCB BULK PRODUCT WASTE.
13. THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR SHALL REMOVE AND DISPOSE OF ASBESTOS AND ASSUMED PCB >50 PPM CONTAINING EXTERIOR VENT CAULKING COMPOUNDS AS ACM AND PCB BULK PRODUCT WASTE.



KEY PLAN

Project Title:

ADDITION & ALTERATIONS TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

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Revision:	Description:	Date:	Revised By:
	95% Construction Documents		

Drawing Title:
SECOND FLOOR HAZARDOUS BUILDING MATERIALS ABATEMENT PLAN - PART "B"

100% DESIGN DEVELOPMENT SUBMISSION ISSUE DATE: 01/19/2024

Date: 08/29/2024
Scale: N.T.S.
Drawn By: HHG/MM
Project Number: 22-382
Drawing Number: HBM-04

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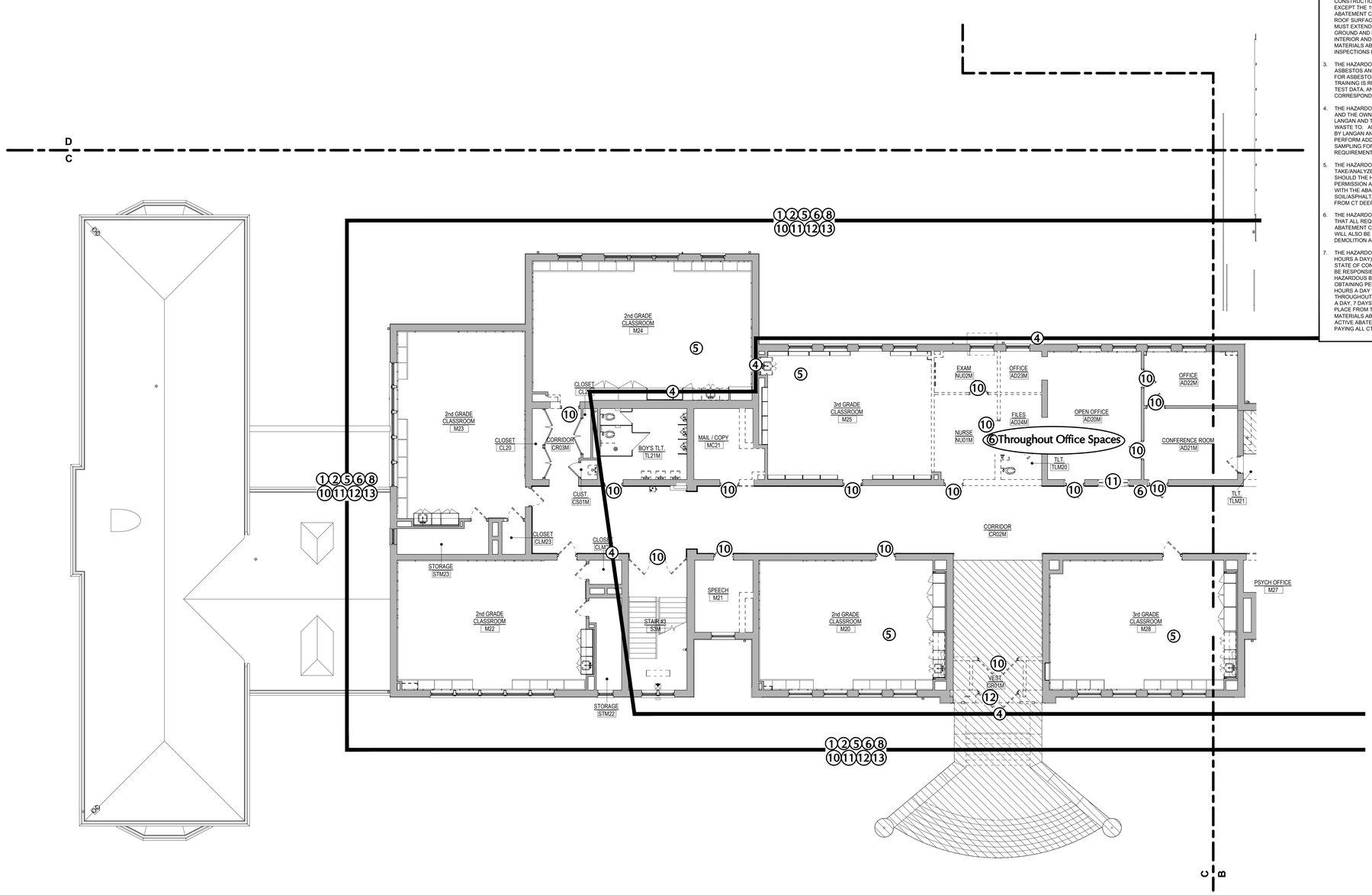
Filename: \\langan.com\data\WH\data8\140265802\Project Data\Specifications\CAD\Second Floor HBMAP.dwg Date: 8/19/2024 Time: 18:55 User: hgriesbach Style Table: Langan.stb Layout: HBM-04



GENERAL NOTES:

1. THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR IS RESPONSIBLE FOR THE VERIFICATION OF ALL EXISTING CONDITIONS, QUANTITIES, AND FOR NOTIFYING THE CONSULTANT OF ANY DISCREPANCIES PRIOR TO FINALIZING BID.
2. ABATEMENT AND REMEDIATION IN ALL AREAS WILL START WITH SELECTIVE DEMOLITION AND REMOVING MATERIALS AT THE CEILING LEVEL AND END WITH THE MATERIALS AT THE FLOORING LEVEL. THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR WILL COORDINATE AND PERFORM ENOUGH SELECTIVE DEMOLITION/DEMOLITION TO IDENTIFY/LOCATE AND ACCESS ALL MATERIALS TO BE REMOVED/ABATED/REMEDIATED. THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR SHALL OPEN UP WALLS, AND CEILINGS TO CHECK FOR HIDDEN PIPING, DUCT, ETC. AS WELL AS DEMOLISHING MILLWORK, CABINETRY, NON-MOVEABLE OBJECTS, LAYER(S) OF FLOORING, WALLS, MATERIALS ATTACHED TO WALLS, ETC. TO LOCATE KNOWN AND POTENTIAL ASBESTOS AND ASSUMED PCB CONTAINING MATERIALS. INTERIOR AND EXTERIOR SELECTIVE DEMOLITION/DEMOLITION AND PROBING MUST OCCUR THROUGHOUT THE WORK AREAS BEFORE CONTAINMENT CONSTRUCTION AND ABATEMENT CAN START. ASSUME THE ABATEMENT WORK WILL INCLUDE FULL CONTAINMENTS THROUGHOUT THE ENTIRE INTERIOR OF THE BUILDING EXCEPT THE 1995 ADDITION. EXTERIOR ABATEMENT/REMEDIATION WILL BE EITHER PERFORMED IN CONTAINMENT (INTERIOR) OR THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR WILL INSTALL POLYETHYLENE SHEETING ON THE INTERIOR OF THE BUILDING AND REMOVE MATERIALS FROM THE EXTERIOR. ALL GROUND AND ROOF SURFACES MUST ALSO BE PROTECTED WITH TARPS, PLYWOOD AND TWO LAYERS OF 10-MIL REINFORCED POLYETHYLENE SHEETING. THIS GROUND PROTECTION MUST EXTEND AT LEAST 20 FEET AWAY FROM THE BUILDING FOUNDATION (OR FARTHER - ENOUGH TO PREVENT BUILDING MATERIALS FROM TOUCHING UNPROTECTED GROUND AND FLOOR SURFACES). THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR WILL PAY FOR ALL CONTAMINATION/REMEDIATION/ABATEMENT OF INTERIOR AND EXTERIOR SURFACES, INCLUDING GROUND SURFACES IF LANGAN DEEMS THEY HAVE CONTAMINATED THESE SURFACES. THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR WILL SUPPLY LIFTS, SCAFFOLDING, STAGING, ETC. TO LANGAN IN AREAS OF REMEDIATION/ABATEMENT UNTIL ALL VISUAL INSPECTIONS HAVE PASSED. THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR WILL PROVIDE TEMPORARY SHORING IN AREAS THAT REQUIRE IT.
3. THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR/DEMOLITION CONTRACTOR SHALL ONLY USE HEAVY EQUIPMENT OPERATORS THAT HAVE PROPER ASBESTOS AND/OR HAZWOPER TRAINING WHEN DISTURBING/REMOVING/MOVING AND LOADING ASBESTOS, LEAD, AND PCB CONTAINING MATERIALS. ACCEPTABLE TRAINING FOR ASBESTOS CAN BE 32 OR 40 HOUR ASBESTOS WORKER/SUPERVISOR WITH ANNUAL REFRESHER TRAINING. 40 HOUR HAZWOPER TRAINING AND ANNUAL REFRESHER TRAINING IS REQUIRED FOR OPERATORS HANDLING LEAD AND/OR PCB CONTAINING/CONTAMINATED MATERIALS. ALL OPERATORS MUST ALSO HAVE CURRENT MEDICAL, FIT TEST DATA, AND WEAR RESPIRATORS DURING WORK. ALL CONTRACTORS MUST COMPLY WITH ALL APPLICABLE OSHA LEAD REGULATIONS AND THIS WORK (AND ALL CORRESPONDING OSHA REGULATION COMPLIANCE) IS INCLUDED IN THE BASE BID.
4. THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR, THEIR SUBCONTRACTORS, WASTE TRANSPORTERS MUST SUBMIT LANDFILL INFORMATION TO LANGAN AND THE OWNER PRIOR TO THE SHIPMENT OF ANY WASTE. THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR(S)/HAULER(S) CANNOT SHIP WASTE UNTIL LANGAN AND THE OWNER HAVE APPROVED THE LANDFILL THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR/HAULER IS/ARE PROPOSING TO SHIP THE WASTE TO. ALL PCB TCLP SAMPLING OF THE WASTE MUST BE PERFORMED BY THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR (IF TESTING IS APPROVED BY LANGAN AND THE OWNER) WITH LANGAN PRESENT AND THE RESULTS MADE AVAILABLE TO LANGAN AND THE OWNER PRIOR TO WASTE SHIPMENT. LANGAN MAY PERFORM ADDITIONAL TCLP SAMPLING TO CONFIRM THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR'S RESULTS. LANGAN WILL PERFORM THE LEAD TCLP SAMPLING FOR CLASSIFICATION OF THE DEMOLITION AND ABATEMENT WASTE. PLEASE SEE THE ASBESTOS, PCB, AND LEAD-BASED PAINT SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS AND CONTRACTORS LIABILITY.
5. THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR, THEIR SUBCONTRACTORS, WASTE TRANSPORTERS AND/OR LANDFILL(S) DO NOT HAVE PERMISSION TO TAKE/ANALYZE BUILDING MATERIALS FOR PCB CONTENT/ CONCENTRATIONS WITHOUT WRITTEN PERMISSION FROM THE BUILDING OWNER PRIOR TO SUCH SAMPLING. SHOULD THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR OR OTHER PARTIES LISTED ABOVE TAKE/ANALYZE PCB SAMPLES WITHOUT THE OWNER'S PERMISSION AND PCB'S ARE FOUND TO BE >1 PPM, THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR WILL BE RESPONSIBLE FOR ALL COSTS ASSOCIATED WITH THE ABATEMENT/ REMEDIATION/REPLACEMENT OF ALL THE INTERIOR/EXTERIOR BUILDING MATERIALS AND ADJACENT SURFACES, INCLUDING SOIL/ASPHALT/CONCRETE/ETC. AS WELL AS ALL COSTS ASSOCIATED WITH PROJECT DELAYS, ATTORNEY FEES FOR ALL PARTIES AFFECTED AND ALL COSTS RESULTING FROM CT DEEP/EPA REQUIREMENTS THAT MAY OCCUR AS A RESULT.
6. THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR WILL BE RESPONSIBLE FOR HIRING AN ENGINEER AND OTHER APPROPRIATE PERSONNEL TO ENSURE THAT ALL REQUIRED SELECTIVE DEMOLITION AND DEMOLITION ACTIVITIES ARE SAFE TO PERFORM FOR ALL PERSONNEL ON SITE. THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR(S) WILL BE FINANCIALLY RESPONSIBLE FOR ANY DAMAGE THAT MAY OCCUR TO THE SITE, ON-SITE PERSONNEL, FINES, PENALTIES, ETC. THEY WILL ALSO BE RESPONSIBLE FOR PAYING/REIMBURSING ALL LEGAL FEES/COSTS FOR ALL PARTIES INVOLVED WITH THE PROJECT SHOULD SELECTIVE DEMOLITION OR DEMOLITION ACTIVITIES CAUSE INJURY OR DEATH TO ANY PERSONS ON SITE.
7. THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR IS RESPONSIBLE FOR PROVIDING TEMPORARY WATER, POWER, AND HEAT AS NEEDED AT THE SITE (24 HOURS A DAY). TEMPORARY LIGHTING WITHIN THE WORK AREAS MUST BE CONNECTED TO GROUND FAULT CIRCUIT INTERRUPTER (GFCI) POWER PANELS INSTALLED BY A STATE OF CONNECTICUT LICENSED ELECTRICIAN AND LOCATED OUTSIDE OF THE WORK AREAS. THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR SHALL BE RESPONSIBLE FOR PAYING FOR THE USE OF POWER AND WATER UNLESS THE OWNER AGREES IN WRITING TO PAY FOR THESE UTILITIES. IT SHALL ALSO BE THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR'S RESPONSIBILITY TO PROVIDE ALL FIXED AND TEMPORARY CONNECTIONS AND HOOK-UPS AS WELL AS OBTAINING PERMITS AND PAYING ALL FEES FOR MAKING SUCH SERVICES AVAILABLE FOR HIS WORK AS IS NECESSARY. ALL POWER AND WATER MUST BE SUPPLIED 24 HOURS A DAY THROUGHOUT THE ABATEMENT PROJECT. CT DPH WILL BE NOTIFIED IMMEDIATELY IF ACTIVE CONTAINMENTS DO NOT HAVE SUFFICIENT NEGATIVE PRESSURE THROUGHOUT THE ABATEMENT PROCESS UNTIL ACCEPTABLE REOCCUPANCY AIR RESULTS ARE RECEIVED. THE USE OF PORTABLE GENERATORS WILL REQUIRE 24 HOURS A DAY, 7 DAYS A WEEK CONTINUOUS OPERATION IF NEGATIVE AIR MACHINES IN CONTAINMENTS ARE POWERED BY THEM. THIS CONTINUOUS OPERATION MUST REMAIN IN PLACE FROM THE TIME THE PRE-ABATEMENT VISUAL IS COMPLETED UP UNTIL CLEARANCE RE-OCCUPANCY SAMPLING RESULTS HAVE PASSED. THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR WILL PAY THE OWNER A $2,500 PENALTY SHOULD THE POWER BE FOUND TO NOT BE RUNNING THE NEGATIVE AIR MACHINES IN ACTIVE ABATEMENT CONTAINMENTS. THIS PENALTY WILL APPLY DAILY AND THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR IS ALSO RESPONSIBLE FOR PAYING ALL CT DPH FINES THAT MAY BE IMPOSED ON THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR AND OWNER.

HAZARDOUS BUILDING MATERIALS ABATEMENT NOTES (SEE ASBESTOS ABATEMENT SPECIFICATION AND PCB REMEDIATION SPECIFICATIONS FOR ADDITIONAL INFORMATION NOT INCLUDED ON DRAWINGS)

1. THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR SHALL REMOVE AND DISPOSE OF ASBESTOS CONTAINING FLOOR TILES AND/OR BLACK MASTIC AS ACM.
2. THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR SHALL REMOVE AND DISPOSE OF ASBESTOS CONTAINING PIPE, PIPE FITTING, PIPE HANGER AND ROOF DRAIN INSULATION AS ACM.
3. THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR SHALL REMOVE AND DISPOSE OF ASBESTOS CONTAINING DUCT INSULATION AS ACM.
4. THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR SHALL REMOVE AND DISPOSE OF ASBESTOS CONTAINING CEILING AND WALL PLASTER AS ACM.
5. THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR SHALL REMOVE AND DISPOSE OF ASBESTOS CONTAINING SINK UNDERCOATING AND SINK COUNTERTOP CAULKING COMPOUNDS AS ACM. CAULKING COMPOUNDS MUST BE DISPOSED OF AS ASSUMED >50 PPM PCB BULK PRODUCT WASTE ALSO.
6. THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR SHALL REMOVE AND DISPOSE OF ASBESTOS CONTAINING BULLETIN BOARD, "CHALK" BOARD, MIRROR AND OTHER WALL ADHESIVES/GLUE DAUBS AS ACM.
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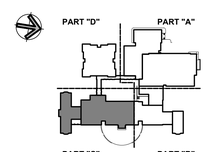
9. THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR SHALL REMOVE AND DISPOSE OF ASBESTOS CONTAINING EXTERIOR FOUNDATION DAMP-PROOFING TAR/MATERIALS AS ACM.
10. THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR SHALL REMOVE AND DISPOSE OF ASBESTOS AND ASSUMED PCB >50 PPM CONTAINING INTERIOR DOOR CAULKING COMPOUNDS, DOOR WINDOW GLAZING COMPOUNDS, WINDOW CAULKING AND GLAZING COMPOUNDS AS ACM AND PCB BULK PRODUCT WASTE.
11. THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR SHALL REMOVE AND DISPOSE OF ASBESTOS AND ASSUMED PCB >50 PPM CONTAINING EXTERIOR/INTERIOR WINDOW CAULKING/GLAZING/LINTEL CAULKING COMPOUNDS AS ACM AND PCB BULK PRODUCT WASTE.
12. THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR SHALL REMOVE AND DISPOSE OF ASBESTOS AND ASSUMED PCB >50 PPM CONTAINING EXTERIOR/INTERIOR DOOR AND DOOR/WINDOW CAULKING COMPOUNDS (GLAZING COMPOUNDS ALSO AT MAIN FRONT ENTRY AND GYM ENTRY), DOOR WINDOW GLAZING COMPOUNDS AS ACM AND PCB BULK PRODUCT WASTE.
13. THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR SHALL REMOVE AND DISPOSE OF ASBESTOS AND ASSUMED PCB >50 PPM CONTAINING EXTERIOR VENT CAULKING COMPOUNDS AS ACM AND PCB BULK PRODUCT WASTE.

1 2nd FLOOR HAZARDOUS BUILDING MATERIALS ABATEMENT PLAN - PART "C"



KEY PLAN

Project Title:
ADDITION & ALTERATIONS TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

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Revision:	Description:	Date:	Revised By:
	95% Construction Documents		

Drawing Title:
SECOND FLOOR HAZARDOUS BUILDING MATERIALS ABATEMENT PLAN - PART "C"

100% DESIGN DEVELOPMENT SUBMISSION ISSUE DATE: 01/19/2024

Date: 08/29/2024
Scale: N.T.S.
Drawn By: HHG/MM
Project Number: 22-382
Drawing Number: HBM-05

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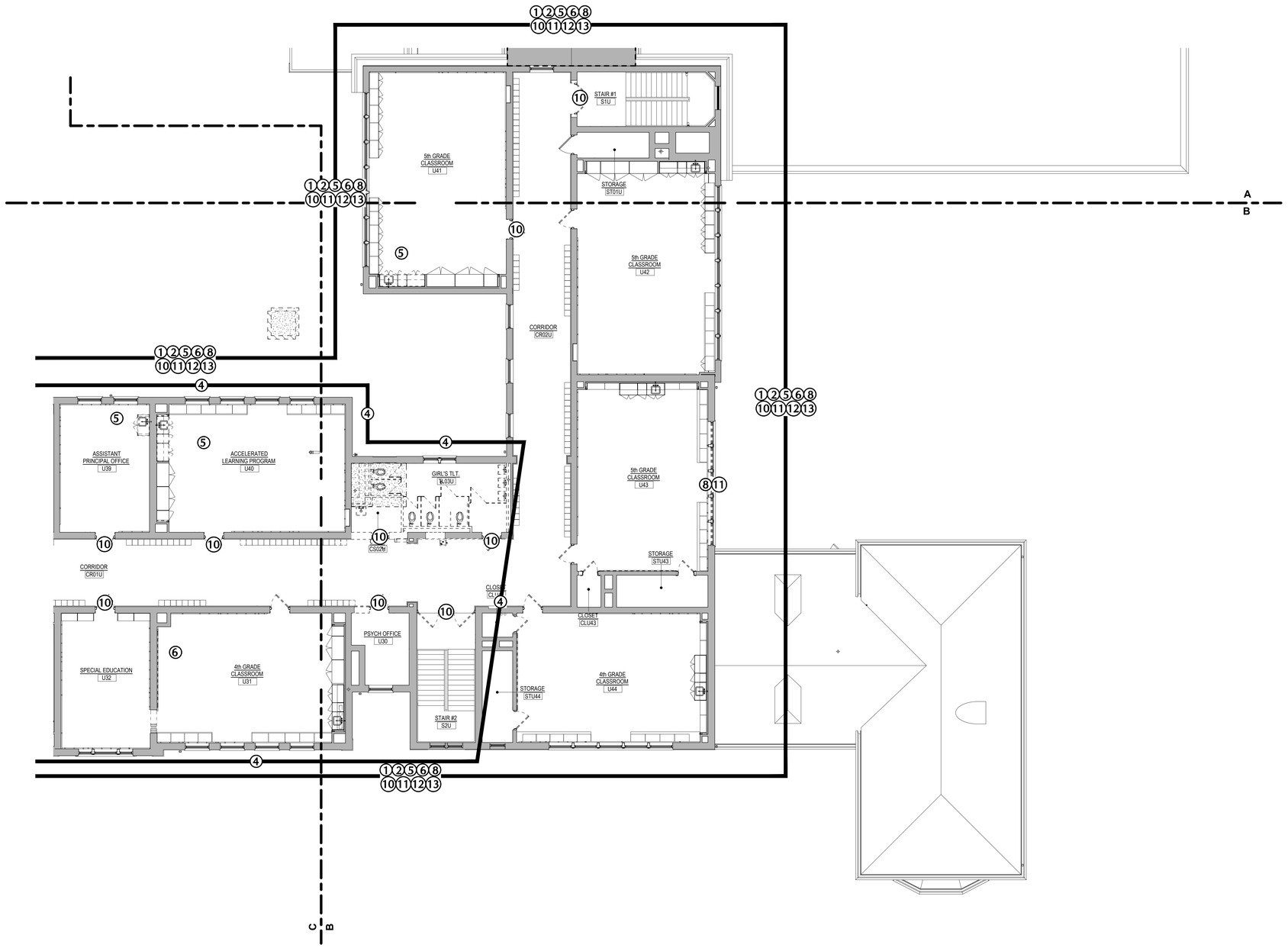
Filename: \\langan.com\data\WH\data8\140265802\Project Data\Specifications\CAD\Second Floor HBMAP.dwg Date: 8/19/2024 Time: 19:03 User: hgriesbach Style Table: Langan.stb Layout: HBM-05



1 3rd FLOOR HAZARDOUS BUILDING MATERIALS ABATEMENT PLAN - PART "B"

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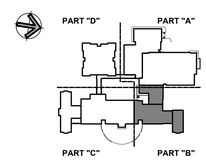

KEY PLAN

Project Title:

ADDITION & ALTERATIONS TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

LANGAN
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203 230 9007 silverpetrucelli.com

Revision:	Description:	Date:	Revised By:
	95% Construction Documents		

Drawing Title:
THIRD FLOOR HAZARDOUS BUILDING MATERIALS ABATEMENT PLAN - PART "B"

100% DESIGN DEVELOPMENT SUBMISSION ISSUE DATE: 01/19/2024

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Project Number: 22-382
Drawing Number: HBM-06

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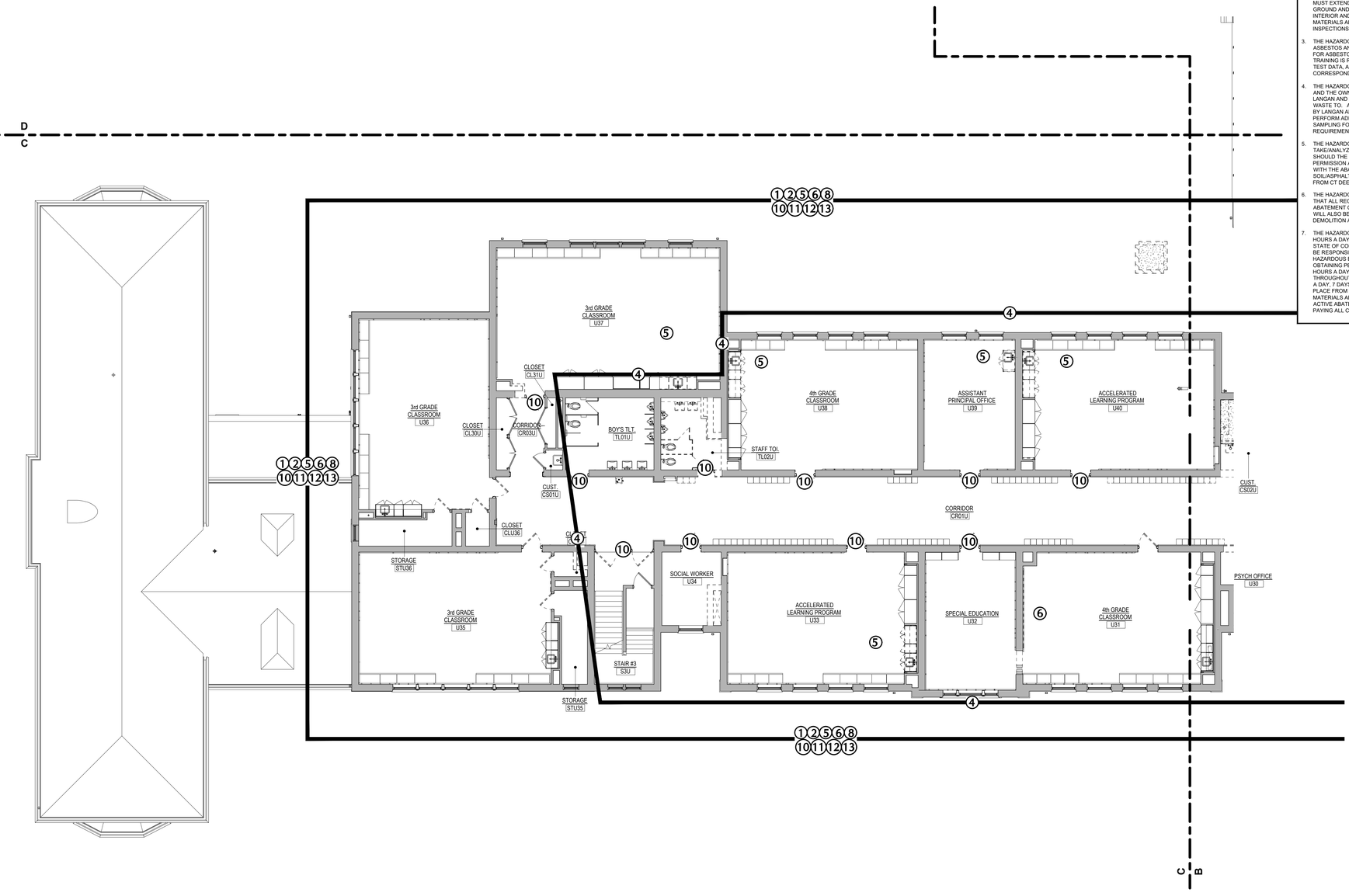
Filename: \\langan.com\data\NH\data8\140285802\Project Data\Specifications\CAD\Third Floor HBMAP.dwg Date: 8/19/2024 Time: 19:08 User: hgriesbach Style Table: Langan.stb Layout: HBM-06



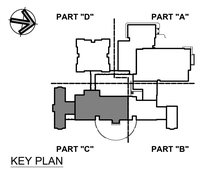
1 3rd FLOOR HAZARDOUS BUILDING MATERIALS ABATEMENT PLAN - PART "C"

GENERAL NOTES:

1. THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR IS RESPONSIBLE FOR THE VERIFICATION OF ALL EXISTING CONDITIONS, QUANTITIES, AND FOR NOTIFYING THE CONSULTANT OF ANY DISCREPANCIES PRIOR TO FINALIZING BID.
2. ABATEMENT AND REMEDIATION IN ALL AREAS WILL START WITH SELECTIVE DEMOLITION AND REMOVING MATERIALS AT THE CEILING LEVEL AND END WITH THE MATERIALS AT THE FLOORING LEVEL. THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR WILL COORDINATE AND PERFORM ENOUGH SELECTIVE DEMOLITION/DEMOLITION TO IDENTIFY/LOCATE AND ACCESS ALL MATERIALS TO BE REMOVED/ABATED/REMEDIATED. THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR SHALL OPEN UP WALLS, AND CEILINGS TO CHECK FOR HIDDEN PIPING, DUCT, ETC. AS WELL AS DEMOLISHING MILLWORK, CABINETRY, NON-MOVEABLE OBJECTS, LAYER(S) OF FLOORING, WALLS, MATERIALS ATTACHED TO WALLS, ETC. TO LOCATE KNOWN AND POTENTIAL ASBESTOS AND ASSUMED PCB CONTAINING MATERIALS. INTERIOR AND EXTERIOR SELECTIVE DEMOLITION/DEMOLITION AND PROBING MUST OCCUR THROUGHOUT THE WORK AREAS BEFORE CONTAINMENT CONSTRUCTION AND ABATEMENT CAN START. ASSUME THE ABATEMENT WORK WILL INCLUDE FULL CONTAINMENTS THROUGHOUT THE ENTIRE INTERIOR OF THE BUILDING EXCEPT THE 1995 ADDITION. EXTERIOR ABATEMENT/REMEDIATION WILL BE EITHER PERFORMED IN CONTAINMENT (INTERIOR) OR THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR WILL INSTALL POLYETHYLENE SHEETING ON THE INTERIOR OF THE BUILDING AND REMOVE MATERIALS FROM THE EXTERIOR. ALL GROUND AND ROOF SURFACES MUST ALSO BE PROTECTED WITH TARPS, PLYWOOD AND TWO LAYERS OF 10-MIL REINFORCED POLYETHYLENE SHEETING. THIS GROUND PROTECTION MUST EXTEND AT LEAST 20 FEET AWAY FROM THE BUILDING FOUNDATION (OR FARTHER - ENOUGH TO PREVENT BUILDING MATERIALS FROM TOUCHING UNPROTECTED GROUND AND FLOOR SURFACES). THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR WILL PAY FOR ALL CONTAMINATION/REMEDIATION/ABATEMENT OF INTERIOR AND EXTERIOR SURFACES, INCLUDING GROUND SURFACES IF LANGAN DEEMS THEY HAVE CONTAMINATED THESE SURFACES. THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR WILL SUPPLY LIFTS, SCAFFOLDING, STAGING, ETC. TO LANGAN IN AREAS OF REMEDIATION/ABATEMENT UNTIL ALL VISUAL INSPECTIONS HAVE PASSED. THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR WILL PROVIDE TEMPORARY SHORING IN AREAS THAT REQUIRE IT.
3. THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR/DEMOLITION CONTRACTOR SHALL ONLY USE HEAVY EQUIPMENT OPERATORS THAT HAVE PROPER ASBESTOS AND/OR HAZWOPER TRAINING WHEN DISTURBING/REMOVING/MOVING AND LOADING ASBESTOS, LEAD, AND PCB CONTAINING MATERIALS. ACCEPTABLE TRAINING FOR ASBESTOS CAN BE 32 OR 40 HOUR ASBESTOS WORKER/SUPERVISOR WITH ANNUAL REFRESHER TRAINING. 40 HOUR HAZWOPER TRAINING AND ANNUAL REFRESHER TRAINING IS REQUIRED FOR OPERATORS HANDLING LEAD AND/OR PCB CONTAINING/CONTAMINATED MATERIALS. ALL OPERATORS MUST ALSO HAVE CURRENT MEDICAL, FIT TEST DATA, AND WEAR RESPIRATORS DURING WORK. ALL CONTRACTORS MUST COMPLY WITH ALL APPLICABLE OSHA LEAD REGULATIONS AND THIS WORK (AND ALL CORRESPONDING OSHA REGULATION COMPLIANCE) IS INCLUDED IN THE BASE BID.
4. THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR, THEIR SUBCONTRACTORS, WASTE TRANSPORTERS MUST SUBMIT LANDFILL INFORMATION TO LANGAN AND THE OWNER PRIOR TO THE SHIPMENT OF ANY WASTE. THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR(S)/HAULER(S) CANNOT SHIP WASTE UNTIL LANGAN AND THE OWNER HAVE APPROVED THE LANDFILL THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR/HAULER IS/ARE PROPOSING TO SHIP THE WASTE TO. ALL PCB TCLP SAMPLING OF THE WASTE MUST BE PERFORMED BY THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR (IF TESTING IS APPROVED BY LANGAN AND THE OWNER) WITH LANGAN PRESENT AND THE RESULTS MADE AVAILABLE TO LANGAN AND THE OWNER PRIOR TO WASTE SHIPMENT. LANGAN MAY PERFORM ADDITIONAL TCLP SAMPLING TO CONFIRM THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR'S RESULTS. LANGAN WILL PERFORM THE LEAD TCLP SAMPLING FOR CLASSIFICATION OF THE DEMOLITION AND ABATEMENT WASTE. PLEASE SEE THE ASBESTOS, PCB, AND LEAD-BASED PAINT SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS AND CONTRACTORS LIABILITY.
5. THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR, THEIR SUBCONTRACTORS, WASTE TRANSPORTERS AND/OR LANDFILL(S) DO NOT HAVE PERMISSION TO TAKE/ANALYZE BUILDING MATERIALS FOR PCB CONTENT/ CONCENTRATIONS WITHOUT WRITTEN PERMISSION FROM THE BUILDING OWNER PRIOR TO SUCH SAMPLING. SHOULD THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR OR OTHER PARTIES LISTED ABOVE TAKE/ANALYZE PCB SAMPLES WITHOUT THE OWNER'S PERMISSION AND PCB'S ARE FOUND TO BE >1 PPM, THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR WILL BE RESPONSIBLE FOR ALL COSTS ASSOCIATED WITH THE ABATEMENT/ REMEDIATION/REPLACEMENT OF ALL THE INTERIOR/EXTERIOR BUILDING MATERIALS AND ADJACENT SURFACES, INCLUDING SOIL/ASPHALT/CONCRETE/ETC. AS WELL AS ALL COSTS ASSOCIATED WITH PROJECT DELAYS, ATTORNEY FEES FOR ALL PARTIES AFFECTED AND ALL COSTS RESULTING FROM CT DEEP/EPA REQUIREMENTS THAT MAY OCCUR AS A RESULT.
6. THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR WILL BE RESPONSIBLE FOR HIRING AN ENGINEER AND OTHER APPROPRIATE PERSONNEL TO ENSURE THAT ALL REQUIRED SELECTIVE DEMOLITION AND DEMOLITION ACTIVITIES ARE SAFE TO PERFORM FOR ALL PERSONNEL ON SITE. THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR(S) WILL BE FINANCIALLY RESPONSIBLE FOR ANY DAMAGE THAT MAY OCCUR TO THE SITE, ON-SITE PERSONNEL, FINES, PENALTIES, ETC. THEY WILL ALSO BE RESPONSIBLE FOR PAYING/REIMBURSING ALL LEGAL FEES/COSTS FOR ALL PARTIES INVOLVED WITH THE PROJECT SHOULD SELECTIVE DEMOLITION OR DEMOLITION ACTIVITIES CAUSE INJURY OR DEATH TO ANY PERSONS ON SITE.
7. THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR IS RESPONSIBLE FOR PROVIDING TEMPORARY WATER, POWER, AND HEAT AS NEEDED AT THE SITE (24 HOURS A DAY). TEMPORARY LIGHTING WITHIN THE WORK AREAS MUST BE CONNECTED TO GROUND FAULT CIRCUIT INTERRUPTER (GFCI) POWER PANELS INSTALLED BY A STATE OF CONNECTICUT LICENSED ELECTRICIAN AND LOCATED OUTSIDE OF THE WORK AREAS. THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR SHALL BE RESPONSIBLE FOR PAYING FOR THE USE OF POWER AND WATER UNLESS THE OWNER AGREES IN WRITING TO PAY FOR THESE UTILITIES. IT SHALL ALSO BE THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR'S RESPONSIBILITY TO PROVIDE ALL FIXED AND TEMPORARY CONNECTIONS AND HOOK-UPS AS WELL AS OBTAINING PERMITS AND PAYING ALL FEES FOR MAKING SUCH SERVICES AVAILABLE FOR HIS WORK AS IS NECESSARY. ALL POWER AND WATER MUST BE SUPPLIED 24 HOURS A DAY THROUGHOUT THE ABATEMENT PROJECT. CT DPH WILL BE NOTIFIED IMMEDIATELY IF ACTIVE CONTAINMENTS DO NOT HAVE SUFFICIENT NEGATIVE PRESSURE THROUGHOUT THE ABATEMENT PROCESS UNTIL ACCEPTABLE REOCCUPANCY AIR RESULTS ARE RECEIVED. THE USE OF PORTABLE GENERATORS WILL REQUIRE 24 HOURS A DAY, 7 DAYS A WEEK CONTINUOUS OPERATION IF NEGATIVE AIR MACHINES IN CONTAINMENTS ARE POWERED BY THEM. THIS CONTINUOUS OPERATION MUST REMAIN IN PLACE FROM THE TIME THE PRE-ABATEMENT VISUAL IS COMPLETED UP UNTIL CLEARANCE RE-OCCUPANCY SAMPLING RESULTS HAVE PASSED. THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR WILL PAY THE OWNER A $2,500 PENALTY SHOULD THE POWER BE FOUND TO NOT BE RUNNING THE NEGATIVE AIR MACHINES IN ACTIVE ABATEMENT CONTAINMENTS. THIS PENALTY WILL APPLY DAILY AND THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR IS ALSO RESPONSIBLE FOR PAYING ALL CT DPH FINES THAT MAY BE IMPOSED ON THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR AND OWNER.

HAZARDOUS BUILDING MATERIALS ABATEMENT NOTES (SEE ASBESTOS ABATEMENT SPECIFICATION AND PCB REMEDIATION SPECIFICATIONS FOR ADDITIONAL INFORMATION NOT INCLUDED ON DRAWINGS)

1. THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR SHALL REMOVE AND DISPOSE OF ASBESTOS CONTAINING FLOOR TILES AND/OR BLACK MASTIC AS ACM.
2. THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR SHALL REMOVE AND DISPOSE OF ASBESTOS CONTAINING PIPE, PIPE FITTING, PIPE HANGER AND ROOF DRAIN INSULATION AS ACM.
3. THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR SHALL REMOVE AND DISPOSE OF ASBESTOS CONTAINING DUCT INSULATION AS ACM.
4. THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR SHALL REMOVE AND DISPOSE OF ASBESTOS CONTAINING CEILING AND WALL PLASTER AS ACM.
5. THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR SHALL REMOVE AND DISPOSE OF ASBESTOS CONTAINING SINK UNDERCOATING AND SINK COUNTERTOP CAULKING COMPOUNDS AS ACM. CAULKING COMPOUNDS MUST BE DISPOSED OF AS ASSUMED >50 PPM PCB BULK PRODUCT WASTE ALSO.
6. THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR SHALL REMOVE AND DISPOSE OF ASBESTOS CONTAINING BULLETIN BOARD, "CHALK" BOARD, MIRROR AND OTHER WALL ADHESIVES/GLUE DAUBS AS ACM.
7. THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR SHALL REMOVE AND DISPOSE OF ASBESTOS CONTAINING CERAMIC WALL TILE ADHESIVE AS ACM.
8. THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR SHALL REMOVE AND DISPOSE OF ASBESTOS CONTAINING WALL BLACK DAMP-PROOFING MATERIALS AS ACM.
9. THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR SHALL REMOVE AND DISPOSE OF ASBESTOS CONTAINING EXTERIOR FOUNDATION DAMP-PROOFING TAR/MATERIALS AS ACM.
10. THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR SHALL REMOVE AND DISPOSE OF ASBESTOS AND ASSUMED PCB >50 PPM CONTAINING INTERIOR DOOR CAULKING COMPOUNDS, DOOR WINDOW GLAZING COMPOUNDS, WINDOW CAULKING AND GLAZING COMPOUNDS AS ACM AND PCB BULK PRODUCT WASTE.
11. THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR SHALL REMOVE AND DISPOSE OF ASBESTOS AND ASSUMED PCB >50 PPM CONTAINING EXTERIOR/INTERIOR WINDOW CAULKING/GLAZING/LINTEL CAULKING COMPOUNDS AS ACM AND PCB BULK PRODUCT WASTE.
12. THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR SHALL REMOVE AND DISPOSE OF ASBESTOS AND ASSUMED PCB >50 PPM CONTAINING EXTERIOR/INTERIOR DOOR AND DOOR/WINDOW CAULKING COMPOUNDS (GLAZING COMPOUNDS ALSO AT MAIN FRONT ENTRY AND GYM ENTRY), DOOR WINDOW GLAZING COMPOUNDS AS ACM AND PCB BULK PRODUCT WASTE.
13. THE HAZARDOUS BUILDING MATERIALS ABATEMENT CONTRACTOR SHALL REMOVE AND DISPOSE OF ASBESTOS AND ASSUMED PCB >50 PPM CONTAINING EXTERIOR VENT CAULKING COMPOUNDS AS ACM AND PCB BULK PRODUCT WASTE.



KEY PLAN

Project Title:
ADDITION & ALTERATIONS TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

LANGAN
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Revision:	Description:	Date:	Revised By:
	95% Construction Documents		

Drawing Title:
THIRD FLOOR HAZARDOUS BUILDING MATERIALS ABATEMENT PLAN - PART "C"
100% DESIGN DEVELOPMENT SUBMISSION ISSUE DATE: 01/19/2024

Date: 08/29/2024
Scale: N.T.S.
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Drawing Number: HBM-07

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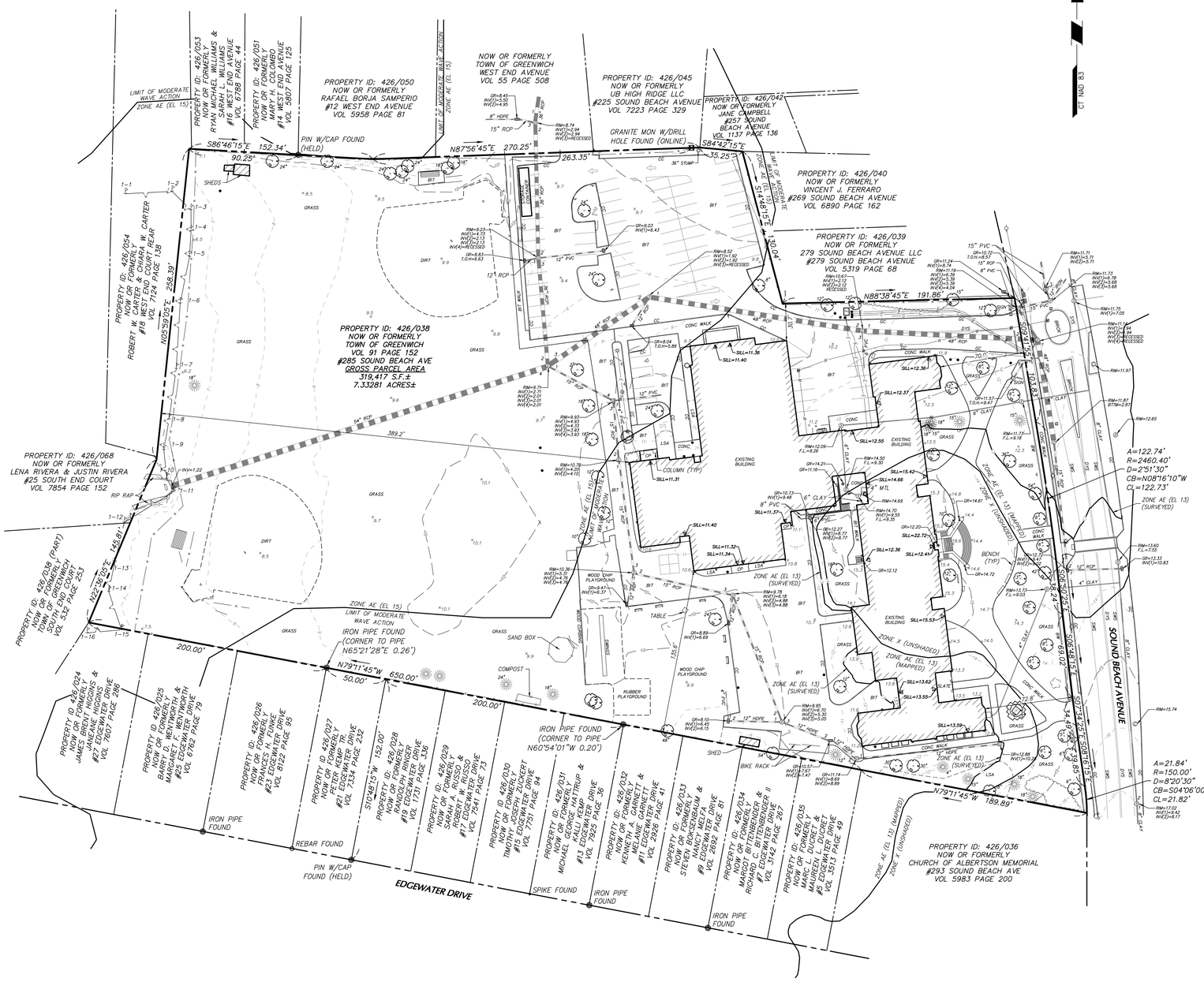
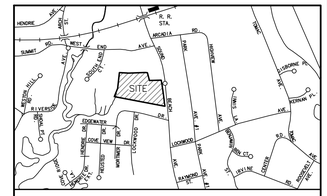
Filename: \\langan.com\data\NH\data\8114028580\2\Project Data\Specifications\CAD\Third Floor HBMAP.dwg Date: 8/19/2024 Time: 19:11 User: hgriesbach Style Table: Langan.stb Layout: HBM-07

LEGEND (NOT SHOWN TO SCALE)

- AIR CONDITIONING UNIT
- BOLLARD
- DOUBLE DOOR
- FLAG POLE
- MAILBOX
- MONITORING WELL
- PARKING METER
- SIGN
- SHRUB
- TREE
- WETLAND FLAG
- GROUND LIGHT
- CABLE BOX HAND HOLE
- CATCH BASIN
- CLEANOUT
- ELECTRIC BOX
- ELECTRIC METER
- FIRE HYDRANT
- FLARED END SECTION
- COMMUNICATION BOX
- FUEL PUMP
- GAS METER
- GAS VALVE
- GUY WIRE
- LIGHT POLE
- MANHOLE (TYPE AS LABELED)
- POST INDICATOR VALVE
- POWER POLE
- ROOF DRAIN
- STANDPIPE
- TELEPHONE BOOTH
- UNDERGROUND VAULT
- VALVE UNKNOWN
- WATER METER
- WATER VALVE
- BIT — BITUMINOUS
- CONC — CONCRETE
- CP — CONCRETE PAD
- LSA — LANDSCAPED AREA
- BOH — BUILDING OVERHANG
- BW — BOTTOM OF WALL
- EP — EDGE OF PAVEMENT
- EG — EDGE OF GRAVEL
- EW — EDGE OF WALK
- DW — DETECTABLE WARNING
- BC — BITUMINOUS CURB
- CC — CONCRETE CURB
- GC — GRANITE CURB
- SG — SLOPED GRANITE CURB
- SWS — SINGLE WHITE STRIPE
- BWS — BROKEN WHITE STRIPE
- SYS — SINGLE YELLOW STRIPE
- DYS — DOUBLE YELLOW STRIPE
- METAL GUARD RAIL
- WOOD GUARD RAIL
- STOCKADE FENCE
- CHAINLINK FENCE
- IRON FENCE
- TREE LINE
- OVERHEAD WIRE
- WETLAND LINE
- EASEMENT LINE
- PROPERTY LINE
- D — DRAINAGE MARK OUT LINE
- E — ELECTRIC MARK OUT LINE
- C — COMMUNICATION MARK OUT LINE
- G — GAS MARK OUT LINE
- S — SANITARY SEWER MARK OUT LINE
- W — WATER MARK OUT LINE
- UNK — UNKNOWN MARK OUT LINE
- R* — REFERENCE UTILITY LINE (TYPE AS NOTED) – PLOTTED FROM EXISTING MAPPING





PROJECT LOCATION MAP

SCALE: 1"=1000'

SOURCE: CONNECTICUT DEPARTMENT OF TRANSPORTATION

CT NAD 83

SCALE: 1 INCH = 40 FEET

NOTES

1. THIS SURVEY HAS BEEN PREPARED PURSUANT TO THE REGULATIONS OF CONNECTICUT STATE AGENCIES SECTIONS 20–300b–1 THROUGH 20–300b–20 AND THE "STANDARDS FOR SURVEYS AND MAPS IN THE STATE OF CONNECTICUT" AS ADOPTED BY THE CONNECTICUT ASSOCIATION OF LAND SURVEYORS, INC. ON SEPTEMBER 26, 1996.
   a. THIS SURVEY IS A PROPERTY SURVEY CONFORMING TO A HORIZONTAL ACCURACY OF A–2 AND A TOPOGRAPHIC SURVEY CONFORMING TO A T–2 ACCURACY. THE BOUNDARY DETERMINATION IS A RESURVEY. THE PURPOSE OF THIS SURVEY IS TO PROVIDE A BOUNDARY OPINION AND DEPICT SITE FEATURES FOR FUTURE SITE DEVELOPMENT.
2. THIS SURVEY IS BASED UPON EXISTING PHYSICAL CONDITIONS FOUND AT THE SUBJECT SITE, DEED INFORMATION AND THE FOLLOWING REFERENCES:
   A. MAP TITLED "PROPERTY & PARTIAL TOPOGRAPHIC SURVEY DEPICTING OLD GREENWICH ELEMENTARY SCHOOL, GREENWICH, CT, PREPARED FOR FLETCHER–THOMPSON, INC.", SCALE: 1"=30', DATED: 10/31/95, ON FILE IN THE TOWN OF GREENWICH ENGINEERING DIVISION
   B. MAP TITLED "IMPROVEMENT LOCATION SURVEY DEPICTING NEW FOUNDATION PREPARED FOR OLD GREENWICH ELEMENTARY SCHOOL BUILDING COMMITTEE GREENWICH, CT," SCALE: 1"=30', DATED: 11/25/96, ON FILE IN THE TOWN OF GREENWICH ENGINEERING DIVISION
   C. MAP TITLED "EDGEWATER PROPERTY OF BOLES, MULLIGAN & BOLES, SOUND BEACH, GREENWICH, CONN.", SCALE: 1/2"=50', DATED: MAY 1915, MAP #526
   D. MAP TITLED "ZONING LOCATION SURVEY SHOWING REVISION OF PROPERTY LINES ON PROPERTY AT WEST END AVENUE OLD GREENWICH GREENWICH, CONNECTICUT PREPARED FOR SYLVESTER J. PECORA JR. AND JOSEPH J. BOBOWICZ JOYCE G. BOBOWICZ", SCALE: 1"=30', DATED: DECEMBER 4, 2002, LAST REVISED: FEBRUARY 27, 2003, BY: ROCCO V. D'ANDREA, INC., MAP #7731
3. THE MERIDIAN OF THIS SURVEY IS REFERENCED TO CONNECTICUT STATE PLANE COORDINATE SYSTEM NAD 83 (EPOCH 2011). POSITION WAS DETERMINED BY GLOBAL NAVIGATION SATELLITE SYSTEMS (GNSS) AS PROVIDED BY HXGN SMARTNET CONTINUOUSLY OPERATED REFERENCE STATIONS (CORS).
4. ELEVATIONS SHOWN ARE REFERENCED TO NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88) (GEOID 12B) AS DETERMINED BY GNSS
5. PLANIMETRIC AND TOPOGRAPHIC INFORMATION SHOWN HEREON HAS BEEN OBTAINED FROM GROUND SURVEYS BY LANGAN CT, INC. FIELD WORK COMPLETED DURING THE MONTH OF MARCH & APRIL 2023.
6. AS PER THE NATIONAL FLOOD INSURANCE PROGRAM FIRM MAP ENTITLED "FAIRFIELD COUNTY, CONNECTICUT PANEL 514 OF 626, MAP NUMBER: 09001C0514G, EFFECTIVE DATE: JULY 8, 2013" THE PROJECT AREA IS IN ZONE AE (ELEV 15), ZONE AE (ELEV 13) & ZONE X (UNSHADED).
7. UNLESS SPECIFICALLY NOTED HEREON, STORM AND SANITARY SEWER INFORMATION (INCLUDING PIPE INVERT, PIPE MATERIAL, AND PIPE SIZE) WAS OBSERVED AND MEASURED AT FIELD LOCATED STRUCTURES (MANHOLES/CATCH BASINS, ETC). CONDITIONS CAN VARY FROM THOSE ENCOUNTERED AT THE TIMES WHEN AND LOCATIONS WHERE DATA IS OBTAINED. DESPITE MEETING THE REQUIRED STANDARD OF CARE, THE SURVEYOR CANNOT, AND DOES NOT WARRANT THAT PIPE MATERIAL AND/OR PIPE SIZE THROUGHOUT THE PIPE RUN ARE THE SAME AS THOSE OBSERVED AT EACH STRUCTURE, OR THAT THE PIPE RUN IS STRAIGHT BETWEEN THE LOCATED STRUCTURES.
8. ADDITIONAL UTILITY (WATER, GAS, ELECTRIC ETC.) DATA MAY BE SHOWN FROM FIELD LOCATED SURFACE MARKINGS (BY OTHERS), EXISTING STRUCTURES, AND/OR FROM EXISTING DRAWINGS.
9. UNLESS SPECIFICALLY NOTED HEREON, THE SURVEYOR HAS NOT EXCAVATED TO PHYSICALLY LOCATE THE UNDERGROUND UTILITIES. THE SURVEYOR MAKES NO GUARANTEES THAT THE SHOWN UNDERGROUND UTILITIES ARE EITHER IN SERVICE, ABANDONED OR SUITABLE FOR USE, NOR ARE IN THE EXACT LOCATION OR CONFIGURATION INDICATED HEREON.
10. ALL BUILDINGS AND STRUCTURES WERE LOCATED AND MEASURED AT GROUND LEVEL. THE SURVEYOR MAKES NO DETERMINATIONS OR GUARANTEES AS TO THE ABSENCE, EXISTENCE OR LOCATION OF UNDERGROUND STRUCTURES, FOUNDATIONS, FOOTINGS, PROJECTIONS, WALLS, TANKS, SEPTIC SYSTEMS, ETC. NO TEST PITS, EXCAVATIONS OR GROUND PENETRATING RADAR WERE PERFORMED AS PART OF THIS SURVEY.
11. PRIOR TO ANY DESIGN OR CONSTRUCTION, THE PROPER UTILITY AGENCIES MUST BE CONTACTED FOR VERIFICATION OF UTILITY TYPE AND FOR FIELD LOCATIONS.
12. THIS SURVEY IS NOT VALID WITHOUT THE EMBOSSED OR INKED SEAL OF THE PROFESSIONAL.

STATE OF CONNECTICUT · ANDREW G. IVES · NO. 70286 · LICENSED LAND SURVEYOR

Date	Description	No.
REVISIONS		

"TO MY KNOWLEDGE AND BELIEF, THIS MAP IS SUBSTANTIALLY CORRECT AS NOTED HEREON."

ANDREW G. IVES — DATE SIGNED
PROFESSIONAL LAND SURVEYOR
CT STATE LIC. NO. 70286

LANGAN

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Project

OLD GREENWICH SCHOOL

285 SOUND BEACH AVENUE
OLD GREENWICH CONNECTICUT

Drawing Title

BOUNDARY & TOPOGRAPHIC SURVEY

Project No. 140265801	Drawing No. VB101
Date MAY 1, 2023	
Drawn By JJS	
Checked By AGI	Sheet 1 of 1

PROJECT NO. 140265801

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Filename: C:\bim\langan-pw-01\636345\8140265801-V-EX0101.dwg Date: 1/18/2024 Time: 09:13 User: jalubic Style Table: Langan.stb Layout: VB101.30x42

LEGEND

PROPOSED BUILDING OUTLINE	
FULL DEPTH HARDSCAPE REMOVAL	
DEMOLITION EXTENTS	
REMOVE EXISTING UTILITY LINE	

GENERAL NOTES

1. BOUNDARY AND TOPOGRAPHIC INFORMATION OBTAINED FROM A PLAN TITLED "BOUNDARY & TOPOGRAPHIC SURVEY" PREPARED BY LANGAN, DATED 1 MAY 2023.
2. THE SITE IS LOCATED IN ZONE AE, A REGULATORY FLOODWAY AREA PER FIRM MAP 09001C0514G, EFFECTIVE JULY 8, 2013.
3. PROPOSED BUILDING FOOTPRINT RECEIVED ELECTRONICALLY FROM SILVER PETRUCELLI + ASSOCIATES IN MAY 2024.

DEMOLITION NOTES

1. THE CONTRACTOR SHALL INSPECT THE SITE THOROUGHLY AND FIELD-VERIFY THE LOCATION AND DEPTH OF ALL EXISTING UTILITIES. SOME UNDERGROUND UTILITIES MAY BE LOCATED DIFFERENTLY THAN SHOWN ON THIS PLAN. IN ADDITION, THERE MAY BE EXISTING UNDERGROUND UTILITIES PRESENT THAT ARE NOT SHOWN ON THIS PLAN. ALL CONTRACTORS USING THESE PLANS FOR DEMOLITION OR CONSTRUCTION SHALL CONFIRM ALL UTILITIES IN THE FIELD TO ESTABLISH LOCATIONS, SIZES, MATERIALS, AND ELEVATIONS. ANY DISCREPANCIES SHALL IMMEDIATELY BE BROUGHT TO THE ATTENTION OF THE ENGINEER AND THE CONSTRUCTION MANAGER.
2. THE CONTRACTOR IS RESPONSIBLE FOR CONTACTING "CALL BEFORE YOU DIG," EXCAVATING THE HOLES, AND PERFORMING ANY ADDITIONAL RESEARCH OR INVESTIGATIONS REQUIRED IN ORDER TO ENSURE THAT PROPOSED UTILITIES TO REMAIN ARE PROTECTED FROM DAMAGE DURING DEMOLITION. ANY DAMAGE TO EXISTING UTILITIES TO REMAIN IS REQUIRED TO BE REPAIRED BY THE CONTRACTOR.
3. EXCEPT WHERE OTHERWISE NOTED, EXISTING STORM DRAINS AND SANITARY PIPING TO BE ABANDONED ARE TO BE COMPLETELY REMOVED. EXISTING UTILITY CONDUITS 6" AND SMALLER MAY BE ABANDONED IN PLACE. ALL EXCAVATIONS SHALL BE PROPERLY BACKFILLED AND COMPACTED IN ACCORDANCE WITH THE EARTHWORK SPECIFICATIONS.
4. THE CONTRACTOR SHALL NOTIFY AND OBTAIN ALL SHUTOFFS FOR ALL APPLICABLE UTILITIES PRIOR TO THE COMMENCEMENT OF DEMOLITION.
5. THE CONTRACTOR SHALL LOCATE/CONFIRM ALL DRAINAGE INFRASTRUCTURE AND MAINTAIN ADEQUATE STORM DRAINAGE THROUGHOUT CONSTRUCTION.
6. THE CONTRACTOR SHALL FIELD LOCATE AND PROPERLY DISCONNECT APPROPRIATE LATERALS TO LIVE MAINS PRIOR TO DEMOLITION AND IN ACCORDANCE WITH UTILITY COMPANY STANDARDS.
7. THE CONTRACTOR SHALL MAINTAIN THE SAFETY AND PROTECTION OF BOTH PEDESTRIANS AND MOTORISTS. IT IS THE CONTRACTOR'S RESPONSIBILITY TO TAKE ALL NECESSARY PRECAUTIONARY AND PROTECTIVE MEASURES, INCLUDING SIGNS, LIGHTS, BARRIERS, FENCING AND TRAFFIC FLAGMEN.
8. THE CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING ALL NECESSARY DEMOLITION ASSOCIATED PERMITS.
9. THE CONTRACTOR SHALL REMOVE AND LEGALLY DISPOSE OF ALL MATERIALS WITHIN THE PROJECT LIMITS UNLESS INDICATED TO REMAIN.
10. THE CONTRACTOR SHALL INCLUDE ALL TEMPORARY FACILITIES AND SERVICES NECESSARY TO SATISFY FEDERAL, STATE & LOCAL REQUIREMENTS INCLUDING BUT NOT LIMITED TO BRACING, SHORING, PAVEMENT REPAIR, FENCING, PEDESTRIAN AND VEHICLE ACCESS, CONCRETE PADS, ETC.
11. THE CONTRACTOR SHALL PROVIDE PERIMETER FENCING AND OTHER SECURITY MEASURES AS REQUIRED BY THE OWNER.
12. THE CONTRACTOR SHALL PROVIDE TEMPORARY PEDESTRIAN ACCESS AS REQUIRED BY THE OWNER.
13. COORDINATE LIMIT OF DEMOLITION WITH ALL PROPOSED WORK.
14. EXISTING BITUMINOUS PAVEMENT TO BE SAWCUT AT ALL LOCATIONS WHERE EXISTING BITUMINOUS PAVEMENT WILL MATCH NEW BITUMINOUS PAVEMENT.
15. EXISTING SIDEWALKS (BITUMINOUS AND CONCRETE) TO BE SAWCUT AT ALL LOCATIONS WHERE EXISTING SIDEWALKS MATCH NEW SIDEWALKS. CONCRETE SIDEWALKS TO BE SAWCUT AT JOINTS.
16. ALL REQUIRED UTILITY DISCONNECTS AND/OR ABANDONMENT TO BE COORDINATED WITH RESPECTIVE UTILITY COMPANIES AND OWNER PRIOR TO CONSTRUCTION PHASING.
17. CONTRACTOR IS TO PROTECT AND MAINTAIN ALL EXISTING UTILITIES TO REMAIN.
18. CONTRACTOR TO INSTALL ALL SOIL EROSION AND SEDIMENT CONTROL MEASURES AND TREE PROTECTION FENCING PRIOR TO START OF DEMOLITION OR CONSTRUCTION.

COORDINATE WORK IN THE DRIVEWAY WITH THE OWNER. MAINTAIN ACCESS TO THE GREATEST EXTENT POSSIBLE.

PROTECT EXISTING DRAINAGE AND UTILITIES TO REMAIN THROUGHOUT CONSTRUCTION.

PROTECT ALL EXISTING TREES NOT SCHEDULED FOR REMOVAL. SEE TREE DEMOLITION PLAN FOR TREE REMOVAL AND PROTECTION DETAILS.

PROTECT ALL EXISTING TREES NOT SCHEDULED FOR REMOVAL. SEE TREE DEMOLITION PLAN FOR TREE REMOVAL AND PROTECTION DETAILS.

LIMIT OF DISTURBANCE (TYP.)

MAINTAIN EMERGENCY EGRESS DURING CONSTRUCTION AS DIRECTED BY OWNER.

CAP EXISTING SANITARY PIPING. SEE MEP PLANS FOR CONTINUATION.

REMOVE EXISTING HARDSCAPE IN THIS AREA.

FULL DEPTH REMOVAL OF HARDSCAPE. PROCESSED AGGREGATE BASE MAY BE REUSED SO LONG AS CONTRACTOR CONFIRMS THE GRADATION OF THE MATERIAL MEETS PROPOSED REQUIREMENTS. (TYP.)

PROTECT AND MAINTAIN EXISTING PLAY EQUIPMENT AND SURFACE.

PROTECT AND RELOCATE EXISTING GAGA PIT

REMOVE EXISTING STAIRS. SEE DEMOLITION PLAN BY OTHERS.

FULL DEPTH REMOVAL OF HARDSCAPE. PROCESSED AGGREGATE BASE MAY BE REUSED SO LONG AS CONTRACTOR CONFIRMS THE GRADATION OF THE MATERIAL MEETS PROPOSED REQUIREMENTS. (TYP.)

MAINTAIN CATCH BASIN OPERATION AT ALL TIMES UNTIL SWITCHOVER TO NEW CATCH BASIN

MAINTAIN EXISTING DRAINAGE PATTERNS TO EXISTING SITE CATCH BASIN. DO NOT OBSTRUCT FLOW FROM ABUTTING PROPERTIES TO THE SOUTH.

EXISTING SHED TO BE RELOCATED OR REMOVED. CONFIRM WITH OWNER.

COORDINATE ACCESS WITH THE OWNER AND AUTHORITY HAVING JURISDICTION WHEN WORK ADJACENT TO THE EXISTING BUILDING.

RESTORE ALL DISTURBED PAVEMENT MARKINGS.

INSTALL NEW FIRE SERVICE CONNECTION TO WATER MAIN. COORDINATE WITH DPW ENGINEER DIVISION AND UTILITY COMPANY.

REMOVE BITUMINOUS PAVEMENT UTILITY INSTALLATION. RESTORE DISTURBANCE PER LOCAL AND S REQUIREMENTS.

FULL DEPTH REMOVAL OF SIDEW REMOVE TO THE NEAREST JOINT.

REPLACE EXISTING POWER AND D CONNECTIONS TO UTILITY POLE. MEP PLANS. COORDINATE WITH UTILITY COMPANY.

REPLACE EXISTING LATERAL CONNECTION TO SEWER MAIN. COORDINATE WITH DPW SEWER DIVISION.

REMOVE BITUMINOUS PAVEMENT UTILITY INSTALLATION. RESTORE DISTURBANCE PER LOCAL AND S REQUIREMENTS.

PROTECT AND MAINTAIN EXISTING SITE WALL ALONG PROPERTY LINE

INSTALL NEW STORM DRAIN CONNECTION TO EXISTING MA COORDINATE WITH DPW ENGI DIVISION.

REMOVE BITUMINOUS PAVE UTILITY INSTALLATION. RES DISTURBANCE PER LOCAL REQUIREMENTS.

REPLACE EXISTING LATERA CONNECTION TO SEWER M COORDINATE WITH DPW SE DIVISION.

SOUND BEACH AVENUE

SCALE: 1 INCH = 20 FEET

Project Title:

ADDITIONS & ALTERATION TO:
Old Greenwich Elementary School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
311 STATE STREET NEW LONDON CT 06320
203 230 9007 silverpetrucelli.com

Revision:	Description:	Date:	Revised By:

Drawing Title: DEMOLITION PLAN

Date: 08/28/2024
Scale:
Drawn By: BTW
Project Number: 22-382

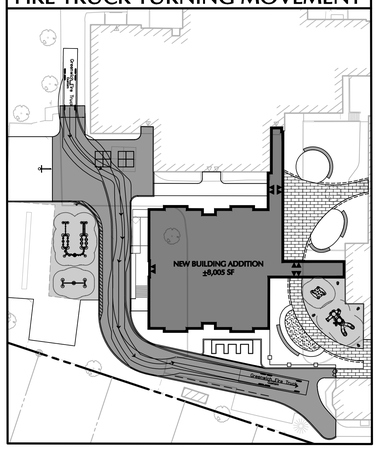
Drawing Number: CD101

ISSUE DATE: 08/28/2024

5/16/2023 2:21:17 PM

Date: 8/28/2024 Time: 19:47 User: acassella Style Table: Langan.stb Layout: CD101 Document Code: 140265801-0502-CD101-0101

FIRE TRUCK TURNING MOVEMENT



40 0 10 25 40
SCALE: 1 INCH = 40 FEET

ZONING CHART

ZONE: R-12 (SINGLE FAMILY)
PROPOSED BUILDING FOOTPRINT: 47,390 SF
PARCEL AREA: 7.33 ACRES[+]

CRITERIA	REQUIRED	EXISTING	PROPOSED	REFERENCE
LOT/BUILDING				
MAXIMUM HEIGHT [FT]	35 (2.5 STORIES)	65	65	SEC. 6-205 (a)
MINIMUM LOT SIZE [SQ. FT]	12,000	319,417	319,417	SEC. 6-205 (a)
MINIMUM FRONTAGE [FT]	80	312	312	SEC. 6-205 (a)
FLOOR AREA RATIO	0.315	0.225	0.250	SEC. 6-205 (a)
MINIMUM PERCENT GREEN AREA [%]	55	63.2	58.2	SEC. 6-205 (a)
MINIMUM FRONT YARD [FT]	65	70.0	70.0	SEC. 6-205 (a)
MINIMUM SIDE YARD [FT]	10	19.5	19.5	SEC. 6-205 (a)
MINIMUM REAR YARD [FT]	65	389.2	389.2	SEC. 6-205 (a)
PARKING				
MINIMUM NUMBER OF PARKING SPACES	N/A	74	74	SEC. 6-158 (b)
REQUIRED NUMBER OF ADA PARKING SPACES	N/A	3	3	SEC. 6-158 (b)

GENERAL NOTES

1. BOUNDARY AND TOPOGRAPHIC INFORMATION OBTAINED FROM A PLAN TITLED "BOUNDARY & TOPOGRAPHIC SURVEY" PREPARED BY LANGAN, DATED 1 MAY 2023.
2. THE SITE IS LOCATED IN ZONE AE, A REGULATORY FLOODWAY AREA PER FIRM MAP 09001C0514G, EFFECTIVE JULY 8, 2013.
3. PROPOSED BUILDING FOOTPRINT RECEIVED ELECTRONICALLY FROM SILVER PETRUCELLI + ASSOCIATES IN MAY 2024.

TOWN OF GREENWICH STANDARD CONSTRUCTION NOTES

1. A HIGHWAY PERMIT IS REQUIRED FOR ALL WORK WITHIN THE TOWN OF GREENWICH – RIGHT OF WAY.
2. ALL WORK WITHIN THE TOWN OF GREENWICH –RIGHT OF WAY SHALL BE CONSTRUCTED TO TOWN OF GREENWICH STANDARDS.
3. CATCH BASINS FOR PRIVATE DRIVEWAYS SHALL HAVE A MINIMUM GRATE OF TWO FEET BY TWO FEET. IF THE DRIVEWAY IS CURBED THE CATCH BASIN SHALL HAVE A MINIMUM CURB INLET OF SIX INCHES. EACH DRIVEWAY CATCH BASIN SHALL ALSO HAVE A MINIMUM TWO–FOOT SUMP AND BELL TRAP.
4. ALL DRAINAGE CONNECTIONS TO THE TOWN DRAINAGE SYSTEM SHALL BE GRAVITY LINES. IF A DISCHARGE FROM A SUMP PUMP IS CONNECTED TO THE TOWN DRAINAGE SYSTEM IT MUST DISCHARGE TO A DRAINAGE STRUCTURE ON PRIVATE PROPERTY AND THEN BE CONNECTED TO THE TOWN DRAINAGE SYSTEM. ALL SUMP PUMPS REQUIRE A BACKFLOW PREVENTER (CHECK VALVE) BETWEEN THE PUMP AND THE DRAINAGE STRUCTURE. A DRAIN CONNECTION PERMIT FROM THE HIGHWAY DIVISION IS REQUIRED FOR ALL CONNECTIONS TO THE TOWN DRAINAGE SYSTEM.
5. IN ROADWAY CUTS, SUBDRAINS SHALL BE REQUIRED IF SEEPAGE OCCURS DURING CONSTRUCTION OR WITHIN ONE YEAR AFTER ROAD CONSTRUCTION IS COMPLETED AND ACCEPTED, EVEN THOUGH PLANS MAY HAVE BEEN APPROVED WITHOUT SUBDRAINS AND/OR ROADWAY CONSTRUCTION HAS BEEN COMPLETED.
6. ALL RETAINING WALLS GREATER THAN THREE FEET ARE REQUIRED TO BE DESIGNED, AND INSPECTED DURING CONSTRUCTION BY A PROFESSIONAL ENGINEER REGISTERED IN THE STATE OF CONNECTICUT.
7. ALL DETENTION/RETENTION SYSTEMS SHALL BE INSTALLED PER MANUFACTURER'S SPECIFICATIONS. ALL SYSTEMS SHALL USE A MANIFOLD SYSTEM TO DISTRIBUTE RUNOFF EVENLY INTO EACH ROW OF INFILTRATORS. DETENTION SYSTEMS WILL HAVE A MANIFOLD SYSTEM THAT CREATES THE LONGEST TRAVEL TIME TO THE CONTROL STRUCTURE. ALL DETENTION/RETENTION SYSTEMS MUST USE A STRUCTURE SUCH AS A MANHOLE FOR THE CONTROL STRUCTURE SO ALL FLOW CONTROL DEVICES CAN BE ACCESSED FOR MAINTENANCE.
8. ALL INFILTRATION SYSTEMS MUST MEET THE STORMWATER INFILTRATION/RECHARGE DESIGN REQUIREMENTS IN APPENDIX B OF THE TOWN OF GREENWICH DRAINAGE MANUAL. THERE MUST BE AT LEAST A 2–FOOT SEPARATION DISTANCE FROM THE BOTTOM OF STONE BELOW THE INFILTRATION STRUCTURE TO THE SEASONAL HIGH GROUNDWATER OR BEDROCK/LEDGE (THIS SEPARATION REQUIREMENT MAY BE WAIVED OR REDUCED BY THE APPROVING AUTHORITY ON A CASE–BY–CASE BASIS). A 3–FOOT SEPARATION DISTANCE IS REQUIRED FROM THE BOTTOM OF STONE BELOW THE INFILTRATION STRUCTURE TO SEASONAL HIGH GROUNDWATER FOR LAND USES WITH HIGHER POTENTIAL POLLUTANT LOADS (HIGH LOAD AREAS). PRIOR TO THE INSTALLATION OF THE INFILTRATORS THE ENGINEER SHALL VERIFY THE INFILTRATION STRUCTURE IS BEING INSTALLED IN THE APPROVED LOCATION AND IF THE LOCATION HAS BEEN CHANGED ADDITIONAL SOIL TESTING SHALL BE PERFORMED AND THE ENGINEER SHALL APPROVE THE REVISED LOCATION. A REVIEW BY THE APPROVING AUTHORITY WILL BE REQUIRED.
9. EACH BMP TO BE INSTALLED SHALL HAVE THE SOILS BENEATH THE BMP SCARIFIED OR TILLED TO IMPROVE INFILTRATION.
10. THE CONTRACTOR MUST CONSTRUCT THE BIORETENTION AREA FOLLOWING THE SPECIFICATIONS IN APPENDIX G OF THE TOWN OF GREENWICH DRAINAGE MANUAL FEBRUARY 2012 AS AMENDED.
11. ALL AREAS THAT ARE USED BY CONSTRUCTION EQUIPMENT AND USED FOR CONTRACTOR PARKING MUST HAVE THE SOIL TILLED 12 TO 16 INCHES AND AMENDED WITH SMALL AMOUNTS OF ORGANIC MATERIAL IF NEEDED. THE AREA TO BE RESTORED SHALL BE DETERMINED BY THE SITE ENGINEER.
12. COMPOST–AMENDED SOILS MUST FOLLOW THE REQUIREMENTS AS STATED IN THE TOWN OF GREENWICH DRAINAGE MANUAL FEBRUARY 2012 AS AMENDED.
13. TO OBTAIN A CERTIFICATE OF OCCUPANCY THE SUBMITTAL MUST INCLUDE THE FOLLOWING:
    - ITEMS ON CHECKLIST FOR CERTIFICATE OF OCCUPANCY – FORM CL–105
    - IMPROVEMENT LOCATION SURVEY (ITEMS ON CHECKLIST FOR IMPROVEMENT LOCATION SURVEY DEPICTING "ASBUILT" CONDITIONS – FORM CL–106)

LEGEND

	EXISTING	PROPOSED
PROPERTY LINE		
BUILDING WALL		
BUILDING DOOR		
CURB LINE		
LANDSCAPE AREA		LA
SITE SIGN		
SIGN DESIGNATION		A
FENCE		
SAWCUT LINE		
CONCRETE SIDEWALK		
CONCRETE PAVERS		
SEAT WALL		
ARTIFICIAL TURF		

SIGN LEGEND

NO PARKING FIRE LANE	AUTHORIZED VEHICLES ONLY	FDC
18" X 24"	31–1790	31–1790
A	B	C

Project Title:
ADDITIONS & ALTERATION TO:
Old Greenwich Elementary School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
311 STATE STREET NEW LONDON CT 06320
203 230 9007 silverpetrucelli.com

Revision:	Description:	Date:	Revised By:

Drawing Title: SITE PLAN

Date: 01/19/2024
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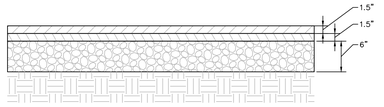
Drawn By: APF
Project Number: 22-382
Drawing Number: CS101

ISSUE DATE: 08/28/2024

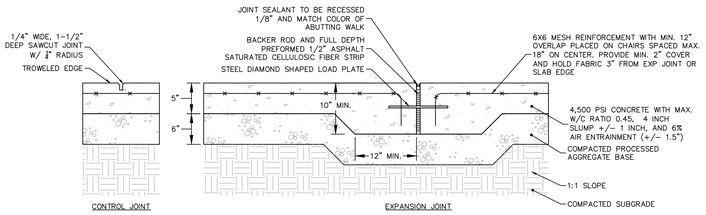
5/16/2023 2:21:17 PM

Date: 8/28/2024 Time: 23:38 User: acassella Style Table: Langan.stb Layout: CS101 Document Code: 140265801-0502-CS101-0101



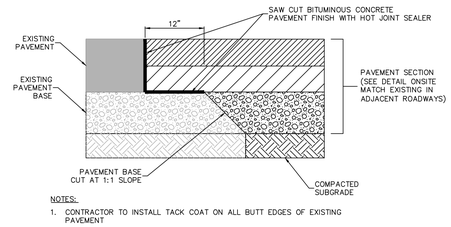
NOTES:
1. PROVIDE BITUMINOUS CONCRETE PAVEMENT AS INDICATED ON THE SITE PLAN.
2. BITUMINOUS CONCRETE SHALL CONFORM TO CT D.O.T. SPECIFICATIONS, FORM 818 SECTION 4.06, LATEST REVISION
3. PROCESSED AGGREGATE SHALL CONFORM TO CT D.O.T. SPECIFICATIONS, FORM 818 SECTION 3.04, LATEST REVISION
4. EXISTING PROCESSED AGGREGATE BASE WITHIN THE PARKING AREAS MAY BE REUSED IN-PLACE SO LONG AS THE CONTRACTOR CONFIRMS THAT THE EXISTING DEPTH, GRADATION, AND COMPACTION OF THE MATERIAL MEETS THE REQUIREMENTS OF THIS PROPOSED PAVEMENT SECTION AND SPECIFICATIONS. CONTRACTOR TO CONFIRM EXISTING THICKNESS A MINIMUM OF ONCE EVERY 2,500 SF

1 BITUMINOUS CONCRETE PAVEMENT SECTION - STANDARD DUTY
N.T.S



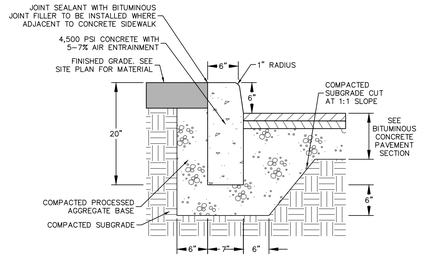
NOTES:
1. SIDEWALK TO BE PLACED BETWEEN APRIL 15-OCTOBER 15 UNLESS PRIOR APPROVAL FROM SCHOOL IS GRANTED.
2. HAUNCH TO BE INSTALLED AT ALL EXPANSION JOINTS AND IN ALL LOCATIONS WHERE WALKWAY ABUTS ADJACENT FIXED OBJECT.
3. LOAD PLATES SHALL BE USED IN LIEU OF ROUND DOWELS EXCEPT AT AREAS WHERE PROPOSED WALK TIES INTO EXISTING, IN AREAS WHERE USED, DOWELS TO BE 12" LONG, 1/2" DIAMETER EPOXY COATED STEEL LOCATED 18" ON CENTER, GREASE ONE END
4. LOAD PLATES, DOWELS, AND EXPANSION JOINTS SHALL BE UTILIZED AT ALL LOCATIONS WHERE CONCRETE IS POURED ABUTTING STATIONARY OBJECTS.
5. EXPANSION AND CONTROL JOINTS SHALL BE INSTALLED WITH MAXIMUM SPACING OF JOINTS AS FOLLOWS:
   EXPANSION - 20 FT.
   CONTROL - 5 FT;
6. FINISH: INTEGRAL COLOR CONCRETE WITH EXPOSED AGGREGATE FINISH. FINISH TO MATCH EXISTING CONCRETE TO REMAIN.
7. CONTRACTOR TO SUBMIT JOINT LAYOUT FOR REVIEW BY PROJECT LANDSCAPE ARCHITECT PRIOR TO INSTALLATION.
8. CONTRACTOR TO PROVIDE 5'x5' MOCK UP FOR REVIEW BY PROJECT LANDSCAPE ARCHITECT PRIOR TO INSTALLATION.

2 ON-SITE CONCRETE SIDEWALK
N.T.S



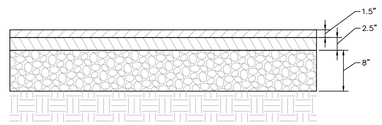
NOTES:
1. CONTRACTOR TO INSTALL TACK COAT ON ALL BUTT EDGES OF EXISTING PAVEMENT

3 SAWCUT PAVEMENT SECTION
N.T.S



NOTES:
1. CURB TO BE PRECAST CONCRETE.
2. STRAIGHT SEGMENTS SHOULD NOT BE INSTALLED ALONG CURVES UNLESS RADIUS IS GREATER THAN 50'.
3. INDIVIDUAL SEGMENTS TO BE GREATEST LENGTH POSSIBLE IN ORDER TO MINIMIZE NUMBER OF JOINTS. CORNERS TO BE SINGLE PIECE.
4. JOINT SEALANT TO BE INSTALLED AT ALL JOINTS BETWEEN CURB SEGMENTS.
5. PROCESSED AGGREGATE SHALL CONFORM TO CT D.O.T. SPECIFICATIONS, FORM 817 SECTION 3.04, LATEST REVISION.
6. CONTRACTOR TO PROVIDE PRODUCT DATA FOR REVIEW PRIOR TO INSTALLATION.

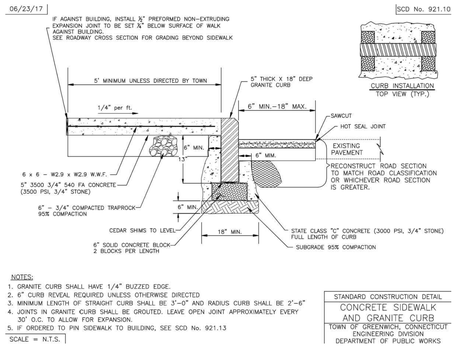
4 PRECAST CONCRETE CURB
N.T.S



NOTES:
1. PROVIDE BITUMINOUS CONCRETE PAVEMENT AS INDICATED ON THE SITE PLAN.
2. BITUMINOUS CONCRETE SHALL CONFORM TO CT D.O.T. SPECIFICATIONS, FORM 818 SECTION 4.06, LATEST REVISION
3. PROCESSED AGGREGATE SHALL CONFORM TO CT D.O.T. SPECIFICATIONS, FORM 818 SECTION 3.04, LATEST REVISION
4. EXISTING PROCESSED AGGREGATE BASE WITHIN THE PARKING AREAS MAY BE REUSED IN-PLACE SO LONG AS THE CONTRACTOR CONFIRMS THAT THE EXISTING DEPTH, GRADATION, AND COMPACTION OF THE MATERIAL MEETS THE REQUIREMENTS OF THIS PROPOSED PAVEMENT SECTION AND SPECIFICATIONS. CONTRACTOR TO CONFIRM EXISTING THICKNESS A MINIMUM OF ONCE EVERY 2,500 SF

5 BITUMINOUS CONCRETE PAVEMENT SECTION - HEAVY DUTY
N.T.S

06/23/17 — SCD No. 921.10



NOTES:
1. GRANITE CURB SHALL HAVE 1/4" BUZZED EDGE.
2. 6" CURB REVEAL REQUIRED UNLESS OTHERWISE DIRECTED
3. MINIMUM LENGTH OF STRAIGHT CURB SHALL BE 3'-0" AND RADIUS CURB SHALL BE 2'-6"
4. JOINTS IN GRANITE CURB SHALL BE GROUTED. LEAVE OPEN JOINT APPROXIMATELY EVERY 30' O.C. TO ALLOW FOR EXPANSION.
5. IF ORDERED TO PIN SIDEWALK TO BUILDING, SEE SCD No. 921.13

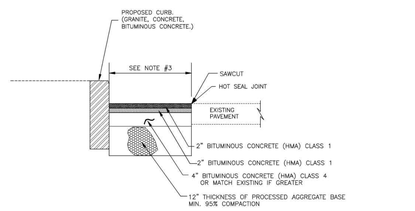
SCALE = N.T.S.

STANDARD CONSTRUCTION DETAIL
CONCRETE SIDEWALK AND GRANITE CURB
TOWN OF GREENWICH, CONNECTICUT
ENGINEERING DIVISION
DEPARTMENT OF PUBLIC WORKS

6 CONCRETE SIDEWALK AND GRANITE CURB (WITHIN RIGHT OF WAY)
N.T.S

DETAIL PROVIDED BY TOWN OF GREENWICH

11/19/19 — SCD No. 406.09A



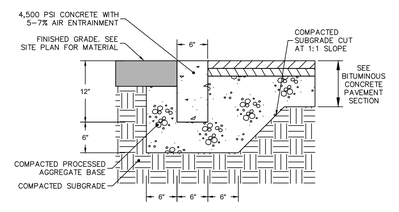
NOTES:
1. THE PROCESSED AGGREGATE SHALL BE FREE OF ORGANIC MATERIAL, RUBBLE FROST, AND ALL DELETERIOUS SUBSTANCES.
2. 6" CURB REVEAL REQUIRED UNLESS OTHERWISE DIRECTED.
3. 18" MAX. FOR CURB INSTALLATIONS. IN ALL OTHER LOCATIONS, WIDTH OF PERMANENT PAVEMENT REPAIR WILL VARY, BUT SHALL ALWAYS BE NEAT SAWCUT LINE ON ALL SIDES OF PERMANENT PAVEMENT REPAIR.
4. SEE SCD No. 406.10, 406.11, 406.12 AND FOR DIFFERENT TYPE OF ROAD SECTIONS.

SCALE = N.T.S.

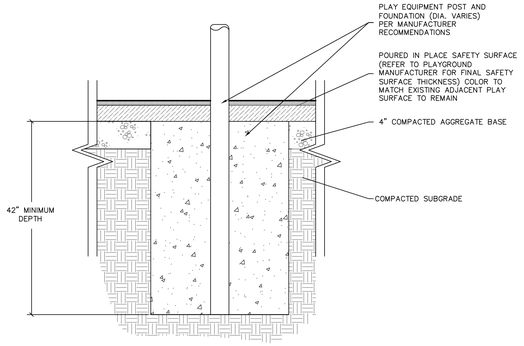
STANDARD CONSTRUCTION DETAIL
PERMANENT PAVEMENT REPAIR
TOWN OF GREENWICH, CONNECTICUT
ENGINEERING DIVISION
DEPARTMENT OF PUBLIC WORKS

7 PAVEMENT REPAIR (WITHIN RIGHT OF WAY)
N.T.S

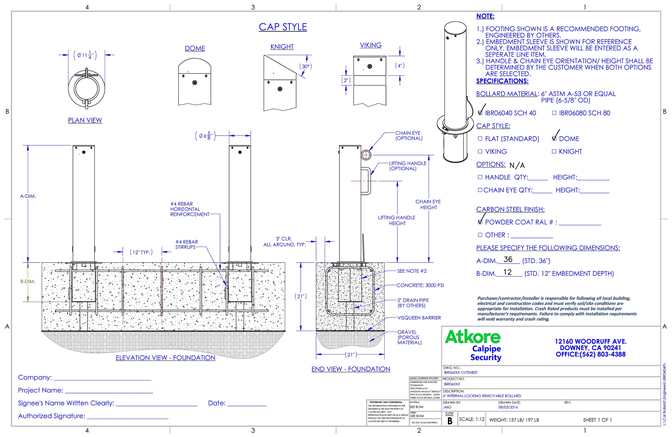
DETAIL PROVIDED BY TOWN OF GREENWICH



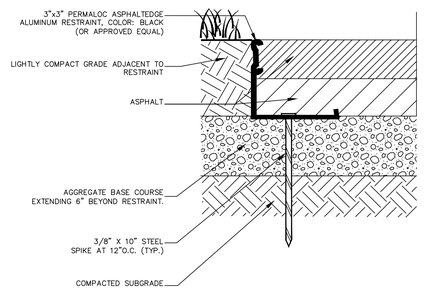
8 FLUSH CONCRETE CURB
N.T.S



9 PLAY SURFACE
N.T.S



10 REMOVABLE BOLLARD
N.T.S



NOTES:
1. METAL EDGE RESTRAINT TO BE INSTALLED IN ALL LOCATIONS WHERE BITUMINOUS CONCRETE IS ADJACENT TO PLANT BED OR LAWN AREA.
2. INSTALL PER MANUFACTURER'S "INSTALLATION GUIDELINES".
3. 8'-0" SECTIONS CONNECTED WITH 4" SLIDING CONNECTOR.
4. MAINTAIN 3/8" GAP BETWEEN SECTIONS TO ALLOW FOR PRODUCT EXPANSION IN EXTREME TEMPERATURES.
5. CORNERS: NOTCH BASE ONLY AND FORM A CONTINUOUS CORNER.
6. PERMALOC ASPHALTEDGE AS MANUFACTURED BY PERMALOC CORPORATION (OR APPROVED EQUAL).
7. PRODUCT DATA TO BE REVIEWED BY PROJECT LANDSCAPE ARCHITECT PRIOR TO INSTALLATION.

11 METAL EDGE RESTRAINT
N.T.S

Project Title:
ADDITIONS & ALTERATION TO:
Old Greenwich Elementary School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
311 STATE STREET NEW LONDON CT 06320
203 230 9007 silverpetrucelli.com

Revision:	Description:	Date:	Revised By:

Drawing Title: SITE DETAILS I

Date: 01/19/2024
Scale:
Drawn By: APF
Project Number: 22-382

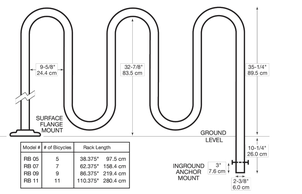
ISSUE DATE: 08/28/2024

Drawing Number: CS501

5/16/2023 2:21:17 PM

The Original Ribbon' Rack—IDSA National Design Award Winner

PERMANENT DESIGN COLLECTION—MUSEUM OF MODERN ART



Model #	# of Bicycles	Rack Length	
RB 05	5	38.375"	97.5 cm
RB 07	7	62.375"	158.4 cm
RB 09	9	86.375"	219.4 cm
RB 11	11	110.375"	280.4 cm

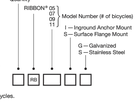
Specifications
All standard units made from ASTM A53/A500 SCHD 40 steel pipe (2.375" OD X .154 wall), hydraulically bent with a mandril, hot-dipped galvanized after fabrication.
The RIBBON® RACK is available in ASTM A312 SCHEDULE 40 TP 304 stainless steel, satin #4 finish—optional and extra.

Installation Methods
Inground Anchor Mount—standard
Surface Flange Mount—optional and extra

General Information
RIBBON and the Brandir International Inc. logo are trademarks of Brandir International Inc., used exclusively by AAA RIBBON RACK CO.
Delivery time: Six weeks or sooner from receipt of order.

Important Considerations
Colors: (Painting/Coating)—Painting or coating the rack will result in a maintenance problem, as no coating will withstand the abuse of the bicycles. Powder coating cannot be maintenanced; an enamel finish will chip. AAA RIBBON RACK CO. has the best solution where color is essential. Please contact us to find out how to achieve an appropriate color with a minimum of maintenance.
Materials: Steel tubing or aluminum are not suitable materials for a bicycle rack. Pre-galvanized material will flake and crack during manufacture. AAA RIBBON RACK CO. uses heavy-duty steel pipe, hot-dipped galvanized after fabrication to provide security and durability.
Manufacture: Hydraulic bending with a mandrit, as used by AAA RIBBON RACK CO., insures smooth and aesthetic curves on the Ribbon® Rack. Press bending leaves an indentation; other methods flatten outer curves and crimp inner curves.

Specifying / Estimating / Ordering
Please use the following notations:



A A A RIBBON BIKE RACK CO.
Division of:
BRANDIR INTERNATIONAL, INC.
521 Fifth Avenue, 17th Floor
New York NY 10175-1799 USA
Phone: **800-849-3468**
Email: **info@ribbonrack.com**
Web: **ribbonrack.com**

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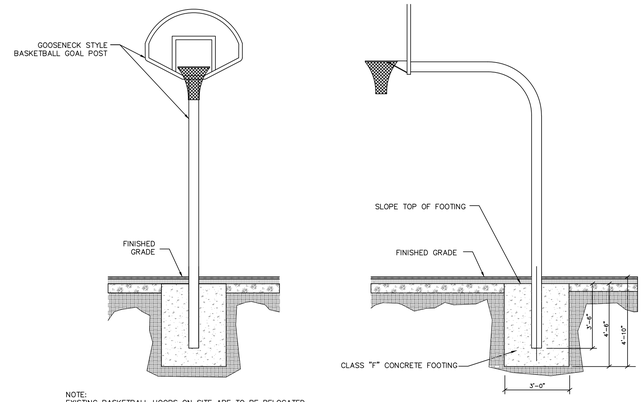
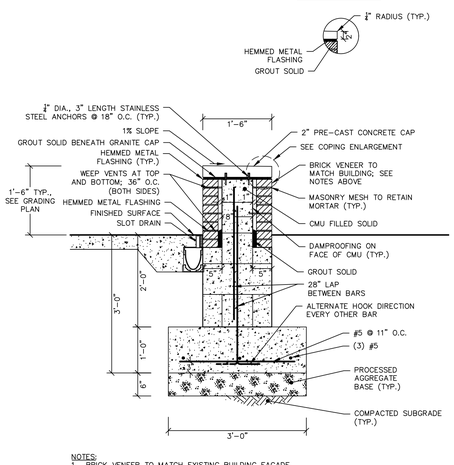
NOTE:
1. MODEL #RB 07, INGROUND ANCHOR MOUNT.
2. COLOR TO MATCH EXISTING EXISTING BLUE COLOR RACKS, CONTRACTOR TO SUBMIT PHYSICAL COLOR SAMPLES AND PRODUCT DATA FOR REVIEW BY PROJECT LANDSCAPE ARCHITECT PRIOR TO INSTALLATION.
3. REFER TO SITE PLAN FOR LOCATIONS AND QUANTITIES.

1 BIKE RACK
N.T.S



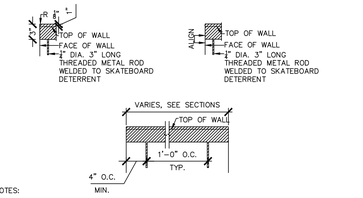
NOTE:
EXISTING BASKETBALL HOOPS ON SITE ARE TO BE RELOCATED.

2 BASKETBALL HOOP AND FOOTING
N.T.S



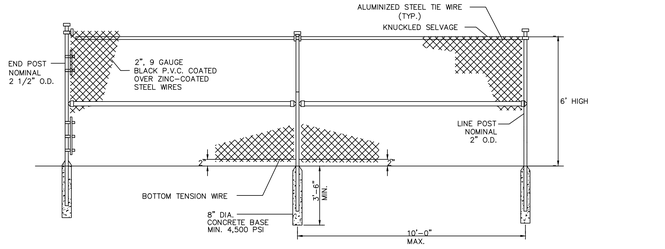
NOTES:
1. BRICK VENEER TO MATCH EXISTING BUILDING FACADE.
2. COPING JOINT TO BE 3/8" THICK, SPACED 4'-6" MAX O.C. JOINTS TO BE MORTARED. MORTAR COLOR TO MATCH COPING COLOR.
3. CONTRACTOR TO PROVIDE 10' LENGTH MOCKUP FOR REVIEW BY PROJECT LANDSCAPE ARCHITECT PRIOR TO INSTALLATION.

3 SEAT WALL
N.T.S



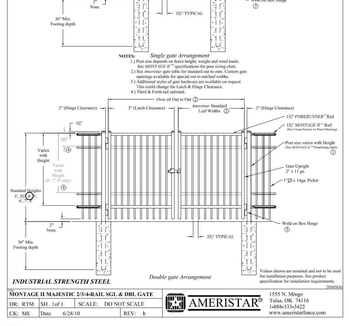
NOTES:
1. ½" THICK 316 STAINLESS STEEL BAR WITH EASED EDGES; CENTERED AT ALL BENCH JOINTS.

4 SKATEBOARD DETERRENT
N.T.S



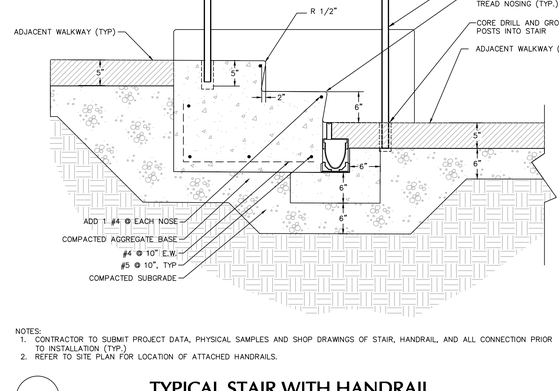
NOTES:
1. CONTRACTOR TO SUBMIT SHOP DRAWINGS TO PROJECT LANDSCAPE ARCHITECT ILLUSTRATING THE HEIGHTS & LAYOUT OF FENCING REQUIRED FOR THE PROJECT. SHOP DRAWINGS SHALL INCLUDE MANUFACTURER CUTS AND SPECIFICATIONS.
2. ALL FENCE COMPONENTS TO BE BLACK VINYL COATED.
3. ALL CHAIN LINK FENCE 6 FOOT HEIGHT OR GREATER TO HAVE MID-RAIL.

5 CHAIN LINK FENCE
N.T.S



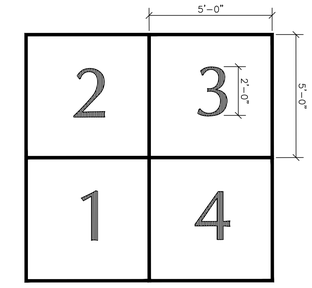
NOTES:
1. CONTRACTOR TO SUBMIT SHOP DRAWINGS TO PROJECT LANDSCAPE ARCHITECT ILLUSTRATING THE HEIGHTS & LAYOUT OF FENCING REQUIRED FOR THE PROJECT. SHOP DRAWINGS SHALL INCLUDE MANUFACTURER CUTS AND SPECIFICATIONS.
2. ALL FENCE COMPONENTS TO BE BLACK POWDERCOATED.

6 STEEL PICKET FENCE
N.T.S



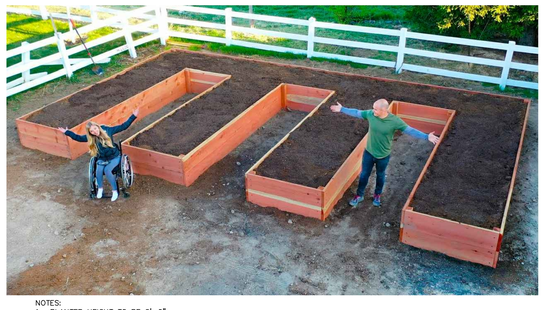
NOTES:
1. CONTRACTOR TO SUBMIT PROJECT DATA, PHYSICAL SAMPLES AND SHOP DRAWINGS OF STAIR, HANDRAIL, AND ALL CONNECTION PRIOR TO INSTALLATION (TYP.)
2. REFER TO SITE PLAN FOR LOCATION OF ATTACHED HANDRAILS.

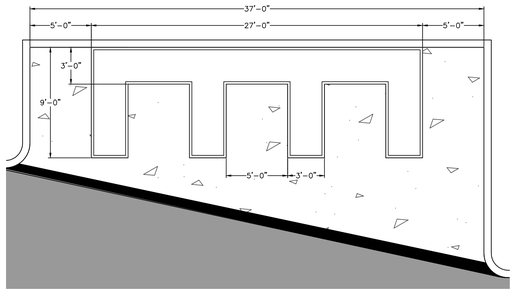
7 TYPICAL STAIR WITH HANDRAIL
N.T.S



NOTES:
1. ALL LINES, NUMBERS, LETTERS AND SHAPES SHALL BE 1 1/2" WIDE.
2. BOX BALL NUMBERS SHALL BE 2'-0" HIGH.
3. ALL LINES, NUMBERS, LETTERS, AND SHAPES SHALL BE PAINTED WHITE.
4. FINAL COLOR SELECTION SHALL BE DETERMINED BY OWNER, PROJECT ARCHITECT, AND LANDSCAPE ARCHITECT. CONTRACTOR SHALL SUBMIT COLOR SAMPLES FOR REVIEW.

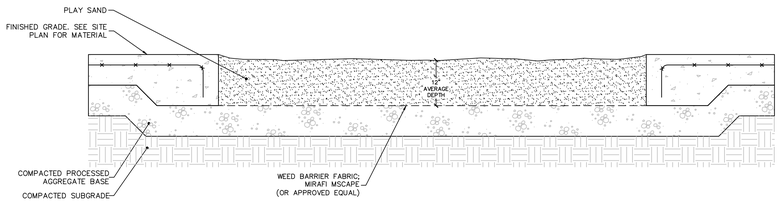
8 PAINTED GAMES
N.T.S





NOTES:
1. PLANTER HEIGHT TO BE 2'-0".
2. CEDAR WOOD CLADDING WITH LINING AND PLANTING SOIL. PLANTING SOILS TO BE GARDEN SOIL BY READ CUSTOM SOILS OR APPROVED EQUAL. PLANTINGS TO BE IMPLEMENTED BY STUDENTS, NOT INCLUDED IN SCHOOL CONSTRUCTION PROJECT.
3. CONTRACTOR TO SUBMIT SHOP DRAWINGS TO PROJECT LANDSCAPE ARCHITECT ILLUSTRATING THE HEIGHTS AND LAYOUT.

9 RAISED GARDEN PLANTER
N.T.S



PLAY SAND NOTES:
1. PLAY SAND SHALL MEET FOLLOWING GRADATION CRITERIA:

PASSING SIEVE (DRY ANALYSIS) BY WEIGHT:	PERCENT
NO. 16	95–100%
NO. 30	85–100%
NO. 50	65–85%
NO. 100	10–30%
NO. 200	0–10%

2. SAND MATERIAL TO BE PLACED IN 12" MAXIMUM LIFTS AND COMPACTED TO 95% MAXIMUM DENSITY PER ASTM D1557.
3. 12" DEPTH IS FOR FINAL, INSTALLED CONDITION. CONTRACTOR SHOULD ACCOUNT FOR ANY POTENTIAL SETTLEMENT OF MATERIAL POST-INSTALLATION.
4. PRODUCT DATA AND PHYSICAL SAMPLE TO BE SUBMITTED FOR REVIEW BY OWNER AND PROJECT LANDSCAPE ARCHITECT PRIOR TO INSTALLATION.

10 SAND PLAY AREA
N.T.S

Project Title:

ADDITIONS & ALTERATION TO:
Old Greenwich Elementary School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
311 STATE STREET NEW LONDON CT 06320
203 230 9007 silverpetrucelli.com

Revision:	Description:	Date:	Revised By:

Drawing Title: SITE DETAILS II

Date: 01/19/2024
Scale:
Drawn By: APF
Project Number: 22-382
Drawing Number: CS502

ISSUE DATE: 08/28/2024

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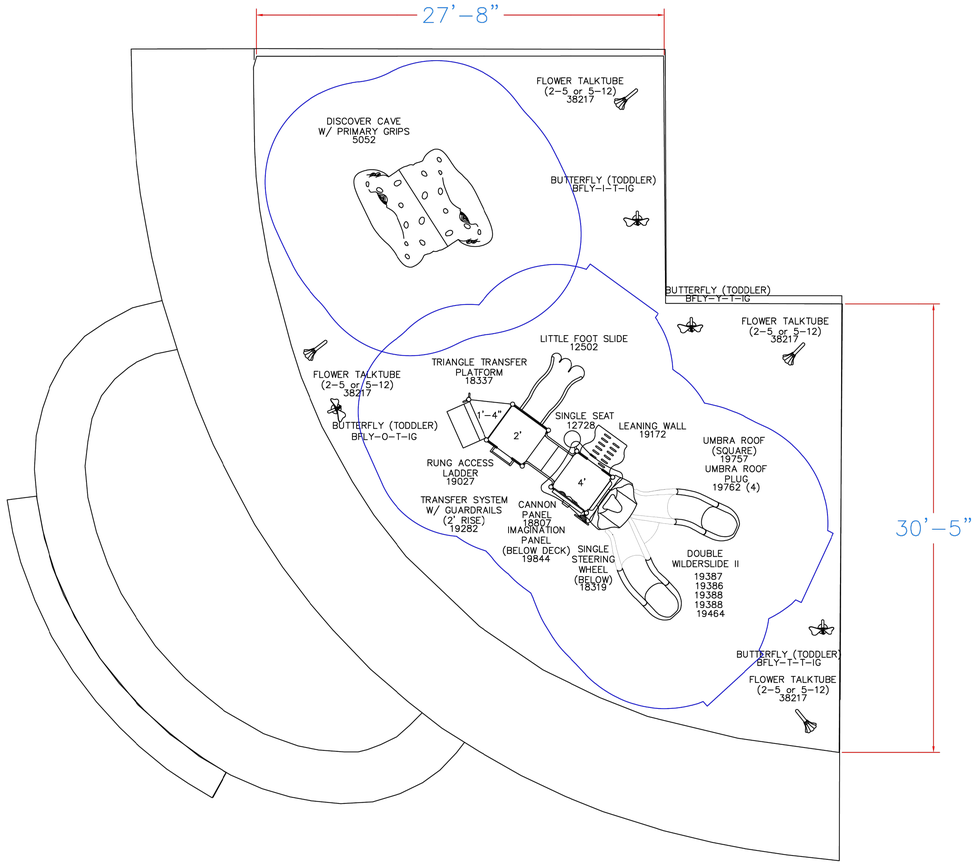

GameTime
A PLAYCORE Company

150 PlayCore Drive SE
Fort Payne, AL 35967
www.gametime.com

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ISO 14001 CERTIFIED

OLD GREENWICH ES
GREENWICH CT

Representative
MRC

This Unit includes play events and routes or travel specifically designed for special needs users. It is the opinion of the manufacturer that these play events and routes of travel conform to the accessibility requirements of the ADA (Americans with Disabilities Act)

Total Elevated Play Components	5		
Total Elevated Play Components Accessible By Ramp	0	Required	0
Total Elevated Components Accessible By Transfer	5	Required	3
Total Accessible Ground Level Components Shown	11	Required	2
Total Different Types Of Ground Level Components	5	Required	2

This play equipment is recommended for children ages
2-5

Minimum Area Required:

This drawing can be scaled only when in an 18" x 24" format

IMPORTANT: Soft resilient surfacing should be placed in the use zones of all equipment, as specified for each type of equipment, and at depths to meet the critical fall heights as specified by the U.S. consumer Product Safety Commission, ASTM standard F 1487 and Canadian Standard CAN/CSA-Z-614

Drawn By: NS MS AF
Date: 7.17.24
Drawing Name: REVISED

OLD GREENWICH ELEM SCHOOL 2-5 PLAY AREA PARTLIST

1	5052	Discover Cave W/Primary Grips	1	19172	Leaning Wall (4')
3	12023	3 1/2" Uprt Ass'Y Alum 8'	1	19282	Transfer System W/ Guardrail (2' Rise
2	12024	3 1/2" Uprt Ass'Y Alum 9'	1	19386	Left Curve Section Wilderslide Ii
4	12069	3 1/2"Uprt Ass'Y Alum 14'	1	19387	Right Curve Section Wilderslide Ii
1	12502	Lil Foot Slide Attachment	2	19388	Exit Section Wilderslide Ii
1	12728	Single Seat P/T	1	19464	Double Entrance
2	18200	36" Sq Punched Deck P/T 1.3125	1	19757	Umbra Square Roof
1	18319	Single Steering Wheel	4	19762	Umbra Roof Plug
1	18337	36" Tri Transfer Platform	1	19844	Imagination Panel
1	18807	Cannon Panel	4	38217	Flower Talk Tube Ground Level 2-5
1	19027	Rung Access Ladder (2')			
1	19172	Leaning Wall (4')			

Project Title:
ADDITIONS & ALTERATION TO:
Old Greenwich Elementary School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
311 STATE STREET NEW LONDON CT 06320
203 230 9007 silverpetrucelli.com

Revision: | Description: | Date: | Revised By:

Drawing Title: SITE DETAIL III

Date: 01/19/2024
Scale:
Drawn By: AC
Project Number: 22-382

Drawing Number: CS503

ISSUE DATE: 08/28/2024

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150 PlayCore Drive SE
Fort Payne, AL 35967
www.gametime.com

OLD GREENWICH ES
GREENWICH CT

Representative
MRC

This Unit includes play events and routes or travel specifically designed for special needs users. It is the opinion of the manufacturer that these play events and routes of travel conform to the accessibility requirements of the ADA (Americans with Disabilities Act)

Total Elevated Play Components	19		
Total Elevated Play Components Accessible By Ramp	13	Required	10
Total Elevated Components Accessible By Transfer	19	Required	10
Total Accessible Ground Level Components Shown	17	Required	6
Total Different Types Of Ground Level Components	6	Required	3

This play equipment is recommended for children ages
5-12

Minimum Area Required:

This drawing can be scaled only when in an 24" x 36" format

IMPORTANT: Soft resilient surfacing should be placed in the use zones of all equipment, as specified for each type of equipment, and at depths to meet the critical fall heights as specified by the U.S. consumer Product Safety Commission, ASTM standard F 1487 and Canadian Standard CAN/CSA-Z-614

Drawn By: NS MS AF
Date: 7.17.24
Drawing Name: OPTION 1

OLD GREENWICH ELEM SCHOOL 5-12 PLAY AREA PARTLIST

4	7088	Rock Step
2	7092	Rockscape Lightning Climber
2	7093	Rockscape Circle Stepper
1	10777	Tire Swing F/S, 5" Od
4	12025	3 1/2" Uprt Ass'Y Alum 10'
2	16465	Slide Transfer (Ada)
4	16803	Ada Wide Triangular Platform
4	16818	Trapezoid Deck
2	19818	Access Platform
1	26057	2 Way X-Pod Step
1	26084	Arched Trapeze Ring Overhead
1	26088	Tri Ladder
14	26094	Triangular Shroud
6	26155	Primetime Cross Beam(Join Pt & Xscape)
1	27079	Trapezoid Overhead Ladder 90 Deg PT
1	27081	Stretched Trapezoid Overhead - 90 Deg
1	27085	Metal Climbing Wall Link
5	32022	Hex Pod Step (1')
1	36013	Rock Wall Link
3	36020	Single Upright Support W/Step
3	36030	Single Link Cross Beam Powerscape Plus
6	80180	Sail Roof
1	80612	Deck Curb
2	80687	Handhold/Kick Plate Pkg
1	80691	90 Deg Caterpillar Attach
1	81665	Seat And Table For Two
1	81669	Hand Cycler
1	81699	Bongos
1	90003	Wide Triangle Deck
1	90006	Trapezoid Deck
1	90011	Flower Talk Tube 0'6" - 2'0" (2 - 12
1	90019	Archway W/ Barrier
1	90023	3'-0" Transfer System W/ Barrier
1	90113	Flower Talk Tube 6'6" To 8'0" (2 To
1	90157	Triple Slide
1	90170	Dolphin Panel Above Dk
1	90193	2-6"/3' Single Curved Zip Slide
1	90207	Overhead Ladder Access Package
2	90264	6' Upright, Alum
2	90265	7' Upright, Alum
2	90266	8' Upright, Alum
1	90267	9' Upright, Alum
3	90270	12' Upright, Alum
4	90272	14' Upright, Alum
1	90288	2' Straight Tube Slide, 30" Dia
1	90299	7'-6"/8' Wavy Tree Climber
1	90306	Climber Archway W/Socket & Barrier
1	90370	2'/3' Climbing Pole
1	90525	Half Panel W/Thunderring
1	90543	Wavy Mirror Panel, Above Dk
1	90565	Dbl Ridge Climb(7'-0",7'-6", &8'-0"

Project Title:
ADDITIONS & ALTERATION TO:
Old Greenwich Elementary School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
311 STATE STREET NEW LONDON CT 06320
203 230 9007 silverpetrucelli.com

Revision: | Description: | Date: | Revised By:

Drawing Title: SITE DETAILS IV

Date: 01/19/2024
Scale:
Drawn By: AC
Project Number: 22-382

Drawing Number: CS504

ISSUE DATE: 08/28/2024

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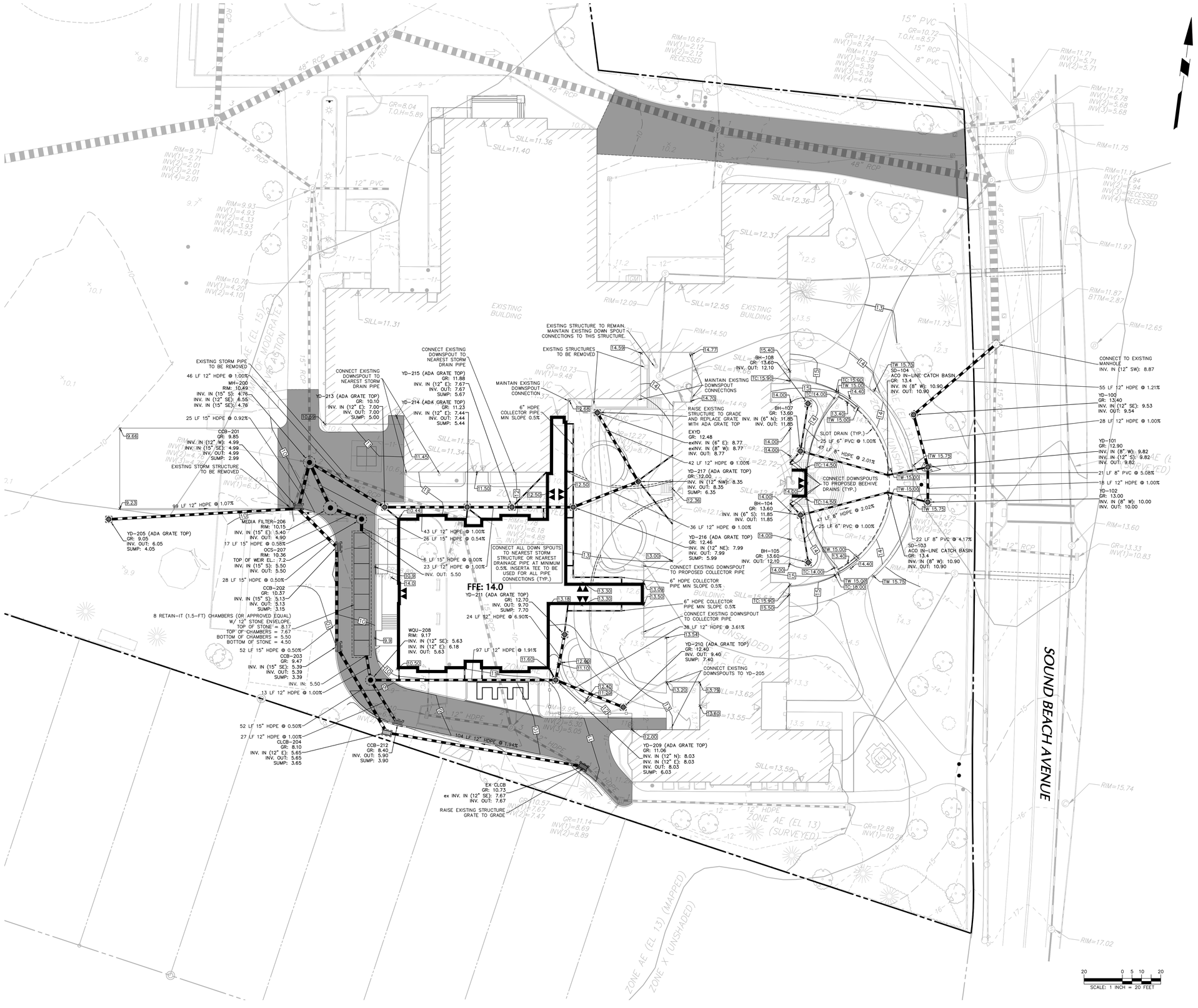


LEGEND

	EXISTING	PROPOSED
PROPERTY LINE		
MINOR CONTOUR	149	149
MAJOR CONTOUR	150	150
SPOT GRADE	×150.1	×150.1
STORM LINE		
CATCH BASIN		
STORM MANHOLE		
CLEAN OUT		CO

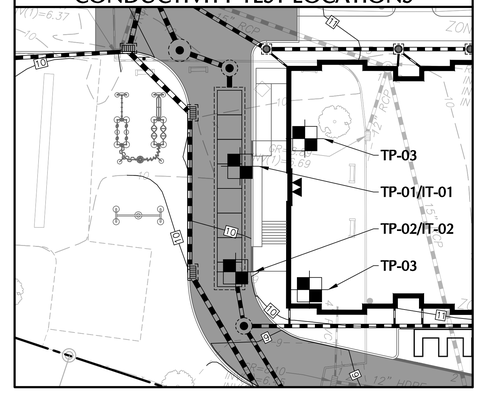
DRAINAGE NOTES

1. ALL PROPOSED STORM DRAINAGE PIPING TO UTILIZE SOIL-TIGHT JOINTS.
2. LOCATIONS AND ELEVATIONS OF ROOF LEADERS SHOULD BE COORDINATED WITH ARCHITECTURAL & MEP DRAWINGS PRIOR TO CONSTRUCTION.
3. CLEANOUTS SHALL BE PROVIDED FLUSH TO GRADE AT ALL LOCATIONS OF ROOF DRAIN INTERSECTIONS, BENDS AND UPSTREAM ENDS.
4. ALL REQUIRED STORM LATERALS SERVICING THE BUILDINGS SHALL BE COORDINATED AND CONSTRUCTED TO WITHIN FIVE FEET OF EACH BUILDING LATERAL ENTRANCE LOCATION AT THE INVERTS NOTED. ANY NECESSARY EXTENSIONS, RELOCATIONS, OR CORRECTIONS WITHIN FIVE FEET OF THE BUILDING NECESSARY TO COMPLETE CONNECTION OF LATERALS TO THE BUILDINGS SHALL BE MADE BY THE BUILDING CONTRACTOR.
5. THE SIZES OF ALL DRAINAGE STRUCTURES HAVE BEEN DESIGNED TO ACCOMMODATE PIPE SIZES AND CONFIGURATIONS AS SHOWN. IN THE EVENT THAT PIPE SIZES OR CONFIGURATIONS ARE PROPOSED TO BE MODIFIED BY THE CONTRACTOR, THE CONTRACTOR SHALL BE RESPONSIBLE FOR PROVIDING APPROPRIATE SIZED STRUCTURES INCLUDING SHOP DRAWINGS AND SUBMITTALS.
6. STORM DRAINAGE PIPING INSTALLATION SHALL COMMENCE AT THE FURTHEST DOWNSTREAM POINT AND PROCEED UPSTREAM "IN THE DRY".
7. EXISTING STORMWATER DRAINAGE STRUCTURES AND PIPES ARE TO REMAIN UNTIL THE PROPOSED SYSTEM IS INSTALLED AND OPERATIONAL IN ACCORDANCE WITH NOTE 6.
8. ALL SIDEWALKS TO BE CONSTRUCTED WITH 1% MINIMUM (2% MAXIMUM) CROSS SLOPE. SIDEWALKS ADJACENT TO THE BUILDING SHALL BE PITCHED TO THE CURBLINE.

GENERAL NOTES

1. BOUNDARY AND TOPOGRAPHIC INFORMATION OBTAINED FROM A PLAN TITLED "BOUNDARY & TOPOGRAPHIC SURVEY" PREPARED BY LANGAN, DATED 1 MAY 2023.
2. THE SITE IS LOCATED IN ZONE AE, A REGULATORY FLOODWAY AREA PER FIRM MAP 09001C0514G, EFFECTIVE JULY 8, 2013.
3. PROPOSED BUILDING FOOTPRINT RECEIVED ELECTRONICALLY FROM SILVER PETRUCELLI + ASSOCIATES IN MAY 2024.

DEEP TEST PIT AND SATURATED HYDRAULIC CONDUCTIVITY TEST LOCATIONS



Project Title:

ADDITIONS & ALTERATION TO:
Old Greenwich Elementary School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
311 STATE STREET NEW LONDON CT 06320
203 230 9007 silverpetrucelli.com

Revision:	Description:	Date:	Revised By:

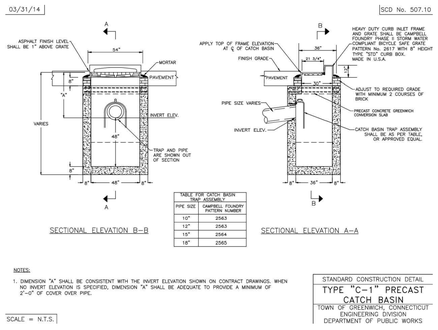
Drawing Title:
GRADING AND DRAINAGE PLAN

Date: 09/18/2023
Scale:
Drawn By: APF
Project Number: 22-382
Drawing Number: CG101

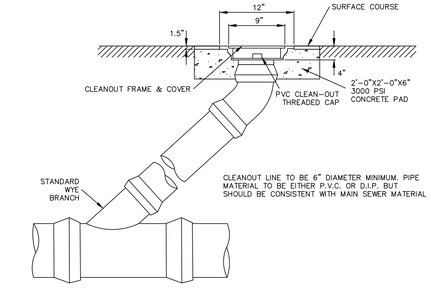
ISSUE DATE: 08/28/2024

5/16/2023 2:21:17 PM

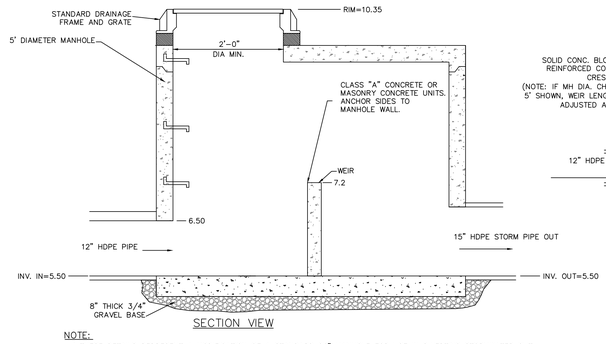
Date: 8/28/2024 Time: 22:56 User: acassella Style Table: Langan.stb Layout: CG101 Document Code: 140265801-0502-CG101-0101



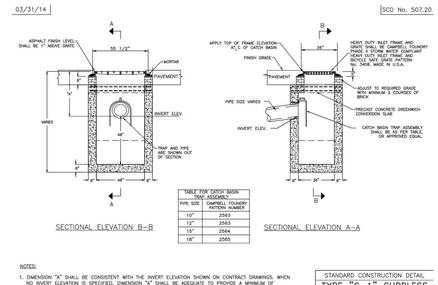
1 PRECAST CURBED CATCH BASIN
N.T.S
DETAIL PROVIDED BY TOWN OF GREENWICH



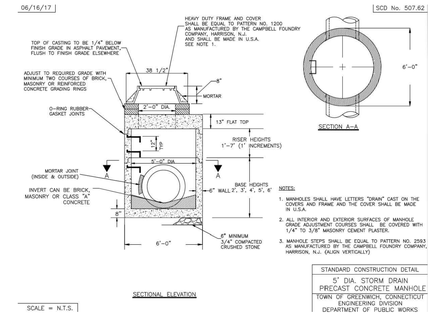
2 STORM CLEANOUT
N.T.S



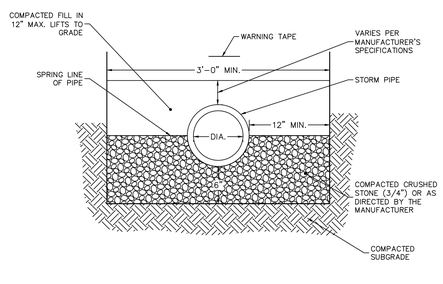
3 OUTLET CONTROL STRUCTURE (OCS-202)
N.T.S



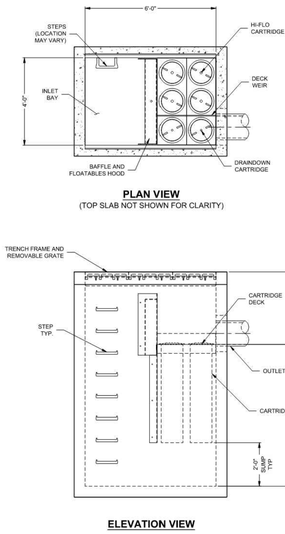
4 PRECAST CURBLESS CATCH BASIN
N.T.S
DETAIL PROVIDED BY TOWN OF GREENWICH



5 PRECAST MANHOLE
N.T.S
DETAIL PROVIDED BY TOWN OF GREENWICH



8 STORM PIPE BEDDING
N.T.S



PLAN VIEW
(TOP SLAB NOT SHOWN FOR CLARITY)

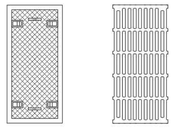
ELEVATION VIEW

JELLYFISH DESIGN NOTES

JELLYFISH TREATMENT CAPACITY IS A FUNCTION OF THE CARTRIDGE LENGTH AND THE NUMBER OF CARTRIDGES. THE STANDARD SURFACE INLET STYLE WITH TRENCH GRATE AND COVER IS SHOWN. ALTERNATE CURB INLET OR PIPE INLET OPTIONS ARE AVAILABLE. PEAK CONVEYANCE CAPACITY TO BE DETERMINED BY ENGINEER OF RECORD.

CARTRIDGE SELECTION

CARTRIDGE LENGTH	54"	40"	27"	15"
OUTLET INVERT TO STRUCTURE INVERT (A)	6'-6"	5'-4"	4'-3"	3'-3"
FLOW RATE HIGH-FLO / DRAINDOWN (CFS) (PER CART)	0.178 / 0.089	0.133 / 0.067	0.089 / 0.045	0.049 / 0.025
MAX. TREATMENT (CFS)	0.89	0.67	0.45	0.25
OUTLET INVERT TO RIM (MIN) (B)	3'-4"	2'-4"	1'-4"	0'-4"



24" TRENCH COVER
N.T.S.

24" TRENCH GRATE
N.T.S.

SITE SPECIFIC DATA REQUIREMENTS

STRUCTURE ID	*
WATER QUALITY FLOW RATE (cfs)	0.33
PEAK FLOW RATE (cfs)	*
RETURN PERIOD OF PEAK FLOW (yrs)	*
# OF CARTRIDGES REQUIRED (#F / DD)	*
CARTRIDGE LENGTH	*

PIPE DATA:	I.E.	MATL	DIA	SLOPE %	HGL
INLET #1	*	*	*	*	*
INLET #2	*	*	*	*	*
OUTLET	*	*	*	*	*

SEE GENERAL NOTES 6-7 FOR INLET AND OUTLET HYDRAULIC AND SIZING REQUIREMENTS.

RIM ELEVATION	*

ANTI-FLOTATION BALLAST	WIDTH	HEIGHT
	*	*

NOTES/SPECIAL REQUIREMENTS:
*PER ENGINEER OF RECORD

GENERAL NOTES:
1. CONTECH TO PROVIDE ALL MATERIALS UNLESS NOTED OTHERWISE.
2. FOR SITE SPECIFIC DRAWINGS WITH DETAILED STRUCTURE DIMENSIONS AND WEIGHT, PLEASE CONTACT YOUR CONTECH ENGINEERED SOLUTIONS REPRESENTATIVE. www.ContechES.com
3. JELLYFISH WATER QUALITY STRUCTURE SHALL BE IN ACCORDANCE WITH ALL DESIGN DATA AND INFORMATION CONTAINED IN THIS DRAWING. CONTRACTOR TO CONFIRM STRUCTURE MEETS REQUIREMENTS OF PROJECT.
4. STRUCTURE SHALL MEET AASHTO HS-20 OR PER APPROVING JURISDICTION REQUIREMENTS, WHICHEVER IS MORE STRINGENT, ASSUMING EARTH COVER OF 0'. AND GROUNDWATER ELEVATION AT, OR BELOW, THE OUTLET PIPE INVERT ELEVATION. ENGINEER OF RECORD TO CONFIRM ACTUAL GROUNDWATER ELEVATION. CASTINGS SHALL MEET AASHTO M306 LOAD RATING AND BE CAST WITH THE CONTECH LOGO.
5. STRUCTURE SHALL BE PRECAST CONCRETE CONFORMING TO ASTM C-857, ASTM C-918, AND AASHTO LOAD FACTOR DESIGN METHOD.
6. OUTLET PIPE INVERT IS EQUAL TO THE CARTRIDGE DECK ELEVATION.
7. THE OUTLET PIPE DIAMETER FOR NEW INSTALLATIONS IS RECOMMENDEDTO BE ONE PIPE SIZE LARGER THAN THE INLET PIPE (WHERE APPLICABLE) AT EQUAL OR GREATER SLOPE.
8. NO PRODUCT SUBSTITUTIONS SHALL BE ACCEPTED UNLESS SUBMITTED 10 DAYS PRIOR TO PROJECT BID DATE, OR AS DIRECTED BY THE ENGINEER OF RECORD.

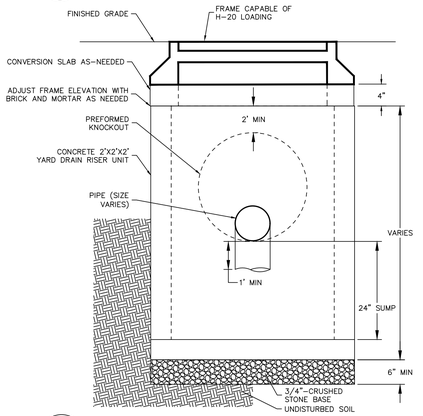
INSTALLATION NOTES
A. ANY SUB-BASE, BACKFILL DEPTH, AND/OR ANTI-FLOTATION PROVISIONS ARE SITE-SPECIFIC DESIGN CONSIDERATIONS AND SHALL BE SPECIFIED BY ENGINEER OF RECORD.
B. CONTRACTOR TO PROVIDE EQUIPMENT WITH SUFFICIENT LIFTING AND REACH CAPACITY TO LIFT AND SET THE STRUCTURE.
C. CONTRACTOR WILL INSTALL AND LEVEL THE STRUCTURE, SEALING THE JOINTS, LINE ENTRY AND EXIT POINTS (NON-SHRINK GROUT WITH APPROVED WATERSTOP OR FLEXIBLE BOOT).
D. CARTRIDGE INSTALLATION, BY CONTECH, SHALL OCCUR ONLY AFTER SITE HAS BEEN STABILIZED AND THE JELLYFISH UNIT IS CLEAN AND FREE OF DEBRIS. CONTACT CONTECH TO COORDINATE CARTRIDGE INSTALLATION WITH SITE STABILIZATION.

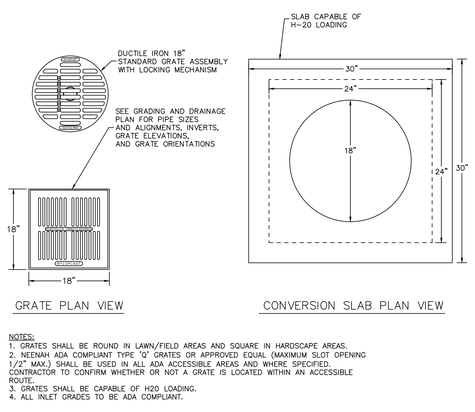
Jellyfish Filter
THIS PRODUCT MAY BE PROTECTED BY ONE OR MORE OF THE FOLLOWING U.S. PATENTS NO. 8,287,730; 8,470,174; 8,671,538 & 9,103,563; OTHER INTERNATIONAL PATENTS PENDING

CONTECH ENGINEERED SOLUTIONS LLC
www.ContechES.com
9025 Centre Pointe Dr., Suite 400, West Chester, OH 45069
800-338-1122 513-645-7000 513-645-7993 FAX

JELLYFISH JFSI0406
STANDARD DETAIL
SURFACE INLET CONFIGURATION

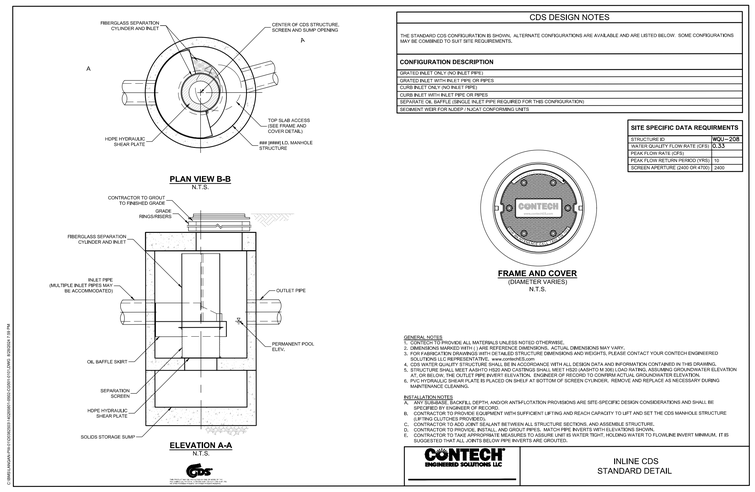
6 JELLYFISH MEDIA FILTER (OR APPROVED EQUAL)
N.T.S



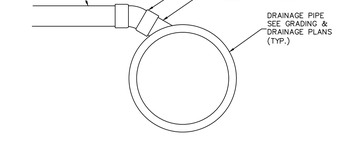


NOTES:
1. GRATES SHALL BE ROUND IN LAWN/FIELD AREAS AND SQUARE IN HARDSCAPE AREAS.
2. NEENAH ADA COMPLIANT TYPE "Q" GRATES OR APPROVED EQUAL (MAXIMUM SLOT OPENING 1/2" MAX.) SHALL BE USED IN ALL ADA ACCESSIBLE AREAS AND WHERE SPECIFIED. CONTRACTOR TO CONFIRM WHETHER OR NOT A GRATE IS LOCATED WITHIN AN ACCESSIBLE ROUTE.
3. GRATES SHALL BE CAPABLE OF H20 LOADING.
4. ALL INLET GRADES TO BE ADA COMPLIANT.

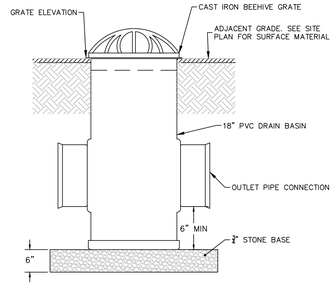
9 YARD DRAIN
N.T.S



7 WATER QUALITY UNIT (OR APPROVED EQUAL)
N.T.S



10 ROOF LEADER CONNECTION
N.T.S.



11 BEEHIVE
N.T.S.

Project Title:
ADDITIONS & ALTERATION TO:
Old Greenwich Elementary School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
311 STATE STREET NEW LONDON CT 06320
203 230 9007 silverpetrucelli.com

Revision:	Description:	Date:	Revised By:

Drawing Title:
GRADING AND DRAINAGE DETAILS I

Date: 09/18/2023
Scale:
Drawn By: APF
Project Number: 22-382
Drawing Number: CG501

ISSUE DATE: 08/28/2024

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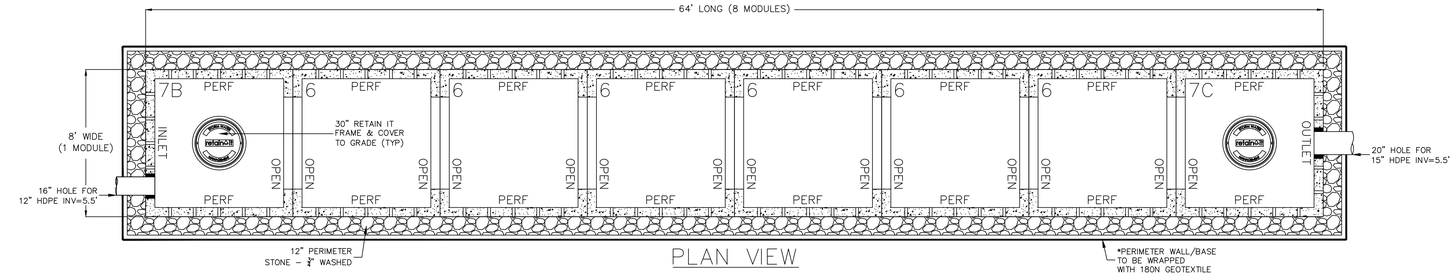
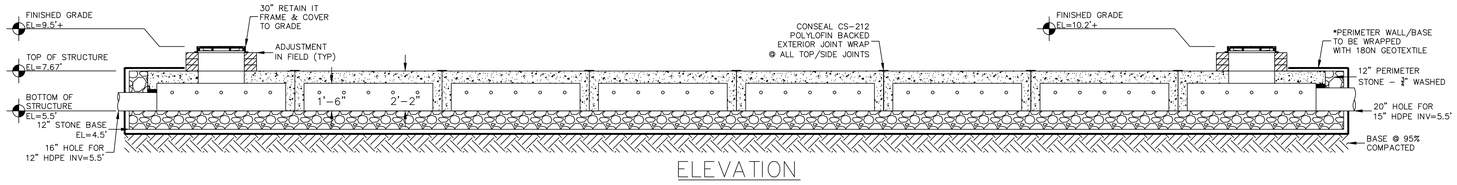
TYPICAL 1.5' MODULE DIMENSIONS

DESIGN NOTES:
1. CONCRETE - 5,000 PSI, 28 DAYS
2. REINFORCING STEEL CONFORMS TO LATEST ASTM A615
3. H-20 DESIGN LOADING PER AASHTO HS-20-44



PLAN VIEW



ELEVATION

1

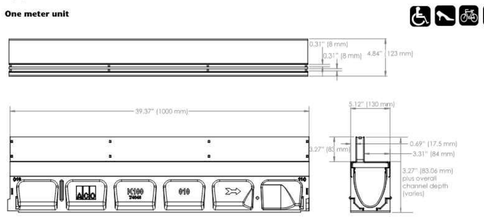
RETAIN-IT (1.5-FT) STORMWATER CHAMBERS (OR APPROVED EQUAL)

N.T.S

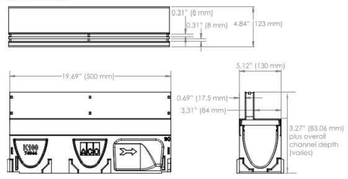
ACO DRAIN

Type 472/473 Stainless Steel Heel Resistant Brickslot 100

One meter unit



Half meter unit



Description	Part No.	Overall Depth in.	mm	Weight lbs.
Type 472/473 - Brickslot 100 - 39.37" (1m) Stainless Steel	**138055**	4.06	103	18.0
Type 472/473 - Brickslot 100 - 19.69" (0.5m) Stainless Steel	**138056**	4.06	103	9.2

Notes:
1. For use with KS100 channels and Series 900 catch basins.
2. Brickslot can also be used with SlabDrain H and HKS channels.

NOTES:
1. CONTRACTOR TO PROVIDE SHOP DRAWINGS TO ENGINEER PRIOR TO INSTALLATION.

2

SLOT DRAIN (OR APPROVED EQUAL)

N.T.S

SOURCE: ACO USA

Project Title:

ADDITIONS & ALTERATION TO:
Old Greenwich Elementary School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
311 STATE STREET NEW LONDON CT 06320
203 230 9007 silverpetrucelli.com

Revision:	Description:	Date:	Revised By:

Drawing Title:
GRADING AND
DRAINAGE DETAILS II

Date: 09/18/2023
Scale:
Drawn By: APF
Project Number: 22-382

Drawing Number: CG502

ISSUE DATE: 08/28/2024

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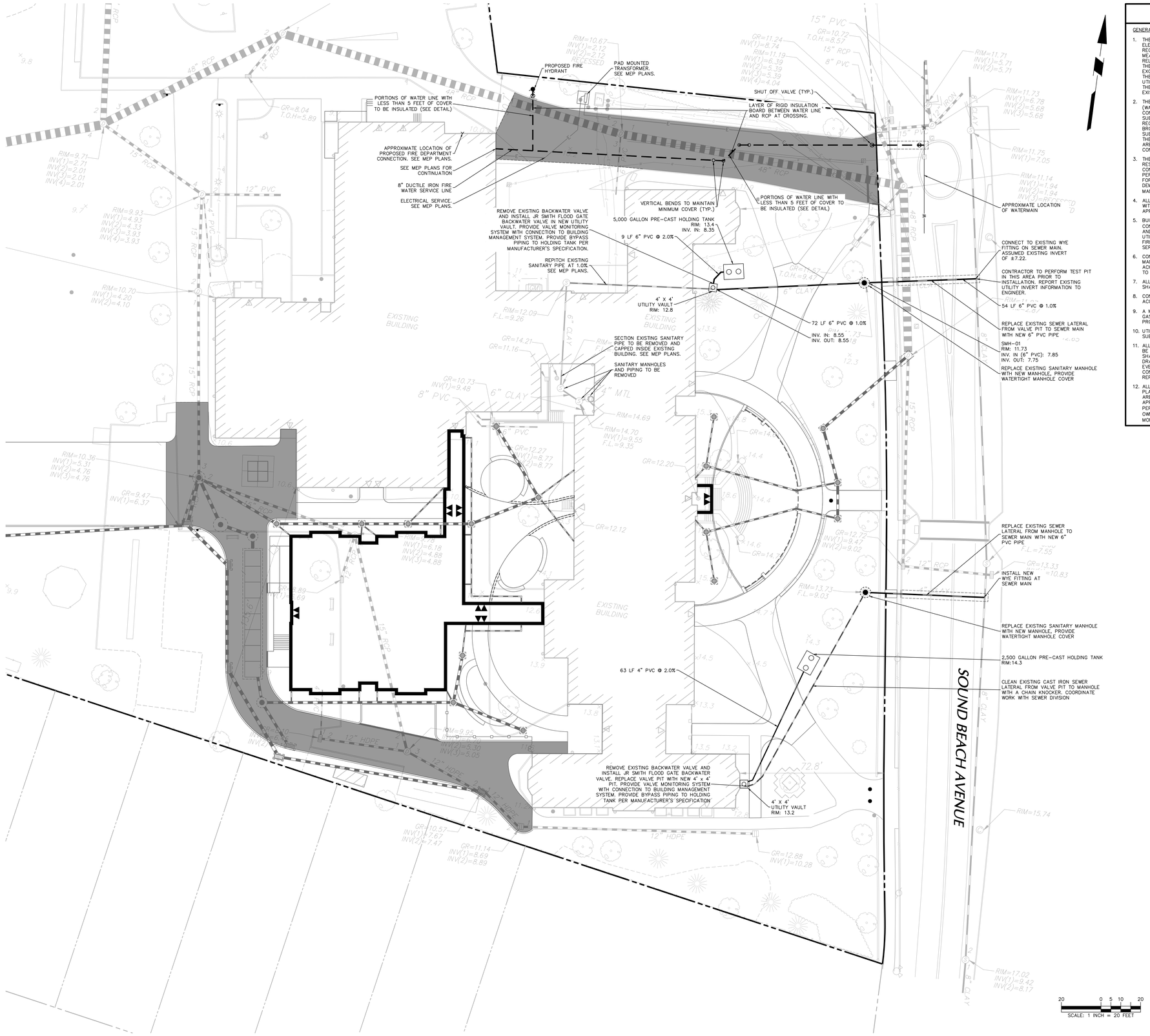

UTILITY NOTES

GENERAL:

1. THE CONTRACTOR IS SPECIFICALLY CAUTIONED THAT THE LOCATION AND/OR ELEVATION OF EXISTING UTILITIES AS SHOWN ON THESE PLANS IS BASED ON RECORDS OF THE VARIOUS UTILITY COMPANIES AND, WHERE POSSIBLE, MEASUREMENTS TAKEN IN THE FIELD. THE INFORMATION IS NOT TO BE RELIED ON AS BEING EXACT OR COMPLETE. THE CONTRACTOR MUST CALL THE APPROPRIATE UTILITY COMPANY AT LEAST 48 HOURS BEFORE ANY EXCAVATION TO REQUEST EXACT FIELD LOCATION OF UTILITIES. IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO RELOCATE ALL EXISTING UTILITIES WHICH CONFLICT WITH THE PROPOSED IMPROVEMENTS SHOWN ON THE PLANS IN A MANNER WHICH WILL NOT NEGATIVELY AFFECT ANY EXISTING USERS OF THESE UTILITIES.
2. THE CONTRACTOR SHALL FIELD VERIFY ALL EXISTING UTILITY LOCATIONS (WATER, SEWER, GAS, ELECTRIC, TELEPHONE AND CABLE), INVERTS AND CONDITIONS PRIOR TO CONSTRUCTION. ANY CONDITIONS FOUND TO SUBSTANTIALLY DIFFER FROM THOSE SHOWN ON THE DRAWINGS AND REQUIRING MODIFICATIONS TO THE SITE DESIGN SHALL BE IMMEDIATELY BROUGHT TO THE ATTENTION OF THE ENGINEER BEFORE CONSTRUCTION. SUBSTANTIALLY DIFFERING UTILITY CONDITIONS THAT ARE ENCOUNTERED BY THE CONTRACTOR, THAT REQUIRE MODIFICATION OF SITE DESIGN AND THAT ARE NOT BROUGHT TO THE ATTENTION OF THE ENGINEER PRIOR TO CONSTRUCTION SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO.
3. THE CONTRACTOR SHALL ARRANGE FOR AND COORDINATE WITH THE RESPECTIVE UTILITY PROVIDERS FOR SERVICE INSTALLATIONS AND CONNECTIONS. THE CONTRACTOR SHALL COORDINATE WORK TO BE PERFORMED BY THE VARIOUS UTILITY PROVIDERS AND SHALL PAY ALL FEES FOR CONNECTIONS, DISCONNECTIONS RELOCATIONS, INSPECTIONS, AND DEMOLITION UNLESS OTHERWISE STATED IN THE PROJECT SPECIFICATIONS MANUAL AND/OR GENERAL CONDITIONS OF THE CONTRACT.
4. ALL UNDERGROUND UTILITIES MUST BE CLEARLY & PERMANENTLY MARKED WITH UNDERGROUND MARKING TAPE AND AS REQUIRED BY THE APPROPRIATE UTILITY COMPANY.
5. BUILDING UTILITY PENETRATIONS AND LOCATIONS ARE SHOWN FOR THE CONTRACTOR'S INFORMATION. CONTRACTOR SHALL REFER TO ARCHITECTURAL AND MEP PLANS AND SPECIFICATIONS FOR ACTUAL LOCATIONS OF ALL UTILITY ENTRANCES TO INCLUDE SANITARY SEWER LATERALS, DOMESTIC AND FIRE PROTECTION WATER SERVICE, ELECTRICAL, TELEPHONE AND GAS SERVICE, ROOF DRAINS, AND ALL OTHER UTILITIES.
6. CONTRACTOR SHALL COORDINATE INSTALLATION OF UTILITIES IN SUCH A MANNER AS TO AVOID CONFLICTS AND TO ENSURE PROPER DEPTHS ARE ACHIEVED AS WELL AS COORDINATING WITH THE REGULATORY AGENCY AS TO LOCATION OF AND SCHEDULING OF CONNECTIONS TO THEIR FACILITIES.
7. ALL MANHOLE COVERS, GRATES, RIMS, AND UTILITY STRUCTURES TO REMAIN SHALL BE ADJUSTED TO PROPOSED ELEVATION.
8. CONTRACTOR TO PROVIDE ALL FITTINGS AND BENDS NECESSARY TO ACCOMPLISH WORK.
9. A MINIMUM EIGHTEEN (18) INCHES VERTICAL CLEARANCE BETWEEN WATER, GAS, ELECTRICAL, AND TELEPHONE LINES AND STORM PIPING SHALL BE PROVIDED.
10. UTILITY CONNECTION DESIGN AS REFLECTED ON THE PLAN MAY CHANGE SUBJECT TO UTILITY PROVIDER AND GOVERNING AUTHORITY STAFF REVIEW.
11. ALL EXISTING PAVEMENT WHERE UTILITY PIPING IS TO BE INSTALLED SHALL BE SAW CUT. AFTER UTILITY INSTALLATION IS COMPLETED, THE CONTRACTOR SHALL INSTALL PERMANENT PAVEMENT REPAIR AS DETAILED ON THE DRAWINGS OR AS REQUIRED BY THE OWNER HAVING JURISDICTION. IN THE EVENT THAT PAVEMENT REPAIR CANNOT BE PROVIDED DUE TO WEATHER CONDITIONS, PROVIDE TEMPORARY PAVEMENT REPAIR UNTIL PERMANENT REPAIR CAN BE PROVIDED.
12. ALL UTILITY LINES SHALL BE INSPECTED AND APPROVED PRIOR TO PLACEMENT OF BACKFILL. INSPECTION SHALL OCCUR ONLY WHEN THE LINES ARE FULLY BEDDED IN THE SPECIFIED MATERIAL AND AFTER ANY APPLICABLE TESTS ARE SUCCESSFULLY COMPLETED. INSPECTIONS SHALL BE PERFORMED BY THE APPLICABLE UTILITY PROVIDER, THE AHJ, AND/OR THE OWNER'S SPECIAL INSPECTOR. IF APPLICABLE, BACKFILLING SHALL BE MONITORED AND TESTED BY THE OWNER'S SPECIAL INSPECTOR.
13. SITE CONTRACTOR SHALL COORDINATE INSTALLATION OF CONDUIT AND CABLES FOR SITE LIGHTING WITH THE BUILDING ELECTRICAL CONTRACTOR.
14. THE CONTRACTOR SHALL ARRANGE AND COORDINATE WITH UTILITY PROVIDERS FOR WORK TO BE PERFORMED BY UTILITY PROVIDERS. THE CONTRACTOR SHALL PAY ALL UTILITY FEES UNLESS OTHERWISE STATED IN THE PROJECT SPECIFICATION MANUAL AND GENERAL CONDITIONS, AND REPAIR PAVEMENTS AS NECESSARY.
15. ALTERNATIVE METHODS AND PRODUCTS OTHER THAN THOSE SPECIFIED MAY BE USED IF REVIEWED AND APPROVED BY THE OWNER, ENGINEER, AND APPROPRIATE REGULATORY AGENCIES PRIOR TO INSTALLATION.
16. THE CONTRACTOR SHALL MAINTAIN ALL FLOWS AND UTILITY CONNECTIONS TO EXISTING BUILDINGS WITHOUT INTERRUPTION UNLESS/UNTIL AUTHORIZED TO DISCONNECT BY THE OWNERS, THE CIVIL ENGINEER, UTILITY PROVIDERS AND GOVERNING AUTHORITIES.
17. ALL REQUIRED UTILITIES SERVING THE BUILDINGS SHALL BE COORDINATED AND CONSTRUCTED TO WITHIN FIVE FEET OF BUILDING UTILITY ENTRANCE LOCATION AT THE INVERTS NOTED. ALL REQUIRED CONNECTION FEES SHALL BE PAID BY THE BUILDING CONTRACTOR. ANY NECESSARY EXTENSIONS, RELOCATIONS, OR CORRECTIONS WITHIN FIVE FEET OF THE BUILDING NECESSARY TO COMPLETE CONNECTION OF UTILITIES TO THE BUILDINGS SHALL BE MADE BY THE BUILDING CONTRACTOR.
18. ALL ON-SITE UTILITIES SHALL BE UNDERGROUND, WHERE APPLICABLE.
19. CONTRACTOR IS REQUIRED TO DIGITALLY PHOTOGRAPH 75% OF THE UTILITIES INSTALLED.

WATER & SANITARY:

1. SEWER AND WATER SERVICES TO THE EXISTING BUILDINGS SHALL REMAIN CONTINUOUS THROUGHOUT CONSTRUCTION. THESE BUILDINGS WILL BE OCCUPIED THROUGHOUT CONSTRUCTION.
2. THE CONTRACTOR MUST VERIFY THE LOCATION, SIZE, AND SERVICEABILITY OF THE EXISTING WATER AND SANITARY SEWER MAINS PRIOR TO BEGINNING ANY SITE OR BUILDING CONSTRUCTION.
3. ALL WATER MAIN PIPING SHALL BE CLASS 54 DUCTILE IRON PIPE.
4. CONTRACTOR SHALL MAINTAIN A MINIMUM OF 4 FEET OF COVER FOR ALL WATER DISTRIBUTION PIPING.
5. THRUST BLOCKS SHALL BE PROVIDED ALONG WATER AND FORCE MAIN LINES 6" IN DIAMETER OR LARGER AT ALL TEES, ELBOWS AND PLUGS.
6. ALL NEW WATER LINES SHALL BE PRESSURE TESTED AND LEAKAGE TESTED IN ACCORDANCE WITH THE LATEST EDITION OF AWWA STANDARD C600, OR THE REGIONAL WATER AUTHORITY REQUIREMENTS, WHICHEVER IS MORE RESTRICTIVE.
7. ALL NEW WATER MAINS SHALL BE DISINFECTED AND TESTED IN ACCORDANCE WITH AWWA STANDARD C651 AND LOCAL PROVIDER REQUIREMENTS.
8. ALL SANITARY SEWER PIPE TO BE SDR 35 PVC PIPE UNLESS OTHERWISE NOTED.
9. CONTRACTOR SHALL MAINTAIN 4.5 FEET OF COVER ON ALL SEWER PIPES.
10. WATER MAINS CROSSING SEWERS SHALL BE LAID TO PROVIDE A MINIMUM HORIZONTAL DISTANCE OF 10 FEET AND MINIMUM VERTICAL DISTANCE OF 18-INCHES BETWEEN THE OUTSIDE OF WATER MAIN AND THE OUTSIDE OF SEWER. IN CASES WHERE THE VERTICAL SEPARATION IS LESS THAN 18-INCHES OR AS OTHERWISE SPECIFIED ON THIS DRAWING OR THE PROFILE SHEETS, STORM OR SANITARY SEWER PIPE SHALL BE ENCASED WITH K-KRETE 5-FT MINIMUM IN EACH DIRECTION OF PIPE RUN AND 6-INCHES MINIMUM AROUND THE PIPE DIAMETER. AT ALL CROSSING ONE FULL LENGTH OF WATER PIPE SHALL BE LOCATED SO BOTH JOINTS ARE MAXIMUM DISTANCE FROM SEWER.
11. CONTRACTOR TO PROVIDE NECESSARY MATERIALS TO ENSURE CONTINUOUS SERVICE OF THE FORCE MAIN THROUGHOUT CONSTRUCTION. ITEMS NEEDED INCLUDE BUT ARE NOT LIMITED TO TEMPORARY PUMPS, STORAGE TANKS, AND POWER. IF A SHUTDOWN IS NEEDED, PRIOR COORDINATION AND AUTHORIZATION FROM THE AFFECTED PROPERTIES MUST BE OBTAINED BY THE CONTRACTOR.

LEGEND

	EXISTING	PROPOSED
PROPERTY LINE		
BUILDING LINE		
SANITARY LINE	S	S
FIRE SERVICE LINE		

GENERAL NOTES

1. BOUNDARY AND TOPOGRAPHIC INFORMATION OBTAINED FROM A PLAN TITLED "BOUNDARY & TOPOGRAPHIC SURVEY" PREPARED BY LANGAN, DATED 1 MAY 2023.
2. THE SITE IS LOCATED IN ZONE AE, A REGULATORY FLOODWAY AREA PER FIRM MAP 09001C0514G, EFFECTIVE JULY 8, 2013.
3. PROPOSED BUILDING FOOTPRINT RECEIVED ELECTRONICALLY FROM SILVER PETRUCELLI + ASSOCIATES IN MAY 2024.

Project Title:

ADDITIONS & ALTERATION TO:
Old Greenwich Elementary School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
311 STATE STREET NEW LONDON CT 06320
203 230 9007 silverpetrucelli.com

Revision:	Description:	Date:	Revised By:

Drawing Title: UTILITY PLAN

Date: 09/18/2023
Scale:
Drawn By: APF
Project Number: 22-382

Drawing Number: CU101

ISSUE DATE: 08/28/2024

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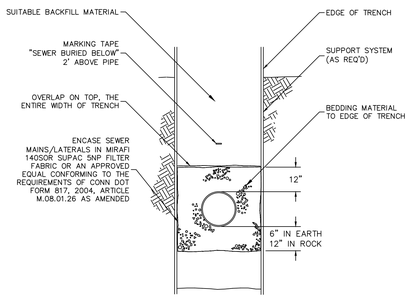
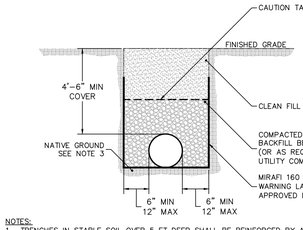
Date: 8/28/2024 Time: 19:50 User: acassella Style Table: Langan.stb Layout: Layout1 Document Code: 140265801-0502-CU101-0101



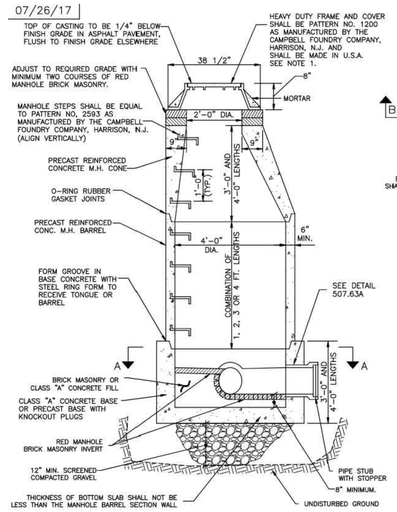
1 SANITARY TRENCH
N.T.S



NOTES:
1. TRENCHES IN STABLE SOIL OVER 5 FT DEEP SHALL BE REINFORCED BY APPROVED OSHA METHODS.
2. TRENCHES SHALL BE COMPACTED.
3. IF NATIVE GROUND IS NOT SUITABLE, THE CONTRACTOR SHALL EXCAVATE TO AN ACCEPTABLE DEPTH AND INSTALL MATERIALS AS APPROVED BY ENGINEERS AND UTILITY COMPANY.
4. THE WARNING LAYER IS NOT REQUIRED IN AREAS OF THE SITE WHERE SOIL IS CLASSIFIED AS REGULATED MATERIAL. WHERE INSTALLED, WARNING LAYER SHALL EXTEND UP THE SIDES OF THE EXCAVATION TO MATCH WITH THE HORIZONTAL LINER.

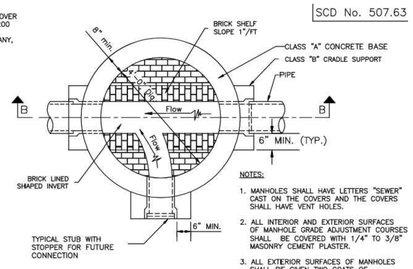
2 WATER MAIN TRENCH
N.T.S

07/26/17



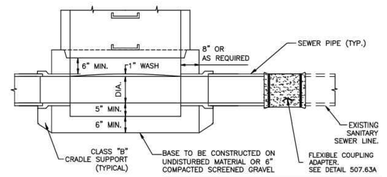
SECTIONAL ELEVATION

SCD No. 507.63



SECTION A–A

NOTES:
1. MANHOLES SHALL HAVE LETTERS "SEWER" CAST ON THE COVERS AND THE COVERS SHALL HAVE VENT HOLES.
2. ALL INTERIOR AND EXTERIOR SURFACES OF MANHOLE GRADE ADJUSTMENT COURSES SHALL BE COVERED WITH 1/4" TO 3/8" MASONRY CEMENT PLASTER.
3. ALL EXTERIOR SURFACES OF MANHOLES SHALL BE GIVEN TWO COATS OF BITUMINOUS WATER-PROOFING.
4. MANHOLE FRAME AND COVER SHALL BE MADE IN U.S.A.



SECTION B–B

STANDARD CONSTRUCTION DETAIL
SANITARY SEWER
PRECAST CONCRETE MANHOLE
TOWN OF GREENWICH, CONNECTICUT
ENGINEERING DIVISION
DEPARTMENT OF PUBLIC WORKS

SCALE = N.T.S.

DETAIL PROVIDED BY TOWN OF GREENWICH

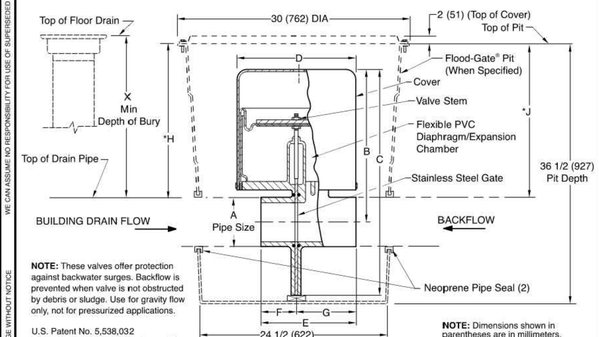
3 SANITARY MANHOLE
N.T.S

SMITH® JAY R. SMITH MFG. CO.®
MEMBER OF MOFFIS GROUP INTERNATIONAL
POST OFFICE BOX 3237
MONTGOMERY, ALABAMA 36109-0237 (USA)
TEL: 334-277-8520 FAX: 888-377-7818 www.jrsmith.com
MEMBER OF:

LOCATION

FLOOD-GATE® BACKWATER VALVE

IN-LINE AUTOMATIC BACKWATER VALVE



NOTE: These valves offer protection against backwater surges. Backflow is prevented when valve is not obstructed by debris or sludge. Use for gravity flow only, not for pressurized applications.

U.S. Patent No. 5,538,032
Other U.S. and foreign patents pending

NOTE: Dimensions shown in parentheses are in millimeters.

A DIA NO-HUB (-Y) IN/OUT SIZE	B CENTERLINE TO TOP	C OVERALL HEIGHT	D DIA WIDTH	E LENGTH	F INLET LENGTH	G OUTLET LENGTH	*H	*J	X MIN BURY DEPTH	BASE WIDTH
04 (100)	15 (380)	22 15/16 (583)	13 1/4 (335)	6 5/8 (168)	2 3/8 (60)	4 1/4 (110)	26 (660)	26 1/2(675)	9 (230)	7 1/2 (190)
06 (150)	20 3/8 (518)	31 1/4 (795)	13 1/4 (335)	8 3/16 (208)	3 3/16 (85)	5 (125)	22 (560)	22 1/2(570)	14 (355)	9 1/2 (240)

*Dimension can be decreased by up to 10 (254) for the 4 (100) size and 3 (76) for the 6 (150) size by cutting the pit and telescoping the 2 sections to meet required depth. See instructions supplied with pit. See Operation & Maintenance Manual for required maintenance.

REGULARLY FURNISHED:
Duco Coated Cast Iron Body Complete with Stainless Steel Gate and Flexible PVC Diaphragm/Expansion Chamber.

Conforms to ASME A112.14.1 & CSA B70-12
IAPMO Listed, File No. 2696

VARIATIONS:
- Flood-Gate® Alarm (-FGA, Alarm Control Box, Sensor and 35' Connecting Wire)
- Flood-Gate® Pits **(FOR NON TRAFFIC AREAS ONLY!)** (-FGP, Poly Pit, Secured, Gasketed Poly Lid and Hardware) (-FGS, Poly Pit, Secured, Gasketed Steel Cover and Hardware) (-FGSL, Steel Cover only)

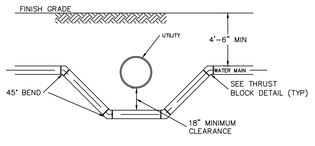
DIMENSIONS ARE SUBJECT TO MANUFACTURERS TOLERANCE AND CHANGE WITHOUT NOTICE
WE CAN ASSUME NO RESPONSIBILITY FOR USE OF SUPERSEDED OR VOID DATA

FIGURE NUMBER	DRAWN BY:	CHECKED BY:	APPROVED BY:	DATE:	SCALE:	SIZE	DRAWING NUMBER	
7140 Series	EMB	JM	SJM	8-1-97	NONE	A	7140 Series	S

REV.	DATE	DESCRIPTION	BY	CKD. BY
S	7-20-23	Removed Function	HS	CL
R	4-12-16	Revised ASME No., Added UPC	TBW	CL
Q	8-20-12	Revised Table	TBW	CL
O	06/04/10	Added Maintenance Note	JJ	CL

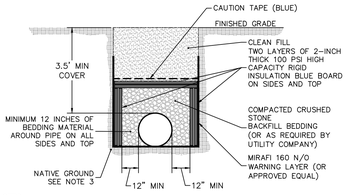
WEIGHT POUNDS | VOLUME CUBIC FEET | **FIGURE NUMBER 7140 Series**

4 BACKWATER VALVE
N.T.S



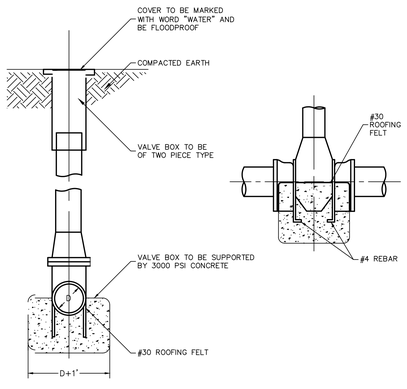
NOTES:
1. WATER MAIN SHALL BE CONSTRUCTED OF CEMENT LINED CLASS 52 DUCTILE IRON PIPE OR BETTER. ONE FULL LENGTH OF WATER MAIN SHOULD BE CENTERED UNDER THE CROSS PIPE SO THAT BOTH JOINTS WILL BE AS FAR FROM THE CROSSING AS POSSIBLE.
2. UTILIZE C110 TYLER UNION DUCTILE IRON MECHANICAL JOINT (OR APPROVED EQUAL) PER AQUARION COMMENTS.

5 WATER MAIN DROP
N.T.S

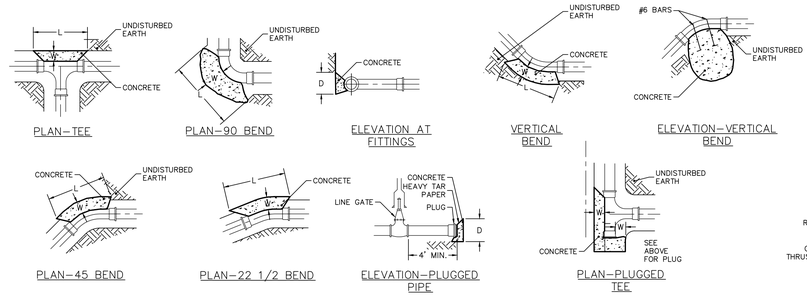


NOTES:
1. TRENCHES IN STABLE SOIL OVER 5 FT DEEP SHALL BE REINFORCED BY APPROVED OSHA METHODS.
2. TRENCHES SHALL BE COMPACTED.
3. IF NATIVE GROUND IS NOT SUITABLE, THE CONTRACTOR SHALL EXCAVATE TO AN ACCEPTABLE DEPTH AND INSTALL MATERIALS AS APPROVED BY ENGINEERS AND UTILITY COMPANY.
4. THE WARNING LAYER IS NOT REQUIRED IN AREAS OF THE SITE WHERE SOIL IS CLASSIFIED AS REGULATED MATERIAL. WHERE INSTALLED, WARNING LAYER SHALL EXTEND UP THE SIDES OF THE EXCAVATION TO MATCH WITH THE HORIZONTAL LINER.
5. INSULATION SHALL PROVIDE EQUIVALENT PROTECTION AS 48 INCHES OF COVER AS REQUIRED BY CODE.

6 INSULATED WATER MAIN TRENCH
N.T.S



8 SHUT OFF VALVE
N.T.S

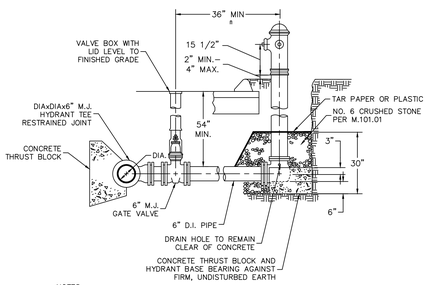


THRUST BLOCK SCHEDULE									
PIPE SIZE	TEE		22 1/2		45		90		W
	L	D	L	D	L	D	L	D	
6"	18"	15"	15"	12"	15"	12"	15"	15"	21"
8"	2'	18"	18"	12"	18"	12"	2'	18"	2'
12"	3'	2'	2'	12"	2'	12"	3'	2'	28"
16"	4'	2.5'	2'	12"	2.33'	15"	4'	2.5'	31"
20"	5.25'	3'	2'	18"	3'	2'	5.25'	3'	33"
24"	7.5'	3'	3'	18"	4'	2.5'	7.5'	3'	3'

BASIS:
2,000 LB/SQ.FT. SOIL RESISTANCE
250 PSI WATER PRESSURE
CORRECTION FACTORS FOR OTHER SOILS:
SOFT CLAY 4
SAND 2
SAND & GRAVEL 1.33
SHALE 0.4

NOTE:
1. IF SOFT MATERIALS ARE ENCOUNTERED, THE THRUST BLOCKS SIZES SHALL BE ADJUSTED ACCORDINGLY.
2. CONCRETE TO BE 3000 PSI.

9 THRUST BLOCKS
N.T.S



NOTES:
1. ALL MECHANICAL JOINTS TO BE RESTRAINED WITH MECHANICAL JOINT RESTRAINTS.
2. FIRE HYDRANTS SHALL HAVE 5–1/4" MAIN VALVE OPENING, 2 – 2–1/2" HOSE NOZZLES, 1 – 4–1/2" PUMPER NOZZLE AND A 6" M.J. INLET SHOE.
3. GREENWICH HYDRANT STREAMER NOZZLE: 5.162" THREAD OD. FOUR THREADS PER AQUARION COMMENTS.
4. GREENWICH HYDRANT SIDE NOZZLE: 2.5" NST THREAD. PER AQUARION COMMENTS.

10 FIRE HYDRANT
N.T.S

Project Title:
ADDITIONS & ALTERATION TO:
Old Greenwich Elementary School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
311 STATE STREET NEW LONDON CT 06320
203 230 9007 silverpetrucelli.com

Revision:	Description:	Date:	Revised By:

Drawing Title: UTILITY DETAILS

Date: 09/18/2023
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Drawn By: APF
Project Number: 22-382
Drawing Number: CU501

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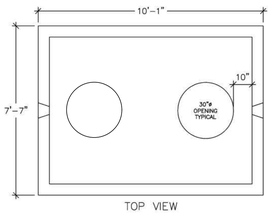
CHAMBER SIZED SPECIFIED ON PLAN

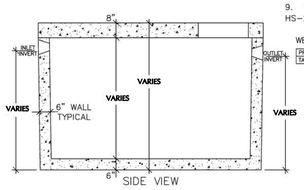
TANK DESIGN SPECIFICATIONS
CONFORMS TO LATEST:
ASTM DESIGNATION C913

NOTES:

1. JOINT SEALANT IS BUTYL RUBBER MASTIC TYPE SEAL THAT CONFORMS TO LATEST AASHTO SPECIFICATION M-198. MEETS FEDERAL SPECIFICATION SS-S-0021(210-A).
2. PIPE INLET AND OUTLET LOCATIONS HAVE POLYLOK II PIPE SEALS, TYPICAL. CUSTOM KNOCKOUTS CAN BE CAST ON REQUEST.
3. WHEN SPECIFIED THE TANK EXTERIOR IS COATED WITH BAY OIL, "EBONY" OR EQUAL.
4. WHEN SPECIFIED THE TANK INTERIOR IS COATED WITH FLOROK EPOXY OR EQUAL.
5. REINFORCING STEEL DEFORMED BARS CONFORM TO LATEST ASTM SPECIFICATION A615.
6. CONCRETE COMPRESSIVE STRENGTH- 4000 PSI AT 28 DAYS.
7. METHOD OF MANUFACTURE: WET CAST.
8. SECTIONS ARE MONOLITHIC.
9. THE CHAMBER IS DESIGNED FOR HS-20 LOADING w/18" OF SOIL COVER.



TOP VIEW



SIDE VIEW

WEIGHT CHART

PRODUCT	APPROX WEIGHT
TANK	26800 LBS.

UNITED CONCRETE PRODUCTS INC.
173 CHURCH STREET TEL. 800 234-3119 FAX. (203) 265-4941
YALESVILLE, CT 06492 (203) 269-3119

NOTES:
1. PROVIDE WATER TIGHT MANHOLE COVERS.
2. PROVIDE TWO MANHOLE OPENINGS.
3. CONTRACTOR TO PROVIDE SHOP DRAWINGS TO ENGINEER PRIOR TO INSTALLATION.

1 HOLDING TANK (OR APPROVED EQUAL)
N.T.S

UTILITY VAULT 4' x 4'

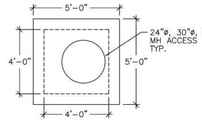
TANK DESIGN SPECIFICATIONS
CONFORMS TO LATEST: "STANDARD SPECIFICATION FOR PRECAST CONCRETE STRUCTURES ASTM DESIGNATION C913.

NOTES:

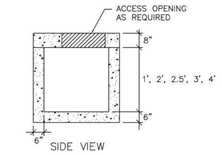
1. JOINT SEALANT IS BUTYL RUBBER MASTIC TYPE SEAL THAT CONFORMS TO LATEST AASHTO SPECIFICATION M-198. MEETS FEDERAL SPECIFICATION SS-S-0021(210-A).
2. REINFORCING STEEL CONFORMS TO LATEST ASTM SPECIFICATION A615.
3. CONCRETE COMPRESSIVE STRENGTH- 4000 PSI AT 28 DAYS.
4. METHOD OF MANUFACTURE: WET CAST.
5. BASE SECTION IS MONOLITHIC.
6. THE VAULT IS DESIGNED FOR HS-20 LOADING w/18" OF SOIL COVER.

WEIGHT CHART

PRODUCT	APPROX WEIGHT
BASE SLAB	2000 LBS.
RISER	1450 LBS./VFT.
ROOF SLAB	2500 LBS.



TOP VIEW



SIDE VIEW

CUSTOM OPENINGS AS REQUIRED

UNITED CONCRETE PRODUCTS INC.
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YALESVILLE, CT 06492 (203) 269-3119

NOTES:
1. PROVIDE WATER TIGHT MANHOLE COVERS.

2 UTILITY VAULT (OR APPROVED EQUAL)
N.T.S

Project Title:
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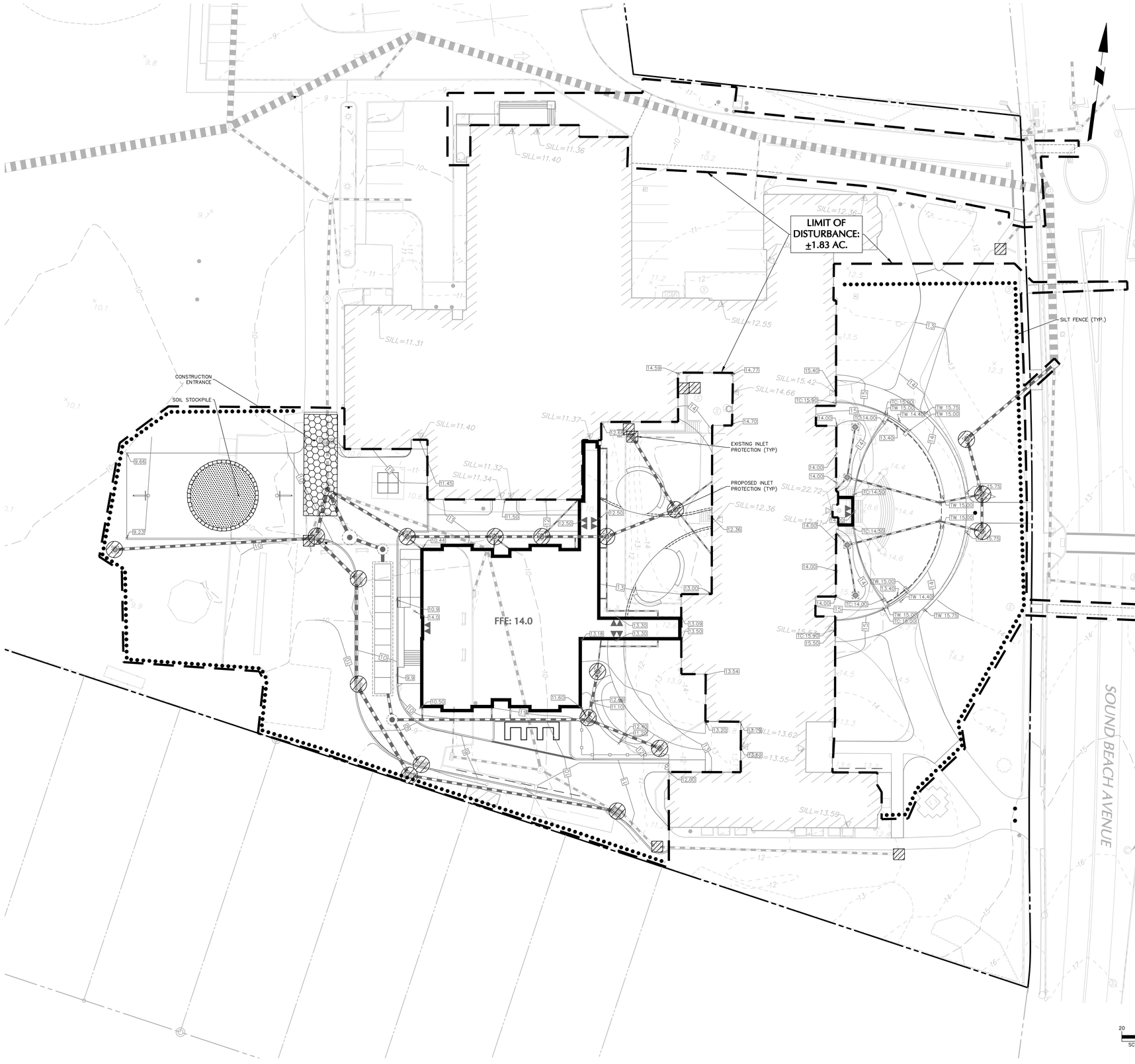

SOIL EROSION-SEDIMENT CONTROL NOTES

PROPOSED DEVELOPMENT

1. CONSTRUCTION WILL INCLUDE EARTHWORK, CURBING, PAVING, UTILITY INSTALLATION, LANDSCAPING AND BUILDING CONSTRUCTION. ALL DEMOLITION DEBRIS AND SOIL REMOVAL RELATED TO CONSTRUCTION SHALL BE REMOVED AND DISPOSED OF IN ACCORDANCE WITH APPLICABLE STATE AND LOCAL LAWS GOVERNING SUCH ACTIVITIES.
2. THE DETAILED EROSION AND SEDIMENT CONTROL MEASURES ARE SHOWN WITHIN THIS PLANSET. THE PROPOSED MEASURES HAVE BEEN DESIGNED TO PREVENT THE MIGRATION OF SOIL SEDIMENT FROM THE SITE.

SOIL EROSION AND SEDIMENT CONTROL NOTES

1. THE SOIL AND SEDIMENT CONTROL PRACTICES MUST BE INSTALLED IN ACCORDANCE WITH THE LOCAL GOVERNING AUTHORITY AND THE CONNECTICUT COUNCIL ON SOIL AND WATER CONSERVATION AND THE 2002 CONNECTICUT GUIDELINES FOR SOIL EROSION AND SEDIMENT CONTROL.
2. EROSION AND SEDIMENT CONTROL DEVICES MUST BE INSTALLED PRIOR TO START OF DEMOLITION AND CONSTRUCTION AND DISTURBANCE OF SITE CONTRIBUTORY DRAINAGE AREAS. THE OWNER OR ITS CONTRACTOR SHALL INSPECT, REPAIR AND REMOVE ALL SEDIMENT AND EROSION CONTROL DEVICES, AS INDICATED HEREIN.
3. DISPOSAL OF COLLECTED SEDIMENT SHALL BE MADE TO AREA DESIGNATED BY THE OWNER'S SOIL ENGINEER.
4. FILTER FABRIC/SILT FENCE WILL BE INSTALLED ALONG THE TOE OF ALL CRITICAL CUT AND FILL SLOPES.
5. ALL TOPSOIL NOT TO BE USED FOR FINAL GRADING/LANDSCAPED AREAS SHALL BE REMOVED FROM THE SITE IMMEDIATELY, IN ACCORDANCE WITH APPLICABLE STATE AND LOCAL LAW. ALL TOPSOIL TO BE USED IN LANDSCAPED AREAS SHALL BE STORED/STOCKPILED IN ACCORDANCE WITH APPLICABLE STATE AND LOCAL LAW STANDARDS.
6. ALL AREAS WITHIN 500 FEET OF AN INHABITED DWELLING SHALL BE WETTED AS NECESSARY TO PROVIDE DUST CONTROL.
7. SEDIMENT DISPOSAL AREAS AND TOPSOIL STOCKPILES NOT SCHEDULED FOR CONSTRUCTION ACTIVITIES WITHIN THIRTY (30) DAYS OF DISTURBANCE SHALL BE STABILIZED AS FOLLOWS:
   A. GROUND LIMESTONE AT A RATE OF 135 LBS. PER 1,000 SF.
   B. FERTILIZER AT A RATE OF 14 LBS. PER 1,000 SF USING A 10-20-10 ANALYSIS OR AN EQUIVALENT.
   C. ANNUAL RYE GRASS SEEDING APPLIED AT A RATE OF NOT LESS THAN 1 LB. PER 1,000 SF.
   D. MULCH ALL NEWLY SEEDED AREAS WITHIN 80 LBS. OF SALT HAY OR SMALL GRAIN STRAW PER 1,000 SF.
8. BETWEEN OCTOBER 15 AND MARCH 15, WHEN DISTURBED AREAS ARE SCHEDULED FOR IMMEDIATE LANDSCAPING, THEY MAY BE MULCHED AND SEEDED PER ITEM D ABOVE.
9. PAVEMENT BASE COURSE MUST BE PLACED IN ALL NEW ROADWAY AREAS UPON COMPLETION OF FINE GRADING.
10. THE CONTRACTOR IS RESPONSIBLE FOR ALL PAVED ROADWAYS, ON AND OFF-SITE, WHICH MUST BE KEPT FREE OF SITE GENERATED SEDIMENT AT ALL TIMES. DUST SHALL BE CONTROLLED BY SPRINKLING OR OTHER APPROVED METHOD.
11. SILT FENCES AND BARRIERS MUST BE CLEANED OR REPLACED PERIODICALLY TO REMOVE BUILT-UP SILT.
12. ALL EROSION AND SEDIMENT CONTROL DEVICES MUST BE INSPECTED ON A DAILY BASIS AND CLEANED IMMEDIATELY AFTER EACH STORM.
13. ALL EXPOSED SURFACES WILL BE TREATED WITH TOPSOIL PER THE LANDSCAPE PLANS PRIOR TO FINAL STABILIZATION.
14. PERMANENT VEGETATION IS TO BE SEEDED OR SODDED ON ALL EXPOSED AREAS WITHIN TEN (10) DAYS AFTER FINAL GRADING. MULCH AS NECESSARY FOR SEED PROTECTION AND ESTABLISHMENT. LIME AND FERTILIZE PRIOR TO PERMANENT SEEDING.
15. SOIL EROSION AND SEDIMENT CONTROL SHALL INCLUDE, BUT NOT BE LIMITED TO, OMISSIONS, ERRORS, OR FIELD OPERATIONS IMMEDIATELY AND IN ACCORDANCE WITH THE ABOVE MEASURES. THE CONTRACTOR SHALL BE RESPONSIBLE TO CORRECT ANY OMISSIONS, ERRORS, OR FIELD OPERATIONS IMMEDIATELY AND IN ACCORDANCE WITH THE GUIDELINES FOR SOIL EROSION AND SEDIMENT CONTROL.
16. ANY CONVEYANCE OF THIS PROJECT PRIOR TO ITS COMPLETION WILL TRANSFER FULL RESPONSIBILITY FOR COMPLIANCE WITH THE CERTIFIED PLAN TO ANY SUBSEQUENT OWNERS.
17. PERMANENT
   A. MATERIALS SPECIFICATION: LAWN AREAS.
      a. SOIL
         ANY SOIL HAVING A pH OF 4 OR LESS CONTAINING IRON SULFIDES SHALL BE COVERED WITH A MINIMUM OF TWELVE INCHES OF SOIL HAVING A pH OF FIVE OR MORE PRIOR TO SEED BED PREPARATION.
      b. LIME
         THREE TONS PER ACRE GROUND LIMESTONE INCORPORATED FOUR INCHES INTO SOIL.
      c. FERTILIZER
         500 L.S. PER ACRES 10-20-10 INCORPORATED FOUR INCHES INTO SOIL.
      d. SEED
         DATES 4/15-6/15 AND 9/15-10/15. 30 LBS OF KENTUCKY 31 TALL FESCUE, 30 LBS OF SPREADING FESCUE, 30 LBS OF KENTUCKY BLUEGRASS PER ACRE.
      e. SHADE AREAS
         15 LBS OF SPREADING FESCUE, 15 LBS OF CHEWINGS RED FESCUE, 30 LBS KENTUCKY BLUEGRASS, AND 10 LBS OF PERENNIAL RYE GRASS PER ACRE. MULCH SHOULD BE APPLIED AFTER SEEDING FOR ADDED PROTECTION.
   B. MULCHING SHALL BE DONE AT THE RATE OF SEVENTY TO NINETY POUNDS (70-90 LBS) PER 1,000 SQUARE FEET WITH UNROTTED SALT HAY.
   C. LIQUID MULCH BINDERS MUST BE USED TO ANCHOR SALT HAY, HAY OR STRAY MULCHES.
      a. APPLICATIONS SHOULD BE HEAVIER AT EDGES WHERE WIND CATCHES THE MULCH IN VALLEYS AND AT CREATED BANKS. REMAINDER OF AREA SHOULD BE UNIFORM IN APPEARANCE.
      b. USE ONE OF THE FOLLOWING: SYNTHETIC OR ORGANIC BINDERS, BINDERS SUCH AS CURASOL DCA-70, PETRO SET, TERRA TACH, HYDRO MULCH AND AEROSPRAY MAY BE USED AT RATES RECOMMENDED BY THE MANUFACTURER OF ANCHOR MULCH MATERIALS. BINDERS CONTAINING PETROLEUM PRODUCTS SHALL NOT BE USED.

      NOTE: ALL NAMES GIVEN ABOVE ARE REGISTERED TRADE NAMES. THIS DOES NOT CONSTITUTE A RECOMMENDATION OF THESE TO THE EXCLUSION OF OTHER PRODUCTS.
   D. FILL MATERIAL SHALL BE FREE FROM DEBRIS, PERISHABLE OR COMBUSTIBLE MATERIAL AND FROZEN OR WET EARTH OR STONES LARGER THAN THREE INCHES IN MAXIMUM DIMENSION.
   E. CONSTRUCTION AREAS SHALL BE PERIODICALLY SPRAYED WITH WATER UNTIL THE SURFACE IS WET TO CONTROL THE GENERATION OF DUST.
   F. ALL REVISIONS AFTER APPROVAL HAS BEEN GRANTED SHALL BE FORWARDED TO THE APPROPRIATE DISTRICT FOR REVIEW.
   G. THE LOCAL GOVERNING AUTHORITY SHALL RECEIVE WRITTEN NOTIFICATION SEVENTY TWO HOURS BEFORE THE START OF ANY CONSTRUCTION.
   H. SEEDED PREPARATION:
      c. TOPSOIL SHOULD BE A MINIMUM OF SIX INCHES DEEP (COMPACTED) BEFORE SEEDING.
      d. HAVE TOPSOIL TESTED FOR pH, ADD LIME AS NECESSARY TO ACHIEVE pH OF 6.5. APPLY FERTILIZER AT A RATE OF 300 POUNDS PER ACRE OR SEVEN POUNDS PER 4,000 SQUARE FEET USING 10-20-10 OR EQUIVALENT. IN ADDITION, 300 POUNDS 38-0-0 PER ACRE OF SLOW RELEASE NITROGEN MAY BE USED IN LIEU OF TOP DRESSING.
      e. WORK LIME AND FERTILIZER INTO SOIL AS NEARLY AS PRACTICAL TO A DEPTH OF FOUR INCHES WITH A DISC, SPRINGTOOTH HARROW OR OTHER SUITABLE EQUIPMENT. THE FINAL HARROWING OR DISCING OPERATION SHOULD BE ON THE GENERAL CONTOUR. CONTINUE ALL CLAY OR SILTY SOIL AND COARSE SANDS SHOULD BE ROLLED TO FIRM THE SEED BED WHEREVER FEASIBLE.
      f. REMOVE FROM THE SURFACE ALL STONES ONE INCH OR LARGER IN ANY DIMENSION. REMOVE ALL OTHER DEBRIS, SUCH AS WIRE, CABLE, TREE ROOTS, PIECES OF CONCRETE, CLODS, LUMPS, OR OTHER UNSUITABLE MATERIAL.
      g. INSPECT SEED BED JUST BEFORE SEEDING. IF TRAFFIC HAS LEFT SOIL COMPACT, THE AREA MUST BE RETILLED AND FIRMED AS ABOVE.

CONTINGENCY SOIL EROSION AND SEDIMENT CONTROL NARRATIVE

1. THE GENERAL CONTRACTOR WILL DESIGNATE PERSONNEL FOR 24 HOUR EMERGENCY RESPONSE IN THE EVENT OF SEVERE WEATHER AND INCREASED POTENTIAL FOR SEVERE EROSION. CONTRACTOR TO PROVIDE NAME AND PHONE NUMBER OF INDIVIDUAL TO THE PLANNING AND ZONING COMMISSION PRIOR TO THE START OF CONSTRUCTION.
2. THE GENERAL CONTRACTOR IS REQUIRED TO MAINTAIN ON SITE OR HAVE THE ABILITY TO RETRIEVE WITHIN 12 HOURS THE FOLLOWING MATERIALS IN THE EVENT THAT THERE ARE DEFICIENCIES IN THE SESC MEASURES:
   A. 25% OF THE INSTALLED LENGTH OF SILT FENCE
   B. EQUIVALENT TONNAGE OF STONE FOR STABILIZATION OF 1 STABILIZATION ENTRANCE. STONE COULD BE USED FOR SLOPE REPAIRS, ENERGY DISSIPATER ENHANCEMENTS, ETC.
   C. HEAVY EQUIPMENT CAPABLE OF TRENCHING/EXCAVATING LARGE AREAS TO DIVERT AND CONTROL RUNOFF IN A CONTROLLED MANNER.
   D. HAVE DESIGNATED A HYDRO-SEED CONTRACTOR CAPABLE OF RESPONDING TO THE SITE WITHIN 12 HOURS

LIMITS OF CONSTRUCTION FENCE TO BE COORDINATED WITH OWNER PRIOR TO CONSTRUCTION

GENERAL NOTES

1. BOUNDARY AND TOPOGRAPHIC INFORMATION OBTAINED FROM A PLAN TITLED "BOUNDARY & TOPOGRAPHIC SURVEY" PREPARED BY LANGAN, DATED 1 MAY 2023.
2. THE SITE IS LOCATED IN ZONE AE, A REGULATORY FLOODWAY AREA PER FIRM MAP 09001C0514G, EFFECTIVE JULY 8, 2013.
3. PROPOSED BUILDING FOOTPRINT RECEIVED ELECTRONICALLY FROM SILVER PETRUCELLI + ASSOCIATES IN MAY 2024.

LEGEND

	PROPOSED
LIMIT OF DISTURBANCE	
SILT FENCE	
EXISTING INLET PROTECTION	
PROPOSED INLET PROTECTION	
CONSTRUCTION ENTRANCE	
SOIL STOCKPILE	

Project Title:

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Revision:	Description:	Date:	Revised By:

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SOIL EROSION & SEDIMENT CONTROL PLAN

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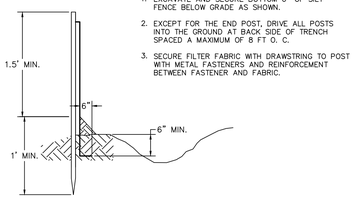
Date: 8/28/2024 Time: 20:02 User: acassella Style Table: Langan.stb Layout: Layout1 Document Code: 140265801-0502-CE101-0101



1 SILT FENCE
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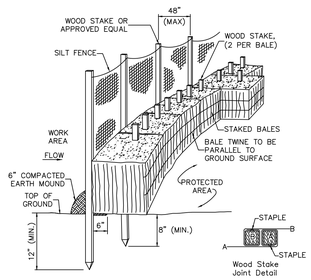

2 STAKED HAY BALES/SILT FENCE
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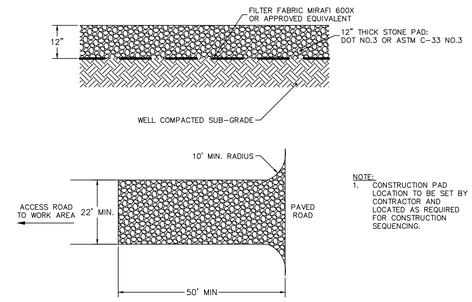

3 CONSTRUCTION ENTRANCE
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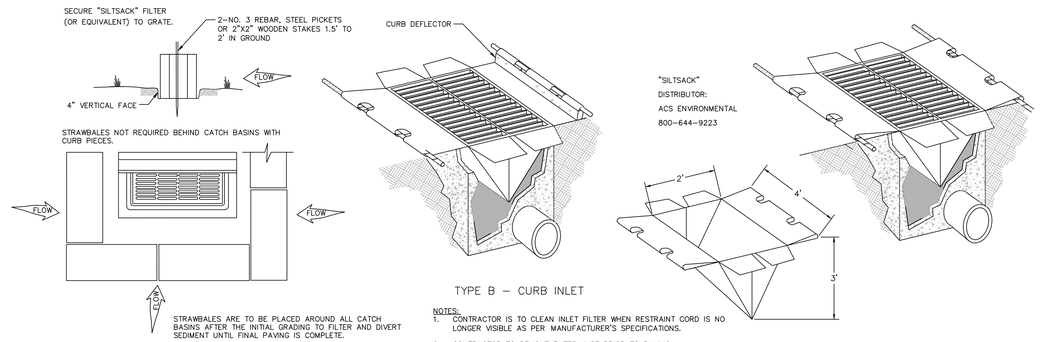

4 INLET PROTECTION
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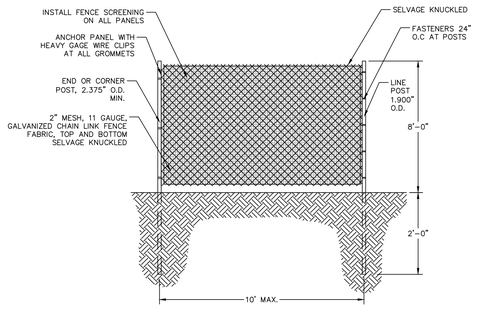
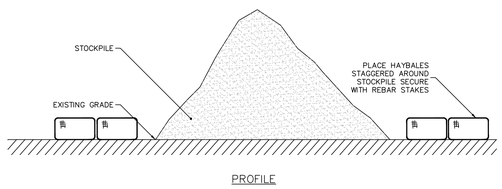
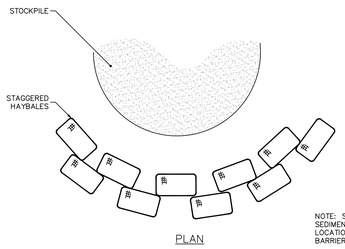


NOTE:
CONTRACTOR TO COORDINATE LOCATION WITH SITE LOGISTICS PLAN

5 TEMPORARY CONSTRUCTION FENCE
N.T.S



PROFILE



PLAN

NOTE: SEE SOIL EROSION & SEDIMENT CONTROL PLAN FOR LOCATION OF HAYBALE BARRIER

6 TEMPORARY STOCKPILE
N.T.S

Project Title:
ADDITIONS & ALTERATION TO:
Old Greenwich Elementary School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
311 STATE STREET NEW LONDON CT 06320
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Revision:	Description:	Date:	Revised By:

Drawing Title:
SOIL EROSION AND SEDIMENT CONTROL DETAILS

ISSUE DATE: 08/28/2024

Date: 09/18/2023
Scale:
Drawn By: APF
Project Number: 22-382
Drawing Number: CE501

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Date: 8/28/2024 Time: 19:51 User: acassella Style Table: Langan.stb Layout: Layout1 Document Code: 140265801-0502-CE501-0101

EXISTING BUILDING

EXISTING BUILDING

EXISTING BUILDING

NEW BUILDING ADDITION
±8,005 SF

EXISTING BUILDING

SOUND BEACH AVENUE

TREE PROTECTION FENCE (TYP.)

TREE PROTECTION FENCE (TYP.)

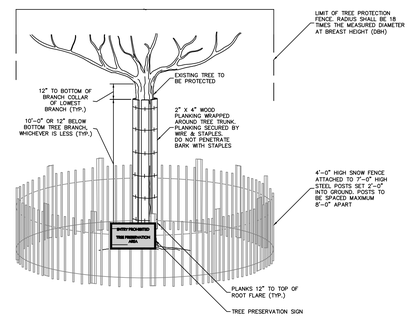
EXISTING TREE TO BE REMOVED (TYP.)

EXISTING TREE TO BE REMOVED (TYP.)

EXISTING MATURE TREES TO REMAIN AND BE PROTECTED THROUGH CONSTRUCTION; ALL EXCAVATION PERFORMED WITHIN CRITICAL ROOT ZONE OF TREES TO BE PNEUMATIC AND UNDER DIRECT SUPERVISION OF ISA-CERTIFIED ARBORIST. CONTRACTOR TO REVIEW ANTICIPATED EXTENTS OF EXCAVATION WITH TOWN TREE WARDEN PRIOR TO PERFORMING WORK.

20 0 5 10 20
SCALE: 1 INCH = 20 FEET

NOTES:
1. PRIOR TO ANY WORK BEING PERFORMED WITHIN CRITICAL ROOT ZONE OF TREES, CONTRACTOR TO CONTACT TOWN TREE WARDEN AND CONDUCT ON-SITE MEETING TO REVIEW LIMIT OF ANTICIPATED DISTURBANCE.
2. ALL EXISTING TREES WITHIN THE LIMITS OF TREE PROTECTION FENCING SHALL BE PROTECTED THROUGHOUT THE DURATION OF WORK. THE LIMIT OF TREE PROTECTION FENCE RADIUS SHALL BE 18 TIMES THE MEASURED DIAMETER-AT-BREAST-HEIGHT (DBH), UNLESS CONDITIONS WARRANT THE FENCE TO BE LOCATED CLOSER TO THE TREE. THE PROJECT LANDSCAPE ARCHITECT TO APPROVE THE LOCATION OF ALL FENCING PRIOR TO INSTALLATION.
3. TREE PROTECTION PLANKING SHALL BE INSTALLED ON ALL EXISTING TREES WHERE WORK IS TO BE DONE WITHIN THE LIMIT OF TREE PROTECTION FENCING. REFER TO DETAIL ON THIS SHEET.
4. IF TREE PROTECTION FENCING NEEDS TO BE MOVED OR BREACHED DUE TO TEMPORARY CONSTRUCTION ACTIVITY WITHIN THE TREE PROTECTION ZONE, THE FENCING WILL BE RESET TO ITS ORIGINAL LOCATION IMMEDIATELY AFTER CONSTRUCTION WITHIN THE TREE PROTECTION ZONE IS COMPLETE.
5. TREE PROTECTION FENCING SHALL BE MAINTAINED TO PROTECT TREES AT ALL TIMES. ANY DAMAGED FENCING SHALL BE IMMEDIATELY REPLACED WHEN DAMAGED.
6. DEMOLITION WORK WITHIN THE TREE PROTECTION FENCE OF PROTECTED TREES SHALL BE PERFORMED BY NON-MECHANICAL METHODS. CONTRACTOR TO PROTECT ROOT MASS AGAINST DAMAGE DURING EXCAVATION; ANY TREE ROOTS THAT ARE ENCOUNTERED, SEVERED, BROKEN, OR CUT SHALL BE PRUNED BACK WITH CLEAN, SHARP TOOLS.
7. ALL TEMPORARILY EXPOSED TREE ROOTS SHALL BE COVERED WITH 2 INCHES OF SHREDDED HARDWOOD MULCH AND THOROUGHLY IRRIGATED ON A DAILY BASIS AS DIRECTED BY THE PROJECT LANDSCAPE ARCHITECT.
8. ALL WORK TO BE PERFORMED UNDER THE DIRECT SUPERVISION OF THE PROJECT ARBORIST.



1 TREE PROTECTION FENCE
NTS

Project Title:
ADDITIONS & ALTERATION TO:
Old Greenwich Elementary School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

SILVER PETRUCELLI + ASSOCIATES
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Revision:	Description:	Date:	Revised By:

Drawing Title:
TREE DEMOLITION PLAN

Date: 09/18/2023
Scale:
Drawn By: AC
Project Number: 22-382
Drawing Number: LD101

ISSUE DATE: 08/28/2024

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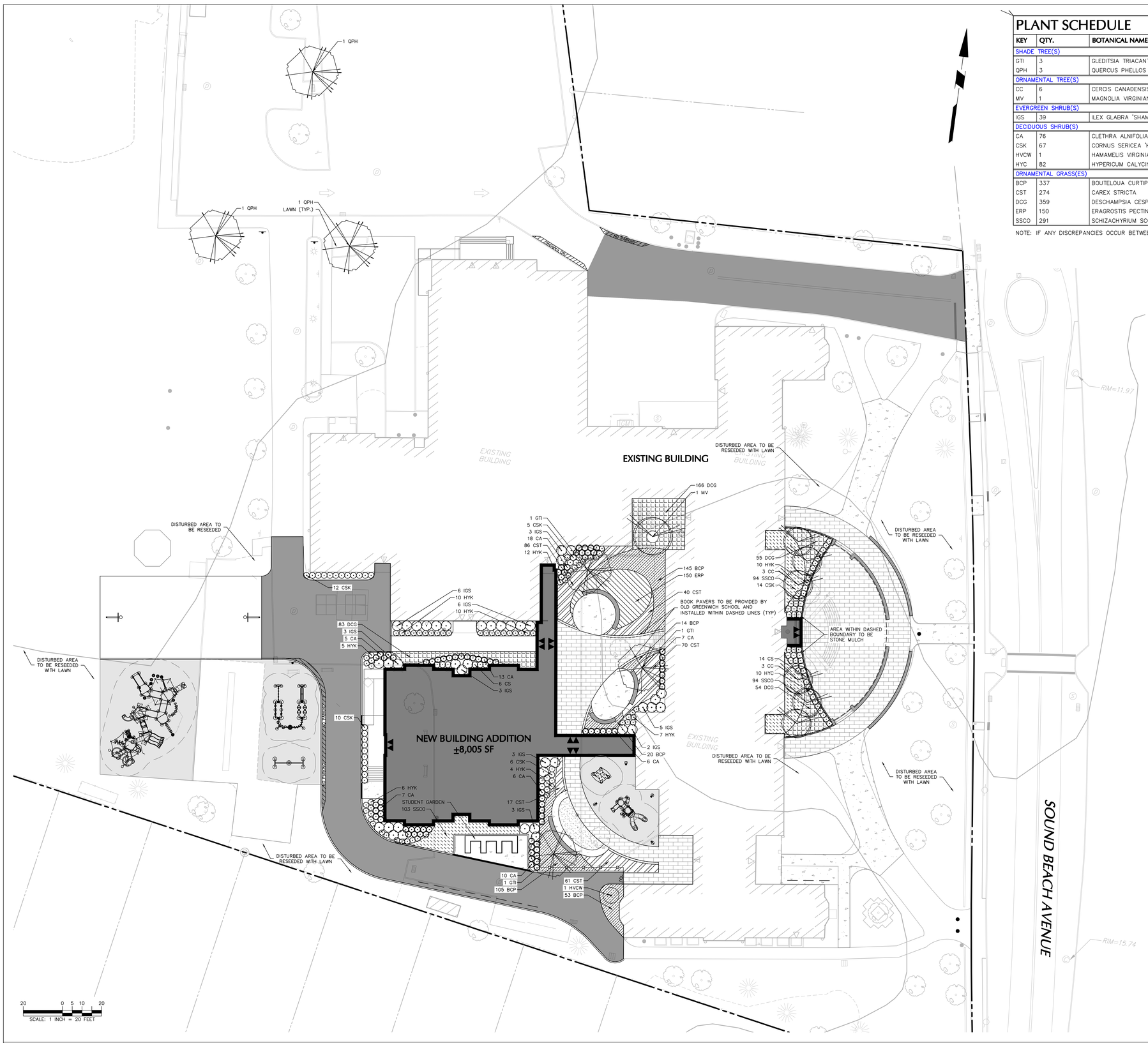
Date: 8/28/2024 Time: 19:51 User: acassella Style Table: Langan.stb Layout: LD101 Document Code: 140265801-0502-LD101-0101

PLANT SCHEDULE

KEY	QTY.	BOTANICAL NAME	COMMON NAME	SIZE	ROOT	REMARKS
SHADE TREE(S)						
GTI	3	GLEDITSIA TRIACANTHOS INERMIS	THORNLESS HONEYLOCUST	3–3 1/2" CAL.	B+B	–
QPH	3	QUERCUS PHELLOS	WILLOW OAK	3–3 1/2" CAL.	B+B	–
ORNAMENTAL TREE(S)						
CC	6	CERCIS CANADENSIS	EASTERN REDBUD	10–12'	B+B	–
MV	1	MAGNOLIA VIRGINIANA	SWEETBAY MAGNOLIA	10–12'	B+B	–
EVERGREEN SHRUB(S)						
IGS	39	ILEX GLABRA 'SHAMROCK'	SHAMROCK INKBERRY HOLLY	24–30"	CONTAINER	–
DECIDUOUS SHRUB(S)						
CA	76	CLETHRA ALNIFOLIA	SUMMERSWEET CLETHRA	24–30"	CONTAINER	–
CSK	67	CORNUS SERICEA 'KELSEYII'	KELSEYS DWARF RED TWIG DOGWOOD	24–30"	CONTAINER	–
HVCW	1	HAMAMELIS VIRGINIANA	COMMON WITCHHAZEL	24–30"	CONTAINER	–
HYC	82	HYPERICUM CALYCINUM	ST. JOHNSWORT	24–30"	CONTAINER	–
ORNAMENTAL GRASS(ES)						
BCP	337	BOUTELOUA CURTIPENDULA	SIDEOATS GRAMA	2 GAL.	CONTAINER	spaced @ 24" o.c.
CST	274	CAREX STRICTA	TUSSOCK SEDGE	2 GAL.	CONTAINER	spaced @ 24" o.c.
DCG	359	DESCHAMPSIA CESPITOSA 'GOLDTAU'	TUFTED HAIRGRASS 'GOLDTAU'	2 GAL.	CONTAINER	spaced @ 24" o.c.
ERP	150	ERAGROSTIS PECTINACEA	PURPLE LOVEGRASS	2 GAL.	CONTAINER	spaced @ 24" o.c.
SSCO	291	SCHIZACHYRIUM SCOPARIUM	LITTLE BLUESTEM	2 GAL.	CONTAINER	spaced @ 24" o.c.

NOTE: IF ANY DISCREPANCIES OCCUR BETWEEN AMOUNTS SHOWN IN THE PLAN AND THE PLANT LIST, THE PLAN SHALL DICTATE.



Project Title:

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285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

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Revision:	Description:	Date:	Revised By:

Drawing Title: PLANTING PLAN

Date: 09/18/2023
Scale:
Drawn By: AC
Project Number: 22-382

Drawing Number: LP101

ISSUE DATE: 08/28/2024

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Date: 8/28/2024 Time: 23:46 User: acassella Style Table: Langan.stb Layout: LP101 Document Code: 140265801-0502-LP101-0101

GENERAL LANDSCAPE PLANTING NOTES:

PLANTING MATERIALS

1. NAMES OF PLANTS AS DESCRIBED ON THIS PLAN CONFORM TO THOSE GIVEN IN "STANDARDIZED PLANT NAMES", 1942 EDITION PREPARED BY THE AMERICAN JOINT COMMITTEE ON HORTICULTURAL NOMENCLATURE. NAMES OF PLANT VARIETIES NOT INCLUDED THEREIN CONFORM TO NAMES GENERALLY ACCEPTED IN NURSERY TRADE.

2. STANDARDS FOR TYPE, SPREAD, HEIGHT, ROOT BALL AND QUALITY OF NEW PLANT MATERIAL SHALL BE IN ACCORDANCE WITH GUIDELINES AS SET FORTH IN THE "AMERICAN STANDARD FOR NURSERY STOCK", PUBLISHED BY THE AMERICAN ASSOCIATION OF NURSERYMEN. PLANT MATERIAL SHALL HAVE NORMAL HABIT OF GROWTH AND BE HEALTHY, VIGOROUS, AND FREE FROM DISEASES AND INSECT INFESTATION.

3. NEW PLANT MATERIAL SHALL BE NURSERY GROWN UNLESS SPECIFIED OTHERWISE. ALL PLANTS SHALL BE SET PLUMB AND SHALL BEAR THE SAME RELATIONSHIP TO FINISHED GRADE AS THE PLANT'S ORIGINAL GRADE BEFORE DIGGING. PLANT MATERIAL OF THE SAME SPECIES AND SPECIFIED AS THE SAME SIZE SHOULD BE SIMILAR IN SHAPE, COLOR AND HABIT. THE LANDSCAPE ARCHITECT HAS THE RIGHT TO REJECT PLANT MATERIAL THAT DOES NOT CONFORM TO THE TYPICAL OR SPECIFIED HABIT OF THAT SPECIES.

4. THE CONTRACTOR SHALL NOT MAKE SUBSTITUTIONS. IF THE SPECIFIED LANDSCAPE MATERIAL IS NOT OBTAINABLE, THE CONTRACTOR SHALL SUBMIT PROOF OF NON-AVAILABILITY TO THE LANDSCAPE ARCHITECT AND OWNER TOGETHER WITH A WRITTEN PROPOSAL FOR USE OF AN EQUIVALENT MATERIAL.

DELIVERY, STORAGE, AND HANDLING

1. PACKAGED MATERIALS: PACKAGED MATERIALS SHALL BE DELIVERED IN CONTAINERS SHOWING WEIGHT, ANALYSIS, AND NAME OF MANUFACTURER. MATERIALS SHALL BE PROTECTED FROM DETERIORATION DURING DELIVERY, AND WHILE STORED AT SITE.

2. TREES AND SHRUBS: THE CONTRACTOR SHALL PROVIDE TREES AND SHRUBS DUG FOR THE GROWING SEASON FOR WHICH THEY WILL BE PLANTED. DO NOT PRUNE PRIOR TO DELIVERY UNLESS OTHERWISE DIRECTED BY THE LANDSCAPE ARCHITECT. DO NOT BEND OR BIND-TIE TREES OR SHRUBS IN SUCH A MANNER AS TO DAMAGE BARK, BREAK BRANCHES, OR DESTROY NATURAL SHAPE. PROVIDE PROTECTIVE COVERING DURING TRANSIT. DO NOT DROP OR BREAK BALLED STOCK DURING DELIVERY OR HANDLING.

3. ALL PLANTS SHALL BE BALLED AND BURLAPPED OR CONTAINER GROWN AS SPECIFIED. NO CONTAINER GROWN STOCK WILL BE ACCEPTED IF IT IS ROOT BOUND. ALL ROOT BALL WRAPPING AND BINDING MATERIAL MADE OF SYNTHETICS OR PLASTICS SHALL BE REMOVED FROM THE TOP OF THE BALL AT THE TIME OF PLANTING. IF THE PLANT IS SHIPPED WITH A WIRE BASKET AROUND THE ROOT BALL, THE WIRE BASKET SHALL BE CUT AND FOLDED DOWN 8" INTO THE PLANTING HOLE. WITH CONTAINER-GROWN STOCK, THE CONTAINER SHALL BE REMOVED AND THE ROOT BALL SHALL BE CUT THROUGH THE SURFACE IN TWO LOCATIONS.

4. THE CONTRACTOR SHALL HAVE TREES AND SHRUBS DELIVERED TO SITE AFTER PREPARATIONS FOR PLANTING HAVE BEEN COMPLETED AND PLANT IMMEDIATELY. IF PLANTING IS DELAYED MORE THAN 6 HOURS AFTER DELIVERY, THE CONTRACTOR SHALL SET TREES AND SHRUBS IN SHADE, PROTECT FROM WEATHER AND MECHANICAL DAMAGE AND KEEP ROOTS MOIST BY COVERING WITH MULCH, BURLAP OR OTHER ACCEPTABLE MEANS OF RETAINING MOISTURE.

INSTALLATION

1. THE CONTRACTOR SHALL VERIFY THE LOCATION OF ALL EXISTING UNDERGROUND UTILITY AND SEWER LINES PRIOR TO THE START OF EXCAVATION ACTIVITIES. NOTIFY THE PROJECT ENGINEER AND OWNER IMMEDIATELY OF ANY CONFLICTS WITH PROPOSED PLANTING LOCATIONS. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ANY DAMAGE.

2. THE CONTRACTOR TO STAKE OUT PLANTING LOCATIONS, FOR REVIEW AND APPROVAL BY THE LANDSCAPE ARCHITECT AND/OR OWNER BEFORE PLANTING WORK BEGINS. THE LANDSCAPE ARCHITECT AND/OR OWNER SHALL DIRECT THE CONTRACTOR IN THE FINAL PLACEMENT OF ALL PLANT MATERIAL AND LOCATION OF PLANTING BEDS TO ENSURE COMPLIANCE WITH DESIGN INTENT UNLESS OTHERWISE INSTRUCTED.

3. NO PLANTING SHALL BE INSTALLED BEFORE ACCEPTANCE OF FINAL GRADING.

4. COMPLETE QUANTITIES OF PLANTS FOR EACH AREA TO BE AVAILABLE ON SITE AT THE TIME OF PLANTING FOR FIELD LAYOUT BY OWNER'S REPRESENTATIVE. NO PARTIAL LAYOUT AND PLANTING OF AREAS WILL BE ACCEPTABLE,

5. INSTALL PLANTS WITH ROOT FLARES FLUSH WITH GRADE. IMMEDIATELY REPLANT PLANTS WHICH SETTLE OUT OF PLUMB OR BELOW FINISH GRADE.

6. NO PLANT SHALL BE PUT INTO THE GROUND BEFORE ROUGH GRADING HAS BEEN COMPLETED AND APPROVED BY THE PROJECT LANDSCAPE ARCHITECT OR PROJECT ENGINEER.

7. ALL LANDSCAPED AREAS TO BE CLEARED OF ROCKS, STUMPS, TRASH AND OTHER UNSIGHTLY DEBRIS. ALL FINE GRADED AREAS SHOULD BE HAND RAKED SMOOTH ELIMINATING ANY CLUMPS AND UNEVEN SURFACES PRIOR TO PLANTING OR MULCHING.

8. ALL PLANT MATERIAL SHALL BE INSTALLED AS PER DETAILS, NOTES AND CONTRACT SPECIFICATIONS. THE LANDSCAPE ARCHITECT MAY REVIEW INSTALLATION AND MAINTENANCE PROCEDURES.

9. PLANT UNDER FULL SUPERVISION OF CERTIFIED ARBORIST, NURSERYMAN, OR LICENSED LANDSCAPE ARCHITECT. PROVIDE WRITTEN VERIFICATION OF CERTIFICATION AND/OR LICENSE FOR OWNER'S REPRESENTATIVE'S APPROVAL.

10. THE CONTRACTOR SHALL KEEP AREA CLEAN DURING DELIVERY AND INSTALLATION OF PLANT MATERIALS. REMOVE AND DISPOSE OF OFF-SITE ANY ACCUMULATED DEBRIS OR UNUSED MATERIALS. REPAIR DAMAGE TO ADJACENT AREAS CAUSED BY LANDSCAPE INSTALLATION OPERATIONS.

11. LOOSE OR CRACKED ROOTBALLS ARE UNACCEPTABLE.

12. DO NOT USE TREE WRAP.

13. AFTER PLANT IS PLACED IN TREE PIT LOCATION, ALL TWINE HOLDING ROOT BALL TOGETHER SHOULD BE COMPLETELY REMOVED. REMOVE TOP 2/3 OF WIRE BASKETS, REMOVE TOP 1/3 OF BURLAP. SYNTHETIC BURLAP WILL NOT BE ACCEPTED. FOR CONTAINER PLANTS, REMOVE CONTAINER AND SCARIFY EDGES OF ROOTBALL 1/2" DEEP IN A MINIMUM OF FOUR LOCATIONS.

14. MULCH SHOULD NOT BE PILED UP AROUND THE TRUNK OF ANY PLANT MATERIAL. NO MULCH OR TOPSOIL SHOULD BE TOUCHING THE BASE OF THE TRUNK ABOVE THE ROOT COLLAR.

15. ALL PLANTS SHALL BE WATERED THOROUGHLY TWICE DURING THE FIRST 24-HOUR PERIOD AFTER PLANTING. ALL PLANTS SHALL THEN BE WATERED WEEKLY OR AS REQUIRED BY SITE AND WEATHER CONDITIONS TO MAINTAIN VIGOROUS AND HEALTHY PLANT GROWTH.

16. RAISE AND REPLANT PLANTS THAT SETTLE AFTER PLANTING AND WATERING.

17. AFTER COMPLETION OF A PROJECT, ALL EXPOSED GROUND SURFACES THAT ARE NOT PAVED WITHIN THE CONTRACT LIMIT LINE, AND THAT ARE NOT COVERED BY LANDSCAPE PLANTING OR SEEDING AS SPECIFIED, SHALL BE COVERED BY A SHREDDED HARDWOOD BARK OR APPROVED EQUAL MULCH THAT WILL PREVENT SOIL EROSION AND THE EMANATION OF DUST.

GUARANTEE

1. NEW PLANT MATERIAL SHALL BE GUARANTEED TO BE ALIVE AND IN VIGOROUS GROWING CONDITION FOR A PERIOD OF 24 MONTHS FOLLOWING ACCEPTANCE BY THE OWNER. PLANT MATERIAL FOUND TO BE UNHEALTHY, DYING OR DEAD DURING THIS PERIOD, SHALL BE REMOVED AND REPLACED IN KIND BY THE CONTRACTOR AT NO EXPENSE TO THE OWNER.

LAWN SEED NOTES

1. LAWN SEED MIX: LESCO GRASS SEED – ALL PRO TRANSITION MIX (3 TURF-TYPE TALL-FESCUE GRASSES)

   NOTES:
   A) SEED RATE:
      1) NEW ESTABLISHMENT: SEED AT A RATE OF 6-8 LBS/1000 SQ FT
      2) RENOVATION: 20-50% EXISTING COVER: 5-7 LBS/1000 SQ FT
         50-75% EXISTING COVER: 4-6 LBS/1000 SQ FT

2. GENERAL SEED NOTES:

   A) FINAL SEED MIXTURES, RATES, AND SPECIES TO BE DETERMINED BASED ON PROJECT LANDSCAPE ARCHITECT REVIEW.
   B) SEEDING SHALL TAKE PLACE IN THE SPRING (APRIL 1 TO JUNE 15) OR THE FALL (SEPTEMBER 1 TO OCTOBER 15).
   C) ELIMINATE UNWANTED VEGETATION PRIOR TO SEEDING USING A NON-SELECTIVE HERBICIDE PER MANUFACTURER'S SPECIFICATIONS.
   D) IT IS RECOMMENDED THAT CONTRACTOR INSTALL SEED MIXTURE USING A NO-TILL TRUAX-TYPE DRILL SEEDER WHERE APPLICABLE.
   E) THERE MUST BE CONTINUOUS SOIL MOISTURE FOR 4-6 WEEKS TO ALLOW FOR PROPER GERMINATION.

LAWN WATERING SCHEDULE

THE FOLLOWING WATERING SCHEDULE COVERS ROUGHLY 8 WEEKS TO ESTABLISH A HEALTHY STAND OF GRASS FROM SEED. THE CONTRACTOR SHALL BE OBLIGATED TO ENSURE A HEALTHY STAND OF GRASS AT THE END OF THE MAINTENANCE/BOND PERIOD. ANY BARE OR DEAD AREAS IN THE LAWN SHALL BE PREPARED, RESEEDED AND REESTABLISHED PRIOR TO THE END OF THE MAINTENANCE/BOND PERIOD AND TO THE SATISFACTION OF THE PROJECT LANDSCAPE ARCHITECT AND THE OWNER.

IMPORTANT ASPECTS TO ATTAINING AND SUSTAINING A HEALTHY STAND OF GRASS ARE THE INSTALLATION OF TOPSOIL, SEED BED PREPARATION, ATTAINING OPTIMAL pH FOR THE INTENDED PLANT SPECIES, FERTILIZING, MULCH COVERING, AND SUFFICIENT WATERING PER THESE NOTES AND/OR PROJECT SPECIFICATIONS.

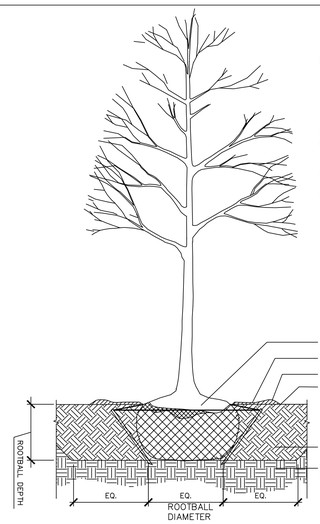
1. SEEDING SHALL BE DONE DURING THE SEASONS SPECIFIED IN THE LAWN SEED MIX NOTES AND/OR PROJECT SPECIFICATIONS.

2. AFTER THE SEEDBED IS PREPARED, SEED IS INSTALLED, AND MULCH IS APPLIED, WATER LIGHTLY TO KEEP THE TOP 2 INCHES OF SOIL CONSISTENTLY MOIST, NOT SATURATED. AT NO TIME SHOULD WATER BE APPLIED TO THE POINT OF RUNOFF OR THE DISPLACEMENT OF SEED.

3. DEPENDING ON SOIL TEMPERATURES, IT MAY TAKE SEVERAL WEEKS FOR GERMINATION TO OCCUR. DIFFERENT SPECIES WITHIN THE MIX GERMINATE AT DIFFERENT TIMES AND THEREFORE CONTRACTOR SHOULD CONTINUE THE LIGHT WATERING, AS DESCRIBED ABOVE, UNTIL THERE IS AT LEAST 2 INCHES OF GROWTH THROUGHOUT.

4. AT THIS POINT, WATERING FREQUENCY MAY BE REDUCED TO EVERY 3 TO 5 DAYS. WATER SHALL BE APPLIED TO WET A 6 INCH MINIMUM SOIL DEPTH TO PROMOTE HEALTHY DEEP ROOTS.

5. BEGIN MOWING ONCE PER WEEK AFTER THE GRASS HAS REACHED 3 INCHES HEIGHT. MOW TO A HEIGHT OF NO LESS THAN 2-½ INCHES. AFTER 2 TO 3 WEEKS OF MOWING, CONTINUE TO WATER TO A 6 INCH MINIMUM SOIL DEPTH AS NECESSARY PER WEATHER CONDITIONS, AND SOIL MOISTURE SENSORS IF APPLICABLE.



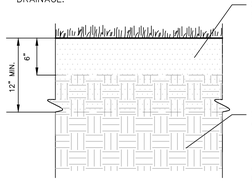
NOTES:
1. TAPER MULCH FROM 2" DEPTH AT EDGE OF ROOT BALL TO 0" DEPTH AT ROOT FLARE
2. TREE SHALL HAVE STRAIGHT TRUNK AND SINGLE LEADER, TREES WITH DOUBLE LEADER TRUNKS WILL NOT BE ACCEPTED.
3. DO NOT CUT LEADER
4. SET TREE PLUMB
5. FLOOD SAUCER TWICE DURING FIRST 24 HOURS AFTER PLANTING.
6. TREE PIT TO BE 3 TIMES WIDTH OF ROOT BALL OR 10' DIA. MINIMUM
7. SYNTHETIC BURLAP IS UNACCEPTABLE.
8. LOOSE OR CRACKED ROOTBALLS WILL NOT BE ACCEPTED FOR PLANTING
9. REMOVE TOP 2/3 OF WIRE BASKETS
10. PLANT STAKING SYSTEMS INDICATED ARE SHOWN DIAGRAMMATICALLY. CONTRACTOR IS RESPONSIBLE FOR MAINTAINING STAKING SYSTEM AT THEIR DISCRETION TO MAINTAIN PLANTS IN A PLUMB CONDITION AND TO ASSURE TREES ARE INSTALLED IN A WAY THAT ENSURES SAFETY FOR USERS.
11. WOODEN STAKES ARE NOT PERMITTED.
12. TREES ALONG WALKWAYS AND/OR WITH A GREATER THAN 3 1" CALIPER MUST BE SECURED WITH ROOT BALL ANCHORING SYSTEM.
13. STAKE MAINTENANCE AS DEFINED IN SPECIFICATIONS
14. REMOVE ALL STAKING AT FINAL ACCEPTANCE.

PLANT TREE WITH ROOT FLARE 1" ABOVE FINISHED GRADE AFTER SETTLEMENT
2" DEPTH MULCH (KEEP MULCH 1" FROM TREE TRUNK)
2" HIGH EARTH WATERING SAUCER 1'-0" BEYOND TREE TRUNK.
SCARIFY/LOOSEN SOIL TOP 6" OF SUBGRADE/FILL PRIOR TO SPREADING OF PLANTING MEDIUM
PLANTING MEDIUM
UNDISTURBED SUBGRADE

1 DECIDUOUS TREE PLANTING
N.T.S

GENERAL NOTE:

DUE TO GENERAL CONSTRUCTION ACTIVITIES AND ADJACENT SITE COMPACTION REQUIREMENTS, SUBGRADE SOILS WITHIN PROPOSED PLANTING AREAS TEND TO BECOME HIGHLY COMPACTED. IN ORDER TO CREATE A HEALTHY GROWTH MEDIUM TO ALLOW PROPOSED PLANTINGS TO ESTABLISH A VIGOROUS ROOT MASS, THIS SUBGRADE SOIL MUST UNDERGO A RESTORATION PROCESS. IN ADDITION, IMPORTED OR AMENDED EXISTING SOILS SHALL BE MIXED WITH SUBGRADE SOILS WHERE THEY MEET IN ORDER TO CREATE A TRANSITIONAL GRADIENT TO ALLOW FOR PROPER DRAINAGE.

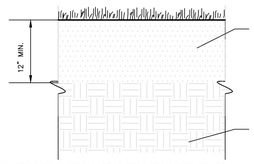


6" PLANTING SOIL (IMPORTED OR AMENDED EXISTING PLANTING SOIL) SHALL BE ROTO-TILLED INTO SUBGRADE TO A DEPTH OF 12".

SUBGRADE WITHIN 2'-6" OF FINISH GRADE IN PLANTING AREAS SHALL CONSIST OF FREE DRAINING SANDY SOIL FILL

*EXISTING SOIL STRIPPED FROM SITE CAN BE USED FOR PLANTING SOIL UPON APPROVAL BY THE PROJECT LANDSCAPE ARCHITECT. CONTRACTOR SHALL REFER TO PLANTING SOIL SPECIFICATIONS FOR REQUIRED SUBMITTALS.

PLANTING SOIL WITHIN AREAS OF CUT OR RAISED GRADE



EXISTING SOIL IN ALL PROPOSED PLANTING AREAS SHALL BE ROTO-TILLED TO A DEPTH OF 12" (EXCLUDING TREE PROTECTION AREAS) AND AMENDED AS NECESSARY TO MEET PLANTING SOIL SPECIFICATIONS. EXISTING SOIL WITHIN TREE PROTECTION AREAS SHALL BE LOOSENED AND AMENDED BY NON-MECHANICAL METHODS, PROTECTING ROOT MASS AGAINST DAMAGE.

SUBGRADE

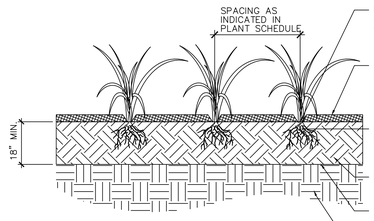
PLANTING SOIL WITHIN AREAS OF UNCHANGED GRADE

NOTES:

1. CONTRACTOR IS RESPONSIBLE TO SEND SAMPLES OF EXISTING SOILS INTENDED FOR USE IN PLANTING AREAS (1 PER 500 CY.) TO TESTING LABORATORY OR UNIVERSITY COOPERATIVE EXTENSION FOR TESTING. ALL TESTING COSTS ARE AT THE CONTRACTOR'S EXPENSE.
2. RECYCLED CRUSHED CONCRETE AND ASPHALT MILLINGS SHALL NOT BE PLACED WITHIN 2'-6" OF FINISH GRADE IN PROPOSED LANDSCAPE AREAS.
3. IMPORTED FILL SHALL CONTAIN NO CONTAMINATION IN EXCEEDENCE OF THE APPLICABLE STATE ENVIRONMENTAL STANDARDS AND MEET THE ENVIRONMENTAL REQUIREMENTS FOR THE PROJECT. THE CONTRACTOR SHALL PROVIDE DOCUMENTATION OF COMPLIANCE PRIOR TO DELIVERY OF ANY FILL TO THE SITE.
4. CONTRACTOR TO LIGHTLY COMPACT ALL PLACED PLANTING SOILS AND RAISE GRADES ACCORDINGLY TO ALLOW FOR FUTURE SETTLEMENT OF PLANTING SOILS (TYP.)
5. NO STONES, WOOD CHIPS, OR DEBRIS LARGER THAN 1/2" SHALL BE ACCEPTABLE WITHIN PLANTING AREAS.

2 PLANTING SOIL
N.T.S

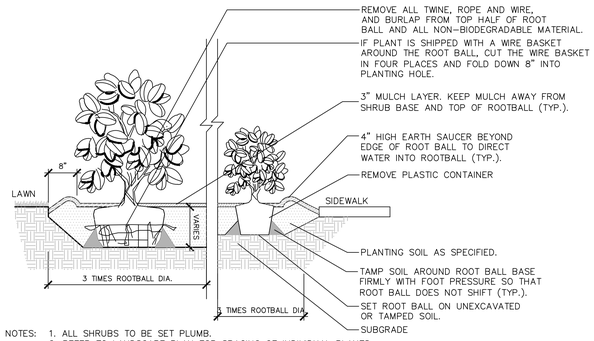
NOTES
1. LOOSE OR CRACKED ROOT BALLS ARE UNACCEPTABLE
2. EXCAVATE TO REQUIRED DEPTH AND DO NOT EXCAVATE BELOW ROOT BALL DEPTH
3. FLOOD WATERING SAUCER TWICE IN FIRST 24 HOURS AFTER PLANTING.
4. RAISE AND REPLANT ANY SHRUBS THAT SETTLE AFTER PLANTING & WATERING.
5. REMOVE 1/3 BURLAP PRIOR TO BACKFILL. SYNTHETIC BURLAP UNACCEPTABLE
6. FOR CONTAINERIZED PLANTS: REMOVE CONTAINER PRIOR TO PLANTING, SCARIFY ROOT BALL BELOW EDGE 1/2" DEEP IN FOUR LOCATIONS.



PLANT AT SAME DEPTH (AFTER SETTLEMENT) AS GROWN IN NURSERY
1" DEPTH SHREDDED HARDWOOD MULCH
REMOVE FROM CONTAINER AND LOOSEN ROOTS BY HAND
PLANTING MEDIUM
SCARIFY/LOOSEN SOIL TOP 3" OF SUBGRADE/FILL PRIOR TO SPREADING OF PLANTING BED MEDIUM
UNDISTURBED SUBGRADE

3 ORNAMENTAL GRASS PLANTING
N.T.S

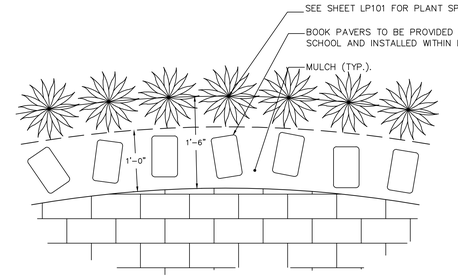
LARGE SHRUB (B&B) SMALL SHRUB (CONTAINER)



REMOVE ALL TWINE, ROPE AND WIRE, AND BURLAP FROM TOP HALF OF ROOT BALL AND ALL NON-BIODEGRADABLE MATERIAL.
IF PLANT IS SHIPPED WITH A WIRE BASKET AROUND THE ROOT BALL, CUT THE WIRE BASKET IN FOUR PLACES AND FOLD DOWN 8" INTO PLANTING HOLE.
3" MULCH LAYER. KEEP MULCH AWAY FROM SHRUB BASE AND TOP OF ROOTBALL (TYP.).
4" HIGH EARTH SAUCER BEYOND EDGE OF ROOT BALL TO DIRECT WATER INTO ROOTBALL (TYP.).
REMOVE PLASTIC CONTAINER
PLANTING SOIL AS SPECIFIED.
TAMP SOIL AROUND ROOT BALL BASE FIRMLY WITH FOOT PRESSURE SO THAT ROOT BALL DOES NOT SHIFT (TYP.).
SET ROOT BALL ON UNEXCAVATED OR TAMPED SOIL.
SUBGRADE

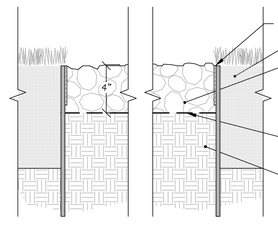
NOTES: 1. ALL SHRUBS TO BE SET PLUMB.
2. REFER TO LANDSCAPE PLAN FOR SPACING OF INDIVIDUAL PLANTS.
3. REMOVE ALL WIRE, PLASTIC, TAGS OR SYNTHETIC MATERIAL FROM PLANTS PRIOR TO PLANTING.

4 SHRUB PLANTING
N.T.S



SEE SHEET LP101 FOR PLANT SPECIES (TYP.).
BOOK PAVERS TO BE PROVIDED BY OLD GREENWICH SCHOOL AND INSTALLED WITHIN DASHED LINES (TYP.).
MULCH (TYP.).

5 PAVER BORDER IN LANDSCAPE
N.T.S



¼" THICK, 4" DEEP FLUSH STEEL EDGING POWDER COATED BLACK, AS MANUFACTURED BY COL-MET (OR APPROVED EQUAL). STAKES SECURED WITH 18" LONG METAL STAKES, 30" ON CENTER.
SOIL (PLANTING MIX)
1-3" CONNECTICUT RIVER ROUNDS; CONTRACTOR TO SUBMIT PRODUCT DATA AND PHYSICAL SAMPLE FOR REVIEW BY PROJECT LANDSCAPE ARCHITECT
WEED BARRIER FABRIC; MIRAFI MSCAPE (OR APPROVED EQUAL)
COMPACTED SUBGRADE

NOTES:
1. IN LOCATIONS WHERE STONE ABUTS HARDSCAPE, STEEL EDGING IS NOT REQUIRED.

6 STONE MULCH
N.T.S

Project Title:
ADDITIONS & ALTERATION TO:
Old Greenwich Elementary School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
311 STATE STREET NEW LONDON CT 06320
203 230 9007 silverpetrucelli.com

Revision:	Description:	Date:	Revised By:

Drawing Title: PLANTING DETAILS

Date: 09/18/2023
Scale:
Drawn By: AC
Project Number: 22-382
Drawing Number: LP501

ISSUE DATE: 08/28/2024

5/16/2023 2:21:17 PM

Date: 8/28/2024 Time: 23:53 User: acassella Style Table: Langan.stb Layout: LP501 Document Code: 140265801-0502-LP501-0101

GENERAL

GOVERNING CODE: 2022 CONNECTICUT STATE BUILDING CODE, (2021 INTERNATIONAL BUILDING CODE).

DESIGN LOADS: TOWN OF GREENWICH

CONSTRUCTION LIVE LOADS: 20 PSF
PRE-COMPOSITE LOAD FOR CONCRETE PLACEMENT BY HOSE AND FINISHING. CONTRACTOR IS RESPONSIBLE FOR ANY SHORING REQUIRED OF THE DECK FOR HEAVIER LOADS DURING CONCRETE PLACEMENT.

MINIMUM LIVE LOADS:	OFFICES:	50 PSF + 15 PSF PARTITION
	CORRIDORS ABOVE FIRST FLOOR:	80 PSF
	STAIRS:	100 PSF
	CLASSROOMS:	40 PSF
	STORAGE:	125 PSF

FLOOD LOAD: BUILDING IS PARTIALLY LOCATED IN A NON-COASTAL TYPE AE FLOOD ZONE. BFE = 13.0'. HYDROSTATIC FLOOD LOADING AS REQUIRED FOR TYPE AE FLOOD ZONES IN ASCE 7 CHAPTER 5 HAVE BEEN INCLUDED IN THE BUILDING DESIGN.

ROOF LOAD:

ROOF SNOW LOAD CRITERIA:
Pg = 30 PSF
Ce = 1.0
Is = 1.10
Ct= 1.0
Pf = 23.1 PSF

WITH INCREASES FOR SNOW DRIFTING, UNBALANCES AND SLIDING PER SECTION 1608 (2021 IBC).

MINIMUM ROOF LIVE LOAD = 30 PSF

ROOF DEAD LOAD = 20 PSF

WIND LOAD CRITERIA: SECTION 1609 (2021 IBC)
ULTIMATE WIND SPEED V_U = 130 MPH
NOMINAL DESIGN WIND V_{ASD} = 101 MPH
RISK CATEGORY III, Iw = 1.0
EXPOSURE CLASSIFICATION "C".

MINIMUM WIND LOAD ON PRIMARY STRUCTURE = 15 PSF

WIND LOADS ON SECONDARY ELEMENTS SHALL CONFORM WITH ASCE 7-16.

COMPONENT AND CLADDING DESIGN WIND PRESSURES:

ROOF ZONE 1:	POSITIVE: 19.35 PSF	NEGATIVE: -75.504 PSF
ROOF ZONE 1':	POSITIVE: 19.35 PSF	NEGATIVE: -43.368 PSF
ROOF ZONE 2:	POSITIVE: 19.344 PSF	NEGATIVE: -99.684 PSF
ROOF ZONE 3:	POSITIVE: 19.35 PSF	NEGATIVE: -135.876 PSF
WALL ZONE 4:	POSITIVE: 47.424 PSF	NEGATIVE: -51.480 PSF
WALL ZONE 5:	POSITIVE: 47.424 PSF	NEGATIVE: -63.492 PSF

ROOF OVERHANG ZONE 1:	-68.328 PSF
ROOF OVERHANG ZONE 1':	-68.328 PSF
ROOF OVERHANG ZONE 2:	-92.508 PSF
ROOF OVERHANG ZONE 3:	-128.544 PSF

DESIGN WIND PRESSURE IS COMPUTED BASED ON ULTIMATE WIND SPEED USING 10 SQUARE FOOT OF AREA.

SEISMIC LOAD CRITERIA: AS PER SECTION 1613 (2021 IBC) WITH:
RISK CATEGORY = III
SEISMIC IMPORTANCE FACTOR, Ie = 1.25
Ss = 0.274g, S1 = 0.099g
SOIL SITE CLASS = D
SPECTRAL RESPONSE COEFFICIENTS, Sds = 0.289G, Sd1 = 0.094g
SEISMIC DESIGN CATEGORY, B
BASIC SEISMIC-FORCE-RESISTING SYSTEM: STEEL SYSTEMS NOT SPECIFICALLY DETAILED FOR SEISMIC RESISTANCE, AND BUILDING FRAME: INTERMEDIATE REINFORCED MASONRY SHEARWALLS
SEISMIC RESPONSE COEFFICIENT, Cs = 0.1203
DESIGN BASE SHEAR, V = Cs x W
RESPONSE MODIFICATION FACTOR, R = 3.0
ANALYSIS PROCEDURE USED: EQUIVALENT LATERAL FORCE PROCEDURE

ALLOWABLE BEARING PRESSURE ON STRUCTURAL FILL OR NATURAL SANDS: 4000 PSF

1. SHOULD ANY OF THE DETAILED INSTRUCTIONS SHOWN ON THE PLANS CONFLICT WITH THE GENERAL STRUCTURAL NOTES, THE SPECIFICATIONS, OR WITH EACH OTHER, THE STRICTEST PROVISION SHALL GOVERN.

2. THE STRUCTURE IS DESIGNED TO BE SELF-SUPPORTING AND STABLE AFTER THE BUILDING IS FULLY COMPLETED. IT IS THE CONTRACTOR'S SOLE RESPONSIBILITY TO DETERMINE ERECTION PROCEDURE AND SEQUENCE AND TO INSURE THE SAFETY OF THE BUILDING AND ITS COMPONENT PARTS DURING ERECTION. THIS INCLUDES THE ADDITION OF WHATEVER SHORING, SHEETING, TEMPORARY BRACING, GUYS OR TIEDOWNS WHICH MIGHT BE NECESSARY. SUCH MATERIAL SHALL REMAIN THE CONTRACTOR'S PROPERTY AFTER COMPLETION OF THE PROJECT.

   THE CONTRACTOR SHALL PROVIDE SHORING CALCULATIONS AND SHORING DRAWINGS, INDICATING THE WORK TO BE PROVIDED, SIGNED AND SEALED BY A PROFESSIONAL ENGINEER LICENSED IN THE STATE OF CONNECTICUT.

3. THE STRUCTURE UTILIZES SHEAR WALLS TO PROVIDE LATERAL STABILITY. THEREFORE, TEMPORARY BRACING, GUYS, ETC. MUST BE MAINTAINED UNTIL ALL MASONRY SHEAR WALLS HAVE BEEN ERECTED AND ATTACHED TO STEEL FRAMING.

4. LOADS, OPENINGS AND STRUCTURE IN ANY WAY RELATED TO REQUIREMENTS OF OTHER (NON-STRUCTURAL) DISCIPLINES ARE SHOWN FOR BIDDING PURPOSES ONLY. THE CONTRACTOR SHALL OBTAIN FROM THE HEATING AND VENTILATING, ELECTRICAL, PLUMBING AND OTHER SUBCONTRACTORS THE FINAL APPROVED SIZE AND LOCATION OF ALL OPENINGS AND WORK TO BE PROVIDED FOR THEIR TRADE IN ROOFS, FLOORS AND WALLS, WHETHER SHOWN OR NOT SHOWN ON STRUCTURAL DRAWINGS. CONTRACTOR SHALL BE RESPONSIBLE FOR TRANSMISSION OF REQUIREMENTS, LOCATIONS AND DETAILS TO STRUCTURAL SUBCONTRACTORS. EXCESS COST RELATED TO VARIATION IN MECHANICAL REQUIREMENTS ARE NOT TO BE BORNE BY THE OWNER.

5. MECHANICAL EQUIPMENT WEIGHTS USED IN DESIGN OF SUPPORTING ELEMENTS HAVE BEEN INDICATED ON THE DRAWINGS. CONTRACTOR SHALL NOTIFY THE ARCHITECT PRIOR TO INSTALLATION IF ACTUAL WEIGHT EXCEEDS WEIGHT SHOWN ON DRAWINGS.

6. IT IS THE CONTRACTOR'S SOLE RESPONSIBILITY TO FOLLOW ALL APPLICABLE SAFETY CODES AND REGULATIONS DURING ALL PHASES OF CONSTRUCTION.

7. SHOP DRAWINGS ARE TO BE CHECKED BY THE CONTRACTOR AND SUBCONTRACTOR AND BEAR CHECKER'S INITIALS BEFORE BEING SUBMITTED TO THE ARCHITECT FOR APPROVAL.

8. THE CONTRACTOR SHALL VERIFY ALL DIMENSIONS, ELEVATIONS, ANGLES AND EXISTING CONDITIONS BEFORE PROCEEDING WITH ANY WORK.

9. ALL SECTIONS AND DETAILS SHALL BE CONSIDERED TYPICAL AND APPLY FOR THE SAME AND SIMILAR SITUATIONS THROUGHOUT THE BUILDING, UNLESS OTHERWISE SPECIFICALLY NOTED.

10. CONTRACTOR SHALL REVIEW ALL ARCHITECTURAL AND STRUCTURAL DRAWINGS PRIOR TO SUBMITTING THEIR BID FOR REFERENCE TO ALL NOTES ON ARCHITECTURAL DRAWINGS REFERRING TO ASEE STRUCTURAL DRAWINGS@. IF THE SIZE OF ELEMENTS AND DETAILING OF MEMBERS IS NOT INDICATED, THE CONTRACTOR SHALL CONTACT THE ARCHITECT TO REQUEST THE MISSING INFORMATION IN PREPARATION OF THEIR BID. THESE REFERENCED ITEMS SHALL BE PART OF THE BASE BID.

11. IN CASES OF DISCREPANCIES BETWEEN CONTRACT DOCUMENTS AND SUBMITTED SHOP DRAWINGS, THE CONTRACT DOCUMENTS SHALL GOVERN INSTALLATION OF MATERIALS.

CONTRACTOR'S DELEGATED DESIGN

1. CONTRACTOR SHALL RETAIN THE SERVICES OF A PROFESSIONAL ENGINEER REGISTERED IN THE STATE OF CONNECTICUT TO PERFORM THE DESIGN OF THE FOLLOWING:

   1. STRUCTURAL STEEL CONNECTIONS, INCLUDING BRACING AND MOMENT FRAMES
   2. COLD-FORMED METAL EXTERIOR WALL FRAMING, JOISTS, AND INTERIOR HUNG FRAMING AND THEIR CONNECTIONS
   3. RAILINGS, LADDERS, STAIR STRINGERS, AND STAIR LANDING DESIGN AND THEIR CONNECTIONS
   4. TEMPORARY SHORING OF EXISTING STRUCTURAL MEMBERS.
   5. ALL NON-STRUCTURAL EQUIPMENT ATTACHMENT TO SUPPORTING STRUCTURE, THIS INCLUDES BUT IS NOT LIMITED TO MECHANICAL CURB ATTACHMENTS, HANGING CONNECTIONS OF MEP ITEMS, ETC.
   6. CEILING CLOUDS AND THEIR CONNECTIONS

2. ALL CALCULATIONS SHALL BE SIGNED AND SEALED BY THE ENGINEER AND SUBMITTED FOR REVIEW.

FOUNDATIONS

1. BACKFILLING SHALL BE ACCOMPLISHED TO EQUAL HEIGHTS ON BOTH SIDES OF FOUNDATION WALLS TO PREVENT MOVEMENTS DUE TO UNBALANCED EARTH PRESSURE. WHERE EARTH IS ON ONE SIDE ONLY, BACKFILLING AND COMPACTION SHALL NOT START UNTIL FLOOR SLAB OR ADEQUATE BRACING IS PROVIDED FOR WALL SUPPORT (EXCEPT AT RETAINING WALLS).

2. ALL FOOTINGS ARE TO REST ON UNDISTURBED NATURAL SOIL, AS DEFINED IN THE SPECIFICATIONS, OR CONTROLLED COMPACTED FILL, REGARDLESS OF ELEVATIONS SHOWN ON DRAWINGS. FOOTING BOTTOM ELEVATIONS SHALL NOT BE HIGHER THAN INDICATED ON THE FOUNDATION PLAN, NOR LESS THAN 3'-0" BELOW FINISH GRADES.

3. IF FILL MATERIALS ARE ENCOUNTERED AT FOOTING BEARING ELEVATIONS, ALL FILL MATERIAL SHALL BE EXCAVATED AND DISPOSED OF LEGALLY OFF-SITE. THE OVER EXCAVATION SHALL BE BACKFILLED WITH CONTROLLED COMPACTED FILL TO THE BOTTOM OF FOOTING ELEVATION AS REQUIRED.

4. ALL CONTROLLED COMPACTED BACKFILL UNDER FOOTINGS AND WITHIN THE FOOTPRINT OF THE STRUCTURE SHALL BE COMPACTED TO 95% OF THE MODIFIED OPTIMUM DENSITY.

5. BOTTOM OF ALL EXTERIOR FOOTINGS SHALL BE AT LEAST 3'-6" BELOW FINISHED GRADE. PRIOR TO PROCEEDING WITH FOOTING EXCAVATION, THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE COORDINATION OF FINISH GRADES AND BOTTOM OF EXTERIOR FOOTING ELEVATIONS TO MAINTAIN THE 3'-6" FROST PROTECTION.

6. ALL SOIL SURROUNDING AND UNDER ALL FOOTINGS SHALL BE PROTECTED FROM FREEZING AND FROST ACTION DURING THE COURSE OF CONSTRUCTION.

7. FOOTING BOTTOMS SHALL STEP AT THE RATE OF 1 UNIT VERTICAL TO 2 UNITS HORIZONTAL WITH A MAXIMUM VERTICAL STEP OF 2'-0".

8. WHERE SUBSURFACE PIPING PASSES THROUGH FOUNDATION WALLS, THE TOP OF THE FOOTINGS SHALL BE AT LEAST 8" BELOW THE INVERT ELEVATION OF THE PIPING AND CONDUITS. COORDINATE ALL INVERTS WITH MECHANICAL, PLUMBING, FIRE PROTECTION, ELECTRICAL, SITE AND SITE UTILITY DRAWINGS.

9. WHERE FOOTINGS ARE IN CLOSE PROXIMITY OF SUBSURFACE PIPING OR CONDUIT, BOTTOM OF FOOTINGS SHALL BE AT LEAST 8" BELOW INVERT ELEVATION OF PIPING OR CONDUITS.

10. KEEP FOUNDATION EXCAVATIONS FREE OF WATER AT ALL TIMES.

11. USE LEAN CONCRETE (f'c= 1500) OR CONTROLLED COMPACTED FILL FOR OVER-EXCAVATION OF FOOTINGS.

12. PLACEMENT OF ALL COMPACTED FILL MATERIALS MUST BE UNDER SUPERVISION OF AN APPROVED TESTING LABORATORY (SEE SPECIFICATIONS). CONCRETE FOUNDATIONS SHALL NOT BE PLACED UNTIL SUBGRADE HAS BEEN CHECKED IN PLACE AND APPROVED BY TESTING LABORATORY.

13. EXISTING ON-SITE EXCAVATED MATERIALS SHALL NOT BE ACCEPTABLE BACKFILL MATERIAL BELOW BUILDING FOUNDATIONS, SLABS ON GRADE, OR FOR BACKFILLING OF FOUNDATION WALLS, OR WITHIN 2 FEET OF PAVEMENT GRADES UNLESS APPROVED BY THE GEOTECHNICAL ENGINEER OF RECORD.

14. CONTROL JOINT SPACING EXPOSED FOUNDATION RETAINING WALLS SHALL NOT EXCEED 30 FEET. 50% OF HORIZONTAL REINFORCEMENT SHALL EXTEND THROUGH JOINT AND HAVE A CLASS 'B' SPLICE (PER ACI 318). CONTROL JOINTS ARE NOT REQUIRED AT FROST WALLS UNLESS NOTED ON PLAN.

15. WHERE REQUIRED, CONSTRUCTION JOINTS SHALL BE KEYED AND OCCUR AT CONTROL JOINT INTERVALS. PROVIDE BENTONITE WATERSTOP FULL HEIGHT IN ALL WALL CONSTRUCTION JOINTS WHERE THERE IS A DIFFENCE IN GRADE.

16. SEE ARCHITECTURAL DRAWINGS FOR LOCATIONS OF BRICK OR CONCRETE MASONRY BLOCK SHELF ELEVATIONS IN THE FOUNDATION WALLS.

17. THE LOCATION AND ELEVATION OF THE EXISTING FOOTINGS INDICATED ARE BASED ON DRAWINGS BY DAVID M. CHIN AND ASSOCIATES, P.C., AND CONSULTANTS, DATED APRIL 6, 1993, WHICH HAVE BEEN PROVIDED TO THE DESIGNERS BY THE OWNER. THIS INFORMATION IS PROVIDED FOR BIDDING PURPOSES ONLY. ACTUAL EXISTING FOUNDATIONS MAY VARY FROM WHAT IS INDICATED, AND MUST BE VERIFIED IN THE FIELD PRIOR TO PREPARATION OF SHOP DRAWINGS. NOTIFY THE ARCHITECT IF EXISTING CONDITIONS PRECLUDE THE USE OF DETAILS AS SHOWN.

18. THE FOUNDATION DESIGN OF THE STRUCTURE HAS BEEN PREPARED BASED ON THE SOIL BORINGS, SOILS REPORT AND RECOMMENDATIONS PROVIDED BY THE GEOTECHNICAL ENGINEER, LANGAN, DATED 10 MAY 2023, REVISED 24 MAY 2023. IT IS THE CONTRACTOR'S RESPONSIBILITY TO REVIEW THE MATERIAL PRIOR TO PREPARING HIS BID TO ASSURE HE UNDERSTANDS THE SOIL CONDITIONS AND THE RECOMMENDATIONS OF THE GEOTECHNICAL ENGINEER.

19. THE FOUNDATION DESIGN OF THE STRUCTURE HAS BEEN PREPARED BASED ON THE SITE GRADING PLAN PREPARED BY ————————, DATED ————————. IT IS THE CONTRACTOR=S RESPONSIBILITY TO REVIEW THE DRAWING PRIOR TO PREPARING HIS BID TO ASSURE HE UNDERSTANDS THE SITE CONDITIONS AND THE REQUIREMENTS OF THE SITE ENGINEER.

20. FOUNDATION DESIGN SITE PREPARATION: THE FOUNDATION DESIGN AS INDICATED ON THE STRUCTURAL DRAWINGS HAS BEEN BASED ON THE FOLLOWING SITE PREPARATION. THE SITE HAS BEEN PREPARED BY THE EXCAVATION AND REMOVAL FROM THE SITE OF ALL EXISTING FILL AND CONTAMINATED SOILS. THE FOUNDATION DESIGN IS BASED ON THE CONTROLLED BACKFILLING OF THE SITE EXCAVATION WITH CONTROLLED FILL COMPACTED TO AT LEAST 95% OF THE MODIFIED OPTIMUM DENSITY IN ACCORDANCE WITH ASTM D1557.

21. PROVIDE CONTINUOUS BENTONITE WATERSTOPS BETWEEN THE TOP OF FOOTING AND BOTTOM OF ALL WALLS WHERE THE SLAB ON GRADE IS BELOW THE FINISH GRADE. PLACE THE WATERSTOP WITH A MINIMUM OF 2" CLEAR FROM THE FACE OF WALL, OR PER THE MANUFACTURER=S WRITTEN INSTALLATION INSTRUCTIONS. ATTACH WATERSTOP TO THE CONCRETE PER THE MANUFACTURER=S WRITTEN INSTALLATION INSTRUCTIONS.

SLAB ON GRADE

1. ALL SLABS ON GRADE SHALL BEAR ON A 15 MIL, CLASS A, VAPOR RETARDER OVER A MINIMUM OF 12 INCHES OF 3/4" COMPACTED CLEAN CRUSHED STONE.

   ALL JOINTS OF THE VAPOR RETARDER SHALL BE SEALED WITH TAPE. TURN THE VAPOR BARRIER UP AT ALL TERMINATIONS AGAINST FOUNDATION WALLS AND SEAL JOINT BY CONTINUOUSLY TAPING.

2. IF FILL MATERIALS ARE ENCOUNTERED SLAB SUBGRADE ELEVATIONS, ALL FILL MATERIAL SHALL BE EXCAVATED AND DISPOSED OF LEGALLY OFF-SITE. THE OVER EXCAVATION SHALL BE BACKFILLED WITH CONTROLLED COMPACTED FILL TO THE BOTTOM OF THE SLAB SUBGRADE AS REQUIRED. ALL CONTROLLED COMPACTED BACKFILL UNDER SLABS WITHIN THE FOOTPRINT OF THE STRUCTURE SHALL BE COMPACTED TO 95% OF THE MODIFIED OPTIMUM DENSITY.

3. EXISTING ON-SITE EXCAVATED MATERIALS SHALL NOT BE ACCEPTABLE BACKFILL MATERIAL BELOW BUILDING SLABS ON GRADE UNLESS APPROVED BY THE GEOTECHNICAL ENGINEER OF RECORD.

4. CONTROL JOINTS ARE TO BE CREATED IN SLABS ON GRADE. JOINTS SHALL BE SAW CUT 1/8" WIDE AND TO A DEPTH EQUAL TO 1/4 OF THE SLAB THICKNESS. LOCATE JOINTS A MAXIMUM OF 12'-0" ON CENTER IN EACH DIRECTION, IN ADDITION TO THOSE LOCATIONS INDICATED ON PLAN.

5. CONSTRUCTION JOINTS AS REQUIRED SHALL BE KEYED AND DOWELED AND LOCATED AT INTERVALS OF A MAXIMUM OF 75 FEET ON CENTER.

6. SEE ARCHITECTURAL DRAWINGS FOR LOCATION AND SIZE OF DEPRESSED AREAS IN CONCRETE SLABS AND FOR CONCRETE PADS. MAINTAIN FULL SLAB THICKNESS IN DEPRESSED AREAS, UNLESS OTHERWISE SHOWN.

7. SEE ARCHITECTURAL DRAWINGS FOR LOCATION OF ALL MASONRY WALLS FOR WHICH NO FOOTING IS SHOWN. SEE DETAILS FOR SLAB REINFORCING REQUIREMENTS AT ALL WALL LOCATIONS.

8. CONTRACTOR SHALL CONSOLIDATE ALL SLAB CONCRETE USING VIBRATIONAL METHODS IN CONFORMANCE WITH ACI 309, AGUIDE FOR CONSOLIDATION OF CONCRETE.

9. ALL CONDUIT AND PIPING ARE TO BE PLACED BELOW THE SLAB VAPOR BARRIER. ANY STUB-UPS SHOULD BE TAPED WITH APPROVED TAPE.

CONCRETE

MATERIALS:

CONCRETE SHALL MEET THE REQUIREMENTS OF THE EXPOSURE CATEGORY LISTED BELOW PER ACI 318 CHAPTER 19, AND SHALL HAVE THE MAXIMUM WATER TO CEMENT RATIO, TARGET AIR CONTENT AND DEVELOP STRENGTH IN 28 DAYS AS FOLLOWS:

LOCATION	EXPOSURE CATEGORY	STRENGTH (PSI)	MAXIMUM WATER TO CEMENT RATIO	TARGET AIR CONTENT
FOUNDATIONS	F2	4500	0.45	6%
EXTERIOR SLABS ON GRADE	F2	4500	0.45	6%
SLABS ON GRADE	F0	3500	N/A	N/A

* INCLUDES ANY EXTERIOR CONCRETE PADS, SLABS, ETC. NOTED ON THE STRUCTURAL DRAWINGS. REFER TO SITE CONCRETE SPECIFICATIONS FOR ALL OTHER EXTERIOR CONCRETE REQUIREMENTS.

1. ALL DETAILING, FABRICATION AND ERECTION OF REINFORCING BARS MUST FOLLOW ACI 318-19.

2. CONTRACTOR IS RESPONSIBLE FOR FOLLOWING ACI GUIDELINES FOR HOT AND COLD WEATHER CONCRETE AND SHALL SUBMIT PROCEDURES FOR RECORD PRIOR TO COMMENCING WORK.

3. REINFORCING STEEL SHALL BE ASTM A615, GRADE 60.

4. NO TACK WELDING OF REINFORCING WILL BE PERMITTED.

5. UNLESS NOTED OTHERWISE, ALL LAP SPLICES SHALL BE CLASS B, IN ACCORDANCE WITH ACI 318-19.

6. WELDED WIRE FABRIC SHALL CONFORM TO ASTM A-185.

7. WIRE MESH REINFORCEMENT MUST LAP ONE MESH SIZE AT SIDES AND ENDS AND BE WIRED TOGETHER.

8. WELDED WIRE FABRIC SIDE LAPS SHALL BE STAGGERED TO AVOID FOUR MESH THICKNESS AT COINCIDING END LAP AND SIDE LAP LOCATION.

9. NO CALCIUM CHLORIDE OR ADMIXTURES CONTAINING MORE THAN 0.1% CHLORIDE BY WEIGHT OF ADMIXTURE SHALL BE USED IN THE CONCRETE.

10. BOTTOM OF ALL EXTERIOR FOOTINGS SHALL BE AT LEAST 3'-6" BELOW FINISHED GRADE. PRIOR TO PROCEEDING WITH FOOTING FORMWORK, THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE COORDINATION OF BOTTOM OF EXTERIOR FOOTING ELEVATIONS WITH THE FINISH GRADES AND MAINTAINING THE 3'-6" FROST PROTECTION. WHERE SUBSURFACE PIPING PASSES THROUGH FOUNDATION WALLS, THE TOP OF FOOTINGS SHALL BE AT LEAST 8" BELOW THE INVERT ELEVATION OF THE PIPING AND CONDUITS. COORDINATE ALL INVERTS WITH MECHANICAL, PLUMBING, FIRE PROTECTION, ELECTRICAL, SITE AND SITE UTILITY DRAWINGS. PIPING OR CONDUITS SHALL NOT PASS THROUGH COLUMNS OR PIERS.

11. CONTRACTOR SHALL ANTICIPATE DEFLECTION OF STEEL MEMBERS AT SUPPORTED ELEVATED SLABS OF 1 INCH MAXIMUM, AND PROVIDE ADDITIONAL CONCRETE AS REQUIRED.

12. ALL HORIZONTAL STEEL SHOWN IN SECTIONS AND DETAILS SHALL BE CONTINUOUS, UNLESS OTHERWISE NOTED. ALL LAPS SHALL BE CLASS AB@ SPLICES IN ACCORDANCE WITH ACI 318.

13. AT INTERSECTIONS OF REINFORCED CONCRETE WALLS, PROVIDE CORNER DOWELS OF SAME SIZE AND AT THE SAME SPACING AS THE SMALLER HORIZONTAL REINFORCING. DOWELS SHALL HAVE A CLASS B LAP WITH HORIZONTAL REINFORCING IN EACH DIRECTION.

14. PROVIDE DRILLED AND EPOXIED DOWELS OF SAME SIZE TO MATCH NEW REINFORCING WHERE NEW CONSTRUCTION ABUTS EXISTING CONCRETE CONSTRUCTION. LENGTH SHALL BE THE REQUIRED EMBEDMENT DEPTH PER THE ANCHOR BOLT/EPOXY MANUFACTURER PLUS A CLASS B LAP SPLICE FOR THE SIZE OF BAR.

15. PROVIDE CORROSION RESISTANT ACCESSORIES IN ALL EXPOSED CONSTRUCTION.

16. ALL KEYS IN CONCRETE WALLS SHALL BE 2 X 4 UNLESS NOTED OTHERWISE.

17. CONCRETE PIERS: PLACE CONCRETE PIERS AND WALLS TOGETHER. SET PIER REINFORCING AND SET WALL REINFORCING THROUGH PIER VERTICAL BARS. PROVIDE DOWELS WITH STANDARD HOOK FROM FOOTING AT ALL PIERS. SIZE AND QUANTITY OF DOWELS TO MATCH VERTICAL PIER REINFORCING, PROVIDE CLASS "B" SPLICE.

18. SEE ARCHITECTURAL, MECHANICAL, PLUMBING, FIRE PROTECTION, ELECTRICAL, SITE, SITE UTILITY AND EQUIPMENT DRAWINGS FOR CONCRETE PADS, SLEEVES, OPENINGS, RECESSES, AND BUILT-IN WORK IN CONCRETE ELEMENTS.

19. THE CONTRACTOR SHALL FURNISH, LOCATE AND INSTALL ALL ACCESSORIES FOR PROPER ANCHORAGE OF WOOD AND METAL FRAMING, WOOD BLOCKING, BRICK WORK AND MASONRY UNITS. HE SHALL BE SOLELY RESPONSIBLE FOR FURNISHING, LOCATING AND ENSURING PROPER QUANTITY OF ALL FASTENING DEVICES.

20. ALL CONCRETE TO REMAIN EXPOSED TO VIEW SHALL RECEIVE A SMOOTH RUBBED FINISH (SEE SPECIFICATIONS).

21. ALL CONCRETE CORNERS WITH BOTH SIDES EXPOSED TO VIEW SHALL BE SQUARE UNLESS OTHERWISE SHOWN OR NOTED. THE EDGE SHALL BE RUBBED, PRODUCING A SMOOTH, DENSE SURFACE WITHOUT PITS OR IRREGULARITIES.

22. PROVIDE CONTINUOUS VERTICAL DOVETAIL SLOTS AT 16 INCH CENTERS HORIZONTALLY FOR ALL CONCRETE WALLS ABUTTING A MASONRY WALL OR MASONRY VENEER, UNLESS OTHERWISE NOTED.

23. PROVIDE CLEARANCE FROM EDGE OF REINFORCING TO EDGE OF CONCRETE AS FOLLOWS:

FOOTINGS (AGAINST EARTH)	3"
BEAMS (LONGITUDINAL REINFORCING)	2"
COLUMNS AND PIERS (VERTICAL REINFORCING)	2"
WALLS, EXTERIOR FACE (#5 AND SMALLER)	1 1/2"
WALLS, EXTERIOR FACE (#6 AND LARGER)	2"
SLABS (INTERIOR)	3/4"
SLABS (EXTERIOR)	1 1/2"
SLABS ON GRADE (W.W.F.)	1/3 X THK. FROM TOP SURFACE

24. PROVIDE 2 -#4 BARS IN TOP OF ALL CONCRETE BEAMS WITH STIRRUPS THAT DO NOT HAVE ANY OTHER TOP STEEL SPECIFIED.

25. NO SLEEVES, HOLES OR INSERTS SHALL BE PLACED IN SLABS WITHIN 2'-0" OF THE EDGE OF COLUMNS, OR ANYWHERE IN BEAMS, COLUMNS OR JOISTS WITHOUT APPROVAL OF THE ARCHITECT.

26. PROVIDE LENGTH OF BEARING ON MASONRY WALLS AS FOLLOWS, UNLESS NOTED OTHERWISE:

REINFORCED CONCRETE BEAMS:	8 INCHES
SOLID CONCRETE SLABS:	4 INCHES

27. CONCRETE COLUMNS SHALL BE PLACED AT LEAST TWO HOURS IN ADVANCE OF BEAMS, JOISTS AND SLABS.

28. JOINTS NOT INDICATED ON THE DRAWINGS SHALL BE MADE SO AS TO LEAST IMPAIR THE STRENGTH OF THE STRUCTURE. THERE SHALL BE NO HORIZONTAL JOINTS IN BEAMS OR SUSPENDED SLABS.

29. PROVIDE THE FOLLOWING AT OPENINGS IN ALL CONCRETE WALLS AND FRAMED SLABS, UNLESS OTHERWISE INDICATED:

   1-#5 AT EACH FACE ON EACH SIDE OF OPENING, EXTENDING 2'-0" BEYOND OPENING.

   1-#5 X 4'-0" LONG AT EACH FACE DIAGONALLY AT EACH CORNER.

30. REINFORCING STEEL SHOP DRAWINGS SHALL INDICATE THE SEQUENCE IN WHICH LAYERS OF CROSSING REINFORCING SHOULD BE PLACED, IN ORDER TO PRODUCE THE CORRECT OUTERMOST LAYER AS INDICATED ON THE DRAWINGS.

31. SHOP DRAWINGS SHALL INDICATE LOCATIONS OF ALL WALL CONTROL AND CONSTRUCTION JOINTS.

32. ALL REINFORCING, THREADED RODS OR BOLTS INDICATED TO BE DRILLED AND EPOXIED SHALL UTILIZE HILTI HIT-HY200 ADHESIVE OR APPROVED EQUAL.

STRUCTURAL STEEL

MATERIALS:

STRUCTURAL STEEL	ASTM A 36
ALL W SHAPES	ASTM A 992, GR.50
STRUCTURAL STEEL TUBING	ASTM A500, GRADE C
STRUCTURAL STEEL PIPE	ASTM A53, GRADE B
BOLTS	ASTM A325
ANCHOR BOLTS	ASTM F1554, GRADE 36
WELDING ELECTRODE	ASTM E 70
WELDABLE REBAR	ASTM A706, GRADE 60

1. DESIGN, FABRICATION, AND ERECTION OF STRUCTURAL STEEL SHALL CONFORM TO AMERICAN INSTITUTE OF STEEL CONSTRUCTION SPECIFICATION, AISC 360-10. ALL REACTIONS SHOWN ON PLAN HAVE BEEN DEVELOPED USING ALLOWABLE STRESS DESIGN.

2. WELDING SHALL CONFORM TO THE CODE FOR "ARC AND GAS WELDING IN BUILDING CONSTRUCTION" OF THE AMERICAN WELDING SOCIETY. ALL WELDING SHALL BE DONE BY A CERTIFIED WELDER.

3. ALL LOOSE BEAM LINTELS SHALL HAVE 8" MINIMUM BEARING. SEE ARCHITECTURAL JAMB DETAILS FOR LENGTHS.

4. FOR MISCELLANEOUS STEEL NOT SPECIFICALLY DETAILED ON STRUCTURAL DRAWINGS, REFER TO ARCHITECTURAL DRAWINGS.

5. PROVIDE LEVELING NUTS FOR ALL COLUMN BASE PLATES WITH FOUR (4) ANCHOR BOLTS AND PROVIDE 1 1/2" MINIMUM, 5000 PSI NON-SHRINK GROUT. PROVIDE TACK WELDED NUT AT THE BOTTOM OF THE ANCHOR BOLT EMBEDDED IN CONCRETE.

6. CONNECTIONS:

   CONNECTIONS SHALL BE DESIGNED BY THE FABRICATOR AND CONSTRUCTED IN ACCORDANCE WITH AISC 360-10. CONNECTIONS SHALL BE PROVIDED TO CONFORM TO THE REQUIREMENTS OF SIMPLE CONNECTIONS UNLESS OTHERWISE DETAILED.

   CONNECTIONS SHALL BE DESIGNED TO ACCOMMODATE THE REACTIONS SHOWN ON THE CONTRACT DOCUMENTS. IF NO REACTIONS ARE GIVEN THEN PROVIDE CONNECTION FOR ONE HALF THE ALLOWABLE UNIFORM LOAD BEAM TABLES. PER THE AISC MANUAL, FOR THE SPAN INDICATED ON THE DRAWINGS. MINIMUM CONNECTION DESIGN LOAD IS 6 KIPS.

   MINIMUM CONNECTION ANGLE THICKNESS SHALL BE 5/16". MINIMUM SHEAR PLATE IS 3/8".

   IN ADDITION TO PROVIDING ADEQUATE BOLTS TO ACCOMMODATE REACTIONS, THE FOLLOWING MINIMUM NUMBER OF BOLT ROWS SHALL BE USED:

MEMBER DEPTH	MINIMUM BOLT ROWS
10" or Less	2
12" to 14"	3
16" to 18"	4
21" to 24"	5
27" to 30"	6
Over 30"	7

   CONNECTIONS SHALL BE MADE USING 3/4" DIAMETER ASTM A325 BOLTS (SNUG TIGHT OR SLIP CRITICAL) OR WELDS, UNLESS NOTED OTHERWISE. IF TENSION CONTROL BOLTS ARE USED, CONNECTIONS SHALL BE DESIGNED FOR SLIP CRITICAL BOLT ALLOWABLE LOAD VALUES USING CLASS A FAYING SURFACE.

   USE LARGER OF 1/4" FILLET WELDS OR MINIMUM SIZE PER AISC REQUIREMENTS WHERE NO WELD SIZE IS SHOWN ON DRAWINGS.

   WELDS IN EXCESS OF 24" IN LENGTH SHALL BE 3" STITCH WELDS AT 8" ON CENTERS, UNLESS SPECIFICALLY SHOWN ON DRAWINGS TO BE CONTINUOUS.

   MOMENT CONNECTIONS SHALL BE DESIGNED TO DEVELOP FULL MOMENT CAPACITY OF THE ELEMENTS CONNECTED, UNLESS SPECIFIC MOMENT IS INDICATED ON THE DRAWINGS.

7. NO WELDING OR FINAL BOLTING SHALL BE DONE UNTIL AS MUCH OF THE STRUCTURE THAT WILL BE STIFFENED THEREBY HAS BEEN PROPERLY ALIGNED.

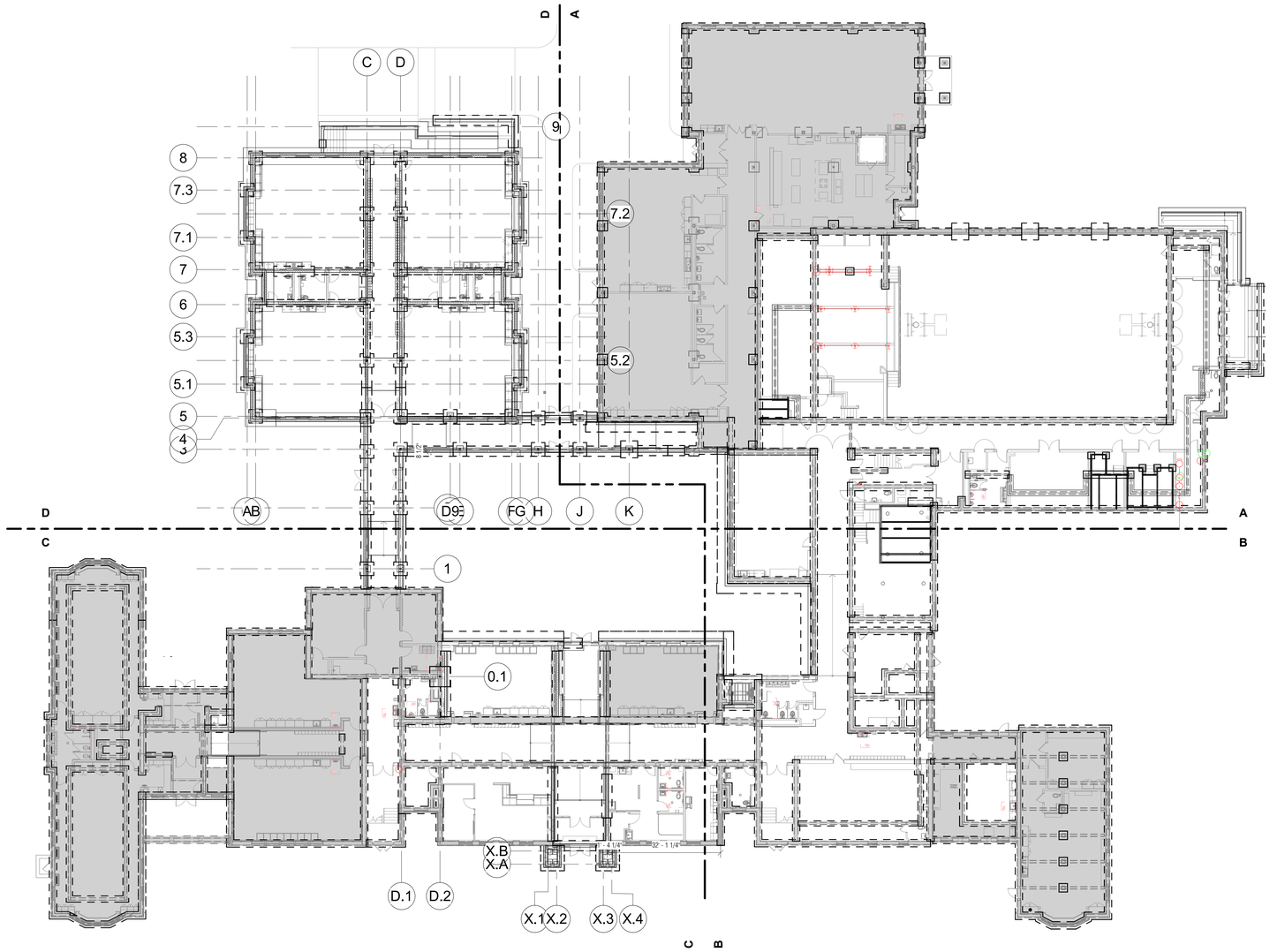
8. SEQUENCE OF PLACING WELDS SHALL BE SUCH AS TO AVOID DISTORTION OF MEMBERS.

9. SUBSTITUTION OF STRUCTURAL STEEL MEMBERS IS PERMITTED TO FACILITATE DELIVERY AT NO ADDITIONAL COST TO THE OWNER. SUBSTITUTED MEMBERS MUST BE OF THE SAME NOMINAL DEPTH AS THE MEMBER ORIGINALLY INDICATED AND HAVE A WEIGHT GREATER THAN THAT INDICATED. BEAM FLANGES MUST NOT INFRINGE ON ADJACENT ARCHITECTURAL ELEMENTS.

10. ALL STRUCTURAL STEEL BEAMS AND COLUMNS ADJACENT TO MASONRY SHALL HAVE THE FOLLOWING MASONRY ANCHORAGE:

    16 GAGE GALVANIZED CHANNEL SLOTS (DUR-O-WAL, INC. D/A 901) WELDED TO COLUMNS AND BEAMS WITH 1/4" GALVANIZED STRAP ANCHORS (DUR-O-WAL, INC. D/A 914) SPACED 1'-4" O.C. AT COLUMNS AND 1'-4" AT BEAMS (UNLESS OTHERWISE NOTED). INSTALL PER MANUFACTURER'S SPECIFICATIONS.

12. PROVIDE DEFORMED BAR ANCHORS ON THE TOP OF ALL BEAMS SUPPORTING CONCR



1 1ST FLOOR - OVERALL FOUNDATION AND FIRST FLOOR PLAN

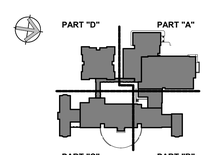
1/16" = 1'-0"

FOUNDATION NOTES:

1. TOP OF CONCRETE SLAB ELEVATION = REFER TO PLAN
2. FLOOR CONSTRUCTION: 5" NORMAL WEIGHT CONCRETE SLAB REINF. WITH 6X6-W2.9XW2.9 W.W.F. (CHAIRED). REFER TO GENERAL NOTES FOR SUBGRADE REQUIREMENTS.
3. PROVIDE SAWCUT JOINTS IN SLAB ON GRADE PER NOTE #4 ON DRAWINGS S100 , AND "TYPICAL SLAB ON GRADE DETAILS" ON SHEET S600
4. (X'-X") INDICATES TOP OF NEW FOOTING ELEVATION GIVEN FROM ELEVATION (0'-0")
   [X'-X"] INDICATES BOTTOM OF EXISTING FOOTING ELEVATION GIVEN FROM ELEVATION (0'-0"). ELEVATIONS MUST BE VERIFIED IN FIELD.
5. COORDINATE ALL SLAB ON GRADE DEPRESSIONS WITH ARCH'L DRAWINGS.
6. COORDINATE ALL PLUMBING INVERTS AND LOCATIONS WITH PLUMBING & SITE DRAWINGS REFER TO TYPICAL DETAIL ON DRAWING S600 FOR SUB SURFACE PIPING THROUGH FOUNDATION WALLS.
7. PROVIDE FOUNDATION WALL CONTROL JOINTS PER GENERAL NOTES AND TYPICAL DETAIL ON DRAWING S600
8. ELEVATIONS SHOWN ON PLAN ARE BASED ON GRADING AND DRAINAGE PLAN PROVIDED BY LANGAN DATED JANUARY 19, 2024
9. R — INDICATES RADON REMOVAL PIT. COORDINATE WITH PLUMBING DRAWINGS. REFER TO TYPICAL DETAIL ON S603

FOOTING SCHEDULE 2.0 TONS/SF

Mark	Footing Size			Reinf Each Way		Remarks
	Length	Width	Thickness	No.	Size	
	<varies>	<varies>				<varies>
F40	4' - 0"	4' - 0"	1' - 3"	8	#4	
F40T	4' - 0"	4' - 0"	1' - 3"	8	#4	REINF. TOP AND BOTTOM
F50	5' - 0"	5' - 0"				
F50T	5' - 0"	5' - 0"	1' - 3"	6	#5	REINF. TOP AND BOTTOM
F60	6' - 0"	6' - 0"	1' - 6"	8	#5	



KEY PLAN

Project Title:

ADDITIONS & ALTERATION TO:
Old Greenwich Elementary School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
311 STATE STREET NEW LONDON CT 06320
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Revision:	Description:	Date:	Revised By:

Drawing Title: OVERALL FOUNDATION AND FIRST FLOOR PLAN

95% SUBMISSION ISSUE DATE: 08/29/2024

Date: 8/16/2024
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Drawn By: AC
Project Number: 22-382

Drawing Number: S110

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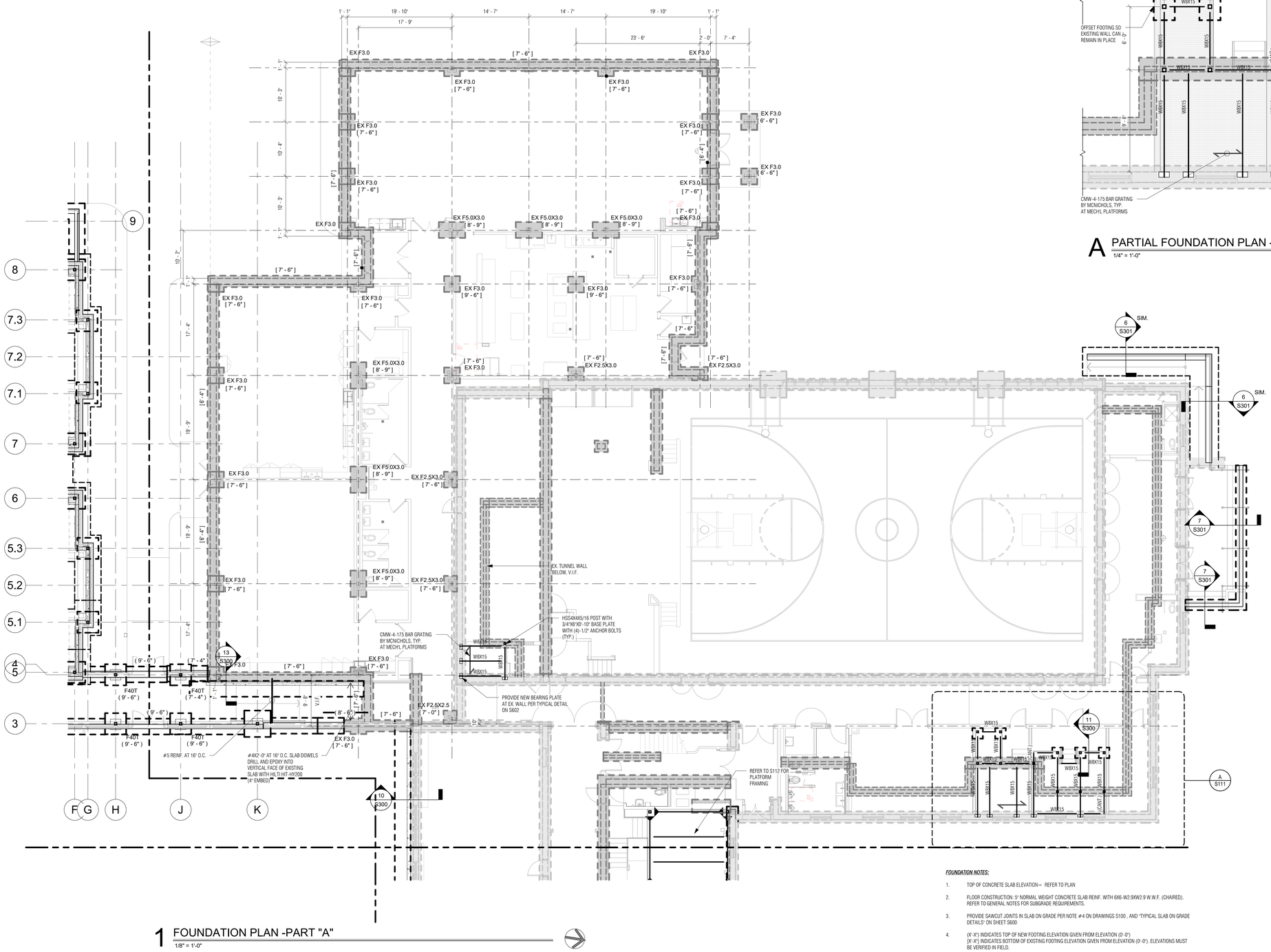
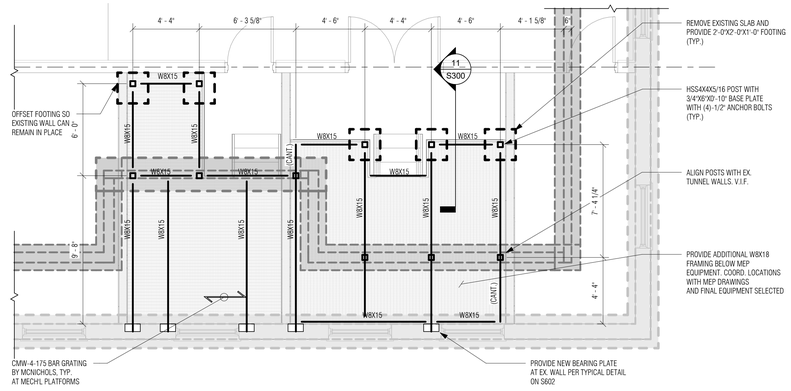


1 FOUNDATION PLAN -PART "A"

1/8" = 1'-0"

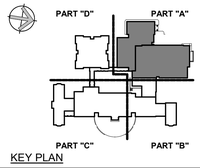


A PARTIAL FOUNDATION PLAN -PART "A"

1/4" = 1'-0"

FOUNDATION NOTES:

1. TOP OF CONCRETE SLAB ELEVATION= REFER TO PLAN
2. FLOOR CONSTRUCTION: 5" NORMAL WEIGHT CONCRETE SLAB REINF. WITH 6X6-W2.9XW2.9 W.W.F. (CHAIRED). REFER TO GENERAL NOTES FOR SUBGRADE REQUIREMENTS.
3. PROVIDE SAWCUT JOINTS IN SLAB ON GRADE PER NOTE #4 ON DRAWINGS S100 , AND "TYPICAL SLAB ON GRADE DETAILS" ON SHEET S600
4. (X'-X") INDICATES TOP OF NEW FOOTING ELEVATION GIVEN FROM ELEVATION (0'-0"). (X'-X") INDICATES BOTTOM OF EXISTING FOOTING ELEVATION GIVEN FROM ELEVATION (0'-0"). ELEVATIONS MUST BE VERIFIED IN FIELD.
5. COORDINATE ALL SLAB ON GRADE DEPRESSIONS WITH ARCH'L DRAWINGS.
6. COORDINATE ALL PLUMBING INVERTS AND LOCATIONS WITH PLUMBING & SITE DRAWINGS REFER TO TYPICAL DETAIL ON DRAWING S600 FOR SUB SURFACE PIPING THROUGH FOUNDATION WALLS.
7. PROVIDE FOUNDATION WALL CONTROL JOINTS PER GENERAL NOTES AND TYPICAL DETAIL ON DRAWING S600
8. ELEVATIONS SHOWN ON PLAN ARE BASED ON GRADING AND DRAINAGE PLAN PROVIDED BY LANGAN DATED JANUARY 19, 2024
9. R INDICATES RADON REMOVAL PIT. COORDINATE WITH PLUMBING DRAWINGS. REFER TO TYPICAL DETAIL ON S600



KEY PLAN

Project Title:

ADDITIONS & ALTERATION TO:
Old Greenwich Elementary School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
311 STATE STREET NEW LONDON CT 06320
203 230 9007 silverpetrucelli.com

Revision: Description:

MHAI
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780 East Main Street
Branford, Connecticut 06405
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Drawing Title: FOUNDATION PLAN - PART "A"

Date: 8/16/2024
Scale: As indicated
Drawn By: AC
Project Number: 22-382
Drawing Number: S111

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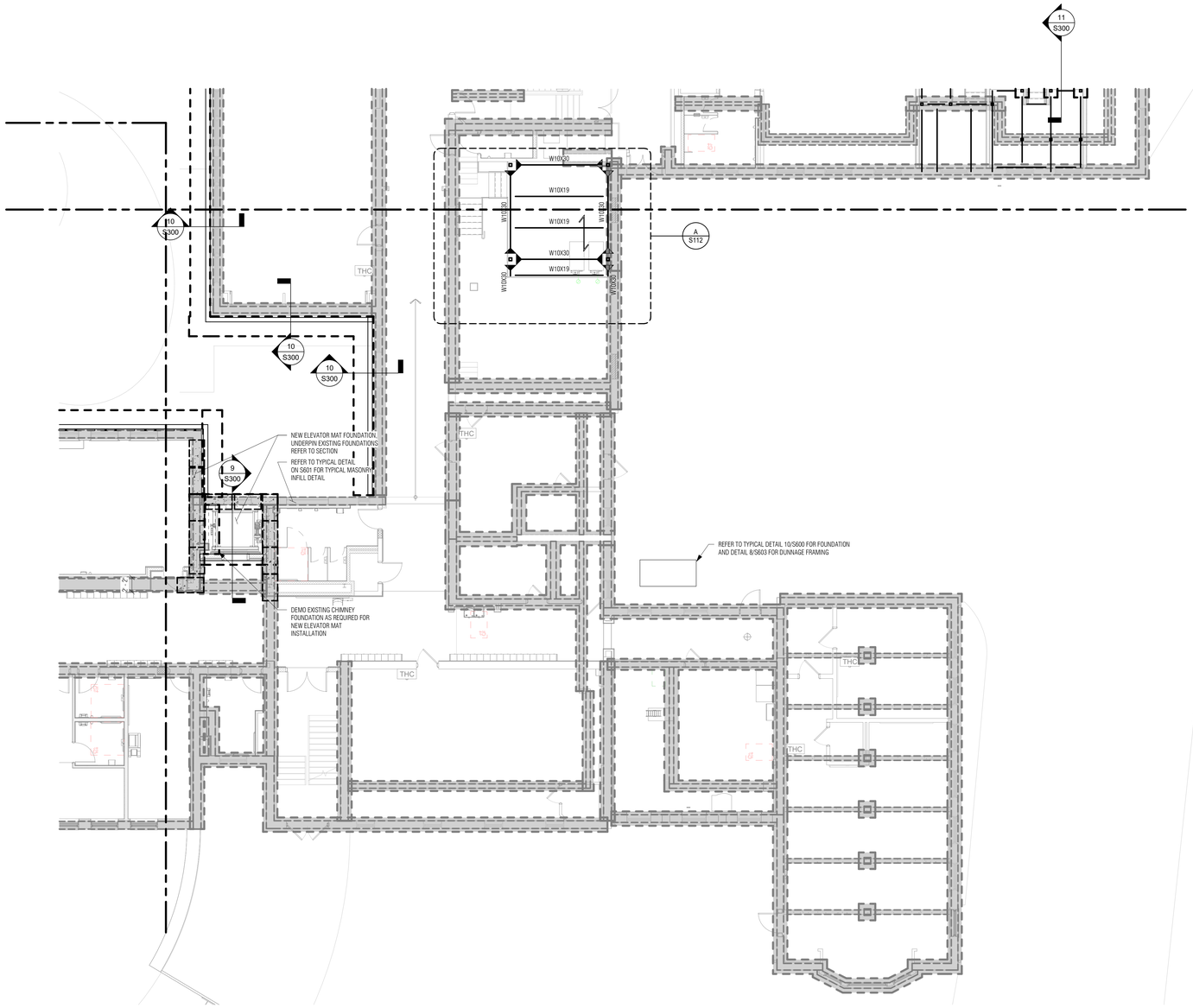
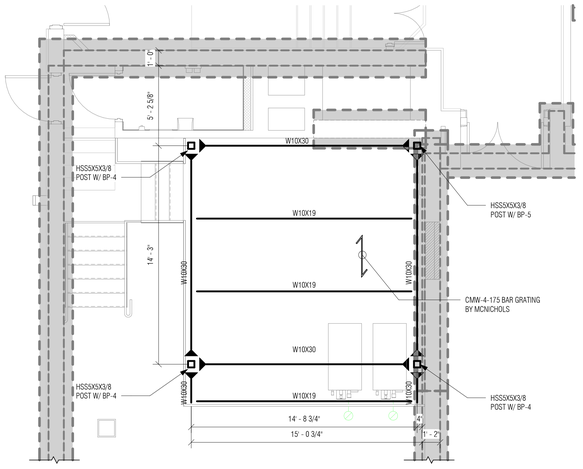


1 FOUNDATION PLAN -PART "B"

1/8" = 1'-0"

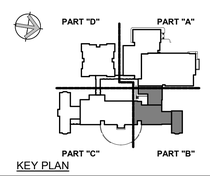


A PARTIAL FOUNDATION PLAN -PART "B"

1/4" = 1'-0"

FOUNDATION NOTES:

1. TOP OF CONCRETE SLAB ELEVATION= REFER TO PLAN
2. FLOOR CONSTRUCTION: 5" NORMAL WEIGHT CONCRETE SLAB REINF. WITH 6X6-W2.9XW2.9 W.W.F. (CHAIRED). REFER TO GENERAL NOTES FOR SUBGRADE REQUIREMENTS.
3. PROVIDE SAWCUT JOINTS IN SLAB ON GRADE PER NOTE #4 ON DRAWINGS S100 , AND "TYPICAL SLAB ON GRADE DETAILS" ON SHEET S600
4. (X'-X") INDICATES TOP OF NEW FOOTING ELEVATION GIVEN FROM ELEVATION (0'-0") [X'-X"] INDICATES BOTTOM OF EXISTING FOOTING ELEVATION GIVEN FROM ELEVATION (0'-0"). ELEVATIONS MUST BE VERIFIED IN FIELD.
5. COORDINATE ALL SLAB ON GRADE DEPRESSIONS WITH ARCH'L DRAWINGS.
6. COORDINATE ALL PLUMBING INVERTS AND LOCATIONS WITH PLUMBING & SITE DRAWINGS REFER TO TYPICAL DETAIL ON DRAWING S600 FOR SUB SURFACE PIPING THROUGH FOUNDATION WALLS.
7. PROVIDE FOUNDATION WALL CONTROL JOINTS PER GENERAL NOTES AND TYPICAL DETAIL ON DRAWING S600
8. ELEVATIONS SHOWN ON PLAN ARE BASED ON GRADING AND DRAINAGE PLAN PROVIDED BY LANGAN DATED JANUARY 19, 2024
9. R INDICATES RADON REMOVAL PIT. COORDINATE WITH PLUMBING DRAWINGS. REFER TO TYPICAL DETAIL ON S603



KEY PLAN

Project Title:

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Old Greenwich Elementary School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

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Revision:	Description:	Date:	Revised By:

Drawing Title: FOUNDATION PLAN - PART "B"

95% SUBMISSION ISSUE DATE: 08/29/2024

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Scale: As indicated
Drawn By: AC
Project Number: 22-382

Drawing Number: S112

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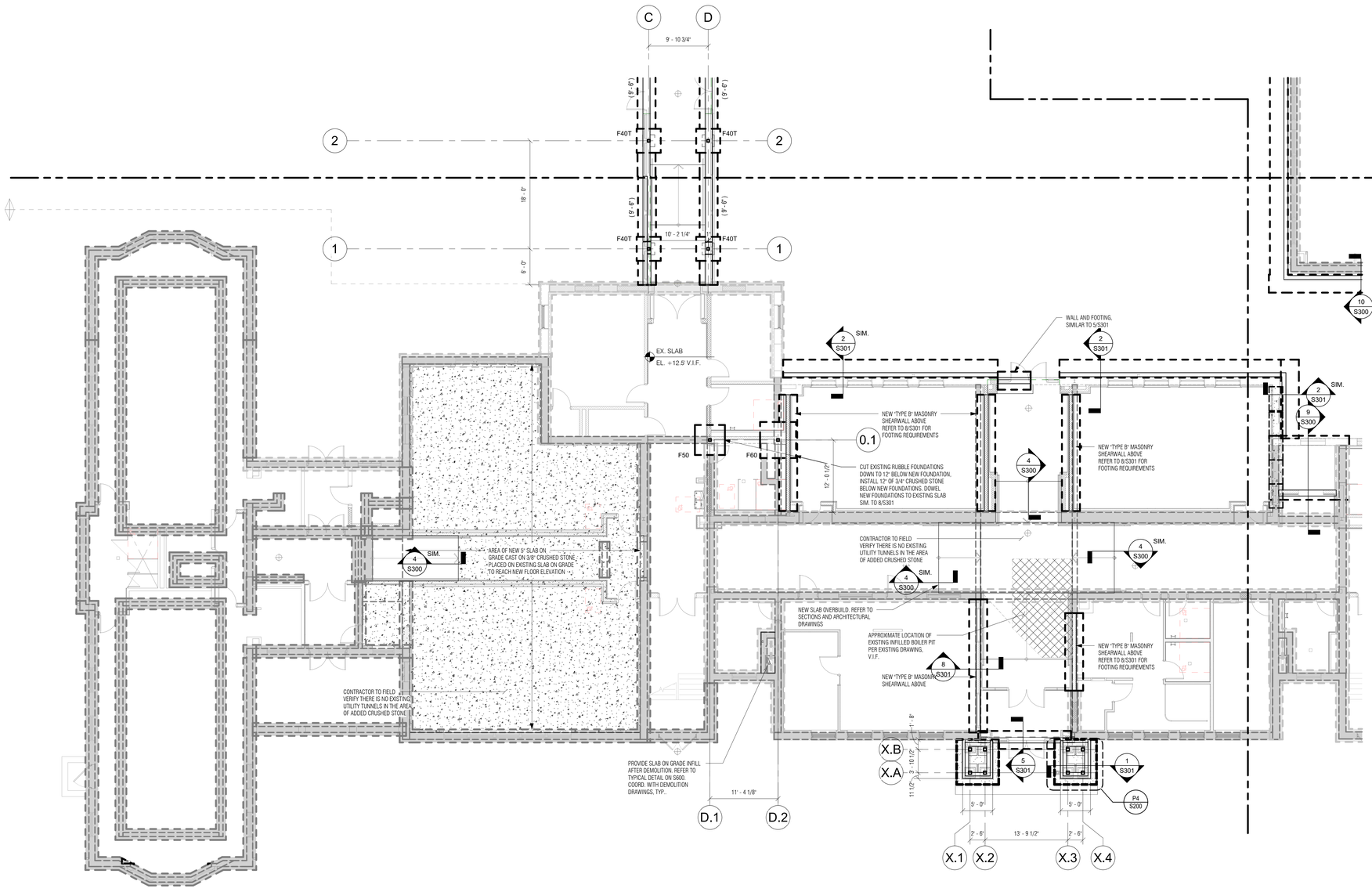


1 FOUNDATION PLAN -PART "C"

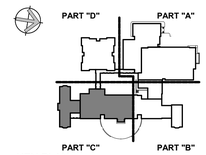
1/8" = 1'-0"

FOUNDATION NOTES:

1. TOP OF CONCRETE SLAB ELEVATION= REFER TO PLAN
2. FLOOR CONSTRUCTION: 5" NORMAL WEIGHT CONCRETE SLAB REINF. WITH 6X6-W2.9XW2.9 W.W.F. (CHAIRED). REFER TO GENERAL NOTES FOR SUBGRADE REQUIREMENTS.
3. PROVIDE SAWCUT JOINTS IN SLAB ON GRADE PER NOTE #4 ON DRAWINGS S100 , AND "TYPICAL SLAB ON GRADE DETALS" ON SHEET S600
4. (X'-X") INDICATES TOP OF NEW FOOTING ELEVATION GIVEN FROM ELEVATION (0'-0"). (X'-X") INDICATES BOTTOM OF EXISTING FOOTING ELEVATION GIVEN FROM ELEVATION (0'-0"). ELEVATIONS MUST BE VERIFIED IN FIELD.
5. COORDINATE ALL SLAB ON GRADE DEPRESSIONS WITH ARCHI. DRAWINGS.
6. COORDINATE ALL PLUMBING INVERTS AND LOCATIONS WITH PLUMBING & SITE DRAWINGS REFER TO TYPICAL DETAIL ON DRAWING S600 FOR SUB SURFACE PIPING THROUGH FOUNDATION WALLS.
7. PROVIDE FOUNDATION WALL CONTROL JOINTS PER GENERAL NOTES AND TYPICAL DETAIL ON DRAWING S600
8. ELEVATIONS SHOWN ON PLAN ARE BASED ON GRADING AND DRAINAGE PLAN PROVIDED BY LANGAN DATED JANUARY 19, 2024
9. R — INDICATES RADON REMOVAL PIT. COORDINATE WITH PLUMBING DRAWINGS. REFER TO TYPICAL DETAIL ON S603

FOOTING SCHEDULE 2.0 TONS/SF

Mark	Footing Size			Reinf Each Way		Remarks
	Length	Width	Thickness	No.	Size	
	<varies>	<varies>				<varies>
F40	4' - 0"	4' - 0"	1' - 3"	8	#4	
F40T	4' - 0"	4' - 0"	1' - 3"	8	#4	REINF. TOP AND BOTTOM
F50	5' - 0"	5' - 0"				
F50T	5' - 0"	5' - 0"	1' - 3"	6	#5	REINF. TOP AND BOTTOM
F60	6' - 0"	6' - 0"	1' - 6"	8	#5	



KEY PLAN

Project Title:

ADDITIONS & ALTERATION TO:
Old Greenwich Elementary School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
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Revision:	Description:	Date:	Revised By:

MHAI
Michael Horton Associates Inc.
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780 East Main Street
Branford, Connecticut 06405
203-481-8600 mha-eng.com

Drawing Title: FOUNDATION PLAN - PART "C"

95% SUBMISSION ISSUE DATE: 08/29/2024

Date: 8/16/2024
Scale: 1/8" = 1'-0"
Drawn By: AC
Project Number: 22-382

Drawing Number: S113

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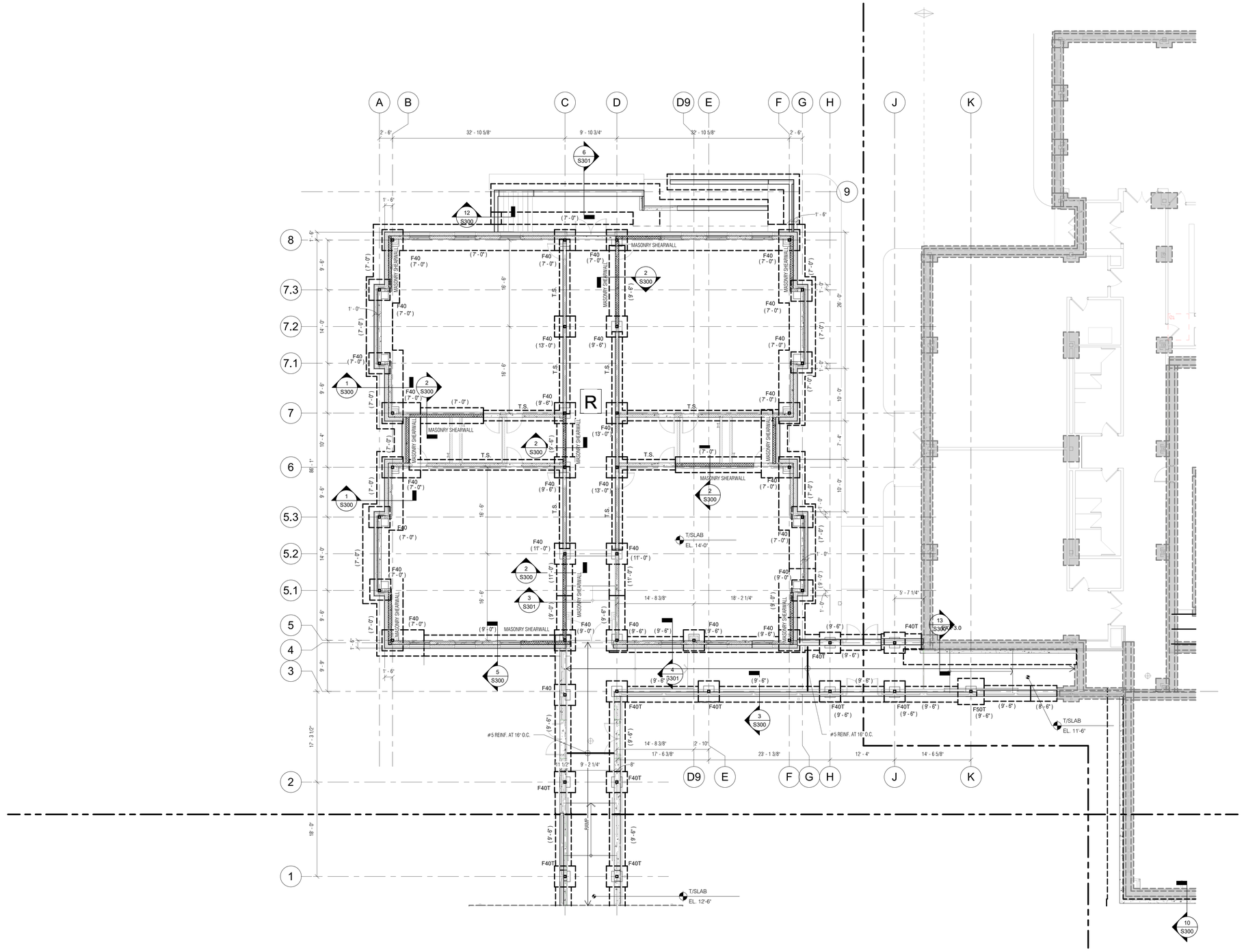


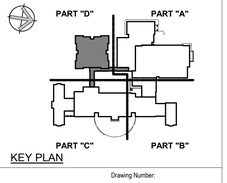
1 FOUNDATION PLAN -PART "D"

1/8" = 1'-0"

FOOTING SCHEDULE 2.0 TONS/SF						
	Footing Size			Reinf Each Way		
Mark	Length	Width	Thickness	No.	Size	Remarks
	<varies>	<varies>				<varies>
F40	4' - 0"	4' - 0"	1' - 3"	8	#4	
F40T	4' - 0"	4' - 0"	1' - 3"	8	#4	REINF. TOP AND BOTTOM
F50	5' - 0"	5' - 0"				
F50T	5' - 0"	5' - 0"	1' - 3"	6	#5	REINF. TOP AND BOTTOM
F60	6' - 0"	6' - 0"	1' - 6"	8	#5	

FOUNDATION NOTES:

1. TOP OF CONCRETE SLAB ELEVATION = REFER TO PLAN
2. FLOOR CONSTRUCTION: 5" NORMAL WEIGHT CONCRETE SLAB REINF. WITH 6X6-W2.9XW2.9 W.W.F. (CHAIRED). REFER TO GENERAL NOTES FOR SUBGRADE REQUIREMENTS.
3. PROVIDE SAWCUT JOINTS IN SLAB ON GRADE PER NOTE #4 ON DRAWINGS S100 , AND "TYPICAL SLAB ON GRADE DETAILS" ON SHEET S600
4. (X'-X") INDICATES TOP OF NEW FOOTING ELEVATION GIVEN FROM ELEVATION (0'-0")
   [X'-X"] INDICATES BOTTOM OF EXISTING FOOTING ELEVATION GIVEN FROM ELEVATION (0'-0"). ELEVATIONS MUST BE VERIFIED IN FIELD.
5. COORDINATE ALL SLAB ON GRADE DEPRESSIONS WITH ARCH'L DRAWINGS.
6. COORDINATE ALL PLUMBING INVERTS AND LOCATIONS WITH PLUMBING & SITE DRAWINGS REFER TO TYPICAL DETAIL ON DRAWING S600 FOR SUB SURFACE PIPING THROUGH FOUNDATION WALLS.
7. PROVIDE FOUNDATION WALL CONTROL JOINTS PER GENERAL NOTES AND TYPICAL DETAIL ON DRAWING S600
8. ELEVATIONS SHOWN ON PLAN ARE BASED ON GRADING AND DRAINAGE PLAN PROVIDED BY LANGAN DATED JANUARY 19, 2024
9. R INDICATES RADON REMOVAL PIT. COORDINATE WITH PLUMBING DRAWINGS. REFER TO TYPICAL DETAIL ON S603



KEY PLAN

Project Title:

ADDITIONS & ALTERATION TO:
Old Greenwich Elementary School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
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Revision:	Description:	Date:	Revised By:

Drawing Title: FOUNDATION PLAN - PART "D"

95% SUBMISSION ISSUE DATE: 08/29/2024

Date: 8/16/2024
Scale: 1/8" = 1'-0"
Drawn By: AC
Project Number: 22-382
Drawing Number: S114

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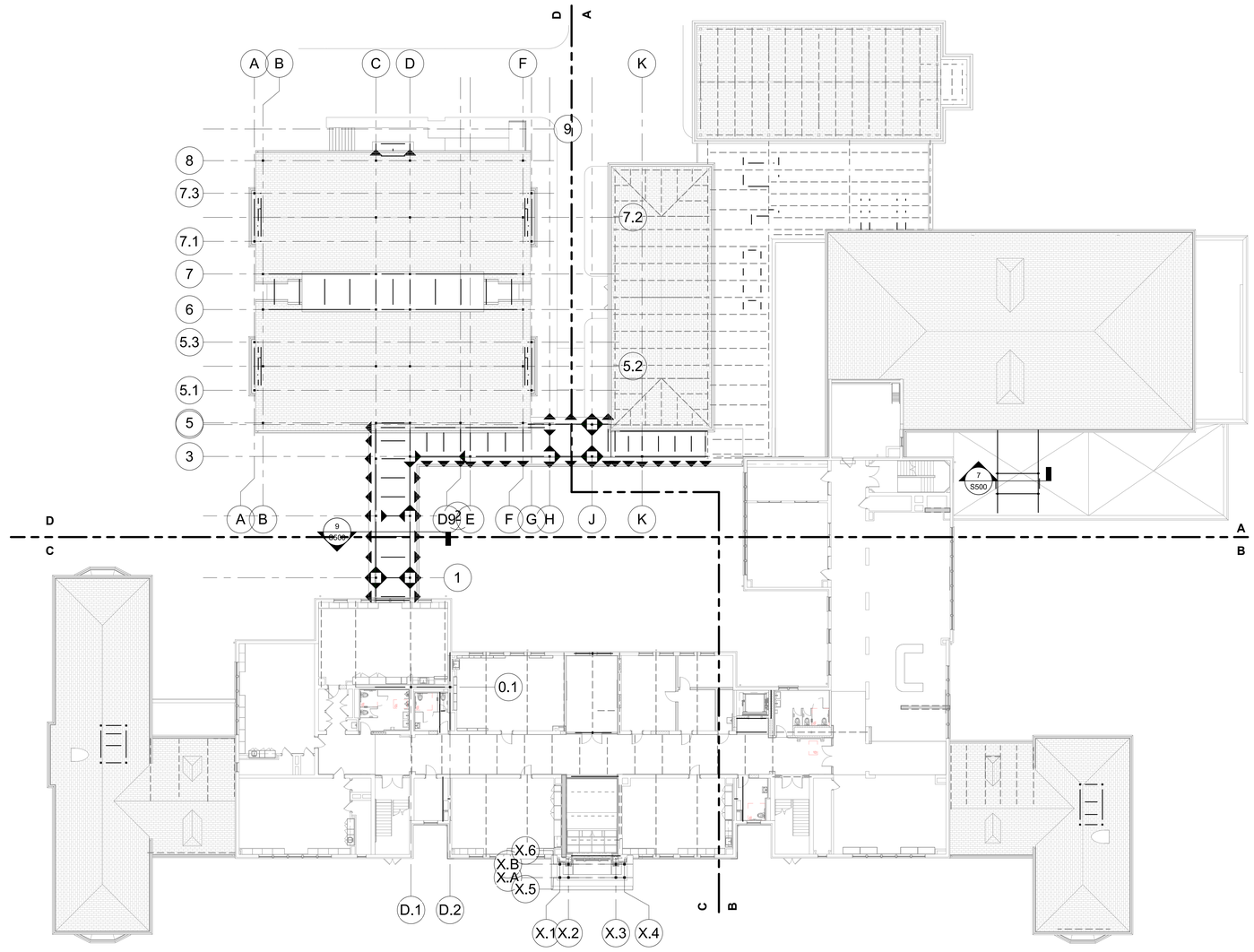


1 OVERALL SECOND FLOOR FRAMING PLAN

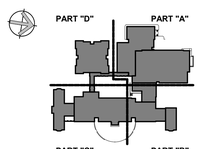
1/16" = 1'-0"

FLOOR FRAMING NOTES

1. CONTRACTOR TO FIELD VERIFY ALL EXISTING FRAMING SIZES, SPACING AND LOCATIONS PRIOR TO SUBMITTING SHOP DRAWINGS
2. REFER TO DRAWING S501 FOR ALL ROOF FRAMES AT OPENINGS. COORDINATE ALL OPENING LOCATIONS WITH ARCHITECTURAL AND MECHANICAL DRAWINGS.
3. REFER TO MECHANICAL AND ARCHITECTURAL DRAWINGS FOR ALL OPENINGS, DRAINS AND EQUIPMENT. PROVIDE FRAMES PER TYPICAL DETAILS.
4. " — " INDICATES MOMENT CONNECTION, REFER TO TYPICAL DETAILS ON DRAWING S601

ROOF CONSTRUCTION NOTES:

1. D1.5 — TYPICAL ROOF CONSTRUCTION: 1 1/2" X 20GA. GALVANIZED TYPE "B" METAL ROOF DECK, REFER TO GENERAL NOTES FOR FASTENING REQUIREMENTS.
   D1.5A — INDICATES 1 1/2"X20GA. ACOUSTIC GALVANIZED TYPE "BA" METAL ROOF DECK, REFER TO GENERAL NOTES FOR FASTENING REQUIREMENTS
   D2A — INDICATES 2"X20GA. ACOUSTIC ROOF DECK CEILING SYSTEM. REFER TO GENERAL NOTES FOR FASTENING REQUIREMENTS
2. " — " INDICATES MOMENT CONNECTION, REFER TO TYPICAL DETAILS ON DRAWING S601
3. ALL BEAM FRAMING SHALL HAVE EQUAL SPACING BETWEEN COLUMNS, UNLESS NOTED OTHERWISE.
4. REFER TO DRAWING S601 FOR ALL ROOF FRAMES AT OPENINGS. COORDINATE ALL OPENING LOCATIONS WITH ARCHITECTURAL AND MECHANICAL DRAWINGS.
5. REFER TO MECHANICAL AND ARCHITECTURAL DRAWINGS FOR ALL OPENING, DRAINS AND EQUIPMENT. PROVIDE FRAMES PER TYPICAL DETAILS.
6. CONTRACTOR TO FIELD VERIFY ALL EXISTING FRAMING SIZES, SPACING AND LOCATIONS PRIOR TO SUBMITTING SHOP DRAWINGS
7. PROVIDE W8X18 FRAMING BELOW MECHANICAL EQUIPMENT CURBS. REFER TO MECHANICAL DRAWINGS FOR EQUIPMENT LOCATIONS



KEY PLAN

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Revision:	Description:	Date:	Revised By:

Drawing Title: OVERALL SECOND FLOOR FRAMING PLAN

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Date: 8/16/2024
Scale: As indicated
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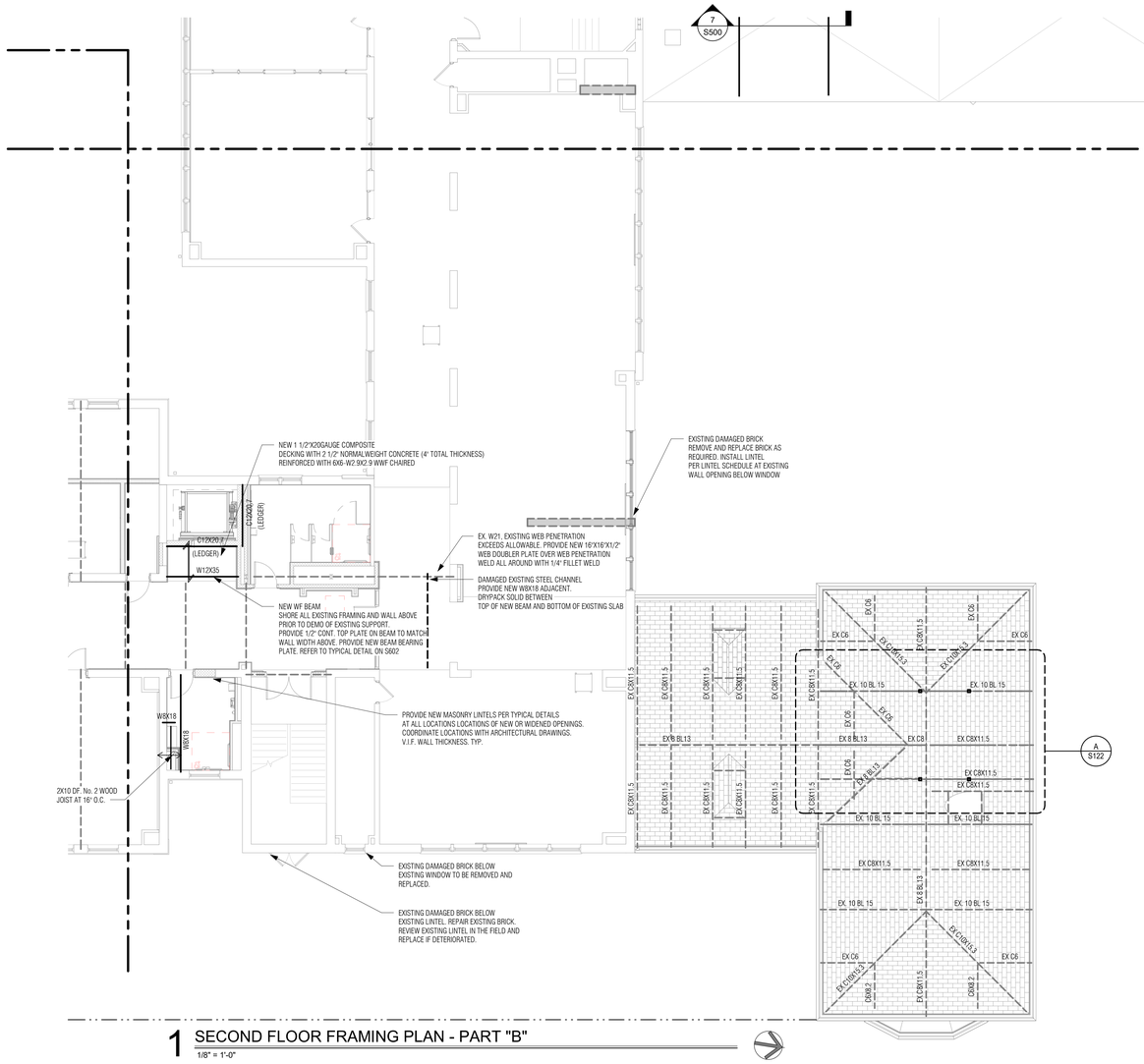
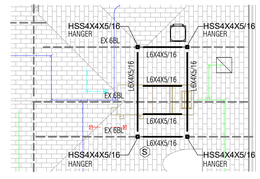


1 SECOND FLOOR FRAMING PLAN - PART "B"

1/8" = 1'-0"

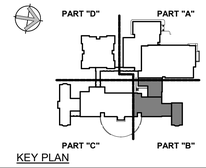
FLOOR FRAMING NOTES

1. CONTRACTOR TO FIELD VERIFY ALL EXISTING FRAMING SIZES, SPACING AND LOCATIONS PRIOR TO SUBMITTING SHOP DRAWINGS
2. REFER TO DRAWING S601 FOR ALL ROOF FRAMES AT OPENINGS. COORDINATE ALL OPENING LOCATIONS WITH ARCHITECTURAL AND MECHANICAL DRAWINGS.
3. REFER TO MECHANICAL AND ARCHITECTURAL DRAWINGS FOR ALL OPENINGS, DRAINS AND EQUIPMENT. PROVIDE FRAMES PER TYPICAL DETAILS.
4. " —◀ " INDICATES MOMENT CONNECTION, REFER TO TYPICAL DETAILS ON DRAWING S601



A MECH UNIT PLATFROM FRAMING PLAN - PART "B"

1/8" = 1'-0"



KEY PLAN

Project Title:

ADDITIONS & ALTERATION TO:
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285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

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Revision:	Description:	Date:	Revised By:

Drawing Title: SECOND FLOOR FRAMING PLAN - PART "B"

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Drawn By: AC
Project Number: 22-382

Drawing Number: S122

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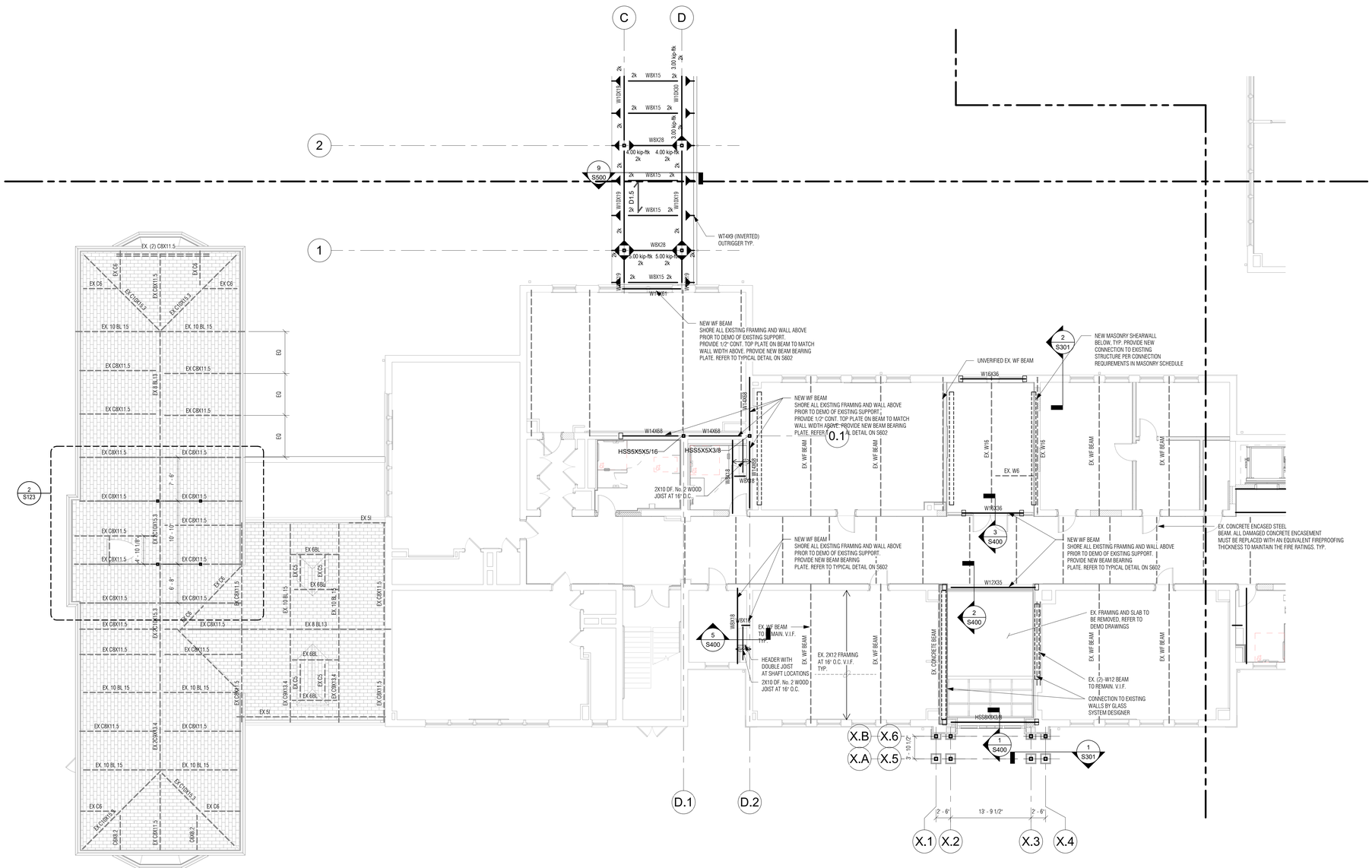


1 SECOND FLOOR FRAMING PLAN - PART "C"

1/8" = 1'-0"

FLOOR FRAMING NOTES

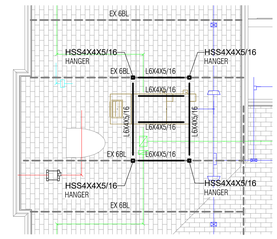
1. CONTRACTOR TO FIELD VERIFY ALL EXISTING FRAMING SIZES, SPACING AND LOCATIONS PRIOR TO SUBMITTING SHOP DRAWINGS
2. REFER TO DRAWING S601 FOR ALL ROOF FRAMES AT OPENINGS. COORDINATE ALL OPENING LOCATIONS WITH ARCHITECTURAL AND MECHANICAL DRAWINGS.
3. REFER TO MECHANICAL AND ARCHITECTURAL DRAWINGS FOR ALL OPENINGS, DRAINS AND EQUIPMENT. PROVIDE FRAMES PER TYPICAL DETAILS.
4. INDICATES MOMENT CONNECTION, REFER TO TYPICAL DETAILS ON DRAWING S601

ROOF CONSTRUCTION NOTES:

1. D1.5 — TYPICAL ROOF CONSTRUCTION: 1 1/2" X 20GA. GALVANIZED TYPE 'B' METAL ROOF DECK, REFER TO GENERAL NOTES FOR FASTENING REQUIREMENTS.

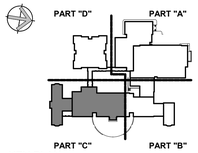
   D1.5A — INDICATES 1 1/2"X20GA. ACOUSTIC GALVANIZED TYPE 'BA' METAL ROOF DECK, REFER TO GENERAL NOTES FOR FASTENING REQUIREMENTS

   D2A — INDICATES 2"X20GA. ACOUSTIC ROOF DECK CEILING SYSTEM, REFER TO GENERAL NOTES FOR FASTENING REQUIREMENTS
2. INDICATES MOMENT CONNECTION, REFER TO TYPICAL DETAILS ON DRAWING S601
3. ALL BEAM FRAMING SHALL HAVE EQUAL SPACING BETWEEN COLUMNS, UNLESS NOTED OTHERWISE.
4. REFER TO DRAWING S601 FOR ALL ROOF FRAMES AT OPENINGS. COORDINATE ALL OPENING LOCATIONS WITH ARCHITECTURAL AND MECHANICAL DRAWINGS.
5. REFER TO MECHANICAL AND ARCHITECTURAL DRAWINGS FOR ALL OPENING, DRAINS AND EQUIPMENT. PROVIDE FRAMES PER TYPICAL DETAILS.
6. CONTRACTOR TO FIELD VERIFY ALL EXISTING FRAMING SIZES, SPACING AND LOCATIONS PRIOR TO SUBMITTING SHOP DRAWINGS
7. PROVIDE W8X18 FRAMING BELOW MECHANICAL EQUIPMENT CURBS. REFER TO MECHANICAL DRAWINGS FOR EQUIPMENT LOCATIONS



2 MECHANICAL UNIT PLATFORM FRAMING PLAN - PART "C" -

1/8" = 1'-0"



KEY PLAN

Project Title:

ADDITIONS & ALTERATION TO:
Old Greenwich Elementary School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

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Revision:	Description:	Date:	Revised By:

Drawing Title: SECOND FLOOR FRAMING PLAN - PART "C"

95% SUBMISSION ISSUE DATE: 08/29/2024

Date: 8/16/2024
Scale: 1/8" = 1'-0"
Drawn By: AC
Project Number: 22-382
Drawing Number: S123

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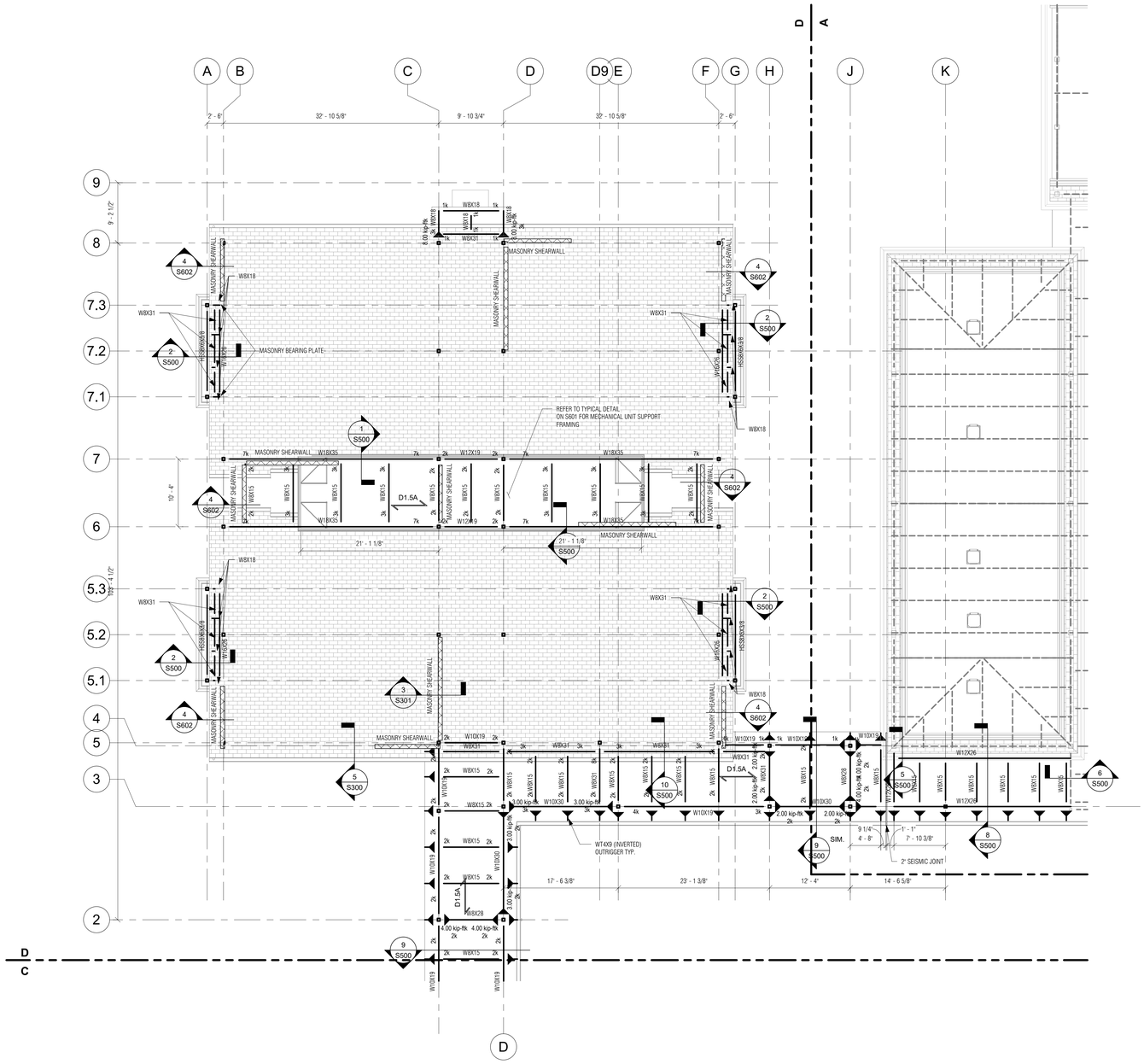
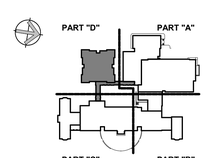


1 SECOND FLOOR FRAMING PLAN - PART "D"
1/8" = 1'-0"

ROOF CONSTRUCTION NOTES:

1. D1.5 — TYPICAL ROOF CONSTRUCTION: 1 1/2" X 20GA. GALVANIZED TYPE "B" METAL ROOF DECK, REFER TO GENERAL NOTES FOR FASTENING REQUIREMENTS.
   D1.5A — INDICATES 1 1/2"X20GA. ACOUSTIC GALVANIZED TYPE "BA" METAL ROOF DECK, REFER TO GENERAL NOTES FOR FASTENING REQUIREMENTS
   D2A — INDICATES 2"X20GA. ACOUSTIC ROOF DECK CEILING SYSTEM, REFER TO GENERAL NOTES FOR FASTENING REQUIREMENTS
2. " — " INDICATES MOMENT CONNECTION, REFER TO TYPICAL DETAILS ON DRAWING S601
3. ALL BEAM FRAMING SHALL HAVE EQUAL SPACING BETWEEN COLUMNS, UNLESS NOTED OTHERWISE.
4. REFER TO DRAWING S601 FOR ALL ROOF FRAMES AT OPENINGS. COORDINATE ALL OPENING LOCATIONS WITH ARCHITECTURAL AND MECHANICAL DRAWINGS.
5. REFER TO MECHANICAL AND ARCHITECTURAL DRAWINGS FOR ALL OPENING, DRAINS AND EQUIPMENT. PROVIDE FRAMES PER TYPICAL DETAILS.
6. CONTRACTOR TO FIELD VERIFY ALL EXISTING FRAMING SIZES, SPACING AND LOCATIONS PRIOR TO SUBMITTING SHOP DRAWINGS.
7. PROVIDE W8X18 FRAMING BELOW MECHANICAL EQUIPMENT CURBS. REFER TO MECHANICAL DRAWINGS FOR EQUIPMENT LOCATIONS



KEY PLAN

Project Title:
ADDITIONS & ALTERATION TO:
Old Greenwich Elementary School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
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780 East Main Street
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Revision: | Description: | Date: | Revised By:

Drawing Title: SECOND FLOOR AND LOW ROOF FRAMING PLAN-AREA D

95% SUBMISSION ISSUE DATE: 08/29/2024

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Drawn By: Author
Project Number: 22-382
Drawing Number: S124

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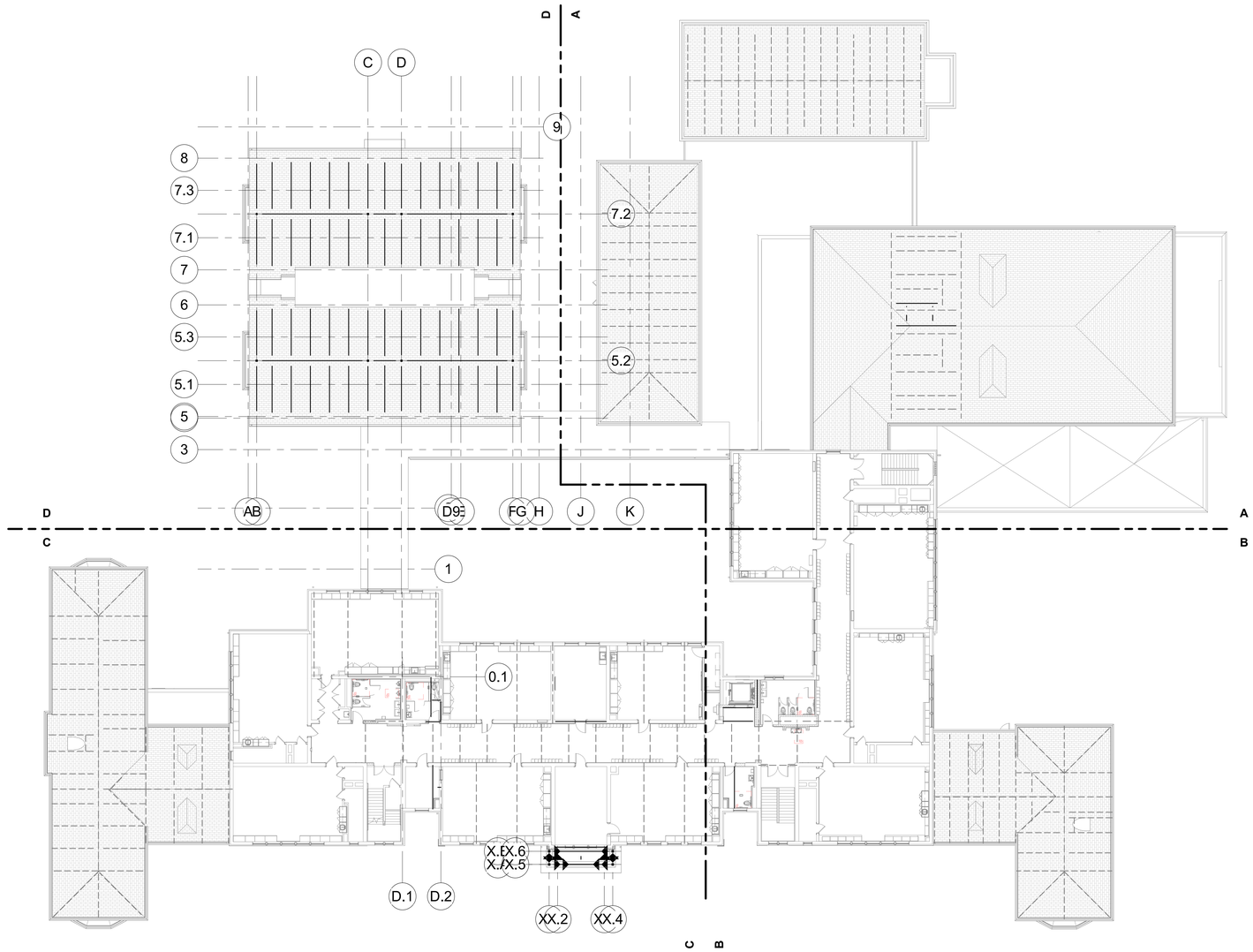


1 OVERALL THIRD FLOOR FRAMING PLAN

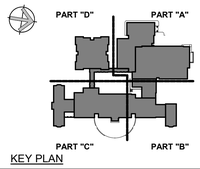
1/16" = 1'-0"

FLOOR FRAMING NOTES

1. CONTRACTOR TO FIELD VERIFY ALL EXISTING FRAMING SIZES, SPACING AND LOCATIONS PRIOR TO SUBMITTING SHOP DRAWINGS
2. REFER TO DRAWING S601 FOR ALL ROOF FRAMES AT OPENINGS. COORDINATE ALL OPENING LOCATIONS WITH ARCHITECTURAL AND MECHANICAL DRAWINGS.
3. REFER TO MECHANICAL AND ARCHITECTURAL DRAWINGS FOR ALL OPENINGS, DRAINS AND EQUIPMENT. PROVIDE FRAMES PER TYPICAL DETAILS.
4. INDICATES MOMENT CONNECTION, REFER TO TYPICAL DETAILS ON DRAWING S601

ROOF CONSTRUCTION NOTES:

1. D1.5 — TYPICAL ROOF CONSTRUCTION: 1 1/2" X 20GA. GALVANIZED TYPE 'B' METAL ROOF DECK, REFER TO GENERAL NOTES FOR FASTENING REQUIREMENTS.
   D1.5A — INDICATES 1 1/2"X20GA. ACOUSTIC GALVANIZED TYPE 'BA' METAL ROOF DECK, REFER TO GENERAL NOTES FOR FASTENING REQUIREMENTS
   D2A — INDICATES 2"X20GA. ACOUSTIC ROOF DECK CEILING SYSTEM, REFER TO GENERAL NOTES FOR FASTENING REQUIREMENTS
2. INDICATES MOMENT CONNECTION, REFER TO TYPICAL DETAILS ON DRAWING S601
3. ALL BEAM FRAMING SHALL HAVE EQUAL SPACING BETWEEN COLUMNS, UNLESS NOTED OTHERWISE.
4. REFER TO DRAWING S601 FOR ALL ROOF FRAMES AT OPENINGS. COORDINATE ALL OPENING LOCATIONS WITH ARCHITECTURAL AND MECHANICAL DRAWINGS.
5. REFER TO MECHANICAL AND ARCHITECTURAL DRAWINGS FOR ALL OPENING, DRAINS AND EQUIPMENT. PROVIDE FRAMES PER TYPICAL DETAILS.
6. CONTRACTOR TO FIELD VERIFY ALL EXISTING FRAMING SIZES, SPACING AND LOCATIONS PRIOR TO SUBMITTING SHOP DRAWINGS
7. PROVIDE W8X18 FRAMING BELOW MECHANICAL EQUIPMENT CURBS. REFER TO MECHANICAL DRAWINGS FOR EQUIPMENT LOCATIONS



KEY PLAN

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Drawing Title: OVERALL THIRD FLOOR FRAMING PLAN

Date: 8/16/2024
Scale: As indicated
Drawn By: AC
Project Number: 22-382
Drawing Number: S130

95% SUBMISSION ISSUE DATE: 08/29/2024

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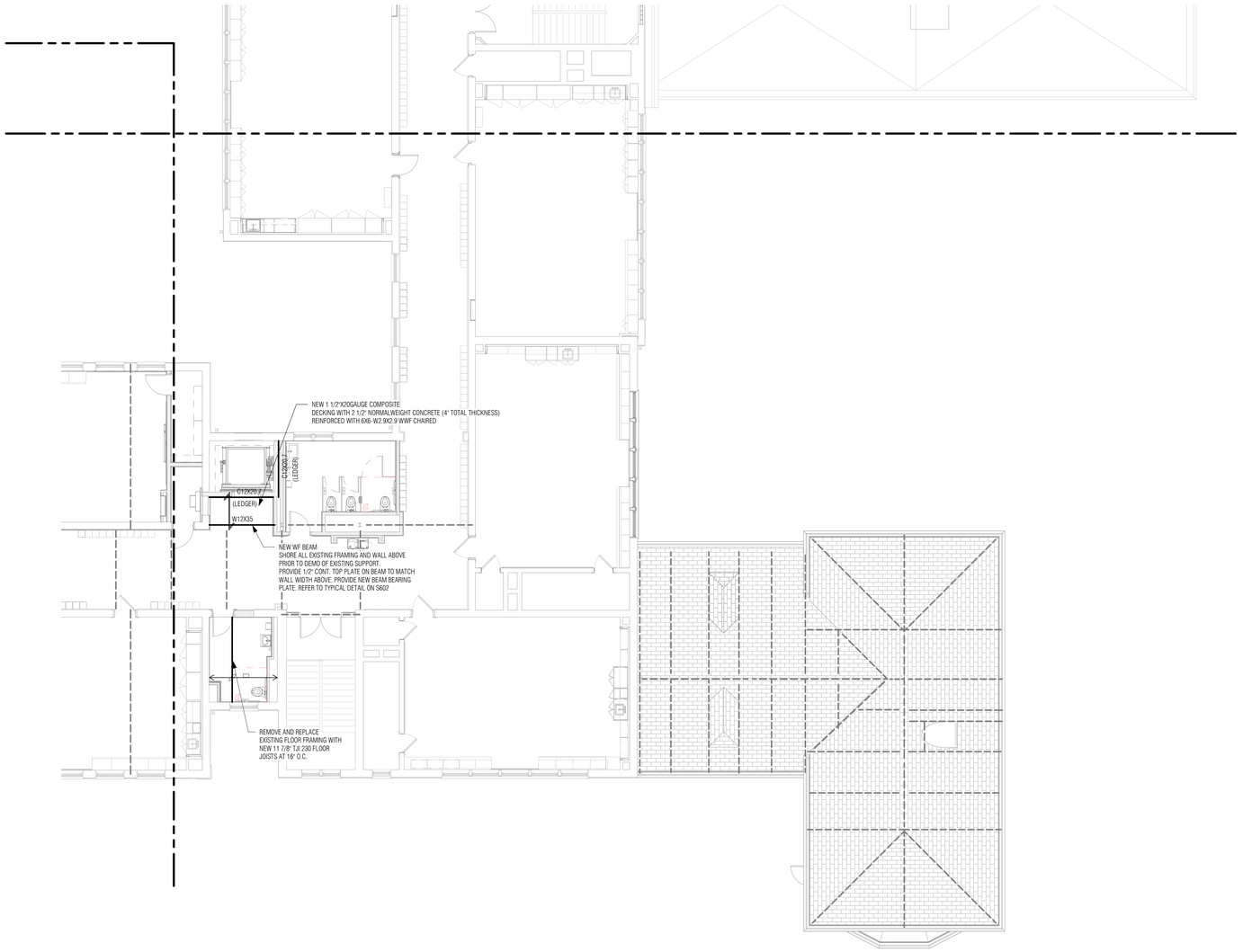
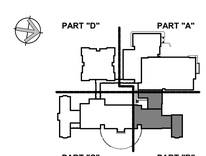


1 THIRD FLOOR FRAMING PLAN - PART "B"

1/8" = 1'-0"

FLOOR FRAMING NOTES

1. CONTRACTOR TO FIELD VERIFY ALL EXISTING FRAMING SIZES, SPACING AND LOCATIONS PRIOR TO SUBMITTING SHOP DRAWINGS
2. REFER TO DRAWING S601 FOR ALL ROOF FRAMES AT OPENINGS. COORDINATE ALL OPENING LOCATIONS WITH ARCHITECTURAL AND MECHANICAL DRAWINGS.
3. REFER TO MECHANICAL AND ARCHITECTURAL DRAWINGS FOR ALL OPENINGS, DRAINS AND EQUIPMENT. PROVIDE FRAMES PER TYPICAL DETAILS.
4. " —◀ " INDICATES MOMENT CONNECTION, REFER TO TYPICAL DETAILS ON DRAWING S601



KEY PLAN

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Revision:	Description:	Date:	Revised By:

Drawing Title: THIRD FLOOR FRAMING PLAN - PART "B"

95% SUBMISSION ISSUE DATE: 08/29/2024

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Scale: 1/8" = 1'-0"
Drawn By: AC
Project Number: 22-382

Drawing Number: S132

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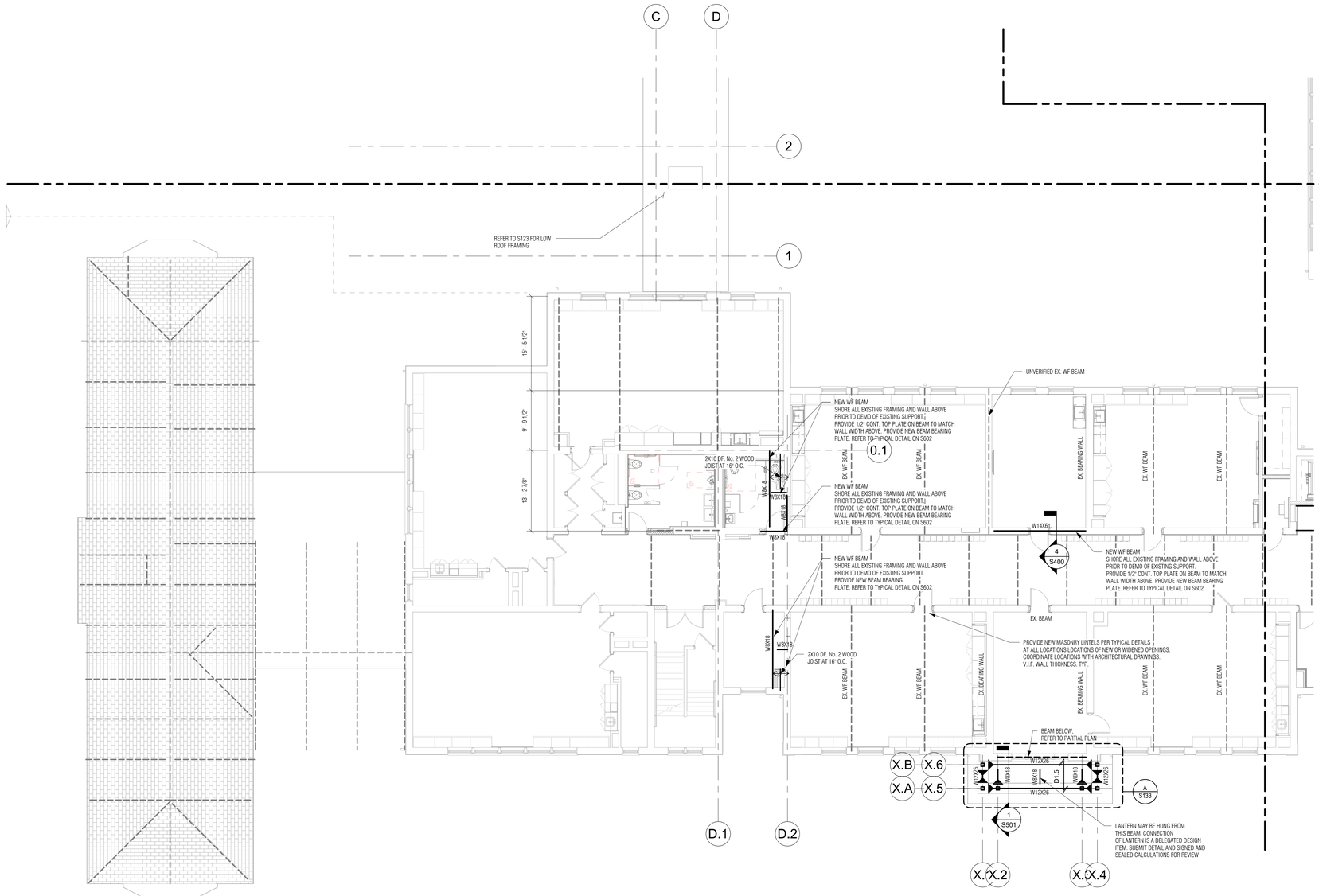

1 THIRD FLOOR FRAMING PLAN - PART "C"

1/8" = 1'-0"

FLOOR FRAMING NOTES

1. CONTRACTOR TO FIELD VERIFY ALL EXISTING FRAMING SIZES, SPACING AND LOCATIONS PRIOR TO SUBMITTING SHOP DRAWINGS
2. REFER TO DRAWING S601 FOR ALL ROOF FRAMES AT OPENINGS. COORDINATE ALL OPENING LOCATIONS WITH ARCHITECTURAL AND MECHANICAL DRAWINGS.
3. REFER TO MECHANICAL AND ARCHITECTURAL DRAWINGS FOR ALL OPENINGS, DRAINS AND EQUIPMENT. PROVIDE FRAMES PER TYPICAL DETAILS.
4. " —◀— " INDICATES MOMENT CONNECTION. REFER TO TYPICAL DETAILS ON DRAWING S601

ROOF CONSTRUCTION NOTES:

1. D1.5 — TYPICAL ROOF CONSTRUCTION: 1 1/2" X 20GA. GALVANIZED TYPE 'B' METAL ROOF DECK, REFER TO GENERAL NOTES FOR FASTENING REQUIREMENTS.

   D1.5A — INDICATES 1 1/2"X20GA. ACOUSTIC GALVANIZED TYPE 'BA' METAL ROOF DECK, REFER TO GENERAL NOTES FOR FASTENING REQUIREMENTS

   D2A — INDICATES 2"X20GA. ACOUSTIC ROOF DECK CEILING SYSTEM. REFER TO GENERAL NOTES FOR FASTENING REQUIREMENTS
2. " —◀— " INDICATES MOMENT CONNECTION. REFER TO TYPICAL DETAILS ON DRAWING S601
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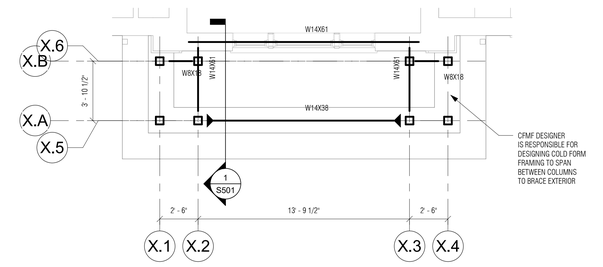
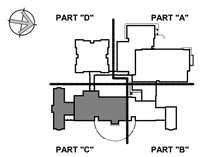
7. PROVIDE W8X18 FRAMING BELOW MECHANICAL EQUIPMENT CURBS. REFER TO MECHANICAL DRAWINGS FOR EQUIPMENT LOCATIONS



A PARTIAL THIRD FLOOR FRAMING PLAN - PART "C"

1/4" = 1'-0"



KEY PLAN

Project Title:

ADDITIONS & ALTERATION TO:
Old Greenwich Elementary School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
311 STATE STREET NEW LONDON CT 06320
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Branford, Connecticut 06405
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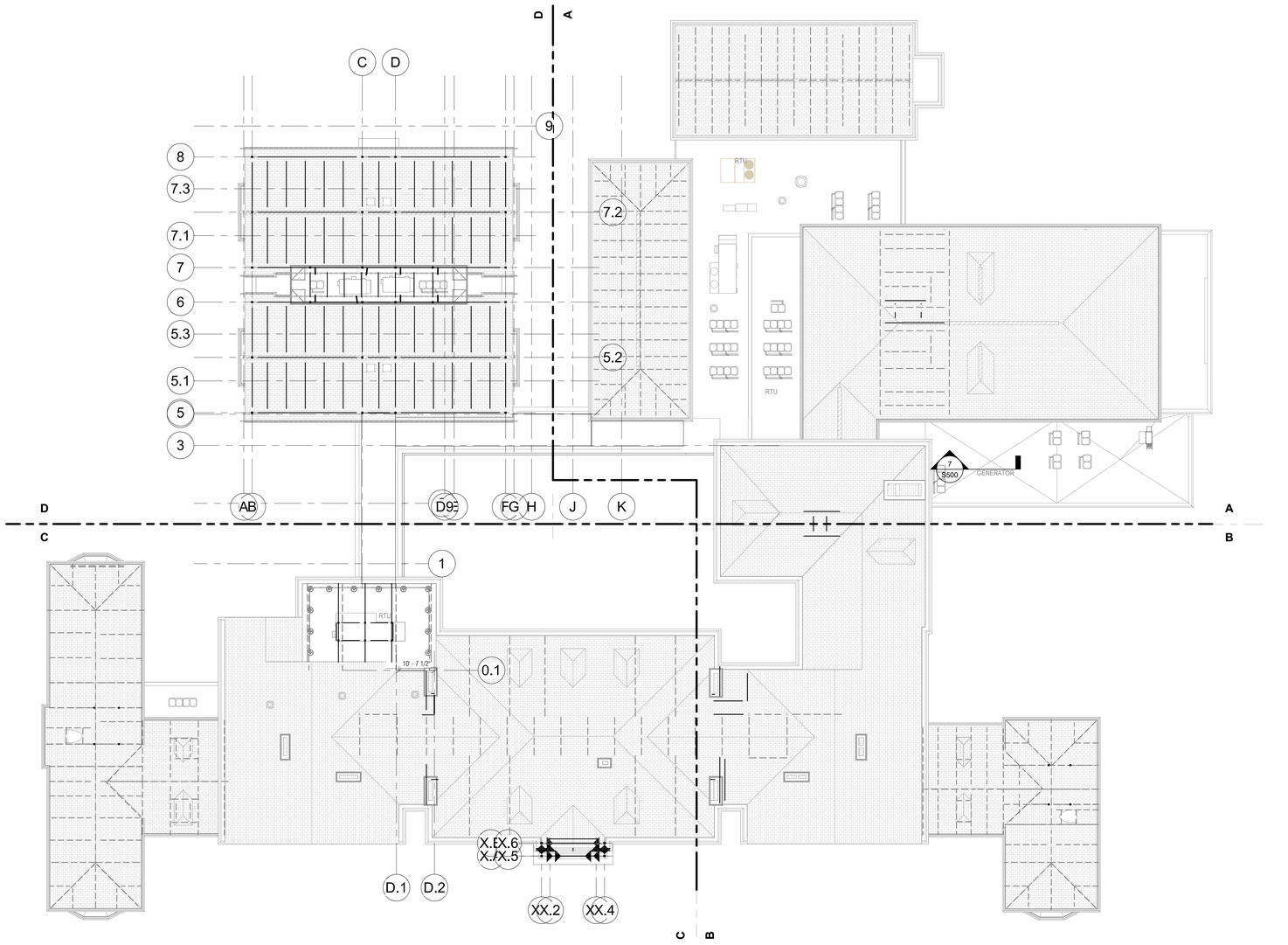
Revision:	Description:	Date:	Revised By:

Drawing Title: THIRD FLOOR FRAMING PLAN - PART "C"

Date: 8/16/2024
Scale: As indicated
Drawn By: AC
Project Number: 22-382
Drawing Number: S133

95% SUBMISSION ISSUE DATE: 08/29/2024

8/29/2024 4:56:12 PM

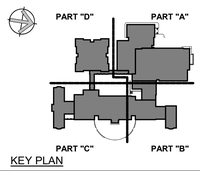


1 OVERALL ROOF FRAMING PLAN

1/16" = 1'-0"

ROOF CONSTRUCTION NOTES:

1. D1.5 — TYPICAL ROOF CONSTRUCTION: 1 1/2" X 20GA. GALVANIZED TYPE 'B' METAL ROOF DECK, REFER TO GENERAL NOTES FOR FASTENING REQUIREMENTS.
   D1.5A — INDICATES 1 1/2"X20GA. ACOUSTIC GALVANIZED TYPE 'BA' METAL ROOF DECK, REFER TO GENERAL NOTES FOR FASTENING REQUIREMENTS
   D2A — INDICATES 2"X20GA. ACOUSTIC ROOF DECK CEILING SYSTEM, REFER TO GENERAL NOTES FOR FASTENING REQUIREMENTS
2. INDICATES MOMENT CONNECTION, REFER TO TYPICAL DETAILS ON DRAWING S601
3. ALL BEAM FRAMING SHALL HAVE EQUAL SPACING BETWEEN COLUMNS, UNLESS NOTED OTHERWISE.
4. REFER TO DRAWING S601 FOR ALL ROOF FRAMES AT OPENINGS. COORDINATE ALL OPENING LOCATIONS WITH ARCHITECTURAL AND MECHANICAL DRAWINGS.
5. REFER TO MECHANICAL AND ARCHITECTURAL DRAWINGS FOR ALL OPENING, DRAINS AND EQUIPMENT. PROVIDE FRAMES PER TYPICAL DETAILS.
6. CONTRACTOR TO FIELD VERIFY ALL EXISTING FRAMING SIZES, SPACING AND LOCATIONS PRIOR TO SUBMITTING SHOP DRAWINGS
7. PROVIDE W8X18 FRAMING BELOW MECHANICAL EQUIPMENT CURBS. REFER TO MECHANICAL DRAWINGS FOR EQUIPMENT LOCATIONS



KEY PLAN

Project Title:

ADDITIONS & ALTERATION TO:
Old Greenwich Elementary School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

SILVER PETRUCELLI + ASSOCIATES
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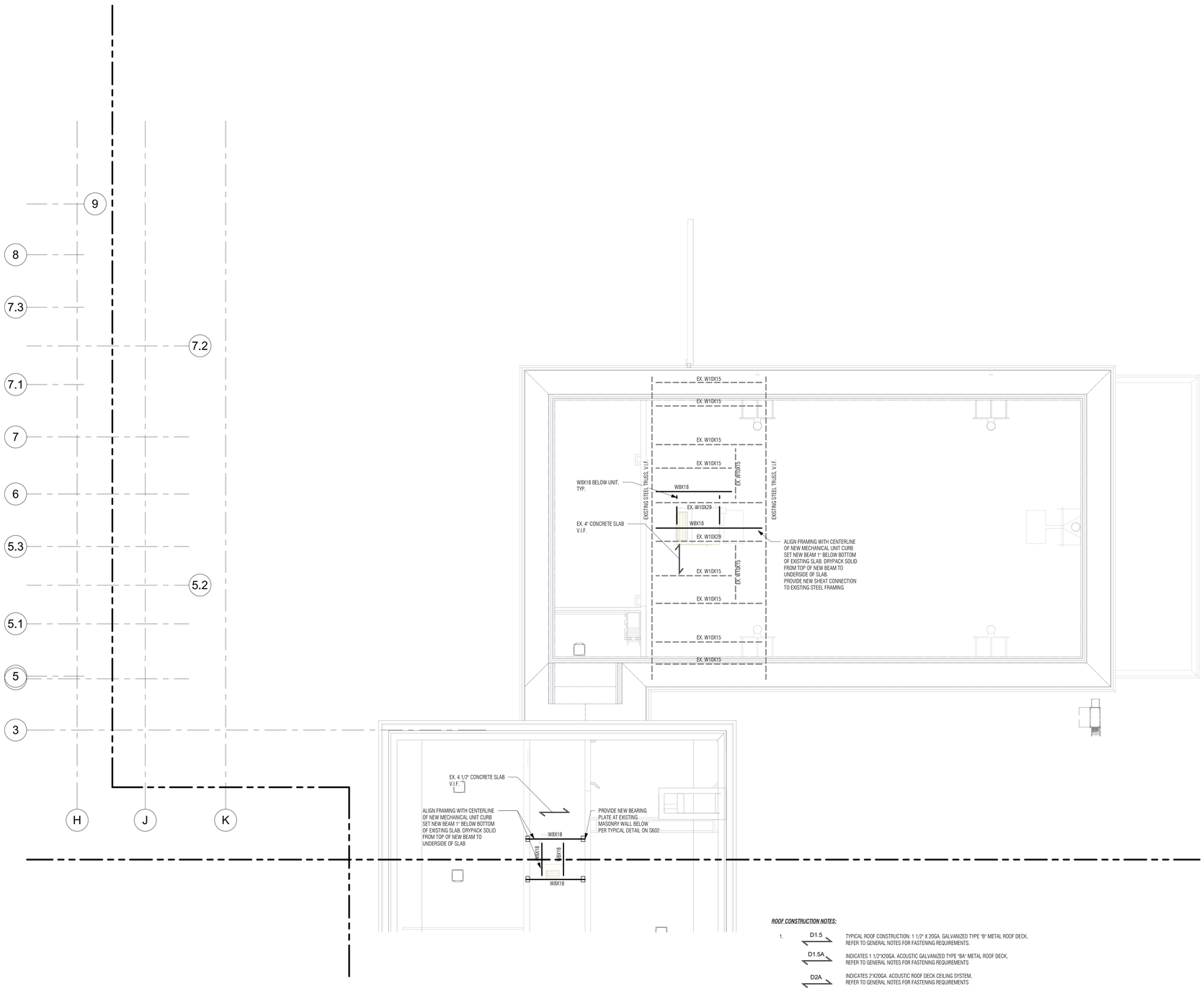
Revision: | Description: | Date: | Revised By:

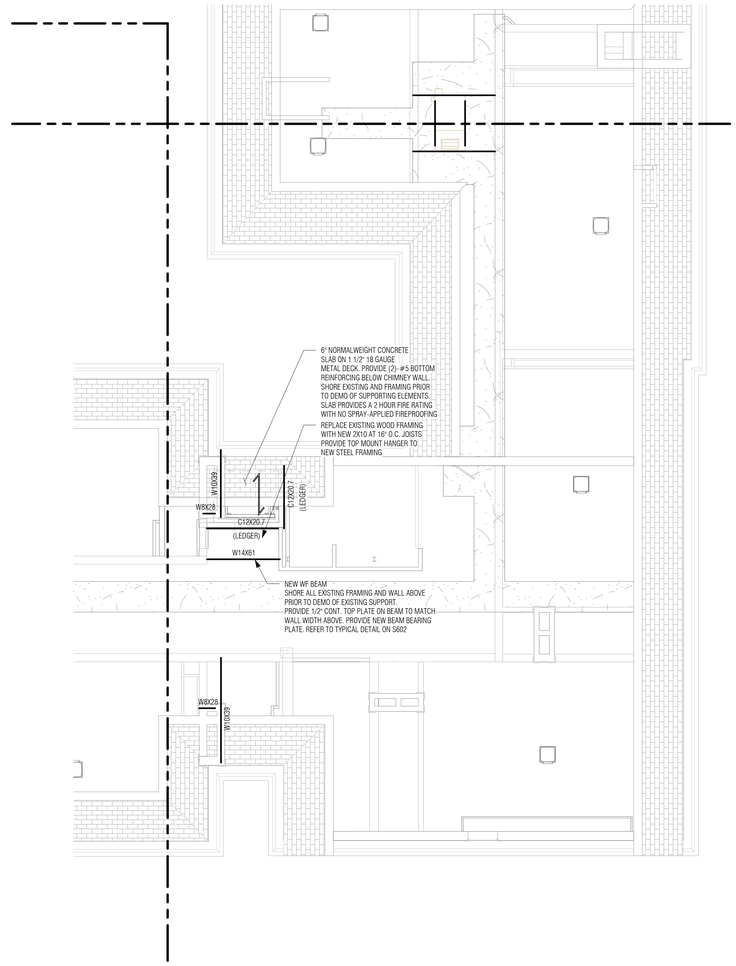
Drawing Title: OVERALL ROOF FRAMING PLAN

Date: 8/16/2024
Scale: As indicated
Drawn By: AC
Project Number: 22-382
Drawing Number: S140

95% SUBMISSION ISSUE DATE: 08/29/2024

8/29/2024 4:56:16 PM


9
8
7.3
7.2
7.1
7
6
5.3
5.2
5.1
5
3
H
J
K
EX. W10X15
EX. W10X15
EX. W10X15

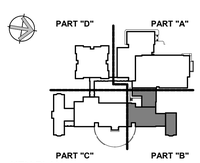


1 ATTIC AND ROOF FRAMING PLAN - PART "B"

1/8" = 1'-0"

ROOF CONSTRUCTION NOTES:

1. D1.5 — TYPICAL ROOF CONSTRUCTION: 1 1/2" X 20GA. GALVANIZED TYPE 'B' METAL ROOF DECK, REFER TO GENERAL NOTES FOR FASTENING REQUIREMENTS.
   D1.5A — INDICATES 1 1/2"X20GA. ACOUSTIC GALVANIZED TYPE 'BA' METAL ROOF DECK, REFER TO GENERAL NOTES FOR FASTENING REQUIREMENTS
   D2A — INDICATES 2"X20GA. ACOUSTIC ROOF DECK CEILING SYSTEM, REFER TO GENERAL NOTES FOR FASTENING REQUIREMENTS
2. INDICATES MOMENT CONNECTION, REFER TO TYPICAL DETAILS ON DRAWING S601
3. ALL BEAM FRAMING SHALL HAVE EQUAL SPACING BETWEEN COLUMNS, UNLESS NOTED OTHERWISE.
4. REFER TO DRAWING S601 FOR ALL ROOF FRAMES AT OPENINGS. COORDINATE ALL OPENING LOCATIONS WITH ARCHITECTURAL AND MECHANICAL DRAWINGS.
5. REFER TO MECHANICAL AND ARCHITECTURAL DRAWINGS FOR ALL OPENING, DRAINS AND EQUIPMENT. PROVIDE FRAMES PER TYPICAL DETAILS.
6. CONTRACTOR TO FIELD VERIFY ALL EXISTING FRAMING SIZES, SPACING AND LOCATIONS PRIOR TO SUBMITTING SHOP DRAWINGS
7. PROVIDE W8X18 FRAMING BELOW MECHANICAL EQUIPMENT CURBS. REFER TO MECHANICAL DRAWINGS FOR EQUIPMENT LOCATIONS



KEY PLAN

Project Title:

ADDITIONS & ALTERATION TO:
Old Greenwich Elementary School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

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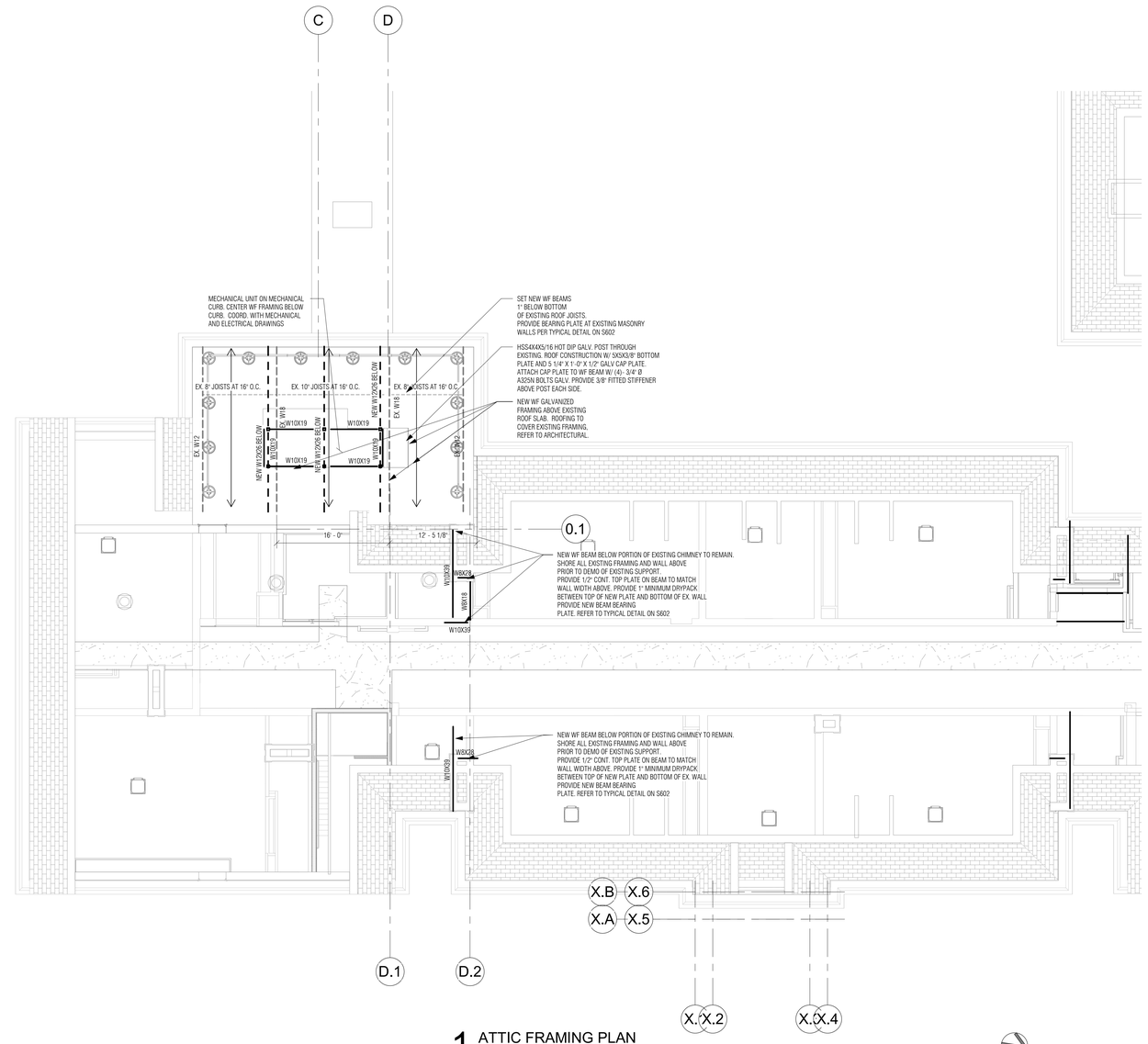
Revision:	Description:	Date:	Revised By:

Drawing Title: ATTIC AND ROOF FRAMING PLAN - PART "B"

95% SUBMISSION ISSUE DATE: 08/29/2024

Date: 8/16/2024
Scale: 1/8" = 1'-0"
Drawn By: AC
Project Number: 22-382
Drawing Number: S142

8/29/2024 4:56:19 PM

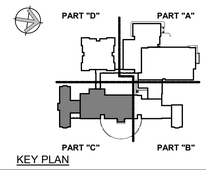


1 ATTIC FRAMING PLAN

1/8" = 1'-0"

ROOF CONSTRUCTION NOTES:

1. D1.5 — TYPICAL ROOF CONSTRUCTION: 1 1/2" X 20GA. GALVANIZED TYPE 'B' METAL ROOF DECK. REFER TO GENERAL NOTES FOR FASTENING REQUIREMENTS.
   D1.5A — INDICATES 1 1/2"X20GA. ACOUSTIC GALVANIZED TYPE 'BA' METAL ROOF DECK. REFER TO GENERAL NOTES FOR FASTENING REQUIREMENTS
   D2A — INDICATES 2"X20GA. ACOUSTIC ROOF DECK CEILING SYSTEM. REFER TO GENERAL NOTES FOR FASTENING REQUIREMENTS
2. INDICATES MOMENT CONNECTION. REFER TO TYPICAL DETAILS ON DRAWING S601
3. ALL BEAM FRAMING SHALL HAVE EQUAL SPACING BETWEEN COLUMNS, UNLESS NOTED OTHERWISE.
4. REFER TO DRAWING S601 FOR ALL ROOF FRAMES AT OPENINGS. COORDINATE ALL OPENING LOCATIONS WITH ARCHITECTURAL AND MECHANICAL DRAWINGS.
5. REFER TO MECHANICAL AND ARCHITECTURAL DRAWINGS FOR ALL OPENING, DRAINS AND EQUIPMENT. PROVIDE FRAMES PER TYPICAL DETAILS.
6. CONTRACTOR TO FIELD VERIFY ALL EXISTING FRAMING SIZES, SPACING AND LOCATIONS PRIOR TO SUBMITTING SHOP DRAWINGS
7. PROVIDE W8X18 FRAMING BELOW MECHANICAL EQUIPMENT CURBS. REFER TO MECHANICAL DRAWINGS FOR EQUIPMENT LOCATIONS



KEY PLAN

Project Title:

ADDITIONS & ALTERATION TO:
Old Greenwich Elementary School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

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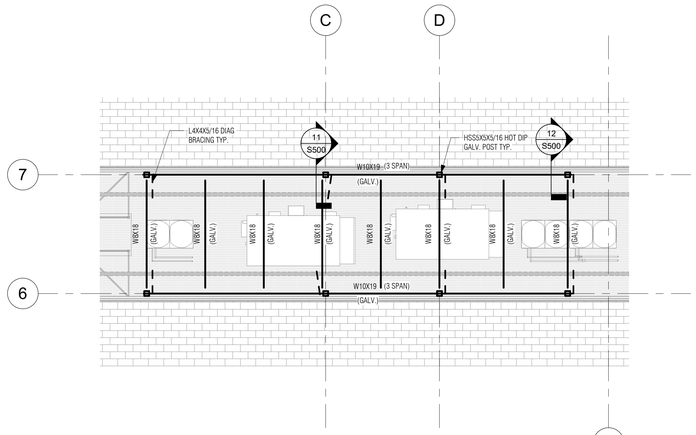
Revision:	Description:	Date:	Revised By:

Drawing Title: ATTIC AND ROOF FRAMING PLAN - PART "C"

95% SUBMISSION ISSUE DATE: 08/29/2024

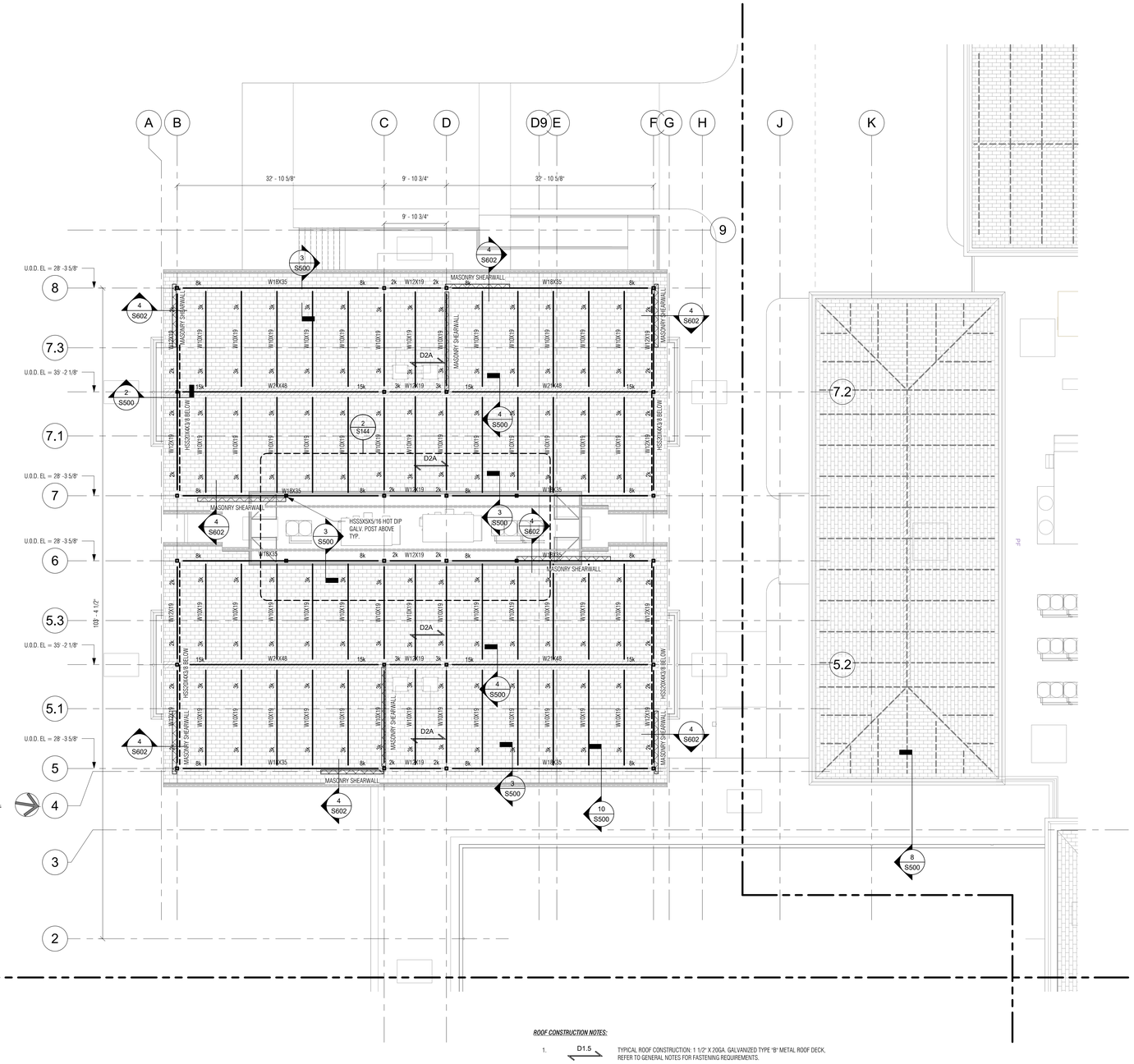
Date: 8/16/2024
Scale: 1/8" = 1'-0"
Drawn By: AC
Project Number: 22-382
Drawing Number: S143

8/29/2024 4:56:20 PM



2 DUNNAGE FRAMING PLAN

3/16" = 1'-0"

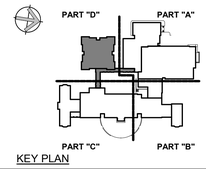


1 ROOF FRAMING PLAN - PART "D"

1/8" = 1'-0"

ROOF CONSTRUCTION NOTES:

1. D1.5 — TYPICAL ROOF CONSTRUCTION: 1 1/2" X 20GA. GALVANIZED TYPE 'B' METAL ROOF DECK. REFER TO GENERAL NOTES FOR FASTENING REQUIREMENTS.
   D1.5A — INDICATES 1 1/2"X20GA. ACOUSTIC GALVANIZED TYPE 'BA' METAL ROOF DECK. REFER TO GENERAL NOTES FOR FASTENING REQUIREMENTS
   D2A — INDICATES 2"X20GA. ACOUSTIC ROOF DECK CEILING SYSTEM. REFER TO GENERAL NOTES FOR FASTENING REQUIREMENTS
2. INDICATES MOMENT CONNECTION. REFER TO TYPICAL DETAILS ON DRAWING S601
3. ALL BEAM FRAMING SHALL HAVE EQUAL SPACING BETWEEN COLUMNS, UNLESS NOTED OTHERWISE.
4. REFER TO DRAWING S601 FOR ALL ROOF FRAMES AT OPENINGS. COORDINATE ALL OPENING LOCATIONS WITH ARCHITECTURAL AND MECHANICAL DRAWINGS.
5. REFER TO MECHANICAL AND ARCHITECTURAL DRAWINGS FOR ALL OPENING, DRAINS AND EQUIPMENT. PROVIDE FRAMES PER TYPICAL DETAILS.
6. CONTRACTOR TO FIELD VERIFY ALL EXISTING FRAMING SIZES, SPACING AND LOCATIONS PRIOR TO SUBMITTING SHOP DRAWINGS
7. PROVIDE W8X18 FRAMING BELOW MECHANICAL EQUIPMENT CURBS. REFER TO MECHANICAL DRAWINGS FOR EQUIPMENT LOCATIONS



KEY PLAN

Project Title:

ADDITIONS & ALTERATION TO:
Old Greenwich Elementary School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
311 STATE STREET NEW LONDON CT 06320
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780 East Main Street
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Revision: | Description: | Date: | Revised By:

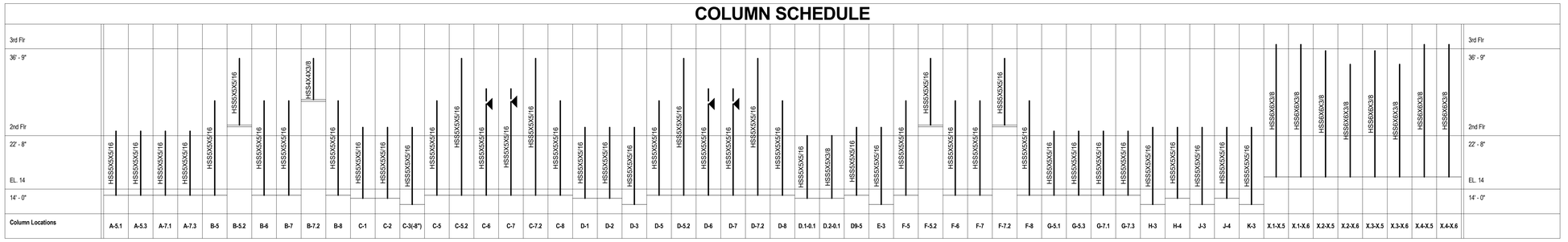
Drawing Title: ROOF FRAMING PLAN - PART "D"

95% SUBMISSION ISSUE DATE: 08/29/2024

Date: 8/16/2024
Scale: As indicated
Drawn By: AC
Project Number: 22-382
Drawing Number: S144

8/29/2024 4:56:22 PM

COLUMN SCHEDULE

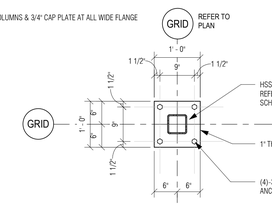


COLUMN PIER SCHEDULE			
GRID	T/CONC	BASE PLATE	PIER
A-5.1	13' - 0"	BP-2	P3
A-5.3	13' - 0"	BP-2	P3
A-7.1	13' - 0"	BP-2	P3
A-7.3	13' - 0"	BP-2	P3
B-5	13' - 0"	BP-1	P2
B-6	13' - 0"	BP-1	P2
B-7	13' - 0"	BP-1	P2
B-8	13' - 0"	BP-1	P2
C-1	12' - 6"	BP-1	P1
C-2	12' - 6"	BP-1	P1
C-3(-8")	11' - 6"	BP-1	P1
C-5	13' - 0"	BP-1	P2
C-5.2	13' - 0"	BP-1	P1
C-6	13' - 0"	BP-1	P1
C-7	13' - 0"	BP-1	P1
C-7.2	13' - 0"	BP-1	P1
C-8	13' - 0"	BP-1	P2
D9-5	13' - 0"	BP-1	P1
D-1	12' - 6"	BP-1	P1
D-2	12' - 6"	BP-1	P1
D-3	11' - 6"	BP-1	P1
D-5	13' - 0"	BP-1	P1
D-5.2	13' - 0"	BP-1	P1
D-6	13' - 0"	BP-1	P1
D-7	13' - 0"	BP-1	P1
D-7.2	13' - 0"	BP-1	P1
D-8	13' - 0"	BP-1	P2
E-3	11' - 6"	BP-1	P1
F-5	13' - 0"	BP-1	P2
F-6	13' - 0"	BP-1	P2
F-7	13' - 0"	BP-1	P2
F-8	13' - 0"	BP-1	P2
G-5.1	13' - 0"	BP-2	P3
G-5.3	13' - 0"	BP-2	P3
G-7.1	13' - 0"	BP-2	P3
G-7.3	13' - 0"	BP-2	P3
H-3	11' - 6"	BP-1	P1
H-4	12' - 6"	BP-1	P1
J-3	11' - 6"	BP-1	P1
J-4	12' - 6"	BP-1	P1
K-3	11' - 6"	BP-1	P1
X.1-X.5	15' - 11 5/8"	BP-1	P4
X.1-X.6	15' - 11 5/8"	BP-1	P4
X.2-X.5	15' - 11 5/8"	BP-1	P4
X.2-X.6	15' - 11 5/8"	BP-1	P4
X.3-X.5	15' - 11 5/8"	BP-3	P4
X.3-X.6	15' - 11 5/8"	BP-3	P4
X.4-X.5	15' - 11 5/8"	BP-3	P4
X.4-X.6	15' - 11 5/8"	BP-3	P4

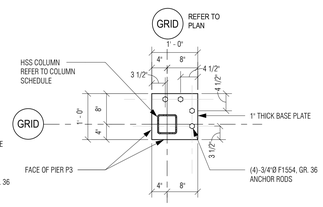
NOTE:
1. IF NO PIER DETAIL DESIGNATION IS GIVEN. COLUMN SITS DIRECTLY ON FOOTING OR STEEL BEAM.
2. REFER TO DRAWING S200 FOR BASE PLATE DETAILS

COLUMN SCHEDULE NOTES:

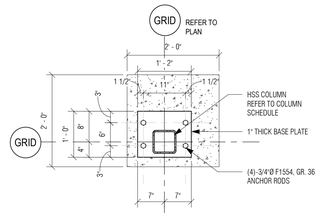
1. LINE AT BOTTOM OF COLUMN INDICATES BOTTOM OF STEEL BASE PLATE. ADD 2" FOR GROUT AND LEVELING NUTS FOR TOP OF CONCRETE ELEVATION SEE COLUMN PIER SCHEDULE. IF NO PIER DETAIL IS GIVEN. COLUMN SITS DIRECTLY ON FOOTING OR STEEL BEAM.
2. APPROXIMATE TOP OF COLUMN ELEVATION. FOR ACTUAL ELEVATION SEE PLANS AND SECTIONS.
3. PROVIDE 1/4" CAP PLATE AT ALL HSS COLUMNS & 3/4" CAP PLATE AT ALL WIDE FLANGE COLUMNS UNLESS OTHERWISE NOTED.



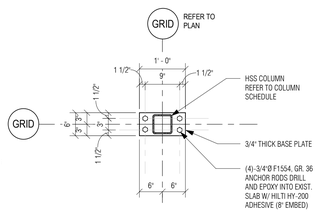
BASE PLATE BP-1



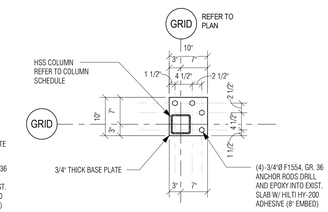
BASE PLATE BP-2



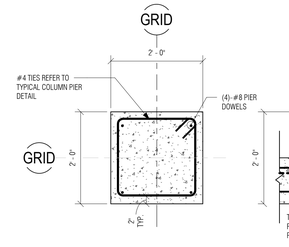
BASE PLATE BP-3



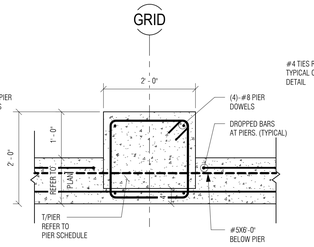
BASE PLATE BP-4



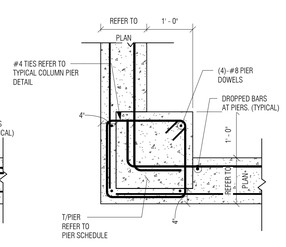
BASE PLATE BP-5



BETWEEN WALLS



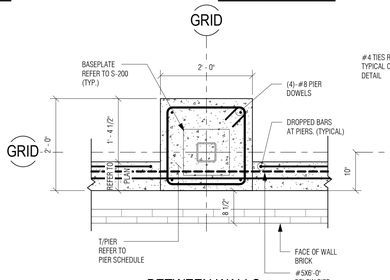
BETWEEN WALLS



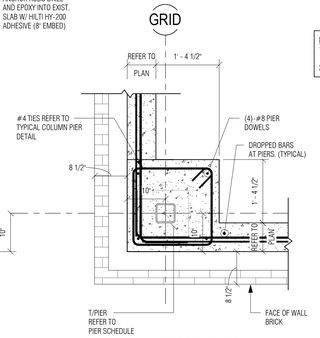
AT CORNERS

P1 PIER DETAIL

3/4" = 1'-0" REFERENCE:



BETWEEN WALLS

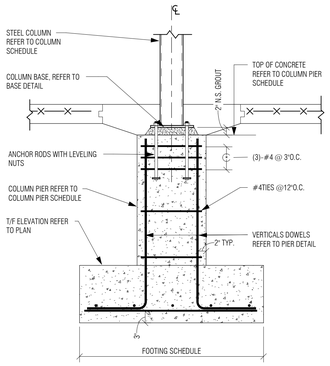


AT CORNERS

P2 PIER DETAIL

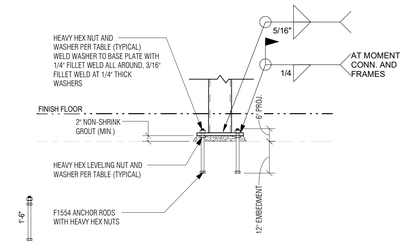
3/4" = 1'-0" REFERENCE:

RECOMMENDED SIZES FOR ANCHOR ROD HOLES IN BASE PLATES			
Anchor Rod Diameter, in.	Hole Diameter, in.	Min. Washer Dimension, in.	Min. Washer Thickness, in.
3/4"	1 5/16"	2"	1/4"
7/8"	1 9/16"	2 1/2"	5/16"
1"	1 13/16"	3"	3/8"
1 1/4"	2 1/16"	3"	1/2"
1 1/2"	2 5/16"	3 1/2"	1/2"



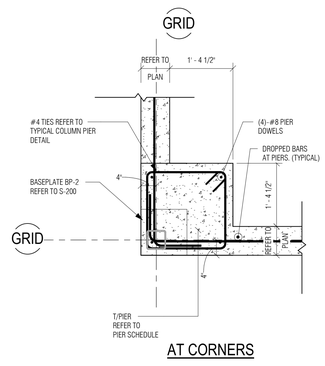
1 TYPICAL COLUMN PIER DETAIL

3/4" = 1'-0" REFERENCE:



3 TYPICAL COLUMN BASE PLATE DETAIL

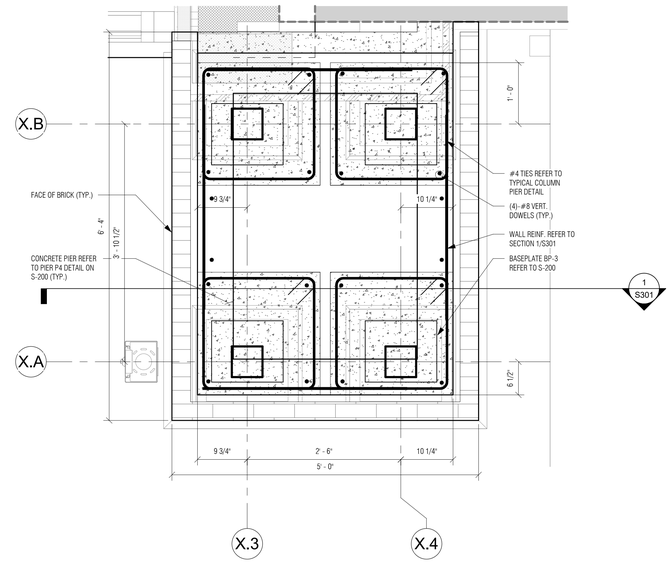
3/4" = 1'-0" REFERENCE:



AT CORNERS

P3 PIER DETAIL

3/4" = 1'-0" REFERENCE:



P4 PIER DETAIL

1" = 1'-0" REFERENCE: 1/ S113

Project Title:
ADDITIONS & ALTERATION TO:
Old Greenwich Elementary School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
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MHAI Michael Horton Associates Inc.
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203-481-8600 mha-eng.com

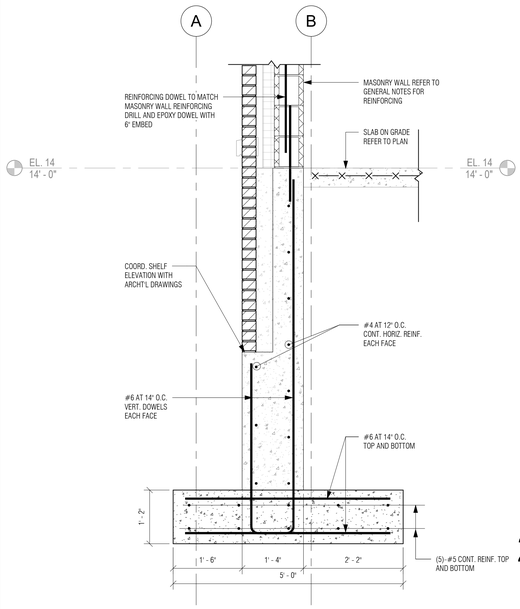
Revision: Description: Date: Revised By:

Drawing Title: COLUMN SCHEDULE AND DETAILS

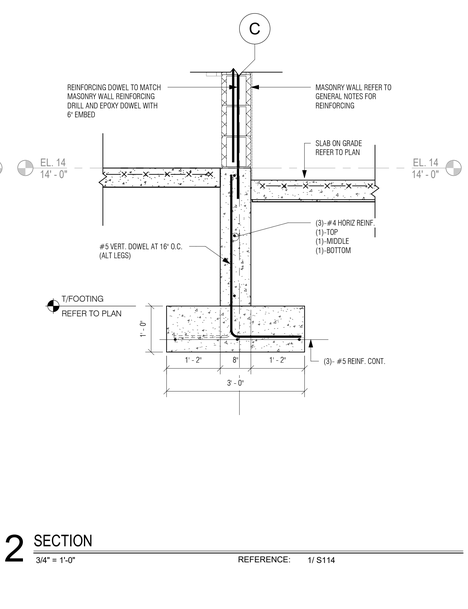
Date: 8/16/2024
Scale: As indicated
Drawn By: AC
Project Number: 22-382
Drawing Number: S200

95% SUBMISSION ISSUE DATE: 08/29/2024

8/29/2024 4:56:23 PM



1 SECTION
3/4" = 1'-0" REFERENCE: 1/ S114



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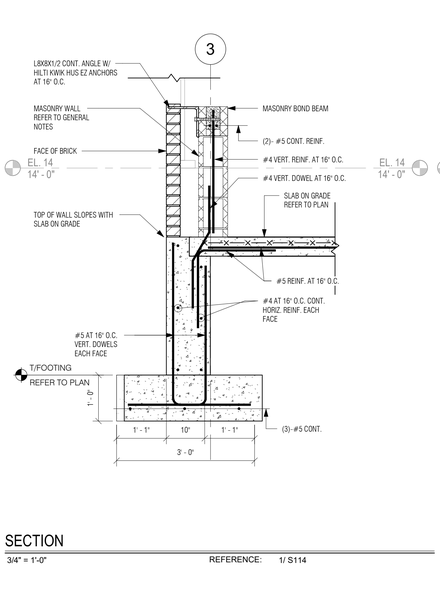
3/4" = 1'-0" REFERENCE: 1/ S114



3 SECTION
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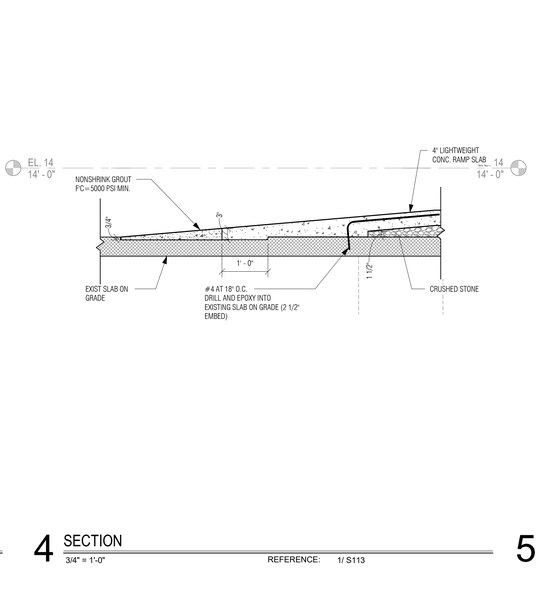
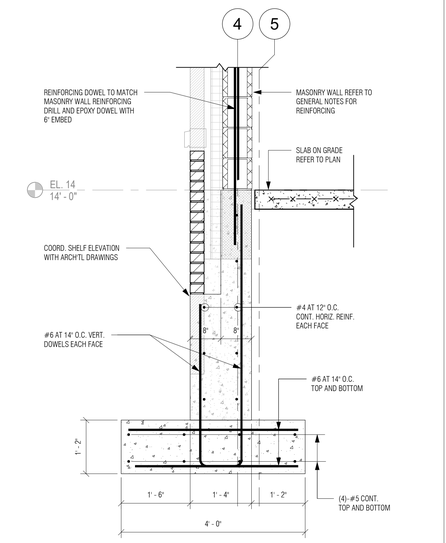
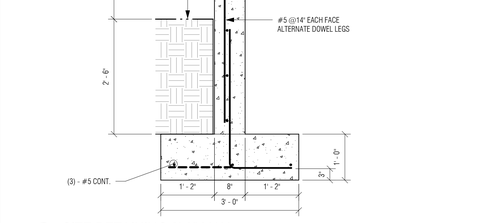


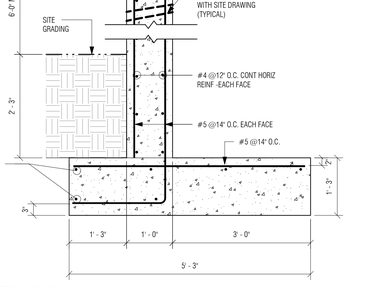
4 SECTION
3/4" = 1'-0" REFERENCE: 1/ S113



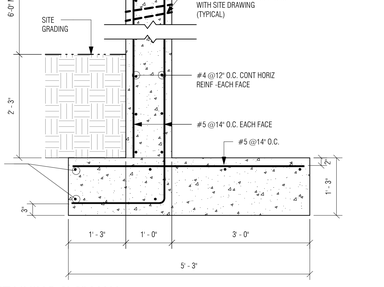
5 SECTION
3/4" = 1'-0" REFERENCE: 1/ S114



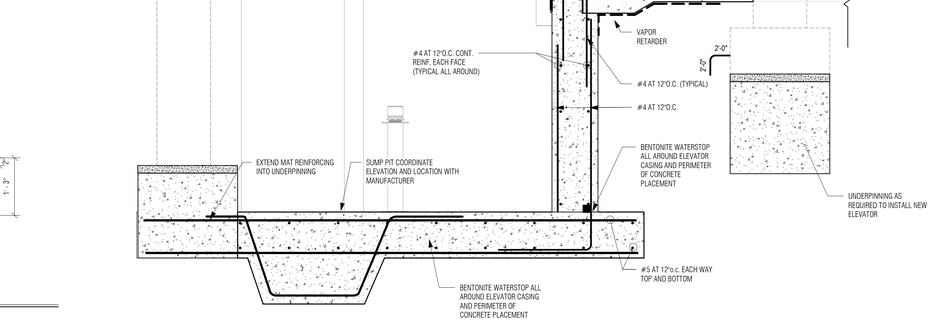
6 SITE RETAINING 2'-0" MAX
3/4" = 1'-0" REFERENCE:



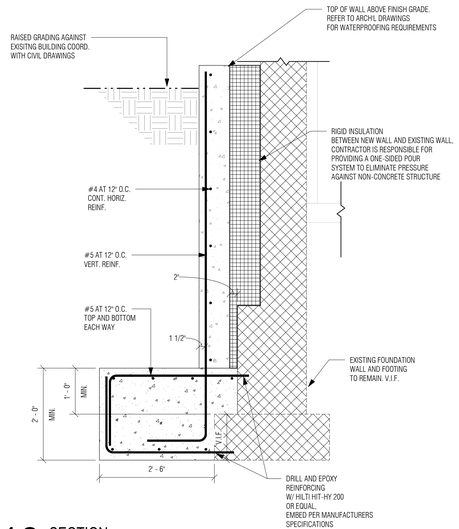
7 SITE RETAINING 4'-0" WALL
3/4" = 1'-0" REFERENCE:



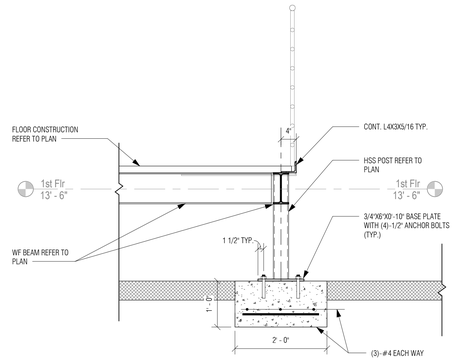
8 SITE RETAINING 6'-0" MAX
3/4" = 1'-0" REFERENCE:



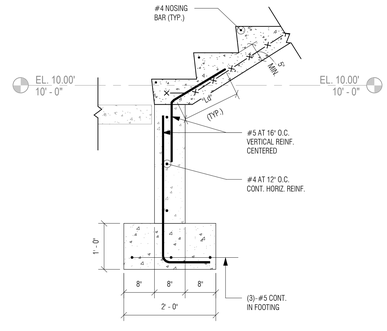
9 SECTION
3/4" = 1'-0" REFERENCE: 1/ S112



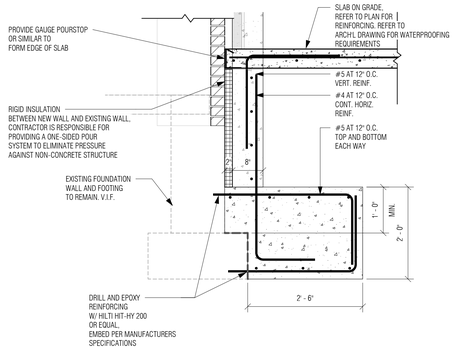
10 SECTION
3/4" = 1'-0" REFERENCE: 1/ S111



11 SECTION
3/4" = 1'-0" REFERENCE: 1/ S111



12 SECTION
3/4" = 1'-0" REFERENCE: 1/ S114



13 SECTION
3/4" = 1'-0" REFERENCE: 1/ S111

Project Title:

ADDITIONS & ALTERATION TO:
Old Greenwich Elementary School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

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3190 WHITNEY AVENUE HAMDEN CT 06518
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Consulting Structural Intel Engineers
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203-481-8600 mha-eng.com

Revision: Description: Date: Revised By:

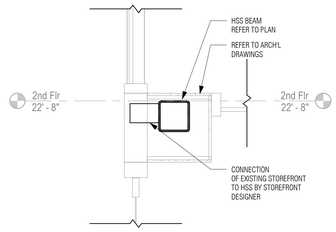
Drawing Title: FOUNDATION SECTIONS

Date: 8/16/2024
Scale: 3/4" = 1'-0"
Drawn By: AC
Project Number: 22-382

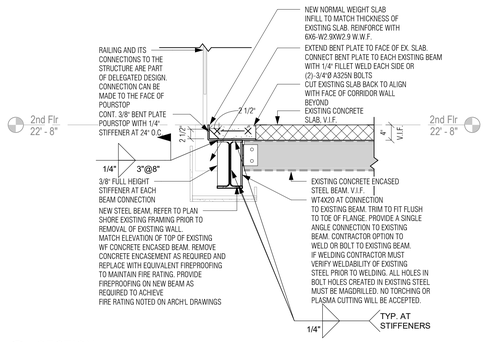
Drawing Number: S300

95% SUBMISSION ISSUE DATE: 08/29/2024

8/29/2024 4:56:27 PM



1 SECTION
3/4" = 1'-0" REFERENCE: 1/ S123



2 SECTION
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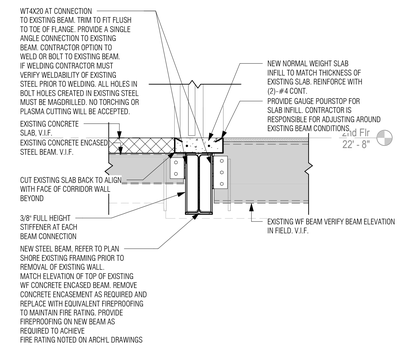
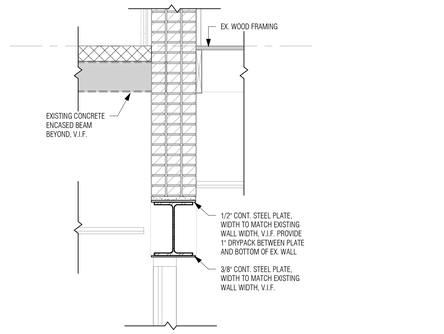
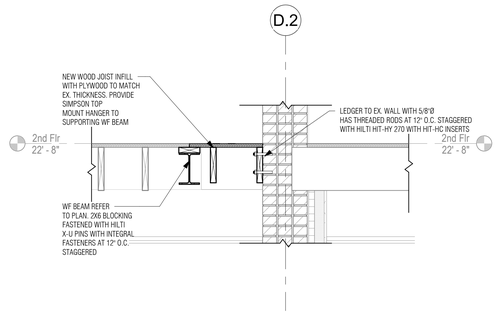


3 SECTION
3/4" = 1'-0" REFERENCE: 1/ S123



4 SECTION
3/4" = 1'-0" REFERENCE: 1/ S133



5 SECTION
3/4" = 1'-0" REFERENCE: 1/ S123

Project Title:

ADDITIONS & ALTERATION TO:
Old Greenwich Elementary School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
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MHAI
Michael Horton Associates Inc.
Consulting Structural Engineers
780 East Main Street
Branford, Connecticut 06405
203-481-8600 mha-eng.com

Revision:	Description:	Date:	Revised By:

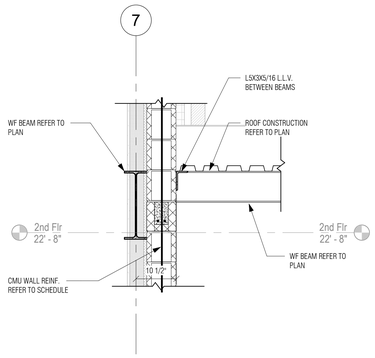
Drawing Title: FLOOR SECTIONS

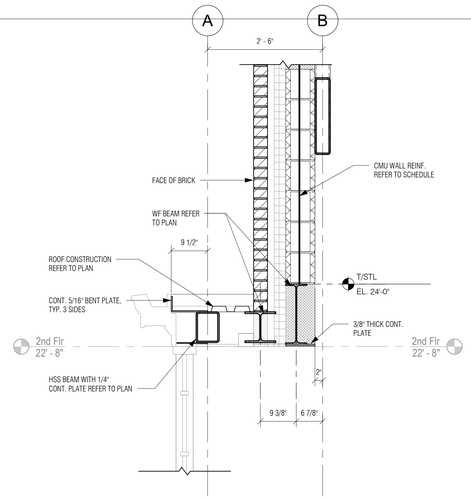
95% SUBMISSION ISSUE DATE: 08/29/2024

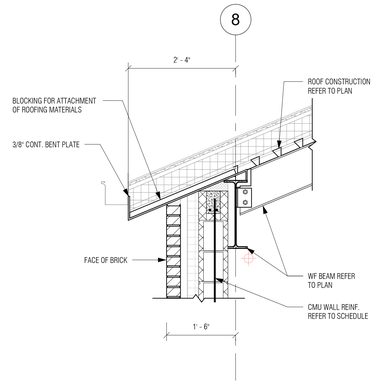
Date: 8/16/2024
Scale: 3/4" = 1'-0"
Drawn By: AC
Project Number: 22-382

Drawing Number: S400

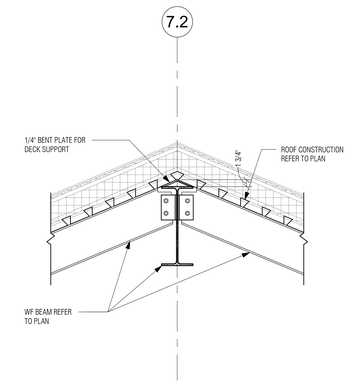
8/29/2024 4:56:31 PM





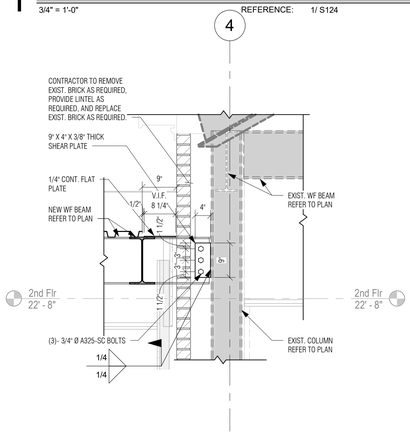


3 SECTION
3/4" = 1'-0" REFERENCE: 1/ S144

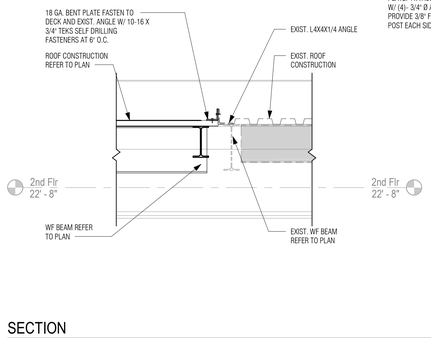


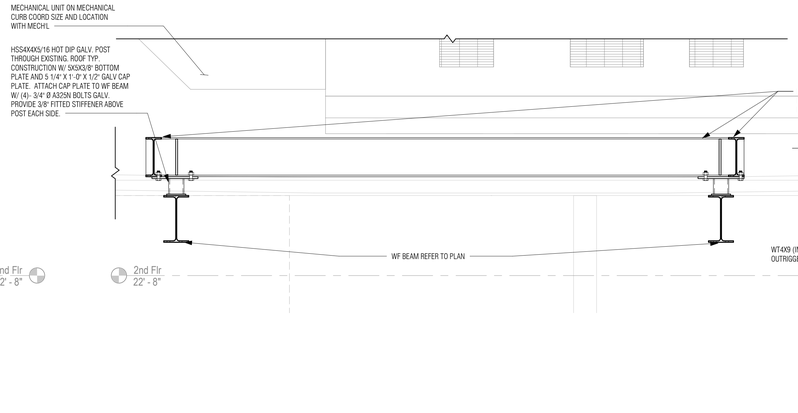
4 SECTION
3/4" = 1'-0" REFERENCE: 1/ S144

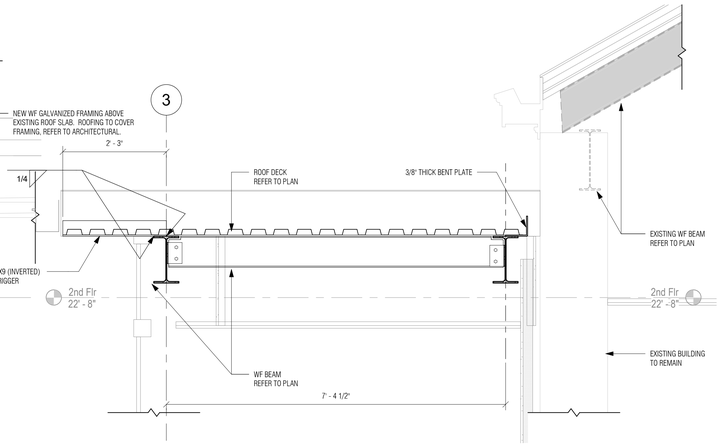
1 SECTION
3/4" = 1'-0" REFERENCE: 1/ S124



2 SECTION
3/4" = 1'-0" REFERENCE: 1/ S124

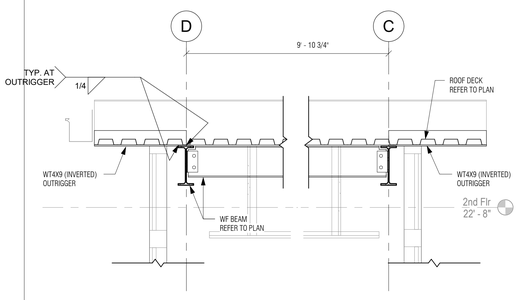




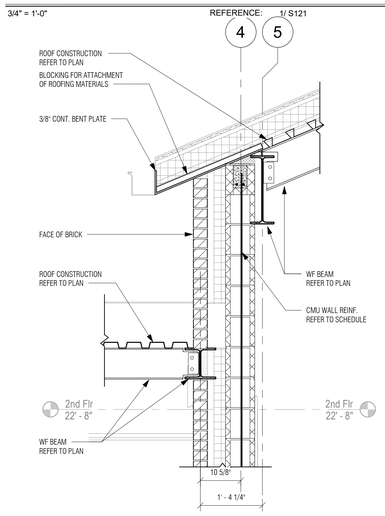


8 SECTION
3/4" = 1'-0" REFERENCE: 1/ S121

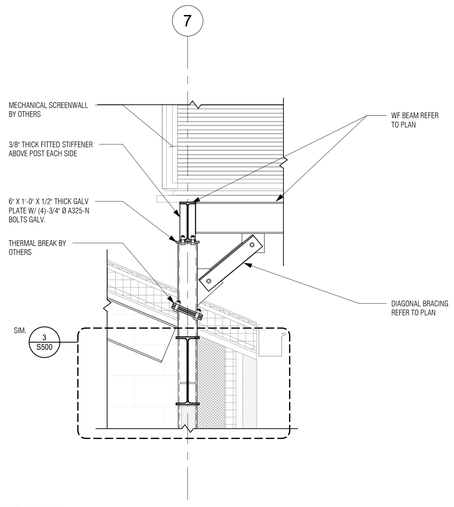
5 SECTION
3/4" = 1'-0" REFERENCE: 1/ S121

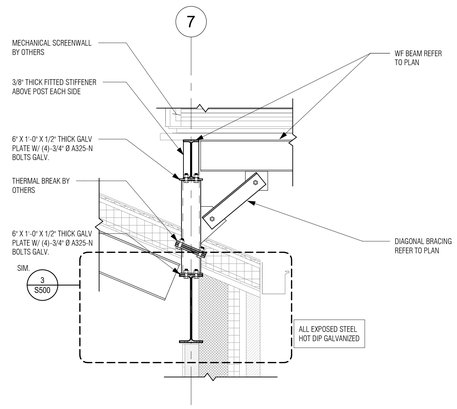


6 SECTION
3/4" = 1'-0" REFERENCE: 1/ S121



7 SECTION
3/4" = 1'-0" REFERENCE: 1/ S120





9 SECTION
3/4" = 1'-0" REFERENCE: 1/ S120

10 SECTION
3/4" = 1'-0" REFERENCE: 1/ S124

11 SECTION
3/4" = 1'-0" REFERENCE: 2/ S144

12 SECTION
3/4" = 1'-0" REFERENCE: 2/ S144

Project Title:

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311 STATE STREET NEW LONDON CT 06320
203 230 9007 silverpetrucelli.com

Revision:	Description:	Date:	Revised By:

MHAI
Michael Horton Associates Inc.
Consulting Structural Engineers
780 East Main Street
Branford, Connecticut 06405
203-481-8600 mha-eng.com

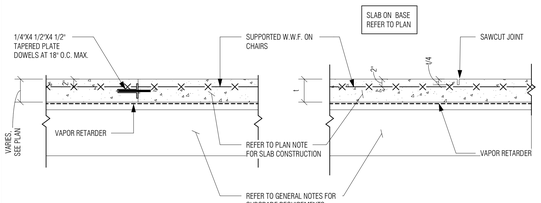
Drawing Title: ROOF SECTIONS

Date: 8/16/2024
Scale: 3/4" = 1'-0"
Drawn By: AC
Project Number: 22-382

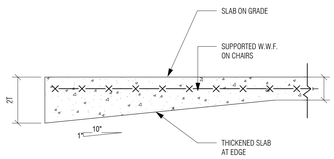
Drawing Number: S500

95% SUBMISSION ISSUE DATE: 08/29/2024

8/29/2024 4:56:34 PM



CONSTRUCTION JOINT



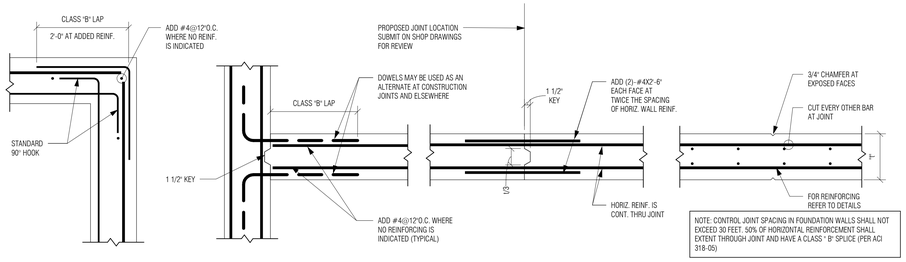
SAWCUT SLAB JOINT

TYPICAL THICKENED EDGE

NOTE:
CONTRACTOR SHALL SUBMIT A PLAN INDICATING THE PROPOSED LOCATION OF CONTROL AND CONSTRUCTION JOINTS PRIOR TO PLACING CONCRETE FOR SLAB.
REFER TO GEOTECHNICAL REPORT BY . . . . . DATED
FOR SUBGRADE PREPERATION. REMOVE ALL FILL MATERIALS BELOW SLAB ON GRADE

1 TYPICAL SLAB ON GRADE DETAILS

3/4" = 1'-0" REFERENCE:



CORNER

INTERSECTION

CONSTRUCTION JOINT

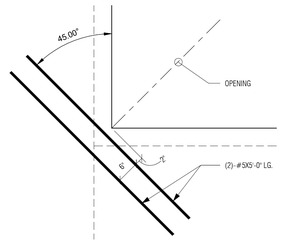
CONTROL JOINT

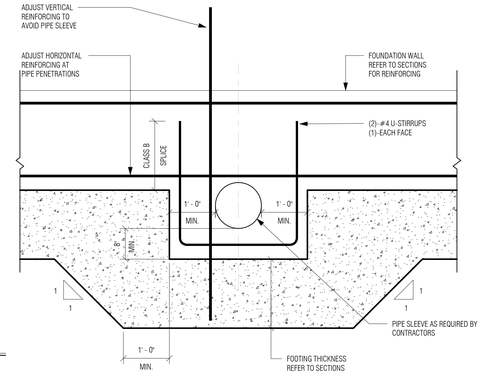
NOTED "CJ" ON PLAN

NOTE: CONTROL JOINT SPACING IN FOUNDATION WALLS SHALL NOT EXCEED 30 FEET. 50% OF HORIZONTAL REINFORCEMENT SHALL EXTENT THROUGH JOINT AND HAVE A CLASS ' B' SPLICE (PER ACI 318-05)

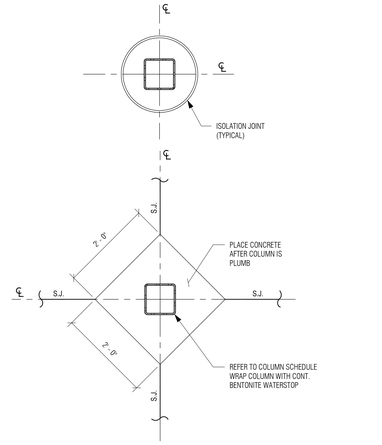
2 TYPICAL AT REENTRANT SLAB CORNERS

3/4" = 1'-0" REFERENCE:





NOTE: DO NOT PLACE PENETRATIONS THROUGH COLUMNS PIERS OR FOOTINGS. REFER TO PLAN FOR LOCATIONS AND COORDINATE WITH SITE, MECHANICAL, PLUMBING, ELECTRICAL, AND FIRE PROTECTION DRAWINGS.

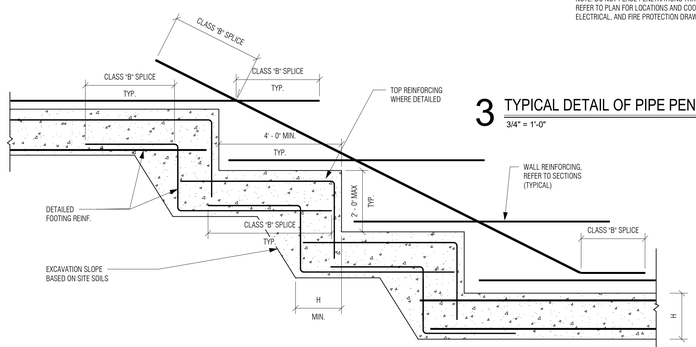


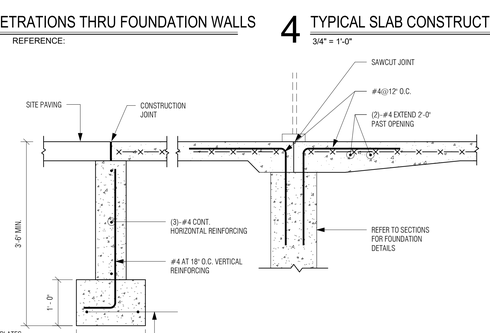
3 TYPICAL DETAIL OF PIPE PENETRATIONS THRU FOUNDATION WALLS

3/4" = 1'-0" REFERENCE:

4 TYPICAL SLAB CONSTRUCTION JOINTS AT COLUMNS

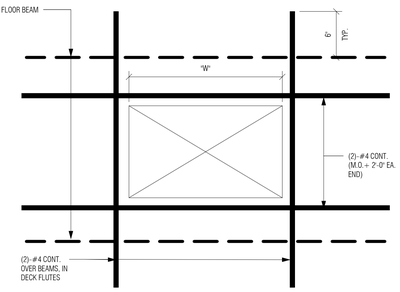
3/4" = 1'-0" REFERENCE:





5 TYPICAL WALL REINFORCING DETAIL

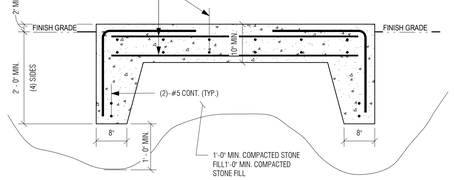
3/4" = 1'-0" REFERENCE:

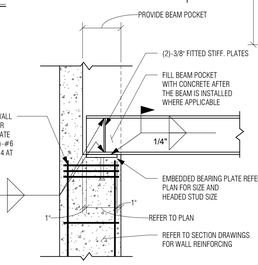


NOTES:
1. FOR OPENINGS WITH 'W' GREATER THAN 4'-0' SUBMIT LOCATION FOR REVIEW.
2. FOR STEEL FRAME, REFER TO TYPICAL FLOOR OPENING DETAIL.
3. COORDINATE QUANTITY AND LOCATIONS WITH MECHANICAL, ELECTRICAL AND PLUMBING DRAWINGS.

6 TYPICAL STEPPED FOOTING DETAIL

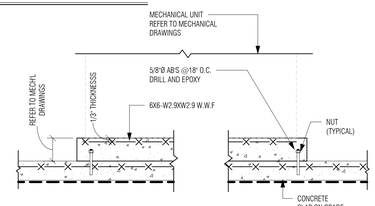
1/2" = 1'-0" REFERENCE:





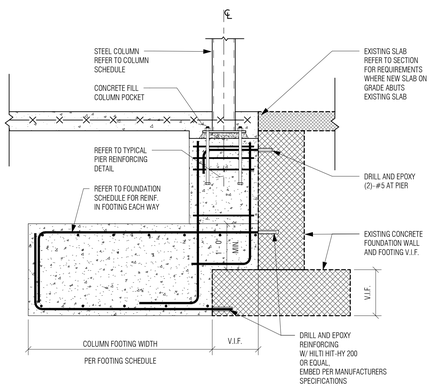
7 TYPICAL FOUNDATION AT DOORS1

3/4" = 1'-0" REFERENCE:



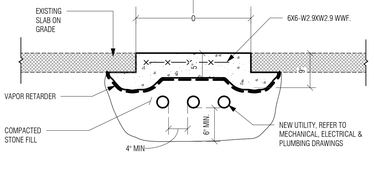
8 TYPICAL SLAB OPENING DETAIL

1 1/2" = 1'-0" REFERENCE:



9 TYPICAL DETAIL FOR NEW UTILITIES BELOW EX. SLAB ON GRADE

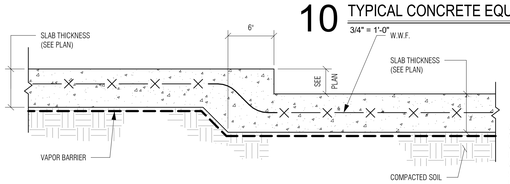
3/4" = 1'-0" REFERENCE:



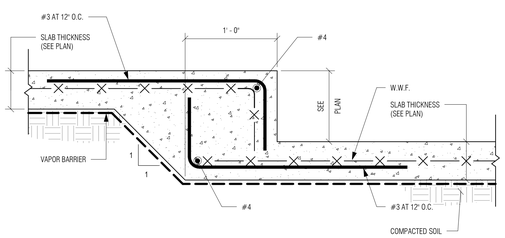
1. COORDINATE WITH MECHANICAL DRAWING FOR QUANTITY, SIZE AND LOCATION. 2. PROVIDE PADS AT GENERATORS, REFRIDGERATOR AND FREEZER UNITS. COORDINATE WITH ELECTRICAL & KITCHEN DRAWINGS FOR SIZE AND LOCATION.

10 TYPICAL CONCRETE EQUIPMENT PAD ON GRADE

3/4" = 1'-0" REFERENCE:



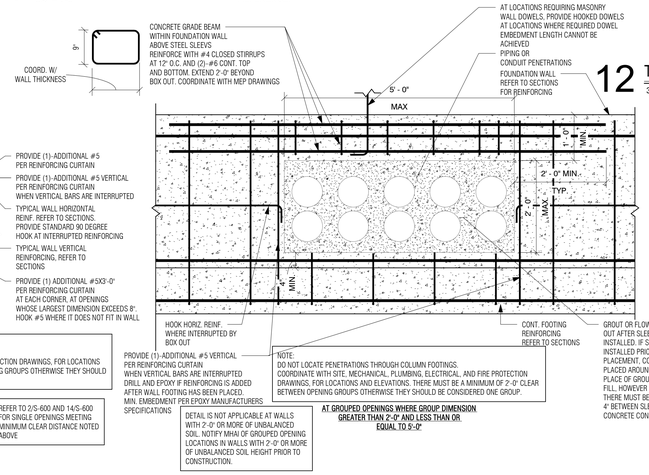
(STEP 6" OR LESS)



(STEP MORE THAN 6" BUT LESS THAN 12")

11 TYPICAL BEAM BEARING PLATE DETAIL

3/4" = 1'-0" REFERENCE:



DETAIL IS NOT APPLICABLE AT WALLS WITH 2'-0" OR MORE OF UNBALANCED SOIL. NOTIFY MHAI OF GROUPED OPENING LOCATIONS IN WALLS WITH 2'-0" OR MORE OF UNBALANCED SOIL HEIGHT PRIOR TO CONSTRUCTION.

NOTE:
DO NOT LOCATE PENETRATIONS THROUGH COLUMN FOOTINGS.
COORDINATE WITH SITE, MECHANICAL, PLUMBING, ELECTRICAL, AND FIRE PROTECTION DRAWINGS, FOR LOCATIONS AND ELEVATIONS. THERE MUST BE A MINIMUM OF 2'-0" CLEAR BETWEEN OPENING GROUPS OTHERWISE THEY SHOULD BE CONSIDERED ONE GROUP.

AT GROUPED OPENINGS WHERE GROUP DIMENSION IS LESS THAN OR EQUAL TO 2'-0"

REFER TO 2/S-600 AND 14/S-600 FOR SINGLE OPENINGS MEETING MINIMUM CLEAR DISTANCE NOTED ABOVE

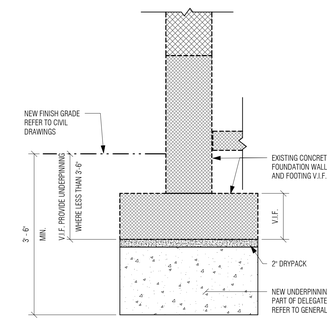
AT GROUPED OPENINGS WHERE GROUP DIMENSION GREATER THAN 2'-0" AND LESS THAN OR EQUAL TO 5'-0"

12 TYPICAL NEW CONCRETE PAD ON CONCRETE SLAB ON GRADE

3/4" = 1'-0" REFERENCE:

NOTE:
DO NOT LOCATE PENETRATIONS THROUGH COLUMN FOOTINGS.
COORDINATE WITH SITE, MECHANICAL, PLUMBING, ELECTRICAL, AND FIRE PROTECTION DRAWINGS, FOR LOCATIONS AND ELEVATIONS. THERE MUST BE A MINIMUM OF 2'-0" CLEAR BETWEEN OPENING GROUPS OTHERWISE THEY SHOULD BE CONSIDERED ONE GROUP.

1. COORDINATE WITH MECHANICAL DRAWING FOR QUANTITY, SIZE AND LOCATION



13 TYPICAL NEW COLUMN FOOTING AT EXISTING

3/4" = 1'-0" REFERENCE:

14 TYPICAL PIER DETAIL

1 1/2" = 1'-0" REFERENCE:

15 TYPICAL GROUPED OPENINGS IN FOUNDATION WALLS

3/4" = 1'-0" REFERENCE:

16 TYPICAL UNDERPINNING DETAIL

3/4" = 1'-0" REFERENCE:

LAP SCHEDULE

SIZE	4500 PSI	
	TOP	OTHERS
#3	24"	19"
#4	32"	25"
#5	40"	31"
#6	48"	37"
#7	70"	54"
#8	80"	62"
#9	91"	70"

Project Title:

ADDITIONS & ALTERATION TO:
Old Greenwich Elementary School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
311 STATE STREET NEW LONDON CT 06320
203 230 9007 silverpetrucelli.com

Revision:	Description:	Date:	Revised By:

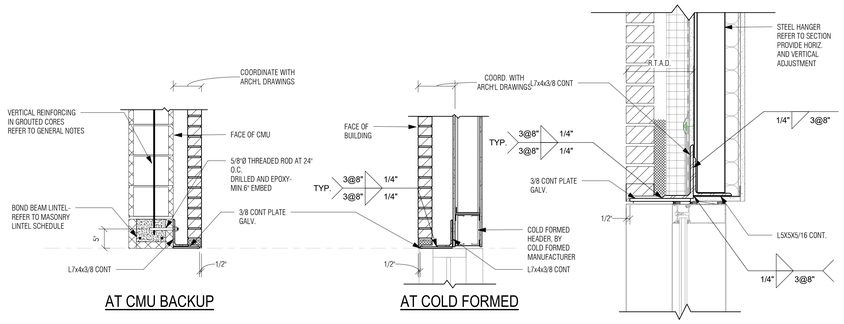
MHAI
Michael Horton Associates Inc.
Consulting Structural Engineers
780 East Main Street
Branford, Connecticut 06405
203-481-8600 mha-eng.com

Drawing Title: TYPICAL DETAILS

Date: 8/16/2024
Scale: As indicated
Drawn By: AC
Project Number: 22-382
Drawing Number: S600

95% SUBMISSION ISSUE DATE: 08/29/2024

8/29/2024 4:56:35 PM

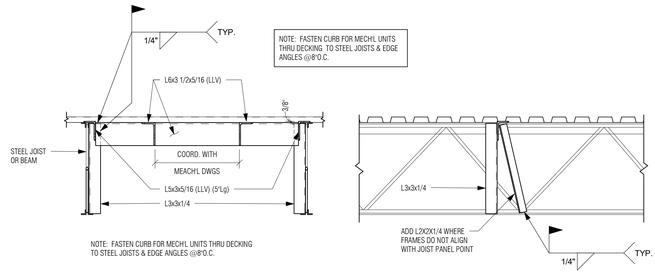


1 TYPICAL EXTERIOR LOOSE LINTEL.

3/4" = 1'-0" REFERENCE:

2 TYPICAL HUNG ANGLE DETAIL.

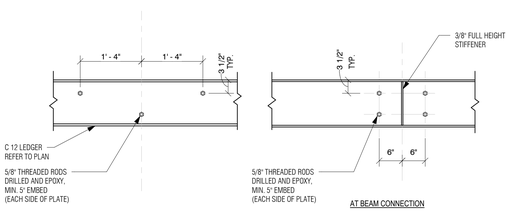
1 1/2" = 1'-0" REFERENCE:



1. TYPICAL FOR ALL OPENINGS 4'-0"X4'-0" OR LESS. FOR LARGER OPENINGS SEE SPECIFIC DETAILS.
2. SIMILAR FRAMES FOR ROOF DRAIN OPENINGS.
3. FRAMES TO BE SHOP WELDED ASSEMBLY.
4. FOR LOCATION, SIZE AND QUANTITY REQUIRED SEE ARCH'L. AND MECH'L. DRAWINGS.
5. FOR FRAMES ON JOISTS, PROVIDE JOIST REINFORCING AT BEARING LOCATIONS.
6. PROVIDE FRAMES BELOW ALL COMPRESSOR UNITS. PROVIDE FRAMES BELOW ALL OTHER MECHANICAL EQUIPMENT OR ROOFTOP DUCT SUPPORTS WHERE THE EQUIPMENT WEIGHT (INCLUSIVE OF RAIL AND CURB WEIGHTS) EXCEEDS 250LBS. COORDINATE LOCATIONS, QUANTITY, WEIGHTS, AND DIMENSIONS WITH MECHANICAL DRAWINGS AND FINAL EQUIPMENT SELECTED. CENTER FRAME BELOW MECHANICAL CURB OR RAILS. REFER TO 8/S-601 FOR FRAMING REQUIRED BELOW ALL AIR HANDLING UNITS.

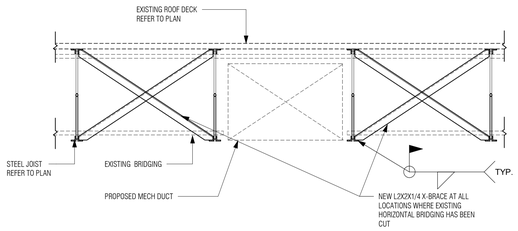
3 TYPICAL NEW ROOF OPENING DETAIL WITH JOISTS & TYPICAL JOIST REINF. DETAIL

3/4" = 1'-0" REFERENCE:



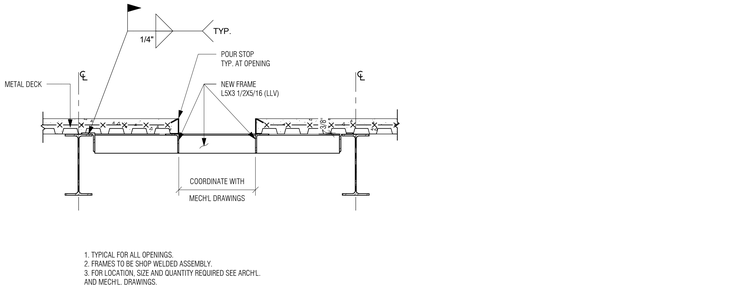
4 TYPICAL LEDGER BOLTING DETAIL

3/4" = 1'-0" REFERENCE:



5 TYPICAL X-BRACE AT CUT JOIST BRIDGING

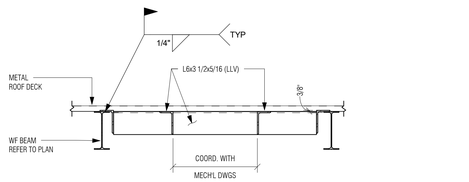
3/4" = 1'-0" REFERENCE:



1. TYPICAL FOR ALL OPENINGS.
2. FRAMES TO BE SHOP WELDED ASSEMBLY.
3. FOR LOCATION, SIZE AND QUANTITY REQUIRED SEE ARCH'L. AND MECH'L. DRAWINGS.

6 TYPICAL FLOOR OPENING DETAIL

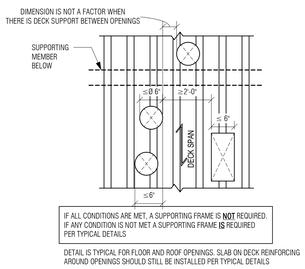
3/4" = 1'-0" REFERENCE:



1. TYPICAL FOR ALL OPENINGS 4'-0"X4'-0" OR LESS. FOR LARGER OPENINGS SEE SPECIFIC DETAILS.
2. SIMILAR FRAMES FOR ROOF DRAIN OPENINGS.
3. FRAMES TO BE SHOP WELDED ASSEMBLY.
4. FOR LOCATION, SIZE AND QUANTITY REQUIRED SEE ARCH'L. AND MECH'L. DRAWINGS.
5. PROVIDE FRAMES BELOW ALL COMPRESSOR UNITS. PROVIDE FRAMES BELOW ALL OTHER MECHANICAL EQUIPMENT OR ROOFTOP DUCT SUPPORTS WHERE THE EQUIPMENT WEIGHT (INCLUSIVE OF RAIL AND CURB WEIGHTS) EXCEEDS 250LBS. COORDINATE LOCATIONS, QUANTITY, WEIGHTS, AND DIMENSIONS WITH MECHANICAL DRAWINGS AND FINAL EQUIPMENT SELECTED. CENTER FRAME BELOW MECHANICAL CURB OR RAILS. REFER TO 8/S-601 FOR FRAMING REQUIRED BELOW ALL AIR HANDLING UNITS.

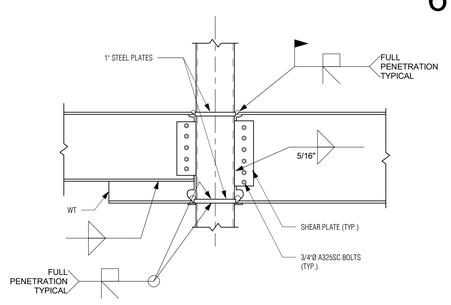
7 TYPICAL ROOF FRAME OPENING DETAIL (W BEAM)

3/4" = 1'-0" REFERENCE:



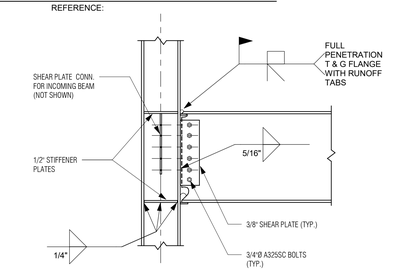
8 TYPICAL FLOOR AND ROOF DECK UNREINFORCED OPENINGS

3/4" = 1'-0" REFERENCE:



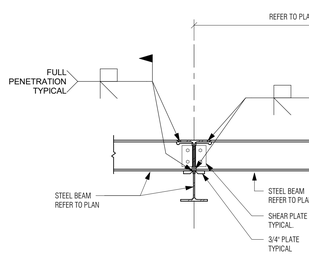
9 TYPICAL MOMENT CONNECTION DETAIL

3/4" = 1'-0" REFERENCE:



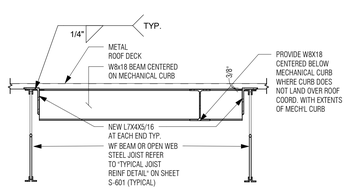
10 TYPICAL MOMENT CONNECTION DETAIL

3/4" = 1'-0" REFERENCE:



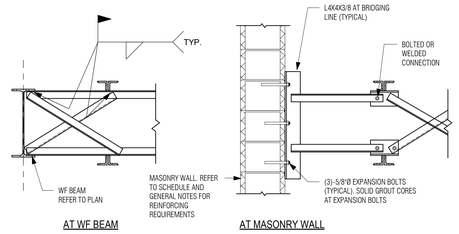
11 TYPICAL WF OUTRIGGER DETAIL

3/4" = 1'-0" REFERENCE:



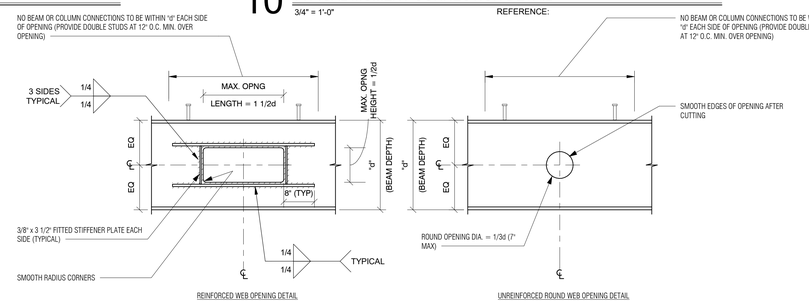
12 TYPICAL MECHANICE EQUIPMENT SUPPORT

3/4" = 1'-0" REFERENCE:



13 TYPICAL BRIDGING DETAIL

3/4" = 1'-0" REFERENCE:



NOTES:

1. CONTRACTOR SHALL COORDINATE SIZE, QUANTITY AND LOCATIONS OF OPENINGS w/ ARCH'L, MECH'L & COORDINATION DWGS PREPARED BY OTHER TRADES. SUBMIT SHOP DRAWINGS SHOWING ALL PENETRATIONS TO ENGINEER FOR REVIEW & APPROVAL PRIOR TO FABRICATION.
2. A MAXIMUM OF ONE (1) PENETRATION PER BEAM SHALL BE PERMITTED UNLESS OTHERWISE APPROVED BY ENGINEER OR NOTED ON THE DRAWINGS.

14 TYPICAL DETAIL AT BEAM WEB OPENINGS

NTS REFERENCE:

Project Title:

ADDITIONS & ALTERATION TO:
Old Greenwich Elementary School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
311 STATE STREET NEW LONDON CT 06320
203 230 9007 silverpetrucelli.com

Revision:	Description:	Date:	Revised By:

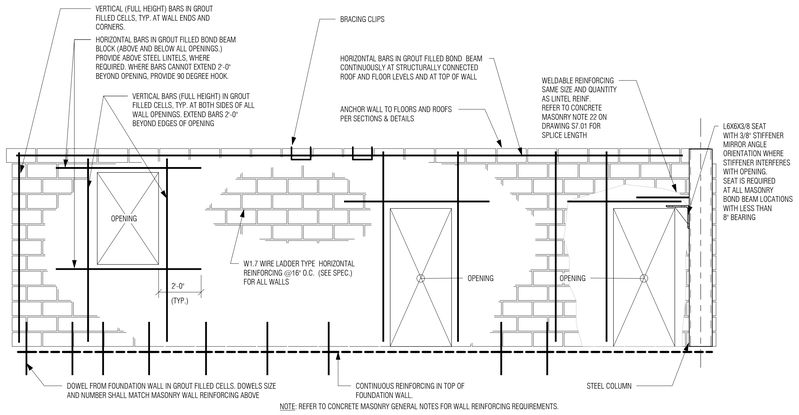
MHAI
Michael Horton Associates Inc.
Consulting Structural Engineers
780 East Main Street
Branford, Connecticut 06405
203-481-8600 mha-eng.com

Drawing Title: TYPICAL DETAILS

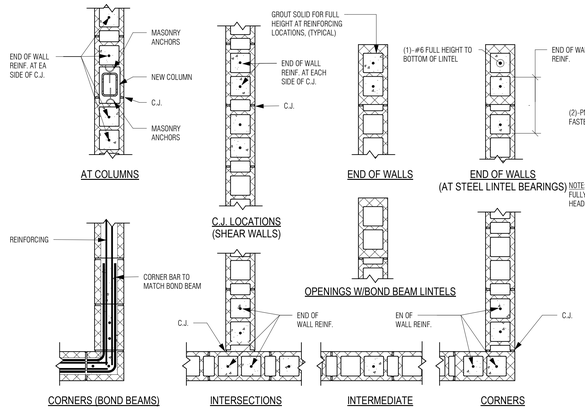
Date: 8/16/2024
Scale: As indicated
Drawn By: AC
Project Number: 22-382
Drawing Number: S601

95% SUBMISSION ISSUE DATE: 08/29/2024

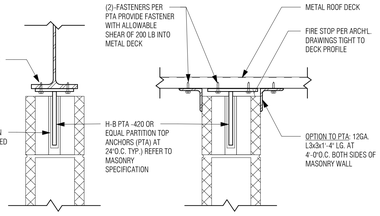
8/29/2024 4:56:38 PM



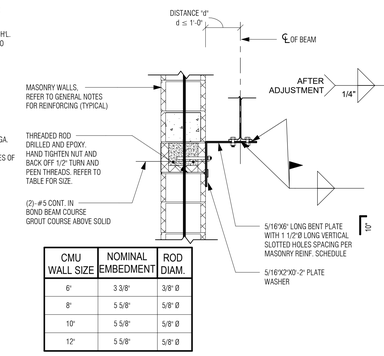
NOTE: REFER TO CONCRETE MASONRY GENERAL NOTES FOR WALL REINFORCING REQUIREMENTS.



NOTES:
1. REINFORCING DETAILS APPLY TO ALL CMU WALLS. FOR ACTUAL REINFORCING REQUIREMENTS, REFER TO GENERAL NOTES ON DRAWINGS.
2. PROVIDE DOWELS FROM CONCRETE FOUNDATIONS TO CMU WALL ABOVE. SIZE AND NUMBER TO MATCH WALL REINFORCING.



NOTE: APPLIES TO INTERIOR WALLS ONLY.



CMU WALL SIZE	NOMINAL EMBEDMENT	ROD DIAM.
6"	3 3/8"	3/8" Ø
8"	5 5/8"	5/8" Ø
10"	5 5/8"	5/8" Ø
12"	5 5/8"	5/8" Ø

4 TYPICAL BEAM TO MASONRY CONNECTION
3/4" = 1'-0" REFERENCE: 1/ S124

1 TYPICAL CMU WALL REINFORCEMENT DETAIL
3/4" = 1'-0" REFERENCE:

2 TYPICAL CMU REINFORCING PLAN DETAILS
3/4" = 1'-0" REFERENCE:



3 TYPICAL TOP OF WALL MASONRY ANCHORAGE TO STEEL
1 1/2" = 1'-0" REFERENCE:

1. 6" CMU GREATER THAN 20'-0" IN HEIGHT.
2. 8" CMU GREATER THAN 15'-0" IN HEIGHT.

MASONRY LINTEL SCHEDULE

MARK	CMU	OPENING WIDTH	LINTEL
	10" & 12" BLOCK	6'-1" TO 12'-0"	(2)- # 6 CONT. TOP AND BOTTOM
	10" & 12" BLOCK	UP TO 6'-0"	(2)- # 5 CONT.
	8" BLOCK	UP TO 5'-0"	(2)- # 5 CONT.
	8" BLOCK	5'-1" TO 10'-0"	(2)- # 6 CONT. TOP AND BOTTOM
	6" BLOCK	UP TO 6'-0"	(1)- # 5 CONT.
	INTERIOR 4" MASONRY	UP TO 6'-0"	L5X3 1/2X5/16 (4" MIN. BEARING)
	INTERIOR 4" MASONRY	6'-0" TO 10'-0"	L7X4X3/8 (4" MIN. BEARING)

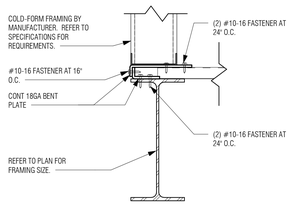
5 TYP. DETAIL OF CMU PARTITION ON SUPPORTED SLAB
3/4" = 1'-0" REFERENCE:

EXISTING MASONRY LINTEL SCHEDULE

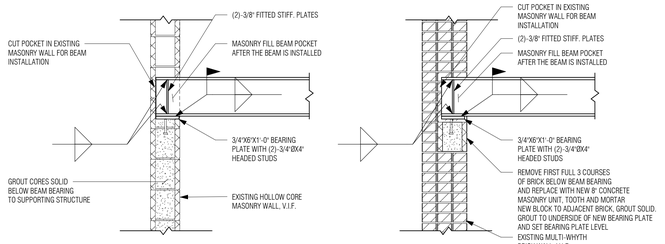
MARK	CMU	OPENING WIDTH	LINTEL
	EXISTING 12" BLOCK	UP TO 9'-6"	(3)-L7X4X3/8 L.L.V. (MIN. 8" BEARING)
	EXISTING 8" BLOCK	UP TO 9'-6"	(2)-L7X4X3/8 L.L.V. (MIN. 8" BEARING)
	EXISTING INTERIOR 4" MASONRY	UP TO 6'-0"	L5X3 1/2X5/16 (4" MIN. BEARING)
	EXISTING INTERIOR 4" MASONRY	6'-0" TO 10'-0"	L7X4X3/8 (4" MIN. BEARING)

NOTE:
1. PROVIDE LINTELS WHERE NEEDED. NOT SHOWN ON THE DRAWINGS
2. ALL EXTERIOR STEEL SHALL BE HOT DIPPED GALVANIZED
3. COORDINATE ALL OPENINGS WITH ARCHT & MECH DRAWINGS.
4. GROUT CORES SOLID BELOW LINTEL BEARING FULL HEIGHT TO UNDERSIDE OF LINTEL.
5. LINTELS FOR EXISTING 8" AND 12" CMU WERE DESIGNED BASED ON A BEARING WALL SUPPORTING 15' OF ROOF, WITH 8' OF CMU ABOVE LINTEL. CONTRACTOR TO CONTACT STRUCTURAL ENGINEER, MICHAEL HORTON ASSOCIATES, INC. FOR ALL FIELD CONDITIONS WITH BEARING WALLS SUPPORTING MORE THAN 15' OF ROOF ABOVE AND ALL OPENINGS LARGER THAN THOSE IN THE LINTEL SCHEDULE.
6. AT LOCATIONS WHERE EXISTING WALL IS THICKER THAN THOSE SHOWN, PROVIDE AN L7"4X3/8 FOR EACH 4" OF EXISTING MASONRY.

6 TYPICAL BEAM BEARING PLATE AT NEW CMU
3/4" = 1'-0" REFERENCE:

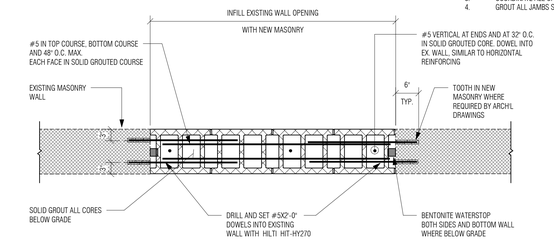


7 TYPICAL BENT PLATE AT METAL ROOF DECK PERIMETER
1 1/2" = 1'-0" REFERENCE:



8 TYPICAL THICKENED SLAB DETAIL
3/4" = 1'-0" REFERENCE:

NOTE:
1. PROVIDE LINTELS WHERE NEEDED. NOT SHOWN ON THE DRAWINGS
2. ALL EXTERIOR STEEL SHALL BE HOT DIPPED GALVANIZED
3. COORDINATE ALL OPENINGS WITH ARCHT & MECH DRAWINGS.
4. GROUT ALL JAMBS SOLID PER TYPICAL CMU WALL REINF. DETAILS.



9 TYPICAL WALL CONNECTION TO DECK DETAIL
1 1/2" = 1'-0" REFERENCE:

10 TYPICAL BEAM BEARING PLATE PERP. TO EXISTING CMU
3/4" = 1'-0" REFERENCE:

11 TYPICAL MASONRY WALL INFILL
3/4" = 1'-0" REFERENCE:

SMALL MASONRY WALL OPENING REQUIREMENTS

OPENING GEOMETRY	MASONRY WALL TYPE	OPENING WIDTH	HEAD OF OPENING LINTEL	SILL OF OPENING REINFORCING	JAMB REINFORCING	MINIMUM CLEAR HORIZONTAL SPACE BETWEEN OPENINGS
ROUND	ALL	≤8'Ø	NONE	NONE	NONE	8"
	NON-SHEARWALLS	8'Ø≤OPENING≤16'Ø	SCHEDULE 40 PIPE SLEEVE	NONE	NONE	8"
	SHEARWALLS	8'Ø≤OPENING≤16'Ø	PER MASONRY LINTEL SCHEDULE	PER MASONRY REINFORCING SCHEDULE	PER MASONRY REINFORCING SCHEDULE	BEARING AS REQUIRED IN LINTEL SCHEDULE
	ALL	>16'Ø	PER MASONRY LINTEL SCHEDULE	PER MASONRY REINFORCING SCHEDULE	PER MASONRY REINFORCING SCHEDULE	BEARING AS REQUIRED IN LINTEL SCHEDULE
SQUARE OR RECTANGULAR	ALL	≤12"	GROUT COURSE ABOVE OPENING SOLID, EXTEND 8" BEYOND OPENING	NONE	GROUT JAMBS SOLID AT OPENING	8"
	ALL	>12"	PER MASONRY LINTEL SCHEDULE	PER MASONRY REINFORCING SCHEDULE	PER MASONRY REINFORCING SCHEDULE	BEARING AS REQUIRED IN LINTEL SCHEDULE

1. IF THE REQUIRED CLEAR SPACE BETWEEN OPENINGS IS NOT MET, A MASONRY LINTEL MUST BE PROVIDED PER THE MASONRY LINTEL SCHEDULE.

CMU REINFORCING SCHEDULE

DESCRIPTION	NOMINAL WALL THICKNESS	VERTICAL REINFORCING	VERTICAL ENDWALL CHORD REINFORCEMENT (IF APPLICABLE)	HORIZONTAL REINFORCING	SUPPLEMENTAL HORIZONTAL REINFORCEMENT (IF APPLICABLE)	NOTES	ATTACHMENT TO STRUCTURE
MASONRY SHEARWALLS	8"	#5 AT 32" O.C.	(2)- # 6	NO. 19 GAGE LADUR TYPE @ 16" O.C.	--	--	4/S602 AT 32" O.C. TYP.
"TYPE B" MASONRY SHEARWALLS	8"	#5 AT 16" O.C.	(2)- # 6	NO. 19 GAGE LADUR TYPE @ 16" O.C.	--	--	4/S602 AT 16" O.C. TYP.
8" EXTERIOR WALLS	8"	#5 AT 32" O.C.	(2)- # 6	NO. 19 GAGE LADUR TYPE @ 16" O.C.	--	--	4/S602 AT 32" O.C. TYP.
INTERIOR PARTITION WALLS	8"	# 4 AT 48" O.C.	(1)- # 4	NO. 19 GAGE LADUR TYPE @ 16" O.C. --	--	--	3/S602 AT 24" O.C. TYP.

1. PROVIDE VERTICAL ENDWALL REINFORCEMENT NOTED AT BOTH SIDES OF DOOR, WINDOW, AND MECHANICAL OPENINGS AS WELL AS ON EACH SIDE OF CONTROL JOINTS.
   A. REFER TO "SMALL MASONRY WALL OPENING REQUIREMENTS" TABLE FOR MASONRY WALL OPENINGS THAT DO NOT REQUIRE ADDITIONAL REINFORCING AROUND OPENINGS.
   B. COORDINATE ALL OPENING LOCATIONS WITH ARCHITECTURAL AND MEP DRAWINGS
2. PROVIDE (2)- # 5 CONT. MINIMUM FULLY GROUTED BOND BEAM COURSE AT THE TOP OF ALL WALLS AND AT BOND BEAMS CONNECTED AT FLOOR AND ROOFS, UNLESS OTHERWISE INDICATED.
   A. REFER TO MASONRY LINTEL SCHEDULE FOR HORIZONTAL REINFORCEMENT REQUIRED ABOVE AND BELOW WINDOW AND MECHANICAL OPENINGS AND ABOVE ALL DOOR OPENINGS.
   B. REFER TO "SMALL MASONRY WALL OPENINGS REQUIREMENTS" TABLE FOR MASONRY WALL OPENINGS THAT DO NOT REQUIRE ADDITIONAL REINFORCING AROUND OPENINGS.

Project Title:
ADDITIONS & ALTERATION TO:
Old Greenwich Elementary School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

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Drawing Number: S602

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MATERIALS LEGEND (All MATERIALS ARE NEW UNLESS OTHERWISE NOTED)

CONCRETE
BRICK (SECTION)
CMU (SECTION)
WOOL INSULATION
EIFS INSULATION
RIGID INSULATION
ALUMINUM
GYPSUM
CRUSHED STONE
EARTH
METAL
ACOUSTICAL TILE
WOOD FRAMING THROUGH MEMBER
WOOD FRAMING INTERRUPTED MEMBER
FINISHED WOOD **[WD-XX]**
WOOD **[WD-XX]**
WOOD **[WD-XX]**
WOOD **[WD-XX]**
WOOD **[WD-XX]**
BATT INSULATION
STONE **[ST-XX]**
STONE **[ST-XX]**
STONE **[ST-XX]**
GYMPSUM BOARD
PLYWOOD

CEILING LEGEND

GYPSUM BOARD CEILING
LAY-IN CEILING - 2X2 GRID
LAY IN CEILNG - 2X4 GRID
WOOD SLAT CEILING
EXIT SIGN & TRAVEL DIRECTION
4' FLUORESCENT PENDANT LIGHT
EXTERIOR DOWN LIGHT
2'x4' LIGHT FIXTURE
2'x2' LIGHT FIXTURE
1'x4' PENDANT LIGHT FIXTURE
DOWNLIGHT
SUPPLY DIFFUSER
RETURN DIFFUSER
SPRINKLER HEAD

ABBREVIATIONS

A.C.T.	ACOUSTICAL CEILING TILE
ADJ.	ADJUSTABLE
ALUM.	ALUMINUM
A.B.	ANCHOR BOLT
APPROX.	APPROXIMATE
ARCH.	ARCHITECTURAL
A.C.P.	ASBESTOS CEMENT PIPE
ASPH.	ASPHALT
AVG.	AVERAGE
BSMT.	BASEMENT
BRG.	BEARING
BIT.	BITUMINOUS
BLK.	BLOCK
BD.	BOARD
B.S.	BOTH SIDES
BRK.	BRICK
BLDG.	BUILDING
C.I.	CAST IRON
C.I.P.	CAST IN PLACE CONCRETE
C.B.	CATCH BASIN
C.B.R.	CATCH BASIN TO BE REMOVED
CLG.	CEILING
C L	CENTER LINE
C. BD.	CHALK BOARD
C.O.	CLEAN OUT
COL.	COLUMN
CONC.	CONCRETE
C.M.U.	CONCRETE MASONRY UNIT
CONF.	CONFERENCE
CONT.	CONTINUOUS, CONTINUE
CONTR.	CONTRACTOR
C.J.	CONTROL JOINT
C.C.	CURB CUT
DET.	DETAIL
DIA.	DIAMETER
DIM.	DIMENSION
DR.	DOOR
DN.	DOWN
DWG.	DRAWING
EA.	EACH
E.F. / E.W.	EACH FACE / EACH WAY
ED.	EDUCATION
E / ELEC.	ELECTRICAL
EL. / ELEV.	ELEVATION
EMER.	EMERGENCY
ENCL.	ENCLOSURE
ENT.	ENTRANCE
EP.	EPOXY PAINT
EQ.	EQUAL
EXAM.	EXAMINATION
EXIST.	EXISTING
EXP.	EXPANSION
E.J.	EXPANSION JOINT
EXT.	EXTERIOR
F.S.	FAR SIDE
FIN.	FINISH, FINISHED
F.F.	FINISHED FLOOR
FIXT.	FIXTURE
FL.	FLOOR
F.P.	FOLDING PARTITION
FT.	FOOT
FTG.	FOOTING
FDN.	FOUNDATION
G.	GAS
GA.	GAUGE
GEN.	GENERAL
G.C.	GENERAL CONTRACTOR
GYP.	GYPSUM
GYP. BO.	GYPSUM BOARD
H.C.	HANDICAPPED
HDWE.	HARDWARE
HD.	HEADED
HGT.	HEIGHT
H.P.	HIGH POINT
H.M.	HOLLOW METAL
HORZ.	HORIZONTAL, HORIZONTALLY
H.B.	HOSE BIB
HR.	HOUR
HYD.	HYDRANT
INSUL.	INSULATION, INSULATED
INT.	INTERIOR
INV.	INVERTED
JAN.	JANITOR
K.P.	KICK PLATE
LAM.	LAMINATE
L.F.	LINEAR FOOT
LG.	LONG
LOC.	LOCATION
L.P.	LOW POINT
LTG.	LIGHTING
M.H.	MANHOLE
MAS.	MASONRY
M.O.	MASONRY OPENING
MAX.	MAXIMUM
MECH.	MECHANICAL
MIN.	MINIMUM
M.	MINUTE
MISC.	MISCELLANEOUS
MTD.	MOUNTED
N.S.	NEAR SIDE
NOM.	NOMINAL
N.A.	NOT APPLICABLE
N.I.C.	NOT IN CONTRACT
N.T.S.	NOT TO SCALE
NO.	NUMBER
OCC.	OCCUPANT
O.C.	ON CENTER
OPNG.	OPENING
O.D.	OUTSIDE DIMENSION
PTD.	PAINTED
P.C.B.	PAINTED CONCRETE BLOCK
P.G.B.	PAINTED GYPSUM BOARD
PL.	PLATE
PLUMB.	PLUMBING
PREP.	PREPARATION, PREPARE
P.T.	PRESSURE TREATED
PROJ. MAN	PROJECT MANUAL
P.V.C.	POLYVINYL CHLORIDE
RAD.	RADIUS
R.C.P.	REINFORCED CONCRETE PIPE
RCP	REFLECTED CEILING PLAN
REINF.	REINFORCEMENT
REQD.	REQUIRED
R.	RISER
R.D.	ROOF DRAIN
R.H.	ROOF HATCH
R.L.	ROOF LEADER
RM.	ROOM
SAN.	SANITARY
SCHED.	SCHEDULE
S.C.	SEALED CONCRETE
SECT.	SECTION
S.W.	SHEAR WALL
S.W.F.	SHEAR WALL FOOTING
SIM.	SIMILAR
S.O.G.	SLAB ON GRADE
SPEC.	SPECIFICATIONS
SQ.	SQUARE
SQ. FT.	SQUARE FEET
STL.	STEEL
S.F.	STEP FOOTING
S.	STORM
STRUCT.	STRUCTURAL
SUSP.	SUSPENDED, SUSPENSION

ABBREVIATIONS cont...

TECH.	TECHNOLOGY
T.	TELEPHONE
T&B	TOP AND BOTTOM
T.O.	TOP OF
T.O.F.	TOP OF FRAME
T/S	TOP OF SLAB
T.O.S.	TOP OF STEEL
T/W	TOP OF WALL
TYP.	TYPICAL
U.O.N.	UNLESS OTHERWISE NOTED
V.I.F.	VERIFY IN FIELD
VERT.	VERTICAL
V.B.	VINYL BASE
V.C.T.	VINYL COMPOSITE TILE
W.	WATER
W.C.J.	WALL CONTROL JOINT
W.W.F.	WELDED WIRE FABRIC
W.W.M.	WELDED WIRE MESH
W/	WITH
WD.	WOOD
@	AT
Ø	DIAMETER

GRAPHIC LEGEND

NEW SINGLE DOOR
NEW DOUBLE DOOR
EXISTING DOOR TO REMAIN
REMOVE EXISTING DOOR

SYMBOL LEGEND

101 / A — DOOR NUMBER
Room name / 101 — WINDOW TYPE; ROOM NAME; ROOM NUMBER
t — PARTITION TYPE
1 — CONSTRUCTION NOTE
X — GLAZING TYPE
2 / A101 — EXTERIOR ELEVATION NUMBER; SHEET NUMBER
2 / A101 — INTERIOR ELEVATION NUMBER; SHEET NUMBER
2 / A101 — BUILDING SECTION NUMBER; SHEET NUMBER
2 / A101 — WALL SECTION NUMBER; SHEET NUMBER
REFERENCE POINT
X — REVISION MARK

GENERAL NOTES

1. ALL DOCUMENTS WERE PREPARED BASED ON A REVIEW OF AVAILABLE RECORD DATA SUPPLIED BY THE OWNER. IN THE EVENT THAT UNFORSEEN UTILITIES, STRUCTURES OR CONDITIONS ARE DISCOVERED DURING CONSTRUCTION, THE ARCHITECT IS TO BE NOTIFIED IMMEDIATELY.
2. HEIGHTS AND ELEVATIONS SHALL BE MEASURED FROM FINISHED FLOOR UNLESS OTHERWISE NOTED. CONTRACTORS SHALL ENSURE FINISH MATERIALS WILL BE FLUSH WITH ADJACENT SURFACES AND JOINTS. (EXCEPT WHERE INDICATED OTHERWISE.).
3. DIMENSIONS ARE TO FACE OF GYPSUM BOARD, SUBTRATE OR MASONRY. DIMENSIONS ARE TO THE CENTERLINE OF COLUMNS AND GRIDS. DIMENSIONS IN MASONRY WALLS AND PARTITIONS ARE TO THE ROUGH OPENINGS OF DOORS, WINDOWS AND OTHER SCHEDULED OPENINGS.
4. PENETRATIONS OF FIRE RATED WALL AND FLOOR ASSEMBLIES SHALL BE FIRESTOPPED WITH THROUGH PENETRATION FIRESTOP SYSTEMS.
5. STAIR ENCLOSURES SHALL NOT BE USED FOR THE VERTICAL DISTRIBUTION OF ELECTRICAL MECHANICAL OR PLUMBING SYSTEMS OTHER THAN THOSE SERVING AND TERMINATING IN THE STAIR ENCLOSURE.
6. COORDINATE ACCESS DOOR LOCATIONS AND MISCELLANEOUS WALL PENETRATIONS (FOR CONCEALED ITEMS) WITH APPROPRIATE CONTRACTORS.
7. SCHEDULES:
   - A. DOOR AND FRAME SCHEDULE: REFER TO DRAWING A910
   - B. ROOM FINISH SCHEDULE: REFER TO DRAWING A960
   - C. MOUNTING HEIGHT SCHEDULE: REFER TO DRAWING G002
   - D. PARTITION TYPE SCHEDULE: REFER TO DRAWINGS G003
8. THE TERM "TYPICAL" OR TYP AS USED IN THESE DOCUMENTS SHALL MEAN THAT THE CONDITION IS THE SAME FOR SIMILAR CONDITIONS THROUGHOUT, UNLESS OTHERWISE NOTED.
9. REFER TO SP+A STANDARD MATERIAL / FINISH DESIGNATIONS FOR MATERIAL AND EQUIPMENT DESIGNATIONS SHOWN IN THE DRAWINGS AND SPECIFICATION.
10. REFER TO THE ABBREVIATIONS LIST FOR ABBREVIATIONS THROUGHOUT THE CONTRACT DOCUMENTS.
11. ARCHITECTURAL ELEVATION 12'-6" = SITE / CIVIL ELEVATION 12.5'.
12. NON ARCHITECTURAL WORK QUANTIFIED AND SPECIFIED ON OTHER DRAWINGS SHALL BE LOCATED ACCORDING TO THE ARCHITECTURAL DRAWINGS UNLESS OTHERWISE NOTED OR DIMENSIONED. ANY WORK THAT IS NOT LOCATED SHALL BE BROUGHT TO THE ATTENTION OF THE ARCHITECT AS SOON AS POSSIBLE.

GENERAL CONSTRUCTION NOTES

1. CONTRACTOR SHALL FIELD VERIFY ALL EXISTING CONDITIONS & DIMENSIONS PRIOR TO FABRICATION, FURNISHING AND INSTALLATION OF ANY MATERIALS, EQUIPMENT AND WORK.
2. ALL MATERIALS & EQUIPMENT SHOWN ARE NEW TO BE PROVIDED BY CONTRACTOR UNLESS OTHERWISE NOTED.
3. ALL EXISTING UTILITIES & EQUIPMENT LOCATIONS ARE APPROXIMATE - CONTRACTOR SHALL FIELD VERIFY AND/OR COORDINATE EXACT LOCATIONS.
4. CONTRACTOR ASSUMES ALL RESPONSIBILITY DURING CONSTRUCTION TO PROTECT MATERIALS AND EQUIPMENT. ANY & ALL DAMAGED ITEMS & EQUIPMENT DURING CONSTRUCTION SHALL BE REPLACED AT NO ADDITIONAL COST TO THE OWNER.
5. ALL RATED DOORS & DOORS FRONTING A CORRIDOR SHALL HAVE POSITIVE LATCHING LOCKSETS UNLESS OTHERWISE INDICATED ON THE DOOR SCHEDULE.
6. All DOORS LEADING TO HAZARDOUS AREAS SHALL HAVE TACTILE WARNING.
7. ALL DOORS EXITING 100 PERSONS OR MORE SHALL HAVE PANIC EXIT DEVICES.
8. ALL HANDICAP ACCESSIBLE DOOR HARDWARE SHALL BE PROVIDED TO COMPLY WITH ADA, ANSI AND ALL OTHER APPLICABLE CODES.
9. ALL NEW EXPOSED/VISIBLE DECKING, BEAMS, COLUMNS, JOISTS AND OTHER STRUCTURAL COMPONENTS SHALL BE PAINTED UNLESS OTHERWISE NOTED.
10. IF A NOTE IS FOUND ON ARCHITECTURAL DRAWINGS READING - "SEE STRUCTURAL DRAWINGS" - AND SIZE AND DETAILING OF MEMBER(S) IS NOT FOUND, THE CONTRACTOR SHALL CONTACT THE ARCHITECT TO REQUEST MISSING INFORMATION. THESE ITEMS SHALL BE PART OF THE BASE BID AND STEEL SUBCONTRACTOR SHALL REVIEW STRUCTURAL AS WELL AS ARCHITECTURAL DRAWINGS PRIOR TO BIDDING.
11. ALL CONTRACTORS SHALL REVIEW DRAWINGS AND PROJECT MANUAL. IF THERE IS A DISCREPANCY BETWEEN THE TWO OR ANY OTHER PARTS OF THE DOCUMENTS, THE HIGHER VALUE (IN DOLLARS) SHALL PREVAIL AS THE SCOPE OF WORK THAT WILL BE PRICED UNLESS OTHERWISE DIRECTED IN WRITING BY THE ARCHITECT DURING THE BIDDING PERIOD.

Project Title:
ADDITION & ALTERATIONS TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

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Revision: | Description: | Date: | Revised By:

Drawing Title:
ARCHITECTURAL GENERAL INFORMATION

Date: 8/29/2024
Scale: As indicated
Drawn By: JM
Project Number: 22-382
Drawing Number: A000

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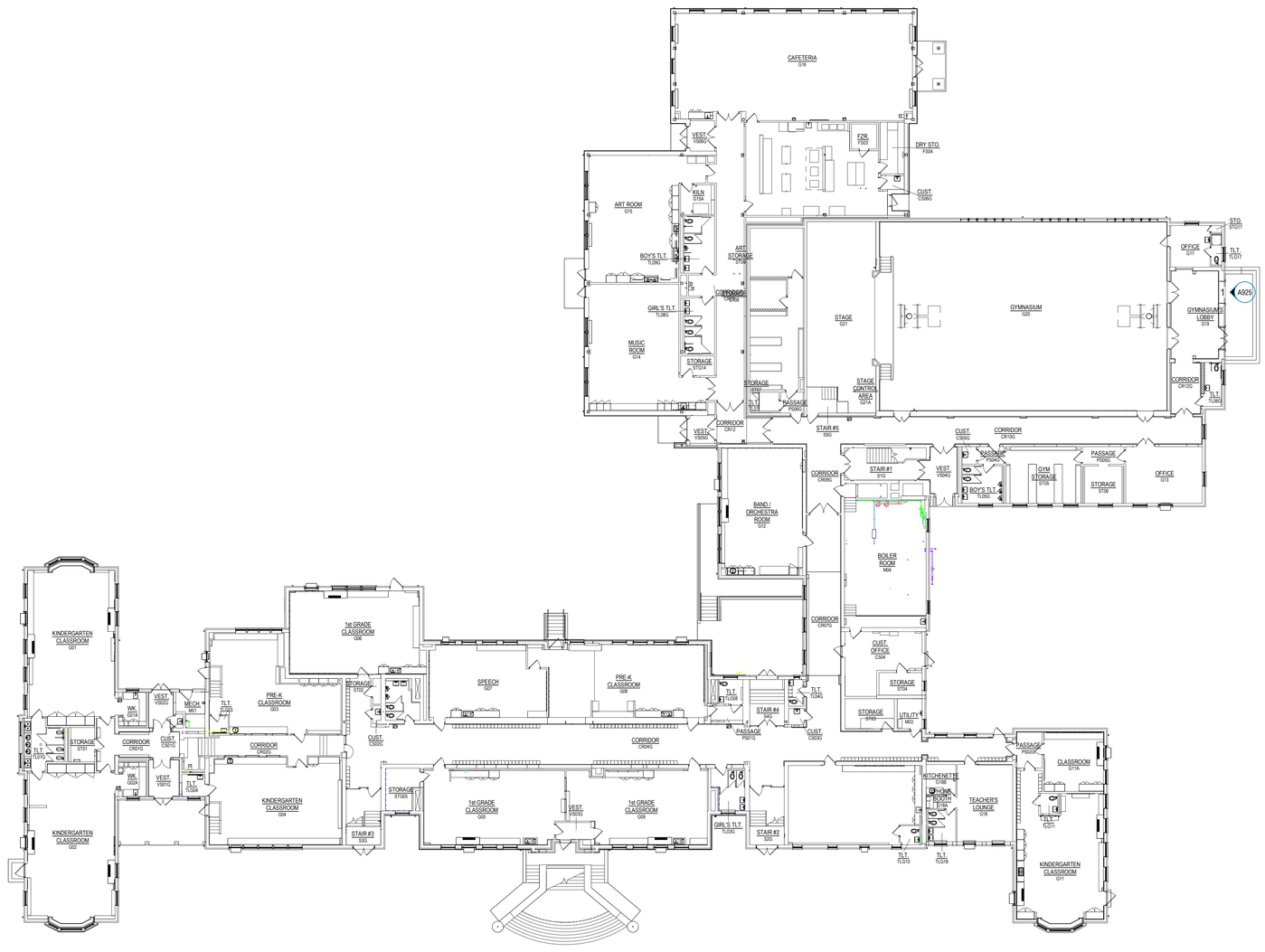
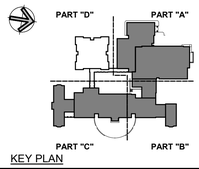


1 1st FLOOR - EXISTING CONDITIONS

1/16" = 1'-0"



KEY PLAN

Project Title:

ADDITION & ALTERATIONS TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

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Revision:	Description:	Date:	Revised By:

Drawing Title:

FIRST FLOOR EXISTING CONDITIONS PLAN

Date: 8/29/2024
Scale: 1/16" = 1'-0"
Drawn By: JM
Project Number: 22-382

Drawing Number: A001

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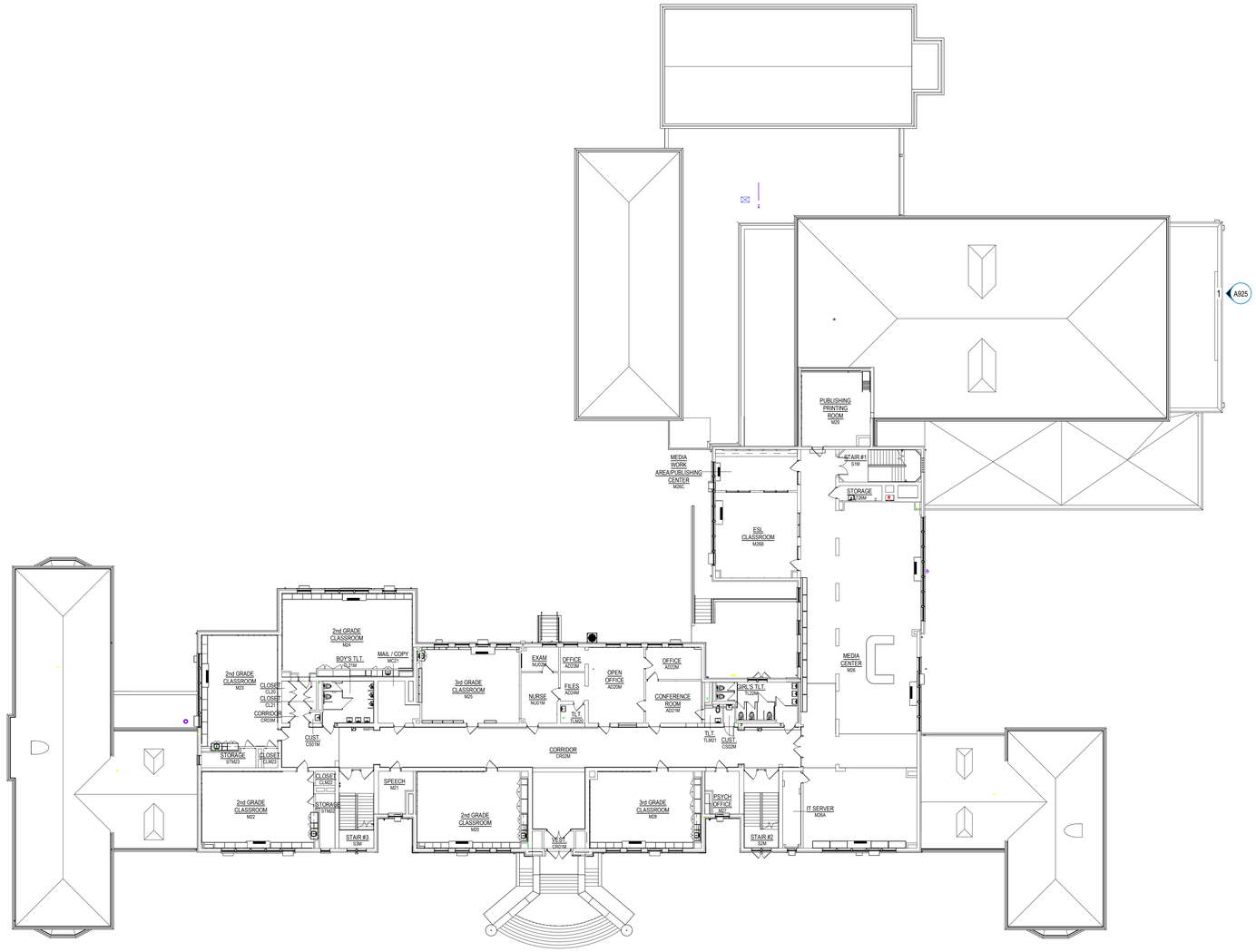
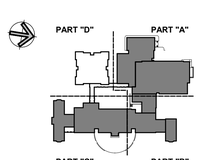


1 2nd FLOOR - EXISTING CONDITIONS

1/16" = 1'-0"



KEY PLAN

Project Title:

ADDITION & ALTERATIONS TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

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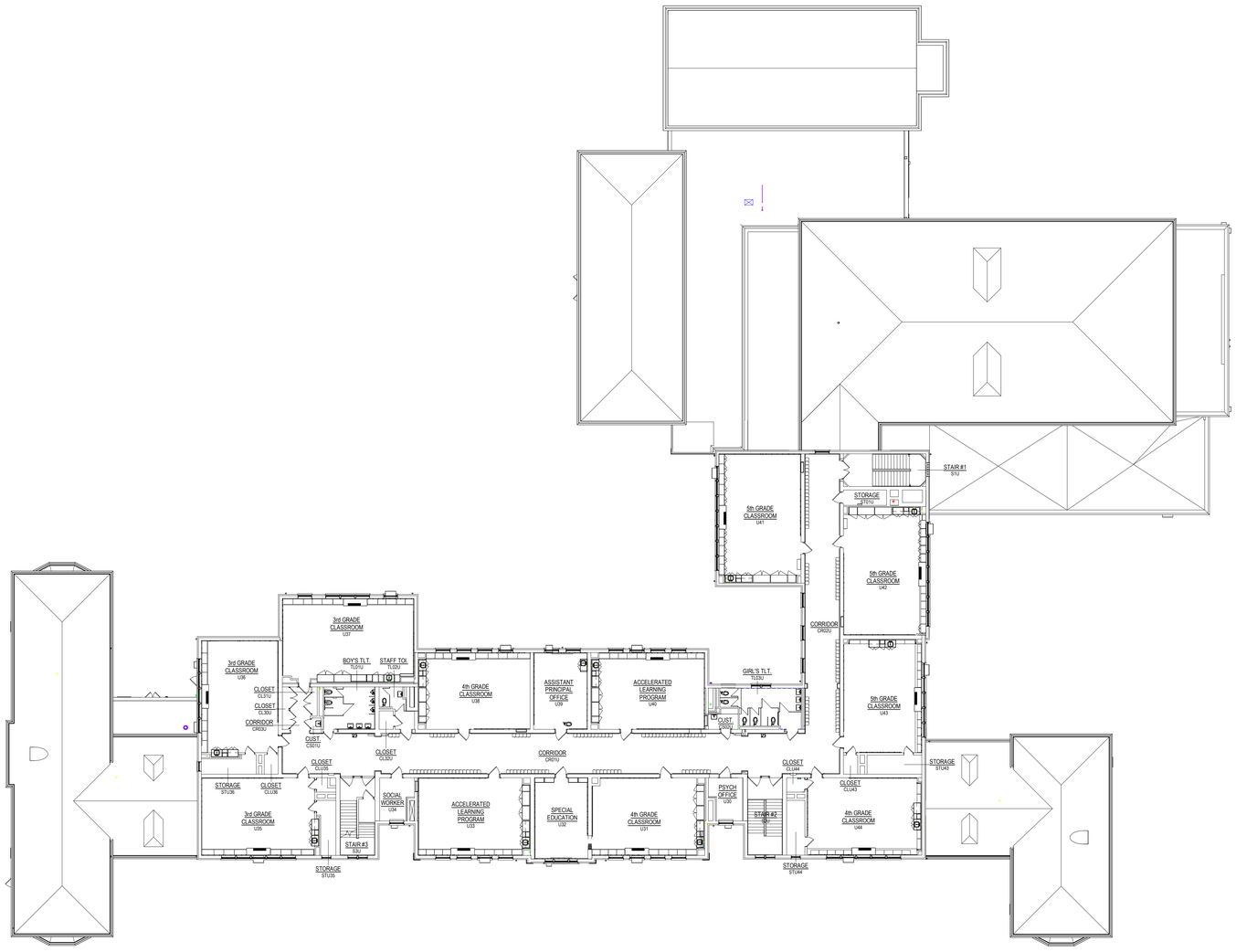
Revision:	Description:	Date:	Revised By:

Drawing Title:
SECOND FLOOR EXISTING CONDITIONS PLAN

Date: 8/29/2024
Scale: 1/16" = 1'-0"
Drawn By: JM
Project Number: 22-382

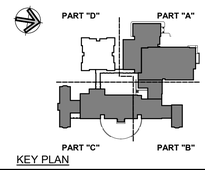
Drawing Number: A002

8/30/2024 8:48:59 AM



1 3rd FLOOR - EXISTING CONDITIONS

1/16" = 1'-0"



KEY PLAN

Project Title:

ADDITION & ALTERATIONS TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

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Revision:	Description:	Date:	Revised By:

Drawing Title: THIRD FLOOR EXISTING CONDITIONS PLAN

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Scale: 1/16" = 1'-0"
Drawn By: JM
Project Number: 22-382

Drawing Number: A003

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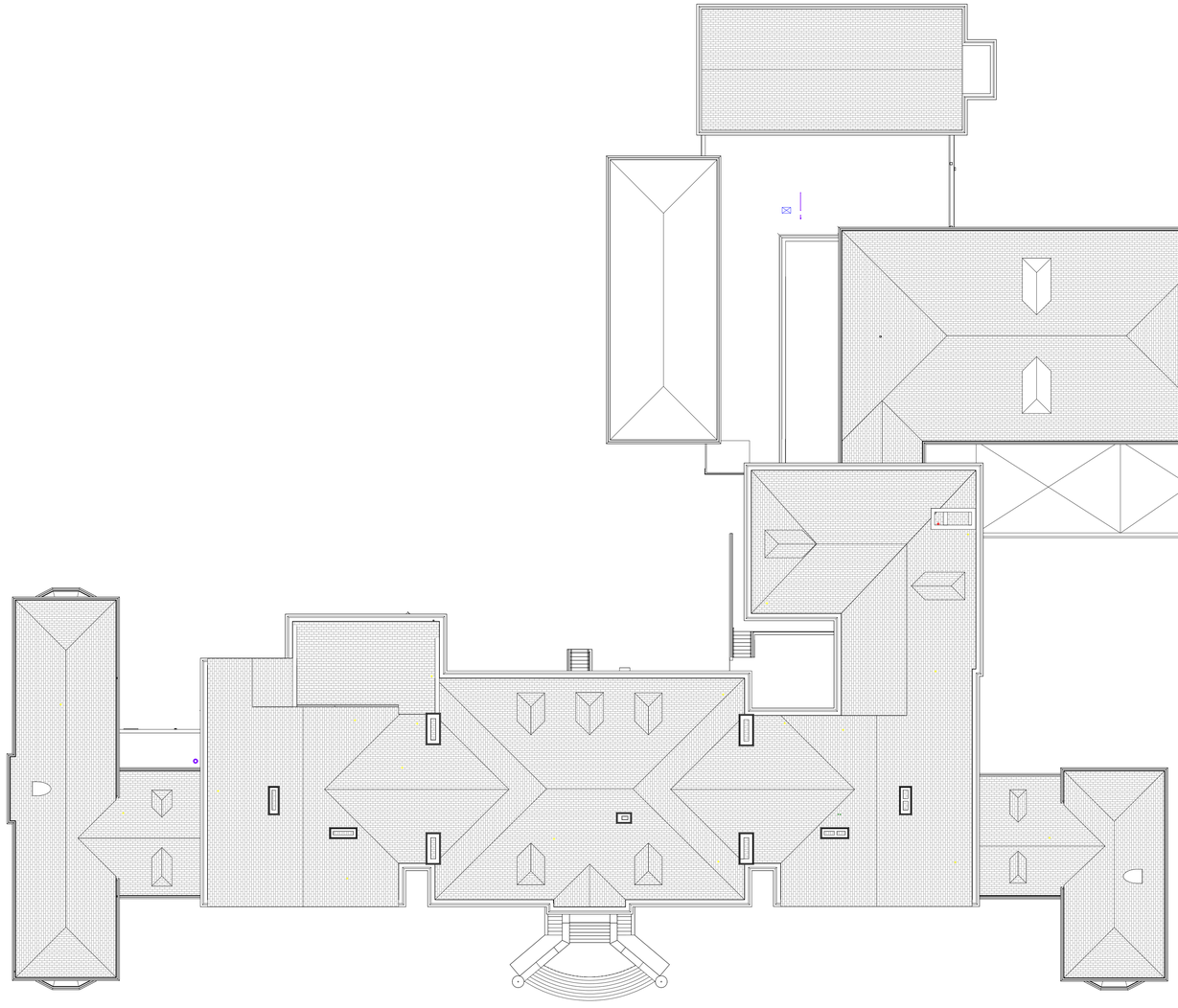
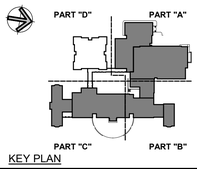


1 ROOF LEVEL - OVERALL EXISTING CONDITIONS PLAN
1/16" = 1'-0"



KEY PLAN

Project Title:

ADDITION & ALTERATIONS TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

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OVERALL ROOF EXISTING CONDITIONS PLAN

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Scale: 1/16" = 1'-0"
Drawn By: JM
Project Number: 22-382

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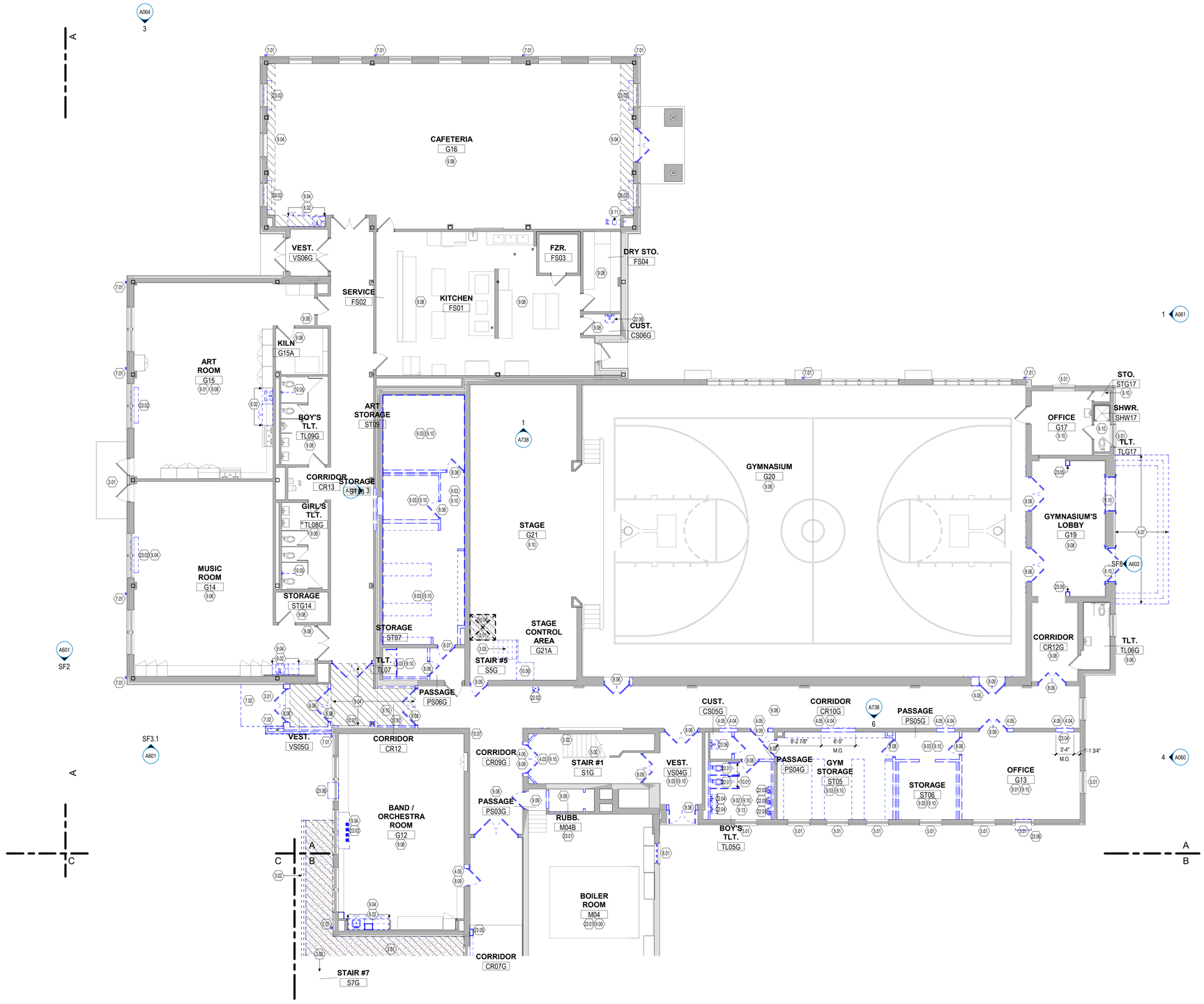


1 1st FLOOR DEMOLITION PLAN - PART "A"
1/8" = 1'-0"

DEMOLITION KEYNOTES

3.01 REMOVE ENTIRE CONCRETE SLAB, SLOPED AND FLAT PORTIONS.
3.02 REMOVE CONCRETE OR STONE STAIR OR STEPS, LANDING, FOUNDATION, FOOTINGS, METAL GUARDRAILS, HANDRAILS AND ALL ASSOCIATED HARDWARE AND FASTENERS.
3.03 REMOVE CONCRETE OR STONE STAIR OR STEPS, LANDING, HANDRAILS, AND ALL ASSOCIATED HARDWARE AND FASTENERS.
4.03 EXISTING TERRAZZO FLOORING TO REMAIN.
4.04 PROVIDE NEW OPENING THROUGH EXISTING MASONRY WALL. PROVIDE TEMPORARY SHORING AND PERMANENT LINTEL AT HEAD AS REQUIRED. COORDINATE SIZE OF OPENING WITH DOOR SIZE AND FRAME AS INDICATED ON DOOR SCHEDULE.
4.05 CAREFULLY SAWCUT AND REMOVE PORTION OF EXISTING GLAZED TILE BLOCK WAINSCOT WALL TO THE EXTENT INDICATED ON THE DRAWINGS.
4.06 REMOVE THIS PORTION OF MASONRY WALL TO ACCOMMODATE NEW LAYOUT. SEE ALSO FLOOR PLAN TO COORDINATE EXACT SIZE OF REMOVAL.
4.07 REMOVE GRANITE STONE ENTRY STOOP. GRANITE STONE STAIR STEPS, AND ALL DAMAGED SUBSTRATE STRUCTURAL BASE. SEE LANDSCAPE DRAWINGS FOR MORE INFORMATION.
4.08 REMOVE STONE SILL
4.09 PROVIDE NEW OPENING THROUGH EXISTING MASONRY WALL. PROVIDE TEMPORARY SHORING AND PERMANENT LINTEL AT HEAD AS REQUIRED. COORDINATE SIZE OF OPENING WITH WINDOW SIZE, REFER TO WINDOW SCHEDULE.
5.01 REMOVE AND REPLACE STEEL LINTEL. SEE STRUCTURAL DRAWINGS.
5.02 REMOVE AND DISPOSE OF ALL SIDEWALL AND INTERMEDIATED METAL HANDRAIL, BRACKETS, AND ALL ASSOCIATED HARDWARE. STRIP PAINT AND CLEAN ALL EXISTING METAL GUARDRAILS AND NEWEL POST.
5.03 STRUCTURAL COLUMN SHALL BE PROTECTED DURING MASONRY REMOVAL.
6.01 REMOVE COUNTERTOPS, BASE AND TOP CABINETS, AND/OR TALL CABINETS AND ASSOCIATED HARDWARE.
6.02 REMOVE COUNTERTOPS, BASE AND TOP CABINETS, AND/OR TALL CABINETS, SINK FIXTURE, FAUCET, AND ASSOCIATED HARDWARE. SEE ALSO PLUMBING DRAWING.
6.03 REMOVE COUNTERTOPS, BASE AND TOP CABINETS, AND/OR TALL CABINETS AND ASSOCIATED HARDWARE.
6.04 REMOVE EXISTING MILLWORK, CASEWORK, AND SHELVING.
6.05 REMOVE ENTIRE WOOD STAIR ASSEMBLY, LANDING, FRAMING, HADRAILS, GUARDRAILS AND ALL ASSOCIATED HARDWARE AND FASTENERS.
6.06 REMOVE AND REPAIR EXISTING CORNICE FASCIA AND SOFFIT.
7.01 REMOVE AND DISPOSE OF ALUMINUM DOWNSPOUT.
7.02 REMOVE ENTIRE CANOPY, INCLUDING ROOF DECKING, BEAMS, ROOFING, FASCIAS, FLASHINGS, STEEL COLUMNS, FOUNDATION, FOOTINGS AND ALL ASSOCIATED HARDWARE AND FASTENERS.
8.01 REMOVE WINDOW SYSTEM, INCLUDING FRAMES. GLAZING, PANELS, LOUVERS, SILLS, GASKETS AND ALL ASSOCIATED HARDWARE. CLEAN OPENING TO RECEIVE NEW WINDOW SYSTEM.
8.02 REMOVE GLAZING, FRAMES, SEALANT AND ASSOCIATED HARDWARE.
8.03 REMOVE AND REPLACE INSULATED GLAZING PANEL. REPAIR ASSOCIATED HARDWARE AS NEEDED.
8.04 REMOVE ALUMINUM ENTRANCE SYSTEM, INCLUDING TRANSOM PANEL, DOORS, FRAMES, GLAZING, SILLS, SEALANTS AND ALL ASSOCIATED HARDWARE.
8.05 REMOVE DOOR, TRANSOM PANEL, FRAME AND ASSOCIATED HARDWARE. ENLARGE OPENING TO ACCEPT NEW FRAME AND MANEUVERING CLEARANCE REQUIREMENT. COORDINATE WITH SCOPE OF NEW WORK REQUIRED.
8.06 REMOVE DOOR, FRAME AND HARDWARE. CLEAN MASONRY OPENING TO ACCEPT NEW FRAME AND DOOR AS SCHEDULED.
8.07 REMOVE DOOR, FRAME AND HARDWARE. PREPARE JAMBS TO RECEIVE TOOTHED-IN INFILL.
8.08 REMOVE DOOR, FRAME AND HARDWARE.
8.09 REMOVE DOOR, FRAME AND HARDWARE. ENLARGE OPENING TO ACCEPT NEW FRAME AND MANEUVERING CLEARANCE REQUIREMENT. PROVIDE TEMPORARY SHORING AND PERMANENT LINTEL AS REQUIRED. SEE NEW PLANS FOR LOCATION OF NEW DOORS.
8.10 REMOVE DOOR, TRANSOM PANEL, FRAME AND ASSOCIATED HARDWARE. CLEAN MASONRY OPENING TO ACCEPT NEW FRAME AND DOOR AS SCHEDULED. COORDINATE WITH SCOPE OF NEW WORK REQUIRED.
8.11 REMOVE AND DISPOSE OF ALUMINUM LOUVER.
9.01 REMOVE AND DISPOSE OF THE FULL EXTENT OF WALL COVED BASE AND VCT OR SHEET FLOORING. CLEAN SUBSTRATE TO ACCEPT NEW SCHEDULED FINISH.
9.02 REMOVE AND DISPOSE OF THE FULL EXTENT OF WALL COVED BASE AND EPOXY FLOORING. CLEAN SUBSTRATE TO ACCEPT NEW SCHEDULED FINISH.
9.03 REMOVE WALL BASE AND CERAMIC FLOORING. CLEAN SUBSTRATE TO ACCEPT NEW SCHEDULED FINISH.
9.04 REMOVE AND DISPOSE PORTION OF THE EXISTING VCT OR SHEET FLOORING. CLEAN SUBSTRATE TO ACCEPT NEW SCHEDULED FINISH. REFER TO ARCHITECTURAL FLOOR PATTERN PLANS FOR REMOVAL COORDINATION.
9.05 REMOVE AND DISPOSE OF THE FULL EXTENT OF EXISTING TERRAZZO FLOORING. PROVIDED NEW SUBSTRATE TO ACCEPT NEW SCHEDULED FINISH. REFER TO ARCHITECTURAL FLOOR PATTERN PLANS FOR REMOVAL COORDINATION.
9.06 REMOVE AND DISPOSE OF ALL EXISTING RUBBER FLOORING, RUBBER STAIR TREADS, AND RISERS. CLEAN SUBSTRATE TO ACCEPT NEW SCHEDULED FINISH.
9.07 REMOVE AND DISPOSE PORTION OF THE EXISTING CARPET. CLEAN SUBSTRATE TO ACCEPT NEW SCHEDULED FINISH. REFER TO ARCHITECTURAL FLOOR PATTERN PLANS FOR REMOVAL COORDINATION.
9.08 REMOVE AND DISPOSE OF ALL SUSPENDED LAY-IN CEILING SYSTEMS INCLUDING ASSOCIATED HANGERS AND ANCHORS. ASSUME PLASTER, GYPSUM BOARD OR BOTH TYPE OF CEILING SYSTEMS MAY BE ABOVE ALL SUSPENDED LAY-IN CEILING SYSTEMS. REMOVE AND DISPOSE OF ALL HARD-SURFACE CEILING SOFFIT AND FRAMING. REFER TO MECHANICAL, PLUMBING AND ELECTRICAL DRAWINGS AND SPECIFICATIONS FOR ADDITIONAL DEMOLITION REQUIREMENTS.
9.09 REMOVE ALL PLASTER CEILING SYSTEMS INCLUDING ASSOCIATED METAL LATH, AND BLOCKING TO THE UNDERSIDE OF FLOOR SLAB ABOVE, UNLESS NOTED OR SHOWN OTHERWISE. REFER TO MECHANICAL, PLUMBING AND ELECTRICAL DRAWINGS AND SPECIFICATIONS FOR ADDITIONAL DEMOLITION REQUIREMENTS.
9.10 REMOVE HARD-SURFACE CEILING/SOFFIT, FRAMING, LOUVERS, DIFFUSERS, SUSPENSION MEMBERS, BRACING AND ALL ASSOCIATED HARDWARE. REFER TO MECHANICAL, PLUMBING AND ELECTRICAL DRAWINGS AND SPECIFICATIONS FOR ADDITIONAL DEMOLITION REQUIREMENTS.
9.11 REMOVE PORTION OF WALL REQUIRED TO ACCESS PLUMBING FOR NEW WATER COOLERS INSTALLATION WHEN APPLICABLE. SEE ALSO NEW FLOOR PLANS.
9.12 REMOVE AND DISPOSE OF ALL MASONRY PLASTER WALL FINISH TO EXPOSE MASONRY CMU WALL.
9.13 REMOVE AND DISPOSE OF ALL WALL TILE FINISH.
10.01 REMOVE TOILET PARTITIONS, DOORS, BRACES AND ALL ASSOCIATED HARDWARE.
10.02 REMOVE METAL LOCKERS, LOCKER METAL BASED, AND ALL ASSOCIATED HARDWARE.
10.03 REMOVE AND SALVAGE METAL LOCKERS, LOCKER METAL BASED, AND ALL ASSOCIATED HARDWARE. CLEAN, REPAIR AS NEEDED, PRIMED AND PAINT FOR INSTALLATION.
10.04 REMOVE TACKBOARDS, BLACK, WHITE BOARDS ON WALL, AND ASSOCIATED HARDWARE.
10.05 REMOVE SWING-UP GRAB BAR AND PATH TILE WALL AS NEEDED.
10.06 REMOVE PORTION OF STAGE: WOOD FLOORING, FRAMING, BASE, CONCRETE SLAB SUBFLOOR, AND ALL ASSOCIATED FASTENERS AND HARDWARE.
10.07 REMOVE SIGNAGE ON WALL AND RETURN TO OWNER.
10.08 REMOVE ARTWORK ON WALL AND RETURN TO OWNER.
12.01 REMOVE WINDOW SHADE SYSTEM AND ASSOCIATED HARDWARE.
22.01 REMOVE WATER CLOSET FIXTURE, CARRIER, PLUMBING VALVE, HARDWARE, GRAB BARS AND ACCESSORIES. SEE ALSO PLUMBING DRAWINGS.
22.02 REMOVE WATER COOLER FIXTURES, CARRIERS AND HARDWARE. SEE ALSO PLUMBING DRAWING.
22.03 REMOVE URINAL FIXTURE AND HARDWARE AND PRIVACY PANELS. SEE ALSO PLUMBING DRAWING.
22.04 REMOVE LAVATORY FIXTURE, CARRIER, HARDWARE, MIRROR AND ACCESSORIES. SEE ALSO PLUMBING DRAWINGS.
22.05 REMOVE PLUMBING FIXTURE AND HARDWARE. SEE ALSO PLUMBING DRAWING.
22.06 REMOVE MOP SINK FIXTURE, CARRIER, AND ACCESSORIES. SEE ALSO PLUMBING DRAWINGS.
23.01 REFER TO MEP DRAWINGS FOR EXTENT OF DEMOLITION.
23.02 REMOVE UNIT VENTILATOR UNIT. REFER TO MECHANICAL DRAWINGS.
23.03 REMOVE WALL-MOUNTED FAN COIL UNIT. REFER TO MECHANICAL DRAWINGS.
23.04 REMOVE WALL-MOUNTED LINEAR HYDRONIC HEATER BASEBOARD UNIT AND ALL ASSOCIATED FASTENERS HARDWARE. PATCH WALL AS NEEDED FOR NEW FINISH. REFER TO MECHANICAL DRAWINGS.
23.05 REMOVE WALL-MOUNTED METAL PIPE COVER ENCLOSURE. PIPES AND ALL ASSOCIATED FASTENERS HARDWARE. PATCH WALL AS NEEDED FOR NEW FINISH. REFER TO MECHANICAL DRAWINGS.
23.06 REMOVE AND DISPOSE OF AIR CONDITIONER UNIT FROM WINDOW AND ANY ASSOCIATED ACCESSORIES. REPAIR WINDOW PANEL AS REQUIRED. REFER TO MECHANICAL DRAWINGS.

DEMOLITION LEGEND:

DEMOLITION SCOPE

SAW CUT AND REMOVE CONCRETE FLOOR SLAB AS SHOWN FOR NEW WORK. REFER TO STRUCTURAL DRAWINGS.

REMOVE AND DISPOSE WOOD FLOOR ASSEMBLY AS SHOWN FOR NEW WORK. REFER TO STRUCTURAL DRAWINGS.

DEMOLITION GENERAL NOTES:

A. THE CONTRACTOR SHALL REFERENCE HAZARDOUS MATERIAL, MECHANICAL, ELECTRICAL, AND PLUMBING DEMOLITION DRAWINGS FOR ADDITIONAL DEMOLITION SCOPE OF WORK.

B. THE CONTRACTOR SHALL VERIFY EXISTING CONDITIONS PRIOR TO THE START OF WORK. REPORT TO THE ARCHITECT OF ANY DISCREPANCIES WITH THE DRAWINGS PROVIDED.

C. THE CONTRACTOR SHALL ADVISE THE ARCHITECT OF ALL CONFLICTS ENCOUNTERED IN THE FIELD. THE CONTRACTOR SHALL PROTECT THE INTERIOR OF THE BUILDING FROM ADVERSE WEATHER CONDITIONS WHERE EXTERIOR WEATHERTIGHT ELEMENTS HAVE BEEN REMOVED.

D. THE EXISTING FACILITY IS CONSIDERED TO BE HISTORIC IN NATURE. THE CONTRACTOR IS TO COORDINATE THE EXTENT OF DEMOLITION WITH THE PROPOSED NEW WORK AND SHALL PROTECT ALL EXISTING SURFACES AND MATERIALS SCHEDULED TO REMAIN. IT IS EXPECTED THAT THE CONTRACTOR WILL PROVIDE THE LEAST INVASIVE AND DESTRUCTIVE METHODS OF DEMOLITION AROUND HISTORICALLY IMPORTANT ELEMENTS. INCLUDING BUT NOT LIMITED TO:
a. EXISTING EXTERIOR FACADE TO REMAIN
b. EXTERIOR WINDOWS NOTED TO REMAIN OR BE SALVAGED
c. TERRAZZO FLOOR SYSTEMS NOTED TO REMAIN

E. THE CONTRACTOR SHALL PROVIDE ALL OPENINGS THROUGH EXISTING WALLS, AND FLOORS REQUIRED FOR THE INSTALLATION OF NEW DUCTWORK, PIPING, AND CONDUITS. PROVIDE TEMPORARY PROTECTION FOR ALL NEW AND EXISTING OPENINGS IN FLOORS AND ROOF DECK.

F. THE CONTRACTOR SHALL PATCH THE REMAINING WALLS, FLOOR, AND CEILING AS REQUIRED BY DEMOLITION TO OBTAIN A UNIFORM SURFACE READY TO RECEIVE FINISHES. REFER TO SPECIFICATIONS REGARDING CUTTING AND PATCHING.

G. THE CONTRACTOR SHALL SALVAGE AND STORE ALL MATERIALS AND/OR EQUIPMENT AS NOTED FOR REINSTALLATION.

H. THE CONTRACTOR SHALL BRING TO THE ATTENTION OF THE ARCHITECT ANY CONSTRUCTION OR MATERIALS TO REMAIN THAT ARE UNSOUND, DETERIORATED, OR ARE NOT AS SHOWN IN THESE CONTRACT DOCUMENTS.

I. DEMOLISH ALL SELECTED INTERIOR CONSTRUCTION AND FINISHES AS SHOWN ON THE PLANS. EXCEPT FOR STRUCTURE, FLOOR SLABS, INTERIOR STAIRS AND STAIR ENCLOSURE WALLS, AND INTERIOR BEARING WALLS, UNLESS NOTED OR SHOWN OTHERWISE. EXPOSED EXTERIOR ROUGH OPENINGS SHALL BE WATERTIGHT.

J. REFER TO MECHANICAL, PLUMBING AND ELECTRICAL DRAWINGS AND SPECIFICATIONS FOR ADDITIONAL DEMOLITION REQUIREMENTS.

K. COORDINATE THE SIZE, LOCATION, AND QUANTITY OF NEW PENETRATIONS THROUGH EXISTING WALLS, FLOORS, AND ROOF DECK WITH THE MEP & FP CONTRACTOR AND PROPOSED NEW EQUIPMENT.

L. REMOVE AND DISPOSE ALL SELECTED FLOOR FINISH AREAS AS SHOWN ON THE PLAN TO THE SUBSTRATE UNLESS NOTED OR SHOWN OTHERWISE.

M. REMOVE AND DISPOSE OF ALL PLASTER WALL FINISH, ASSOCIATED LATH, AND FURRING WITHIN THE PLENUM CEILING SPACE FROM THE INTERIOR FACE OF ALL EXISTING INTERIOR WALLS DOWN TO 4" FROM THE EXISTING CEILING HEIGHT TO THE MASONRY SUBSTRATE, UNLESS NOTED OTHERWISE. REFER TO DETAIL: FOR REFERENCE.

N. REMOVE AND DISPOSE OF ALL SELECTED INTERIOR MILLWORK AS SHOWN ON THE PLANS.

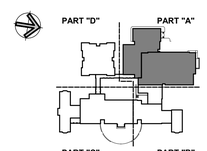
O. REMOVE AND DISPOSE OF ALL SELECTED EXTERIOR WINDOWS, AND LOUVERS, FROM EXTERIOR OPENINGS BACK TO THE ORIGINAL MASONRY OPENING, INCLUDING ALL ASSOCIATED FRAMES AND HARDWARE, UNLESS NOTED OTHERWISE. CAULKING AT EXISTING WINDOWS SHALL BE REMOVED IN PHASES BY THE DEMOLITION CONTRACTOR. EXPOSED WINDOW OPENINGS AS A RESULT OF WINDOW REMOVAL SHALL BE TEMPORARILY BOARDED UP AND MADE WEATHER-TIGHT UNTIL NEW WINDOWS (AS PART OF A FUTURE PHASE) CAN BE INSTALLED. WEATHER-TIGHT INFILL SHALL BE FLUSH WITH THE EXTERIOR AND ATTACHED TO THE JAMB OF THE EXISTING OPENING. WINDOWS TO REMAIN SHALL BE PROTECTED DURING DEMOLITION.

P. REMOVE ALL EXTERIOR DOORS, INCLUDING ALL ASSOCIATED FRAMES, HARDWARE, AND CAULKING UNLESS OTHERWISE NOTED. PROTECT ALL EXPOSED EXTERIOR OPENINGS WITH TEMPORARY BOARDED UP WEATHER-TIGHT AND SECURE INFILLS TO PREVENT THE EXPOSURE TO WEATHER OF HISTORICALLY IMPORTANT ELEMENTS ON THE INTERIOR AND PROTECT THE BUILDING FROM UNAUTHORIZED INTRUSION. INFILL SHALL BE SECURED IN PLACE AT THE JAMB AND FLUSH WITH THE EXTERIOR.

Q. SALVAGE ALL FACE BRICK FROM DEMOLISHED BUILDING. REMOVE THE BRICK TO MAINTAIN ITS APPEARANCE AND STRUCTURAL INTEGRITY. CLEAN BRICK OF ALL EXISTING MORTAR AND STORE IN VANDAL RESISTANT WEATHER PROTECTED AREA.

R. EXISTING TERRAZZO FLOOR FINISH TO REMAIN SHALL BE PROTECTED FROM DAMAGE DURING DEMOLITION. SAW CUT, REMOVE AND DISPOSE OF ASSOCIATED TERRAZZO WALL BASE UNLESS OTHERWISE NOTED RE:

S. ALL ROUGH OPENING DIMENSIONS AND LOCATIONS FOR NEW DOORS AND CASED OPENINGS NEED TO BE COORDINATED WITH THE PROPOSED NEW OPENINGS.



KEY PLAN

Project Title:
ADDITION & ALTERATIONS TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

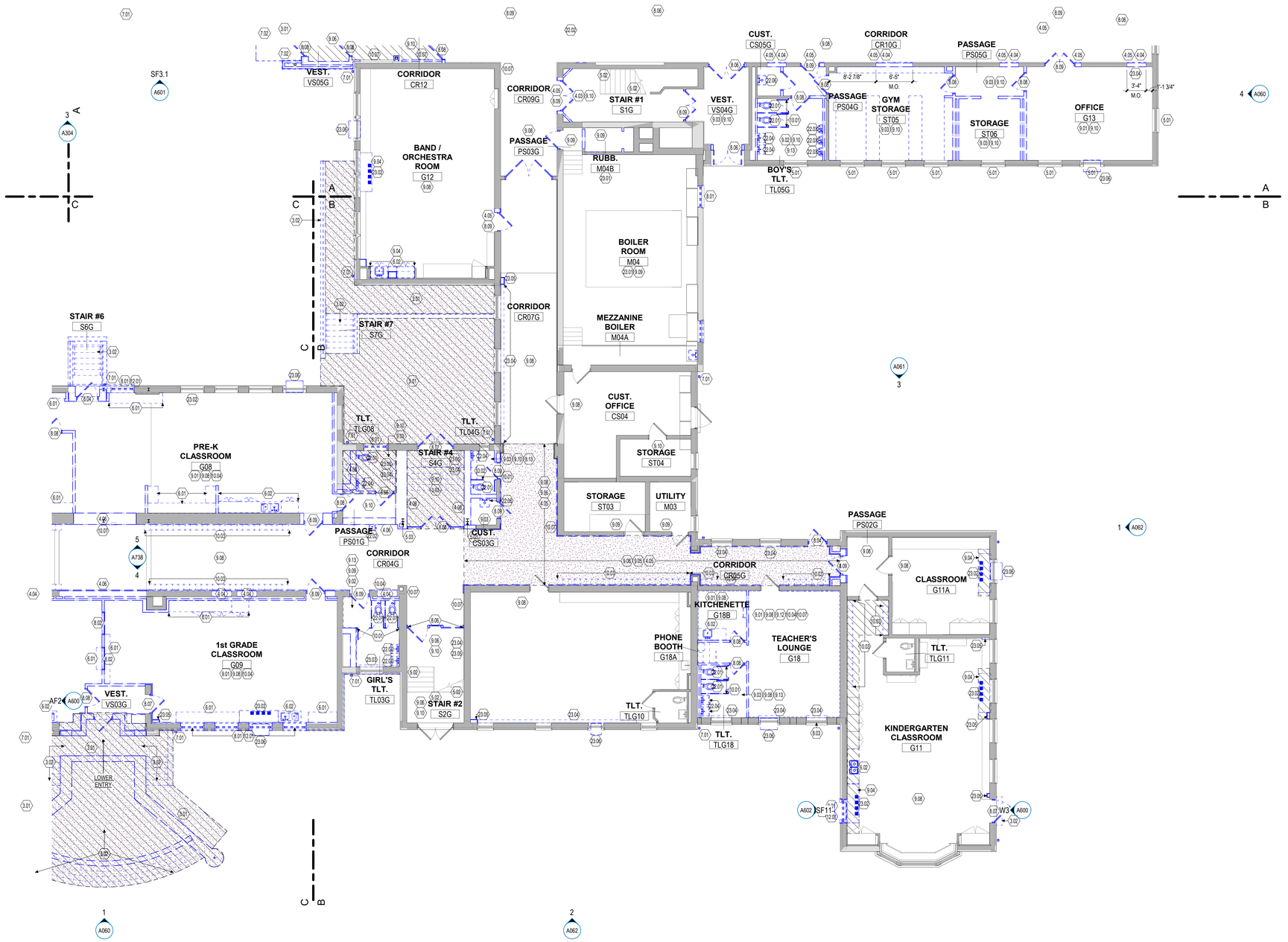
SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
311 STATE STREET NEW LONDON CT 06320
203 230 9007 silverpetrucelli.com

Revision:	Description:	Date:	Revised By:

Drawing Title:
FIRST FLOOR DEMOLITION PLAN - PART "A"

Date: 8/29/2024
Scale: As indicated
Drawn By: JM
Project Number: 22-382
Drawing Number: A011

8/30/2024 7:38:42 AM



1 1st FLOOR DEMOLITION PLAN - PART "B"
1/8" = 1'-0"

DEMOLITION KEYNOTES

3.01 REMOVE ENTIRE CONCRETE SLAB, SLOPED AND FLAT PORTIONS.
3.02 REMOVE CONCRETE OR STONE STAIR OR STEPS, LANDING, FOUNDATION, FOOTINGS, METAL GUARDRAILS, HANDRAILS AND ALL ASSOCIATED HARDWARE AND FASTENERS.
3.03 REMOVE CONCRETE OR STONE STAIR OR STEPS, LANDING, HANDRAILS, AND ALL ASSOCIATED HARDWARE AND FASTENERS.
4.03 EXISTING TERRAZZO FLOORING TO REMAIN.
4.04 PROVIDE NEW OPENING THROUGH EXISTING MASONRY WALL. PROVIDE TEMPORARY SHORING AND PERMANENT LINTEL AT HEAD AS REQUIRED. COORDINATE SIZE OF OPENING WITH DOOR SIZE AND FRAME AS INDICATED ON DOOR SCHEDULE.
4.05 CAREFULLY SAWCUT AND REMOVE PORTION OF EXISTING GLAZED TILE BLOCK WAINSCOT WALL TO THE EXTENT INDICATED ON THE DRAWINGS.
4.06 REMOVE THIS PORTION OF MASONRY WALL TO ACCOMMODATE NEW LAYOUT. SEE ALSO FLOOR PLAN TO COORDINATE EXACT SIZE OF REMOVAL.
4.07 REMOVE GRANITE STONE ENTRY STOOP, GRANITE STONE STAIR STEPS, AND ALL DAMAGED SUBSTRATE STRUCTURAL BASE. SEE LANDSCAPE DRAWINGS FOR MORE INFORMATION.
4.08 REMOVE STONE SILL
4.09 PROVIDE NEW OPENING THROUGH EXISTING MASONRY WALL. PROVIDE TEMPORARY SHORING AND PERMANENT LINTEL AT HEAD AS REQUIRED. COORDINATE SIZE OF OPENING WITH WINDOW SIZE, REFER TO WINDOW SCHEDULE.
5.01 REMOVE AND REPLACE STEEL LINTEL. SEE STRUCTURAL DRAWINGS.
5.02 REMOVE AND DISPOSE OF ALL SIDEWALL AND INTERMEDIATED METAL HANDRAIL, BRACKETS, AND ALL ASSOCIATED HARDWARE. STRIP PAINT AND CLEAN ALL EXISTING METAL GUARDRAILS AND NEWEL POST.
5.03 STRUCTURAL COLUMN SHALL BE PROTECTED DURING MASONRY REMOVAL.
6.01 REMOVE COUNTERTOPS, BASE AND TOP CABINETS, AND/OR TALL CABINETS AND ASSOCIATED HARDWARE.
6.02 REMOVE COUNTERTOPS, BASE AND TOP CABINETS, AND/OR TALL CABINETS, SINK FIXTURE, FAUCET, AND ASSOCIATED HARDWARE. SEE ALSO PLUMBING DRAWING.
6.03 REMOVE COUNTERTOPS, BASE AND TOP CABINETS, AND/OR TALL CABINETS AND ASSOCIATED HARDWARE.
6.04 REMOVE EXISTING MILLWORK, CASEWORK, AND SHELVING.
6.05 REMOVE ENTIRE WOOD STAIR ASSEMBLY, LANDING, FRAMING, HADRAILS, GUARDRAILS AND ALL ASSOCIATED HARDWARE AND FASTENERS.
6.06 REMOVE AND REPAIR EXISTING CORNICE FASCIA AND SOFFIT.
7.01 REMOVE AND DISPOSE OF ALUMINUM DOWNSPOUT.
7.02 REMOVE ENTIRE CANOPY, INCLUDING ROOF DECKING, BEAMS, ROOFING, FASCIAS, FLASHINGS, STEEL COLUMNS, FOUNDATION, FOOTINGS AND ALL ASSOCIATED HARDWARE AND FASTENERS.
8.01 REMOVE WINDOW SYSTEM, INCLUDING FRAMES, GLAZING, PANELS, LOUVERS, SILLS, GASKETS AND ALL ASSOCIATED HARDWARE. CLEAN OPENING TO RECEIVE NEW WINDOW SYSTEM.
8.02 REMOVE GLAZING, FRAMES, SEALANT AND ASSOCIATED HARDWARE.
8.03 REMOVE AND REPLACE INSULATED GLAZING PANEL. REPAIR ASSOCIATED HARDWARE AS NEEDED.
8.04 REMOVE ALUMINUM ENTRANCE SYSTEM, INCLUDING TRANSOM PANEL, DOORS, FRAMES, GLAZING, SILLS, SEALANTS AND ALL ASSOCIATED HARDWARE.
8.05 REMOVE DOOR, TRANSOM PANEL, FRAME AND ASSOCIATED HARDWARE. ENLARGE OPENING TO ACCEPT NEW FRAME AND MANEUVERING CLEARANCE REQUIREMENT. COORDINATE WITH SCOPE OF NEW WORK REQUIRED.
8.06 REMOVE DOOR, FRAME AND HARDWARE. CLEAN MASONRY OPENING TO ACCEPT NEW FRAME AND DOOR AS SCHEDULED.
8.07 REMOVE DOOR, FRAME AND HARDWARE. PREPARE JAMBS TO RECEIVE TOOTHED-IN INFILL.
8.08 REMOVE DOOR, FRAME AND HARDWARE.
8.09 REMOVE DOOR, FRAME AND HARDWARE. ENLARGE OPENING TO ACCEPT NEW FRAME AND MANEUVERING CLEARANCE REQUIREMENT. PROVIDE TEMPORARY SHORING AND PERMANENT LINTEL AS REQUIRED. SEE NEW PLANS FOR LOCATION OF NEW DOORS.
8.10 REMOVE DOOR, TRANSOM PANEL, FRAME AND ASSOCIATED HARDWARE. CLEAN MASONRY OPENING TO ACCEPT NEW FRAME AND DOOR AS SCHEDULED. COORDINATE WITH SCOPE OF NEW WORK REQUIRED.
8.11 REMOVE AND DISPOSE OF ALUMINUM LOUVER.
9.01 REMOVE AND DISPOSE OF THE FULL EXTENT OF WALL COVED BASE AND VCT OR SHEET FLOORING. CLEAN SUBSTRATE TO ACCEPT NEW SCHEDULED FINISH.
9.02 REMOVE AND DISPOSE OF THE FULL EXTENT OF WALL COVED BASE AND EPOXY FLOORING. CLEAN SUBSTRATE TO ACCEPT NEW SCHEDULED FINISH.
9.03 REMOVE WALL BASE AND CERAMIC FLOORING. CLEAN SUBSTRATE TO ACCEPT NEW SCHEDULED FINISH.
9.04 REMOVE AND DISPOSE PORTION OF THE EXISTING VCT OR SHEET FLOORING. CLEAN SUBSTRATE TO ACCEPT NEW SCHEDULED FINISH. REFER TO ARCHITECTURAL FLOOR PATTERN PLANS FOR REMOVAL COORDINATION.
9.05 REMOVE AND DISPOSE OF THE FULL EXTENT OF EXISTING TERRAZZO FLOORING. PROVIDED NEW SUBSTRATE TO ACCEPT NEW SCHEDULED FINISH. REFER TO ARCHITECTURAL FLOOR PATTERN PLANS FOR REMOVAL COORDINATION.
9.06 REMOVE AND DISPOSE OF ALL EXISTING RUBBER FLOORING, RUBBER STAIR TREADS, AND RISERS. CLEAN SUBSTRATE TO ACCEPT NEW SCHEDULED FINISH.
9.07 REMOVE AND DISPOSE PORTION OF THE EXISTING CARPET. CLEAN SUBSTRATE TO ACCEPT NEW SCHEDULED FINISH. REFER TO ARCHITECTURAL FLOOR PATTERN PLANS FOR REMOVAL COORDINATION.
9.08 REMOVE AND DISPOSE OF ALL SUSPENDED LAY-IN CEILING SYSTEMS INCLUDING ASSOCIATED HANGERS AND ANCHORS. ASSUME PLASTER, GYPSUM BOARD OR BOTH TYPE OF CEILING SYSTEMS MAY BE ABOVE ALL SUSPENDED LAY-IN CEILING SYSTEMS. REMOVE AND DISPOSE OF ALL HARD-SURFACE CEILING SOFFIT AND FRAMING. REFER TO MECHANICAL, PLUMBING AND ELECTRICAL DRAWINGS AND SPECIFICATIONS FOR ADDITIONAL DEMOLITION REQUIREMENTS.
9.09 REMOVE ALL PLASTER CEILING SYSTEMS INCLUDING ASSOCIATED METAL LATH, AND BLOCKING TO THE UNDERSIDE OF FLOOR SLAB ABOVE. UNLESS NOTED OR SHOWN OTHERWISE. REFER TO MECHANICAL, PLUMBING AND ELECTRICAL DRAWINGS AND SPECIFICATIONS FOR ADDITIONAL DEMOLITION REQUIREMENTS.
9.10 REMOVE HARD-SURFACE CEILING/SOFFIT, FRAMING, LOUVERS, DIFFUSERS, SUSPENSION MEMBERS, BRACING AND ALL ASSOCIATED HARDWARE. REFER TO MECHANICAL, PLUMBING AND ELECTRICAL DRAWINGS AND SPECIFICATIONS FOR ADDITIONAL DEMOLITION REQUIREMENTS.
9.11 REMOVE PORTION OF WALL REQUIRED TO ACCESS PLUMBING FOR NEW WATER COOLERS INSTALLATION WHEN APPLICABLE. SEE ALSO NEW FLOOR PLANS.
9.12 REMOVE AND DISPOSE OF ALL MASONRY PLASTER WALL FINISH TO EXPOSE MASONRY CMU WALL.
9.13 REMOVE AND DISPOSE OF ALL WALL TILE FINISH.
10.01 REMOVE TOILET PARTITIONS, DOORS, BRACES AND ALL ASSOCIATED HARDWARE.
10.02 REMOVE METAL LOCKERS, LOCKER METAL BASED, AND ALL ASSOCIATED HARDWARE.
10.03 REMOVE AND SALVAGE METAL LOCKERS, LOCKER METAL BASED, AND ALL ASSOCIATED HARDWARE. CLEAN, REPAIR AS NEEDED, PRIMED AND PAINT FOR INSTALLATION.
10.04 REMOVE TACKBOARDS, BLACK, WHITE BOARDS ON WALL, AND ASSOCIATED HARDWARE.
10.05 REMOVE SWING-UP GRAB BAR AND PATH TILE WALL AS NEEDED.
10.06 REMOVE PORTION OF STAGE: WOOD FLOORING, FRAMING, BASE, CONCRETE SLAB SUBFLOOR, AND ALL ASSOCIATED FASTENERS AND HARDWARE.
10.07 REMOVE SIGNAGE ON WALL AND RETURN TO OWNER.
10.08 REMOVE ARTWORK ON WALL AND RETURN TO OWNER.
12.01 REMOVE WINDOW SHADE SYSTEM AND ASSOCIATED HARDWARE.
22.01 REMOVE WATER CLOSET FIXTURE, CARRIER, PLUMBING VALVE, HARDWARE, GRAB BARS AND ACCESSORIES. SEE ALSO PLUMBING DRAWINGS.
22.02 REMOVE WATER COOLER FIXTURES, CARRIERS AND HARDWARE. SEE ALSO PLUMBING DRAWING.
22.03 REMOVE URINAL FIXTURE AND HARDWARE AND PRIVACY PANELS. SEE ALSO PLUMBING DRAWING.
22.04 REMOVE LAVATORY FIXTURE, CARRIER, HARDWARE, MIRROR AND ACCESSORIES. SEE ALSO PLUMBING DRAWINGS.
22.05 REMOVE PLUMBING FIXTURE AND HARDWARE. SEE ALSO PLUMBING DRAWING.
22.06 REMOVE MOP SINK FIXTURE, CARRIER, AND ACCESSORIES. SEE ALSO PLUMBING DRAWINGS.
23.01 REFER TO MEP DRAWINGS FOR EXTENT OF DEMOLITION.
23.02 REMOVE UNIT VENTILATOR UNIT. REFER TO MECHANICAL DRAWINGS.
23.03 REMOVE WALL-MOUNTED FAN COIL UNIT. REFER TO MECHANICAL DRAWINGS.
23.04 REMOVE WALL-MOUNTED LINEAR HYDRONIC HEATER BASEBOARD UNIT AND ALL ASSOCIATED FASTENERS HARDWARE. PATCH WALL AS NEEDED FOR NEW FINISH. REFER TO MECHANICAL DRAWINGS.
23.05 REMOVE WALL-MOUNTED METAL PIPE COVER ENCLOSURE, PIPES AND ALL ASSOCIATED FASTENERS HARDWARE. PATCH WALL AS NEEDED FOR NEW FINISH. REFER TO MECHANICAL DRAWINGS.
23.06 REMOVE AND DISPOSE OF AIR CONDITIONER UNIT FROM WINDOW AND ANY ASSOCIATED ACCESSORIES. REPAIR WINDOW PANEL AS REQUIRED. REFER TO MECHANICAL DRAWINGS.

DEMOLITION LEGEND:

DEMOLITION SCOPE

SAW CUT AND REMOVE CONCRETE FLOOR SLAB AS SHOWN FOR NEW WORK. REFER TO STRUCTURAL DRAWINGS.

REMOVE AND DISPOSE WOOD FLOOR ASSEMBLY AS SHOWN FOR NEW WORK. REFER TO STRUCTURAL DRAWINGS.

DEMOLITION GENERAL NOTES:

A. THE CONTRACTOR SHALL REFERENCE HAZARDOUS MATERIAL, MECHANICAL, ELECTRICAL, AND PLUMBING DEMOLITION DRAWINGS FOR ADDITIONAL DEMOLITION SCOPE OF WORK.

B. THE CONTRACTOR SHALL VERIFY EXISTING CONDITIONS PRIOR TO THE START OF WORK. REPORT TO THE ARCHITECT OF ANY DISCREPANCIES WITH THE DRAWINGS PROVIDED.

C. THE CONTRACTOR SHALL ADVISE THE ARCHITECT OF ALL CONFLICTS ENCOUNTERED IN THE FIELD. THE CONTRACTOR SHALL PROTECT THE INTERIOR OF THE BUILDING FROM ADVERSE WEATHER CONDITIONS WHERE EXTERIOR WEATHERTIGHT ELEMENTS HAVE BEEN REMOVED.

D. THE EXISTING FACILITY IS CONSIDERED TO BE HISTORIC IN NATURE. THE CONTRACTOR IS TO COORDINATE THE EXTENT OF DEMOLITION WITH THE PROPOSED NEW WORK AND SHALL PROTECT ALL EXISTING SURFACES AND MATERIALS SCHEDULED TO REMAIN. IT IS EXPECTED THAT THE CONTRACTOR WILL PROVIDE THE LEAST INVASIVE AND DESTRUCTIVE METHODS OF DEMOLITION AROUND HISTORICALLY IMPORTANT ELEMENTS. INCLUDING BUT NOT LIMITED TO:
a. EXISTING EXTERIOR FACADE TO REMAIN
b. EXTERIOR WINDOWS NOTED TO REMAIN OR BE SALVAGED
c. TERRAZZO FLOOR SYSTEMS NOTED TO REMAIN

E. THE CONTRACTOR SHALL PROVIDE ALL OPENINGS THROUGH EXISTING WALLS, AND FLOORS REQUIRED FOR THE INSTALLATION OF NEW DUCTWORK, PIPING, AND CONDUITS. PROVIDE TEMPORARY PROTECTION FOR ALL NEW AND EXISTING OPENINGS IN FLOORS AND ROOF DECK.

F. THE CONTRACTOR SHALL PATCH THE REMAINING WALLS, FLOOR, AND CEILING AS REQUIRED BY DEMOLITION TO OBTAIN A UNIFORM SURFACE READY TO RECEIVE FINISHES. REFER TO SPECIFICATIONS REGARDING CUTTING AND PATCHING.

G. THE CONTRACTOR SHALL SALVAGE AND STORE ALL MATERIALS AND/OR EQUIPMENT AS NOTED FOR REINSTALLATION.

H. THE CONTRACTOR SHALL BRING TO THE ATTENTION OF THE ARCHITECT ANY CONSTRUCTION OR MATERIALS TO REMAIN THAT ARE UNSOUND, DETERIORATED, OR ARE NOT AS SHOWN IN THESE CONTRACT DOCUMENTS.

I. DEMOLISH ALL SELECTED INTERIOR CONSTRUCTION AND FINISHES AS SHOWN ON THE PLANS. EXCEPT FOR STRUCTURE, FLOOR SLABS, INTERIOR STAIRS AND STAIR ENCLOSURE WALLS, AND INTERIOR BEARING WALLS. UNLESS NOTED OR SHOWN OTHERWISE. EXPOSED EXTERIOR ROUGH OPENINGS SHALL BE WATERTIGHT.

J. REFER TO MECHANICAL, PLUMBING AND ELECTRICAL DRAWINGS AND SPECIFICATIONS FOR ADDITIONAL DEMOLITION REQUIREMENTS.

K. COORDINATE THE SIZE, LOCATION, AND QUANTITY OF NEW PENETRATIONS THROUGH EXISTING WALLS, FLOORS, AND ROOF DECK WITH THE MEP & FP CONTRACTOR AND PROPOSED NEW EQUIPMENT.

L. REMOVE AND DISPOSE ALL SELECTED FLOOR FINISH AREAS AS SHOWN ON THE PLAN TO THE SUBSTRATE UNLESS NOTED OR SHOWN OTHERWISE.

M. REMOVE AND DISPOSE OF ALL PLASTER WALL FINISH, ASSOCIATED LATH, AND FURRING WITHIN THE PLENUM CEILING SPACE FROM THE INTERIOR FACE OF ALL EXISTING INTERIOR WALLS DOWN TO 4" FROM THE EXISTING CEILING HEIGHT TO THE MASONRY SUBSTRATE, UNLESS NOTED OTHERWISE. REFER TO DETAIL: FOR REFERENCE.

N. REMOVE AND DISPOSE OF ALL SELECTED INTERIOR MILLWORK AS SHOWN ON THE PLANS.

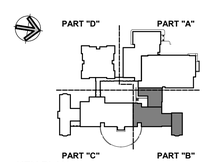
O. REMOVE AND DISPOSE OF ALL SELECTED EXTERIOR WINDOWS, AND LOUVERS, FROM EXTERIOR OPENINGS BACK TO THE ORIGINAL MASONRY OPENING, INCLUDING ALL ASSOCIATED FRAMES AND HARDWARE, UNLESS NOTED OTHERWISE. CAULKING AT EXISTING WINDOWS SHALL BE REMOVED IN PHASES BY THE DEMOLITION CONTRACTOR. EXPOSED WINDOW OPENINGS AS A RESULT OF WINDOW REMOVAL SHALL BE TEMPORARILY BOARDED UP AND MADE WEATHER-TIGHT UNTIL NEW WINDOWS (AS PART OF A FUTURE PHASE) CAN BE INSTALLED. WEATHER-TIGHT INFILL SHALL BE FLUSH WITH THE EXTERIOR AND ATTACHED TO THE JAMB OF THE EXISTING OPENING. WINDOWS TO REMAIN SHALL BE PROTECTED DURING DEMOLITION.

P. REMOVE ALL EXTERIOR DOORS, INCLUDING ALL ASSOCIATED FRAMES, HARDWARE, AND CAULKING UNLESS OTHERWISE NOTED. PROTECT ALL EXPOSED EXTERIOR OPENINGS WITH TEMPORARY BOARDED UP WEATHER-TIGHT AND SECURE INFILLS TO PREVENT THE EXPOSURE TO WEATHER OF HISTORICALLY IMPORTANT ELEMENTS ON THE INTERIOR AND PROTECT THE BUILDING FROM UNAUTHORIZED INTRUSION. INFILL SHALL BE SECURED IN PLACE AT THE JAMB AND FLUSH WITH THE EXTERIOR.

Q. SALVAGE ALL FACE BRICK FROM DEMOLISHED BUILDING. REMOVE THE BRICK TO MAINTAIN ITS APPEARANCE AND STRUCTURAL INTEGRITY. CLEAN BRICK OF ALL EXISTING MORTAR AND STORE IN VANDAL RESISTANT WEATHER PROTECTED AREA.

R. EXISTING TERRAZZO FLOOR FINISH TO REMAIN SHALL BE PROTECTED FROM DAMAGE DURING DEMOLITION. SAW CUT, REMOVE AND DISPOSE OF ASSOCIATED TERRAZZO WALL BASE UNLESS OTHERWISE NOTED RE: .

S. ALL ROUGH OPENING DIMENSIONS AND LOCATIONS FOR NEW DOORS AND CASED OPENINGS NEED TO BE COORDINATED WITH THE PROPOSED NEW OPENINGS.



KEY PLAN

Project Title:
ADDITION & ALTERATIONS TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
311 STATE STREET NEW LONDON CT 06320
203 230 9007 silverpetrucelli.com

Revision: Description: Date: Revised By:

Drawing Title:
FIRST FLOOR DEMOLITION PLAN - PART "B"

Date: 8/29/2024
Scale: As indicated
Drawn By: JM
Project Number: 22-382
Drawing Number: A012

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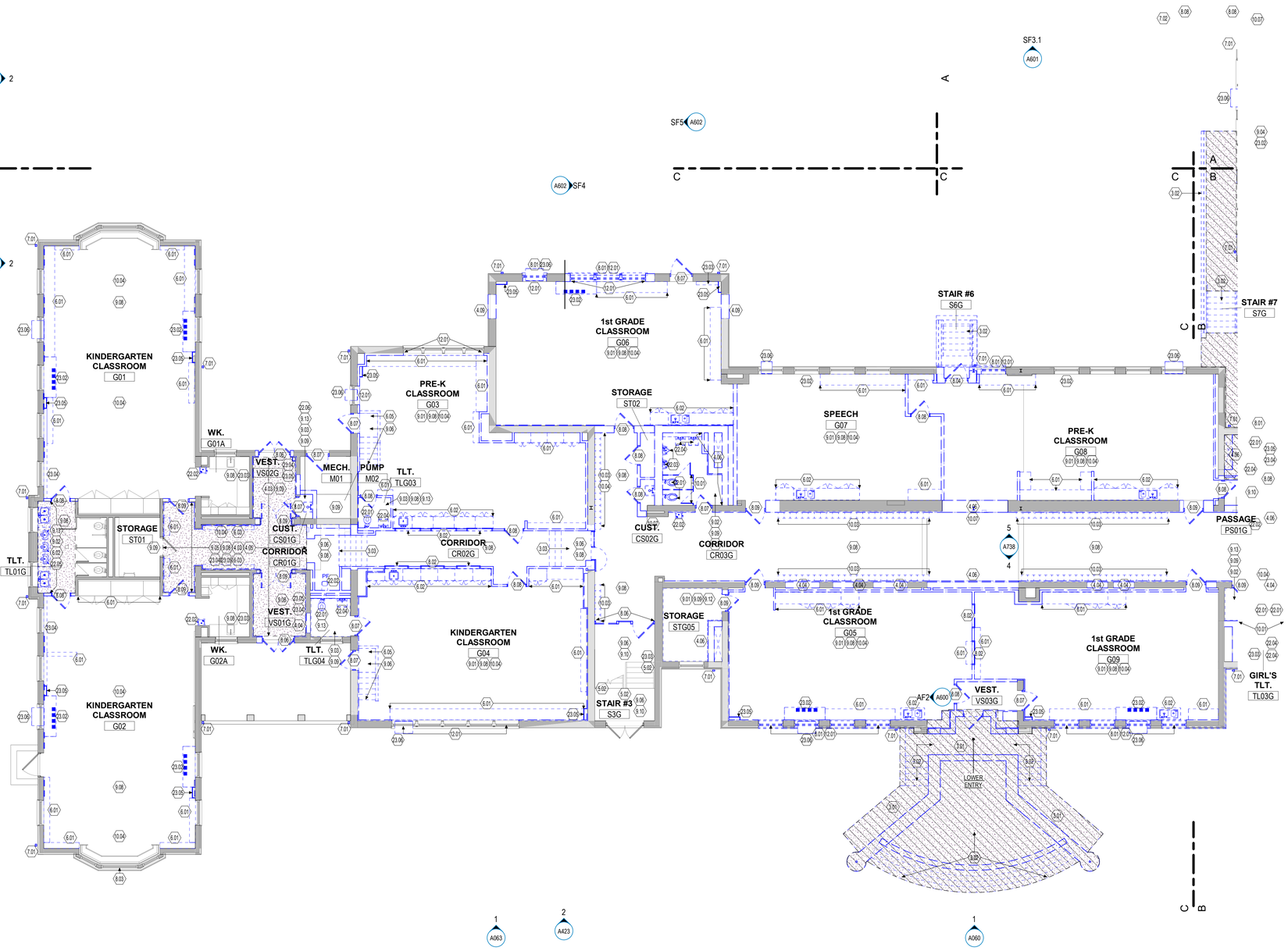


1 1st FLOOR DEMOLITION PLAN - PART "C"
1/8" = 1'-0"

DEMOLITION KEYNOTES

3.01 REMOVE ENTIRE CONCRETE SLAB, SLOPED AND FLAT PORTIONS.
3.02 REMOVE CONCRETE OR STONE STAIR OR STEPS, LANDING, FOUNDATION, FOOTINGS, METAL GUARDRAILS, HANDRAILS AND ALL ASSOCIATED HARDWARE AND FASTENERS.
3.03 REMOVE CONCRETE OR STONE STAIR OR STEPS, LANDING, HANDRAILS, AND ALL ASSOCIATED HARDWARE AND FASTENERS.
4.03 EXISTING TERRAZZO FLOORING TO REMAIN.
4.04 PROVIDE NEW OPENING THROUGH EXISTING MASONRY WALL. PROVIDE TEMPORARY SHORING AND PERMANENT LINTEL AT HEAD AS REQUIRED. COORDINATE SIZE OF OPENING WITH DOOR SIZE AND FRAME AS INDICATED ON DOOR SCHEDULE.
4.05 CAREFULLY SAWCUT AND REMOVE PORTION OF EXISTING GLAZED TILE BLOCK WAINSCOT WALL TO THE EXTENT INDICATED ON THE DRAWINGS.
4.06 REMOVE THIS PORTION OF MASONRY WALL TO ACCOMMODATE NEW LAYOUT. SEE ALSO FLOOR PLAN TO COORDINATE EXACT SIZE OF REMOVAL.
4.07 REMOVE GRANITE STONE ENTRY STOOP. GRANITE STONE STAIR STEPS, AND ALL DAMAGED SUBSTRATE STRUCTURAL BASE. SEE LANDSCAPE DRAWINGS FOR MORE INFORMATION.
4.08 REMOVE STONE SILL
4.09 PROVIDE NEW OPENING THROUGH EXISTING MASONRY WALL. PROVIDE TEMPORARY SHORING AND PERMANENT LINTEL AT HEAD AS REQUIRED. COORDINATE SIZE OF OPENING WITH WINDOW SIZE, REFER TO WINDOW SCHEDULE.
5.01 REMOVE AND REPLACE STEEL LINTEL. SEE STRUCTURAL DRAWINGS.
5.02 REMOVE AND DISPOSE OF ALL SIDEWALL AND INTERMEDIATED METAL HANDRAIL, BRACKETS, AND ALL ASSOCIATED HARDWARE. STRIP PAINT AND CLEAN ALL EXISTING METAL GUARDRAILS AND NEWEL POST.
5.03 STRUCTURAL COLUMN SHALL BE PROTECTED DURING MASONRY REMOVAL.
6.01 REMOVE COUNTERTOPS, BASE AND TOP CABINETS, AND/OR TALL CABINETS AND ASSOCIATED HARDWARE.
6.02 REMOVE COUNTERTOPS, BASE AND TOP CABINETS, AND/OR TALL CABINETS, SINK FIXTURE, FAUCET, AND ASSOCIATED HARDWARE. SEE ALSO PLUMBING DRAWING.
6.03 REMOVE COUNTERTOPS, BASE AND TOP CABINETS, AND/OR TALL CABINETS AND ASSOCIATED HARDWARE.
6.04 REMOVE EXISTING MILLWORK, CASEWORK, AND SHELVING.
6.05 REMOVE ENTIRE WOOD STAIR ASSEMBLY, LANDING, FRAMING, HADRAILS, GUARDRAILS AND ALL ASSOCIATED HARDWARE AND FASTENERS.
6.06 REMOVE AND REPAIR EXISTING CORNICE FASCIA AND SOFFIT.
7.01 REMOVE AND DISPOSE OF ALUMINUM DOWNSPOUT.
7.02 REMOVE ENTIRE CANOPY, INCLUDING ROOF DECKING, BEAMS, ROOFING, FASCIAS, FLASHINGS, STEEL COLUMNS, FOUNDATION, FOOTINGS AND ALL ASSOCIATED HARDWARE AND FASTENERS.
8.01 REMOVE WINDOW SYSTEM, INCLUDING FRAMES. GLAZING, PANELS, LOUVERS, SILLS, GASKETS AND ALL ASSOCIATED HARDWARE. CLEAN OPENING TO RECEIVE NEW WINDOW SYSTEM.
8.02 REMOVE GLAZING, FRAMES, SEALANT AND ASSOCIATED HARDWARE.
8.03 REMOVE AND REPLACE INSULATED GLAZING PANEL. REPAIR ASSOCIATED HARDWARE AS NEEDED.
8.04 REMOVE ALUMINUM ENTRANCE SYSTEM, INCLUDING TRANSOM PANEL, DOORS, FRAMES, GLAZING, SILLS, SEALANTS AND ALL ASSOCIATED HARDWARE.
8.05 REMOVE DOOR, TRANSOM PANEL, FRAME AND ASSOCIATED HARDWARE. ENLARGE OPENING TO ACCEPT NEW FRAME AND MANEUVERING CLEARANCE REQUIREMENT. COORDINATE WITH SCOPE OF NEW WORK REQUIRED.
8.06 REMOVE DOOR, FRAME AND HARDWARE. CLEAN MASONRY OPENING TO ACCEPT NEW FRAME AND DOOR AS SCHEDULED.
8.07 REMOVE DOOR, FRAME AND HARDWARE. PREPARE JAMBS TO RECEIVE TOOTHED-IN INFILL.
8.08 REMOVE DOOR, FRAME AND HARDWARE.
8.09 REMOVE DOOR, FRAME AND HARDWARE. ENLARGE OPENING TO ACCEPT NEW FRAME AND MANEUVERING CLEARANCE REQUIREMENT. PROVIDE TEMPORARY SHORING AND PERMANENT LINTEL AS REQUIRED. SEE NEW PLANS FOR LOCATION OF NEW DOORS.
8.10 REMOVE DOOR, TRANSOM PANEL, FRAME AND ASSOCIATED HARDWARE. CLEAN MASONRY OPENING TO ACCEPT NEW FRAME AND DOOR AS SCHEDULED. COORDINATE WITH SCOPE OF NEW WORK REQUIRED.
8.11 REMOVE AND DISPOSE OF ALUMINUM LOUVER.
9.01 REMOVE AND DISPOSE OF THE FULL EXTENT OF WALL COVED BASE AND VCT OR SHEET FLOORING. CLEAN SUBSTRATE TO ACCEPT NEW SCHEDULED FINISH.
9.02 REMOVE AND DISPOSE OF THE FULL EXTENT OF WALL COVED BASE AND EPOXY FLOORING. CLEAN SUBSTRATE TO ACCEPT NEW SCHEDULED FINISH.
9.03 REMOVE WALL BASE AND CERAMIC FLOORING. CLEAN SUBSTRATE TO ACCEPT NEW SCHEDULED FINISH.
9.04 REMOVE AND DISPOSE PORTION OF THE EXISTING VCT OR SHEET FLOORING. CLEAN SUBSTRATE TO ACCEPT NEW SCHEDULED FINISH. REFER TO ARCHITECTURAL FLOOR PATTERN PLANS FOR REMOVAL COORDINATION.
9.05 REMOVE AND DISPOSE OF THE FULL EXTENT OF EXISTING TERRAZZO FLOORING. PROVIDED NEW SUBSTRATE TO ACCEPT NEW SCHEDULED FINISH. REFER TO ARCHITECTURAL FLOOR PATTERN PLANS FOR REMOVAL COORDINATION.
9.06 REMOVE AND DISPOSE OF ALL EXISTING RUBBER FLOORING, RUBBER STAIR TREADS, AND RISERS. CLEAN SUBSTRATE TO ACCEPT NEW SCHEDULED FINISH.
9.07 REMOVE AND DISPOSE PORTION OF THE EXISTING CARPET. CLEAN SUBSTRATE TO ACCEPT NEW SCHEDULED FINISH. REFER TO ARCHITECTURAL FLOOR PATTERN PLANS FOR REMOVAL COORDINATION.
9.08 REMOVE AND DISPOSE OF ALL SUSPENDED LAY-IN CEILING SYSTEMS INCLUDING ASSOCIATED HANGERS AND ANCHORS. ASSUME PLASTER, GYPSUM BOARD OR BOTH TYPE OF CEILING SYSTEMS MAY BE ABOVE ALL SUSPENDED LAY-IN CEILING SYSTEMS. REMOVE AND DISPOSE OF ALL HARD-SURFACE CEILING SOFFIT AND FRAMING. REFER TO MECHANICAL, PLUMBING AND ELECTRICAL DRAWINGS AND SPECIFICATIONS FOR ADDITIONAL DEMOLITION REQUIREMENTS.
9.09 REMOVE ALL PLASTER CEILING SYSTEMS INCLUDING ASSOCIATED METAL LATH, AND BLOCKING TO THE UNDERSIDE OF FLOOR SLAB ABOVE, UNLESS NOTED OR SHOWN OTHERWISE. REFER TO MECHANICAL, PLUMBING AND ELECTRICAL DRAWINGS AND SPECIFICATIONS FOR ADDITIONAL DEMOLITION REQUIREMENTS.
9.10 REMOVE HARD-SURFACE CEILING/SOFFIT, FRAMING, LOUVERS, DIFFUSERS, SUSPENSION MEMBERS, BRACING AND ALL ASSOCIATED HARDWARE. REFER TO MECHANICAL, PLUMBING AND ELECTRICAL DRAWINGS AND SPECIFICATIONS FOR ADDITIONAL DEMOLITION REQUIREMENTS.
9.11 REMOVE PORTION OF WALL REQUIRED TO ACCESS PLUMBING FOR NEW WATER COOLERS INSTALLATION WHEN APPLICABLE. SEE ALSO NEW FLOOR PLANS.
9.12 REMOVE AND DISPOSE OF ALL MASONRY PLASTER WALL FINISH TO EXPOSE MASONRY CMU WALL.
9.13 REMOVE AND DISPOSE OF ALL WALL TILE FINISH.
10.01 REMOVE TOILET PARTITIONS, DOORS, BRACES AND ALL ASSOCIATED HARDWARE.
10.02 REMOVE METAL LOCKERS, LOCKER METAL BASED, AND ALL ASSOCIATED HARDWARE.
10.03 REMOVE AND SALVAGE METAL LOCKERS, LOCKER METAL BASED, AND ALL ASSOCIATED HARDWARE. CLEAN, REPAIR AS NEEDED, PRIMED AND PAINT FOR INSTALLATION.
10.04 REMOVE TACKBOARDS, BLACK, WHITE BOARDS ON WALL, AND ASSOCIATED HARDWARE.
10.05 REMOVE SWING-UP GRAB BAR AND PATH TILE WALL AS NEEDED.
10.06 REMOVE PORTION OF STAGE: WOOD FLOORING, FRAMING, BASE, CONCRETE SLAB SUBFLOOR, AND ALL ASSOCIATED FASTENERS AND HARDWARE.
10.07 REMOVE SIGNAGE ON WALL AND RETURN TO OWNER.
10.08 REMOVE ARTWORK ON WALL AND RETURN TO OWNER.
12.01 REMOVE WINDOW SHADE SYSTEM AND ASSOCIATED HARDWARE.
22.01 REMOVE WATER CLOSET FIXTURE, CARRIER, PLUMBING VALVE, HARDWARE, GRAB BARS AND ACCESSORIES. SEE ALSO PLUMBING DRAWINGS.
22.02 REMOVE WATER COOLER FIXTURES, CARRIERS AND HARDWARE. SEE ALSO PLUMBING DRAWING.
22.03 REMOVE URINAL FIXTURE AND HARDWARE AND PRIVACY PANELS. SEE ALSO PLUMBING DRAWING.
22.04 REMOVE LAVATORY FIXTURE, CARRIER, HARDWARE, MIRROR AND ACCESSORIES. SEE ALSO PLUMBING DRAWINGS.
22.05 REMOVE PLUMBING FIXTURE AND HARDWARE. SEE ALSO PLUMBING DRAWING.
22.06 REMOVE MOP SINK FIXTURE, CARRIER, AND ACCESSORIES. SEE ALSO PLUMBING DRAWINGS.
23.01 REFER TO MEP DRAWINGS FOR EXTENT OF DEMOLITION.
23.02 REMOVE UNIT VENTILATOR UNIT. REFER TO MECHANICAL DRAWINGS.
23.03 REMOVE WALL-MOUNTED FAN COIL UNIT. REFER TO MECHANICAL DRAWINGS.
23.04 REMOVE WALL-MOUNTED LINEAR HYDRONIC HEATER BASEBOARD UNIT AND ALL ASSOCIATED FASTENERS HARDWARE. PATCH WALL AS NEEDED FOR NEW FINISH. REFER TO MECHANICAL DRAWINGS.
23.05 REMOVE WALL-MOUNTED METAL PIPE COVER ENCLOSURE, PIPES AND ALL ASSOCIATED FASTENERS HARDWARE. PATCH WALL AS NEEDED FOR NEW FINISH. REFER TO MECHANICAL DRAWINGS.
23.06 REMOVE AND DISPOSE OF AIR CONDITIONER UNIT FROM WINDOW AND ANY ASSOCIATED ACCESSORIES. REPAIR WINDOW PANEL AS REQUIRED. REFER TO MECHANICAL DRAWINGS.

DEMOLITION LEGEND:

DEMOLITION SCOPE

SAW CUT AND REMOVE CONCRETE FLOOR SLAB AS SHOWN FOR NEW WORK. REFER TO STRUCTURAL DRAWINGS.

REMOVE AND DISPOSE WOOD FLOOR ASSEMBLY AS SHOWN FOR NEW WORK. REFER TO STRUCTURAL DRAWINGS.

DEMOLITION GENERAL NOTES:

A. THE CONTRACTOR SHALL REFERENCE HAZARDOUS MATERIAL, MECHANICAL, ELECTRICAL, AND PLUMBING DEMOLITION DRAWINGS FOR ADDITIONAL DEMOLITION SCOPE OF WORK.

B. THE CONTRACTOR SHALL VERIFY EXISTING CONDITIONS PRIOR TO THE START OF WORK. REPORT TO THE ARCHITECT OF ANY DISCREPANCIES WITH THE DRAWINGS PROVIDED.

C. THE CONTRACTOR SHALL ADVISE THE ARCHITECT OF ALL CONFLICTS ENCOUNTERED IN THE FIELD. THE CONTRACTOR SHALL PROTECT THE INTERIOR OF THE BUILDING FROM ADVERSE WEATHER CONDITIONS WHERE EXTERIOR WEATHERTIGHT ELEMENTS HAVE BEEN REMOVED.

D. THE EXISTING FACILITY IS CONSIDERED TO BE HISTORIC IN NATURE. THE CONTRACTOR IS TO COORDINATE THE EXTENT OF DEMOLITION WITH THE PROPOSED NEW WORK AND SHALL PROTECT ALL EXISTING SURFACES AND MATERIALS SCHEDULED TO REMAIN. IT IS EXPECTED THAT THE CONTRACTOR WILL PROVIDE THE LEAST INVASIVE AND DESTRUCTIVE METHODS OF DEMOLITION AROUND HISTORICALLY IMPORTANT ELEMENTS. INCLUDING BUT NOT LIMITED TO:
a. EXISTING EXTERIOR FACADE TO REMAIN
b. EXTERIOR WINDOWS NOTED TO REMAIN OR BE SALVAGED
c. TERRAZZO FLOOR SYSTEMS NOTED TO REMAIN

E. THE CONTRACTOR SHALL PROVIDE ALL OPENINGS THROUGH EXISTING WALLS, AND FLOORS REQUIRED FOR THE INSTALLATION OF NEW DUCTWORK, PIPING, AND CONDUITS. PROVIDE TEMPORARY PROTECTION FOR ALL NEW AND EXISTING OPENINGS IN FLOORS AND ROOF DECK.

F. THE CONTRACTOR SHALL PATCH THE REMAINING WALLS, FLOOR, AND CEILING AS REQUIRED BY DEMOLITION TO OBTAIN A UNIFORM SURFACE READY TO RECEIVE FINISHES. REFER TO SPECIFICATIONS REGARDING CUTTING AND PATCHING.

G. THE CONTRACTOR SHALL SALVAGE AND STORE ALL MATERIALS AND/OR EQUIPMENT AS NOTED FOR REINSTALLATION.

H. THE CONTRACTOR SHALL BRING TO THE ATTENTION OF THE ARCHITECT ANY CONSTRUCTION OR MATERIALS TO REMAIN THAT ARE UNSOUND, DETERIORATED, OR ARE NOT AS SHOWN IN THESE CONTRACT DOCUMENTS.

I. DEMOLISH ALL SELECTED INTERIOR CONSTRUCTION AND FINISHES AS SHOWN ON THE PLANS. EXCEPT FOR STRUCTURE, FLOOR SLABS, INTERIOR STAIRS AND STAIR ENCLOSURE WALLS, AND INTERIOR BEARING WALLS, UNLESS NOTED OR SHOWN OTHERWISE. EXPOSED EXTERIOR ROUGH OPENINGS SHALL BE WATERTIGHT.

J. REFER TO MECHANICAL, PLUMBING AND ELECTRICAL DRAWINGS AND SPECIFICATIONS FOR ADDITIONAL DEMOLITION REQUIREMENTS.

K. COORDINATE THE SIZE, LOCATION, AND QUANTITY OF NEW PENETRATIONS THROUGH EXISTING WALLS, FLOORS, AND ROOF DECK WITH THE MEP & FP CONTRACTOR AND PROPOSED NEW EQUIPMENT.

L. REMOVE AND DISPOSE ALL SELECTED FLOOR FINISH AREAS AS SHOWN ON THE PLAN TO THE SUBSTRATE UNLESS NOTED OR SHOWN OTHERWISE.

M. REMOVE AND DISPOSE OF ALL PLASTER WALL FINISH, ASSOCIATED LATH, AND FURRING WITHIN THE PLENUM CEILING SPACE FROM THE INTERIOR FACE OF ALL EXISTING INTERIOR WALLS DOWN TO 4" FROM THE EXISTING CEILING HEIGHT TO THE MASONRY SUBSTRATE, UNLESS NOTED OTHERWISE. REFER TO DETAIL: FOR REFERENCE.

N. REMOVE AND DISPOSE OF ALL SELECTED INTERIOR MILLWORK AS SHOWN ON THE PLANS.

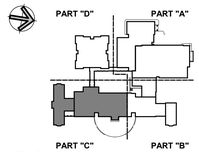
O. REMOVE AND DISPOSE OF ALL SELECTED EXTERIOR WINDOWS, AND LOUVERS, FROM EXTERIOR OPENINGS BACK TO THE ORIGINAL MASONRY OPENING, INCLUDING ALL ASSOCIATED FRAMES AND HARDWARE, UNLESS NOTED OTHERWISE. CAULKING AT EXISTING WINDOWS SHALL BE REMOVED IN PHASES BY THE DEMOLITION CONTRACTOR. EXPOSED WINDOW OPENINGS AS A RESULT OF WINDOW REMOVAL SHALL BE TEMPORARILY BOARDED UP AND MADE WEATHER-TIGHT UNTIL NEW WINDOWS (AS PART OF A FUTURE PHASE) CAN BE INSTALLED. WEATHER-TIGHT INFILL SHALL BE FLUSH WITH THE EXTERIOR AND ATTACHED TO THE JAMB OF THE EXISTING OPENING. WINDOWS TO REMAIN SHALL BE PROTECTED DURING DEMOLITION.

P. REMOVE ALL EXTERIOR DOORS, INCLUDING ALL ASSOCIATED FRAMES, HARDWARE, AND CAULKING UNLESS OTHERWISE NOTED. PROTECT ALL EXPOSED EXTERIOR OPENINGS WITH TEMPORARY BOARDED UP WEATHER-TIGHT AND SECURE INFILLS TO PREVENT THE EXPOSURE TO WEATHER OF HISTORICALLY IMPORTANT ELEMENTS ON THE INTERIOR AND PROTECT THE BUILDING FROM UNAUTHORIZED INTRUSION. INFILL SHALL BE SECURED IN PLACE AT THE JAMB AND FLUSH WITH THE EXTERIOR.

Q. SALVAGE ALL FACE BRICK FROM DEMOLISHED BUILDING. REMOVE THE BRICK TO MAINTAIN ITS APPEARANCE AND STRUCTURAL INTEGRITY. CLEAN BRICK OF ALL EXISTING MORTAR AND STORE IN VANDAL RESISTANT WEATHER PROTECTED AREA.

R. EXISTING TERRAZZO FLOOR FINISH TO REMAIN SHALL BE PROTECTED FROM DAMAGE DURING DEMOLITION. SAW CUT, REMOVE AND DISPOSE OF ASSOCIATED TERRAZZO WALL BASE UNLESS OTHERWISE NOTED RE: .

S. ALL ROUGH OPENING DIMENSIONS AND LOCATIONS FOR NEW DOORS AND CASED OPENINGS NEED TO BE COORDINATED WITH THE PROPOSED NEW OPENINGS.



KEY PLAN

Project Title:
ADDITION & ALTERATIONS TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
311 STATE STREET NEW LONDON CT 06320
203 230 9007 silverpetrucelli.com

Revision:	Description:	Date:	Revised By:

Drawing Title: FIRST FLOOR DEMOLITION PLAN - PART "C"

Date: 8/29/2024
Scale: As indicated
Drawn By: JM
Project Number: 22-382
Drawing Number: A013

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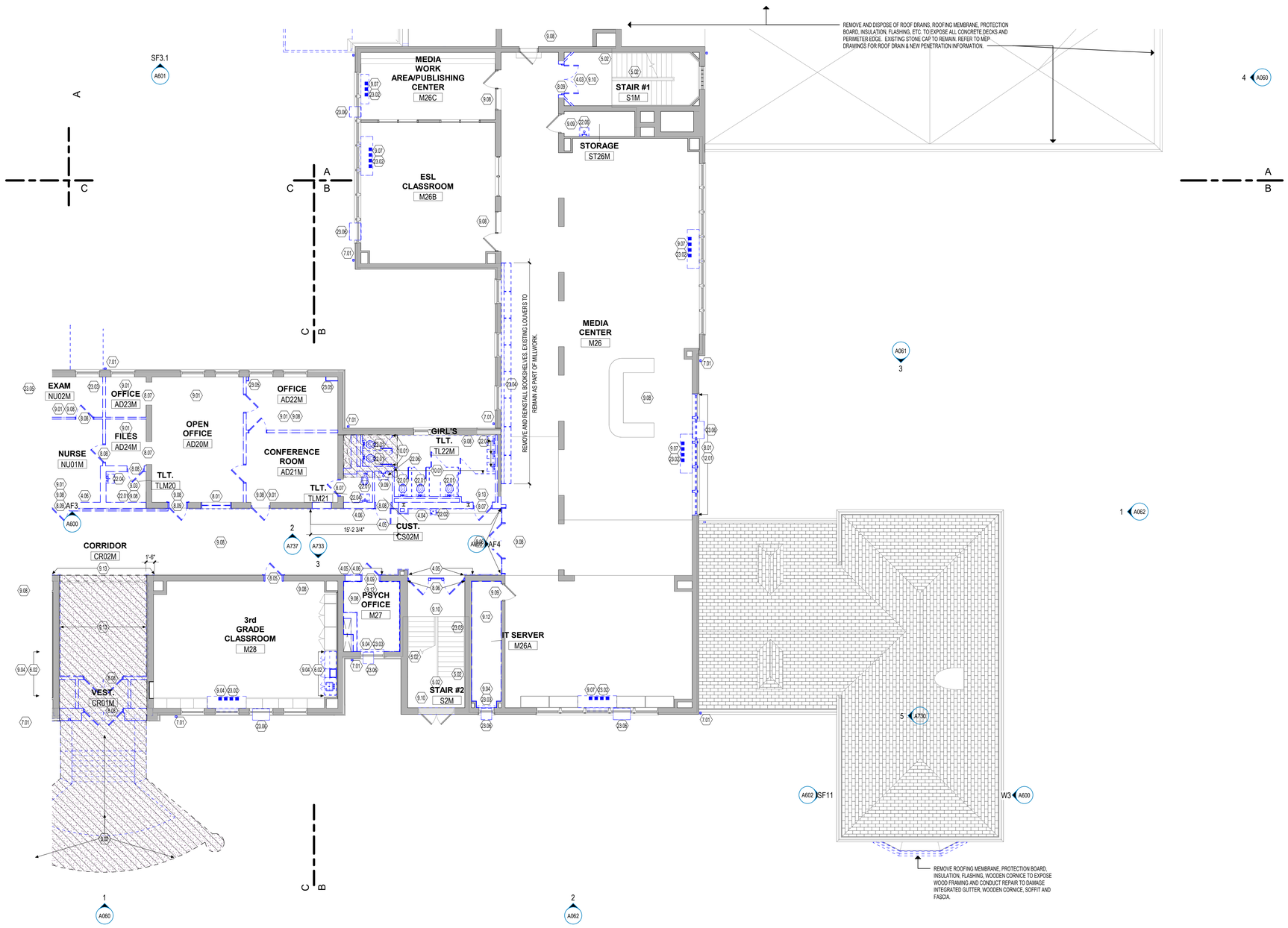


1 2nd FLOOR DEMOLITION PLAN - PART "B"
1/8" = 1'-0"

DEMOLITION KEYNOTES

3.01 REMOVE ENTIRE CONCRETE SLAB, SLOPED AND FLAT PORTIONS.
3.02 REMOVE CONCRETE OR STONE STAIR OR STEPS, LANDING, FOUNDATION, FOOTINGS, METAL GUARDRAILS, HANDRAILS AND ALL ASSOCIATED HARDWARE AND FASTENERS.
3.03 REMOVE CONCRETE OR STONE STAIR OR STEPS, LANDING, HANDRAILS, AND ALL ASSOCIATED HARDWARE AND FASTENERS.
4.03 EXISTING TERRAZZO FLOORING TO REMAIN.
4.04 PROVIDE NEW OPENING THROUGH EXISTING MASONRY WALL. PROVIDE TEMPORARY SHORING AND PERMANENT LINTEL AT HEAD AS REQUIRED. COORDINATE SIZE OF OPENING WITH DOOR SIZE AND FRAME AS INDICATED ON DOOR SCHEDULE.
4.05 CAREFULLY SAWCUT AND REMOVE PORTION OF EXISTING GLAZED TILE BLOCK WAINSCOT WALL TO THE EXTENT INDICATED ON THE DRAWINGS.
4.06 REMOVE THIS PORTION OF MASONRY WALL TO ACCOMMODATE NEW LAYOUT. SEE ALSO FLOOR PLAN TO COORDINATE EXACT SIZE OF REMOVAL.
4.07 REMOVE GRANITE STONE ENTRY STOOP, GRANITE STONE STAIR STEPS, AND ALL DAMAGED SUBSTRATE STRUCTURAL BASE. SEE LANDSCAPE DRAWINGS FOR MORE INFORMATION.
4.08 REMOVE STONE SILL
4.09 PROVIDE NEW OPENING THROUGH EXISTING MASONRY WALL. PROVIDE TEMPORARY SHORING AND PERMANENT LINTEL AT HEAD AS REQUIRED. COORDINATE SIZE OF OPENING WITH WINDOW SIZE, REFER TO WINDOW SCHEDULE.
5.01 REMOVE AND REPLACE STEEL LINTEL. SEE STRUCTURAL DRAWINGS.
5.02 REMOVE AND DISPOSE OF ALL SIDEWALL AND INTERMEDIATED METAL HANDRAIL, BRACKETS, AND ALL ASSOCIATED HARDWARE. STRIP PAINT AND CLEAN ALL EXISTING METAL GUARDRAILS AND NEWEL POST.
5.03 STRUCTURAL COLUMN SHALL BE PROTECTED DURING MASONRY REMOVAL.
6.01 REMOVE COUNTERTOPS, BASE AND TOP CABINETS, AND/OR TALL CABINETS AND ASSOCIATED HARDWARE.
6.02 REMOVE COUNTERTOPS, BASE AND TOP CABINETS, AND/OR TALL CABINETS, SINK FIXTURE, FAUCET, AND ASSOCIATED HARDWARE. SEE ALSO PLUMBING DRAWING.
6.03 REMOVE COUNTERTOPS, BASE AND TOP CABINETS, AND/OR TALL CABINETS AND ASSOCIATED HARDWARE.
6.04 REMOVE EXISTING MILLWORK, CASEWORK, AND SHELVING.
6.05 REMOVE ENTIRE WOOD STAIR ASSEMBLY, LANDING, FRAMING, HADRAILS, GUARDRAILS AND ALL ASSOCIATED HARDWARE AND FASTENERS.
6.06 REMOVE AND REPAIR EXISTING CORNICE FASCIA AND SOFFIT.
7.01 REMOVE AND DISPOSE OF ALUMINUM DOWNSPOUT.
7.02 REMOVE ENTIRE CANOPY, INCLUDING ROOF DECKING, BEAMS, ROOFING, FASCIAS, FLASHINGS, STEEL COLUMNS, FOUNDATION, FOOTINGS AND ALL ASSOCIATED HARDWARE AND FASTENERS.
8.01 REMOVE WINDOW SYSTEM, INCLUDING FRAMES, GLAZING, PANELS, LOUVERS, SILLS, GASKETS AND ALL ASSOCIATED HARDWARE. CLEAN OPENING TO RECEIVE NEW WINDOW SYSTEM.
8.02 REMOVE GLAZING, FRAMES, SEALANT AND ASSOCIATED HARDWARE.
8.03 REMOVE AND REPLACE INSULATED GLAZING PANEL. REPAIR ASSOCIATED HARDWARE AS NEEDED.
8.04 REMOVE ALUMINUM ENTRANCE SYSTEM, INCLUDING TRANSOM PANEL, DOORS, FRAMES, GLAZING, SILLS, SEALANTS AND ALL ASSOCIATED HARDWARE.
8.05 REMOVE DOOR, TRANSOM PANEL, FRAME AND ASSOCIATED HARDWARE. ENLARGE OPENING TO ACCEPT NEW FRAME AND MANEUVERING CLEARANCE REQUIREMENT. COORDINATE WITH SCOPE OF NEW WORK REQUIRED.
8.06 REMOVE DOOR, FRAME AND HARDWARE. CLEAN MASONRY OPENING TO ACCEPT NEW FRAME AND DOOR AS SCHEDULED.
8.07 REMOVE DOOR, FRAME AND HARDWARE. PREPARE JAMBS TO RECEIVE TOOTHED-IN INFILL.
8.08 REMOVE DOOR, FRAME AND HARDWARE.
8.09 REMOVE DOOR, FRAME AND HARDWARE. ENLARGE OPENING TO ACCEPT NEW FRAME AND MANEUVERING CLEARANCE REQUIREMENT. PROVIDE TEMPORARY SHORING AND PERMANENT LINTEL AS REQUIRED. SEE NEW PLANS FOR LOCATION OF NEW DOORS.
8.10 REMOVE DOOR, TRANSOM PANEL, FRAME AND ASSOCIATED HARDWARE. CLEAN MASONRY OPENING TO ACCEPT NEW FRAME AND DOOR AS SCHEDULED. COORDINATE WITH SCOPE OF NEW WORK REQUIRED.
8.11 REMOVE AND DISPOSE OF ALUMINUM LOUVER.
9.01 REMOVE AND DISPOSE OF THE FULL EXTENT OF WALL COVED BASE AND VCT OR SHEET FLOORING. CLEAN SUBSTRATE TO ACCEPT NEW SCHEDULED FINISH.
9.02 REMOVE AND DISPOSE OF THE FULL EXTENT OF WALL COVED BASE AND EPOXY FLOORING. CLEAN SUBSTRATE TO ACCEPT NEW SCHEDULED FINISH.
9.03 REMOVE WALL BASE AND CERAMIC FLOORING. CLEAN SUBSTRATE TO ACCEPT NEW SCHEDULED FINISH.
9.04 REMOVE AND DISPOSE PORTION OF THE EXISTING VCT OR SHEET FLOORING. CLEAN SUBSTRATE TO ACCEPT NEW SCHEDULED FINISH. REFER TO ARCHITECTURAL FLOOR PATTERN PLANS FOR REMOVAL COORDINATION.
9.05 REMOVE AND DISPOSE OF THE FULL EXTENT OF EXISTING TERRAZZO FLOORING. PROVIDED NEW SUBSTRATE TO ACCEPT NEW SCHEDULED FINISH. REFER TO ARCHITECTURAL FLOOR PATTERN PLANS FOR REMOVAL COORDINATION.
9.06 REMOVE AND DISPOSE OF ALL EXISTING RUBBER FLOORING, RUBBER STAIR TREADS, AND RISERS. CLEAN SUBSTRATE TO ACCEPT NEW SCHEDULED FINISH.
9.07 REMOVE AND DISPOSE PORTION OF THE EXISTING CARPET. CLEAN SUBSTRATE TO ACCEPT NEW SCHEDULED FINISH. REFER TO ARCHITECTURAL FLOOR PATTERN PLANS FOR REMOVAL COORDINATION.
9.08 REMOVE AND DISPOSE OF ALL SUSPENDED LAY-IN CEILING SYSTEMS INCLUDING ASSOCIATED HANGERS AND ANCHORS. ASSUME PLASTER, GYPSUM BOARD OR BOTH TYPE OF CEILING SYSTEMS MAY BE ABOVE ALL SUSPENDED LAY-IN CEILING SYSTEMS. REMOVE AND DISPOSE OF ALL HARD-SURFACE CEILING SOFFIT AND FRAMING. REFER TO MECHANICAL, PLUMBING AND ELECTRICAL DRAWINGS AND SPECIFICATIONS FOR ADDITIONAL DEMOLITION REQUIREMENTS.
9.09 REMOVE ALL PLASTER CEILING SYSTEMS INCLUDING ASSOCIATED METAL LATH, AND BLOCKING TO THE UNDERSIDE OF FLOOR SLAB ABOVE, UNLESS NOTED OR SHOWN OTHERWISE. REFER TO MECHANICAL, PLUMBING AND ELECTRICAL DRAWINGS AND SPECIFICATIONS FOR ADDITIONAL DEMOLITION REQUIREMENTS.
9.10 REMOVE HARD-SURFACE CEILING/SOFFIT, FRAMING, LOUVERS, DIFFUSERS, SUSPENSION MEMBERS, BRACING AND ALL ASSOCIATED HARDWARE. REFER TO MECHANICAL, PLUMBING AND ELECTRICAL DRAWINGS AND SPECIFICATIONS FOR ADDITIONAL DEMOLITION REQUIREMENTS.
9.11 REMOVE PORTION OF WALL REQUIRED TO ACCESS PLUMBING FOR NEW WATER COOLERS INSTALLATION WHEN APPLICABLE. SEE ALSO NEW FLOOR PLANS.
9.12 REMOVE AND DISPOSE OF ALL MASONRY PLASTER WALL FINISH TO EXPOSE MASONRY CMU WALL.
9.13 REMOVE AND DISPOSE OF ALL WALL TILE FINISH.
10.01 REMOVE TOILET PARTITIONS, DOORS, BRACES AND ALL ASSOCIATED HARDWARE.
10.02 REMOVE METAL LOCKERS, LOCKER METAL BASED, AND ALL ASSOCIATED HARDWARE.
10.03 REMOVE AND SALVAGE METAL LOCKERS, LOCKER METAL BASED, AND ALL ASSOCIATED HARDWARE. CLEAN, REPAIR AS NEEDED, PRIMED AND PAINT FOR INSTALLATION.
10.04 REMOVE TACKBOARDS, BLACK, WHITE BOARDS ON WALL, AND ASSOCIATED HARDWARE.
10.05 REMOVE SWING-UP GRAB BAR AND PATH TILE WALL AS NEEDED.
10.06 REMOVE PORTION OF STAGE: WOOD FLOORING, FRAMING, BASE, CONCRETE SLAB SUBFLOOR, AND ALL ASSOCIATED FASTENERS AND HARDWARE.
10.07 REMOVE SIGNAGE ON WALL AND RETURN TO OWNER.
10.08 REMOVE ARTWORK ON WALL AND RETURN TO OWNER.
12.01 REMOVE WINDOW SHADE SYSTEM AND ASSOCIATED HARDWARE.
22.01 REMOVE WATER CLOSET FIXTURE, CARRIER, PLUMBING VALVE, HARDWARE, GRAB BARS AND ACCESSORIES. SEE ALSO PLUMBING DRAWINGS.
22.02 REMOVE WATER COOLER FIXTURES, CARRIERS AND HARDWARE. SEE ALSO PLUMBING DRAWING.
22.03 REMOVE URINAL FIXTURE AND HARDWARE AND PRIVACY PANELS. SEE ALSO PLUMBING DRAWING.
22.04 REMOVE LAVATORY FIXTURE, CARRIER, HARDWARE, MIRROR AND ACCESSORIES. SEE ALSO PLUMBING DRAWINGS.
22.05 REMOVE PLUMBING FIXTURE AND HARDWARE. SEE ALSO PLUMBING DRAWING.
22.06 REMOVE MOP SINK FIXTURE, CARRIER, AND ACCESSORIES. SEE ALSO PLUMBING DRAWINGS.
23.01 REFER TO MEP DRAWINGS FOR EXTENT OF DEMOLITION.
23.02 REMOVE UNIT VENTILATOR UNIT. REFER TO MECHANICAL DRAWINGS.
23.03 REMOVE WALL-MOUNTED FAN COIL UNIT. REFER TO MECHANICAL DRAWINGS.
23.04 REMOVE WALL-MOUNTED LINEAR HYDRONIC HEATER BASEBOARD UNIT AND ALL ASSOCIATED FASTENERS HARDWARE. PATCH WALL AS NEEDED FOR NEW FINISH. REFER TO MECHANICAL DRAWINGS.
23.05 REMOVE WALL-MOUNTED METAL PIPE COVER ENCLOSURE, PIPES AND ALL ASSOCIATED FASTENERS HARDWARE. PATCH WALL AS NEEDED FOR NEW FINISH. REFER TO MECHANICAL DRAWINGS.
23.06 REMOVE AND DISPOSE OF AIR CONDITIONER UNIT FROM WINDOW AND ANY ASSOCIATED ACCESSORIES. REPAIR WINDOW PANEL AS REQUIRED. REFER TO MECHANICAL DRAWINGS.

DEMOLITION LEGEND:

DEMOLITION SCOPE

SAW CUT AND REMOVE CONCRETE FLOOR SLAB AS SHOWN FOR NEW WORK. REFER TO STRUCTURAL DRAWINGS.

REMOVE AND DISPOSE WOOD FLOOR ASSEMBLY AS SHOWN FOR NEW WORK. REFER TO STRUCTURAL DRAWINGS.

DEMOLITION GENERAL NOTES:

A. THE CONTRACTOR SHALL REFERENCE HAZARDOUS MATERIAL, MECHANICAL, ELECTRICAL, AND PLUMBING DEMOLITION DRAWINGS FOR ADDITIONAL DEMOLITION SCOPE OF WORK.

B. THE CONTRACTOR SHALL VERIFY EXISTING CONDITIONS PRIOR TO THE START OF WORK. REPORT TO THE ARCHITECT OF ANY DISCREPANCIES WITH THE DRAWINGS PROVIDED.

C. THE CONTRACTOR SHALL ADVISE THE ARCHITECT OF ALL CONFLICTS ENCOUNTERED IN THE FIELD. THE CONTRACTOR SHALL PROTECT THE INTERIOR OF THE BUILDING FROM ADVERSE WEATHER CONDITIONS WHERE EXTERIOR WEATHERTIGHT ELEMENTS HAVE BEEN REMOVED.

D. THE EXISTING FACILITY IS CONSIDERED TO BE HISTORIC IN NATURE. THE CONTRACTOR IS TO COORDINATE THE EXTENT OF DEMOLITION WITH THE PROPOSED NEW WORK AND SHALL PROTECT ALL EXISTING SURFACES AND MATERIALS SCHEDULED TO REMAIN. IT IS EXPECTED THAT THE CONTRACTOR WILL PROVIDE THE LEAST INVASIVE AND DESTRUCTIVE METHODS OF DEMOLITION AROUND HISTORICALLY IMPORTANT ELEMENTS. INCLUDING BUT NOT LIMITED TO:
a. EXISTING EXTERIOR FACADE TO REMAIN
b. EXTERIOR WINDOWS NOTED TO REMAIN OR BE SALVAGED
c. TERRAZZO FLOOR SYSTEMS NOTED TO REMAIN

E. THE CONTRACTOR SHALL PROVIDE ALL OPENINGS THROUGH EXISTING WALLS, AND FLOORS REQUIRED FOR THE INSTALLATION OF NEW DUCTWORK, PIPING, AND CONDUITS. PROVIDE TEMPORARY PROTECTION FOR ALL NEW AND EXISTING OPENINGS IN FLOORS AND ROOF DECK.

F. THE CONTRACTOR SHALL PATCH THE REMAINING WALLS, FLOOR, AND CEILING AS REQUIRED BY DEMOLITION TO OBTAIN A UNIFORM SURFACE READY TO RECEIVE FINISHES. REFER TO SPECIFICATIONS REGARDING CUTTING AND PATCHING.

G. THE CONTRACTOR SHALL SALVAGE AND STORE ALL MATERIALS AND/OR EQUIPMENT AS NOTED FOR REINSTALLATION.

H. THE CONTRACTOR SHALL BRING TO THE ATTENTION OF THE ARCHITECT ANY CONSTRUCTION OR MATERIALS TO REMAIN THAT ARE UNSOUND, DETERIORATED, OR ARE NOT AS SHOWN IN THESE CONTRACT DOCUMENTS.

I. DEMOLISH ALL SELECTED INTERIOR CONSTRUCTION AND FINISHES AS SHOWN ON THE PLANS. EXCEPT FOR STRUCTURE, FLOOR SLABS, INTERIOR STAIRS AND STAIR ENCLOSURE WALLS, AND INTERIOR BEARING WALLS, UNLESS NOTED OR SHOWN OTHERWISE. EXPOSED EXTERIOR ROUGH OPENINGS SHALL BE WATERTIGHT.

J. REFER TO MECHANICAL, PLUMBING AND ELECTRICAL DRAWINGS AND SPECIFICATIONS FOR ADDITIONAL DEMOLITION REQUIREMENTS.

K. COORDINATE THE SIZE, LOCATION, AND QUANTITY OF NEW PENETRATIONS THROUGH EXISTING WALLS, FLOORS, AND ROOF DECK WITH THE MEP & FP CONTRACTOR AND PROPOSED NEW EQUIPMENT.

L. REMOVE AND DISPOSE ALL SELECTED FLOOR FINISH AREAS AS SHOWN ON THE PLAN TO THE SUBSTRATE UNLESS NOTED OR SHOWN OTHERWISE.

M. REMOVE AND DISPOSE OF ALL PLASTER WALL FINISH, ASSOCIATED LATH, AND FURRING WITHIN THE PLENUM CEILING SPACE FROM THE INTERIOR FACE OF ALL EXISTING INTERIOR WALLS DOWN TO 4" FROM THE EXISTING CEILING HEIGHT TO THE MASONRY SUBSTRATE, UNLESS NOTED OTHERWISE. REFER TO DETAIL: FOR REFERENCE.

N. REMOVE AND DISPOSE OF ALL SELECTED INTERIOR MILLWORK AS SHOWN ON THE PLANS.

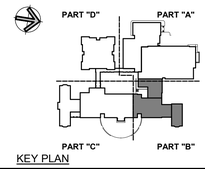
O. REMOVE AND DISPOSE OF ALL SELECTED EXTERIOR WINDOWS, AND LOUVERS, FROM EXTERIOR OPENINGS BACK TO THE ORIGINAL MASONRY OPENING, INCLUDING ALL ASSOCIATED FRAMES AND HARDWARE, UNLESS NOTED OTHERWISE. CAULKING AT EXISTING WINDOWS SHALL BE REMOVED IN PHASES BY THE DEMOLITION CONTRACTOR. EXPOSED WINDOW OPENINGS AS A RESULT OF WINDOW REMOVAL SHALL BE TEMPORARILY BOARDED UP AND MADE WEATHER-TIGHT UNTIL NEW WINDOWS (AS PART OF A FUTURE PHASE) CAN BE INSTALLED. WEATHER-TIGHT INFILL SHALL BE FLUSH WITH THE EXTERIOR AND ATTACHED TO THE JAMB OF THE EXISTING OPENING. WINDOWS TO REMAIN SHALL BE PROTECTED DURING DEMOLITION.

P. REMOVE ALL EXTERIOR DOORS, INCLUDING ALL ASSOCIATED FRAMES, HARDWARE, AND CAULKING UNLESS OTHERWISE NOTED. PROTECT ALL EXPOSED EXTERIOR OPENINGS WITH TEMPORARY BOARDED UP WEATHER-TIGHT AND SECURE INFILLS TO PREVENT THE EXPOSURE TO WEATHER OF HISTORICALLY IMPORTANT ELEMENTS ON THE INTERIOR AND PROTECT THE BUILDING FROM UNAUTHORIZED INTRUSION. INFILL SHALL BE SECURED IN PLACE AT THE JAMB AND FLUSH WITH THE EXTERIOR.

Q. SALVAGE ALL FACE BRICK FROM DEMOLISHED BUILDING. REMOVE THE BRICK TO MAINTAIN ITS APPEARANCE AND STRUCTURAL INTEGRITY. CLEAN BRICK OF ALL EXISTING MORTAR AND STORE IN VANDAL RESISTANT WEATHER PROTECTED AREA.

R. EXISTING TERRAZZO FLOOR FINISH TO REMAIN SHALL BE PROTECTED FROM DAMAGE DURING DEMOLITION. SAW CUT, REMOVE AND DISPOSE OF ASSOCIATED TERRAZZO WALL BASE UNLESS OTHERWISE NOTED RE:

S. ALL ROUGH OPENING DIMENSIONS AND LOCATIONS FOR NEW DOORS AND CASED OPENINGS NEED TO BE COORDINATED WITH THE PROPOSED NEW OPENINGS.



KEY PLAN

Project Title:
ADDITION & ALTERATIONS TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

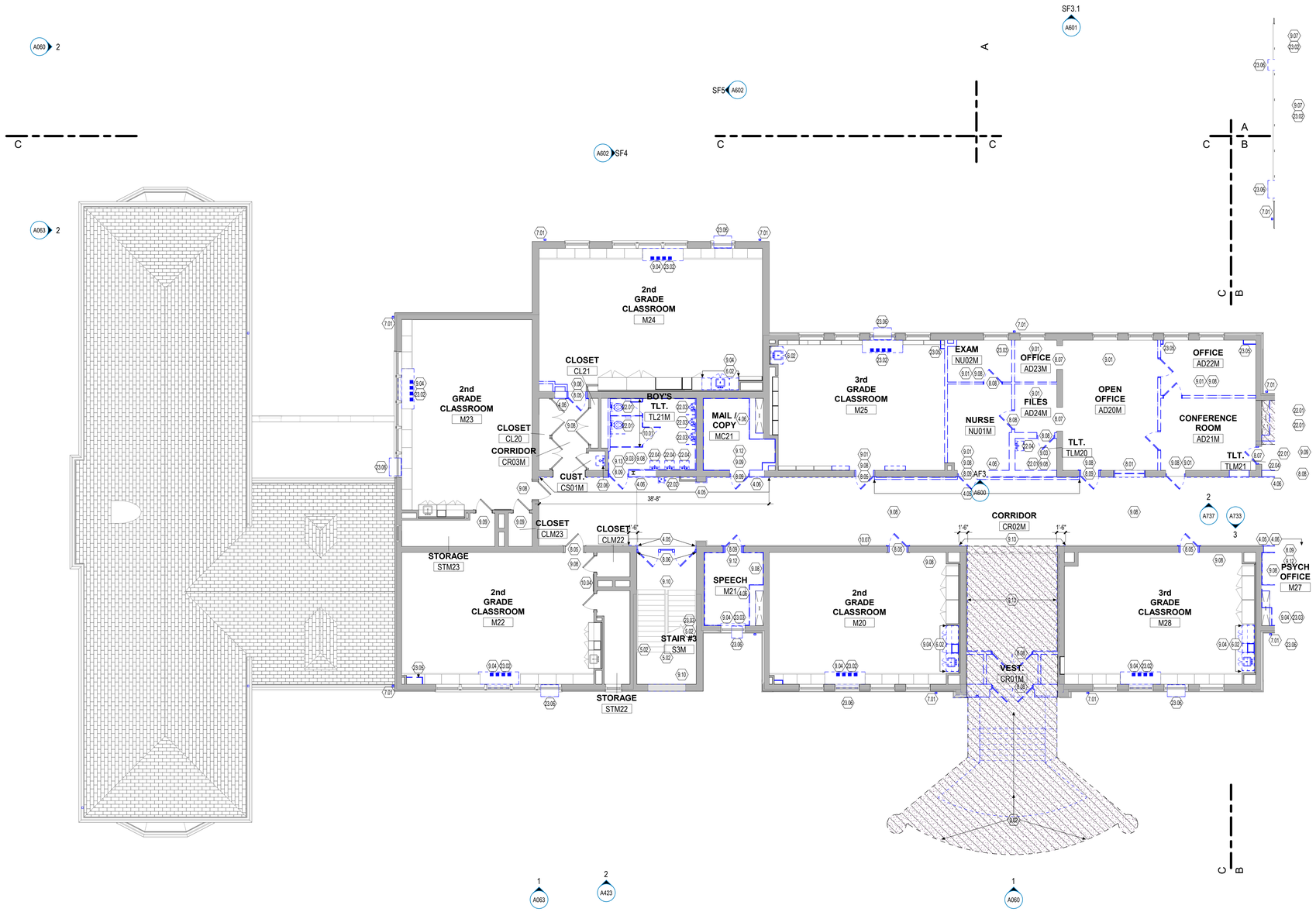
SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
311 STATE STREET NEW LONDON CT 06320
203 230 9007 silverpetrucelli.com

Revision: Description: Date: Revised By:

Drawing Title:
SECOND FLOOR DEMOLITION PLAN - PART "B"

Date: 8/29/2024
Scale: As indicated
Drawn By: JM
Project Number: 22-382
Drawing Number: A022

8/30/2024 7:39:13 AM



1 2nd FLOOR DEMOLITION PLAN - PART "C"

1/8" = 1'-0"

DEMOLITION KEYNOTES

3.01 REMOVE ENTIRE CONCRETE SLAB, SLOPED AND FLAT PORTIONS.

3.02 REMOVE CONCRETE OR STONE STAIR OR STEPS, LANDING, FOUNDATION, FOOTINGS, METAL GUARDRAILS, HANDRAILS AND ALL ASSOCIATED HARDWARE AND FASTENERS.

3.03 REMOVE CONCRETE OR STONE STAIR OR STEPS, LANDING, HANDRAILS, AND ALL ASSOCIATED HARDWARE AND FASTENERS.

4.03 EXISTING TERRAZZO FLOORING TO REMAIN.

4.04 PROVIDE NEW OPENING THROUGH EXISTING MASONRY WALL. PROVIDE TEMPORARY SHORING AND PERMANENT LINTEL AT HEAD AS REQUIRED. COORDINATE SIZE OF OPENING WITH DOOR SIZE AND FRAME AS INDICATED ON DOOR SCHEDULE.

4.05 CAREFULLY SAWCUT AND REMOVE PORTION OF EXISTING GLAZED TILE BLOCK WAINSCOT WALL TO THE EXTENT INDICATED ON THE DRAWINGS.

4.06 REMOVE THIS PORTION OF MASONRY WALL TO ACCOMMODATE NEW LAYOUT. SEE ALSO FLOOR PLAN TO COORDINATE EXACT SIZE OF REMOVAL.

4.07 REMOVE GRANITE STONE ENTRY STOOP. GRANITE STONE STAIR STEPS, AND ALL DAMAGED SUBSTRATE STRUCTURAL BASE. SEE LANDSCAPE DRAWINGS FOR MORE INFORMATION.

4.08 REMOVE STONE SILL

4.09 PROVIDE NEW OPENING THROUGH EXISTING MASONRY WALL. PROVIDE TEMPORARY SHORING AND PERMANENT LINTEL AT HEAD AS REQUIRED. COORDINATE SIZE OF OPENING WITH WINDOW SIZE, REFER TO WINDOW SCHEDULE.

5.01 REMOVE AND REPLACE STEEL LINTEL. SEE STRUCTURAL DRAWINGS.

5.02 REMOVE AND DISPOSE OF ALL SIDEWALL AND INTERMEDIATED METAL HANDRAIL, BRACKETS, AND ALL ASSOCIATED HARDWARE. STRIP PAINT AND CLEAN ALL EXISTING METAL GUARDRAILS AND NEWEL POST.

5.03 STRUCTURAL COLUMN SHALL BE PROTECTED DURING MASONRY REMOVAL.

6.01 REMOVE COUNTERTOPS, BASE AND TOP CABINETS, AND/OR TALL CABINETS AND ASSOCIATED HARDWARE.

6.02 REMOVE COUNTERTOPS, BASE AND TOP CABINETS, AND/OR TALL CABINETS, SINK FIXTURE, FAUCET, AND ASSOCIATED HARDWARE. SEE ALSO PLUMBING DRAWING.

6.03 REMOVE COUNTERTOPS, BASE AND TOP CABINETS, AND/OR TALL CABINETS AND ASSOCIATED HARDWARE.

6.04 REMOVE EXISTING MILLWORK, CASEWORK, AND SHELVING.

6.05 REMOVE ENTIRE WOOD STAIR ASSEMBLY, LANDING, FRAMING, HADRAILS, GUARDRAILS AND ALL ASSOCIATED HARDWARE AND FASTENERS.

6.06 REMOVE AND REPAIR EXISTING CORNICE FASCIA AND SOFFIT.

7.01 REMOVE AND DISPOSE OF ALUMINUM DOWNSPOUT.

7.02 REMOVE ENTIRE CANOPY, INCLUDING ROOF DECKING, BEAMS, ROOFING, FASCIAS, FLASHINGS, STEEL COLUMNS, FOUNDATION, FOOTINGS AND ALL ASSOCIATED HARDWARE AND FASTENERS.

8.01 REMOVE WINDOW SYSTEM, INCLUDING FRAMES. GLAZING, PANELS, LOUVERS, SILLS, GASKETS AND ALL ASSOCIATED HARDWARE. CLEAN OPENING TO RECEIVE NEW WINDOW SYSTEM.

8.02 REMOVE GLAZING, FRAMES, SEALANT AND ASSOCIATED HARDWARE.

8.03 REMOVE AND REPLACE INSULATED GLAZING PANEL. REPAIR ASSOCIATED HARDWARE AS NEEDED.

8.04 REMOVE ALUMINUM ENTRANCE SYSTEM, INCLUDING TRANSOM PANEL, DOORS, FRAMES, GLAZING, SILLS, SEALANTS AND ALL ASSOCIATED HARDWARE.

8.05 REMOVE DOOR, TRANSOM PANEL, FRAME AND ASSOCIATED HARDWARE. ENLARGE OPENING TO ACCEPT NEW FRAME AND MANEUVERING CLEARANCE REQUIREMENT. COORDINATE WITH SCOPE OF NEW WORK REQUIRED.

8.06 REMOVE DOOR, FRAME AND HARDWARE. CLEAN MASONRY OPENING TO ACCEPT NEW FRAME AND DOOR AS SCHEDULED.

8.07 REMOVE DOOR, FRAME AND HARDWARE. PREPARE JAMBS TO RECEIVE TOOTHED-IN INFILL.

8.08 REMOVE DOOR, FRAME AND HARDWARE.

8.09 REMOVE DOOR, FRAME AND HARDWARE. ENLARGE OPENING TO ACCEPT NEW FRAME AND MANEUVERING CLEARANCE REQUIREMENT. PROVIDE TEMPORARY SHORING AND PERMANENT LINTEL AS REQUIRED. SEE NEW PLANS FOR LOCATION OF NEW DOORS.

8.10 REMOVE DOOR, TRANSOM PANEL, FRAME AND ASSOCIATED HARDWARE. CLEAN MASONRY OPENING TO ACCEPT NEW FRAME AND DOOR AS SCHEDULED. COORDINATE WITH SCOPE OF NEW WORK REQUIRED.

8.11 REMOVE AND DISPOSE OF ALUMINUM LOUVER.

9.01 REMOVE AND DISPOSE OF THE FULL EXTENT OF WALL COVED BASE AND VCT OR SHEET FLOORING. CLEAN SUBSTRATE TO ACCEPT NEW SCHEDULED FINISH.

9.02 REMOVE AND DISPOSE OF THE FULL EXTENT OF WALL COVED BASE AND EPOXY FLOORING. CLEAN SUBSTRATE TO ACCEPT NEW SCHEDULED FINISH.

9.03 REMOVE WALL BASE AND CERAMIC FLOORING. CLEAN SUBSTRATE TO ACCEPT NEW SCHEDULED FINISH.

9.04 REMOVE AND DISPOSE PORTION OF THE EXISTING VCT OR SHEET FLOORING. CLEAN SUBSTRATE TO ACCEPT NEW SCHEDULED FINISH. REFER TO ARCHITECTURAL FLOOR PATTERN PLANS FOR REMOVAL COORDINATION.

9.05 REMOVE AND DISPOSE OF THE FULL EXTENT OF EXISTING TERRAZZO FLOORING. PROVIDED NEW SUBSTRATE TO ACCEPT NEW SCHEDULED FINISH. REFER TO ARCHITECTURAL FLOOR PATTERN PLANS FOR REMOVAL COORDINATION.

9.06 REMOVE AND DISPOSE OF ALL EXISTING RUBBER FLOORING, RUBBER STAIR TREADS, AND RISERS. CLEAN SUBSTRATE TO ACCEPT NEW SCHEDULED FINISH.

9.07 REMOVE AND DISPOSE PORTION OF THE EXISTING CARPET. CLEAN SUBSTRATE TO ACCEPT NEW SCHEDULED FINISH. REFER TO ARCHITECTURAL FLOOR PATTERN PLANS FOR REMOVAL COORDINATION.

9.08 REMOVE AND DISPOSE OF ALL SUSPENDED LAY-IN CEILING SYSTEMS INCLUDING ASSOCIATED HANGERS AND ANCHORS. ASSUME PLASTER, GYPSUM BOARD OR BOTH TYPE OF CEILING SYSTEMS MAY BE ABOVE ALL SUSPENDED LAY-IN CEILING SYSTEMS. REMOVE AND DISPOSE OF ALL HARD-SURFACE CEILING SOFFIT AND FRAMING. REFER TO MECHANICAL, PLUMBING AND ELECTRICAL DRAWINGS AND SPECIFICATIONS FOR ADDITIONAL DEMOLITION REQUIREMENTS.

9.09 REMOVE ALL PLASTER CEILING SYSTEMS INCLUDING ASSOCIATED METAL LATH, AND BLOCKING TO THE UNDERSIDE OF FLOOR SLAB ABOVE, UNLESS NOTED OR SHOWN OTHERWISE. REFER TO MECHANICAL, PLUMBING AND ELECTRICAL DRAWINGS AND SPECIFICATIONS FOR ADDITIONAL DEMOLITION REQUIREMENTS.

9.10 REMOVE HARD-SURFACE CEILING/SOFFIT, FRAMING, LOUVERS, DIFFUSERS, SUSPENSION MEMBERS, BRACING AND ALL ASSOCIATED HARDWARE. REFER TO MECHANICAL, PLUMBING AND ELECTRICAL DRAWINGS AND SPECIFICATIONS FOR ADDITIONAL DEMOLITION REQUIREMENTS.

9.11 REMOVE PORTION OF WALL REQUIRED TO ACCESS PLUMBING FOR NEW WATER COOLERS INSTALLATION WHEN APPLICABLE. SEE ALSO NEW FLOOR PLANS.

9.12 REMOVE AND DISPOSE OF ALL MASONRY PLASTER WALL FINISH TO EXPOSE MASONRY CMU WALL.

9.13 REMOVE AND DISPOSE OF ALL WALL TILE FINISH.

10.01 REMOVE TOILET PARTITIONS, DOORS, BRACES AND ALL ASSOCIATED HARDWARE.

10.02 REMOVE METAL LOCKERS, LOCKER METAL BASED, AND ALL ASSOCIATED HARDWARE.

10.03 REMOVE AND SALVAGE METAL LOCKERS, LOCKER METAL BASED, AND ALL ASSOCIATED HARDWARE. CLEAN, REPAIR AS NEEDED, PRIMED AND PAINT FOR INSTALLATION.

10.04 REMOVE TACKBOARDS, BLACK, WHITE BOARDS ON WALL, AND ASSOCIATED HARDWARE.

10.05 REMOVE SWING-UP GRAB BAR AND PATH TILE WALL AS NEEDED.

10.06 REMOVE PORTION OF STAGE: WOOD FLOORING, FRAMING, BASE, CONCRETE SLAB SUBFLOOR, AND ALL ASSOCIATED FASTENERS AND HARDWARE.

10.07 REMOVE SIGNAGE ON WALL AND RETURN TO OWNER.

10.08 REMOVE ARTWORK ON WALL AND RETURN TO OWNER.

12.01 REMOVE WINDOW SHADE SYSTEM AND ASSOCIATED HARDWARE.

22.01 REMOVE WATER CLOSET FIXTURE, CARRIER, PLUMBING VALVE, HARDWARE, GRAB BARS AND ACCESSORIES. SEE ALSO PLUMBING DRAWINGS.

22.02 REMOVE WATER COOLER FIXTURES, CARRIERS AND HARDWARE. SEE ALSO PLUMBING DRAWING.

22.03 REMOVE URINAL FIXTURE AND HARDWARE AND PRIVACY PANELS. SEE ALSO PLUMBING DRAWING.

22.04 REMOVE LAVATORY FIXTURE, CARRIER, HARDWARE, MIRROR AND ACCESSORIES. SEE ALSO PLUMBING DRAWINGS.

22.05 REMOVE PLUMBING FIXTURE AND HARDWARE. SEE ALSO PLUMBING DRAWING.

22.06 REMOVE MOP SINK FIXTURE, CARRIER, AND ACCESSORIES. SEE ALSO PLUMBING DRAWINGS.

23.01 REFER TO MEP DRAWINGS FOR EXTENT OF DEMOLITION.

23.02 REMOVE UNIT VENTILATOR UNIT. REFER TO MECHANICAL DRAWINGS.

23.03 REMOVE WALL-MOUNTED FAN COIL UNIT. REFER TO MECHANICAL DRAWINGS.

23.04 REMOVE WALL-MOUNTED LINEAR HYDRONIC HEATER BASEBOARD UNIT AND ALL ASSOCIATED FASTENERS HARDWARE. PATCH WALL AS NEEDED FOR NEW FINISH. REFER TO MECHANICAL DRAWINGS.

23.05 REMOVE WALL-MOUNTED METAL PIPE COVER ENCLOSURE, PIPES AND ALL ASSOCIATED FASTENERS HARDWARE. PATCH WALL AS NEEDED FOR NEW FINISH. REFER TO MECHANICAL DRAWINGS.

23.06 REMOVE AND DISPOSE OF AIR CONDITIONER UNIT FROM WINDOW AND ANY ASSOCIATED ACCESSORIES. REPAIR WINDOW PANEL AS REQUIRED. REFER TO MECHANICAL DRAWINGS.

DEMOLITION LEGEND:

DEMOLITION SCOPE

SAW CUT AND REMOVE CONCRETE FLOOR SLAB AS SHOWN FOR NEW WORK. REFER TO STRUCTURAL DRAWINGS.

REMOVE AND DISPOSE WOOD FLOOR ASSEMBLY AS SHOWN FOR NEW WORK. REFER TO STRUCTURAL DRAWINGS.

DEMOLITION GENERAL NOTES:

A. THE CONTRACTOR SHALL REFERENCE HAZARDOUS MATERIAL, MECHANICAL, ELECTRICAL, AND PLUMBING DEMOLITION DRAWINGS FOR ADDITIONAL DEMOLITION SCOPE OF WORK.

B. THE CONTRACTOR SHALL VERIFY EXISTING CONDITIONS PRIOR TO THE START OF WORK. REPORT TO THE ARCHITECT OF ANY DISCREPANCIES WITH THE DRAWINGS PROVIDED.

C. THE CONTRACTOR SHALL ADVISE THE ARCHITECT OF ALL CONFLICTS ENCOUNTERED IN THE FIELD. THE CONTRACTOR SHALL PROTECT THE INTERIOR OF THE BUILDING FROM ADVERSE WEATHER CONDITIONS WHERE EXTERIOR WEATHERTIGHT ELEMENTS HAVE BEEN REMOVED.

D. THE EXISTING FACILITY IS CONSIDERED TO BE HISTORIC IN NATURE. THE CONTRACTOR IS TO COORDINATE THE EXTENT OF DEMOLITION WITH THE PROPOSED NEW WORK AND SHALL PROTECT ALL EXISTING SURFACES AND MATERIALS SCHEDULED TO REMAIN. IT IS EXPECTED THAT THE CONTRACTOR WILL PROVIDE THE LEAST INVASIVE AND DESTRUCTIVE METHODS OF DEMOLITION AROUND HISTORICALLY IMPORTANT ELEMENTS. INCLUDING BUT NOT LIMITED TO:
a. EXISTING EXTERIOR FACADE TO REMAIN
b. EXTERIOR WINDOWS NOTED TO REMAIN OR BE SALVAGED
c. TERRAZZO FLOOR SYSTEMS NOTED TO REMAIN

E. THE CONTRACTOR SHALL PROVIDE ALL OPENINGS THROUGH EXISTING WALLS, AND FLOORS REQUIRED FOR THE INSTALLATION OF NEW DUCTWORK, PIPING, AND CONDUITS. PROVIDE TEMPORARY PROTECTION FOR ALL NEW AND EXISTING OPENINGS IN FLOORS AND ROOF DECK.

F. THE CONTRACTOR SHALL PATCH THE REMAINING WALLS, FLOOR, AND CEILING AS REQUIRED BY DEMOLITION TO OBTAIN A UNIFORM SURFACE READY TO RECEIVE FINISHES. REFER TO SPECIFICATIONS REGARDING CUTTING AND PATCHING.

G. THE CONTRACTOR SHALL SALVAGE AND STORE ALL MATERIALS AND/OR EQUIPMENT AS NOTED FOR REINSTALLATION.

H. THE CONTRACTOR SHALL BRING TO THE ATTENTION OF THE ARCHITECT ANY CONSTRUCTION OR MATERIALS TO REMAIN THAT ARE UNSOUND, DETERIORATED, OR ARE NOT AS SHOWN IN THESE CONTRACT DOCUMENTS.

I. DEMOLISH ALL SELECTED INTERIOR CONSTRUCTION AND FINISHES AS SHOWN ON THE PLANS. EXCEPT FOR STRUCTURE, FLOOR SLABS, INTERIOR STAIRS AND STAIR ENCLOSURE WALLS, AND INTERIOR BEARING WALLS, UNLESS NOTED OR SHOWN OTHERWISE. EXPOSED EXTERIOR ROUGH OPENINGS SHALL BE WATERTIGHT.

J. REFER TO MECHANICAL, PLUMBING AND ELECTRICAL DRAWINGS AND SPECIFICATIONS FOR ADDITIONAL DEMOLITION REQUIREMENTS.

K. COORDINATE THE SIZE, LOCATION, AND QUANTITY OF NEW PENETRATIONS THROUGH EXISTING WALLS, FLOORS, AND ROOF DECK WITH THE MEP & FP CONTRACTOR AND PROPOSED NEW EQUIPMENT.

L. REMOVE AND DISPOSE ALL SELECTED FLOOR FINISH AREAS AS SHOWN ON THE PLAN TO THE SUBSTRATE UNLESS NOTED OR SHOWN OTHERWISE.

M. REMOVE AND DISPOSE OF ALL PLASTER WALL FINISH, ASSOCIATED LATH, AND FURRING WITHIN THE PLENUM CEILING SPACE FROM THE INTERIOR FACE OF ALL EXISTING INTERIOR WALLS DOWN TO 4" FROM THE EXISTING CEILING HEIGHT TO THE MASONRY SUBSTRATE, UNLESS NOTED OTHERWISE. REFER TO DETAIL: FOR REFERENCE.

N. REMOVE AND DISPOSE OF ALL SELECTED INTERIOR MILLWORK AS SHOWN ON THE PLANS.

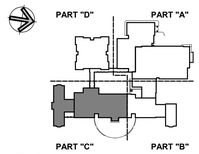
O. REMOVE AND DISPOSE OF ALL SELECTED EXTERIOR WINDOWS, AND LOUVERS, FROM EXTERIOR OPENINGS BACK TO THE ORIGINAL MASONRY OPENING, INCLUDING ALL ASSOCIATED FRAMES AND HARDWARE, UNLESS NOTED OTHERWISE. CAULKING AT EXISTING WINDOWS SHALL BE REMOVED IN PHASES BY THE DEMOLITION CONTRACTOR. EXPOSED WINDOW OPENINGS AS A RESULT OF WINDOW REMOVAL SHALL BE TEMPORARILY BOARDED UP AND MADE WEATHER-TIGHT UNTIL NEW WINDOWS (AS PART OF A FUTURE PHASE) CAN BE INSTALLED. WEATHER-TIGHT INFILL SHALL BE FLUSH WITH THE EXTERIOR AND ATTACHED TO THE JAMB OF THE EXISTING OPENING. WINDOWS TO REMAIN SHALL BE PROTECTED DURING DEMOLITION.

P. REMOVE ALL EXTERIOR DOORS, INCLUDING ALL ASSOCIATED FRAMES, HARDWARE, AND CAULKING UNLESS OTHERWISE NOTED. PROTECT ALL EXPOSED EXTERIOR OPENINGS WITH TEMPORARY BOARDED UP WEATHER-TIGHT AND SECURE INFILLS TO PREVENT THE EXPOSURE TO WEATHER OF HISTORICALLY IMPORTANT ELEMENTS ON THE INTERIOR AND PROTECT THE BUILDING FROM UNAUTHORIZED INTRUSION. INFILL SHALL BE SECURED IN PLACE AT THE JAMB AND FLUSH WITH THE EXTERIOR.

Q. SALVAGE ALL FACE BRICK FROM DEMOLISHED BUILDING. REMOVE THE BRICK TO MAINTAIN ITS APPEARANCE AND STRUCTURAL INTEGRITY. CLEAN BRICK OF ALL EXISTING MORTAR AND STORE IN VANDAL RESISTANT WEATHER PROTECTED AREA.

R. EXISTING TERRAZZO FLOOR FINISH TO REMAIN SHALL BE PROTECTED FROM DAMAGE DURING DEMOLITION. SAW CUT, REMOVE AND DISPOSE OF ASSOCIATED TERRAZZO WALL BASE UNLESS OTHERWISE NOTED RE:

S. ALL ROUGH OPENING DIMENSIONS AND LOCATIONS FOR NEW DOORS AND CASED OPENINGS NEED TO BE COORDINATED WITH THE PROPOSED NEW OPENINGS.



KEY PLAN

Project Title:

ADDITION & ALTERATIONS TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
311 STATE STREET NEW LONDON CT 06320
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Revision:	Description:	Date:	Revised By:

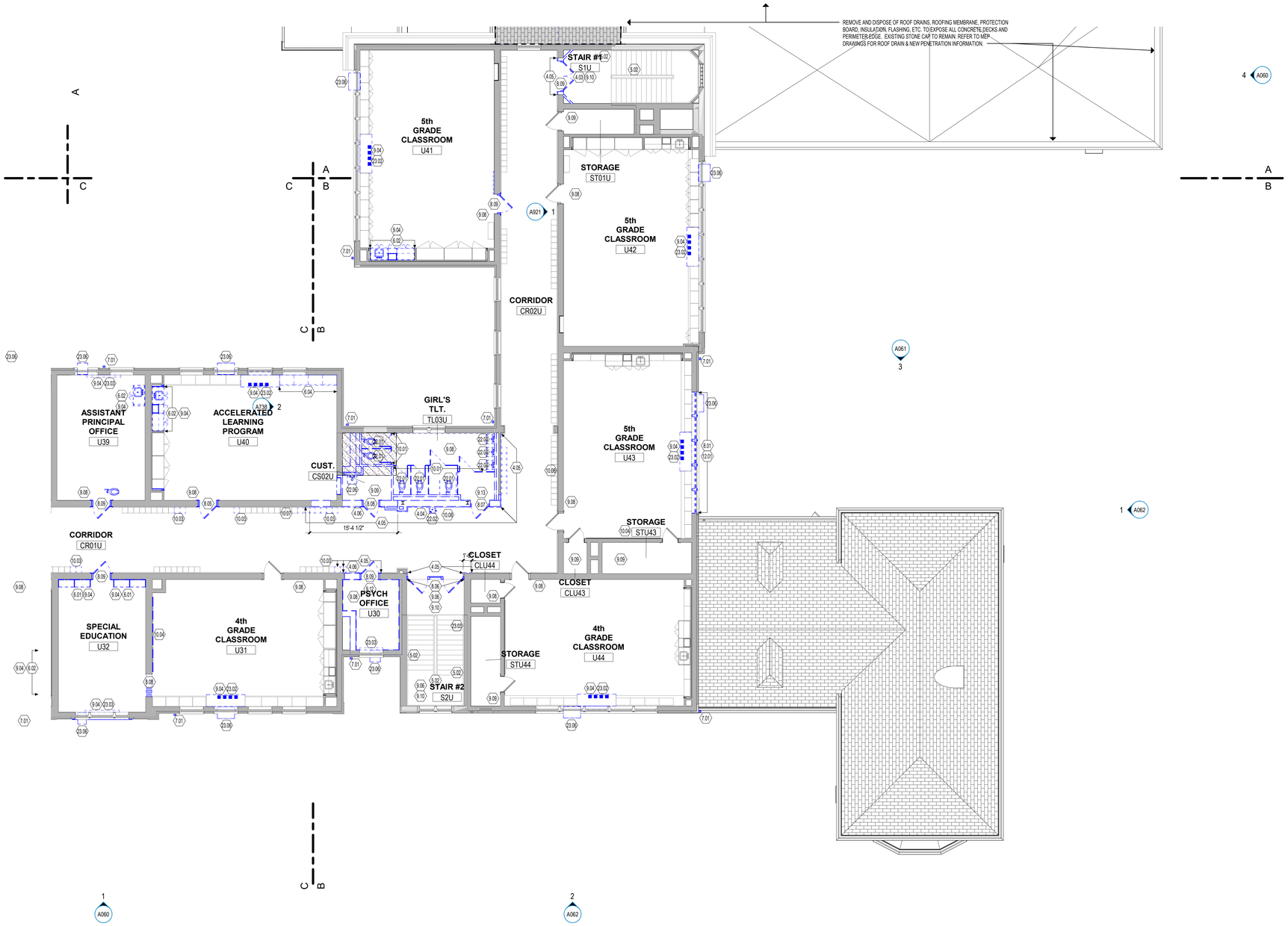
Drawing Title:

SECOND FLOOR DEMOLITION PLAN - PART "C"

Date: 8/29/2024
Scale: As indicated
Drawn By: JM
Project Number: 22-382

Drawing Number: A023

8/30/2024 7:39:23 AM



1 3rd FLOOR DEMOLITION PLAN - PART "B"
1/8" = 1'-0"

DEMOLITION KEYNOTES

3.01 REMOVE ENTIRE CONCRETE SLAB, SLOPED AND FLAT PORTIONS.
3.02 REMOVE CONCRETE OR STONE STAIR OR STEPS, LANDING, FOUNDATION, FOOTINGS, METAL GUARDRAILS, HANDRAILS AND ALL ASSOCIATED HARDWARE AND FASTENERS.
3.03 REMOVE CONCRETE OR STONE STAIR OR STEPS, LANDING, HANDRAILS, AND ALL ASSOCIATED HARDWARE AND FASTENERS.
4.03 EXISTING TERRAZZO FLOORING TO REMAIN.
4.04 PROVIDE NEW OPENING THROUGH EXISTING MASONRY WALL. PROVIDE TEMPORARY SHORING AND PERMANENT LINTEL AT HEAD AS REQUIRED. COORDINATE SIZE OF OPENING WITH DOOR SIZE AND FRAME AS INDICATED ON DOOR SCHEDULE.
4.05 CAREFULLY SAWCUT AND REMOVE PORTION OF EXISTING GLAZED TILE BLOCK WAINSCOT WALL TO THE EXTENT INDICATED ON THE DRAWINGS.
4.06 REMOVE THIS PORTION OF MASONRY WALL TO ACCOMMODATE NEW LAYOUT. SEE ALSO FLOOR PLAN TO COORDINATE EXACT SIZE OF REMOVAL.
4.07 REMOVE GRANITE STONE ENTRY STOOP, GRANITE STONE STAIR STEPS, AND ALL DAMAGED SUBSTRATE STRUCTURAL BASE. SEE LANDSCAPE DRAWINGS FOR MORE INFORMATION.
4.08 REMOVE STONE SILL
4.09 PROVIDE NEW OPENING THROUGH EXISTING MASONRY WALL. PROVIDE TEMPORARY SHORING AND PERMANENT LINTEL AT HEAD AS REQUIRED. COORDINATE SIZE OF OPENING WITH WINDOW SIZE, REFER TO WINDOW SCHEDULE.
5.01 REMOVE AND REPLACE STEEL LINTEL. SEE STRUCTURAL DRAWINGS.
5.02 REMOVE AND DISPOSE OF ALL SIDEWALL AND INTERMEDIATED METAL HANDRAIL, BRACKETS, AND ALL ASSOCIATED HARDWARE. STRIP PAINT AND CLEAN ALL EXISTING METAL GUARDRAILS AND NEWEL POST.
5.03 STRUCTURAL COLUMN SHALL BE PROTECTED DURING MASONRY REMOVAL.
6.01 REMOVE COUNTERTOPS, BASE AND TOP CABINETS, AND/OR TALL CABINETS AND ASSOCIATED HARDWARE.
6.02 REMOVE COUNTERTOPS, BASE AND TOP CABINETS, AND/OR TALL CABINETS, SINK FIXTURE, FAUCET, AND ASSOCIATED HARDWARE. SEE ALSO PLUMBING DRAWING.
6.03 REMOVE COUNTERTOPS, BASE AND TOP CABINETS, AND/OR TALL CABINETS AND ASSOCIATED HARDWARE.
6.04 REMOVE EXISTING MILLWORK, CASEWORK, AND SHELVING.
6.05 REMOVE ENTIRE WOOD STAIR ASSEMBLY, LANDING, FRAMING, HADRAILS, GUARDRAILS AND ALL ASSOCIATED HARDWARE AND FASTENERS.
6.06 REMOVE AND REPAIR EXISTING CORNICE FASCIA AND SOFFIT.
7.01 REMOVE AND DISPOSE OF ALUMINUM DOWNSPOUT.
7.02 REMOVE ENTIRE CANOPY, INCLUDING ROOF DECKING, BEAMS, ROOFING, FASCIAS, FLASHINGS, STEEL COLUMNS, FOUNDATION, FOOTINGS AND ALL ASSOCIATED HARDWARE AND FASTENERS.
8.01 REMOVE WINDOW SYSTEM, INCLUDING FRAMES, GLAZING, PANELS, LOUVERS, SILLS, GASKETS AND ALL ASSOCIATED HARDWARE. CLEAN OPENING TO RECEIVE NEW WINDOW SYSTEM.
8.02 REMOVE GLAZING, FRAMES, SEALANT AND ASSOCIATED HARDWARE.
8.03 REMOVE AND REPLACE INSULATED GLAZING PANEL. REPAIR ASSOCIATED HARDWARE AS NEEDED.
8.04 REMOVE ALUMINUM ENTRANCE SYSTEM, INCLUDING TRANSOM PANEL, DOORS, FRAMES, GLAZING, SILLS, SEALANTS AND ALL ASSOCIATED HARDWARE.
8.05 REMOVE DOOR, TRANSOM PANEL, FRAME AND ASSOCIATED HARDWARE. ENLARGE OPENING TO ACCEPT NEW FRAME AND MANEUVERING CLEARANCE REQUIREMENT. COORDINATE WITH SCOPE OF NEW WORK REQUIRED.
8.06 REMOVE DOOR, FRAME AND HARDWARE. CLEAN MASONRY OPENING TO ACCEPT NEW FRAME AND DOOR AS SCHEDULED.
8.07 REMOVE DOOR, FRAME AND HARDWARE. PREPARE JAMBS TO RECEIVE TOOTHED-IN INFILL.
8.08 REMOVE DOOR, FRAME AND HARDWARE.
8.09 REMOVE DOOR, FRAME AND HARDWARE. ENLARGE OPENING TO ACCEPT NEW FRAME AND MANEUVERING CLEARANCE REQUIREMENT. PROVIDE TEMPORARY SHORING AND PERMANENT LINTEL AS REQUIRED. SEE NEW PLANS FOR LOCATION OF NEW DOORS.
8.10 REMOVE DOOR, TRANSOM PANEL, FRAME AND ASSOCIATED HARDWARE. CLEAN MASONRY OPENING TO ACCEPT NEW FRAME AND DOOR AS SCHEDULED. COORDINATE WITH SCOPE OF NEW WORK REQUIRED.
8.11 REMOVE AND DISPOSE OF ALUMINUM LOUVER.
9.01 REMOVE AND DISPOSE OF THE FULL EXTENT OF WALL COVED BASE AND VCT OR SHEET FLOORING. CLEAN SUBSTRATE TO ACCEPT NEW SCHEDULED FINISH.
9.02 REMOVE AND DISPOSE OF THE FULL EXTENT OF WALL COVED BASE AND EPOXY FLOORING. CLEAN SUBSTRATE TO ACCEPT NEW SCHEDULED FINISH.
9.03 REMOVE WALL BASE AND CERAMIC FLOORING. CLEAN SUBSTRATE TO ACCEPT NEW SCHEDULED FINISH.
9.04 REMOVE AND DISPOSE PORTION OF THE EXISTING VCT OR SHEET FLOORING. CLEAN SUBSTRATE TO ACCEPT NEW SCHEDULED FINISH. REFER TO ARCHITECTURAL FLOOR PATTERN PLANS FOR REMOVAL COORDINATION.
9.05 REMOVE AND DISPOSE OF THE FULL EXTENT OF EXISTING TERRAZZO FLOORING. PROVIDED NEW SUBSTRATE TO ACCEPT NEW SCHEDULED FINISH. REFER TO ARCHITECTURAL FLOOR PATTERN PLANS FOR REMOVAL COORDINATION.
9.06 REMOVE AND DISPOSE OF ALL EXISTING RUBBER FLOORING, RUBBER STAIR TREADS, AND RISERS. CLEAN SUBSTRATE TO ACCEPT NEW SCHEDULED FINISH.
9.07 REMOVE AND DISPOSE PORTION OF THE EXISTING CARPET. CLEAN SUBSTRATE TO ACCEPT NEW SCHEDULED FINISH. REFER TO ARCHITECTURAL FLOOR PATTERN PLANS FOR REMOVAL COORDINATION.
9.08 REMOVE AND DISPOSE OF ALL SUSPENDED LAY-IN CEILING SYSTEMS INCLUDING ASSOCIATED HANGERS AND ANCHORS. ASSUME PLASTER, GYPSUM BOARD OR BOTH TYPE OF CEILING SYSTEMS MAY BE ABOVE ALL SUSPENDED LAY-IN CEILING SYSTEMS. REMOVE AND DISPOSE OF ALL HARD-SURFACE CEILING SOFFIT AND FRAMING. REFER TO MECHANICAL, PLUMBING AND ELECTRICAL DRAWINGS AND SPECIFICATIONS FOR ADDITIONAL DEMOLITION REQUIREMENTS.
9.09 REMOVE ALL PLASTER CEILING SYSTEMS INCLUDING ASSOCIATED METAL LATH, AND BLOCKING TO THE UNDERSIDE OF FLOOR SLAB ABOVE, UNLESS NOTED OR SHOWN OTHERWISE. REFER TO MECHANICAL, PLUMBING AND ELECTRICAL DRAWINGS AND SPECIFICATIONS FOR ADDITIONAL DEMOLITION REQUIREMENTS.
9.10 REMOVE HARD-SURFACE CEILING/SOFFIT, FRAMING, LOUVERS, DIFFUSERS, SUSPENSION MEMBERS, BRACING AND ALL ASSOCIATED HARDWARE. REFER TO MECHANICAL, PLUMBING AND ELECTRICAL DRAWINGS AND SPECIFICATIONS FOR ADDITIONAL DEMOLITION REQUIREMENTS.
9.11 REMOVE PORTION OF WALL REQUIRED TO ACCESS PLUMBING FOR NEW WATER COOLERS INSTALLATION WHEN APPLICABLE. SEE ALSO NEW FLOOR PLANS.
9.12 REMOVE AND DISPOSE OF ALL MASONRY PLASTER WALL FINISH TO EXPOSE MASONRY CMU WALL.
9.13 REMOVE AND DISPOSE OF ALL WALL TILE FINISH.
10.01 REMOVE TOILET PARTITIONS, DOORS, BRACES AND ALL ASSOCIATED HARDWARE.
10.02 REMOVE METAL LOCKERS, LOCKER METAL BASED, AND ALL ASSOCIATED HARDWARE.
10.03 REMOVE AND SALVAGE METAL LOCKERS, LOCKER METAL BASED, AND ALL ASSOCIATED HARDWARE. CLEAN, REPAIR AS NEEDED, PRIMED AND PAINT FOR INSTALLATION.
10.04 REMOVE TACKBOARDS, BLACK, WHITE BOARDS ON WALL, AND ASSOCIATED HARDWARE.
10.05 REMOVE SWING-UP GRAB BAR AND PATH TILE WALL AS NEEDED.
10.06 REMOVE PORTION OF STAGE: WOOD FLOORING, FRAMING, BASE, CONCRETE SLAB SUBFLOOR, AND ALL ASSOCIATED FASTENERS AND HARDWARE.
10.07 REMOVE SIGNAGE ON WALL AND RETURN TO OWNER.
10.08 REMOVE ARTWORK ON WALL AND RETURN TO OWNER.
12.01 REMOVE WINDOW SHADE SYSTEM AND ASSOCIATED HARDWARE.
22.01 REMOVE WATER CLOSET FIXTURE, CARRIER, PLUMBING VALVE, HARDWARE, GRAB BARS AND ACCESSORIES. SEE ALSO PLUMBING DRAWINGS.
22.02 REMOVE WATER COOLER FIXTURES, CARRIERS AND HARDWARE. SEE ALSO PLUMBING DRAWING.
22.03 REMOVE URINAL FIXTURE AND HARDWARE AND PRIVACY PANELS. SEE ALSO PLUMBING DRAWING.
22.04 REMOVE LAVATORY FIXTURE, CARRIER, HARDWARE, MIRROR AND ACCESSORIES. SEE ALSO PLUMBING DRAWINGS.
22.05 REMOVE PLUMBING FIXTURE AND HARDWARE. SEE ALSO PLUMBING DRAWING.
22.06 REMOVE MOP SINK FIXTURE, CARRIER, AND ACCESSORIES. SEE ALSO PLUMBING DRAWINGS.
23.01 REFER TO MEP DRAWINGS FOR EXTENT OF DEMOLITION.
23.02 REMOVE UNIT VENTILATOR UNIT. REFER TO MECHANICAL DRAWINGS.
23.03 REMOVE WALL-MOUNTED FAN COIL UNIT. REFER TO MECHANICAL DRAWINGS.
23.04 REMOVE WALL-MOUNTED LINEAR HYDRONIC HEATER BASEBOARD UNIT AND ALL ASSOCIATED FASTENERS HARDWARE. PATCH WALL AS NEEDED FOR NEW FINISH. REFER TO MECHANICAL DRAWINGS.
23.05 REMOVE WALL-MOUNTED METAL PIPE COVER ENCLOSURE. PIPES AND ALL ASSOCIATED ACCESSORIES. REPAIR WALL AS NEEDED FOR NEW FINISH. REFER TO MECHANICAL DRAWINGS.
23.06 REMOVE AND DISPOSE OF AIR CONDITIONER UNIT FROM WINDOW AND ANY ASSOCIATED ACCESSORIES. REPAIR WINDOW PANEL AS REQUIRED. REFER TO MECHANICAL DRAWINGS.

DEMOLITION LEGEND:

DEMOLITION SCOPE

SAW CUT AND REMOVE CONCRETE FLOOR SLAB AS SHOWN FOR NEW WORK. REFER TO STRUCTURAL DRAWINGS.

REMOVE AND DISPOSE WOOD FLOOR ASSEMBLY AS SHOWN FOR NEW WORK. REFER TO STRUCTURAL DRAWINGS.

DEMOLITION GENERAL NOTES:

A. THE CONTRACTOR SHALL REFERENCE HAZARDOUS MATERIAL, MECHANICAL, ELECTRICAL, AND PLUMBING DEMOLITION DRAWINGS FOR ADDITIONAL DEMOLITION SCOPE OF WORK.

B. THE CONTRACTOR SHALL VERIFY EXISTING CONDITIONS PRIOR TO THE START OF WORK. REPORT TO THE ARCHITECT OF ANY DISCREPANCIES WITH THE DRAWINGS PROVIDED.

C. THE CONTRACTOR SHALL ADVISE THE ARCHITECT OF ALL CONFLICTS ENCOUNTERED IN THE FIELD. THE CONTRACTOR SHALL PROTECT THE INTERIOR OF THE BUILDING FROM ADVERSE WEATHER CONDITIONS WHERE EXTERIOR WEATHERTIGHT ELEMENTS HAVE BEEN REMOVED.

D. THE EXISTING FACILITY IS CONSIDERED TO BE HISTORIC IN NATURE. THE CONTRACTOR IS TO COORDINATE THE EXTENT OF DEMOLITION WITH THE PROPOSED NEW WORK AND SHALL PROTECT ALL EXISTING SURFACES AND MATERIALS SCHEDULED TO REMAIN. IT IS EXPECTED THAT THE CONTRACTOR WILL PROVIDE THE LEAST INVASIVE AND DESTRUCTIVE METHODS OF DEMOLITION AROUND HISTORICALLY IMPORTANT ELEMENTS. INCLUDING BUT NOT LIMITED TO:
a. EXISTING EXTERIOR FACADE TO REMAIN
b. EXTERIOR WINDOWS NOTED TO REMAIN OR BE SALVAGED
c. TERRAZZO FLOOR SYSTEMS NOTED TO REMAIN

E. THE CONTRACTOR SHALL PROVIDE ALL OPENINGS THROUGH EXISTING WALLS, AND FLOORS REQUIRED FOR THE INSTALLATION OF NEW DUCTWORK, PIPING, AND CONDUITS. PROVIDE TEMPORARY PROTECTION FOR ALL NEW AND EXISTING OPENINGS IN FLOORS AND ROOF DECK.

F. THE CONTRACTOR SHALL PATCH THE REMAINING WALLS, FLOOR, AND CEILING AS REQUIRED BY DEMOLITION TO OBTAIN A UNIFORM SURFACE READY TO RECEIVE FINISHES. REFER TO SPECIFICATIONS REGARDING CUTTING AND PATCHING.

G. THE CONTRACTOR SHALL SALVAGE AND STORE ALL MATERIALS AND/OR EQUIPMENT AS NOTED FOR REINSTALLATION.

H. THE CONTRACTOR SHALL BRING TO THE ATTENTION OF THE ARCHITECT ANY CONSTRUCTION OR MATERIALS TO REMAIN THAT ARE UNSOUND, DETERIORATED, OR ARE NOT AS SHOWN IN THESE CONTRACT DOCUMENTS.

I. DEMOLISH ALL SELECTED INTERIOR CONSTRUCTION AND FINISHES AS SHOWN ON THE PLANS. EXCEPT FOR STRUCTURE, FLOOR SLABS, INTERIOR STAIRS AND STAIR ENCLOSURE WALLS, AND INTERIOR BEARING WALLS. UNLESS NOTED OR SHOWN OTHERWISE. EXPOSED EXTERIOR ROUGH OPENINGS SHALL BE WATERTIGHT.

J. REFER TO MECHANICAL, PLUMBING AND ELECTRICAL DRAWINGS AND SPECIFICATIONS FOR ADDITIONAL DEMOLITION REQUIREMENTS.

K. COORDINATE THE SIZE, LOCATION, AND QUANTITY OF NEW PENETRATIONS THROUGH EXISTING WALLS, FLOORS, AND ROOF DECK WITH THE MEP & FP CONTRACTOR AND PROPOSED NEW EQUIPMENT.

L. REMOVE AND DISPOSE ALL SELECTED FLOOR FINISH AREAS AS SHOWN ON THE PLAN TO THE SUBSTRATE UNLESS NOTED OR SHOWN OTHERWISE.

M. REMOVE AND DISPOSE OF ALL PLASTER WALL FINISH, ASSOCIATED LATH, AND FURRING WITHIN THE PLENUM CEILING SPACE FROM THE INTERIOR FACE OF ALL EXISTING INTERIOR WALLS DOWN TO 4" FROM THE EXISTING CEILING HEIGHT TO THE MASONRY SUBSTRATE, UNLESS NOTED OTHERWISE. REFER TO DETAIL: FOR REFERENCE.

N. REMOVE AND DISPOSE OF ALL SELECTED INTERIOR MILLWORK AS SHOWN ON THE PLANS.

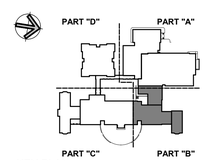
O. REMOVE AND DISPOSE OF ALL SELECTED EXTERIOR WINDOWS, AND LOUVERS, FROM EXTERIOR OPENINGS BACK TO THE ORIGINAL MASONRY OPENING, INCLUDING ALL ASSOCIATED FRAMES AND HARDWARE, UNLESS NOTED OTHERWISE. CAULKING AT EXISTING WINDOWS SHALL BE REMOVED IN PHASES BY THE DEMOLITION CONTRACTOR. EXPOSED WINDOW OPENINGS AS A RESULT OF WINDOW REMOVAL SHALL BE TEMPORARILY BOARDED UP AND MADE WEATHER-TIGHT UNTIL NEW WINDOWS (AS PART OF A FUTURE PHASE) CAN BE INSTALLED. WEATHER-TIGHT INFILL SHALL BE FLUSH WITH THE EXTERIOR AND ATTACHED TO THE JAMB OF THE EXISTING OPENING. WINDOWS TO REMAIN SHALL BE PROTECTED DURING DEMOLITION.

P. REMOVE ALL EXTERIOR DOORS, INCLUDING ALL ASSOCIATED FRAMES, HARDWARE, AND CAULKING UNLESS OTHERWISE NOTED. PROTECT ALL EXPOSED EXTERIOR OPENINGS WITH TEMPORARY BOARDED UP WEATHER-TIGHT AND SECURE INFILLS TO PREVENT THE EXPOSURE TO WEATHER OF HISTORICALLY IMPORTANT ELEMENTS ON THE INTERIOR AND PROTECT THE BUILDING FROM UNAUTHORIZED INTRUSION. INFILL SHALL BE SECURED IN PLACE AT THE JAMB AND FLUSH WITH THE EXTERIOR.

Q. SALVAGE ALL FACE BRICK FROM DEMOLISHED BUILDING. REMOVE THE BRICK TO MAINTAIN ITS APPEARANCE AND STRUCTURAL INTEGRITY. CLEAN BRICK OF ALL EXISTING MORTAR AND STORE IN VANDAL RESISTANT WEATHER PROTECTED AREA.

R. EXISTING TERRAZZO FLOOR FINISH TO REMAIN SHALL BE PROTECTED FROM DAMAGE DURING DEMOLITION. SAW CUT, REMOVE AND DISPOSE OF ASSOCIATED TERRAZZO WALL BASE UNLESS OTHERWISE NOTED RE:

S. ALL ROUGH OPENING DIMENSIONS AND LOCATIONS FOR NEW DOORS AND CASED OPENINGS NEED TO BE COORDINATED WITH THE PROPOSED NEW OPENINGS.



KEY PLAN

Project Title:
ADDITION & ALTERATIONS TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
311 STATE STREET NEW LONDON CT 06320
203 230 9007 silverpetrucelli.com

Revision: Description: Date: Revised By:

Drawing Title:
THIRD FLOOR DEMOLITION PLAN - PART "B"

Date: 8/29/2024
Scale: As indicated
Drawn By: JM
Project Number: 22-382
Drawing Number: A032

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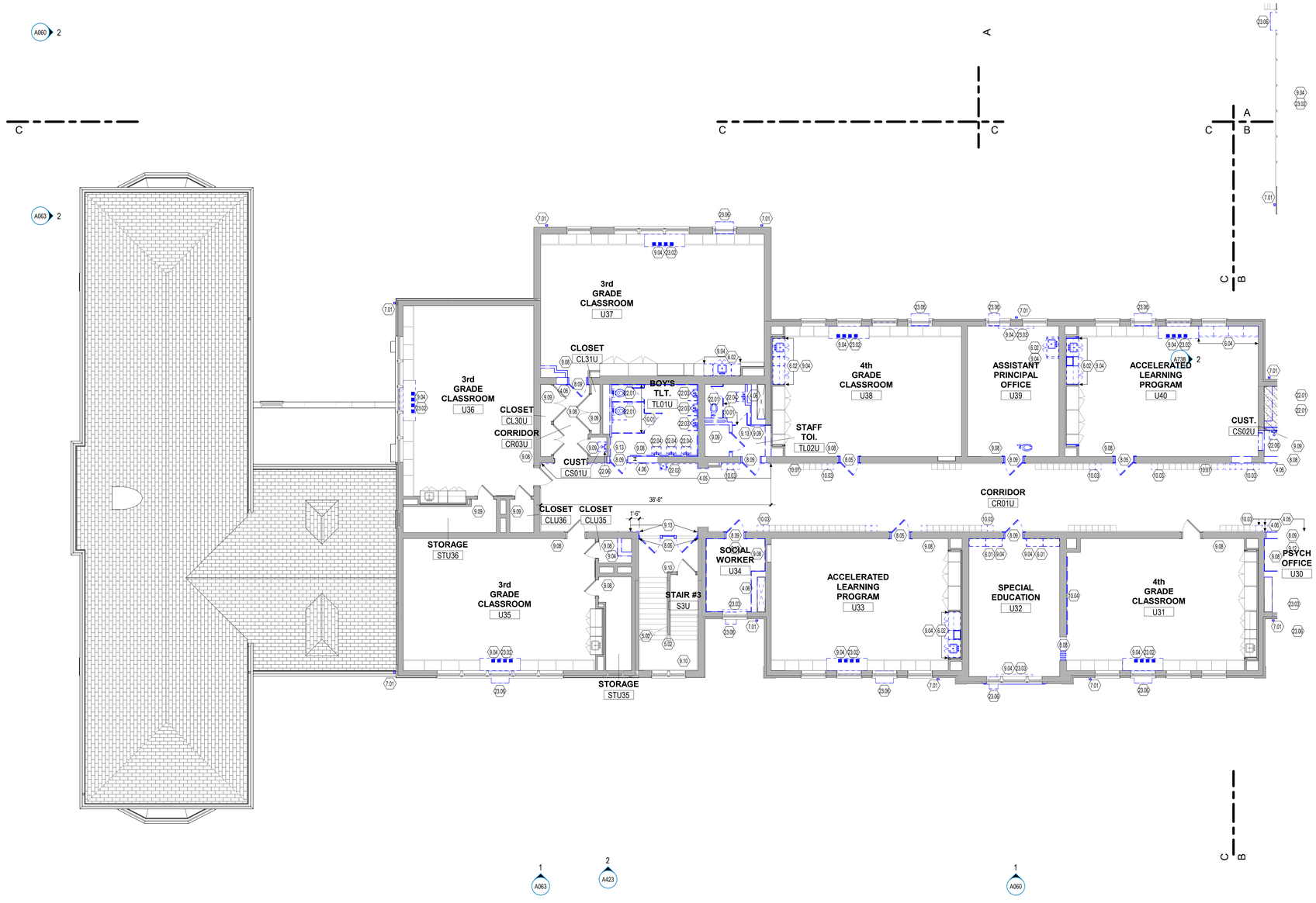


1 3rd FLOOR DEMOLITION PLAN - PART "C"
1/8" = 1'-0"

DEMOLITION KEYNOTES

3.01 REMOVE ENTIRE CONCRETE SLAB, SLOPED AND FLAT PORTIONS.
3.02 REMOVE CONCRETE OR STONE STAIR OR STEPS, LANDING, FOUNDATION, FOOTINGS, METAL GUARDRAILS, HANDRAILS AND ALL ASSOCIATED HARDWARE AND FASTENERS.
3.03 REMOVE CONCRETE OR STONE STAIR OR STEPS, LANDING, HANDRAILS, AND ALL ASSOCIATED HARDWARE AND FASTENERS.
4.03 EXISTING TERRAZZO FLOORING TO REMAIN.
4.04 PROVIDE NEW OPENING THROUGH EXISTING MASONRY WALL. PROVIDE TEMPORARY SHORING AND PERMANENT LINTEL AT HEAD AS REQUIRED. COORDINATE SIZE OF OPENING WITH DOOR SIZE AND FRAME AS INDICATED ON DOOR SCHEDULE.
4.05 CAREFULLY SAWCUT AND REMOVE PORTION OF EXISTING GLAZED TILE BLOCK WAINSCOT WALL TO THE EXTENT INDICATED ON THE DRAWINGS.
4.06 REMOVE THIS PORTION OF MASONRY WALL TO ACCOMMODATE NEW LAYOUT. SEE ALSO FLOOR PLAN TO COORDINATE EXACT SIZE OF REMOVAL.
4.07 REMOVE GRANITE STONE ENTRY STOOP. GRANITE STONE STAIR STEPS, AND ALL DAMAGED SUBSTRATE STRUCTURAL BASE. SEE LANDSCAPE DRAWINGS FOR MORE INFORMATION.
4.08 REMOVE STONE SILL
4.09 PROVIDE NEW OPENING THROUGH EXISTING MASONRY WALL. PROVIDE TEMPORARY SHORING AND PERMANENT LINTEL AT HEAD AS REQUIRED. COORDINATE SIZE OF OPENING WITH WINDOW SIZE, REFER TO WINDOW SCHEDULE.
5.01 REMOVE AND REPLACE STEEL LINTEL. SEE STRUCTURAL DRAWINGS.
5.02 REMOVE AND DISPOSE OF ALL SIDEWALL AND INTERMEDIATED METAL HANDRAIL, BRACKETS, AND ALL ASSOCIATED HARDWARE. STRIP PAINT AND CLEAN ALL EXISTING METAL GUARDRAILS AND NEWEL POST.
5.03 STRUCTURAL COLUMN SHALL BE PROTECTED DURING MASONRY REMOVAL.
6.01 REMOVE COUNTERTOPS, BASE AND TOP CABINETS, AND/OR TALL CABINETS AND ASSOCIATED HARDWARE.
6.02 REMOVE COUNTERTOPS, BASE AND TOP CABINETS, AND/OR TALL CABINETS, SINK FIXTURE, FAUCET, AND ASSOCIATED HARDWARE. SEE ALSO PLUMBING DRAWING.
6.03 REMOVE COUNTERTOPS, BASE AND TOP CABINETS, AND/OR TALL CABINETS AND ASSOCIATED HARDWARE.
6.04 REMOVE EXISTING MILLWORK, CASEWORK, AND SHELVING.
6.05 REMOVE ENTIRE WOOD STAIR ASSEMBLY, LANDING, FRAMING, HADRAILS, GUARDRAILS AND ALL ASSOCIATED HARDWARE AND FASTENERS.
6.06 REMOVE AND REPAIR EXISTING CORNICE FASCIA AND SOFFIT.
7.01 REMOVE AND DISPOSE OF ALUMINUM DOWNSPOUT.
7.02 REMOVE ENTIRE CANOPY, INCLUDING ROOF DECKING, BEAMS, ROOFING, FASCIAS, FLASHINGS, STEEL COLUMNS, FOUNDATION, FOOTINGS AND ALL ASSOCIATED HARDWARE AND FASTENERS.
8.01 REMOVE WINDOW SYSTEM, INCLUDING FRAMES. GLAZING, PANELS, LOUVERS, SILLS, GASKETS AND ALL ASSOCIATED HARDWARE. CLEAN OPENING TO RECEIVE NEW WINDOW SYSTEM.
8.02 REMOVE GLAZING, FRAMES, SEALANT AND ASSOCIATED HARDWARE.
8.03 REMOVE AND REPLACE INSULATED GLAZING PANEL. REPAIR ASSOCIATED HARDWARE AS NEEDED.
8.04 REMOVE ALUMINUM ENTRANCE SYSTEM, INCLUDING TRANSOM PANEL, DOORS, FRAMES, GLAZING, SILLS, SEALANTS AND ALL ASSOCIATED HARDWARE.
8.05 REMOVE DOOR, TRANSOM PANEL, FRAME AND ASSOCIATED HARDWARE. ENLARGE OPENING TO ACCEPT NEW FRAME AND MANEUVERING CLEARANCE REQUIREMENT. COORDINATE WITH SCOPE OF NEW WORK REQUIRED.
8.06 REMOVE DOOR, FRAME AND HARDWARE. CLEAN MASONRY OPENING TO ACCEPT NEW FRAME AND DOOR AS SCHEDULED.
8.07 REMOVE DOOR, FRAME AND HARDWARE. PREPARE JAMBS TO RECEIVE TOOTHED-IN INFILL.
8.08 REMOVE DOOR, FRAME AND HARDWARE.
8.09 REMOVE DOOR, FRAME AND HARDWARE. ENLARGE OPENING TO ACCEPT NEW FRAME AND MANEUVERING CLEARANCE REQUIREMENT. PROVIDE TEMPORARY SHORING AND PERMANENT LINTEL AS REQUIRED. SEE NEW PLANS FOR LOCATION OF NEW DOORS.
8.10 REMOVE DOOR, TRANSOM PANEL, FRAME AND ASSOCIATED HARDWARE. CLEAN MASONRY OPENING TO ACCEPT NEW FRAME AND DOOR AS SCHEDULED. COORDINATE WITH SCOPE OF NEW WORK REQUIRED.
8.11 REMOVE AND DISPOSE OF ALUMINUM LOUVER.
9.01 REMOVE AND DISPOSE OF THE FULL EXTENT OF WALL COVED BASE AND VCT OR SHEET FLOORING. CLEAN SUBSTRATE TO ACCEPT NEW SCHEDULED FINISH.
9.02 REMOVE AND DISPOSE OF THE FULL EXTENT OF WALL COVED BASE AND EPOXY FLOORING. CLEAN SUBSTRATE TO ACCEPT NEW SCHEDULED FINISH.
9.03 REMOVE WALL BASE AND CERAMIC FLOORING. CLEAN SUBSTRATE TO ACCEPT NEW SCHEDULED FINISH.
9.04 REMOVE AND DISPOSE PORTION OF THE EXISTING VCT OR SHEET FLOORING. CLEAN SUBSTRATE TO ACCEPT NEW SCHEDULED FINISH. REFER TO ARCHITECTURAL FLOOR PATTERN PLANS FOR REMOVAL COORDINATION.
9.05 REMOVE AND DISPOSE OF THE FULL EXTENT OF EXISTING TERRAZZO FLOORING. PROVIDED NEW SUBSTRATE TO ACCEPT NEW SCHEDULED FINISH. REFER TO ARCHITECTURAL FLOOR PATTERN PLANS FOR REMOVAL COORDINATION.
9.06 REMOVE AND DISPOSE OF ALL EXISTING RUBBER FLOORING, RUBBER STAIR TREADS, AND RISERS. CLEAN SUBSTRATE TO ACCEPT NEW SCHEDULED FINISH.
9.07 REMOVE AND DISPOSE PORTION OF THE EXISTING CARPET. CLEAN SUBSTRATE TO ACCEPT NEW SCHEDULED FINISH. REFER TO ARCHITECTURAL FLOOR PATTERN PLANS FOR REMOVAL COORDINATION.
9.08 REMOVE AND DISPOSE OF ALL SUSPENDED LAY-IN CEILING SYSTEMS INCLUDING ASSOCIATED HANGERS AND ANCHORS. ASSUME PLASTER, GYPSUM BOARD OR BOTH TYPE OF CEILING SYSTEMS MAY BE ABOVE ALL SUSPENDED LAY-IN CEILING SYSTEMS. REMOVE AND DISPOSE OF ALL HARD-SURFACE CEILING SOFFIT AND FRAMING. REFER TO MECHANICAL, PLUMBING AND ELECTRICAL DRAWINGS AND SPECIFICATIONS FOR ADDITIONAL DEMOLITION REQUIREMENTS.
9.09 REMOVE ALL PLASTER CEILING SYSTEMS INCLUDING ASSOCIATED METAL LATH, AND BLOCKING TO THE UNDERSIDE OF FLOOR SLAB ABOVE, UNLESS NOTED OR SHOWN OTHERWISE. REFER TO MECHANICAL, PLUMBING AND ELECTRICAL DRAWINGS AND SPECIFICATIONS FOR ADDITIONAL DEMOLITION REQUIREMENTS.
9.10 REMOVE HARD-SURFACE CEILING/SOFFIT, FRAMING, LOUVERS, DIFFUSERS, SUSPENSION MEMBERS, BRACING AND ALL ASSOCIATED HARDWARE. REFER TO MECHANICAL, PLUMBING AND ELECTRICAL DRAWINGS AND SPECIFICATIONS FOR ADDITIONAL DEMOLITION REQUIREMENTS.
9.11 REMOVE PORTION OF WALL REQUIRED TO ACCESS PLUMBING FOR NEW WATER COOLERS INSTALLATION WHEN APPLICABLE. SEE ALSO NEW FLOOR PLANS.
9.12 REMOVE AND DISPOSE OF ALL MASONRY PLASTER WALL FINISH TO EXPOSE MASONRY CMU WALL.
9.13 REMOVE AND DISPOSE OF ALL WALL TILE FINISH.
10.01 REMOVE TOILET PARTITIONS, DOORS, BRACES AND ALL ASSOCIATED HARDWARE.
10.02 REMOVE METAL LOCKERS, LOCKER METAL BASED, AND ALL ASSOCIATED HARDWARE.
10.03 REMOVE AND SALVAGE METAL LOCKERS, LOCKER METAL BASED, AND ALL ASSOCIATED HARDWARE. CLEAN, REPAIR AS NEEDED, PRIMED AND PAINT FOR INSTALLATION.
10.04 REMOVE TACKBOARDS, BLACK, WHITE BOARDS ON WALL, AND ASSOCIATED HARDWARE.
10.05 REMOVE SWING-UP GRAB BAR AND PATH TILE WALL AS NEEDED.
10.06 REMOVE PORTION OF STAGE: WOOD FLOORING, FRAMING, BASE, CONCRETE SLAB SUBFLOOR, AND ALL ASSOCIATED FASTENERS AND HARDWARE.
10.07 REMOVE SIGNAGE ON WALL AND RETURN TO OWNER.
10.08 REMOVE ARTWORK ON WALL AND RETURN TO OWNER.
12.01 REMOVE WINDOW SHADE SYSTEM AND ASSOCIATED HARDWARE.
22.01 REMOVE WATER CLOSET FIXTURE, CARRIER, PLUMBING VALVE, HARDWARE, GRAB BARS AND ACCESSORIES. SEE ALSO PLUMBING DRAWINGS.
22.02 REMOVE WATER COOLER FIXTURES, CARRIERS AND HARDWARE. SEE ALSO PLUMBING DRAWING.
22.03 REMOVE URINAL FIXTURE AND HARDWARE AND PRIVACY PANELS. SEE ALSO PLUMBING DRAWING.
22.04 REMOVE LAVATORY FIXTURE, CARRIER, HARDWARE, MIRROR AND ACCESSORIES. SEE ALSO PLUMBING DRAWINGS.
22.05 REMOVE PLUMBING FIXTURE AND HARDWARE. SEE ALSO PLUMBING DRAWING.
22.06 REMOVE MOP SINK FIXTURE, CARRIER, AND ACCESSORIES. SEE ALSO PLUMBING DRAWINGS.
23.01 REFER TO MEP DRAWINGS FOR EXTENT OF DEMOLITION.
23.02 REMOVE UNIT VENTILATOR UNIT. REFER TO MECHANICAL DRAWINGS.
23.03 REMOVE WALL-MOUNTED FAN COIL UNIT. REFER TO MECHANICAL DRAWINGS.
23.04 REMOVE WALL-MOUNTED LINEAR HYDRONIC HEATER BASEBOARD UNIT AND ALL ASSOCIATED FASTENERS HARDWARE. PATCH WALL AS NEEDED FOR NEW FINISH. REFER TO MECHANICAL DRAWINGS.
23.05 REMOVE WALL-MOUNTED METAL PIPE COVER ENCLOSURE, PIPES AND ALL ASSOCIATED FASTENERS HARDWARE. PATCH WALL AS NEEDED FOR NEW FINISH. REFER TO MECHANICAL DRAWINGS.
23.06 REMOVE AND DISPOSE OF AIR CONDITIONER UNIT FROM WINDOW AND ANY ASSOCIATED ACCESSORIES. REPAIR WINDOW PANEL AS REQUIRED. REFER TO MECHANICAL DRAWINGS.

DEMOLITION LEGEND:

DEMOLITION SCOPE

SAW CUT AND REMOVE CONCRETE FLOOR SLAB AS SHOWN FOR NEW WORK. REFER TO STRUCTURAL DRAWINGS.

REMOVE AND DISPOSE WOOD FLOOR ASSEMBLY AS SHOWN FOR NEW WORK. REFER TO STRUCTURAL DRAWINGS.

DEMOLITION GENERAL NOTES:

A. THE CONTRACTOR SHALL REFERENCE HAZARDOUS MATERIAL, MECHANICAL, ELECTRICAL, AND PLUMBING DEMOLITION DRAWINGS FOR ADDITIONAL DEMOLITION SCOPE OF WORK.

B. THE CONTRACTOR SHALL VERIFY EXISTING CONDITIONS PRIOR TO THE START OF WORK. REPORT TO THE ARCHITECT OF ANY DISCREPANCIES WITH THE DRAWINGS PROVIDED.

C. THE CONTRACTOR SHALL ADVISE THE ARCHITECT OF ALL CONFLICTS ENCOUNTERED IN THE FIELD. THE CONTRACTOR SHALL PROTECT THE INTERIOR OF THE BUILDING FROM ADVERSE WEATHER CONDITIONS WHERE EXTERIOR WEATHERTIGHT ELEMENTS HAVE BEEN REMOVED.

D. THE EXISTING FACILITY IS CONSIDERED TO BE HISTORIC IN NATURE. THE CONTRACTOR IS TO COORDINATE THE EXTENT OF DEMOLITION WITH THE PROPOSED NEW WORK AND SHALL PROTECT ALL EXISTING SURFACES AND MATERIALS SCHEDULED TO REMAIN. IT IS EXPECTED THAT THE CONTRACTOR WILL PROVIDE THE LEAST INVASIVE AND DESTRUCTIVE METHODS OF DEMOLITION AROUND HISTORICALLY IMPORTANT ELEMENTS. INCLUDING BUT NOT LIMITED TO:
a. EXISTING EXTERIOR FACADE TO REMAIN
b. EXTERIOR WINDOWS NOTED TO REMAIN OR BE SALVAGED
c. TERRAZZO FLOOR SYSTEMS NOTED TO REMAIN

E. THE CONTRACTOR SHALL PROVIDE ALL OPENINGS THROUGH EXISTING WALLS, AND FLOORS REQUIRED FOR THE INSTALLATION OF NEW DUCTWORK, PIPING, AND CONDUITS. PROVIDE TEMPORARY PROTECTION FOR ALL NEW AND EXISTING OPENINGS IN FLOORS AND ROOF DECK.

F. THE CONTRACTOR SHALL PATCH THE REMAINING WALLS, FLOOR, AND CEILING AS REQUIRED BY DEMOLITION TO OBTAIN A UNIFORM SURFACE READY TO RECEIVE FINISHES. REFER TO SPECIFICATIONS REGARDING CUTTING AND PATCHING.

G. THE CONTRACTOR SHALL SALVAGE AND STORE ALL MATERIALS AND/OR EQUIPMENT AS NOTED FOR REINSTALLATION.

H. THE CONTRACTOR SHALL BRING TO THE ATTENTION OF THE ARCHITECT ANY CONSTRUCTION OR MATERIALS TO REMAIN THAT ARE UNSOUND, DETERIORATED, OR ARE NOT AS SHOWN IN THESE CONTRACT DOCUMENTS.

I. DEMOLISH ALL SELECTED INTERIOR CONSTRUCTION AND FINISHES AS SHOWN ON THE PLANS. EXCEPT FOR STRUCTURE, FLOOR SLABS, INTERIOR STAIRS AND STAIR ENCLOSURE WALLS, AND INTERIOR BEARING WALLS, UNLESS NOTED OR SHOWN OTHERWISE. EXPOSED EXTERIOR ROUGH OPENINGS SHALL BE WATERTIGHT.

J. REFER TO MECHANICAL, PLUMBING AND ELECTRICAL DRAWINGS AND SPECIFICATIONS FOR ADDITIONAL DEMOLITION REQUIREMENTS.

K. COORDINATE THE SIZE, LOCATION, AND QUANTITY OF NEW PENETRATIONS THROUGH EXISTING WALLS, FLOORS, AND ROOF DECK WITH THE MEP & FP CONTRACTOR AND PROPOSED NEW EQUIPMENT.

L. REMOVE AND DISPOSE ALL SELECTED FLOOR FINISH AREAS AS SHOWN ON THE PLAN TO THE SUBSTRATE UNLESS NOTED OR SHOWN OTHERWISE.

M. REMOVE AND DISPOSE OF ALL PLASTER WALL FINISH, ASSOCIATED LATH, AND FURRING WITHIN THE PLENUM CEILING SPACE FROM THE INTERIOR FACE OF ALL EXISTING INTERIOR WALLS DOWN TO 4" FROM THE EXISTING CEILING HEIGHT TO THE MASONRY SUBSTRATE, UNLESS NOTED OTHERWISE. REFER TO DETAIL: FOR REFERENCE.

N. REMOVE AND DISPOSE OF ALL SELECTED INTERIOR MILLWORK AS SHOWN ON THE PLANS.

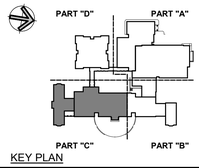
O. REMOVE AND DISPOSE OF ALL SELECTED EXTERIOR WINDOWS, AND LOUVERS, FROM EXTERIOR OPENINGS BACK TO THE ORIGINAL MASONRY OPENING, INCLUDING ALL ASSOCIATED FRAMES AND HARDWARE, UNLESS NOTED OTHERWISE. CAULKING AT EXISTING WINDOWS SHALL BE REMOVED IN PHASES BY THE DEMOLITION CONTRACTOR. EXPOSED WINDOW OPENINGS AS A RESULT OF WINDOW REMOVAL SHALL BE TEMPORARILY BOARDED UP AND MADE WEATHER-TIGHT UNTIL NEW WINDOWS (AS PART OF A FUTURE PHASE) CAN BE INSTALLED. WEATHER-TIGHT INFILL SHALL BE FLUSH WITH THE EXTERIOR AND ATTACHED TO THE JAMB OF THE EXISTING OPENING. WINDOWS TO REMAIN SHALL BE PROTECTED DURING DEMOLITION.

P. REMOVE ALL EXTERIOR DOORS, INCLUDING ALL ASSOCIATED FRAMES, HARDWARE, AND CAULKING UNLESS OTHERWISE NOTED. PROTECT ALL EXPOSED EXTERIOR OPENINGS WITH TEMPORARY BOARDED UP WEATHER-TIGHT AND SECURE INFILLS TO PREVENT THE EXPOSURE TO WEATHER OF HISTORICALLY IMPORTANT ELEMENTS ON THE INTERIOR AND PROTECT THE BUILDING FROM UNAUTHORIZED INTRUSION. INFILL SHALL BE SECURED IN PLACE AT THE JAMB AND FLUSH WITH THE EXTERIOR.

Q. SALVAGE ALL FACE BRICK FROM DEMOLISHED BUILDING. REMOVE THE BRICK TO MAINTAIN ITS APPEARANCE AND STRUCTURAL INTEGRITY. CLEAN BRICK OF ALL EXISTING MORTAR AND STORE IN VANDAL RESISTANT WEATHER PROTECTED AREA.

R. EXISTING TERRAZZO FLOOR FINISH TO REMAIN SHALL BE PROTECTED FROM DAMAGE DURING DEMOLITION. SAW CUT, REMOVE AND DISPOSE OF ASSOCIATED TERRAZZO WALL BASE UNLESS OTHERWISE NOTED RE:

S. ALL ROUGH OPENING DIMENSIONS AND LOCATIONS FOR NEW DOORS AND CASED OPENINGS NEED TO BE COORDINATED WITH THE PROPOSED NEW OPENINGS.



KEY PLAN

Project Title:
ADDITION & ALTERATIONS TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
311 STATE STREET NEW LONDON CT 06320
203 230 9007 silverpetrucelli.com

Revision:	Description:	Date:	Revised By:

Drawing Title: THIRD FLOOR DEMOLITION PLAN - PART "C"

Date: 8/29/2024
Scale: As indicated
Drawn By: JM
Project Number: 22-382
Drawing Number: A033

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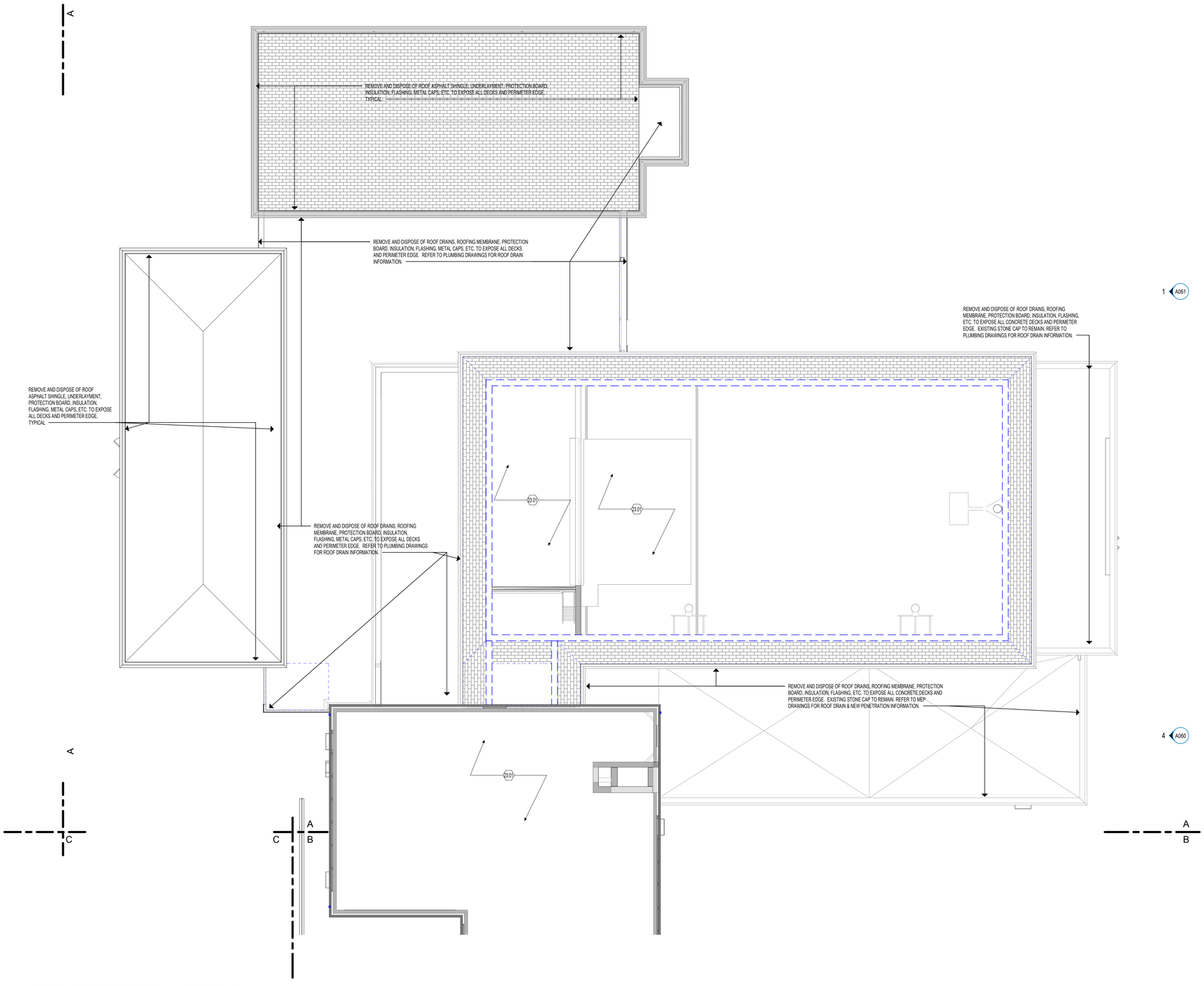


1 ATTIC - DEMOLITION PLAN - PART "A"
1/8" = 1'-0"

DEMOLITION KEYNOTES

3.01 REMOVE ENTIRE CONCRETE SLAB, SLOPED AND FLAT PORTIONS.
3.02 REMOVE CONCRETE OR STONE STAIR OR STEPS, LANDING, FOUNDATION, FOOTINGS, METAL GUARDRAILS, HANDRAILS AND ALL ASSOCIATED HARDWARE AND FASTENERS.
3.03 REMOVE CONCRETE OR STONE STAIR OR STEPS, LANDING, HANDRAILS, AND ALL ASSOCIATED HARDWARE AND FASTENERS.
4.03 EXISTING TERRAZZO FLOORING TO REMAIN.
4.04 PROVIDE NEW OPENING THROUGH EXISTING MASONRY WALL. PROVIDE TEMPORARY SHORING AND PERMANENT LINTEL AT HEAD AS REQUIRED. COORDINATE SIZE OF OPENING WITH DOOR SIZE AND FRAME AS INDICATED ON DOOR SCHEDULE.
4.05 CAREFULLY SAWCUT AND REMOVE PORTION OF EXISTING GLAZED TILE BLOCK WAINSCOT WALL TO THE EXTENT INDICATED ON THE DRAWINGS.
4.06 REMOVE THIS PORTION OF MASONRY WALL TO ACCOMMODATE NEW LAYOUT. SEE ALSO FLOOR PLAN TO COORDINATE EXACT SIZE OF REMOVAL.
4.07 REMOVE GRANITE STONE ENTRY STOOP, GRANITE STONE STAIR STEPS, AND ALL DAMAGED SUBSTRATE STRUCTURAL BASE. SEE LANDSCAPE DRAWINGS FOR MORE INFORMATION.
4.08 REMOVE STONE SILL
4.09 PROVIDE NEW OPENING THROUGH EXISTING MASONRY WALL. PROVIDE TEMPORARY SHORING AND PERMANENT LINTEL AT HEAD AS REQUIRED. COORDINATE SIZE OF OPENING WITH WINDOW SIZE, REFER TO WINDOW SCHEDULE.
5.01 REMOVE AND REPLACE STEEL LINTEL. SEE STRUCTURAL DRAWINGS.
5.02 REMOVE AND DISPOSE OF ALL SIDEWALL AND INTERMEDIATED METAL HANDRAIL, BRACKETS, AND ALL ASSOCIATED HARDWARE. STRIP PAINT AND CLEAN ALL EXISTING METAL GUARDRAILS AND NEWEL POST.
5.03 STRUCTURAL COLUMN SHALL BE PROTECTED DURING MASONRY REMOVAL.
6.01 REMOVE COUNTERTOPS, BASE AND TOP CABINETS, AND/OR TALL CABINETS AND ASSOCIATED HARDWARE.
6.02 REMOVE COUNTERTOPS, BASE AND TOP CABINETS, AND/OR TALL CABINETS, SINK FIXTURE, FAUCET, AND ASSOCIATED HARDWARE. SEE ALSO PLUMBING DRAWING.
6.03 REMOVE COUNTERTOPS, BASE AND TOP CABINETS, AND/OR TALL CABINETS AND ASSOCIATED HARDWARE.
6.04 REMOVE EXISTING MILLWORK, CASEWORK, AND SHELVING.
6.05 REMOVE ENTIRE WOOD STAIR ASSEMBLY, LANDING, FRAMING, HADRAILS, GUARDRAILS AND ALL ASSOCIATED HARDWARE AND FASTENERS.
6.06 REMOVE AND REPAIR EXISTING CORNICE FASCIA AND SOFFIT.
7.01 REMOVE AND DISPOSE OF ALUMINUM DOWNSPOUT.
7.02 REMOVE ENTIRE CANOPY, INCLUDING ROOF DECKING, BEAMS, ROOFING, FASCIAS, FLASHINGS, STEEL COLUMNS, FOUNDATION, FOOTINGS AND ALL ASSOCIATED HARDWARE AND FASTENERS.
8.01 REMOVE WINDOW SYSTEM, INCLUDING FRAMES, GLAZING, PANELS, LOUVERS, SILLS, GASKETS AND ALL ASSOCIATED HARDWARE. CLEAN OPENING TO RECEIVE NEW WINDOW SYSTEM.
8.02 REMOVE GLAZING, FRAMES, SEALANT AND ASSOCIATED HARDWARE.
8.03 REMOVE AND REPLACE INSULATED GLAZING PANEL. REPAIR ASSOCIATED HARDWARE AS NEEDED.
8.04 REMOVE ALUMINUM ENTRANCE SYSTEM, INCLUDING TRANSOM PANEL, DOORS, FRAMES, GLAZING, SILLS, SEALANTS AND ALL ASSOCIATED HARDWARE.
8.05 REMOVE DOOR, TRANSOM PANEL, FRAME AND ASSOCIATED HARDWARE. ENLARGE OPENING TO ACCEPT NEW FRAME AND MANEUVERING CLEARANCE REQUIREMENT. COORDINATE WITH SCOPE OF NEW WORK REQUIRED.
8.06 REMOVE DOOR, FRAME AND HARDWARE. CLEAN MASONRY OPENING TO ACCEPT NEW FRAME AND DOOR AS SCHEDULED.
8.07 REMOVE DOOR, FRAME AND HARDWARE. PREPARE JAMBS TO RECEIVE TOOTHED-IN INFILL.
8.08 REMOVE DOOR, FRAME AND HARDWARE.
8.09 REMOVE DOOR, FRAME AND HARDWARE. ENLARGE OPENING TO ACCEPT NEW FRAME AND MANEUVERING CLEARANCE REQUIREMENT. PROVIDE TEMPORARY SHORING AND PERMANENT LINTEL AS REQUIRED. SEE NEW PLANS FOR LOCATION OF NEW DOORS.
8.10 REMOVE DOOR, TRANSOM PANEL, FRAME AND ASSOCIATED HARDWARE. CLEAN MASONRY OPENING TO ACCEPT NEW FRAME AND DOOR AS SCHEDULED. COORDINATE WITH SCOPE OF NEW WORK REQUIRED.
8.11 REMOVE AND DISPOSE OF ALUMINUM LOUVER.
9.01 REMOVE AND DISPOSE OF THE FULL EXTENT OF WALL COVED BASE AND VCT OR SHEET FLOORING. CLEAN SUBSTRATE TO ACCEPT NEW SCHEDULED FINISH.
9.02 REMOVE AND DISPOSE OF THE FULL EXTENT OF WALL COVED BASE AND EPOXY FLOORING. CLEAN SUBSTRATE TO ACCEPT NEW SCHEDULED FINISH.
9.03 REMOVE WALL BASE AND CERAMIC FLOORING. CLEAN SUBSTRATE TO ACCEPT NEW SCHEDULED FINISH.
9.04 REMOVE AND DISPOSE PORTION OF THE EXISTING VCT OR SHEET FLOORING. CLEAN SUBSTRATE TO ACCEPT NEW SCHEDULED FINISH. REFER TO ARCHITECTURAL FLOOR PATTERN PLANS FOR REMOVAL COORDINATION.
9.05 REMOVE AND DISPOSE OF THE FULL EXTENT OF EXISTING TERRAZZO FLOORING. PROVIDED NEW SUBSTRATE TO ACCEPT NEW SCHEDULED FINISH. REFER TO ARCHITECTURAL FLOOR PATTERN PLANS FOR REMOVAL COORDINATION.
9.06 REMOVE AND DISPOSE OF ALL EXISTING RUBBER FLOORING, RUBBER STAIR TREADS, AND RISERS. CLEAN SUBSTRATE TO ACCEPT NEW SCHEDULED FINISH.
9.07 REMOVE AND DISPOSE PORTION OF THE EXISTING CARPET. CLEAN SUBSTRATE TO ACCEPT NEW SCHEDULED FINISH. REFER TO ARCHITECTURAL FLOOR PATTERN PLANS FOR REMOVAL COORDINATION.
9.08 REMOVE AND DISPOSE OF ALL SUSPENDED LAY-IN CEILING SYSTEMS INCLUDING ASSOCIATED HANGERS AND ANCHORS. ASSUME PLASTER, GYPSUM BOARD OR BOTH TYPE OF CEILING SYSTEMS MAY BE ABOVE ALL SUSPENDED LAY-IN CEILING SYSTEMS. REMOVE AND DISPOSE OF ALL HARD-SURFACE CEILING SOFFIT AND FRAMING. REFER TO MECHANICAL, PLUMBING AND ELECTRICAL DRAWINGS AND SPECIFICATIONS FOR ADDITIONAL DEMOLITION REQUIREMENTS.
9.09 REMOVE ALL PLASTER CEILING SYSTEMS INCLUDING ASSOCIATED METAL LATH, AND BLOCKING TO THE UNDERSIDE OF FLOOR SLAB ABOVE, UNLESS NOTED OR SHOWN OTHERWISE. REFER TO MECHANICAL, PLUMBING AND ELECTRICAL DRAWINGS AND SPECIFICATIONS FOR ADDITIONAL DEMOLITION REQUIREMENTS.
9.10 REMOVE HARD-SURFACE CEILING/SOFFIT, FRAMING, LOUVERS, DIFFUSERS, SUSPENSION MEMBERS, BRACING AND ALL ASSOCIATED HARDWARE. REFER TO MECHANICAL, PLUMBING AND ELECTRICAL DRAWINGS AND SPECIFICATIONS FOR ADDITIONAL DEMOLITION REQUIREMENTS.
9.11 REMOVE PORTION OF WALL REQUIRED TO ACCESS PLUMBING FOR NEW WATER COOLERS INSTALLATION WHEN APPLICABLE. SEE ALSO NEW FLOOR PLANS.
9.12 REMOVE AND DISPOSE OF ALL MASONRY PLASTER WALL FINISH TO EXPOSE MASONRY CMU WALL.
9.13 REMOVE AND DISPOSE OF ALL WALL TILE FINISH.
10.01 REMOVE TOILET PARTITIONS, DOORS, BRACES AND ALL ASSOCIATED HARDWARE.
10.02 REMOVE METAL LOCKERS, LOCKER METAL BASED, AND ALL ASSOCIATED HARDWARE.
10.03 REMOVE AND SALVAGE METAL LOCKERS, LOCKER METAL BASED, AND ALL ASSOCIATED HARDWARE. CLEAN, REPAIR AS NEEDED, PRIMED AND PAINT FOR INSTALLATION.
10.04 REMOVE TACKBOARDS, BLACK, WHITE BOARDS ON WALL, AND ASSOCIATED HARDWARE.
10.05 REMOVE SWING-UP GRAB BAR AND PATH TILE WALL AS NEEDED.
10.06 REMOVE PORTION OF STAGE: WOOD FLOORING, FRAMING, BASE, CONCRETE SLAB SUBFLOOR, AND ALL ASSOCIATED FASTENERS AND HARDWARE.
10.07 REMOVE SIGNAGE ON WALL AND RETURN TO OWNER.
10.08 REMOVE ARTWORK ON WALL AND RETURN TO OWNER.
12.01 REMOVE WINDOW SHADE SYSTEM AND ASSOCIATED HARDWARE.
22.01 REMOVE WATER CLOSET FIXTURE, CARRIER, PLUMBING VALVE, HARDWARE, GRAB BARS AND ACCESSORIES. SEE ALSO PLUMBING DRAWINGS.
22.02 REMOVE WATER COOLER FIXTURES, CARRIERS AND HARDWARE. SEE ALSO PLUMBING DRAWING.
22.03 REMOVE URINAL FIXTURE AND HARDWARE AND PRIVACY PANELS. SEE ALSO PLUMBING DRAWING.
22.04 REMOVE LAVATORY FIXTURE, CARRIER, HARDWARE, MIRROR AND ACCESSORIES. SEE ALSO PLUMBING DRAWINGS.
22.05 REMOVE PLUMBING FIXTURE AND HARDWARE. SEE ALSO PLUMBING DRAWING.
22.06 REMOVE MOP SINK FIXTURE, CARRIER, AND ACCESSORIES. SEE ALSO PLUMBING DRAWINGS.
23.01 REFER TO MEP DRAWINGS FOR EXTENT OF DEMOLITION.
23.02 REMOVE UNIT VENTILATOR UNIT. REFER TO MECHANICAL DRAWINGS.
23.03 REMOVE WALL-MOUNTED FAN COIL UNIT. REFER TO MECHANICAL DRAWINGS.
23.04 REMOVE WALL-MOUNTED LINEAR HYDRONIC HEATER BASEBOARD UNIT AND ALL ASSOCIATED FASTENERS HARDWARE. PATCH WALL AS NEEDED FOR NEW FINISH. REFER TO MECHANICAL DRAWINGS.
23.05 REMOVE WALL-MOUNTED METAL PIPE COVER ENCLOSURE. PIPES AND ALL ASSOCIATED FASTENERS HARDWARE. PATCH WALL AS NEEDED FOR NEW FINISH. REFER TO MECHANICAL DRAWINGS.
23.06 REMOVE AND DISPOSE OF AIR CONDITIONER UNIT FROM WINDOW AND ANY ASSOCIATED ACCESSORIES. REPAIR WINDOW PANEL AS REQUIRED. REFER TO MECHANICAL DRAWINGS.

DEMOLITION LEGEND:

DEMOLITION SCOPE

SAW CUT AND REMOVE CONCRETE FLOOR SLAB AS SHOWN FOR NEW WORK. REFER TO STRUCTURAL DRAWINGS.

REMOVE AND DISPOSE WOOD FLOOR ASSEMBLY AS SHOWN FOR NEW WORK. REFER TO STRUCTURAL DRAWINGS.

DEMOLITION GENERAL NOTES:

A. THE CONTRACTOR SHALL REFERENCE HAZARDOUS MATERIAL, MECHANICAL, ELECTRICAL, AND PLUMBING DEMOLITION DRAWINGS FOR ADDITIONAL DEMOLITION SCOPE OF WORK.

B. THE CONTRACTOR SHALL VERIFY EXISTING CONDITIONS PRIOR TO THE START OF WORK. REPORT TO THE ARCHITECT OF ANY DISCREPANCIES WITH THE DRAWINGS PROVIDED.

C. THE CONTRACTOR SHALL ADVISE THE ARCHITECT OF ALL CONFLICTS ENCOUNTERED IN THE FIELD. THE CONTRACTOR SHALL PROTECT THE INTERIOR OF THE BUILDING FROM ADVERSE WEATHER CONDITIONS WHERE EXTERIOR WEATHERTIGHT ELEMENTS HAVE BEEN REMOVED.

D. THE EXISTING FACILITY IS CONSIDERED TO BE HISTORIC IN NATURE. THE CONTRACTOR IS TO COORDINATE THE EXTENT OF DEMOLITION WITH THE PROPOSED NEW WORK AND SHALL PROTECT ALL EXISTING SURFACES AND MATERIALS SCHEDULED TO REMAIN. IT IS EXPECTED THAT THE CONTRACTOR WILL PROVIDE THE LEAST INVASIVE AND DESTRUCTIVE METHODS OF DEMOLITION AROUND HISTORICALLY IMPORTANT ELEMENTS. INCLUDING BUT NOT LIMITED TO:
a. EXISTING EXTERIOR FACADE TO REMAIN
b. EXTERIOR WINDOWS NOTED TO REMAIN OR BE SALVAGED
c. TERRAZZO FLOOR SYSTEMS NOTED TO REMAIN

E. THE CONTRACTOR SHALL PROVIDE ALL OPENINGS THROUGH EXISTING WALLS, AND FLOORS REQUIRED FOR THE INSTALLATION OF NEW DUCTWORK, PIPING, AND CONDUITS. PROVIDE TEMPORARY PROTECTION FOR ALL NEW AND EXISTING OPENINGS IN FLOORS AND ROOF DECK.

F. THE CONTRACTOR SHALL PATCH THE REMAINING WALLS, FLOOR, AND CEILING AS REQUIRED BY DEMOLITION TO OBTAIN A UNIFORM SURFACE READY TO RECEIVE FINISHES. REFER TO SPECIFICATIONS REGARDING CUTTING AND PATCHING.

G. THE CONTRACTOR SHALL SALVAGE AND STORE ALL MATERIALS AND/OR EQUIPMENT AS NOTED FOR REINSTALLATION.

H. THE CONTRACTOR SHALL BRING TO THE ATTENTION OF THE ARCHITECT ANY CONSTRUCTION OR MATERIALS TO REMAIN THAT ARE UNSOUND, DETERIORATED, OR ARE NOT AS SHOWN IN THESE CONTRACT DOCUMENTS.

I. DEMOLISH ALL SELECTED INTERIOR CONSTRUCTION AND FINISHES AS SHOWN ON THE PLANS. EXCEPT FOR STRUCTURE, FLOOR SLABS, INTERIOR STAIRS AND STAIR ENCLOSURE WALLS, AND INTERIOR BEARING WALLS, UNLESS NOTED OR SHOWN OTHERWISE. EXPOSED EXTERIOR ROUGH OPENINGS SHALL BE WATERTIGHT.

J. REFER TO MECHANICAL, PLUMBING AND ELECTRICAL DRAWINGS AND SPECIFICATIONS FOR ADDITIONAL DEMOLITION REQUIREMENTS.

K. COORDINATE THE SIZE, LOCATION, AND QUANTITY OF NEW PENETRATIONS THROUGH EXISTING WALLS, FLOORS, AND ROOF DECK WITH THE MEP & FP CONTRACTOR AND PROPOSED NEW EQUIPMENT.

L. REMOVE AND DISPOSE ALL SELECTED FLOOR FINISH AREAS AS SHOWN ON THE PLAN TO THE SUBSTRATE UNLESS NOTED OR SHOWN OTHERWISE.

M. REMOVE AND DISPOSE OF ALL PLASTER WALL FINISH, ASSOCIATED LATH, AND FURRING WITHIN THE PLENUM CEILING SPACE FROM THE INTERIOR FACE OF ALL EXISTING INTERIOR WALLS DOWN TO 4" FROM THE EXISTING CEILING HEIGHT TO THE MASONRY SUBSTRATE, UNLESS NOTED OTHERWISE. REFER TO DETAIL: FOR REFERENCE.

N. REMOVE AND DISPOSE OF ALL SELECTED INTERIOR MILLWORK AS SHOWN ON THE PLANS.

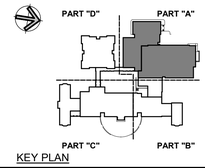
O. REMOVE AND DISPOSE OF ALL SELECTED EXTERIOR WINDOWS, AND LOUVERS, FROM EXTERIOR OPENINGS BACK TO THE ORIGINAL MASONRY OPENING, INCLUDING ALL ASSOCIATED FRAMES AND HARDWARE, UNLESS NOTED OTHERWISE. CAULKING AT EXISTING WINDOWS SHALL BE REMOVED IN PHASES BY THE DEMOLITION CONTRACTOR. EXPOSED WINDOW OPENINGS AS A RESULT OF WINDOW REMOVAL SHALL BE TEMPORARILY BOARDED UP AND MADE WEATHER-TIGHT UNTIL NEW WINDOWS (AS PART OF A FUTURE PHASE) CAN BE INSTALLED. WEATHER-TIGHT INFILL SHALL BE FLUSH WITH THE EXTERIOR AND ATTACHED TO THE JAMB OF THE EXISTING OPENING. WINDOWS TO REMAIN SHALL BE PROTECTED DURING DEMOLITION.

P. REMOVE ALL EXTERIOR DOORS, INCLUDING ALL ASSOCIATED FRAMES, HARDWARE, AND CAULKING UNLESS OTHERWISE NOTED. PROTECT ALL EXPOSED EXTERIOR OPENINGS WITH TEMPORARY BOARDED UP WEATHER-TIGHT AND SECURE INFILLS TO PREVENT THE EXPOSURE TO WEATHER OF HISTORICALLY IMPORTANT ELEMENTS ON THE INTERIOR AND PROTECT THE BUILDING FROM UNAUTHORIZED INTRUSION. INFILL SHALL BE SECURED IN PLACE AT THE JAMB AND FLUSH WITH THE EXTERIOR.

Q. SALVAGE ALL FACE BRICK FROM DEMOLISHED BUILDING. REMOVE THE BRICK TO MAINTAIN ITS APPEARANCE AND STRUCTURAL INTEGRITY. CLEAN BRICK OF ALL EXISTING MORTAR AND STORE IN VANDAL RESISTANT WEATHER PROTECTED AREA.

R. EXISTING TERRAZZO FLOOR FINISH TO REMAIN SHALL BE PROTECTED FROM DAMAGE DURING DEMOLITION. SAW CUT, REMOVE AND DISPOSE OF ASSOCIATED TERRAZZO WALL BASE UNLESS OTHERWISE NOTED RE:

S. ALL ROUGH OPENING DIMENSIONS AND LOCATIONS FOR NEW DOORS AND CASED OPENINGS NEED TO BE COORDINATED WITH THE PROPOSED NEW OPENINGS.



KEY PLAN

Project Title:
ADDITION & ALTERATIONS TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
311 STATE STREET NEW LONDON CT 06320
203 230 9007 silverpetrucelli.com

Revision:	Description:	Date:	Revised By:

Drawing Title: ATTIC DEMOLITION PLAN - PART "A"

Date: 8/29/2024
Scale: As indicated
Drawn By: JM
Project Number: 22-382
Drawing Number: A041

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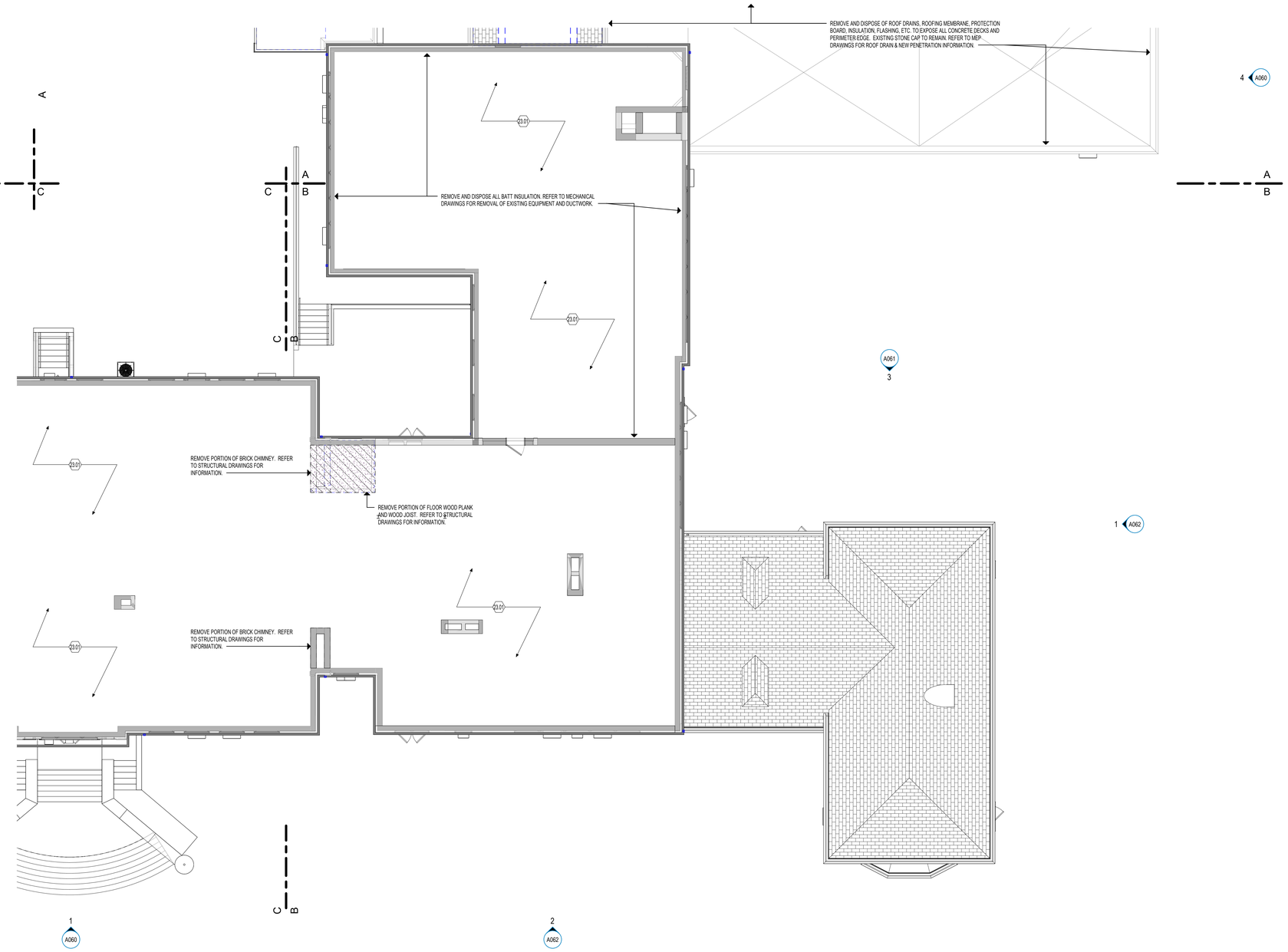


1 ATTIC - DEMOLITION PLAN - PART "B"
1/8" = 1'-0"

DEMOLITION KEYNOTES

3.01 REMOVE ENTIRE CONCRETE SLAB, SLOPED AND FLAT PORTIONS.
3.02 REMOVE CONCRETE OR STONE STAIR OR STEPS, LANDING, FOUNDATION, FOOTINGS, METAL GUARDRAILS, HANDRAILS AND ALL ASSOCIATED HARDWARE AND FASTENERS.
3.03 REMOVE CONCRETE OR STONE STAIR OR STEPS, LANDING, HANDRAILS, AND ALL ASSOCIATED HARDWARE AND FASTENERS.
4.03 EXISTING TERRAZZO FLOORING TO REMAIN.
4.04 PROVIDE NEW OPENING THROUGH EXISTING MASONRY WALL. PROVIDE TEMPORARY SHORING AND PERMANENT LINTEL AT HEAD AS REQUIRED. COORDINATE SIZE OF OPENING WITH DOOR SIZE AND FRAME AS INDICATED ON DOOR SCHEDULE.
4.05 CAREFULLY SAWCUT AND REMOVE PORTION OF EXISTING GLAZED TILE BLOCK WAINSCOT WALL TO THE EXTENT INDICATED ON THE DRAWINGS.
4.06 REMOVE THIS PORTION OF MASONRY WALL TO ACCOMMODATE NEW LAYOUT. SEE ALSO FLOOR PLAN TO COORDINATE EXACT SIZE OF REMOVAL.
4.07 REMOVE GRANITE STONE ENTRY STOOP, GRANITE STONE STAIR STEPS, AND ALL DAMAGED SUBSTRATE STRUCTURAL BASE. SEE LANDSCAPE DRAWINGS FOR MORE INFORMATION.
4.08 REMOVE STONE SILL
4.09 PROVIDE NEW OPENING THROUGH EXISTING MASONRY WALL. PROVIDE TEMPORARY SHORING AND PERMANENT LINTEL AT HEAD AS REQUIRED. COORDINATE SIZE OF OPENING WITH WINDOW SIZE, REFER TO WINDOW SCHEDULE.
5.01 REMOVE AND REPLACE STEEL LINTEL. SEE STRUCTURAL DRAWINGS.
5.02 REMOVE AND DISPOSE OF ALL SIDEWALL AND INTERMEDIATED METAL HANDRAIL, BRACKETS, AND ALL ASSOCIATED HARDWARE. STRIP PAINT AND CLEAN ALL EXISTING METAL GUARDRAILS AND NEWEL POST.
5.03 STRUCTURAL COLUMN SHALL BE PROTECTED DURING MASONRY REMOVAL.
6.01 REMOVE COUNTERTOPS, BASE AND TOP CABINETS, AND/OR TALL CABINETS AND ASSOCIATED HARDWARE.
6.02 REMOVE COUNTERTOPS, BASE AND TOP CABINETS, AND/OR TALL CABINETS, SINK FIXTURE, FAUCET, AND ASSOCIATED HARDWARE. SEE ALSO PLUMBING DRAWING.
6.03 REMOVE COUNTERTOPS, BASE AND TOP CABINETS, AND/OR TALL CABINETS AND ASSOCIATED HARDWARE.
6.04 REMOVE EXISTING MILLWORK, CASEWORK, AND SHELVING.
6.05 REMOVE ENTIRE WOOD STAIR ASSEMBLY, LANDING, FRAMING, HADRAILS, GUARDRAILS AND ALL ASSOCIATED HARDWARE AND FASTENERS.
6.06 REMOVE AND REPAIR EXISTING CORNICE FASCIA AND SOFFIT.
7.01 REMOVE AND DISPOSE OF ALUMINUM DOWNSPOUT.
7.02 REMOVE ENTIRE CANOPY, INCLUDING ROOF DECKING, BEAMS, ROOFING, FASCIAS, FLASHINGS, STEEL COLUMNS, FOUNDATION, FOOTINGS AND ALL ASSOCIATED HARDWARE AND FASTENERS.
8.01 REMOVE WINDOW SYSTEM, INCLUDING FRAMES, GLAZING, PANELS, LOUVERS, SILLS, GASKETS AND ALL ASSOCIATED HARDWARE. CLEAN OPENING TO RECEIVE NEW WINDOW SYSTEM.
8.02 REMOVE GLAZING, FRAMES, SEALANT AND ASSOCIATED HARDWARE.
8.03 REMOVE AND REPLACE INSULATED GLAZING PANEL. REPAIR ASSOCIATED HARDWARE AS NEEDED.
8.04 REMOVE ALUMINUM ENTRANCE SYSTEM, INCLUDING TRANSOM PANEL, DOORS, FRAMES, GLAZING, SILLS, SEALANTS AND ALL ASSOCIATED HARDWARE.
8.05 REMOVE DOOR, TRANSOM PANEL, FRAME AND ASSOCIATED HARDWARE. ENLARGE OPENING TO ACCEPT NEW FRAME AND MANEUVERING CLEARANCE REQUIREMENT. COORDINATE WITH SCOPE OF NEW WORK REQUIRED.
8.06 REMOVE DOOR, FRAME AND HARDWARE. CLEAN MASONRY OPENING TO ACCEPT NEW FRAME AND DOOR AS SCHEDULED.
8.07 REMOVE DOOR, FRAME AND HARDWARE. PREPARE JAMBS TO RECEIVE TOOTHED-IN INFILL.
8.08 REMOVE DOOR, FRAME AND HARDWARE.
8.09 REMOVE DOOR, FRAME AND HARDWARE. ENLARGE OPENING TO ACCEPT NEW FRAME AND MANEUVERING CLEARANCE REQUIREMENT. PROVIDE TEMPORARY SHORING AND PERMANENT LINTEL AS REQUIRED. SEE NEW PLANS FOR LOCATION OF NEW DOORS.
8.10 REMOVE DOOR, TRANSOM PANEL, FRAME AND ASSOCIATED HARDWARE. CLEAN MASONRY OPENING TO ACCEPT NEW FRAME AND DOOR AS SCHEDULED. COORDINATE WITH SCOPE OF NEW WORK REQUIRED.
8.11 REMOVE AND DISPOSE OF ALUMINUM LOUVER.
9.01 REMOVE AND DISPOSE OF THE FULL EXTENT OF WALL COVED BASE AND VCT OR SHEET FLOORING. CLEAN SUBSTRATE TO ACCEPT NEW SCHEDULED FINISH.
9.02 REMOVE AND DISPOSE OF THE FULL EXTENT OF WALL COVED BASE AND EPOXY FLOORING. CLEAN SUBSTRATE TO ACCEPT NEW SCHEDULED FINISH.
9.03 REMOVE WALL BASE AND CERAMIC FLOORING. CLEAN SUBSTRATE TO ACCEPT NEW SCHEDULED FINISH.
9.04 REMOVE AND DISPOSE PORTION OF THE EXISTING VCT OR SHEET FLOORING. CLEAN SUBSTRATE TO ACCEPT NEW SCHEDULED FINISH. REFER TO ARCHITECTURAL FLOOR PATTERN PLANS FOR REMOVAL COORDINATION.
9.05 REMOVE AND DISPOSE OF THE FULL EXTENT OF EXISTING TERRAZZO FLOORING. PROVIDED NEW SUBSTRATE TO ACCEPT NEW SCHEDULED FINISH. REFER TO ARCHITECTURAL FLOOR PATTERN PLANS FOR REMOVAL COORDINATION.
9.06 REMOVE AND DISPOSE OF ALL EXISTING RUBBER FLOORING, RUBBER STAIR TREADS, AND RISERS. CLEAN SUBSTRATE TO ACCEPT NEW SCHEDULED FINISH.
9.07 REMOVE AND DISPOSE PORTION OF THE EXISTING CARPET. CLEAN SUBSTRATE TO ACCEPT NEW SCHEDULED FINISH. REFER TO ARCHITECTURAL FLOOR PATTERN PLANS FOR REMOVAL COORDINATION.
9.08 REMOVE AND DISPOSE OF ALL SUSPENDED LAY-IN CEILING SYSTEMS INCLUDING ASSOCIATED HANGERS AND ANCHORS. ASSUME PLASTER, GYPSUM BOARD OR BOTH TYPE OF CEILING SYSTEMS MAY BE ABOVE ALL SUSPENDED LAY-IN CEILING SYSTEMS. REMOVE AND DISPOSE OF ALL HARD-SURFACE CEILING SOFFIT AND FRAMING. REFER TO MECHANICAL, PLUMBING AND ELECTRICAL DRAWINGS AND SPECIFICATIONS FOR ADDITIONAL DEMOLITION REQUIREMENTS.
9.09 REMOVE ALL PLASTER CEILING SYSTEMS INCLUDING ASSOCIATED METAL LATH, AND BLOCKING TO THE UNDERSIDE OF FLOOR SLAB ABOVE, UNLESS NOTED OR SHOWN OTHERWISE. REFER TO MECHANICAL, PLUMBING AND ELECTRICAL DRAWINGS AND SPECIFICATIONS FOR ADDITIONAL DEMOLITION REQUIREMENTS.
9.10 REMOVE HARD-SURFACE CEILING/SOFFIT, FRAMING, LOUVERS, DIFFUSERS, SUSPENSION MEMBERS, BRACING AND ALL ASSOCIATED HARDWARE. REFER TO MECHANICAL, PLUMBING AND ELECTRICAL DRAWINGS AND SPECIFICATIONS FOR ADDITIONAL DEMOLITION REQUIREMENTS.
9.11 REMOVE PORTION OF WALL REQUIRED TO ACCESS PLUMBING FOR NEW WATER COOLERS INSTALLATION WHEN APPLICABLE. SEE ALSO NEW FLOOR PLANS.
9.12 REMOVE AND DISPOSE OF ALL MASONRY PLASTER WALL FINISH TO EXPOSE MASONRY CMU WALL.
9.13 REMOVE AND DISPOSE OF ALL WALL TILE FINISH.
10.01 REMOVE TOILET PARTITIONS, DOORS, BRACES AND ALL ASSOCIATED HARDWARE.
10.02 REMOVE METAL LOCKERS, LOCKER METAL BASED, AND ALL ASSOCIATED HARDWARE.
10.03 REMOVE AND SALVAGE METAL LOCKERS, LOCKER METAL BASED, AND ALL ASSOCIATED HARDWARE. CLEAN, REPAIR AS NEEDED, PRIMED AND PAINT FOR INSTALLATION.
10.04 REMOVE TACKBOARDS, BLACK, WHITE BOARDS ON WALL, AND ASSOCIATED HARDWARE.
10.05 REMOVE SWING-UP GRAB BAR AND PATH TILE WALL AS NEEDED.
10.06 REMOVE PORTION OF STAGE: WOOD FLOORING, FRAMING, BASE, CONCRETE SLAB SUBFLOOR, AND ALL ASSOCIATED FASTENERS AND HARDWARE.
10.07 REMOVE SIGNAGE ON WALL AND RETURN TO OWNER.
10.08 REMOVE ARTWORK ON WALL AND RETURN TO OWNER.
12.01 REMOVE WINDOW SHADE SYSTEM AND ASSOCIATED HARDWARE.
22.01 REMOVE WATER CLOSET FIXTURE, CARRIER, PLUMBING VALVE, HARDWARE, GRAB BARS AND ACCESSORIES. SEE ALSO PLUMBING DRAWINGS.
22.02 REMOVE WATER COOLER FIXTURES, CARRIERS AND HARDWARE. SEE ALSO PLUMBING DRAWING.
22.03 REMOVE URINAL FIXTURE AND HARDWARE AND PRIVACY PANELS. SEE ALSO PLUMBING DRAWING.
22.04 REMOVE LAVATORY FIXTURE, CARRIER, HARDWARE, MIRROR AND ACCESSORIES. SEE ALSO PLUMBING DRAWINGS.
22.05 REMOVE PLUMBING FIXTURE AND HARDWARE. SEE ALSO PLUMBING DRAWING.
22.06 REMOVE MOP SINK FIXTURE, CARRIER, AND ACCESSORIES. SEE ALSO PLUMBING DRAWINGS.
23.01 REFER TO MEP DRAWINGS FOR EXTENT OF DEMOLITION.
23.02 REMOVE UNIT VENTILATOR UNIT. REFER TO MECHANICAL DRAWINGS.
23.03 REMOVE WALL-MOUNTED FAN COIL UNIT. REFER TO MECHANICAL DRAWINGS.
23.04 REMOVE WALL-MOUNTED LINEAR HYDRONIC HEATER BASEBOARD UNIT AND ALL ASSOCIATED FASTENERS HARDWARE. PATCH WALL AS NEEDED FOR NEW FINISH. REFER TO MECHANICAL DRAWINGS.
23.05 REMOVE WALL-MOUNTED METAL PIPE COVER ENCLOSURE, PIPES AND ALL ASSOCIATED FASTENERS HARDWARE. PATCH WALL AS NEEDED FOR NEW FINISH. REFER TO MECHANICAL DRAWINGS.
23.06 REMOVE AND DISPOSE OF AIR CONDITIONER UNIT FROM WINDOW AND ANY ASSOCIATED ACCESSORIES. REPAIR WINDOW PANEL AS REQUIRED. REFER TO MECHANICAL DRAWINGS.

DEMOLITION LEGEND:

DEMOLITION SCOPE

SAW CUT AND REMOVE CONCRETE FLOOR SLAB AS SHOWN FOR NEW WORK. REFER TO STRUCTURAL DRAWINGS.

REMOVE AND DISPOSE WOOD FLOOR ASSEMBLY AS SHOWN FOR NEW WORK. REFER TO STRUCTURAL DRAWINGS.

DEMOLITION GENERAL NOTES:

A. THE CONTRACTOR SHALL REFERENCE HAZARDOUS MATERIAL, MECHANICAL, ELECTRICAL, AND PLUMBING DEMOLITION DRAWINGS FOR ADDITIONAL DEMOLITION SCOPE OF WORK.

B. THE CONTRACTOR SHALL VERIFY EXISTING CONDITIONS PRIOR TO THE START OF WORK. REPORT TO THE ARCHITECT OF ANY DISCREPANCIES WITH THE DRAWINGS PROVIDED.

C. THE CONTRACTOR SHALL ADVISE THE ARCHITECT OF ALL CONFLICTS ENCOUNTERED IN THE FIELD. THE CONTRACTOR SHALL PROTECT THE INTERIOR OF THE BUILDING FROM ADVERSE WEATHER CONDITIONS WHERE EXTERIOR WEATHERTIGHT ELEMENTS HAVE BEEN REMOVED.

D. THE EXISTING FACILITY IS CONSIDERED TO BE HISTORIC IN NATURE. THE CONTRACTOR IS TO COORDINATE THE EXTENT OF DEMOLITION WITH THE PROPOSED NEW WORK AND SHALL PROTECT ALL EXISTING SURFACES AND MATERIALS SCHEDULED TO REMAIN. IT IS EXPECTED THAT THE CONTRACTOR WILL PROVIDE THE LEAST INVASIVE AND DESTRUCTIVE METHODS OF DEMOLITION AROUND HISTORICALLY IMPORTANT ELEMENTS. INCLUDING BUT NOT LIMITED TO:
a. EXISTING EXTERIOR FACADE TO REMAIN
b. EXTERIOR WINDOWS NOTED TO REMAIN OR BE SALVAGED
c. TERRAZZO FLOOR SYSTEMS NOTED TO REMAIN

E. THE CONTRACTOR SHALL PROVIDE ALL OPENINGS THROUGH EXISTING WALLS, AND FLOORS REQUIRED FOR THE INSTALLATION OF NEW DUCTWORK, PIPING, AND CONDUITS. PROVIDE TEMPORARY PROTECTION FOR ALL NEW AND EXISTING OPENINGS IN FLOORS AND ROOF DECK.

F. THE CONTRACTOR SHALL PATCH THE REMAINING WALLS, FLOOR, AND CEILING AS REQUIRED BY DEMOLITION TO OBTAIN A UNIFORM SURFACE READY TO RECEIVE FINISHES. REFER TO SPECIFICATIONS REGARDING CUTTING AND PATCHING.

G. THE CONTRACTOR SHALL SALVAGE AND STORE ALL MATERIALS AND/OR EQUIPMENT AS NOTED FOR REINSTALLATION.

H. THE CONTRACTOR SHALL BRING TO THE ATTENTION OF THE ARCHITECT ANY CONSTRUCTION OR MATERIALS TO REMAIN THAT ARE UNSOUND, DETERIORATED, OR ARE NOT AS SHOWN IN THESE CONTRACT DOCUMENTS.

I. DEMOLISH ALL SELECTED INTERIOR CONSTRUCTION AND FINISHES AS SHOWN ON THE PLANS. EXCEPT FOR STRUCTURE, FLOOR SLABS, INTERIOR STAIRS AND STAIR ENCLOSURE WALLS, AND INTERIOR BEARING WALLS, UNLESS NOTED OR SHOWN OTHERWISE. EXPOSED EXTERIOR ROUGH OPENINGS SHALL BE WATERTIGHT.

J. REFER TO MECHANICAL, PLUMBING AND ELECTRICAL DRAWINGS AND SPECIFICATIONS FOR ADDITIONAL DEMOLITION REQUIREMENTS.

K. COORDINATE THE SIZE, LOCATION, AND QUANTITY OF NEW PENETRATIONS THROUGH EXISTING WALLS, FLOORS, AND ROOF DECK WITH THE MEP & FP CONTRACTOR AND PROPOSED NEW EQUIPMENT.

L. REMOVE AND DISPOSE ALL SELECTED FLOOR FINISH AREAS AS SHOWN ON THE PLAN TO THE SUBSTRATE UNLESS NOTED OR SHOWN OTHERWISE.

M. REMOVE AND DISPOSE OF ALL PLASTER WALL FINISH, ASSOCIATED LATH, AND FURRING WITHIN THE PLENUM CEILING SPACE FROM THE INTERIOR FACE OF ALL EXISTING INTERIOR WALLS DOWN TO 4" FROM THE EXISTING CEILING HEIGHT TO THE MASONRY SUBSTRATE, UNLESS NOTED OTHERWISE. REFER TO DETAIL: FOR REFERENCE.

N. REMOVE AND DISPOSE OF ALL SELECTED INTERIOR MILLWORK AS SHOWN ON THE PLANS.

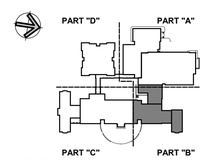
O. REMOVE AND DISPOSE OF ALL SELECTED EXTERIOR WINDOWS, AND LOUVERS, FROM EXTERIOR OPENINGS BACK TO THE ORIGINAL MASONRY OPENING, INCLUDING ALL ASSOCIATED FRAMES AND HARDWARE, UNLESS NOTED OTHERWISE. CAULKING AT EXISTING WINDOWS SHALL BE REMOVED IN PHASES BY THE DEMOLITION CONTRACTOR. EXPOSED WINDOW OPENINGS AS A RESULT OF WINDOW REMOVAL SHALL BE TEMPORARILY BOARDED UP AND MADE WEATHER-TIGHT UNTIL NEW WINDOWS (AS PART OF A FUTURE PHASE) CAN BE INSTALLED. WEATHER-TIGHT INFILL SHALL BE FLUSH WITH THE EXTERIOR AND ATTACHED TO THE JAMB OF THE EXISTING OPENING. WINDOWS TO REMAIN SHALL BE PROTECTED DURING DEMOLITION.

P. REMOVE ALL EXTERIOR DOORS, INCLUDING ALL ASSOCIATED FRAMES, HARDWARE, AND CAULKING UNLESS OTHERWISE NOTED. PROTECT ALL EXPOSED EXTERIOR OPENINGS WITH TEMPORARY BOARDED UP WEATHER-TIGHT AND SECURE INFILLS TO PREVENT THE EXPOSURE TO WEATHER OF HISTORICALLY IMPORTANT ELEMENTS ON THE INTERIOR AND PROTECT THE BUILDING FROM UNAUTHORIZED INTRUSION. INFILL SHALL BE SECURED IN PLACE AT THE JAMB AND FLUSH WITH THE EXTERIOR.

Q. SALVAGE ALL FACE BRICK FROM DEMOLISHED BUILDING. REMOVE THE BRICK TO MAINTAIN ITS APPEARANCE AND STRUCTURAL INTEGRITY. CLEAN BRICK OF ALL EXISTING MORTAR AND STORE IN VANDAL RESISTANT WEATHER PROTECTED AREA.

R. EXISTING TERRAZZO FLOOR FINISH TO REMAIN SHALL BE PROTECTED FROM DAMAGE DURING DEMOLITION. SAW CUT, REMOVE AND DISPOSE OF ASSOCIATED TERRAZZO WALL BASE UNLESS OTHERWISE NOTED RE:

S. ALL ROUGH OPENING DIMENSIONS AND LOCATIONS FOR NEW DOORS AND CASED OPENINGS NEED TO BE COORDINATED WITH THE PROPOSED NEW OPENINGS.



KEY PLAN

Project Title:
ADDITION & ALTERATIONS TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

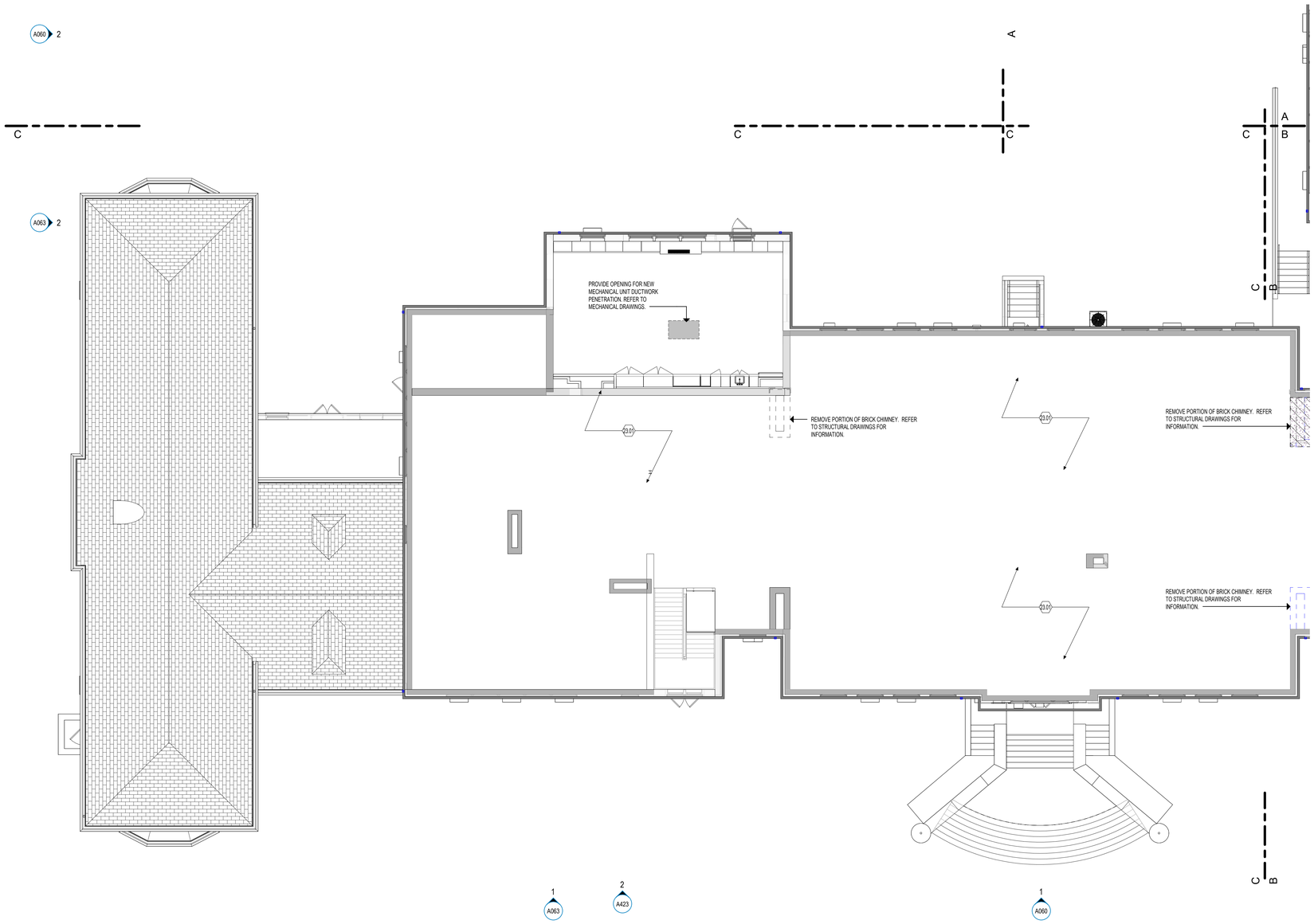
SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
311 STATE STREET NEW LONDON CT 06320
203 230 9007 silverpetrucelli.com

Revision: Description: Date: Revised By:

Drawing Title: ATTIC DEMOLITION PLAN - PART "B"

Date: 8/29/2024
Scale: As indicated
Drawn By: JM
Project Number: 22-382
Drawing Number: A042

8/30/2024 7:39:59 AM



1 ATTIC - DEMOLITION PLAN - PART "C"
1/8" = 1'-0"

DEMOLITION KEYNOTES

3.01 REMOVE ENTIRE CONCRETE SLAB, SLOPED AND FLAT PORTIONS.
3.02 REMOVE CONCRETE OR STONE STAIR OR STEPS, LANDING, FOUNDATION, FOOTINGS, METAL GUARDRAILS, HANDRAILS AND ALL ASSOCIATED HARDWARE AND FASTENERS.
3.03 REMOVE CONCRETE OR STONE STAIR OR STEPS, LANDING, HANDRAILS, AND ALL ASSOCIATED HARDWARE AND FASTENERS.
4.03 EXISTING TERRAZZO FLOORING TO REMAIN.
4.04 PROVIDE NEW OPENING THROUGH EXISTING MASONRY WALL. PROVIDE TEMPORARY SHORING AND PERMANENT LINTEL AT HEAD AS REQUIRED. COORDINATE SIZE OF OPENING WITH DOOR SIZE AND FRAME AS INDICATED ON DOOR SCHEDULE.
4.05 CAREFULLY SAWCUT AND REMOVE PORTION OF EXISTING GLAZED TILE BLOCK WAINSCOT WALL TO THE EXTENT INDICATED ON THE DRAWINGS.
4.06 REMOVE THIS PORTION OF MASONRY WALL TO ACCOMMODATE NEW LAYOUT. SEE ALSO FLOOR PLAN TO COORDINATE EXACT SIZE OF REMOVAL.
4.07 REMOVE GRANITE STONE ENTRY STOOP. GRANITE STONE STAIR STEPS, AND ALL DAMAGED SUBSTRATE STRUCTURAL BASE. SEE LANDSCAPE DRAWINGS FOR MORE INFORMATION.
4.08 REMOVE STONE SILL
4.09 PROVIDE NEW OPENING THROUGH EXISTING MASONRY WALL. PROVIDE TEMPORARY SHORING AND PERMANENT LINTEL AT HEAD AS REQUIRED. COORDINATE SIZE OF OPENING WITH WINDOW SIZE, REFER TO WINDOW SCHEDULE.
5.01 REMOVE AND REPLACE STEEL LINTEL. SEE STRUCTURAL DRAWINGS.
5.02 REMOVE AND DISPOSE OF ALL SIDEWALL AND INTERMEDIATED METAL HANDRAIL, BRACKETS, AND ALL ASSOCIATED HARDWARE. STRIP PAINT AND CLEAN ALL EXISTING METAL GUARDRAILS AND NEWEL POST.
5.03 STRUCTURAL COLUMN SHALL BE PROTECTED DURING MASONRY REMOVAL.
6.01 REMOVE COUNTERTOPS, BASE AND TOP CABINETS, AND/OR TALL CABINETS AND ASSOCIATED HARDWARE.
6.02 REMOVE COUNTERTOPS, BASE AND TOP CABINETS, AND/OR TALL CABINETS, SINK FIXTURE, FAUCET, AND ASSOCIATED HARDWARE. SEE ALSO PLUMBING DRAWING.
6.03 REMOVE COUNTERTOPS, BASE AND TOP CABINETS, AND/OR TALL CABINETS AND ASSOCIATED HARDWARE.
6.04 REMOVE EXISTING MILLWORK, CASEWORK, AND SHELVING.
6.05 REMOVE ENTIRE WOOD STAIR ASSEMBLY, LANDING, FRAMING, HADRAILS, GUARDRAILS AND ALL ASSOCIATED HARDWARE AND FASTENERS.
6.06 REMOVE AND REPAIR EXISTING CORNICE FASCIA AND SOFFIT.
7.01 REMOVE AND DISPOSE OF ALUMINUM DOWNSPOUT.
7.02 REMOVE ENTIRE CANOPY, INCLUDING ROOF DECKING, BEAMS, ROOFING, FASCIAS, FLASHINGS, STEEL COLUMNS, FOUNDATION, FOOTINGS AND ALL ASSOCIATED HARDWARE AND FASTENERS.
8.01 REMOVE WINDOW SYSTEM, INCLUDING FRAMES. GLAZING, PANELS, LOUVERS, SILLS, GASKETS AND ALL ASSOCIATED HARDWARE. CLEAN OPENING TO RECEIVE NEW WINDOW SYSTEM.
8.02 REMOVE GLAZING, FRAMES, SEALANT AND ASSOCIATED HARDWARE.
8.03 REMOVE AND REPLACE INSULATED GLAZING PANEL. REPAIR ASSOCIATED HARDWARE AS NEEDED.
8.04 REMOVE ALUMINUM ENTRANCE SYSTEM, INCLUDING TRANSOM PANEL, DOORS, FRAMES, GLAZING, SILLS, SEALANTS AND ALL ASSOCIATED HARDWARE.
8.05 REMOVE DOOR, TRANSOM PANEL, FRAME AND ASSOCIATED HARDWARE. ENLARGE OPENING TO ACCEPT NEW FRAME AND MANEUVERING CLEARANCE REQUIREMENT. COORDINATE WITH SCOPE OF NEW WORK REQUIRED.
8.06 REMOVE DOOR, FRAME AND HARDWARE. CLEAN MASONRY OPENING TO ACCEPT NEW FRAME AND DOOR AS SCHEDULED.
8.07 REMOVE DOOR, FRAME AND HARDWARE. PREPARE JAMBS TO RECEIVE TOOTHED-IN INFILL.
8.08 REMOVE DOOR, FRAME AND HARDWARE.
8.09 REMOVE DOOR, FRAME AND HARDWARE. ENLARGE OPENING TO ACCEPT NEW FRAME AND MANEUVERING CLEARANCE REQUIREMENT. PROVIDE TEMPORARY SHORING AND PERMANENT LINTEL AS REQUIRED. SEE NEW PLANS FOR LOCATION OF NEW DOORS.
8.10 REMOVE DOOR, TRANSOM PANEL, FRAME AND ASSOCIATED HARDWARE. CLEAN MASONRY OPENING TO ACCEPT NEW FRAME AND DOOR AS SCHEDULED. COORDINATE WITH SCOPE OF NEW WORK REQUIRED.
8.11 REMOVE AND DISPOSE OF ALUMINUM LOUVER.
9.01 REMOVE AND DISPOSE OF THE FULL EXTENT OF WALL COVED BASE AND VCT OR SHEET FLOORING. CLEAN SUBSTRATE TO ACCEPT NEW SCHEDULED FINISH.
9.02 REMOVE AND DISPOSE OF THE FULL EXTENT OF WALL COVED BASE AND EPOXY FLOORING. CLEAN SUBSTRATE TO ACCEPT NEW SCHEDULED FINISH.
9.03 REMOVE WALL BASE AND CERAMIC FLOORING. CLEAN SUBSTRATE TO ACCEPT NEW SCHEDULED FINISH.
9.04 REMOVE AND DISPOSE PORTION OF THE EXISTING VCT OR SHEET FLOORING. CLEAN SUBSTRATE TO ACCEPT NEW SCHEDULED FINISH. REFER TO ARCHITECTURAL FLOOR PATTERN PLANS FOR REMOVAL COORDINATION.
9.05 REMOVE AND DISPOSE OF THE FULL EXTENT OF EXISTING TERRAZZO FLOORING. PROVIDED NEW SUBSTRATE TO ACCEPT NEW SCHEDULED FINISH. REFER TO ARCHITECTURAL FLOOR PATTERN PLANS FOR REMOVAL COORDINATION.
9.06 REMOVE AND DISPOSE OF ALL EXISTING RUBBER FLOORING, RUBBER STAIR TREADS, AND RISERS. CLEAN SUBSTRATE TO ACCEPT NEW SCHEDULED FINISH.
9.07 REMOVE AND DISPOSE PORTION OF THE EXISTING CARPET. CLEAN SUBSTRATE TO ACCEPT NEW SCHEDULED FINISH. REFER TO ARCHITECTURAL FLOOR PATTERN PLANS FOR REMOVAL COORDINATION.
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9.09 REMOVE ALL PLASTER CEILING SYSTEMS INCLUDING ASSOCIATED METAL LATH, AND BLOCKING TO THE UNDERSIDE OF FLOOR SLAB ABOVE, UNLESS NOTED OR SHOWN OTHERWISE. REFER TO MECHANICAL, PLUMBING AND ELECTRICAL DRAWINGS AND SPECIFICATIONS FOR ADDITIONAL DEMOLITION REQUIREMENTS.
9.10 REMOVE HARD-SURFACE CEILING/SOFFIT, FRAMING, LOUVERS, DIFFUSERS, SUSPENSION MEMBERS, BRACING AND ALL ASSOCIATED HARDWARE. REFER TO MECHANICAL, PLUMBING AND ELECTRICAL DRAWINGS AND SPECIFICATIONS FOR ADDITIONAL DEMOLITION REQUIREMENTS.
9.11 REMOVE PORTION OF WALL REQUIRED TO ACCESS PLUMBING FOR NEW WATER COOLERS INSTALLATION WHEN APPLICABLE. SEE ALSO NEW FLOOR PLANS.
9.12 REMOVE AND DISPOSE OF ALL MASONRY PLASTER WALL FINISH TO EXPOSE MASONRY CMU WALL.
9.13 REMOVE AND DISPOSE OF ALL WALL TILE FINISH.
10.01 REMOVE TOILET PARTITIONS, DOORS, BRACES AND ALL ASSOCIATED HARDWARE.
10.02 REMOVE METAL LOCKERS, LOCKER METAL BASED, AND ALL ASSOCIATED HARDWARE.
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23.05 REMOVE WALL-MOUNTED METAL PIPE COVER ENCLOSURE. PIPES AND ALL ASSOCIATED FASTENERS HARDWARE. PATCH WALL AS NEEDED FOR NEW FINISH. REFER TO MECHANICAL DRAWINGS.
23.06 REMOVE AND DISPOSE OF AIR CONDITIONER UNIT FROM WINDOW AND ANY ASSOCIATED ACCESSORIES. REPAIR WINDOW PANEL AS REQUIRED. REFER TO MECHANICAL DRAWINGS.

DEMOLITION LEGEND:

DEMOLITION SCOPE

SAW CUT AND REMOVE CONCRETE FLOOR SLAB AS SHOWN FOR NEW WORK. REFER TO STRUCTURAL DRAWINGS.

REMOVE AND DISPOSE WOOD FLOOR ASSEMBLY AS SHOWN FOR NEW WORK. REFER TO STRUCTURAL DRAWINGS.

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D. THE EXISTING FACILITY IS CONSIDERED TO BE HISTORIC IN NATURE. THE CONTRACTOR IS TO COORDINATE THE EXTENT OF DEMOLITION WITH THE PROPOSED NEW WORK AND SHALL PROTECT ALL EXISTING SURFACES AND MATERIALS SCHEDULED TO REMAIN. IT IS EXPECTED THAT THE CONTRACTOR WILL PROVIDE THE LEAST INVASIVE AND DESTRUCTIVE METHODS OF DEMOLITION AROUND HISTORICALLY IMPORTANT ELEMENTS. INCLUDING BUT NOT LIMITED TO:
a. EXISTING EXTERIOR FACADE TO REMAIN
b. EXTERIOR WINDOWS NOTED TO REMAIN OR BE SALVAGED
c. TERRAZZO FLOOR SYSTEMS NOTED TO REMAIN

E. THE CONTRACTOR SHALL PROVIDE ALL OPENINGS THROUGH EXISTING WALLS, AND FLOORS REQUIRED FOR THE INSTALLATION OF NEW DUCTWORK, PIPING, AND CONDUITS. PROVIDE TEMPORARY PROTECTION FOR ALL NEW AND EXISTING OPENINGS IN FLOORS AND ROOF DECK.

F. THE CONTRACTOR SHALL PATCH THE REMAINING WALLS, FLOOR, AND CEILING AS REQUIRED BY DEMOLITION TO OBTAIN A UNIFORM SURFACE READY TO RECEIVE FINISHES. REFER TO SPECIFICATIONS REGARDING CUTTING AND PATCHING.

G. THE CONTRACTOR SHALL SALVAGE AND STORE ALL MATERIALS AND/OR EQUIPMENT AS NOTED FOR REINSTALLATION.

H. THE CONTRACTOR SHALL BRING TO THE ATTENTION OF THE ARCHITECT ANY CONSTRUCTION OR MATERIALS TO REMAIN THAT ARE UNSOUND, DETERIORATED, OR ARE NOT AS SHOWN IN THESE CONTRACT DOCUMENTS.

I. DEMOLISH ALL SELECTED INTERIOR CONSTRUCTION AND FINISHES AS SHOWN ON THE PLANS. EXCEPT FOR STRUCTURE, FLOOR SLABS, INTERIOR STAIRS AND STAIR ENCLOSURE WALLS, AND INTERIOR BEARING WALLS, UNLESS NOTED OR SHOWN OTHERWISE. EXPOSED EXTERIOR ROUGH OPENINGS SHALL BE WATERTIGHT.

J. REFER TO MECHANICAL, PLUMBING AND ELECTRICAL DRAWINGS AND SPECIFICATIONS FOR ADDITIONAL DEMOLITION REQUIREMENTS.

K. COORDINATE THE SIZE, LOCATION, AND QUANTITY OF NEW PENETRATIONS THROUGH EXISTING WALLS, FLOORS, AND ROOF DECK WITH THE MEP & FP CONTRACTOR AND PROPOSED NEW EQUIPMENT.

L. REMOVE AND DISPOSE ALL SELECTED FLOOR FINISH AREAS AS SHOWN ON THE PLAN TO THE SUBSTRATE UNLESS NOTED OR SHOWN OTHERWISE.

M. REMOVE AND DISPOSE OF ALL PLASTER WALL FINISH, ASSOCIATED LATH, AND FURRING WITHIN THE PLENUM CEILING SPACE FROM THE INTERIOR FACE OF ALL EXISTING INTERIOR WALLS DOWN TO 4" FROM THE EXISTING CEILING HEIGHT TO THE MASONRY SUBSTRATE, UNLESS NOTED OTHERWISE. REFER TO DETAIL: FOR REFERENCE.

N. REMOVE AND DISPOSE OF ALL SELECTED INTERIOR MILLWORK AS SHOWN ON THE PLANS.

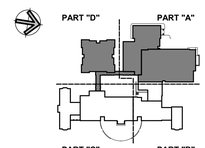
O. REMOVE AND DISPOSE OF ALL SELECTED EXTERIOR WINDOWS, AND LOUVERS, FROM EXTERIOR OPENINGS BACK TO THE ORIGINAL MASONRY OPENING, INCLUDING ALL ASSOCIATED FRAMES AND HARDWARE, UNLESS NOTED OTHERWISE. CAULKING AT EXISTING WINDOWS SHALL BE REMOVED IN PHASES BY THE DEMOLITION CONTRACTOR. EXPOSED WINDOW OPENINGS AS A RESULT OF WINDOW REMOVAL SHALL BE TEMPORARILY BOARDED UP AND MADE WEATHER-TIGHT UNTIL NEW WINDOWS (AS PART OF A FUTURE PHASE) CAN BE INSTALLED. WEATHER-TIGHT INFILL SHALL BE FLUSH WITH THE EXTERIOR AND ATTACHED TO THE JAMB OF THE EXISTING OPENING. WINDOWS TO REMAIN SHALL BE PROTECTED DURING DEMOLITION.

P. REMOVE ALL EXTERIOR DOORS, INCLUDING ALL ASSOCIATED FRAMES, HARDWARE, AND CAULKING UNLESS OTHERWISE NOTED. PROTECT ALL EXPOSED EXTERIOR OPENINGS WITH TEMPORARY BOARDED UP WEATHER-TIGHT AND SECURE INFILLS TO PREVENT THE EXPOSURE TO WEATHER OF HISTORICALLY IMPORTANT ELEMENTS ON THE INTERIOR AND PROTECT THE BUILDING FROM UNAUTHORIZED INTRUSION. INFILL SHALL BE SECURED IN PLACE AT THE JAMB AND FLUSH WITH THE EXTERIOR.

Q. SALVAGE ALL FACE BRICK FROM DEMOLISHED BUILDING. REMOVE THE BRICK TO MAINTAIN ITS APPEARANCE AND STRUCTURAL INTEGRITY. CLEAN BRICK OF ALL EXISTING MORTAR AND STORE IN VANDAL RESISTANT WEATHER PROTECTED AREA.

R. EXISTING TERRAZZO FLOOR FINISH TO REMAIN SHALL BE PROTECTED FROM DAMAGE DURING DEMOLITION. SAW CUT, REMOVE AND DISPOSE OF ASSOCIATED TERRAZZO WALL BASE UNLESS OTHERWISE NOTED RE:

S. ALL ROUGH OPENING DIMENSIONS AND LOCATIONS FOR NEW DOORS AND CASED OPENINGS NEED TO BE COORDINATED WITH THE PROPOSED NEW OPENINGS.



KEY PLAN

Project Title:
ADDITION & ALTERATIONS TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
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Revision:	Description:	Date:	Revised By:

Drawing Title:
ATTIC DEMOLITION PLAN - PART "C"

Date: 8/29/2024
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Project Number: 22-382
Drawing Number: A043

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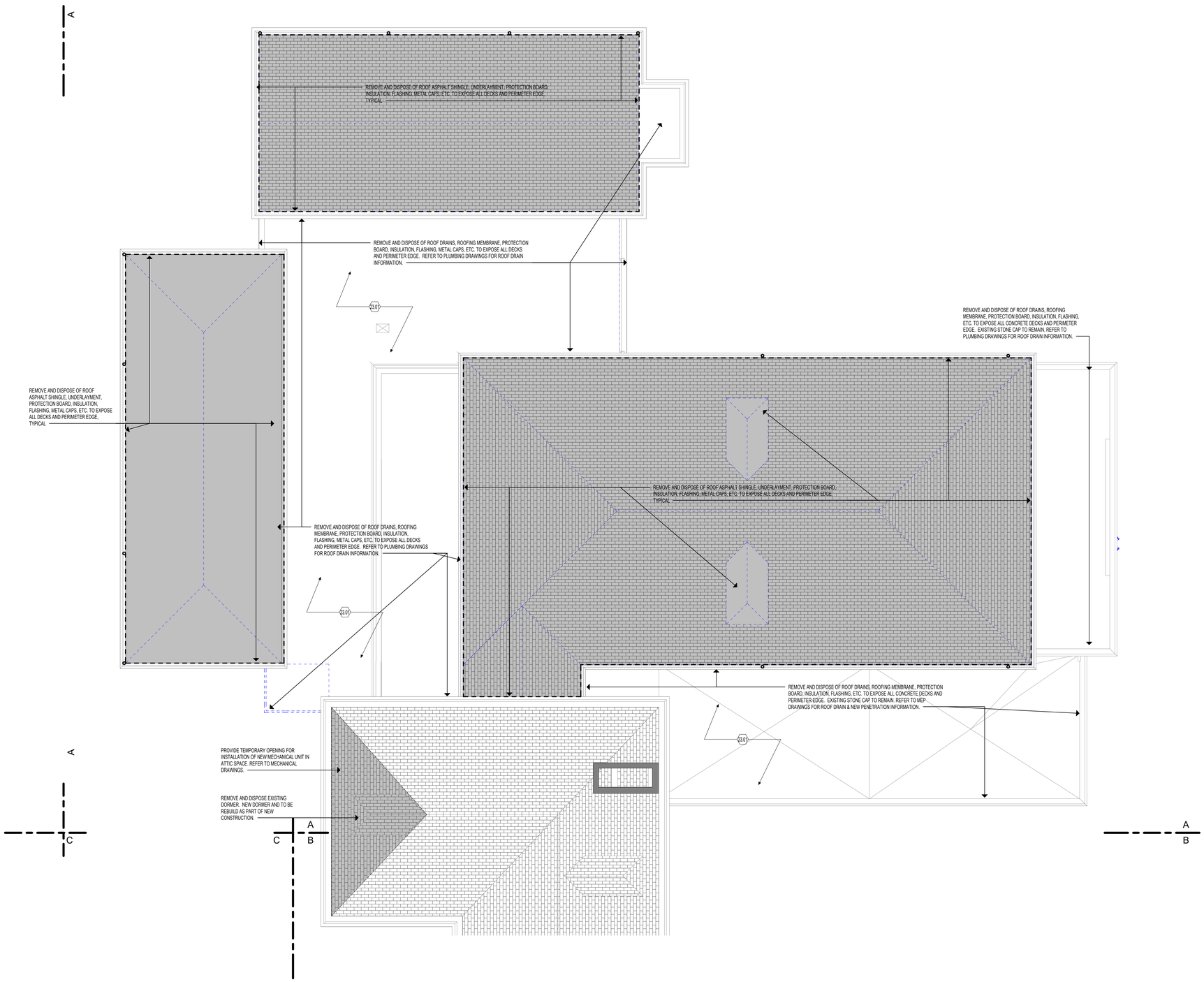


1 ROOF LEVEL DEMOLITION PLAN - PART "A"
1/8" = 1'-0"

DEMOLITION KEYNOTES

3.01 REMOVE ENTIRE CONCRETE SLAB, SLOPED AND FLAT PORTIONS.
3.02 REMOVE CONCRETE OR STONE STAIR OR STEPS, LANDING, FOUNDATION, FOOTINGS, METAL GUARDRAILS, HANDRAILS AND ALL ASSOCIATED HARDWARE AND FASTENERS.
3.03 REMOVE CONCRETE OR STONE STAIR OR STEPS, LANDING, HANDRAILS, AND ALL ASSOCIATED HARDWARE AND FASTENERS.
4.03 EXISTING TERRAZZO FLOORING TO REMAIN.
4.04 PROVIDE NEW OPENING THROUGH EXISTING MASONRY WALL. PROVIDE TEMPORARY SHORING AND PERMANENT LINTEL AT HEAD AS REQUIRED. COORDINATE SIZE OF OPENING WITH DOOR SIZE AND FRAME AS INDICATED ON DOOR SCHEDULE.
4.05 CAREFULLY SAWCUT AND REMOVE PORTION OF EXISTING GLAZED TILE BLOCK WAINSCOT WALL TO THE EXTENT INDICATED ON THE DRAWINGS.
4.06 REMOVE THIS PORTION OF MASONRY WALL TO ACCOMMODATE NEW LAYOUT. SEE ALSO FLOOR PLAN TO COORDINATE EXACT SIZE OF REMOVAL.
4.07 REMOVE GRANITE STONE ENTRY STOOP, GRANITE STONE STAIR STEPS, AND ALL DAMAGED SUBSTRATE STRUCTURAL BASE. SEE LANDSCAPE DRAWINGS FOR MORE INFORMATION.
4.08 REMOVE STONE SILL
4.09 PROVIDE NEW OPENING THROUGH EXISTING MASONRY WALL. PROVIDE TEMPORARY SHORING AND PERMANENT LINTEL AT HEAD AS REQUIRED. COORDINATE SIZE OF OPENING WITH WINDOW SIZE, REFER TO WINDOW SCHEDULE.
5.01 REMOVE AND REPLACE STEEL LINTEL. SEE STRUCTURAL DRAWINGS.
5.02 REMOVE AND DISPOSE OF ALL SIDEWALL AND INTERMEDIATED METAL HANDRAIL, BRACKETS, AND ALL ASSOCIATED HARDWARE. STRIP PAINT AND CLEAN ALL EXISTING METAL GUARDRAILS AND NEWEL POST.
5.03 STRUCTURAL COLUMN SHALL BE PROTECTED DURING MASONRY REMOVAL.
6.01 REMOVE COUNTERTOPS, BASE AND TOP CABINETS, AND/OR TALL CABINETS AND ASSOCIATED HARDWARE.
6.02 REMOVE COUNTERTOPS, BASE AND TOP CABINETS, AND/OR TALL CABINETS, SINK FIXTURE, FAUCET, AND ASSOCIATED HARDWARE. SEE ALSO PLUMBING DRAWING.
6.03 REMOVE COUNTERTOPS, BASE AND TOP CABINETS, AND/OR TALL CABINETS AND ASSOCIATED HARDWARE.
6.04 REMOVE EXISTING MILLWORK, CASEWORK, AND SHELVING.
6.05 REMOVE ENTIRE WOOD STAIR ASSEMBLY, LANDING, FRAMING, HADRAILS, GUARDRAILS AND ALL ASSOCIATED HARDWARE AND FASTENERS.
6.06 REMOVE AND REPAIR EXISTING CORNICE FASCIA AND SOFFIT.
7.01 REMOVE AND DISPOSE OF ALUMINUM DOWNSPOUT.
7.02 REMOVE ENTIRE CANOPY, INCLUDING ROOF DECKING, BEAMS, ROOFING, FASCIAS, FLASHINGS, STEEL COLUMNS, FOUNDATION, FOOTINGS AND ALL ASSOCIATED HARDWARE AND FASTENERS.
8.01 REMOVE WINDOW SYSTEM, INCLUDING FRAMES. GLAZING, PANELS, LOUVERS, SILLS, GASKETS AND ALL ASSOCIATED HARDWARE. CLEAN OPENING TO RECEIVE NEW WINDOW SYSTEM.
8.02 REMOVE GLAZING, FRAMES, SEALANT AND ASSOCIATED HARDWARE.
8.03 REMOVE AND REPLACE INSULATED GLAZING PANEL. REPAIR ASSOCIATED HARDWARE AS NEEDED.
8.04 REMOVE ALUMINUM ENTRANCE SYSTEM, INCLUDING TRANSOM PANEL, DOORS, FRAMES, GLAZING, SILLS, SEALANTS AND ALL ASSOCIATED HARDWARE.
8.05 REMOVE DOOR, TRANSOM PANEL, FRAME AND ASSOCIATED HARDWARE. ENLARGE OPENING TO ACCEPT NEW FRAME AND MANEUVERING CLEARANCE REQUIREMENT. COORDINATE WITH SCOPE OF NEW WORK REQUIRED.
8.06 REMOVE DOOR, FRAME AND HARDWARE. CLEAN MASONRY OPENING TO ACCEPT NEW FRAME AND DOOR AS SCHEDULED.
8.07 REMOVE DOOR, FRAME AND HARDWARE. PREPARE JAMBS TO RECEIVE TOOTHED-IN INFILL.
8.08 REMOVE DOOR, FRAME AND HARDWARE.
8.09 REMOVE DOOR, FRAME AND HARDWARE. ENLARGE OPENING TO ACCEPT NEW FRAME AND MANEUVERING CLEARANCE REQUIREMENT. PROVIDE TEMPORARY SHORING AND PERMANENT LINTEL AS REQUIRED. SEE NEW PLANS FOR LOCATION OF NEW DOORS.
8.10 REMOVE DOOR, TRANSOM PANEL, FRAME AND ASSOCIATED HARDWARE. CLEAN MASONRY OPENING TO ACCEPT NEW FRAME AND DOOR AS SCHEDULED. COORDINATE WITH SCOPE OF NEW WORK REQUIRED.
8.11 REMOVE AND DISPOSE OF ALUMINUM LOUVER.
9.01 REMOVE AND DISPOSE OF THE FULL EXTENT OF WALL COVED BASE AND VCT OR SHEET FLOORING. CLEAN SUBSTRATE TO ACCEPT NEW SCHEDULED FINISH.
9.02 REMOVE AND DISPOSE OF THE FULL EXTENT OF WALL COVED BASE AND EPOXY FLOORING. CLEAN SUBSTRATE TO ACCEPT NEW SCHEDULED FINISH.
9.03 REMOVE WALL BASE AND CERAMIC FLOORING. CLEAN SUBSTRATE TO ACCEPT NEW SCHEDULED FINISH.
9.04 REMOVE AND DISPOSE PORTION OF THE EXISTING VCT OR SHEET FLOORING. CLEAN SUBSTRATE TO ACCEPT NEW SCHEDULED FINISH. REFER TO ARCHITECTURAL FLOOR PATTERN PLANS FOR REMOVAL COORDINATION.
9.05 REMOVE AND DISPOSE OF THE FULL EXTENT OF EXISTING TERRAZZO FLOORING. PROVIDED NEW SUBSTRATE TO ACCEPT NEW SCHEDULED FINISH. REFER TO ARCHITECTURAL FLOOR PATTERN PLANS FOR REMOVAL COORDINATION.
9.06 REMOVE AND DISPOSE OF ALL EXISTING RUBBER FLOORING, RUBBER STAIR TREADS, AND RISERS. CLEAN SUBSTRATE TO ACCEPT NEW SCHEDULED FINISH.
9.07 REMOVE AND DISPOSE PORTION OF THE EXISTING CARPET. CLEAN SUBSTRATE TO ACCEPT NEW SCHEDULED FINISH. REFER TO ARCHITECTURAL FLOOR PATTERN PLANS FOR REMOVAL COORDINATION.
9.08 REMOVE AND DISPOSE OF ALL SUSPENDED LAY-IN CEILING SYSTEMS INCLUDING ASSOCIATED HANGERS AND ANCHORS. ASSUME PLASTER, GYPSUM BOARD OR BOTH TYPE OF CEILING SYSTEMS MAY BE ABOVE ALL SUSPENDED LAY-IN CEILING SYSTEMS. REMOVE AND DISPOSE OF ALL HARD-SURFACE CEILING SOFFIT AND FRAMING. REFER TO MECHANICAL, PLUMBING AND ELECTRICAL DRAWINGS AND SPECIFICATIONS FOR ADDITIONAL DEMOLITION REQUIREMENTS.
9.09 REMOVE ALL PLASTER CEILING SYSTEMS INCLUDING ASSOCIATED METAL LATH, AND BLOCKING TO THE UNDERSIDE OF FLOOR SLAB ABOVE, UNLESS NOTED OR SHOWN OTHERWISE. REFER TO MECHANICAL, PLUMBING AND ELECTRICAL DRAWINGS AND SPECIFICATIONS FOR ADDITIONAL DEMOLITION REQUIREMENTS.
9.10 REMOVE HARD-SURFACE CEILING/SOFFIT, FRAMING, LOUVERS, DIFFUSERS, SUSPENSION MEMBERS, BRACING AND ALL ASSOCIATED HARDWARE. REFER TO MECHANICAL, PLUMBING AND ELECTRICAL DRAWINGS AND SPECIFICATIONS FOR ADDITIONAL DEMOLITION REQUIREMENTS.
9.11 REMOVE PORTION OF WALL REQUIRED TO ACCESS PLUMBING FOR NEW WATER COOLERS INSTALLATION WHEN APPLICABLE. SEE ALSO NEW FLOOR PLANS.
9.12 REMOVE AND DISPOSE OF ALL MASONRY PLASTER WALL FINISH TO EXPOSE MASONRY CMU WALL.
9.13 REMOVE AND DISPOSE OF ALL WALL TILE FINISH.
10.01 REMOVE TOILET PARTITIONS, DOORS, BRACES AND ALL ASSOCIATED HARDWARE.
10.02 REMOVE METAL LOCKERS, LOCKER METAL BASED, AND ALL ASSOCIATED HARDWARE.
10.03 REMOVE AND SALVAGE METAL LOCKERS, LOCKER METAL BASED, AND ALL ASSOCIATED HARDWARE. CLEAN, REPAIR AS NEEDED, PRIMED AND PAINT FOR INSTALLATION.
10.04 REMOVE TACKBOARDS, BLACK, WHITE BOARDS ON WALL, AND ASSOCIATED HARDWARE.
10.05 REMOVE SWING-UP GRAB BAR AND PATH TILE WALL AS NEEDED.
10.06 REMOVE PORTION OF STAGE: WOOD FLOORING, FRAMING, BASE, CONCRETE SLAB SUBFLOOR, AND ALL ASSOCIATED FASTENERS AND HARDWARE.
10.07 REMOVE SIGNAGE ON WALL AND RETURN TO OWNER.
10.08 REMOVE ARTWORK ON WALL AND RETURN TO OWNER.
12.01 REMOVE WINDOW SHADE SYSTEM AND ASSOCIATED HARDWARE.
22.01 REMOVE WATER CLOSET FIXTURE, CARRIER, PLUMBING VALVE, HARDWARE, GRAB BARS AND ACCESSORIES. SEE ALSO PLUMBING DRAWINGS.
22.02 REMOVE WATER COOLER FIXTURES, CARRIERS AND HARDWARE. SEE ALSO PLUMBING DRAWING.
22.03 REMOVE URINAL FIXTURE AND HARDWARE AND PRIVACY PANELS. SEE ALSO PLUMBING DRAWING.
22.04 REMOVE LAVATORY FIXTURE, CARRIER, HARDWARE, MIRROR AND ACCESSORIES. SEE ALSO PLUMBING DRAWINGS.
22.05 REMOVE PLUMBING FIXTURE AND HARDWARE. SEE ALSO PLUMBING DRAWING.
22.06 REMOVE MOP SINK FIXTURE, CARRIER, AND ACCESSORIES. SEE ALSO PLUMBING DRAWINGS.
23.01 REFER TO MEP DRAWINGS FOR EXTENT OF DEMOLITION.
23.02 REMOVE UNIT VENTILATOR UNIT. REFER TO MECHANICAL DRAWINGS.
23.03 REMOVE WALL-MOUNTED FAN COIL UNIT. REFER TO MECHANICAL DRAWINGS.
23.04 REMOVE WALL-MOUNTED LINEAR HYDRONIC HEATER BASEBOARD UNIT AND ALL ASSOCIATED FASTENERS HARDWARE. PATCH WALL AS NEEDED FOR NEW FINISH. REFER TO MECHANICAL DRAWINGS.
23.05 REMOVE WALL-MOUNTED METAL PIPE COVER ENCLOSURE, PIPES AND ALL ASSOCIATED FASTENERS HARDWARE. PATCH WALL AS NEEDED FOR NEW FINISH. REFER TO MECHANICAL DRAWINGS.
23.06 REMOVE AND DISPOSE OF AIR CONDITIONER UNIT FROM WINDOW AND ANY ASSOCIATED ACCESSORIES. REPAIR WINDOW PANEL AS REQUIRED. REFER TO MECHANICAL DRAWINGS.

DEMOLITION LEGEND:

DEMOLITION SCOPE

SAW CUT AND REMOVE CONCRETE FLOOR SLAB AS SHOWN FOR NEW WORK. REFER TO STRUCTURAL DRAWINGS.

REMOVE AND DISPOSE WOOD FLOOR ASSEMBLY AS SHOWN FOR NEW WORK. REFER TO STRUCTURAL DRAWINGS.

DEMOLITION GENERAL NOTES:

A. THE CONTRACTOR SHALL REFERENCE HAZARDOUS MATERIAL, MECHANICAL, ELECTRICAL, AND PLUMBING DEMOLITION DRAWINGS FOR ADDITIONAL DEMOLITION SCOPE OF WORK.

B. THE CONTRACTOR SHALL VERIFY EXISTING CONDITIONS PRIOR TO THE START OF WORK. REPORT TO THE ARCHITECT OF ANY DISCREPANCIES WITH THE DRAWINGS PROVIDED.

C. THE CONTRACTOR SHALL ADVISE THE ARCHITECT OF ALL CONFLICTS ENCOUNTERED IN THE FIELD. THE CONTRACTOR SHALL PROTECT THE INTERIOR OF THE BUILDING FROM ADVERSE WEATHER CONDITIONS WHERE EXTERIOR WEATHERTIGHT ELEMENTS HAVE BEEN REMOVED.

D. THE EXISTING FACILITY IS CONSIDERED TO BE HISTORIC IN NATURE. THE CONTRACTOR IS TO COORDINATE THE EXTENT OF DEMOLITION WITH THE PROPOSED NEW WORK AND SHALL PROTECT ALL EXISTING SURFACES AND MATERIALS SCHEDULED TO REMAIN. IT IS EXPECTED THAT THE CONTRACTOR WILL PROVIDE THE LEAST INVASIVE AND DESTRUCTIVE METHODS OF DEMOLITION AROUND HISTORICALLY IMPORTANT ELEMENTS. INCLUDING BUT NOT LIMITED TO:
a. EXISTING EXTERIOR FACADE TO REMAIN
b. EXTERIOR WINDOWS NOTED TO REMAIN OR BE SALVAGED
c. TERRAZZO FLOOR SYSTEMS NOTED TO REMAIN

E. THE CONTRACTOR SHALL PROVIDE ALL OPENINGS THROUGH EXISTING WALLS, AND FLOORS REQUIRED FOR THE INSTALLATION OF NEW DUCTWORK, PIPING, AND CONDUITS. PROVIDE TEMPORARY PROTECTION FOR ALL NEW AND EXISTING OPENINGS IN FLOORS AND ROOF DECK.

F. THE CONTRACTOR SHALL PATCH THE REMAINING WALLS, FLOOR, AND CEILING AS REQUIRED BY DEMOLITION TO OBTAIN A UNIFORM SURFACE READY TO RECEIVE FINISHES. REFER TO SPECIFICATIONS REGARDING CUTTING AND PATCHING.

G. THE CONTRACTOR SHALL SALVAGE AND STORE ALL MATERIALS AND/OR EQUIPMENT AS NOTED FOR REINSTALLATION.

H. THE CONTRACTOR SHALL BRING TO THE ATTENTION OF THE ARCHITECT ANY CONSTRUCTION OR MATERIALS TO REMAIN THAT ARE UNSOUND, DETERIORATED, OR ARE NOT AS SHOWN IN THESE CONTRACT DOCUMENTS.

I. DEMOLISH ALL SELECTED INTERIOR CONSTRUCTION AND FINISHES AS SHOWN ON THE PLANS. EXCEPT FOR STRUCTURE, FLOOR SLABS, INTERIOR STAIRS AND STAIR ENCLOSURE WALLS, AND INTERIOR BEARING WALLS, UNLESS NOTED OR SHOWN OTHERWISE. EXPOSED EXTERIOR ROUGH OPENINGS SHALL BE WATERTIGHT.

J. REFER TO MECHANICAL, PLUMBING AND ELECTRICAL DRAWINGS AND SPECIFICATIONS FOR ADDITIONAL DEMOLITION REQUIREMENTS.

K. COORDINATE THE SIZE, LOCATION, AND QUANTITY OF NEW PENETRATIONS THROUGH EXISTING WALLS, FLOORS, AND ROOF DECK WITH THE MEP & FP CONTRACTOR AND PROPOSED NEW EQUIPMENT.

L. REMOVE AND DISPOSE ALL SELECTED FLOOR FINISH AREAS AS SHOWN ON THE PLAN TO THE SUBSTRATE UNLESS NOTED OR SHOWN OTHERWISE.

M. REMOVE AND DISPOSE OF ALL PLASTER WALL FINISH, ASSOCIATED LATH, AND FURRING WITHIN THE PLENUM CEILING SPACE FROM THE INTERIOR FACE OF ALL EXISTING INTERIOR WALLS DOWN TO 4" FROM THE EXISTING CEILING HEIGHT TO THE MASONRY SUBSTRATE, UNLESS NOTED OTHERWISE. REFER TO DETAIL: FOR REFERENCE.

N. REMOVE AND DISPOSE OF ALL SELECTED INTERIOR MILLWORK AS SHOWN ON THE PLANS.

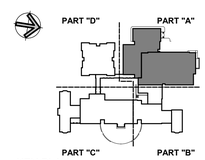
O. REMOVE AND DISPOSE OF ALL SELECTED EXTERIOR WINDOWS, AND LOUVERS, FROM EXTERIOR OPENINGS BACK TO THE ORIGINAL MASONRY OPENING, INCLUDING ALL ASSOCIATED FRAMES AND HARDWARE, UNLESS NOTED OTHERWISE. CAULKING AT EXISTING WINDOWS SHALL BE REMOVED IN PHASES BY THE DEMOLITION CONTRACTOR. EXPOSED WINDOW OPENINGS AS A RESULT OF WINDOW REMOVAL SHALL BE TEMPORARILY BOARDED UP AND MADE WEATHER-TIGHT UNTIL NEW WINDOWS (AS PART OF A FUTURE PHASE) CAN BE INSTALLED. WEATHER-TIGHT INFILL SHALL BE FLUSH WITH THE EXTERIOR AND ATTACHED TO THE JAMB OF THE EXISTING OPENING. WINDOWS TO REMAIN SHALL BE PROTECTED DURING DEMOLITION.

P. REMOVE ALL EXTERIOR DOORS, INCLUDING ALL ASSOCIATED FRAMES, HARDWARE, AND CAULKING UNLESS OTHERWISE NOTED. PROTECT ALL EXPOSED EXTERIOR OPENINGS WITH TEMPORARY BOARDED UP WEATHER-TIGHT AND SECURE INFILLS TO PREVENT THE EXPOSURE TO WEATHER OF HISTORICALLY IMPORTANT ELEMENTS ON THE INTERIOR AND PROTECT THE BUILDING FROM UNAUTHORIZED INTRUSION. INFILL SHALL BE SECURED IN PLACE AT THE JAMB AND FLUSH WITH THE EXTERIOR.

Q. SALVAGE ALL FACE BRICK FROM DEMOLISHED BUILDING. REMOVE THE BRICK TO MAINTAIN ITS APPEARANCE AND STRUCTURAL INTEGRITY. CLEAN BRICK OF ALL EXISTING MORTAR AND STORE IN VANDAL RESISTANT WEATHER PROTECTED AREA.

R. EXISTING TERRAZZO FLOOR FINISH TO REMAIN SHALL BE PROTECTED FROM DAMAGE DURING DEMOLITION. SAW CUT, REMOVE AND DISPOSE OF ASSOCIATED TERRAZZO WALL BASE UNLESS OTHERWISE NOTED RE:

S. ALL ROUGH OPENING DIMENSIONS AND LOCATIONS FOR NEW DOORS AND CASED OPENINGS NEED TO BE COORDINATED WITH THE PROPOSED NEW OPENINGS.



KEY PLAN

Project Title:
ADDITION & ALTERATIONS TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
311 STATE STREET NEW LONDON CT 06320
203 230 9007 silverpetrucelli.com

Revision:	Description:	Date:	Revised By:

Drawing Title: ROOF DEMOLITION PLAN - PART "A"

Date: 8/29/2024
Scale: As indicated
Drawn By: JM
Project Number: 22-382
Drawing Number: A051

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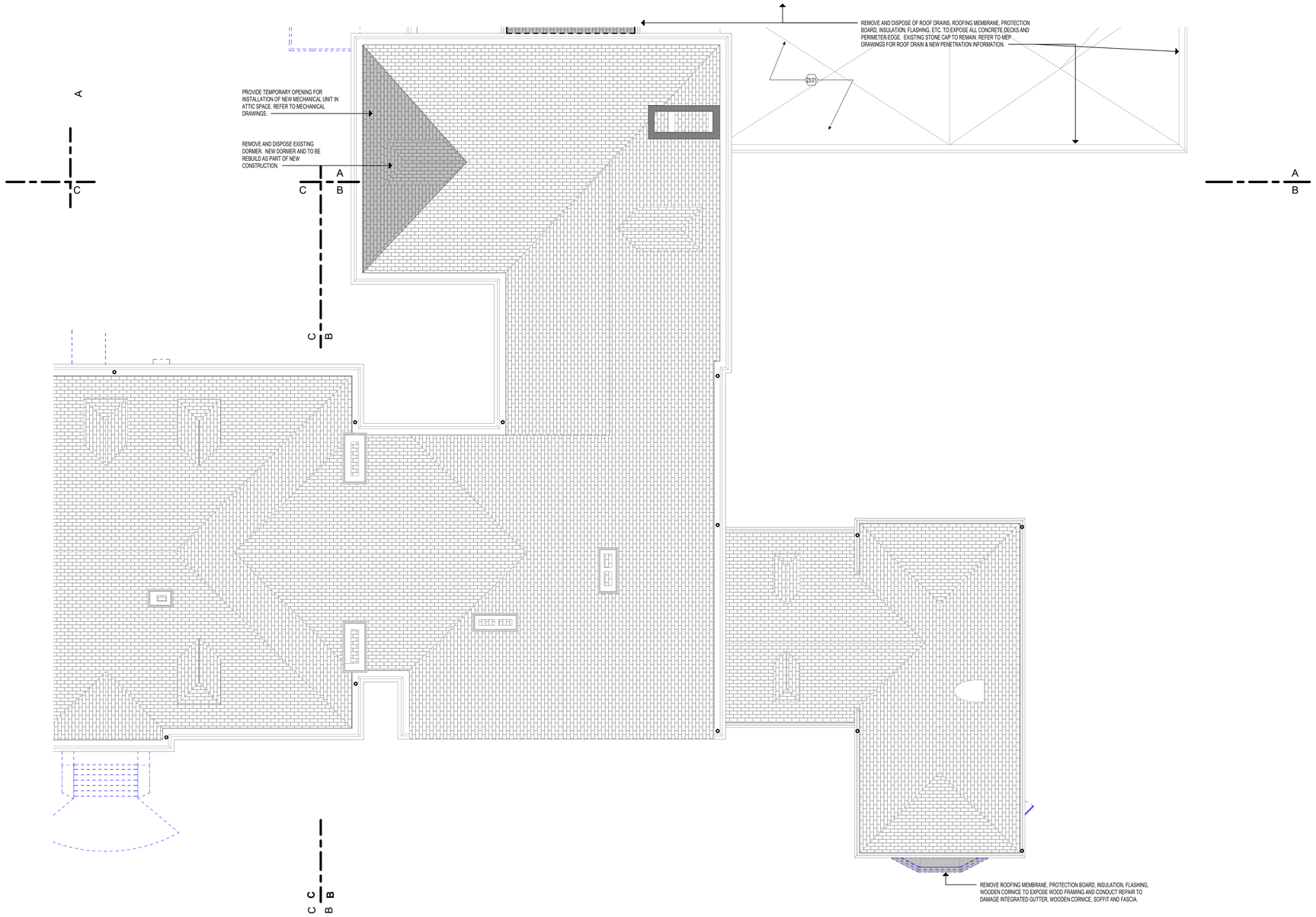


1 ROOF LEVEL DEMOLITION PLAN - PART "B"
1/8" = 1'-0"

DEMOLITION KEYNOTES

3.01 REMOVE ENTIRE CONCRETE SLAB, SLOPED AND FLAT PORTIONS.
3.02 REMOVE CONCRETE OR STONE STAIR OR STEPS, LANDING, FOUNDATION, FOOTINGS, METAL GUARDRAILS, HANDRAILS AND ALL ASSOCIATED HARDWARE AND FASTENERS.
3.03 REMOVE CONCRETE OR STONE STAIR OR STEPS, LANDING, HANDRAILS, AND ALL ASSOCIATED HARDWARE AND FASTENERS.
4.03 EXISTING TERRAZZO FLOORING TO REMAIN.
4.04 PROVIDE NEW OPENING THROUGH EXISTING MASONRY WALL. PROVIDE TEMPORARY SHORING AND PERMANENT LINTEL AT HEAD AS REQUIRED. COORDINATE SIZE OF OPENING WITH DOOR SIZE AND FRAME AS INDICATED ON DOOR SCHEDULE.
4.05 CAREFULLY SAWCUT AND REMOVE PORTION OF EXISTING GLAZED TILE BLOCK WAINSCOT WALL TO THE EXTENT INDICATED ON THE DRAWINGS.
4.06 REMOVE THIS PORTION OF MASONRY WALL TO ACCOMMODATE NEW LAYOUT. SEE ALSO FLOOR PLAN TO COORDINATE EXACT SIZE OF REMOVAL.
4.07 REMOVE GRANITE STONE ENTRY STOOP, GRANITE STONE STAIR STEPS, AND ALL DAMAGED SUBSTRATE STRUCTURAL BASE. SEE LANDSCAPE DRAWINGS FOR MORE INFORMATION.
4.08 REMOVE STONE SILL.
4.09 PROVIDE NEW OPENING THROUGH EXISTING MASONRY WALL. PROVIDE TEMPORARY SHORING AND PERMANENT LINTEL AT HEAD AS REQUIRED. COORDINATE SIZE OF OPENING WITH WINDOW SIZE, REFER TO WINDOW SCHEDULE.
5.01 REMOVE AND REPLACE STEEL LINTEL. SEE STRUCTURAL DRAWINGS.
5.02 REMOVE AND DISPOSE OF ALL SIDEWALL AND INTERMEDIATED METAL HANDRAIL, BRACKETS, AND ALL ASSOCIATED HARDWARE. STRIP PAINT AND CLEAN ALL EXISTING METAL GUARDRAILS AND NEWEL POST.
5.03 STRUCTURAL COLUMN SHALL BE PROTECTED DURING MASONRY REMOVAL.
6.01 REMOVE COUNTERTOPS, BASE AND TOP CABINETS, AND/OR TALL CABINETS AND ASSOCIATED HARDWARE.
6.02 REMOVE COUNTERTOPS, BASE AND TOP CABINETS, AND/OR TALL CABINETS, SINK FIXTURE, FAUCET, AND ASSOCIATED HARDWARE. SEE ALSO PLUMBING DRAWING.
6.03 REMOVE COUNTERTOPS, BASE AND TOP CABINETS, AND/OR TALL CABINETS AND ASSOCIATED HARDWARE.
6.04 REMOVE EXISTING MILLWORK, CASEWORK, AND SHELVING.
6.05 REMOVE ENTIRE WOOD STAIR ASSEMBLY, LANDING, FRAMING, HADRAILS, GUARDRAILS AND ALL ASSOCIATED HARDWARE AND FASTENERS.
6.06 REMOVE AND REPAIR EXISTING CORNICE FASCIA AND SOFFIT.
7.01 REMOVE AND DISPOSE OF ALUMINUM DOWNSPOUT.
7.02 REMOVE ENTIRE CANOPY, INCLUDING ROOF DECKING, BEAMS, ROOFING, FASCIAS, FLASHINGS, STEEL COLUMNS, FOUNDATION, FOOTINGS AND ALL ASSOCIATED HARDWARE AND FASTENERS.
8.01 REMOVE WINDOW SYSTEM, INCLUDING FRAMES. GLAZING, PANELS, LOUVERS, SILLS, GASKETS AND ALL ASSOCIATED HARDWARE. CLEAN OPENING TO RECEIVE NEW WINDOW SYSTEM.
8.02 REMOVE GLAZING, FRAMES, SEALANT AND ASSOCIATED HARDWARE.
8.03 REMOVE AND REPLACE INSULATED GLAZING PANEL. REPAIR ASSOCIATED HARDWARE AS NEEDED.
8.04 REMOVE ALUMINUM ENTRANCE SYSTEM, INCLUDING TRANSOM PANEL, DOORS, FRAMES, GLAZING, SILLS, SEALANTS AND ALL ASSOCIATED HARDWARE.
8.05 REMOVE DOOR, TRANSOM PANEL, FRAME AND ASSOCIATED HARDWARE. ENLARGE OPENING TO ACCEPT NEW FRAME AND MANEUVERING CLEARANCE REQUIREMENT. COORDINATE WITH SCOPE OF NEW WORK REQUIRED.
8.06 REMOVE DOOR, FRAME AND HARDWARE. CLEAN MASONRY OPENING TO ACCEPT NEW FRAME AND DOOR AS SCHEDULED.
8.07 REMOVE DOOR, FRAME AND HARDWARE. PREPARE JAMBS TO RECEIVE TOOTHED-IN INFILL.
8.08 REMOVE DOOR, FRAME AND HARDWARE.
8.09 REMOVE DOOR, FRAME AND HARDWARE. ENLARGE OPENING TO ACCEPT NEW FRAME AND MANEUVERING CLEARANCE REQUIREMENT. PROVIDE TEMPORARY SHORING AND PERMANENT LINTEL AS REQUIRED. SEE NEW PLANS FOR LOCATION OF NEW DOORS.
8.10 REMOVE DOOR, TRANSOM PANEL, FRAME AND ASSOCIATED HARDWARE. CLEAN MASONRY OPENING TO ACCEPT NEW FRAME AND DOOR AS SCHEDULED. COORDINATE WITH SCOPE OF NEW WORK REQUIRED.
8.11 REMOVE AND DISPOSE OF ALUMINUM LOUVER.
9.01 REMOVE AND DISPOSE OF THE FULL EXTENT OF WALL COVED BASE AND VCT OR SHEET FLOORING. CLEAN SUBSTRATE TO ACCEPT NEW SCHEDULED FINISH.
9.02 REMOVE AND DISPOSE OF THE FULL EXTENT OF WALL COVED BASE AND EPOXY FLOORING. CLEAN SUBSTRATE TO ACCEPT NEW SCHEDULED FINISH.
9.03 REMOVE WALL BASE AND CERAMIC FLOORING. CLEAN SUBSTRATE TO ACCEPT NEW SCHEDULED FINISH.
9.04 REMOVE AND DISPOSE PORTION OF THE EXISTING VCT OR SHEET FLOORING. CLEAN SUBSTRATE TO ACCEPT NEW SCHEDULED FINISH. REFER TO ARCHITECTURAL FLOOR PATTERN PLANS FOR REMOVAL COORDINATION.
9.05 REMOVE AND DISPOSE OF THE FULL EXTENT OF EXISTING TERRAZZO FLOORING. PROVIDED NEW SUBSTRATE TO ACCEPT NEW SCHEDULED FINISH. REFER TO ARCHITECTURAL FLOOR PATTERN PLANS FOR REMOVAL COORDINATION.
9.06 REMOVE AND DISPOSE OF ALL EXISTING RUBBER FLOORING, RUBBER STAIR TREADS, AND RISERS. CLEAN SUBSTRATE TO ACCEPT NEW SCHEDULED FINISH.
9.07 REMOVE AND DISPOSE PORTION OF THE EXISTING CARPET. CLEAN SUBSTRATE TO ACCEPT NEW SCHEDULED FINISH. REFER TO ARCHITECTURAL FLOOR PATTERN PLANS FOR REMOVAL COORDINATION.
9.08 REMOVE AND DISPOSE OF ALL SUSPENDED LAY-IN CEILING SYSTEMS INCLUDING ASSOCIATED HANGERS AND ANCHORS. ASSUME PLASTER, GYPSUM BOARD OR BOTH TYPE OF CEILING SYSTEMS MAY BE ABOVE ALL SUSPENDED LAY-IN CEILING SYSTEMS. REMOVE AND DISPOSE OF ALL HARD-SURFACE CEILING SOFFIT AND FRAMING. REFER TO MECHANICAL, PLUMBING AND ELECTRICAL DRAWINGS AND SPECIFICATIONS FOR ADDITIONAL DEMOLITION REQUIREMENTS.
9.09 REMOVE ALL PLASTER CEILING SYSTEMS INCLUDING ASSOCIATED METAL LATH, AND BLOCKING TO THE UNDERSIDE OF FLOOR SLAB ABOVE. UNLESS NOTED OR SHOWN OTHERWISE. REFER TO MECHANICAL, PLUMBING AND ELECTRICAL DRAWINGS AND SPECIFICATIONS FOR ADDITIONAL DEMOLITION REQUIREMENTS.
9.10 REMOVE HARD-SURFACE CEILING/SOFFIT, FRAMING, LOUVERS, DIFFUSERS, SUSPENSION MEMBERS, BRACING AND ALL ASSOCIATED HARDWARE. REFER TO MECHANICAL, PLUMBING AND ELECTRICAL DRAWINGS AND SPECIFICATIONS FOR ADDITIONAL DEMOLITION REQUIREMENTS.
9.11 REMOVE PORTION OF WALL REQUIRED TO ACCESS PLUMBING FOR NEW WATER COOLERS INSTALLATION WHEN APPLICABLE. SEE ALSO NEW FLOOR PLANS.
9.12 REMOVE AND DISPOSE OF ALL MASONRY PLASTER WALL FINISH TO EXPOSE MASONRY CMU WALL.
9.13 REMOVE AND DISPOSE OF ALL WALL TILE FINISH.
10.01 REMOVE TOILET PARTITIONS, DOORS, BRACES AND ALL ASSOCIATED HARDWARE.
10.02 REMOVE METAL LOCKERS, LOCKER METAL BASED, AND ALL ASSOCIATED HARDWARE.
10.03 REMOVE AND SALVAGE METAL LOCKERS, LOCKER METAL BASED, AND ALL ASSOCIATED HARDWARE. CLEAN, REPAIR AS NEEDED, PRIMED AND PAINT FOR INSTALLATION.
10.04 REMOVE TACKBOARDS, BLACK, WHITE BOARDS ON WALL, AND ASSOCIATED HARDWARE.
10.05 REMOVE SWING-UP GRAB BAR AND PATH TILE WALL AS NEEDED.
10.06 REMOVE PORTION OF STAGE: WOOD FLOORING, FRAMING, BASE, CONCRETE SLAB SUBFLOOR, AND ALL ASSOCIATED FASTENERS AND HARDWARE.
10.07 REMOVE SIGNAGE ON WALL AND RETURN TO OWNER.
10.08 REMOVE ARTWORK ON WALL AND RETURN TO OWNER.
12.01 REMOVE WINDOW SHADE SYSTEM AND ASSOCIATED HARDWARE.
22.01 REMOVE WATER CLOSET FIXTURE, CARRIER, PLUMBING VALVE, HARDWARE, GRAB BARS AND ACCESSORIES. SEE ALSO PLUMBING DRAWINGS.
22.02 REMOVE WATER COOLER FIXTURES, CARRIERS AND HARDWARE. SEE ALSO PLUMBING DRAWING.
22.03 REMOVE URINAL FIXTURE AND HARDWARE AND PRIVACY PANELS. SEE ALSO PLUMBING DRAWING.
22.04 REMOVE LAVATORY FIXTURE, CARRIER, HARDWARE, MIRROR AND ACCESSORIES. SEE ALSO PLUMBING DRAWINGS.
22.05 REMOVE PLUMBING FIXTURE AND HARDWARE. SEE ALSO PLUMBING DRAWING.
22.06 REMOVE MOP SINK FIXTURE, CARRIER, AND ACCESSORIES. SEE ALSO PLUMBING DRAWINGS.
23.01 REFER TO MEP DRAWINGS FOR EXTENT OF DEMOLITION.
23.02 REMOVE UNIT VENTILATOR UNIT. REFER TO MECHANICAL DRAWINGS.
23.03 REMOVE WALL-MOUNTED FAN COIL UNIT. REFER TO MECHANICAL DRAWINGS.
23.04 REMOVE WALL-MOUNTED LINEAR HYDRONIC HEATER BASEBOARD UNIT AND ALL ASSOCIATED FASTENERS HARDWARE. PATCH WALL AS NEEDED FOR NEW FINISH. REFER TO MECHANICAL DRAWINGS.
23.05 REMOVE WALL-MOUNTED METAL PIPE COVER ENCLOSURE, PIPES AND ALL ASSOCIATED FASTENERS HARDWARE. PATCH WALL AS NEEDED FOR NEW FINISH. REFER TO MECHANICAL DRAWINGS.
23.06 REMOVE AND DISPOSE OF AIR CONDITIONER UNIT FROM WINDOW AND ANY ASSOCIATED ACCESSORIES. REPAIR WINDOW PANEL AS REQUIRED. REFER TO MECHANICAL DRAWINGS.

DEMOLITION LEGEND:

DEMOLITION SCOPE

SAW CUT AND REMOVE CONCRETE FLOOR SLAB AS SHOWN FOR NEW WORK. REFER TO STRUCTURAL DRAWINGS.

REMOVE AND DISPOSE WOOD FLOOR ASSEMBLY AS SHOWN FOR NEW WORK. REFER TO STRUCTURAL DRAWINGS.

DEMOLITION GENERAL NOTES:

A. THE CONTRACTOR SHALL REFERENCE HAZARDOUS MATERIAL, MECHANICAL, ELECTRICAL, AND PLUMBING DEMOLITION DRAWINGS FOR ADDITIONAL DEMOLITION SCOPE OF WORK.

B. THE CONTRACTOR SHALL VERIFY EXISTING CONDITIONS PRIOR TO THE START OF WORK. REPORT TO THE ARCHITECT OF ANY DISCREPANCIES WITH THE DRAWINGS PROVIDED.

C. THE CONTRACTOR SHALL ADVISE THE ARCHITECT OF ALL CONFLICTS ENCOUNTERED IN THE FIELD. THE CONTRACTOR SHALL PROTECT THE INTERIOR OF THE BUILDING FROM ADVERSE WEATHER CONDITIONS WHERE EXTERIOR WEATHERTIGHT ELEMENTS HAVE BEEN REMOVED.

D. THE EXISTING FACILITY IS CONSIDERED TO BE HISTORIC IN NATURE. THE CONTRACTOR IS TO COORDINATE THE EXTENT OF DEMOLITION WITH THE PROPOSED NEW WORK AND SHALL PROTECT ALL EXISTING SURFACES AND MATERIALS SCHEDULED TO REMAIN. IT IS EXPECTED THAT THE CONTRACTOR WILL PROVIDE THE LEAST INVASIVE AND DESTRUCTIVE METHODS OF DEMOLITION AROUND HISTORICALLY IMPORTANT ELEMENTS. INCLUDING BUT NOT LIMITED TO:
a. EXISTING EXTERIOR FACADE TO REMAIN
b. EXTERIOR WINDOWS NOTED TO REMAIN OR BE SALVAGED
c. TERRAZZO FLOOR SYSTEMS NOTED TO REMAIN

E. THE CONTRACTOR SHALL PROVIDE ALL OPENINGS THROUGH EXISTING WALLS, AND FLOORS REQUIRED FOR THE INSTALLATION OF NEW DUCTWORK, PIPING, AND CONDUITS. PROVIDE TEMPORARY PROTECTION FOR ALL NEW AND EXISTING OPENINGS IN FLOORS AND ROOF DECK.

F. THE CONTRACTOR SHALL PATCH THE REMAINING WALLS, FLOOR, AND CEILING AS REQUIRED BY DEMOLITION TO OBTAIN A UNIFORM SURFACE READY TO RECEIVE FINISHES. REFER TO SPECIFICATIONS REGARDING CUTTING AND PATCHING.

G. THE CONTRACTOR SHALL SALVAGE AND STORE ALL MATERIALS AND/OR EQUIPMENT AS NOTED FOR REINSTALLATION.

H. THE CONTRACTOR SHALL BRING TO THE ATTENTION OF THE ARCHITECT ANY CONSTRUCTION OR MATERIALS TO REMAIN THAT ARE UNSOUND, DETERIORATED, OR ARE NOT AS SHOWN IN THESE CONTRACT DOCUMENTS.

I. DEMOLISH ALL SELECTED INTERIOR CONSTRUCTION AND FINISHES AS SHOWN ON THE PLANS. EXCEPT FOR STRUCTURE, FLOOR SLABS, INTERIOR STAIRS AND STAIR ENCLOSURE WALLS, AND INTERIOR BEARING WALLS. UNLESS NOTED OR SHOWN OTHERWISE. EXPOSED EXTERIOR ROUGH OPENINGS SHALL BE WATERTIGHT.

J. REFER TO MECHANICAL, PLUMBING AND ELECTRICAL DRAWINGS AND SPECIFICATIONS FOR ADDITIONAL DEMOLITION REQUIREMENTS.

K. COORDINATE THE SIZE, LOCATION, AND QUANTITY OF NEW PENETRATIONS THROUGH EXISTING WALLS, FLOORS, AND ROOF DECK WITH THE MEP & FP CONTRACTOR AND PROPOSED NEW EQUIPMENT.

L. REMOVE AND DISPOSE ALL SELECTED FLOOR FINISH AREAS AS SHOWN ON THE PLAN TO THE SUBSTRATE UNLESS NOTED OR SHOWN OTHERWISE.

M. REMOVE AND DISPOSE OF ALL PLASTER WALL FINISH, ASSOCIATED LATH, AND FURRING WITHIN THE PLENUM CEILING SPACE FROM THE INTERIOR FACE OF ALL EXISTING INTERIOR WALLS DOWN TO 4" FROM THE EXISTING CEILING HEIGHT TO THE MASONRY SUBSTRATE, UNLESS NOTED OTHERWISE. REFER TO DETAIL: FOR REFERENCE.

N. REMOVE AND DISPOSE OF ALL SELECTED INTERIOR MILLWORK AS SHOWN ON THE PLANS.

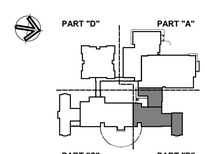
O. REMOVE AND DISPOSE OF ALL SELECTED EXTERIOR WINDOWS, AND LOUVERS, FROM EXTERIOR OPENINGS BACK TO THE ORIGINAL MASONRY OPENING, INCLUDING ALL ASSOCIATED FRAMES AND HARDWARE, UNLESS NOTED OTHERWISE. CAULKING AT EXISTING WINDOWS SHALL BE REMOVED IN PHASES BY THE DEMOLITION CONTRACTOR. EXPOSED WINDOW OPENINGS AS A RESULT OF WINDOW REMOVAL SHALL BE TEMPORARILY BOARDED UP AND MADE WEATHER-TIGHT UNTIL NEW WINDOWS (AS PART OF A FUTURE PHASE) CAN BE INSTALLED. WEATHER-TIGHT INFILL SHALL BE FLUSH WITH THE EXTERIOR AND ATTACHED TO THE JAMB OF THE EXISTING OPENING. WINDOWS TO REMAIN SHALL BE PROTECTED DURING DEMOLITION.

P. REMOVE ALL EXTERIOR DOORS, INCLUDING ALL ASSOCIATED FRAMES, HARDWARE, AND CAULKING UNLESS OTHERWISE NOTED. PROTECT ALL EXPOSED EXTERIOR OPENINGS WITH TEMPORARY BOARDED UP WEATHER-TIGHT AND SECURE INFILLS TO PREVENT THE EXPOSURE TO WEATHER OF HISTORICALLY IMPORTANT ELEMENTS ON THE INTERIOR AND PROTECT THE BUILDING FROM UNAUTHORIZED INTRUSION. INFILL SHALL BE SECURED IN PLACE AT THE JAMB AND FLUSH WITH THE EXTERIOR.

Q. SALVAGE ALL FACE BRICK FROM DEMOLISHED BUILDING. REMOVE THE BRICK TO MAINTAIN ITS APPEARANCE AND STRUCTURAL INTEGRITY. CLEAN BRICK OF ALL EXISTING MORTAR AND STORE IN VANDAL RESISTANT WEATHER PROTECTED AREA.

R. EXISTING TERRAZZO FLOOR FINISH TO REMAIN SHALL BE PROTECTED FROM DAMAGE DURING DEMOLITION. SAW CUT, REMOVE AND DISPOSE OF ASSOCIATED TERRAZZO WALL BASE UNLESS OTHERWISE NOTED RE: .

S. ALL ROUGH OPENING DIMENSIONS AND LOCATIONS FOR NEW DOORS AND CASED OPENINGS NEED TO BE COORDINATED WITH THE PROPOSED NEW OPENINGS.



KEY PLAN

Project Title:
ADDITION & ALTERATIONS TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

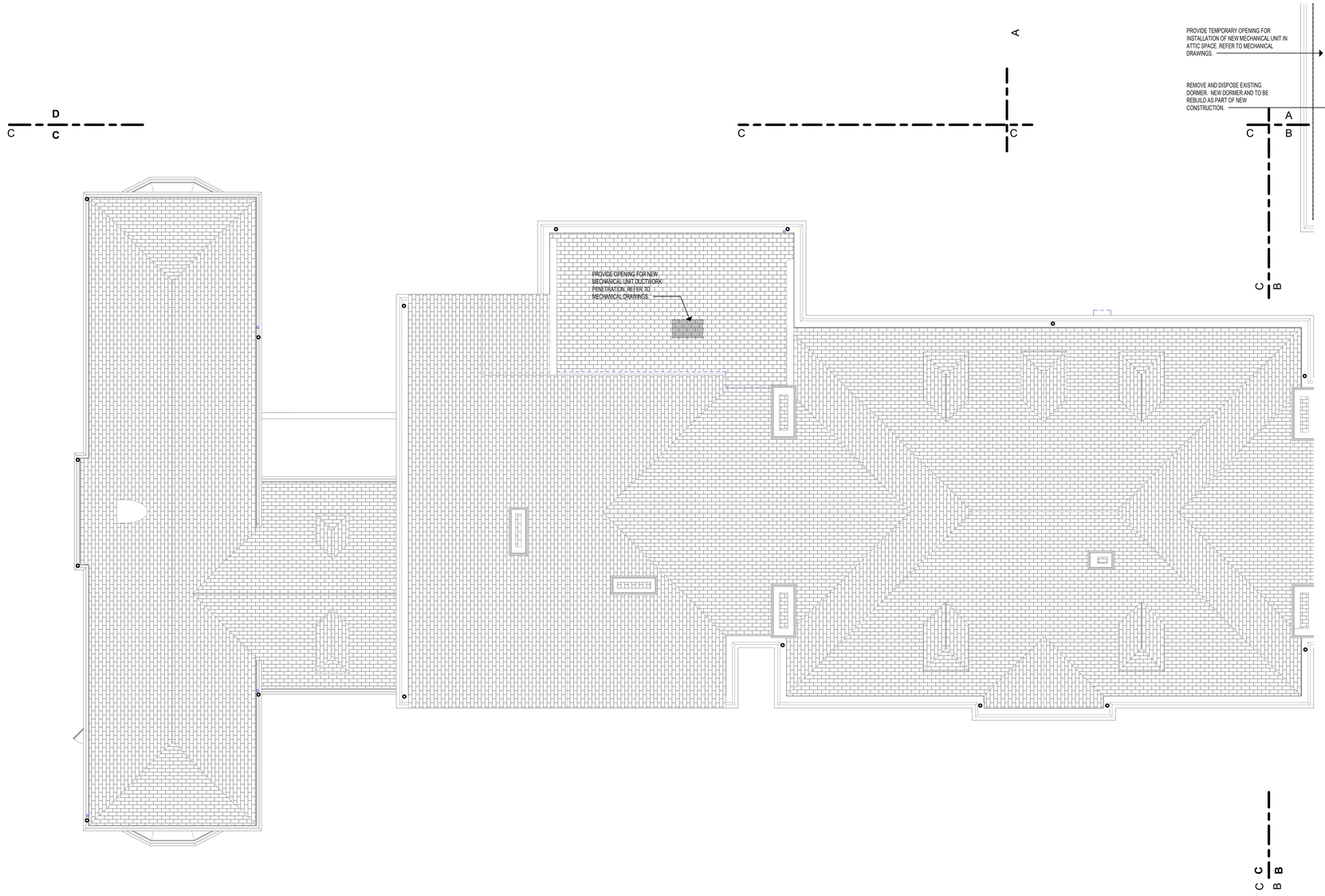
SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
311 STATE STREET NEW LONDON CT 06320
203 230 9007 silverpetrucelli.com

Revision:	Description:	Date:	Revised By:

Drawing Title: ROOF DEMOLITION PLAN - PART "B"

Date: 8/29/2024
Scale: As indicated
Drawn By: JM
Project Number: 22-382
Drawing Number: A052

8/30/2024 8:39:43 AM



1 ROOF LEVEL DEMOLITION PLAN - PART "C"
1/8" = 1'-0"

DEMOLITION KEYNOTES

3.01 REMOVE ENTIRE CONCRETE SLAB, SLOPED AND FLAT PORTIONS.
3.02 REMOVE CONCRETE OR STONE STAIR OR STEPS, LANDING, FOUNDATION, FOOTINGS, METAL GUARDRAILS, HANDRAILS AND ALL ASSOCIATED HARDWARE AND FASTENERS.
3.03 REMOVE CONCRETE OR STONE STAIR OR STEPS, LANDING, HANDRAILS, AND ALL ASSOCIATED HARDWARE AND FASTENERS.
4.03 EXISTING TERRAZZO FLOORING TO REMAIN.
4.04 PROVIDE NEW OPENING THROUGH EXISTING MASONRY WALL. PROVIDE TEMPORARY SHORING AND PERMANENT LINTEL AT HEAD AS REQUIRED. COORDINATE SIZE OF OPENING WITH DOOR SIZE AND FRAME AS INDICATED ON DOOR SCHEDULE.
4.05 CAREFULLY SAWCUT AND REMOVE PORTION OF EXISTING GLAZED TILE BLOCK WAINSCOT WALL TO THE EXTENT INDICATED ON THE DRAWINGS.
4.06 REMOVE THIS PORTION OF MASONRY WALL TO ACCOMMODATE NEW LAYOUT. SEE ALSO FLOOR PLAN TO COORDINATE EXACT SIZE OF REMOVAL.
4.07 REMOVE GRANITE STONE ENTRY STOOP. GRANITE STONE STAIR STEPS, AND ALL DAMAGED SUBSTRATE STRUCTURAL BASE. SEE LANDSCAPE DRAWINGS FOR MORE INFORMATION.
4.08 REMOVE STONE SILL
4.09 PROVIDE NEW OPENING THROUGH EXISTING MASONRY WALL. PROVIDE TEMPORARY SHORING AND PERMANENT LINTEL AT HEAD AS REQUIRED. COORDINATE SIZE OF OPENING WITH WINDOW SIZE, REFER TO WINDOW SCHEDULE.
5.01 REMOVE AND REPLACE STEEL LINTEL. SEE STRUCTURAL DRAWINGS.
5.02 REMOVE AND DISPOSE OF ALL SIDEWALL AND INTERMEDIATED METAL HANDRAIL, BRACKETS, AND ALL ASSOCIATED HARDWARE. STRIP PAINT AND CLEAN ALL EXISTING METAL GUARDRAILS AND NEWEL POST.
5.03 STRUCTURAL COLUMN SHALL BE PROTECTED DURING MASONRY REMOVAL.
6.01 REMOVE COUNTERTOPS, BASE AND TOP CABINETS, AND/OR TALL CABINETS AND ASSOCIATED HARDWARE.
6.02 REMOVE COUNTERTOPS, BASE AND TOP CABINETS, AND/OR TALL CABINETS, SINK FIXTURE, FAUCET, AND ASSOCIATED HARDWARE. SEE ALSO PLUMBING DRAWING.
6.03 REMOVE COUNTERTOPS, BASE AND TOP CABINETS, AND/OR TALL CABINETS AND ASSOCIATED HARDWARE.
6.04 REMOVE EXISTING MILLWORK, CASEWORK, AND SHELVING.
6.05 REMOVE ENTIRE WOOD STAIR ASSEMBLY, LANDING, FRAMING, HADRAILS, GUARDRAILS AND ALL ASSOCIATED HARDWARE AND FASTENERS.
6.06 REMOVE AND REPAIR EXISTING CORNICE FASCIA AND SOFFIT.
7.01 REMOVE AND DISPOSE OF ALUMINUM DOWNSPOUT.
7.02 REMOVE ENTIRE CANOPY, INCLUDING ROOF DECKING, BEAMS, ROOFING, FASCIAS, FLASHINGS, STEEL COLUMNS, FOUNDATION, FOOTINGS AND ALL ASSOCIATED HARDWARE AND FASTENERS.
8.01 REMOVE WINDOW SYSTEM, INCLUDING FRAMES. GLAZING, PANELS, LOUVERS, SILLS, GASKETS AND ALL ASSOCIATED HARDWARE. CLEAN OPENING TO RECEIVE NEW WINDOW SYSTEM.
8.02 REMOVE GLAZING, FRAMES, SEALANT AND ASSOCIATED HARDWARE.
8.03 REMOVE AND REPLACE INSULATED GLAZING PANEL. REPAIR ASSOCIATED HARDWARE AS NEEDED.
8.04 REMOVE ALUMINUM ENTRANCE SYSTEM, INCLUDING TRANSOM PANEL, DOORS, FRAMES, GLAZING, SILLS, SEALANTS AND ALL ASSOCIATED HARDWARE.
8.05 REMOVE DOOR, TRANSOM PANEL, FRAME AND ASSOCIATED HARDWARE. ENLARGE OPENING TO ACCEPT NEW FRAME AND MANEUVERING CLEARANCE REQUIREMENT. COORDINATE WITH SCOPE OF NEW WORK REQUIRED.
8.06 REMOVE DOOR, FRAME AND HARDWARE. CLEAN MASONRY OPENING TO ACCEPT NEW FRAME AND DOOR AS SCHEDULED.
8.07 REMOVE DOOR, FRAME AND HARDWARE. PREPARE JAMBS TO RECEIVE TOOTHED-IN INFILL.
8.08 REMOVE DOOR, FRAME AND HARDWARE.
8.09 REMOVE DOOR, FRAME AND HARDWARE. ENLARGE OPENING TO ACCEPT NEW FRAME AND MANEUVERING CLEARANCE REQUIREMENT. PROVIDE TEMPORARY SHORING AND PERMANENT LINTEL AS REQUIRED. SEE NEW PLANS FOR LOCATION OF NEW DOORS.
8.10 REMOVE DOOR, TRANSOM PANEL, FRAME AND ASSOCIATED HARDWARE. CLEAN MASONRY OPENING TO ACCEPT NEW FRAME AND DOOR AS SCHEDULED. COORDINATE WITH SCOPE OF NEW WORK REQUIRED.
8.11 REMOVE AND DISPOSE OF ALUMINUM LOUVER.
9.01 REMOVE AND DISPOSE OF THE FULL EXTENT OF WALL COVED BASE AND VCT OR SHEET FLOORING. CLEAN SUBSTRATE TO ACCEPT NEW SCHEDULED FINISH.
9.02 REMOVE AND DISPOSE OF THE FULL EXTENT OF WALL COVED BASE AND EPOXY FLOORING. CLEAN SUBSTRATE TO ACCEPT NEW SCHEDULED FINISH.
9.03 REMOVE WALL BASE AND CERAMIC FLOORING. CLEAN SUBSTRATE TO ACCEPT NEW SCHEDULED FINISH.
9.04 REMOVE AND DISPOSE PORTION OF THE EXISTING VCT OR SHEET FLOORING. CLEAN SUBSTRATE TO ACCEPT NEW SCHEDULED FINISH. REFER TO ARCHITECTURAL FLOOR PATTERN PLANS FOR REMOVAL COORDINATION.
9.05 REMOVE AND DISPOSE OF THE FULL EXTENT OF EXISTING TERRAZZO FLOORING. PROVIDED NEW SUBSTRATE TO ACCEPT NEW SCHEDULED FINISH. REFER TO ARCHITECTURAL FLOOR PATTERN PLANS FOR REMOVAL COORDINATION.
9.06 REMOVE AND DISPOSE OF ALL EXISTING RUBBER FLOORING, RUBBER STAIR TREADS, AND RISERS. CLEAN SUBSTRATE TO ACCEPT NEW SCHEDULED FINISH.
9.07 REMOVE AND DISPOSE PORTION OF THE EXISTING CARPET. CLEAN SUBSTRATE TO ACCEPT NEW SCHEDULED FINISH. REFER TO ARCHITECTURAL FLOOR PATTERN PLANS FOR REMOVAL COORDINATION.
9.08 REMOVE AND DISPOSE OF ALL SUSPENDED LAY-IN CEILING SYSTEMS INCLUDING ASSOCIATED HANGERS AND ANCHORS. ASSUME PLASTER, GYPSUM BOARD OR BOTH TYPE OF CEILING SYSTEMS MAY BE ABOVE ALL SUSPENDED LAY-IN CEILING SYSTEMS. REMOVE AND DISPOSE OF ALL HARD-SURFACE CEILING SOFFIT AND FRAMING. REFER TO MECHANICAL, PLUMBING AND ELECTRICAL DRAWINGS AND SPECIFICATIONS FOR ADDITIONAL DEMOLITION REQUIREMENTS.
9.09 REMOVE ALL PLASTER CEILING SYSTEMS INCLUDING ASSOCIATED METAL LATH, AND BLOCKING TO THE UNDERSIDE OF FLOOR SLAB ABOVE, UNLESS NOTED OR SHOWN OTHERWISE. REFER TO MECHANICAL, PLUMBING AND ELECTRICAL DRAWINGS AND SPECIFICATIONS FOR ADDITIONAL DEMOLITION REQUIREMENTS.
9.10 REMOVE HARD-SURFACE CEILING/SOFFIT, FRAMING, LOUVERS, DIFFUSERS, SUSPENSION MEMBERS, BRACING AND ALL ASSOCIATED HARDWARE. REFER TO MECHANICAL, PLUMBING AND ELECTRICAL DRAWINGS AND SPECIFICATIONS FOR ADDITIONAL DEMOLITION REQUIREMENTS.
9.11 REMOVE PORTION OF WALL REQUIRED TO ACCESS PLUMBING FOR NEW WATER COOLERS INSTALLATION WHEN APPLICABLE. SEE ALSO NEW FLOOR PLANS.
9.12 REMOVE AND DISPOSE OF ALL MASONRY PLASTER WALL FINISH TO EXPOSE MASONRY CMU WALL.
9.13 REMOVE AND DISPOSE OF ALL WALL TILE FINISH.
10.01 REMOVE TOILET PARTITIONS, DOORS, BRACES AND ALL ASSOCIATED HARDWARE.
10.02 REMOVE METAL LOCKERS, LOCKER METAL BASED, AND ALL ASSOCIATED HARDWARE.
10.03 REMOVE AND SALVAGE METAL LOCKERS, LOCKER METAL BASED, AND ALL ASSOCIATED HARDWARE. CLEAN, REPAIR AS NEEDED, PRIMED AND PAINT FOR INSTALLATION.
10.04 REMOVE TACKBOARDS, BLACK, WHITE BOARDS ON WALL, AND ASSOCIATED HARDWARE.
10.05 REMOVE SWING-UP GRAB BAR AND PATH TILE WALL AS NEEDED.
10.06 REMOVE PORTION OF STAGE: WOOD FLOORING, FRAMING, BASE, CONCRETE SLAB SUBFLOOR, AND ALL ASSOCIATED FASTENERS AND HARDWARE.
10.07 REMOVE SIGNAGE ON WALL AND RETURN TO OWNER.
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22.01 REMOVE WATER CLOSET FIXTURE, CARRIER, PLUMBING VALVE, HARDWARE, GRAB BARS AND ACCESSORIES. SEE ALSO PLUMBING DRAWINGS.
22.02 REMOVE WATER COOLER FIXTURES, CARRIERS AND HARDWARE. SEE ALSO PLUMBING DRAWING.
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22.04 REMOVE LAVATORY FIXTURE, CARRIER, HARDWARE, MIRROR AND ACCESSORIES. SEE ALSO PLUMBING DRAWINGS.
22.05 REMOVE PLUMBING FIXTURE AND HARDWARE. SEE ALSO PLUMBING DRAWING.
22.06 REMOVE MOP SINK FIXTURE, CARRIER, AND ACCESSORIES. SEE ALSO PLUMBING DRAWINGS.
23.01 REFER TO MEP DRAWINGS FOR EXTENT OF DEMOLITION.
23.02 REMOVE UNIT VENTILATOR UNIT. REFER TO MECHANICAL DRAWINGS.
23.03 REMOVE WALL-MOUNTED FAN COIL UNIT. REFER TO MECHANICAL DRAWINGS.
23.04 REMOVE WALL-MOUNTED LINEAR HYDRONIC HEATER BASEBOARD UNIT AND ALL ASSOCIATED FASTENERS HARDWARE. PATCH WALL AS NEEDED FOR NEW FINISH. REFER TO MECHANICAL DRAWINGS.
23.05 REMOVE WALL-MOUNTED METAL PIPE COVER ENCLOSURE, PIPES AND ALL ASSOCIATED FASTENERS HARDWARE. PATCH WALL AS NEEDED FOR NEW FINISH. REFER TO MECHANICAL DRAWINGS.
23.06 REMOVE AND DISPOSE OF AIR CONDITIONER UNIT FROM WINDOW AND ANY ASSOCIATED ACCESSORIES. REPAIR WINDOW PANEL AS REQUIRED. REFER TO MECHANICAL DRAWINGS.

DEMOLITION LEGEND:

DEMOLITION SCOPE

SAW CUT AND REMOVE CONCRETE FLOOR SLAB AS SHOWN FOR NEW WORK. REFER TO STRUCTURAL DRAWINGS.

REMOVE AND DISPOSE WOOD FLOOR ASSEMBLY AS SHOWN FOR NEW WORK. REFER TO STRUCTURAL DRAWINGS.

DEMOLITION GENERAL NOTES:

A. THE CONTRACTOR SHALL REFERENCE HAZARDOUS MATERIAL, MECHANICAL, ELECTRICAL, AND PLUMBING DEMOLITION DRAWINGS FOR ADDITIONAL DEMOLITION SCOPE OF WORK.

B. THE CONTRACTOR SHALL VERIFY EXISTING CONDITIONS PRIOR TO THE START OF WORK. REPORT TO THE ARCHITECT OF ANY DISCREPANCIES WITH THE DRAWINGS PROVIDED.

C. THE CONTRACTOR SHALL ADVISE THE ARCHITECT OF ALL CONFLICTS ENCOUNTERED IN THE FIELD. THE CONTRACTOR SHALL PROTECT THE INTERIOR OF THE BUILDING FROM ADVERSE WEATHER CONDITIONS WHERE EXTERIOR WEATHERTIGHT ELEMENTS HAVE BEEN REMOVED.

D. THE EXISTING FACILITY IS CONSIDERED TO BE HISTORIC IN NATURE. THE CONTRACTOR IS TO COORDINATE THE EXTENT OF DEMOLITION WITH THE PROPOSED NEW WORK AND SHALL PROTECT ALL EXISTING SURFACES AND MATERIALS SCHEDULED TO REMAIN. IT IS EXPECTED THAT THE CONTRACTOR WILL PROVIDE THE LEAST INVASIVE AND DESTRUCTIVE METHODS OF DEMOLITION AROUND HISTORICALLY IMPORTANT ELEMENTS. INCLUDING BUT NOT LIMITED TO:
a. EXISTING EXTERIOR FACADE TO REMAIN
b. EXTERIOR WINDOWS NOTED TO REMAIN OR BE SALVAGED
c. TERRAZZO FLOOR SYSTEMS NOTED TO REMAIN

E. THE CONTRACTOR SHALL PROVIDE ALL OPENINGS THROUGH EXISTING WALLS, AND FLOORS REQUIRED FOR THE INSTALLATION OF NEW DUCTWORK, PIPING, AND CONDUITS. PROVIDE TEMPORARY PROTECTION FOR ALL NEW AND EXISTING OPENINGS IN FLOORS AND ROOF DECK.

F. THE CONTRACTOR SHALL PATCH THE REMAINING WALLS, FLOOR, AND CEILING AS REQUIRED BY DEMOLITION TO OBTAIN A UNIFORM SURFACE READY TO RECEIVE FINISHES. REFER TO SPECIFICATIONS REGARDING CUTTING AND PATCHING.

G. THE CONTRACTOR SHALL SALVAGE AND STORE ALL MATERIALS AND/OR EQUIPMENT AS NOTED FOR REINSTALLATION.

H. THE CONTRACTOR SHALL BRING TO THE ATTENTION OF THE ARCHITECT ANY CONSTRUCTION OR MATERIALS TO REMAIN THAT ARE UNSOUND, DETERIORATED, OR ARE NOT AS SHOWN IN THESE CONTRACT DOCUMENTS.

I. DEMOLISH ALL SELECTED INTERIOR CONSTRUCTION AND FINISHES AS SHOWN ON THE PLANS. EXCEPT FOR STRUCTURE, FLOOR SLABS, INTERIOR STAIRS AND STAIR ENCLOSURE WALLS, AND INTERIOR BEARING WALLS, UNLESS NOTED OR SHOWN OTHERWISE. EXPOSED EXTERIOR ROUGH OPENINGS SHALL BE WATERTIGHT.

J. REFER TO MECHANICAL, PLUMBING AND ELECTRICAL DRAWINGS AND SPECIFICATIONS FOR ADDITIONAL DEMOLITION REQUIREMENTS.

K. COORDINATE THE SIZE, LOCATION, AND QUANTITY OF NEW PENETRATIONS THROUGH EXISTING WALLS, FLOORS, AND ROOF DECK WITH THE MEP & FP CONTRACTOR AND PROPOSED NEW EQUIPMENT.

L. REMOVE AND DISPOSE ALL SELECTED FLOOR FINISH AREAS AS SHOWN ON THE PLAN TO THE SUBSTRATE UNLESS NOTED OR SHOWN OTHERWISE.

M. REMOVE AND DISPOSE OF ALL PLASTER WALL FINISH, ASSOCIATED LATH, AND FURRING WITHIN THE PLENUM CEILING SPACE FROM THE INTERIOR FACE OF ALL EXISTING INTERIOR WALLS DOWN TO 4" FROM THE EXISTING CEILING HEIGHT TO THE MASONRY SUBSTRATE, UNLESS NOTED OTHERWISE. REFER TO DETAIL: FOR REFERENCE.

N. REMOVE AND DISPOSE OF ALL SELECTED INTERIOR MILLWORK AS SHOWN ON THE PLANS.

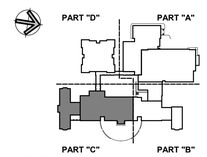
O. REMOVE AND DISPOSE OF ALL SELECTED EXTERIOR WINDOWS, AND LOUVERS, FROM EXTERIOR OPENINGS BACK TO THE ORIGINAL MASONRY OPENING, INCLUDING ALL ASSOCIATED FRAMES AND HARDWARE, UNLESS NOTED OTHERWISE. CAULKING AT EXISTING WINDOWS SHALL BE REMOVED IN PHASES BY THE DEMOLITION CONTRACTOR. EXPOSED WINDOW OPENINGS AS A RESULT OF WINDOW REMOVAL SHALL BE TEMPORARILY BOARDED UP AND MADE WEATHER-TIGHT UNTIL NEW WINDOWS (AS PART OF A FUTURE PHASE) CAN BE INSTALLED. WEATHER-TIGHT INFILL SHALL BE FLUSH WITH THE EXTERIOR AND ATTACHED TO THE JAMB OF THE EXISTING OPENING. WINDOWS TO REMAIN SHALL BE PROTECTED DURING DEMOLITION.

P. REMOVE ALL EXTERIOR DOORS, INCLUDING ALL ASSOCIATED FRAMES, HARDWARE, AND CAULKING UNLESS OTHERWISE NOTED. PROTECT ALL EXPOSED EXTERIOR OPENINGS WITH TEMPORARY BOARDED UP WEATHER-TIGHT AND SECURE INFILLS TO PREVENT THE EXPOSURE TO WEATHER OF HISTORICALLY IMPORTANT ELEMENTS ON THE INTERIOR AND PROTECT THE BUILDING FROM UNAUTHORIZED INTRUSION. INFILL SHALL BE SECURED IN PLACE AT THE JAMB AND FLUSH WITH THE EXTERIOR.

Q. SALVAGE ALL FACE BRICK FROM DEMOLISHED BUILDING. REMOVE THE BRICK TO MAINTAIN ITS APPEARANCE AND STRUCTURAL INTEGRITY. CLEAN BRICK OF ALL EXISTING MORTAR AND STORE IN VANDAL RESISTANT WEATHER PROTECTED AREA.

R. EXISTING TERRAZZO FLOOR FINISH TO REMAIN SHALL BE PROTECTED FROM DAMAGE DURING DEMOLITION. SAW CUT, REMOVE AND DISPOSE OF ASSOCIATED TERRAZZO WALL BASE UNLESS OTHERWISE NOTED RE: .

S. ALL ROUGH OPENING DIMENSIONS AND LOCATIONS FOR NEW DOORS AND CASED OPENINGS NEED TO BE COORDINATED WITH THE PROPOSED NEW OPENINGS.



KEY PLAN

Project Title:
ADDITION & ALTERATIONS TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

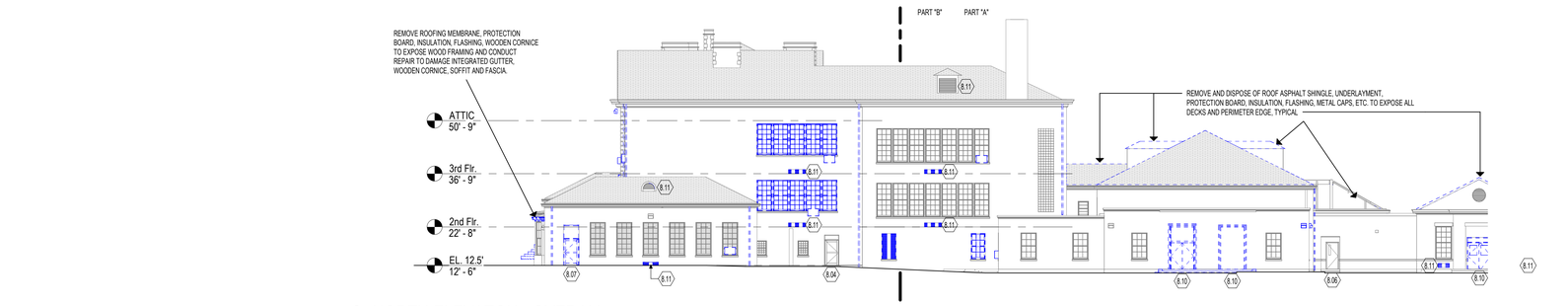
SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
311 STATE STREET NEW LONDON CT 06320
203 230 9007 silverpetrucelli.com

Revision:	Description:	Date:	Revised By:

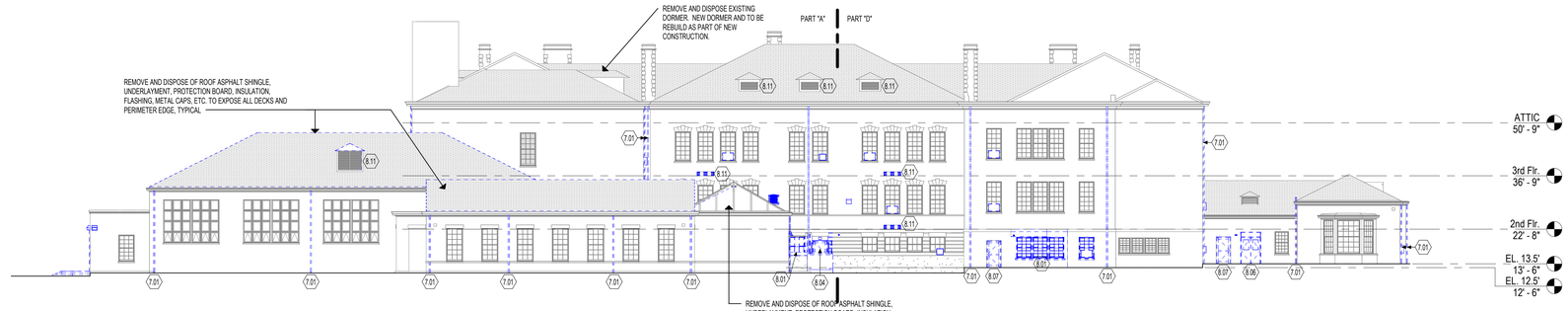
Drawing Title: ROOF DEMOLITION PLAN - PART "C"

Date: 8/29/2024
Scale: As indicated
Drawn By: JM
Project Number: 22-382
Drawing Number: A053

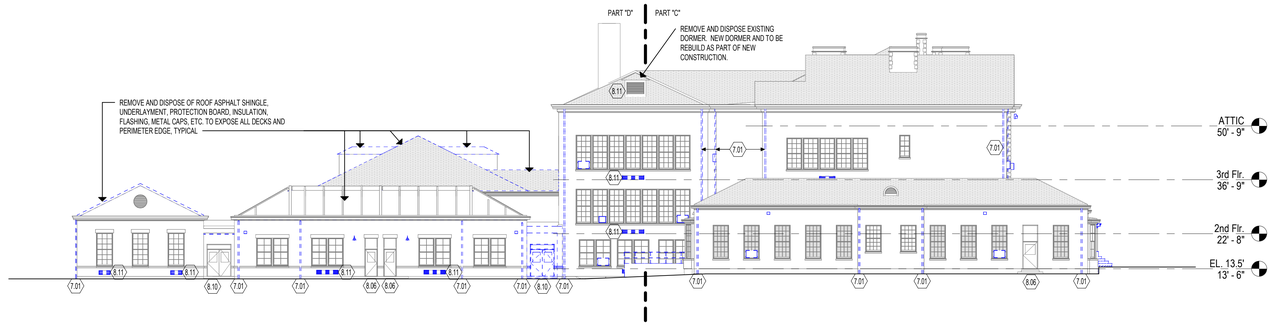
8/30/2024 8:39:45 AM



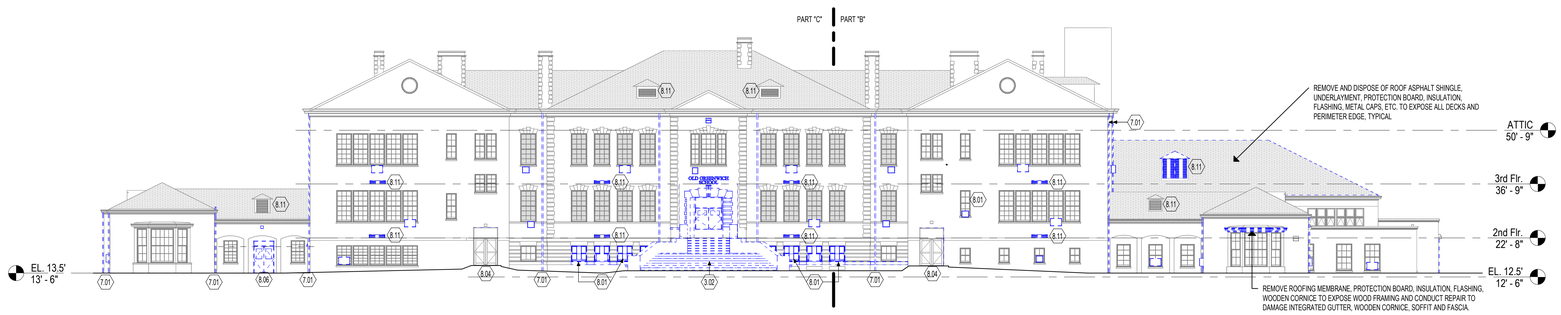
4 NORTH ELEVATON - OVERALL.
1/16" = 1'-0"



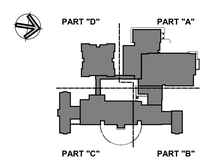
3 WEST ELEVATION - OVERALL.
1/16" = 1'-0"



2 SOUTH ELEVATION - OVERALL.
1/16" = 1'-0"



1 EAST ELEVATION - OVERALL.
1/16" = 1'-0"



KEY PLAN

Project Title:

ADDITION & ALTERATIONS TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
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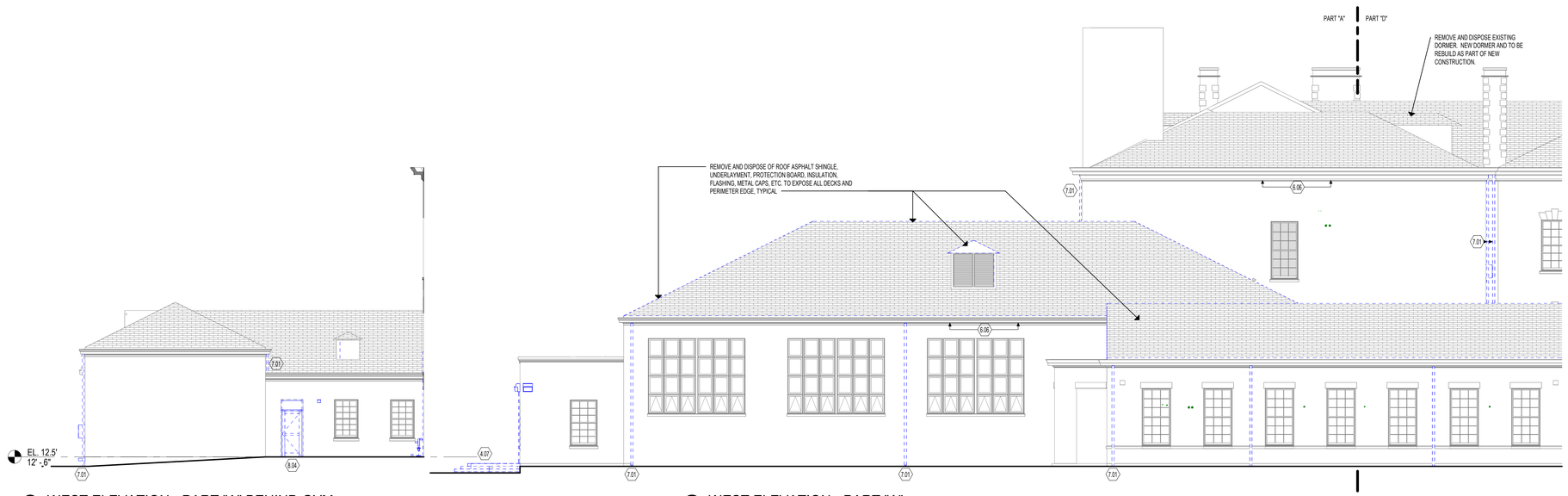
Revision:	Description:	Date:	Revised By:

Drawing Title:
OVERALL EXISTING EXTERIOR ELEVATIONS

Date: 8/29/2024
Scale: 1/16" = 1'-0"
Drawn By: JM
Project Number: 22-382

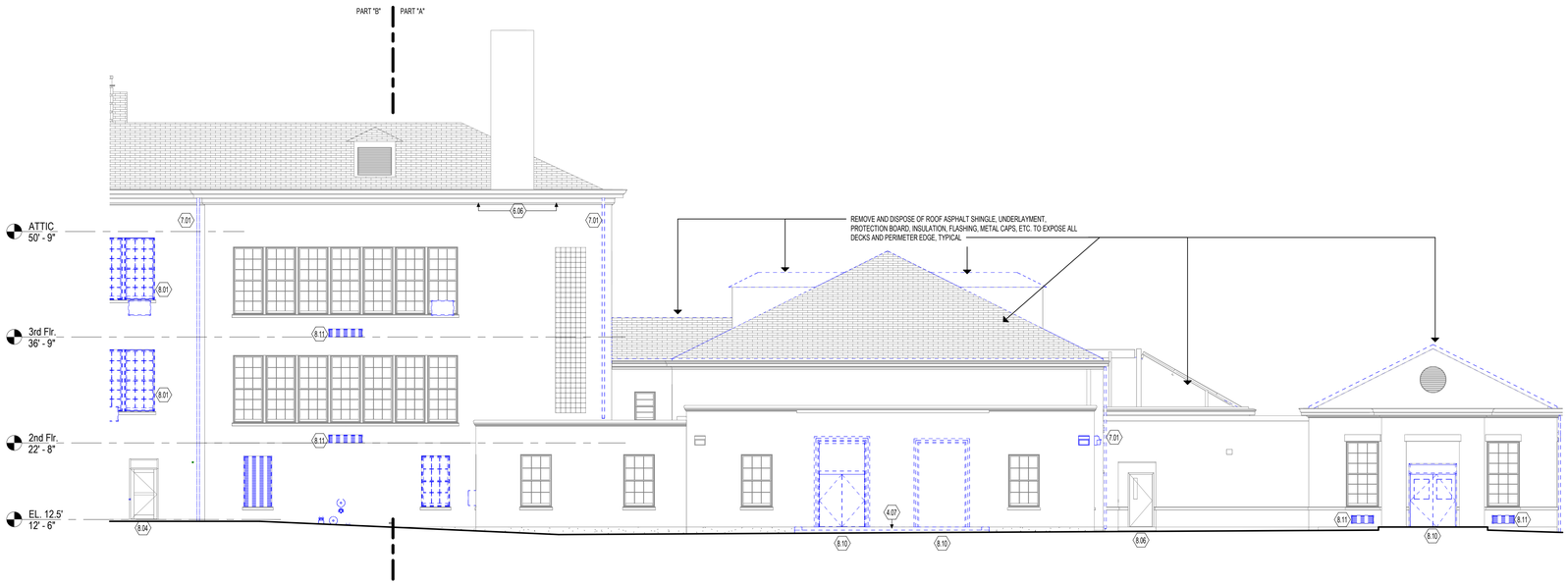
Drawing Number: A060

8/30/2024 7:40:47 AM



3 WEST ELEVATION - PART "A" BEHIND GYM
1/8" = 1'-0"

2 WEST ELEVATION - PART "A"
1/8" = 1'-0"



1 NORTH ELEVATON - PART "A"
1/8" = 1'-0"

DEMOLITION KEYNOTES

3.01 REMOVE ENTIRE CONCRETE SLAB, SLOPED AND FLAT PORTIONS.

3.02 REMOVE CONCRETE OR STONE STAIR OR STEPS, LANDING, FOUNDATION, FOOTINGS, METAL GUARDRAILS, HANDRAILS AND ALL ASSOCIATED HARDWARE AND FASTENERS.

3.03 REMOVE CONCRETE OR STONE STAIR OR STEPS, LANDING, HANDRAILS, AND ALL ASSOCIATED HARDWARE AND FASTENERS.

4.03 EXISTING TERRAZZO FLOORING TO REMAIN.

4.04 PROVIDE NEW OPENING THROUGH EXISTING MASONRY WALL. PROVIDE TEMPORARY SHORING AND PERMANENT LINTEL AT HEAD AS REQUIRED. COORDINATE SIZE OF OPENING WITH DOOR SIZE AND FRAME AS INDICATED ON DOOR SCHEDULE.

4.05 CAREFULLY SAWCUT AND REMOVE PORTION OF EXISTING GLAZED TILE BLOCK WAINSCOT WALL TO THE EXTENT INDICATED ON THE DRAWINGS.

4.06 REMOVE THIS PORTION OF MASONRY WALL TO ACCOMMODATE NEW LAYOUT. SEE ALSO FLOOR PLAN TO COORDINATE EXACT SIZE OF REMOVAL.

4.07 REMOVE GRANITE STONE ENTRY STOOP, GRANITE STONE STAIR STEPS, AND ALL DAMAGED SUBSTRATE STRUCTURAL BASE. SEE LANDSCAPE DRAWINGS FOR MORE INFORMATION.

4.08 REMOVE STONE SILL.

4.09 PROVIDE NEW OPENING THROUGH EXISTING MASONRY WALL. PROVIDE TEMPORARY SHORING AND PERMANENT LINTEL AT HEAD AS REQUIRED. COORDINATE SIZE OF OPENING WITH WINDOW SIZE, REFER TO WINDOW SCHEDULE.

5.01 REMOVE AND REPLACE STEEL LINTEL. SEE STRUCTURAL DRAWINGS.

5.02 REMOVE AND DISPOSE OF ALL SIDEWALL AND INTERMEDIATED METAL HANDRAIL, BRACKETS, AND ALL ASSOCIATED HARDWARE. STRIP PAINT AND CLEAN ALL EXISTING METAL GUARDRAILS AND NEWEL POST.

5.03 STRUCTURAL COLUMN SHALL BE PROTECTED DURING MASONRY REMOVAL.

6.01 REMOVE COUNTERTOPS, BASE AND TOP CABINETS, AND/OR TALL CABINETS AND ASSOCIATED HARDWARE.

6.02 REMOVE COUNTERTOPS, BASE AND TOP CABINETS, AND/OR TALL CABINETS, SINK FIXTURE, FAUCET, AND ASSOCIATED HARDWARE. SEE ALSO PLUMBING DRAWING.

6.03 REMOVE COUNTERTOPS, BASE AND TOP CABINETS, AND/OR TALL CABINETS AND ASSOCIATED HARDWARE.

6.04 REMOVE EXISTING MILLWORK, CASEWORK, AND SHELVING.

6.05 REMOVE ENTIRE WOOD STAIR ASSEMBLY, LANDING, FRAMING, HADRAILS, GUARDRAILS AND ALL ASSOCIATED HARDWARE AND FASTENERS.

6.06 REMOVE AND REPAIR EXISTING CORNICE FASCIA AND SOFFIT.

7.01 REMOVE AND DISPOSE OF ALUMINUM DOWNSPOUT.

7.02 REMOVE ENTIRE CANOPY, INCLUDING ROOF DECKING, BEAMS, ROOFING, FASCIAS, FLASHINGS, STEEL COLUMNS, FOUNDATION, FOOTINGS AND ALL ASSOCIATED HARDWARE AND FASTENERS.

8.01 REMOVE WINDOW SYSTEM. INCLUDING FRAMES, GLAZING, PANELS, LOUVERS, SILLS, GASKETS AND ALL ASSOCIATED HARDWARE. CLEAN OPENING TO RECEIVE NEW WINDOW SYSTEM.

8.02 REMOVE GLAZING, FRAMES, SEALANT AND ASSOCIATED HARDWARE.

8.03 REMOVE AND REPLACE INSULATED GLAZING PANEL. REPAIR ASSOCIATED HARDWARE AS NEEDED.

8.04 REMOVE ALUMINUM ENTRANCE SYSTEM, INCLUDING TRANSOM PANEL, DOOR/S, FRAMES, GLAZING, SILLS, SEALANTS AND ALL ASSOCIATED HARDWARE.

8.05 REMOVE DOOR, TRANSOM PANEL, FRAME AND ASSOCIATED HARDWARE. ENLARGE OPENING TO ACCEPT NEW FRAME AND MANEUVERING CLEARANCE REQUIREMENT. COORDINATE WITH SCOPE OF NEW WORK REQUIRED.

8.06 REMOVE DOOR, FRAME AND HARDWARE. CLEAN MASONRY OPENING TO ACCEPT NEW FRAME AND DOOR AS SCHEDULED.

8.07 REMOVE DOOR, FRAME AND HARDWARE. PREPARE JAMBS TO RECEIVE TOOTHED-IN INFILL.

8.08 REMOVE DOOR, FRAME AND HARDWARE.

8.09 REMOVE DOOR, FRAME AND HARDWARE. ENLARGE OPENING TO ACCEPT NEW FRAME AND MANEUVERING CLEARANCE REQUIREMENT. PROVIDE TEMPORARY SHORING AND PERMANENT LINTEL AS REQUIRED. SEE NEW PLANS FOR LOCATION OF NEW DOOR/S.

8.10 REMOVE DOOR, TRANSOM PANEL, FRAME AND ASSOCIATED HARDWARE. CLEAN MASONRY OPENING TO ACCEPT NEW FRAME AND DOOR AS SCHEDULED. COORDINATE WITH SCOPE OF NEW WORK REQUIRED.

8.11 REMOVE AND DISPOSE OF ALUMINUM LOUVER.

9.01 REMOVE AND DISPOSE OF THE FULL EXTENT OF WALL COVED BASE AND VCT OR SHEET FLOORING. CLEAN SUBSTRATE TO ACCEPT NEW SCHEDULED FINISH.

9.02 REMOVE AND DISPOSE OF THE FULL EXTENT OF WALL COVED BASE AND EPOXY FLOORING. CLEAN SUBSTRATE TO ACCEPT NEW SCHEDULED FINISH.

9.03 REMOVE WALL BASE AND CERAMIC FLOORING. CLEAN SUBSTRATE TO ACCEPT NEW SCHEDULED FINISH.

9.04 REMOVE AND DISPOSE PORTION OF THE EXISTING VCT OR SHEET FLOORING. CLEAN SUBSTRATE TO ACCEPT NEW SCHEDULED FINISH. REFER TO ARCHITECTURAL FLOOR PATTERN PLANS FOR REMOVAL COORDINATION.

9.05 REMOVE AND DISPOSE OF THE FULL EXTENT OF EXISTING TERRAZZO FLOORING. PROVIDED NEW SUBSTRATE TO ACCEPT NEW SCHEDULED FINISH. REFER TO ARCHITECTURAL FLOOR PATTERN PLANS FOR REMOVAL COORDINATION.

9.06 REMOVE AND DISPOSE OF ALL EXISTING RUBBER FLOORING, RUBBER STAIR TREADS, AND RISERS. CLEAN SUBSTRATE TO ACCEPT NEW SCHEDULED FINISH.

9.07 REMOVE AND DISPOSE PORTION OF THE EXISTING CARPET. CLEAN SUBSTRATE TO ACCEPT NEW SCHEDULED FINISH. REFER TO ARCHITECTURAL FLOOR PATTERN PLANS FOR REMOVAL COORDINATION.

9.08 REMOVE AND DISPOSE OF ALL SUSPENDED LAY-IN CEILING SYSTEMS INCLUDING ASSOCIATED HANGERS AND ANCHORS. ASSUME PLASTER, GYPSUM BOARD OR BOTH TYPE OF CEILING SYSTEMS MAY BE ABOVE ALL SUSPENDED LAY-IN CEILING SYSTEMS. REMOVE AND DISPOSE OF ALL HARD-SURFACE CEILING SOFFIT AND FRAMING. REFER TO MECHANICAL, PLUMBING AND ELECTRICAL DRAWINGS AND SPECIFICATIONS FOR ADDITIONAL DEMOLITION REQUIREMENTS.

9.09 REMOVE ALL PLASTER CEILING SYSTEMS INCLUDING ASSOCIATED METAL LATH, AND BLOCKING TO THE UNDERSIDE OF FLOOR SLAB ABOVE, UNLESS NOTED OR SHOWN OTHERWISE. REFER TO MECHANICAL, PLUMBING AND ELECTRICAL DRAWINGS AND SPECIFICATIONS FOR ADDITIONAL DEMOLITION REQUIREMENTS.

9.10 REMOVE HARD-SURFACE CEILING/SOFFIT, FRAMING, LOUVERS, DIFFUSERS, SUSPENSION MEMBERS, BRACING AND ALL ASSOCIATED HARDWARE. REFER TO MECHANICAL, PLUMBING AND ELECTRICAL DRAWINGS AND SPECIFICATIONS FOR ADDITIONAL DEMOLITION REQUIREMENTS.

9.11 REMOVE PORTION OF WALL REQUIRED TO ACCESS PLUMBING FOR NEW WATER COOLERS INSTALLATION WHEN APPLICABLE. SEE ALSO NEW FLOOR PLANS.

9.12 REMOVE AND DISPOSE OF ALL MASONRY PLASTER WALL FINISH TO EXPOSE MASONRY CMU WALL.

9.13 REMOVE AND DISPOSE OF ALL WALL TILE FINISH.

10.01 REMOVE TOILET PARTITIONS, DOORS, BRACES AND ALL ASSOCIATED HARDWARE.

10.02 REMOVE METAL LOCKERS, LOCKER METAL BASED, AND ALL ASSOCIATED HARDWARE.

10.03 REMOVE AND SALVAGE METAL LOCKERS, LOCKER METAL BASED, AND ALL ASSOCIATED HARDWARE. CLEAN, REPAIR AS NEEDED, PRIMED AND PAINT FOR INSTALLATION.

10.04 REMOVE TACKBOARDS, BLACK, WHITE BOARDS ON WALL, AND ASSOCIATED HARDWARE.

10.05 REMOVE SWING-UP GRAB BAR AND PATH TILE WALL AS NEEDED.

10.06 REMOVE PORTION OF STAGE: WOOD FLOORING, FRAMING, BASE, CONCRETE SLAB SUBFLOOR, AND ALL ASSOCIATED FASTENERS AND HARDWARE.

10.07 REMOVE SIGNAGE ON WALL AND RETURN TO OWNER.

10.08 REMOVE ARTWORK ON WALL AND RETURN TO OWNER.

12.01 REMOVE WINDOW SHADE SYSTEM AND ASSOCIATED HARDWARE.

22.01 REMOVE WATER CLOSET FIXTURE, CARRIER, PLUMBING VALVE, HARDWARE, GRAB BARS AND ACCESSORIES. SEE ALSO PLUMBING DRAWINGS.

22.02 REMOVE WATER COOLER FIXTURES, CARRIERS AND HARDWARE. SEE ALSO PLUMBING DRAWING.

22.03 REMOVE URINAL FIXTURE AND HARDWARE AND PRIVACY PANELS. SEE ALSO PLUMBING DRAWING.

22.04 REMOVE LAVATORY FIXTURE, CARRIER, HARDWARE, MIRROR AND ACCESSORIES. SEE ALSO PLUMBING DRAWINGS.

22.05 REMOVE PLUMBING FIXTURE AND HARDWARE. SEE ALSO PLUMBING DRAWING.

22.06 REMOVE MOP SINK FIXTURE, CARRIER, AND ACCESSORIES. SEE ALSO PLUMBING DRAWINGS.

23.01 REFER TO MEP DRAWINGS FOR EXTENT OF DEMOLITION.

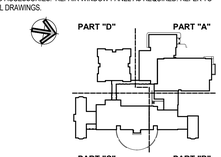
23.02 REMOVE UNIT VENTILATOR UNIT. REFER TO MECHANICAL DRAWINGS.

23.03 REMOVE WALL-MOUNTED FAN COIL UNIT. REFER TO MECHANICAL DRAWINGS.

23.04 REMOVE WALL-MOUNTED LINEAR HYDRONIC HEATER BASEBOARD UNIT AND ALL ASSOCIATED FASTENERS HARDWARE. PATCH WALL AS NEEDED FOR NEW FINISH. REFER TO MECHANICAL DRAWINGS.

23.05 REMOVE WALL-MOUNTED METAL PIPE COVER ENCLOSURE, PIPES AND ALL ASSOCIATED FASTENERS HARDWARE. PATCH WALL AS NEEDED FOR NEW FINISH. REFER TO MECHANICAL DRAWINGS.

23.06 REMOVE AND DISPOSE OF AIR CONDITIONER UNIT FROM WINDOW AND ANY ASSOCIATED ACCESSORIES. REPAIR WINDOW PANEL AS REQUIRED. REFER TO MECHANICAL DRAWINGS.



KEY PLAN

Project Title:
ADDITION & ALTERATIONS TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
311 STATE STREET NEW LONDON CT 06320
203 230 9007 silverpetrucelli.com

Revision: Description: Date: Revised By:

Drawing Title:
EXTERIOR DEMOLITION ELEVATIONS - PART "A"

Date: 8/29/2024
Scale: 1/8" = 1'-0"
Drawn By: JM
Project Number: 22-382

Drawing Number: A061

8/30/2024 7:40:59 AM



2 EAST ELEVATION - PART "B"

1/8" = 1'-0"

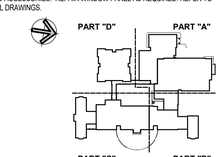


1 NORTH ELEVATON - PART "B"

1/8" = 1'-0"

DEMOLITION KEYNOTES

- 3.01 REMOVE ENTIRE CONCRETE SLAB, SLOPED AND FLAT PORTIONS.
- 3.02 REMOVE CONCRETE OR STONE STAIR OR STEPS, LANDING, FOUNDATION, FOOTINGS, METAL GUARDRAILS, HANDRAILS AND ALL ASSOCIATED HARDWARE AND FASTENERS.
- 3.03 REMOVE CONCRETE OR STONE STAIR OR STEPS, LANDING, HANDRAILS, AND ALL ASSOCIATED HARDWARE AND FASTENERS.
- 4.03 EXISTING TERRAZZO FLOORING TO REMAIN.
- 4.04 PROVIDE NEW OPENING THROUGH EXISTING MASONRY WALL. PROVIDE TEMPORARY SHORING AND PERMANENT LINTEL AT HEAD AS REQUIRED. COORDINATE SIZE OF OPENING WITH DOOR SIZE AND FRAME AS INDICATED ON DOOR SCHEDULE.
- 4.05 CAREFULLY SAWCUT AND REMOVE PORTION OF EXISTING GLAZED TILE BLOCK WAINSCOT WALL TO THE EXTENT INDICATED ON THE DRAWINGS.
- 4.06 REMOVE THIS PORTION OF MASONRY WALL TO ACCOMMODATE NEW LAYOUT. SEE ALSO FLOOR PLAN TO COORDINATE EXACT SIZE OF REMOVAL.
- 4.07 REMOVE GRANITE STONE ENTRY STOOP, GRANITE STONE STAIR STEPS, AND ALL DAMAGED SUBSTRATE STRUCTURAL BASE. SEE LANDSCAPE DRAWINGS FOR MORE INFORMATION.
- 4.08 REMOVE STONE SILL.
- 4.09 PROVIDE NEW OPENING THROUGH EXISTING MASONRY WALL. PROVIDE TEMPORARY SHORING AND PERMANENT LINTEL AT HEAD AS REQUIRED. COORDINATE SIZE OF OPENING WITH WINDOW SIZE, REFER TO WINDOW SCHEDULE.
- 5.01 REMOVE AND REPLACE STEEL LINTEL. SEE STRUCTURAL DRAWINGS.
- 5.02 REMOVE AND DISPOSE OF ALL SIDEWALL AND INTERMEDIATED METAL HANDRAIL, BRACKETS, AND ALL ASSOCIATED HARDWARE. STRIP PAINT AND CLEAN ALL EXISTING METAL GUARDRAILS AND NEWEL POST.
- 5.03 STRUCTURAL COLUMN SHALL BE PROTECTED DURING MASONRY REMOVAL.
- 6.01 REMOVE COUNTERTOPS, BASE AND TOP CABINETS, AND/OR TALL CABINETS AND ASSOCIATED HARDWARE.
- 6.02 REMOVE COUNTERTOPS, BASE AND TOP CABINETS, AND/OR TALL CABINETS, SINK FIXTURE, FAUCET, AND ASSOCIATED HARDWARE. SEE ALSO PLUMBING DRAWING.
- 6.03 REMOVE COUNTERTOPS, BASE AND TOP CABINETS, AND/OR TALL CABINETS AND ASSOCIATED HARDWARE.
- 6.04 REMOVE EXISTING MILLWORK, CASEWORK, AND SHELVING.
- 6.05 REMOVE ENTIRE WOOD STAIR ASSEMBLY, LANDING, FRAMING, HADRAILS, GUARDRAILS AND ALL ASSOCIATED HARDWARE AND FASTENERS.
- 6.06 REMOVE AND REPAIR EXISTING CORNICE FASCIA AND SOFFIT.
- 7.01 REMOVE AND DISPOSE OF ALUMINUM DOWNSPOUT.
- 7.02 REMOVE ENTIRE CANOPY, INCLUDING ROOF DECKING, BEAMS, ROOFING, FASCIAS, FLASHINGS, STEEL COLUMNS, FOUNDATION, FOOTINGS AND ALL ASSOCIATED HARDWARE AND FASTENERS.
- 8.01 REMOVE WINDOW SYSTEM. INCLUDING FRAMES, GLAZING, PANELS, LOUVERS, SILLS, GASKETS AND ALL ASSOCIATED HARDWARE. CLEAN OPENING TO RECEIVE NEW WINDOW SYSTEM.
- 8.02 REMOVE GLAZING, FRAMES, SEALANT AND ASSOCIATED HARDWARE.
- 8.03 REMOVE AND REPLACE INSULATED GLAZING PANEL. REPAIR ASSOCIATED HARDWARE AS NEEDED.
- 8.04 REMOVE ALUMINUM ENTRANCE SYSTEM, INCLUDING TRANSOM PANEL, DOOR/S, FRAMES, GLAZING, SILLS, SEALANTS AND ALL ASSOCIATED HARDWARE.
- 8.05 REMOVE DOOR, TRANSOM PANEL, FRAME AND ASSOCIATED HARDWARE. ENLARGE OPENING TO ACCEPT NEW FRAME AND MANEUVERING CLEARANCE REQUIREMENT. COORDINATE WITH SCOPE OF NEW WORK REQUIRED.
- 8.06 REMOVE DOOR, FRAME AND HARDWARE. CLEAN MASONRY OPENING TO ACCEPT NEW FRAME AND DOOR AS SCHEDULED.
- 8.07 REMOVE DOOR, FRAME AND HARDWARE. PREPARE JAMBS TO RECEIVE TOOTHED-IN INFILL.
- 8.08 REMOVE DOOR, FRAME AND HARDWARE.
- 8.09 REMOVE DOOR, FRAME AND HARDWARE. ENLARGE OPENING TO ACCEPT NEW FRAME AND MANEUVERING CLEARANCE REQUIREMENT. PROVIDE TEMPORARY SHORING AND PERMANENT LINTEL AS REQUIRED. SEE NEW PLANS FOR LOCATION OF NEW DOOR/S.
- 8.10 REMOVE DOOR, TRANSOM PANEL, FRAME AND ASSOCIATED HARDWARE. CLEAN MASONRY OPENING TO ACCEPT NEW FRAME AND DOOR AS SCHEDULED. COORDINATE WITH SCOPE OF NEW WORK REQUIRED.
- 8.11 REMOVE AND DISPOSE OF ALUMINUM LOUVER.
- 9.01 REMOVE AND DISPOSE OF THE FULL EXTENT OF WALL COVED BASE AND VCT OR SHEET FLOORING. CLEAN SUBSTRATE TO ACCEPT NEW SCHEDULED FINISH.
- 9.02 REMOVE AND DISPOSE OF THE FULL EXTENT OF WALL COVED BASE AND EPOXY FLOORING. CLEAN SUBSTRATE TO ACCEPT NEW SCHEDULED FINISH.
- 9.03 REMOVE WALL BASE AND CERAMIC FLOORING. CLEAN SUBSTRATE TO ACCEPT NEW SCHEDULED FINISH .
- 9.04 REMOVE AND DISPOSE PORTION OF THE EXISTING VCT OR SHEET FLOORING. CLEAN SUBSTRATE TO ACCEPT NEW SCHEDULED FINISH. REFER TO ARCHITECTURAL FLOOR PATTERN PLANS FOR REMOVAL COORDINATION.
- 9.05 REMOVE AND DISPOSE OF THE FULL EXTENT OF EXISTING TERRAZZO FLOORING. PROVIDED NEW SUBSTRATE TO ACCEPT NEW SCHEDULED FINISH. REFER TO ARCHITECTURAL FLOOR PATTERN PLANS FOR REMOVAL COORDINATION.
- 9.06 REMOVE AND DISPOSE OF ALL EXISTING RUBBER FLOORING, RUBBER STAIR TREADS, AND RISERS. CLEAN SUBSTRATE TO ACCEPT NEW SCHEDULED FINISH.
- 9.07 REMOVE AND DISPOSE PORTION OF THE EXISTING CARPET. CLEAN SUBSTRATE TO ACCEPT NEW SCHEDULED FINISH. REFER TO ARCHITECTURAL FLOOR PATTERN PLANS FOR REMOVAL COORDINATION.
- 9.08 REMOVE AND DISPOSE OF ALL SUSPENDED LAY-IN CEILING SYSTEMS INCLUDING ASSOCIATED HANGERS AND ANCHORS. ASSUME PLASTER, GYPSUM BOARD OR BOTH TYPE OF CEILING SYSTEMS MAY BE ABOVE ALL SUSPENDED LAY-IN CEILING SYSTEMS. REMOVE AND DISPOSE OF ALL HARD-SURFACE CEILING SOFFIT AND FRAMING. REFER TO MECHANICAL, PLUMBING AND ELECTRICAL DRAWINGS AND SPECIFICATIONS FOR ADDITIONAL DEMOLITION REQUIREMENTS.
- 9.09 REMOVE ALL PLASTER CEILING SYSTEMS INCLUDING ASSOCIATED METAL LATH, AND BLOCKING TO THE UNDERSIDE OF FLOOR SLAB ABOVE, UNLESS NOTED OR SHOWN OTHERWISE. REFER TO MECHANICAL, PLUMBING AND ELECTRICAL DRAWINGS AND SPECIFICATIONS FOR ADDITIONAL DEMOLITION REQUIREMENTS.
- 9.10 REMOVE HARD-SURFACE CEILING/SOFFIT, FRAMING, LOUVERS, DIFFUSERS, SUSPENSION MEMBERS, BRACING AND ALL ASSOCIATED HARDWARE. REFER TO MECHANICAL, PLUMBING AND ELECTRICAL DRAWINGS AND SPECIFICATIONS FOR ADDITIONAL DEMOLITION REQUIREMENTS.
- 9.11 REMOVE PORTION OF WALL REQUIRED TO ACCESS PLUMBING FOR NEW WATER COOLERS INSTALLATION WHEN APPLICABLE. SEE ALSO NEW FLOOR PLANS.
- 9.12 REMOVE AND DISPOSE OF ALL MASONRY PLASTER WALL FINISH TO EXPOSE MASONRY CMU WALL.
- 9.13 REMOVE AND DISPOSE OF ALL WALL TILE FINISH.
- 10.01 REMOVE TOILET PARTITIONS, DOORS, BRACES AND ALL ASSOCIATED HARDWARE.
- 10.02 REMOVE METAL LOCKERS, LOCKER METAL BASED, AND ALL ASSOCIATED HARDWARE.
- 10.03 REMOVE AND SALVAGE METAL LOCKERS, LOCKER METAL BASED, AND ALL ASSOCIATED HARDWARE. CLEAN, REPAIR AS NEEDED, PRIMED AND PAINT FOR INSTALLATION.
- 10.04 REMOVE TACKBOARDS, BLACK, WHITE BOARDS ON WALL, AND ASSOCIATED HARDWARE.
- 10.05 REMOVE SWING-UP GRAB BAR AND PATH TILE WALL AS NEEDED.
- 10.06 REMOVE PORTION OF STAGE: WOOD FLOORING, FRAMING, BASE, CONCRETE SLAB SUB-FLOOR, AND ALL ASSOCIATED FASTENERS AND HARDWARE.
- 10.07 REMOVE SIGNAGE ON WALL AND RETURN TO OWNER.
- 10.08 REMOVE ARTWORK ON WALL AND RETURN TO OWNER.
- 12.01 REMOVE WINDOW SHADE SYSTEM AND ASSOCIATED HARDWARE.
- 22.01 REMOVE WATER CLOSET FIXTURE, CARRIER, PLUMBING VALVE, HARDWARE, GRAB BARS AND ACCESSORIES. SEE ALSO PLUMBING DRAWINGS.
- 22.02 REMOVE WATER COOLER FIXTURES, CARRIERS AND HARDWARE. SEE ALSO PLUMBING DRAWING.
- 22.03 REMOVE URINAL FIXTURE AND HARDWARE AND PRIVACY PANELS. SEE ALSO PLUMBING DRAWING.
- 22.04 REMOVE LAVATORY FIXTURE, CARRIER, HARDWARE, MIRROR AND ACCESSORIES. SEE ALSO PLUMBING DRAWINGS.
- 22.05 REMOVE PLUMBING FIXTURE AND HARDWARE. SEE ALSO PLUMBING DRAWING.
- 22.06 REMOVE MOP SINK FIXTURE, CARRIER, AND ACCESSORIES. SEE ALSO PLUMBING DRAWINGS.
- 23.01 REFER TO MEP DRAWINGS FOR EXTENT OF DEMOLITION.
- 23.02 REMOVE UNIT VENTILATOR UNIT. REFER TO MECHANICAL DRAWINGS.
- 23.03 REMOVE WALL-MOUNTED FAN COIL UNIT. REFER TO MECHANICAL DRAWINGS.
- 23.04 REMOVE WALL-MOUNTED LINEAR HYDRONIC HEATER BASEBOARD UNIT AND ALL ASSOCIATED FASTENERS HARDWARE. PATCH WALL AS NEEDED FOR NEW FINISH. REFER TO MECHANICAL DRAWINGS.
- 23.05 REMOVE WALL-MOUNTED METAL PIPE COVER ENCLOSURE, PIPES AND ALL ASSOCIATED FASTENERS HARDWARE. PATCH WALL AS NEEDED FOR NEW FINISH. REFER TO MECHANICAL DRAWINGS.
- 23.06 REMOVE AND DISPOSE OF AIR CONDITIONER UNIT FROM WINDOW AND ANY ASSOCIATED ACCESSORIES. REPAIR WINDOW PANEL AS REQUIRED. REFER TO MECHANICAL DRAWINGS.



KEY PLAN

Project Title:

ADDITION & ALTERATIONS TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
311 STATE STREET NEW LONDON CT 06320
203 230 9007 silverpetrucelli.com

Revision:	Description:	Date:	Revised By:

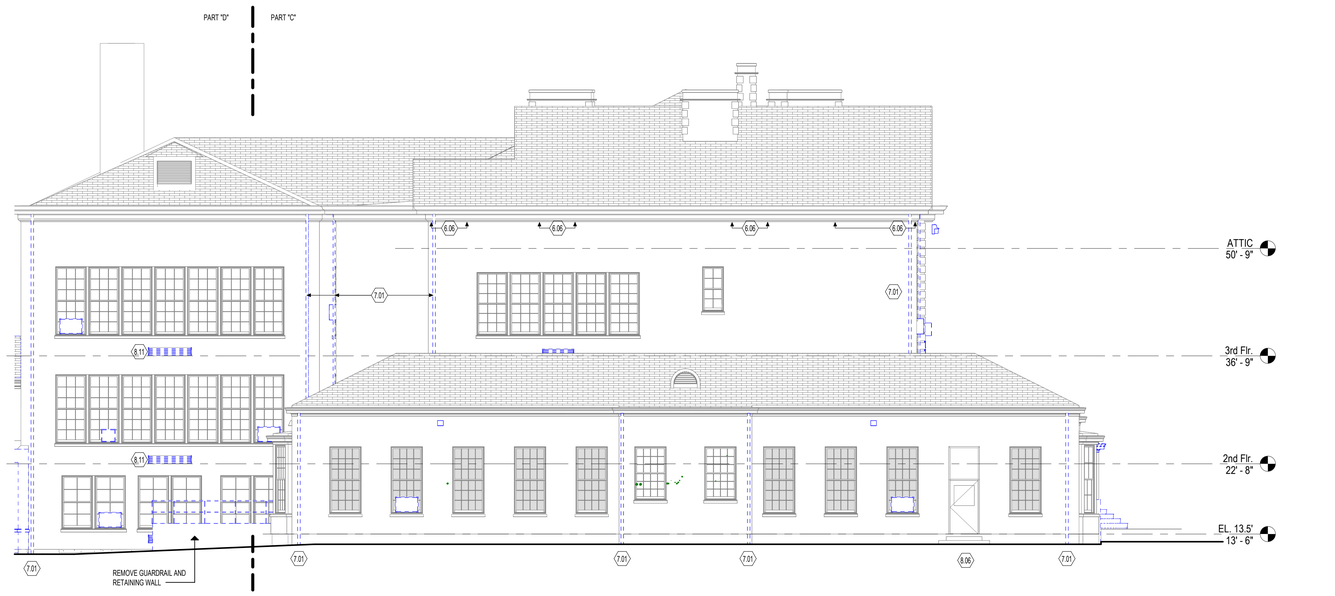
Drawing Title:

EXTERIOR DEMOLITION ELEVATIONS - PART "B"

Date: 8/29/2024
Scale: 1/8" = 1'-0"
Drawn By: JM
Project Number: 22-382

Drawing Number: A062

8/30/2024 7:41:09 AM



2 SOUTH ELEVATION - PART "C"
1/8" = 1'-0"



1 EAST ELEVATION - PART "C"
1/8" = 1'-0"

DEMOLITION KEYNOTES

3.01 REMOVE ENTIRE CONCRETE SLAB, SLOPED AND FLAT PORTIONS.

3.02 REMOVE CONCRETE OR STONE STAIR OR STEPS, LANDING, FOUNDATION, FOOTINGS, METAL GUARDRAILS, HANDRAILS AND ALL ASSOCIATED HARDWARE AND FASTENERS.

3.03 REMOVE CONCRETE OR STONE STAIR OR STEPS, LANDING, HANDRAILS, AND ALL ASSOCIATED HARDWARE AND FASTENERS.

4.03 EXISTING TERRAZZO FLOORING TO REMAIN.

4.04 PROVIDE NEW OPENING THROUGH EXISTING MASONRY WALL. PROVIDE TEMPORARY SHORING AND PERMANENT LINTEL AT HEAD AS REQUIRED. COORDINATE SIZE OF OPENING WITH DOOR SIZE AND FRAME AS INDICATED ON DOOR SCHEDULE.

4.05 CAREFULLY SAWCUT AND REMOVE PORTION OF EXISTING GLAZED TILE BLOCK WAINSCOT WALL TO THE EXTENT INDICATED ON THE DRAWINGS.

4.06 REMOVE THIS PORTION OF MASONRY WALL TO ACCOMMODATE NEW LAYOUT. SEE ALSO FLOOR PLAN TO COORDINATE EXACT SIZE OF REMOVAL.

4.07 REMOVE GRANITE STONE ENTRY STOOP, GRANITE STONE STAIR STEPS, AND ALL DAMAGED SUBSTRATE STRUCTURAL BASE. SEE LANDSCAPE DRAWINGS FOR MORE INFORMATION.

4.08 REMOVE STONE SILL.

4.09 PROVIDE NEW OPENING THROUGH EXISTING MASONRY WALL. PROVIDE TEMPORARY SHORING AND PERMANENT LINTEL AT HEAD AS REQUIRED. COORDINATE SIZE OF OPENING WITH WINDOW SIZE, REFER TO WINDOW SCHEDULE.

5.01 REMOVE AND REPLACE STEEL LINTEL. SEE STRUCTURAL DRAWINGS.

5.02 REMOVE AND DISPOSE OF ALL SIDEWALL AND INTERMEDIATED METAL HANDRAIL, BRACKETS, AND ALL ASSOCIATED HARDWARE. STRIP PAINT AND CLEAN ALL EXISTING METAL GUARDRAILS AND NEWEL POST.

5.03 STRUCTURAL COLUMN SHALL BE PROTECTED DURING MASONRY REMOVAL.

6.01 REMOVE COUNTERTOPS, BASE AND TOP CABINETS, AND/OR TALL CABINETS AND ASSOCIATED HARDWARE.

6.02 REMOVE COUNTERTOPS, BASE AND TOP CABINETS, AND/OR TALL CABINETS, SINK FIXTURE, FAUCET, AND ASSOCIATED HARDWARE. SEE ALSO PLUMBING DRAWING.

6.03 REMOVE COUNTERTOPS, BASE AND TOP CABINETS, AND/OR TALL CABINETS AND ASSOCIATED HARDWARE.

6.04 REMOVE EXISTING MILLWORK, CASEWORK, AND SHELVING.

6.05 REMOVE ENTIRE WOOD STAIR ASSEMBLY, LANDING, FRAMING, HADRAILS, GUARDRAILS AND ALL ASSOCIATED HARDWARE AND FASTENERS.

6.06 REMOVE AND REPAIR EXISTING CORNICE FASCIA AND SOFFIT.

7.01 REMOVE AND DISPOSE OF ALUMINUM DOWNSPOUT.

7.02 REMOVE ENTIRE CANOPY, INCLUDING ROOF DECKING, BEAMS, ROOFING, FASCIAS, FLASHINGS, STEEL COLUMNS, FOUNDATION, FOOTINGS AND ALL ASSOCIATED HARDWARE AND FASTENERS.

8.01 REMOVE WINDOW SYSTEM. INCLUDING FRAMES, GLAZING, PANELS, LOUVERS, SILLS, GASKETS AND ALL ASSOCIATED HARDWARE. CLEAN OPENING TO RECEIVE NEW WINDOW SYSTEM.

8.02 REMOVE GLAZING, FRAMES, SEALANT AND ASSOCIATED HARDWARE.

8.03 REMOVE AND REPLACE INSULATED GLAZING PANEL. REPAIR ASSOCIATED HARDWARE AS NEEDED.

8.04 REMOVE ALUMINUM ENTRANCE SYSTEM, INCLUDING TRANSOM PANEL, DOOR/S, FRAMES, GLAZING, SILLS, SEALANTS AND ALL ASSOCIATED HARDWARE.

8.05 REMOVE DOOR, TRANSOM PANEL, FRAME AND ASSOCIATED HARDWARE. ENLARGE OPENING TO ACCEPT NEW FRAME AND MANEUVERING CLEARANCE REQUIREMENT. COORDINATE WITH SCOPE OF NEW WORK REQUIRED.

8.06 REMOVE DOOR, FRAME AND HARDWARE. CLEAN MASONRY OPENING TO ACCEPT NEW FRAME AND DOOR AS SCHEDULED.

8.07 REMOVE DOOR, FRAME AND HARDWARE. PREPARE JAMBS TO RECEIVE TOOTHED-IN INFILL.

8.08 REMOVE DOOR, FRAME AND HARDWARE.

8.09 REMOVE DOOR, FRAME AND HARDWARE. ENLARGE OPENING TO ACCEPT NEW FRAME AND MANEUVERING CLEARANCE REQUIREMENT. PROVIDE TEMPORARY SHORING AND PERMANENT LINTEL AS REQUIRED. SEE NEW PLANS FOR LOCATION OF NEW DOOR/S.

8.10 REMOVE DOOR, TRANSOM PANEL, FRAME AND ASSOCIATED HARDWARE. CLEAN MASONRY OPENING TO ACCEPT NEW FRAME AND DOOR AS SCHEDULED. COORDINATE WITH SCOPE OF NEW WORK REQUIRED.

8.11 REMOVE AND DISPOSE OF ALUMINUM LOUVER.

9.01 REMOVE AND DISPOSE OF THE FULL EXTENT OF WALL COVED BASE AND VCT OR SHEET FLOORING. CLEAN SUBSTRATE TO ACCEPT NEW SCHEDULED FINISH.

9.02 REMOVE AND DISPOSE OF THE FULL EXTENT OF WALL COVED BASE AND EPOXY FLOORING. CLEAN SUBSTRATE TO ACCEPT NEW SCHEDULED FINISH.

9.03 REMOVE WALL BASE AND CERAMIC FLOORING. CLEAN SUBSTRATE TO ACCEPT NEW SCHEDULED FINISH .

9.04 REMOVE AND DISPOSE PORTION OF THE EXISTING VCT OR SHEET FLOORING. CLEAN SUBSTRATE TO ACCEPT NEW SCHEDULED FINISH. REFER TO ARCHITECTURAL FLOOR PATTERN PLANS FOR REMOVAL COORDINATION.

9.05 REMOVE AND DISPOSE OF THE FULL EXTENT OF EXISTING TERRAZZO FLOORING. PROVIDED NEW SUBSTRATE TO ACCEPT NEW SCHEDULED FINISH. REFER TO ARCHITECTURAL FLOOR PATTERN PLANS FOR REMOVAL COORDINATION.

9.06 REMOVE AND DISPOSE OF ALL EXISTING RUBBER FLOORING, RUBBER STAIR TREADS, AND RISERS. CLEAN SUBSTRATE TO ACCEPT NEW SCHEDULED FINISH.

9.07 REMOVE AND DISPOSE PORTION OF THE EXISTING CARPET. CLEAN SUBSTRATE TO ACCEPT NEW SCHEDULED FINISH. REFER TO ARCHITECTURAL FLOOR PATTERN PLANS FOR REMOVAL COORDINATION.

9.08 REMOVE AND DISPOSE OF ALL SUSPENDED LAY-IN CEILING SYSTEMS INCLUDING ASSOCIATED HANGERS AND ANCHORS. ASSUME PLASTER, GYPSUM BOARD OR BOTH TYPE OF CEILING SYSTEMS MAY BE ABOVE ALL SUSPENDED LAY-IN CEILING SYSTEMS. REMOVE AND DISPOSE OF ALL HARD-SURFACE CEILING SOFFIT AND FRAMING. REFER TO MECHANICAL, PLUMBING AND ELECTRICAL DRAWINGS AND SPECIFICATIONS FOR ADDITIONAL DEMOLITION REQUIREMENTS.

9.09 REMOVE ALL PLASTER CEILING SYSTEMS INCLUDING ASSOCIATED METAL LATH, AND BLOCKING TO THE UNDERSIDE OF FLOOR SLAB ABOVE, UNLESS NOTED OR SHOWN OTHERWISE. REFER TO MECHANICAL, PLUMBING AND ELECTRICAL DRAWINGS AND SPECIFICATIONS FOR ADDITIONAL DEMOLITION REQUIREMENTS.

9.10 REMOVE HARD-SURFACE CEILING/SOFFIT, FRAMING, LOUVERS, DIFFUSERS, SUSPENSION MEMBERS, BRACING AND ALL ASSOCIATED HARDWARE. REFER TO MECHANICAL, PLUMBING AND ELECTRICAL DRAWINGS AND SPECIFICATIONS FOR ADDITIONAL DEMOLITION REQUIREMENTS.

9.11 REMOVE PORTION OF WALL REQUIRED TO ACCESS PLUMBING FOR NEW WATER COOLERS INSTALLATION WHEN APPLICABLE. SEE ALSO NEW FLOOR PLANS.

9.12 REMOVE AND DISPOSE OF ALL MASONRY PLASTER WALL FINISH TO EXPOSE MASONRY CMU WALL.

9.13 REMOVE AND DISPOSE OF ALL WALL TILE FINISH.

10.01 REMOVE TOILET PARTITIONS, DOORS, BRACES AND ALL ASSOCIATED HARDWARE.

10.02 REMOVE METAL LOCKERS, LOCKER METAL BASED, AND ALL ASSOCIATED HARDWARE.

10.03 REMOVE AND SALVAGE METAL LOCKERS, LOCKER METAL BASED, AND ALL ASSOCIATED HARDWARE. CLEAN, REPAIR AS NEEDED, PRIMED AND PAINT FOR INSTALLATION.

10.04 REMOVE TACKBOARDS, BLACK, WHITE BOARDS ON WALL, AND ASSOCIATED HARDWARE.

10.05 REMOVE SWING-UP GRAB BAR AND PATH TILE WALL AS NEEDED.

10.06 REMOVE PORTION OF STAGE: WOOD FLOORING, FRAMING, BASE, CONCRETE SLAB SUBFLOOR, AND ALL ASSOCIATED FASTENERS AND HARDWARE.

10.07 REMOVE SIGNAGE ON WALL AND RETURN TO OWNER.

10.08 REMOVE ARTWORK ON WALL AND RETURN TO OWNER.

12.01 REMOVE WINDOW SHADE SYSTEM AND ASSOCIATED HARDWARE.

22.01 REMOVE WATER CLOSET FIXTURE, CARRIER, PLUMBING VALVE, HARDWARE, GRAB BARS AND ACCESSORIES. SEE ALSO PLUMBING DRAWINGS.

22.02 REMOVE WATER COOLER FIXTURES, CARRIERS AND HARDWARE. SEE ALSO PLUMBING DRAWING.

22.03 REMOVE URINAL FIXTURE AND HARDWARE AND PRIVACY PANELS. SEE ALSO PLUMBING DRAWING.

22.04 REMOVE LAVATORY FIXTURE, CARRIER, HARDWARE, MIRROR AND ACCESSORIES. SEE ALSO PLUMBING DRAWINGS.

22.05 REMOVE PLUMBING FIXTURE AND HARDWARE. SEE ALSO PLUMBING DRAWING.

22.06 REMOVE MOP SINK FIXTURE, CARRIER, AND ACCESSORIES. SEE ALSO PLUMBING DRAWINGS.

23.01 REFER TO MEP DRAWINGS FOR EXTENT OF DEMOLITION.

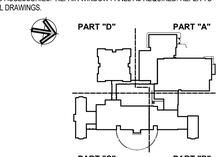
23.02 REMOVE UNIT VENTILATOR UNIT. REFER TO MECHANICAL DRAWINGS.

23.03 REMOVE WALL-MOUNTED FAN COIL UNIT. REFER TO MECHANICAL DRAWINGS.

23.04 REMOVE WALL-MOUNTED LINEAR HYDRONIC HEATER BASEBOARD UNIT AND ALL ASSOCIATED FASTENERS HARDWARE. PATCH WALL AS NEEDED FOR NEW FINISH. REFER TO MECHANICAL DRAWINGS.

23.05 REMOVE WALL-MOUNTED METAL PIPE COVER ENCLOSURE, PIPES AND ALL ASSOCIATED FASTENERS HARDWARE. PATCH WALL AS NEEDED FOR NEW FINISH. REFER TO MECHANICAL DRAWINGS.

23.06 REMOVE AND DISPOSE OF AIR CONDITIONER UNIT FROM WINDOW AND ANY ASSOCIATED ACCESSORIES. REPAIR WINDOW PANEL AS REQUIRED. REFER TO MECHANICAL DRAWINGS.



KEY PLAN

Project Title:

ADDITION & ALTERATIONS TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
311 STATE STREET NEW LONDON CT 06320
203 230 9007 silverpetrucelli.com

Revision:	Description:	Date:	Revised By:

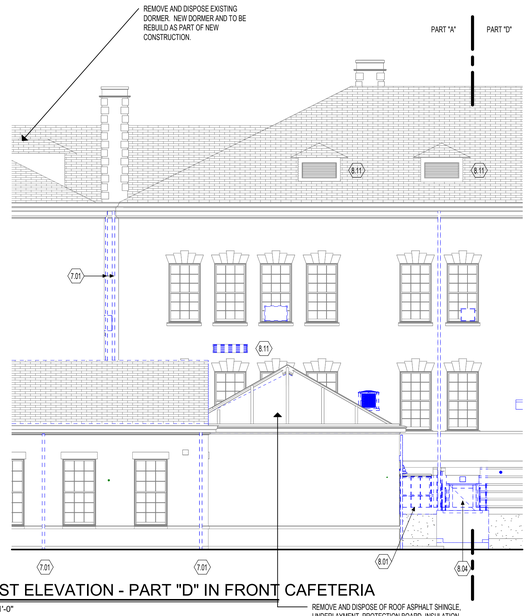
Drawing Title:

EXTERIOR DEMOLITION ELEVATIONS - PART "C"

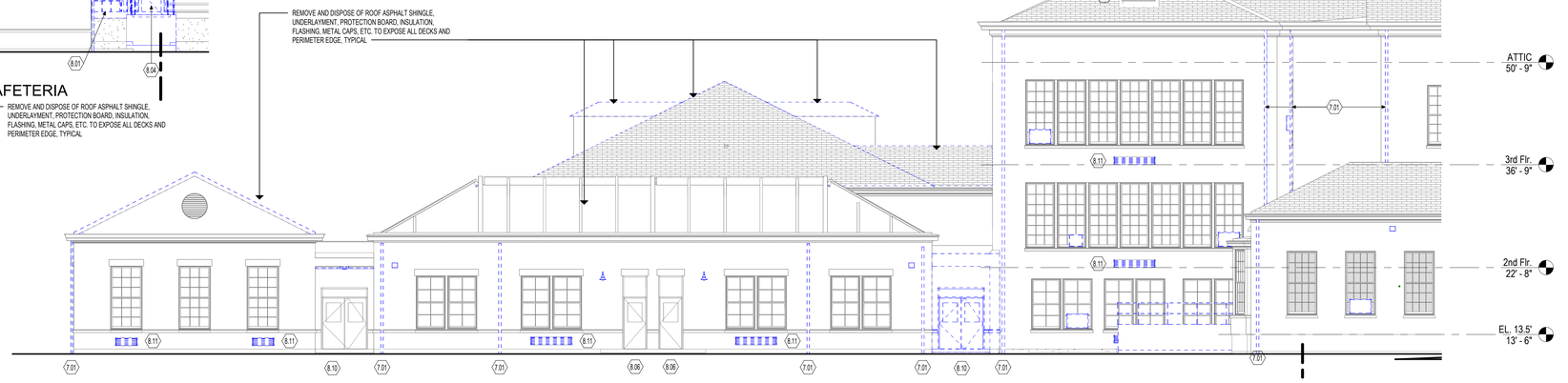
Date: 8/29/2024
Scale: 1/8" = 1'-0"
Drawn By: JM
Project Number: 22-382

Drawing Number: A063

8/30/2024 7:41:20 AM



3 WEST ELEVATION - PART "D" IN FRONT CAFETERIA
1/8" = 1'-0"



2 SOUTH ELEVATION - PART "D"
1/8" = 1'-0"



1 WEST ELEVATION - PART "D"
1/8" = 1'-0"

DEMOLITION KEYNOTES

3.01 REMOVE ENTIRE CONCRETE SLAB, SLOPED AND FLAT PORTIONS.
3.02 REMOVE CONCRETE OR STONE STAIR OR STEPS, LANDING, FOUNDATION, FOOTINGS, METAL GUARDRAILS, HANDRAILS AND ALL ASSOCIATED HARDWARE AND FASTENERS.
3.03 REMOVE CONCRETE OR STONE STAIR OR STEPS, LANDING, HANDRAILS, AND ALL ASSOCIATED HARDWARE AND FASTENERS.
4.03 EXISTING TERRAZZO FLOORING TO REMAIN.
4.04 PROVIDE NEW OPENING THROUGH EXISTING MASONRY WALL. PROVIDE TEMPORARY SHORING AND PERMANENT LINTEL AT HEAD AS REQUIRED. COORDINATE SIZE OF OPENING WITH DOOR SIZE AND FRAME AS INDICATED ON DOOR SCHEDULE.
4.05 CAREFULLY SAWCUT AND REMOVE PORTION OF EXISTING GLAZED TILE BLOCK WAINSCOT WALL TO THE EXTENT INDICATED ON THE DRAWINGS.
4.06 REMOVE THIS PORTION OF MASONRY WALL TO ACCOMMODATE NEW LAYOUT. SEE ALSO FLOOR PLAN TO COORDINATE EXACT SIZE OF REMOVAL.
4.07 REMOVE GRANITE STONE ENTRY STOOP, GRANITE STONE STAIR STEPS, AND ALL DAMAGED SUBSTRATE STRUCTURAL BASE. SEE LANDSCAPE DRAWINGS FOR MORE INFORMATION.
4.08 REMOVE STONE SILL.
4.09 PROVIDE NEW OPENING THROUGH EXISTING MASONRY WALL. PROVIDE TEMPORARY SHORING AND PERMANENT LINTEL AT HEAD AS REQUIRED. COORDINATE SIZE OF OPENING WITH WINDOW SIZE, REFER TO WINDOW SCHEDULE.
5.01 REMOVE AND REPLACE STEEL LINTEL. SEE STRUCTURAL DRAWINGS.
5.02 REMOVE AND DISPOSE OF ALL SIDEWALL AND INTERMEDIATED METAL HANDRAIL, BRACKETS, AND ALL ASSOCIATED HARDWARE. STRIP PAINT AND CLEAN ALL EXISTING METAL GUARDRAILS AND NEWEL POST.
5.03 STRUCTURAL COLUMN SHALL BE PROTECTED DURING MASONRY REMOVAL.
6.01 REMOVE COUNTERTOPS, BASE AND TOP CABINETS, AND/OR TALL CABINETS AND ASSOCIATED HARDWARE.
6.02 REMOVE COUNTERTOPS, BASE AND TOP CABINETS, AND/OR TALL CABINETS, SINK FIXTURE, FAUCET, AND ASSOCIATED HARDWARE. SEE ALSO PLUMBING DRAWING.
6.03 REMOVE COUNTERTOPS, BASE AND TOP CABINETS, AND/OR TALL CABINETS AND ASSOCIATED HARDWARE.
6.04 REMOVE EXISTING MILLWORK, CASEWORK, AND SHELVING.
6.05 REMOVE ENTIRE WOOD STAIR ASSEMBLY, LANDING, FRAMING, HADRAILS, GUARDRAILS AND ALL ASSOCIATED HARDWARE AND FASTENERS.
6.06 REMOVE AND REPAIR EXISTING CORNICE FASCIA AND SOFFIT.
7.01 REMOVE AND DISPOSE OF ALUMINUM DOWNSPOUT.
7.02 REMOVE ENTIRE CANOPY, INCLUDING ROOF DECKING, BEAMS, ROOFING, FASCIAS, FLASHINGS, STEEL COLUMNS, FOUNDATION, FOOTINGS AND ALL ASSOCIATED HARDWARE AND FASTENERS.
8.01 REMOVE WINDOW SYSTEM. INCLUDING FRAMES, GLAZING, PANELS, LOUVERS, SILLS, GASKETS AND ALL ASSOCIATED HARDWARE. CLEAN OPENING TO RECEIVE NEW WINDOW SYSTEM.
8.02 REMOVE GLAZING, FRAMES, SEALANT AND ASSOCIATED HARDWARE.
8.03 REMOVE AND REPLACE INSULATED GLAZING PANEL. REPAIR ASSOCIATED HARDWARE AS NEEDED.
8.04 REMOVE ALUMINUM ENTRANCE SYSTEM, INCLUDING TRANSOM PANEL, DOOR/S, FRAMES, GLAZING, SILLS, SEALANTS AND ALL ASSOCIATED HARDWARE.
8.05 REMOVE DOOR, TRANSOM PANEL, FRAME AND ASSOCIATED HARDWARE. ENLARGE OPENING TO ACCEPT NEW FRAME AND MANEUVERING CLEARANCE REQUIREMENT. COORDINATE WITH SCOPE OF NEW WORK REQUIRED.
8.06 REMOVE DOOR, FRAME AND HARDWARE. CLEAN MASONRY OPENING TO ACCEPT NEW FRAME AND DOOR AS SCHEDULED.
8.07 REMOVE DOOR, FRAME AND HARDWARE. PREPARE JAMBS TO RECEIVE TOOTHED-IN INFILL.
8.08 REMOVE DOOR, FRAME AND HARDWARE.
8.09 REMOVE DOOR, FRAME AND HARDWARE. ENLARGE OPENING TO ACCEPT NEW FRAME AND MANEUVERING CLEARANCE REQUIREMENT. PROVIDE TEMPORARY SHORING AND PERMANENT LINTEL AS REQUIRED. SEE NEW PLANS FOR LOCATION OF NEW DOOR/S.
8.10 REMOVE DOOR, TRANSOM PANEL, FRAME AND ASSOCIATED HARDWARE. CLEAN MASONRY OPENING TO ACCEPT NEW FRAME AND DOOR AS SCHEDULED. COORDINATE WITH SCOPE OF NEW WORK REQUIRED.
8.11 REMOVE AND DISPOSE OF ALUMINUM LOUVER.
9.01 REMOVE AND DISPOSE OF THE FULL EXTENT OF WALL COVED BASE AND VCT OR SHEET FLOORING. CLEAN SUBSTRATE TO ACCEPT NEW SCHEDULED FINISH.
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9.03 REMOVE WALL BASE AND CERAMIC FLOORING. CLEAN SUBSTRATE TO ACCEPT NEW SCHEDULED FINISH.
9.04 REMOVE AND DISPOSE PORTION OF THE EXISTING VCT OR SHEET FLOORING. CLEAN SUBSTRATE TO ACCEPT NEW SCHEDULED FINISH. REFER TO ARCHITECTURAL FLOOR PATTERN PLANS FOR REMOVAL COORDINATION.
9.05 REMOVE AND DISPOSE OF THE FULL EXTENT OF EXISTING TERRAZZO FLOORING. PROVIDED NEW SUBSTRATE TO ACCEPT NEW SCHEDULED FINISH. REFER TO ARCHITECTURAL FLOOR PATTERN PLANS FOR REMOVAL COORDINATION.
9.06 REMOVE AND DISPOSE OF ALL EXISTING RUBBER FLOORING, RUBBER STAIR TREADS, AND RISERS. CLEAN SUBSTRATE TO ACCEPT NEW SCHEDULED FINISH.
9.07 REMOVE AND DISPOSE PORTION OF THE EXISTING CARPET. CLEAN SUBSTRATE TO ACCEPT NEW SCHEDULED FINISH. REFER TO ARCHITECTURAL FLOOR PATTERN PLANS FOR REMOVAL COORDINATION.
9.08 REMOVE AND DISPOSE OF ALL SUSPENDED LAY-IN CEILING SYSTEMS INCLUDING ASSOCIATED HANGERS AND ANCHORS. ASSUME PLASTER, GYPSUM BOARD OR BOTH TYPE OF CEILING SYSTEMS MAY BE ABOVE ALL SUSPENDED LAY-IN CEILING SYSTEMS. REMOVE AND DISPOSE OF ALL HARD-SURFACE CEILING SOFFIT AND FRAMING. REFER TO MECHANICAL, PLUMBING AND ELECTRICAL DRAWINGS AND SPECIFICATIONS FOR ADDITIONAL DEMOLITION REQUIREMENTS.
9.09 REMOVE ALL PLASTER CEILING SYSTEMS INCLUDING ASSOCIATED METAL LATH, AND BLOCKING TO THE UNDERSIDE OF FLOOR SLAB ABOVE, UNLESS NOTED OR SHOWN OTHERWISE. REFER TO MECHANICAL, PLUMBING AND ELECTRICAL DRAWINGS AND SPECIFICATIONS FOR ADDITIONAL DEMOLITION REQUIREMENTS.
9.10 REMOVE HARD-SURFACE CEILING/SOFFIT, FRAMING, LOUVERS, DIFFUSERS, SUSPENSION MEMBERS, BRACING AND ALL ASSOCIATED HARDWARE. REFER TO MECHANICAL, PLUMBING AND ELECTRICAL DRAWINGS AND SPECIFICATIONS FOR ADDITIONAL DEMOLITION REQUIREMENTS.
9.11 REMOVE PORTION OF WALL REQUIRED TO ACCESS PLUMBING FOR NEW WATER COOLERS INSTALLATION WHEN APPLICABLE. SEE ALSO NEW FLOOR PLANS.
9.12 REMOVE AND DISPOSE OF ALL MASONRY PLASTER WALL FINISH TO EXPOSE MASONRY CMU WALL.
9.13 REMOVE AND DISPOSE OF ALL WALL TILE FINISH.
10.01 REMOVE TOILET PARTITIONS, DOORS, BRACES AND ALL ASSOCIATED HARDWARE.
10.02 REMOVE METAL LOCKERS, LOCKER METAL BASED, AND ALL ASSOCIATED HARDWARE.
10.03 REMOVE AND SALVAGE METAL LOCKERS, LOCKER METAL BASED, AND ALL ASSOCIATED HARDWARE. CLEAN, REPAIR AS NEEDED, PRIMED AND PAINT FOR INSTALLATION.
10.04 REMOVE TACKBOARDS, BLACK, WHITE BOARDS ON WALL, AND ASSOCIATED HARDWARE.
10.05 REMOVE SWING-UP GRAB BAR AND PATH TILE WALL AS NEEDED.
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23.06 REMOVE AND DISPOSE OF AIR CONDITIONER UNIT FROM WINDOW AND ANY ASSOCIATED ACCESSORIES. REPAIR WINDOW PANEL AS REQUIRED. REFER TO MECHANICAL DRAWINGS.

Project Title:
ADDITION & ALTERATIONS TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
311 STATE STREET NEW LONDON CT 06320
203 230 9007 silverpetrucelli.com

Revision: Description: Date: Revised By:

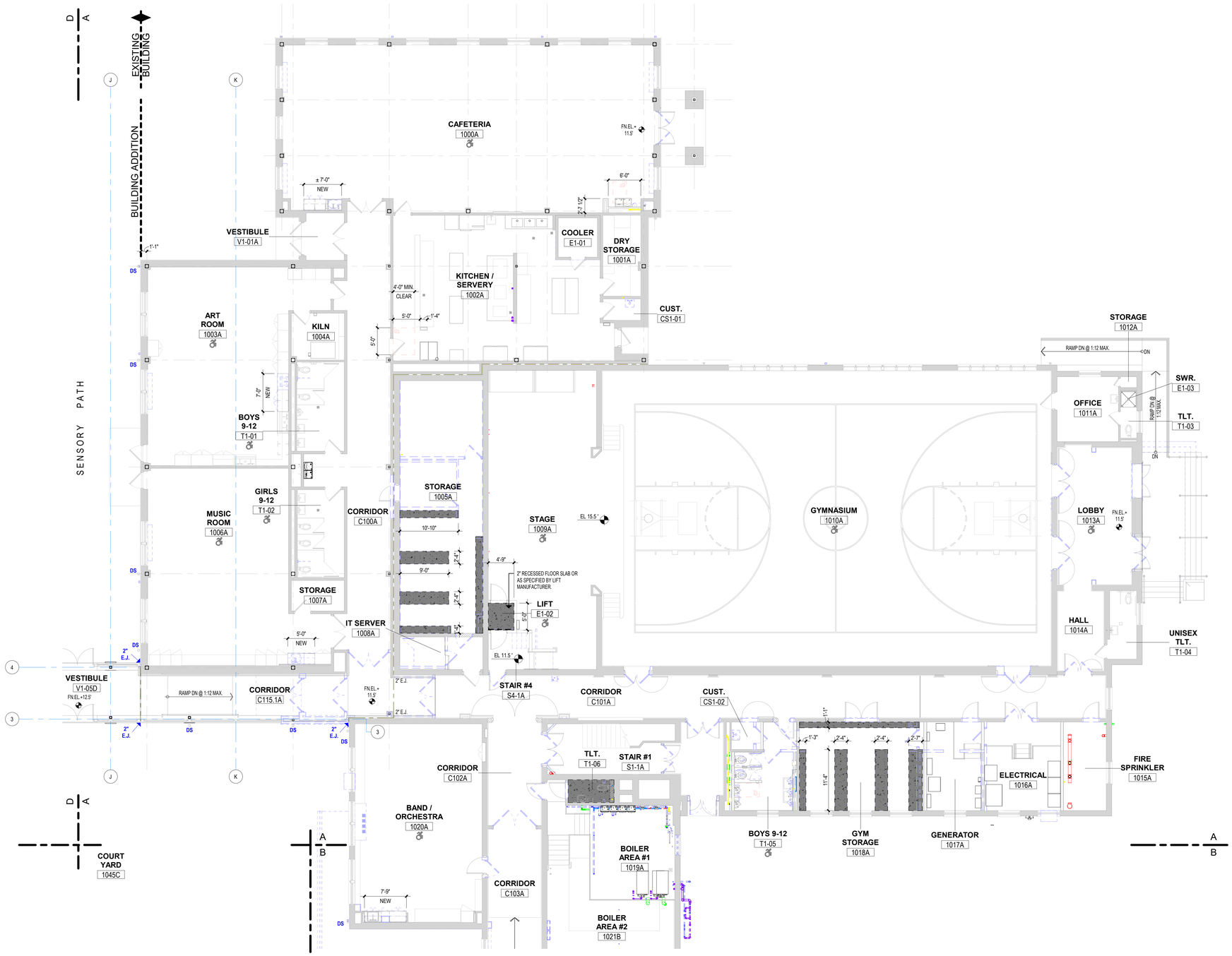
Drawing Title:
EXTERIOR DEMOLITION ELEVATIONS - PART "D"

Date: 8/29/2024
Scale: 1/8" = 1'-0"
Drawn By: JM
Project Number: 22-382
Drawing Number: A064

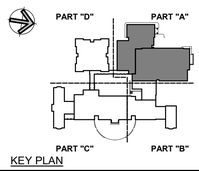
8/30/2024 7:41:33 AM

SLAB INFILL LEGEND:

- DEMOLITION SCOPE
- WOOD FRAMING INFILL. REFER TO STRUCTURAL DRAWINGS FOR MORE INFORMATION.
- CONCRETE SLAB INFILL. REFER TO STRUCTURAL DRAWINGS FOR MORE INFORMATION.



1 1st FLR - SLAB INFILL CONDITION - PART "A"
1/8" = 1'-0"



KEY PLAN

Project Title:
ADDITION & ALTERATIONS TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
311 STATE STREET NEW LONDON CT 06320
203 230 9007 silverpetrucelli.com

Revision:	Description:	Date:	Revised By:

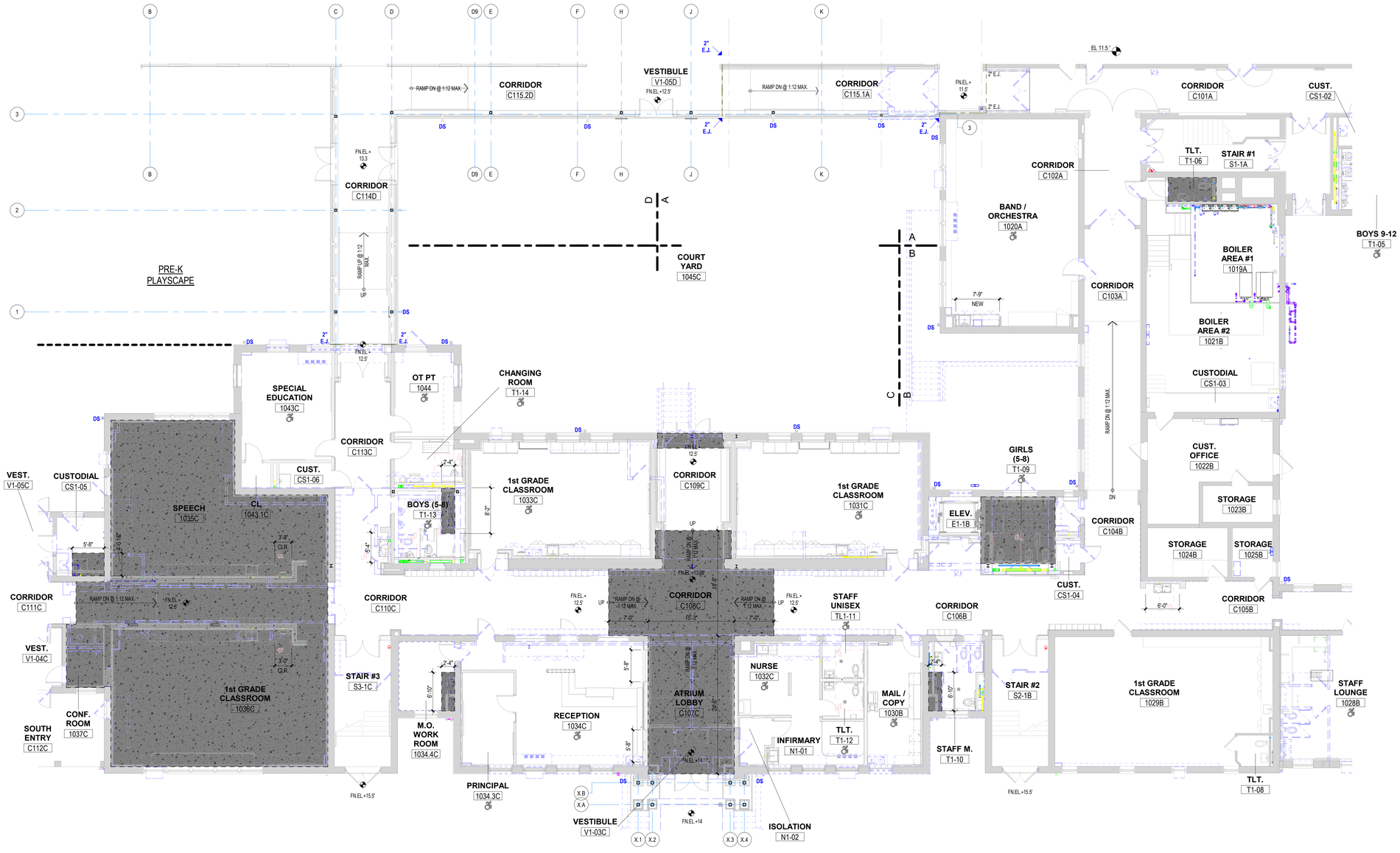
Drawing Title:
FIRST FLOOR - NEW SLAB INFILL CONDITION - PART "A"

Date: 8/29/2024
Scale: As indicated
Drawn By: JM
Project Number: 22-382
Drawing Number: A101

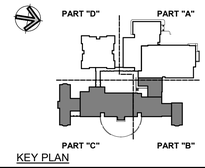
8/30/2024 7:41:45 AM

SLAB INFILL LEGEND:

- DEMOLITION SCOPE
- WOOD FRAMING INFILL. REFER TO STRUCTURAL DRAWINGS FOR MORE INFORMATION.
- CONCRETE SLAB INFILL. REFER TO STRUCTURAL DRAWINGS FOR MORE INFORMATION.



1 1st FLR - SLAB INFILL CONDITION - PART "B & C"
1/8" = 1'-0"



KEY PLAN

Project Title:
ADDITION & ALTERATIONS TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
311 STATE STREET NEW LONDON CT 06320
203 230 9007 silverpetrucelli.com

Revision:	Description:	Date:	Revised By:

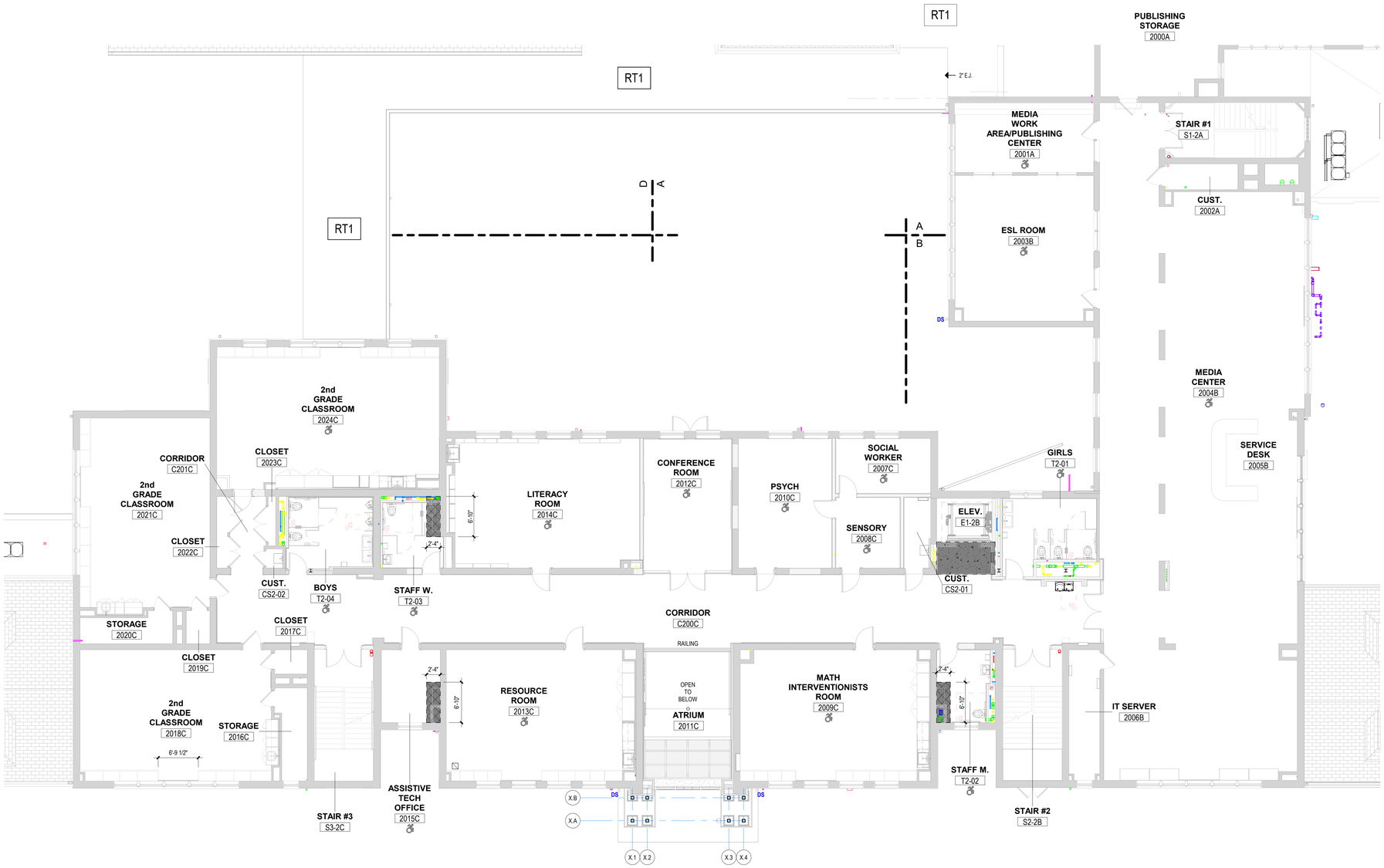
Drawing Title:
FIRST FLOOR - NEW SLAB INFILL CONDITION - PART "B & C"

Date: 8/29/2024
Scale: As indicated
Drawn By: JM
Project Number: 22-382
Drawing Number: A102

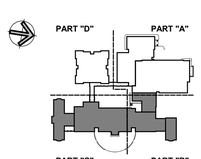
8/30/2024 7:41:57 AM

SLAB INFILL LEGEND:

- DEMOLITION SCOPE
- WOOD FRAMING INFILL. REFER TO STRUCTURAL DRAWINGS FOR MORE INFORMATION.
- CONCRETE SLAB INFILL. REFER TO STRUCTURAL DRAWINGS FOR MORE INFORMATION.



1 2nd FLR - SLAB INFILL CONDITION - PART "B & C"
1/8" = 1'-0"



KEY PLAN

Project Title:
ADDITION & ALTERATIONS TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
311 STATE STREET NEW LONDON CT 06320
203 230 9007 silverpetrucelli.com

Revision:	Description:	Date:	Revised By:

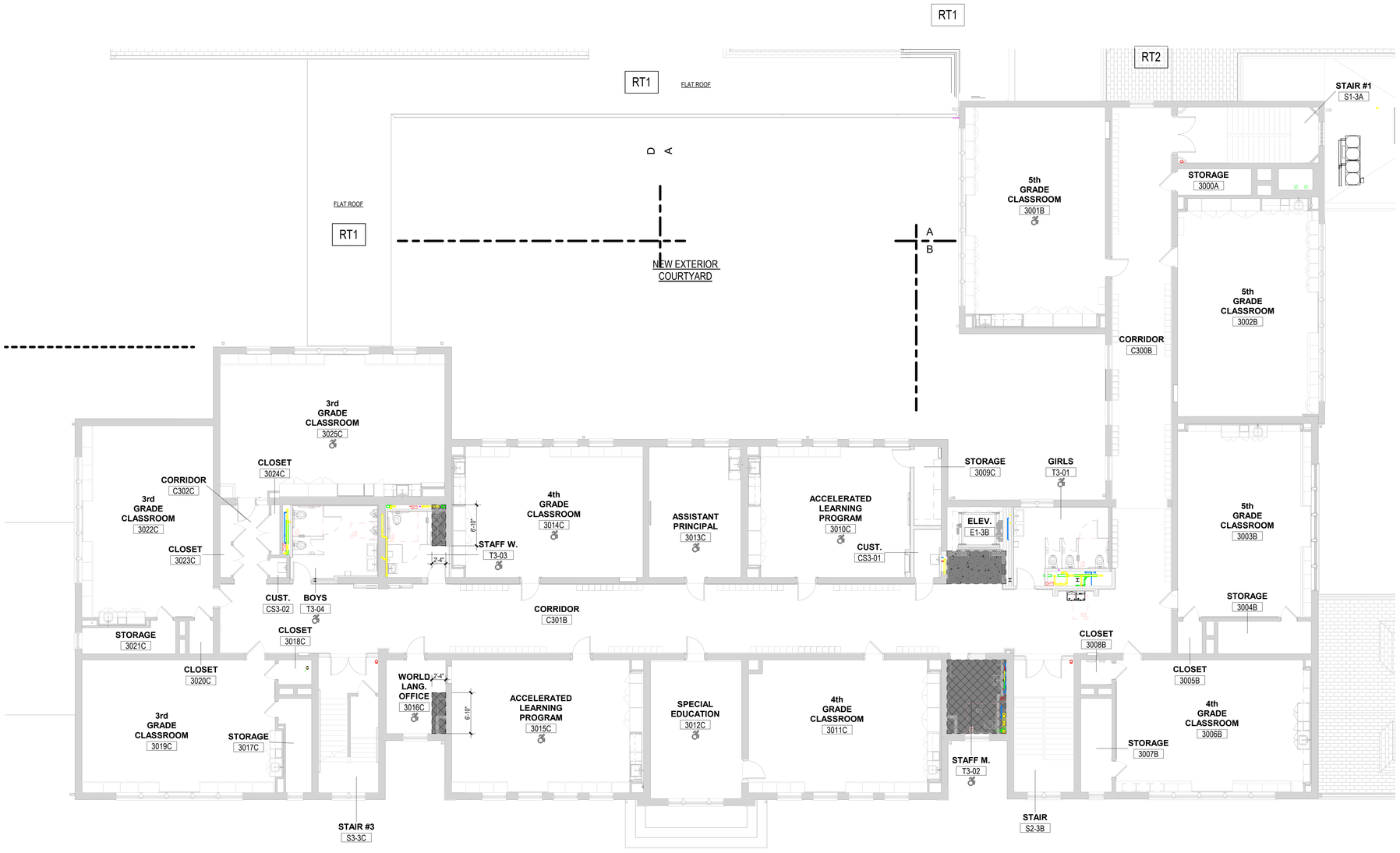
Drawing Title:
SECOND FLOOR - NEW SLAB INFILL CONDITION - PART "B & C"

Date: 8/29/2024
Scale: As indicated
Drawn By: JM
Project Number: 22-382
Drawing Number: A103

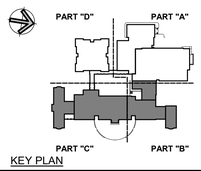
8/30/2024 7:42:07 AM

SLAB INFILL LEGEND:

- DEMOLITION SCOPE
- WOOD FRAMING INFILL. REFER TO STRUCTURAL DRAWINGS FOR MORE INFORMATION.
- CONCRETE SLAB INFILL. REFER TO STRUCTURAL DRAWINGS FOR MORE INFORMATION.



1 3rd FLR - SLAB INFILL CONDITION - PART "B & C"
1/8" = 1'-0"



KEY PLAN

Project Title:
ADDITION & ALTERATIONS TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

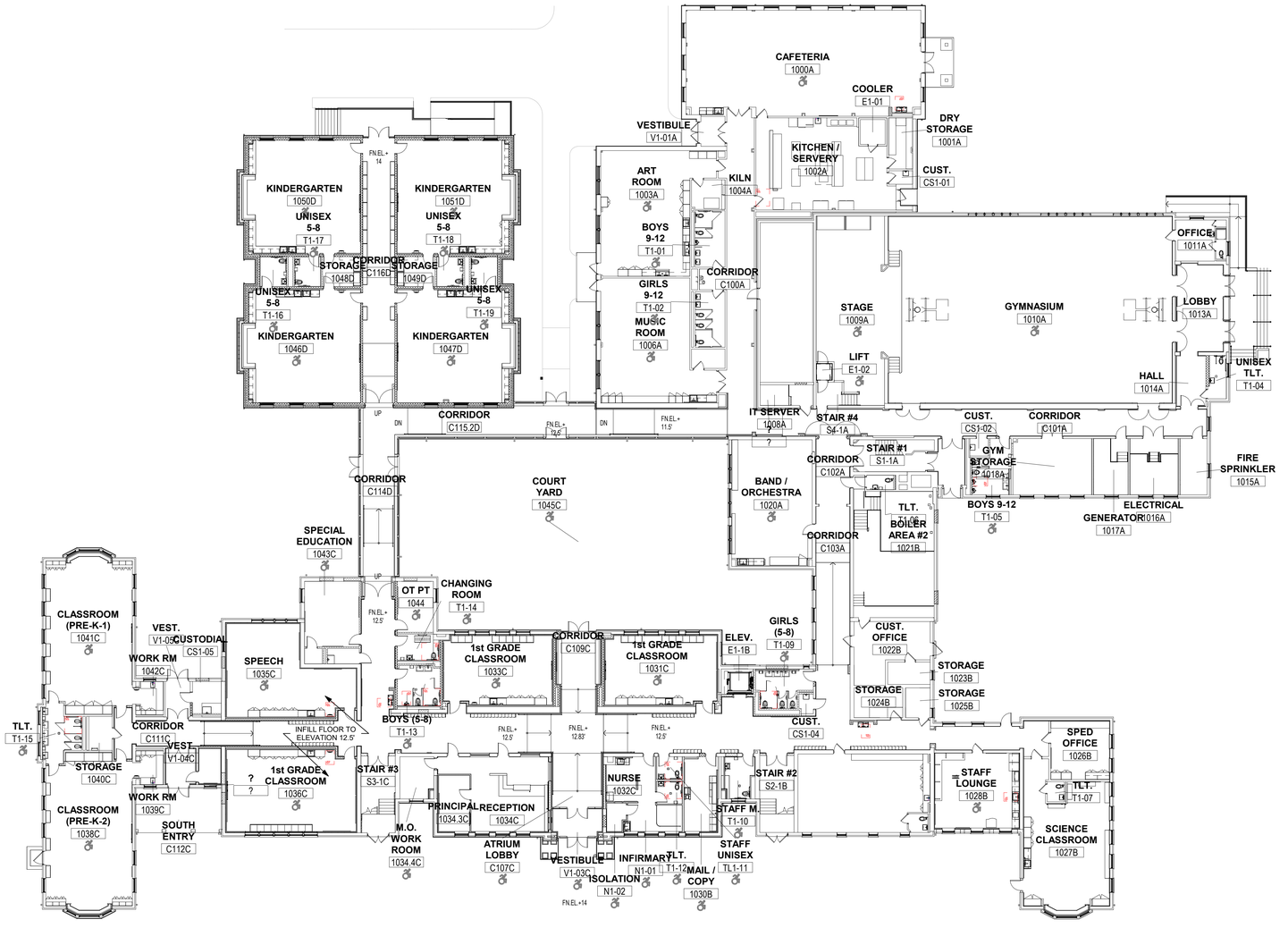
SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
311 STATE STREET NEW LONDON CT 06320
203 230 9007 silverpetrucelli.com

Revision:	Description:	Date:	Revised By:

Drawing Title: THIRD FLOOR - NEW SLAB INFILL CONDITION - PART "B & C"

Date: 8/29/2024
Scale: As indicated
Drawn By: JM
Project Number: 22-382
Drawing Number: A104

8/30/2024 7:42:17 AM



1 1st FLOOR - OVERALL FLOOR PLAN

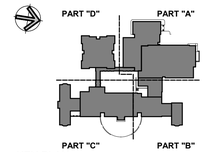
1/16" = 1'-0"

SYMBOL LEGEND

- NEW METAL STUD PARTITIONS
- NEW MASONRY WALL (4" BRICK VENEER)
- NEW CMU WALL
- 101 / A - DOOR NUMBER
- # - WINDOW TYPE (SEE A600s DRAWINGS)
- Room Name / 101 - ROOM NAME / ROOM NUMBER
- # - PARTITION TYPE (SEE A900s DRAWINGS)
- # - CONSTRUCTION KEY NOTE
- # - EXTERIOR DOOR LABEL, SEE DWG. A910
- 1Ref / 2 / A101 - ELEVATION/SECTION NUMBER / SHEET NUMBER
- 1Ref / 2 / A101 - INTERIOR ELEVATION NUMBER / SHEET NUMBER
- 2 / A101 - WALL SECTION NUMBER / SHEET NUMBER
- 2 / A101 - BUILDING SECTION NUMBER / SHEET NUMBER
- A.W.C. - ACCESSIBLE WATER COOLER/S
- RL - ROOF LEADER - REFER TO ROOF PLAN / EXTERIOR ELEVATIONS
- WB/TB/PB - WHITE BOARD / TACK BOARD / PEG BOARD
- SB - SMART BOARD
- F.E.C. - FIRE EXTINGUISHER AND CABINET
- F.D. - FLOOR DRAIN. SLOPE FLOOR TO DRAIN

GENERAL NOTES

1. READ ALL GENERAL NOTES ON DRAWINGS A001.
2. CONTRACTORS SHALL FIELD VERIFY ALL CONDITIONS AND DIMENSIONS.
3. PATCH TO MATCH ALL EXISTING WALLS AND CEILINGS TO REMAIN AFFECTED BY ANY DEMOLITION AND/OR NEW WORK.
4. ALL DIMENSIONS ARE OUTSIDE FACE OF BRICK, CONCRETE MASONRY UNITS AND FACE OF GYPSUM BOARD UNLESS OTHERWISE NOTED.
5. ALL NEW WALL AND PARTITION ASSEMBLIES SHALL EXTEND TO UNDERSIDE OF DECK ABOVE UNLESS OTHERWISE NOTED.
6. PROVIDE CMU WITH PRE-MANUFACTURED BULLNOSE AT ALL EXPOSED CORNERS.
7. PROVIDE CORNER GUARDS AT ALL GYPSUM WALL BOARD EXPOSED CORNERS.
8. WHERE THE WORD "ALIGN" IS INDICATED IT SHALL MEAN TO ALIGN BOTH SIDES OF THE WALL.
9. SEE M.E.P. DRAWINGS TO COORDINATE ALL REQUIRED TRENCHING AT CONCRETE SLABS. SAW CUT SLAB TO THE REQUIRED EXTENT, INSTALL UTILITIES, INFILL SLAB FLUSH WITH ADJACENT. SEE ALSO OTHER DETAILS IN THE DRAWINGS AS APPLICABLE.
10. PROVIDE STRUCTURAL ANCHORS TO TOP OF ALL CURTAIN WALL FRAMES, AND AT INTERMEDIATE STRUCTURAL MEMBERS OR WALLS AS REQUIRED TO RESIST WIND LOADS. SECURE ANCHORS TO STRUCTURAL MEMBERS AND/OR WALLS.



KEY PLAN

Project Title:

ADDITION & ALTERATIONS TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
311 STATE STREET NEW LONDON CT 06320
203 230 9007 silverpetrucelli.com

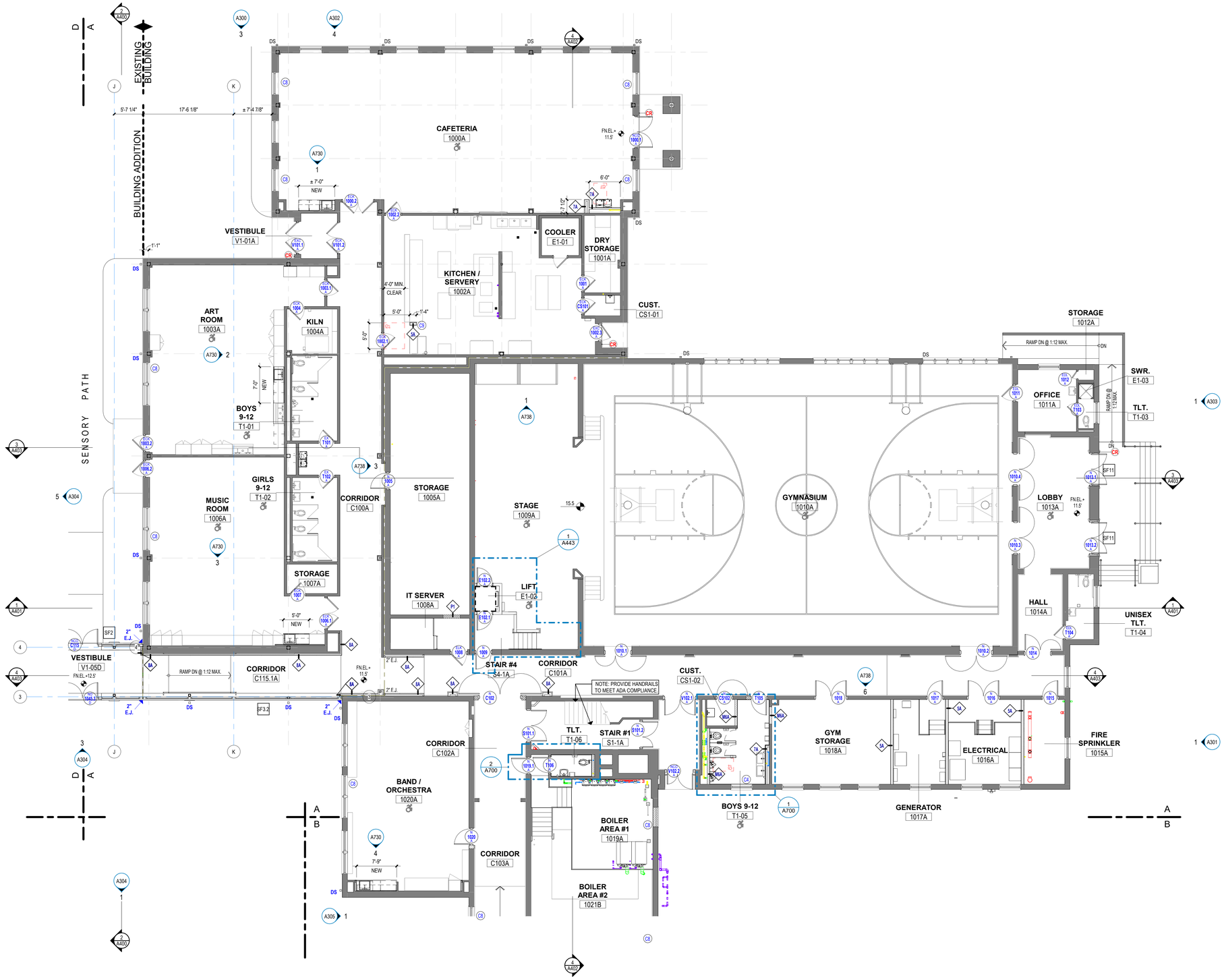
Revision:	Description:	Date:	Revised By:

Drawing Title: OVERALL FIRST FLOOR PLAN

Date: 8/29/2024
Scale: As indicated
Drawn By: JM
Project Number: 22-382

Drawing Number: A110

8/30/2024 7:42:27 AM



1 1st FLOOR PLAN - PART "A"
1/8" = 1'-0"

SYMBOL LEGEND

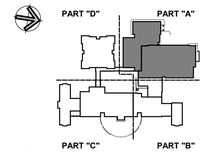
- NEW METAL STUD PARTITIONS
- NEW MASONRY WALL (4" BRICK VENEER)
- NEW CMU WALL
- 101 / A — DOOR NUMBER
- # — WINDOW TYPE (SEE A600s DRAWINGS)
- Room Name / 101 — ROOM NAME / ROOM NUMBER
- # — PARTITION TYPE (SEE A900s DRAWINGS)
- # — CONSTRUCTION KEY NOTE
- # — EXTERIOR DOOR LABEL, SEE DWG. A910
- 1Ref / 2 A101 — ELEVATION/SECTION NUMBER / SHEET NUMBER
- 1Ref / 2 A101 — INTERIOR ELEVATION NUMBER / SHEET NUMBER
- 2 A101 — WALL SECTION NUMBER / SHEET NUMBER
- 2 A101 — BUILDING SECTION NUMBER / SHEET NUMBER
- A.W.C. — ACCESSIBLE WATER COOLER/S
- RL — ROOF LEADER - REFER TO ROOF PLAN / EXTERIOR ELEVATIONS
- WB/TB/PB — WHITE BOARD / TACK BOARD / PEG BOARD
- SB — SMART BOARD
- F.E.C. — FIRE EXTINGUISHER AND CABINET
- F.D. — FLOOR DRAIN. SLOPE FLOOR TO DRAIN

GENERAL NOTES

1. READ ALL GENERAL NOTES ON DRAWINGS A001.
2. CONTRACTORS SHALL FIELD VERIFY ALL CONDITIONS AND DIMENSIONS.
3. PATCH TO MATCH ALL EXISTING WALLS AND CEILINGS TO REMAIN AFFECTED BY ANY DEMOLITION AND/OR NEW WORK.
4. ALL DIMENSIONS ARE OUTSIDE FACE OF BRICK, CONCRETE MASONRY UNITS AND FACE OF GYPSUM BOARD UNLESS OTHERWISE NOTED.
5. ALL NEW WALL AND PARTITION ASSEMBLIES SHALL EXTEND TO UNDERSIDE OF DECK ABOVE UNLESS OTHERWISE NOTED.
6. PROVIDE CMU WITH PRE-MANUFACTURED BULLNOSE AT ALL EXPOSED CORNERS.
7. PROVIDE CORNER GUARDS AT ALL GYPSUM WALL BOARD EXPOSED CORNERS.
8. WHERE THE WORD "ALIGN" IS INDICATED IT SHALL MEAN TO ALIGN BOTH SIDES OF THE WALL.
9. SEE M.E.P. DRAWINGS TO COORDINATE ALL REQUIRED TRENCHING AT CONCRETE SLABS. SAW CUT SLAB TO THE REQUIRED EXTENT, INSTALL UTILITIES, INFILL SLAB FLUSH WITH ADJACENT. SEE ALSO OTHER DETAILS IN THE DRAWINGS AS APPLICABLE.
10. PROVIDE STRUCTURAL ANCHORS TO TOP OF ALL CURTAIN WALL FRAMES, AND AT INTERMEDIATE STRUCTURAL MEMBERS OR WALLS AS REQUIRED TO RESIST WIND LOADS. SECURE ANCHORS TO STRUCTURAL MEMBERS AND/OR WALLS.

CONSTRUCTION KEYNOTES

No.	NOTE DESCRIPTION
C1	PROVIDE 4' x 8' 20 GA. STAINLESS STEEL PANEL BEHIND MOP SINK.
C2	PROVIDE BLACKOUT ROLLER SHADES IN ALL ROOMS WITH NEW EXTERIOR WINDOWS EXCEPT LOBBIES, VESTIBULES, CORRIDORS, AND TOILET ROOMS.
C3	PROVIDE MOTORIZED LIGHT FILTERING ROLLER SHADES.
C4	PROVIDE PRIVACY FILM IN ALL TOILET ROOMS WITH EXTERIOR WINDOWS.
C5	PROVIDE RECESSED BOTTLE FILLING STATION AS INDICATED ON PLAN.
C6	PROVIDE REMOVABLE FLOOR HATCH RECESSED 1/8" FOR VINYL/CARPET. REFER TO FINISH SCHEDULE.
C7	PROVIDE CEILLING MOUNTED FOLDING SECTIONAL METAL LOFT LADDER.
C8	INFILL EXTERIOR WALL AT LOUVER REMOVAL. BRICK VENEER INFILL AS DETAILED. SEE TYPICAL ELEVATION DETAIL 14 ON A610..
C9	WRAP COLUMN WITH SHEET OF STAINLESS STEEL



KEY PLAN

Project Title:
ADDITION & ALTERATIONS TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

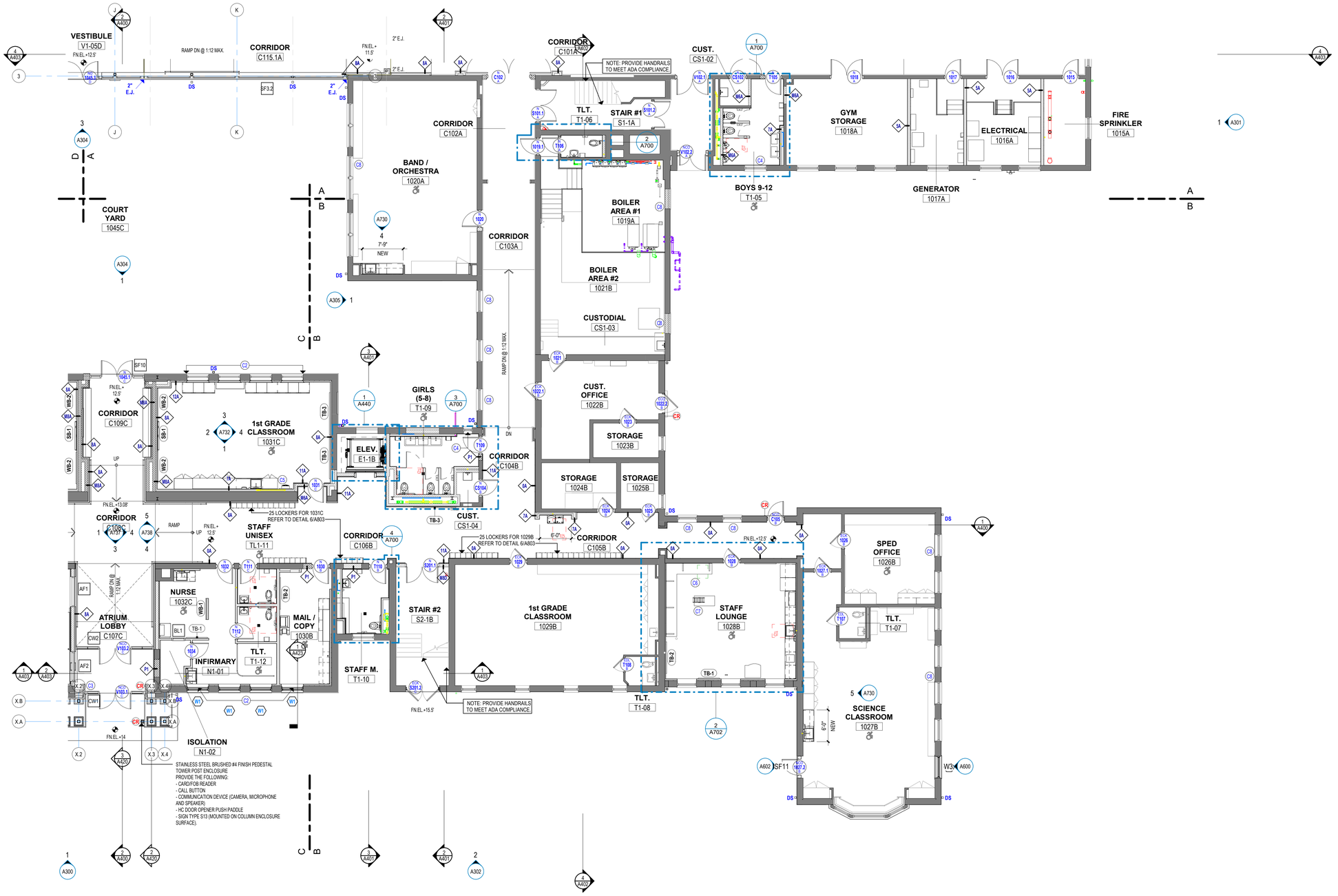
SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
311 STATE STREET NEW LONDON CT 06320
203 230 9007 silverpetrucelli.com

Revision:	Description:	Date:	Revised By:

Drawing Title: FIRST FLOOR PLAN - PART "A"

Date: 8/29/2024
Scale: As indicated
Drawn By: JM
Project Number: 22-382
Drawing Number: A111

8/30/2024 7:42:35 AM



1 1st FLOOR PLAN - PART "B"
1/8" = 1'-0"

SYMBOL LEGEND

- NEW METAL STUD PARTITIONS
- NEW MASONRY WALL (4" BRICK VENEER)
- NEW CMU WALL
- 101 A — DOOR NUMBER
- # — WINDOW TYPE (SEE A600s DRAWINGS)
- Room Name / 101 — ROOM NAME / ROOM NUMBER
- # — PARTITION TYPE (SEE A900s DRAWINGS)
- # — CONSTRUCTION KEY NOTE
- # — EXTERIOR DOOR LABEL, SEE DWG. A910
- 1Ref / 2 A101 / 1Ref / 1Ref — ELEVATION/SECTION NUMBER / SHEET NUMBER
- 1Ref / 2 A101 / 1Ref / 1Ref — INTERIOR ELEVATION NUMBER / SHEET NUMBER
- 2 A101 — WALL SECTION NUMBER / SHEET NUMBER
- 2 A101 — BUILDING SECTION NUMBER / SHEET NUMBER
- A.W.C. — ACCESSIBLE WATER COOLER/S
- RL — ROOF LEADER - REFER TO ROOF PLAN / EXTERIOR ELEVATIONS
- WB/TB/PB — WHITE BOARD / TACK BOARD / PEG BOARD
- SB — SMART BOARD
- F.E.C. — FIRE EXTINGUISHER AND CABINET
- F.D. — FLOOR DRAIN. SLOPE FLOOR TO DRAIN

GENERAL NOTES

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3. PATCH TO MATCH ALL EXISTING WALLS AND CEILINGS TO REMAIN AFFECTED BY ANY DEMOLITION AND/OR NEW WORK.
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10. PROVIDE STRUCTURAL ANCHORS TO TOP OF ALL CURTAIN WALL FRAMES, AND AT INTERMEDIATE STRUCTURAL MEMBERS OR WALLS AS REQUIRED TO RESIST WIND LOADS. SECURE ANCHORS TO STRUCTURAL MEMBERS AND/OR WALLS.

CONSTRUCTION KEYNOTES

No.	NOTE DESCRIPTION
C1	PROVIDE 4' x 8' 20 GA. STAINLESS STEEL PANEL BEHIND MOP SINK.
C2	PROVIDE BLACKOUT ROLLER SHADES IN ALL ROOMS WITH NEW EXTERIOR WINDOWS EXCEPT LOBBIES, VESTIBULES, CORRIDORS, AND TOILET ROOMS.
C3	PROVIDE MOTORIZED LIGHT FILTERING ROLLER SHADES.
C4	PROVIDE PRIVACY FILM IN ALL TOILET ROOMS WITH EXTERIOR WINDOWS.
C5	PROVIDE RECESSED BOTTLE FILLING STATION AS INDICATED ON PLAN.
C6	PROVIDE REMOVABLE FLOOR HATCH RECESSED 1/8" FOR VINYL/CARPET. REFER TO FINISH SCHEDULE.
C7	PROVIDE CEILING MOUNTED FOLDING SECTIONAL METAL LOFT LADDER.
C8	INFILL EXTERIOR WALL AT LOUVER REMOVAL. BRICK VENEER INFILL AS DETAILED. SEE TYPICAL ELEVATION DETAIL 14 ON A610..
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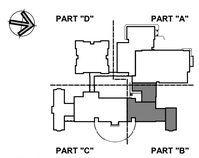


KEY PLAN

Project Title:
ADDITION & ALTERATIONS TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
311 STATE STREET NEW LONDON CT 06320
203 230 9007 silverpetrucelli.com

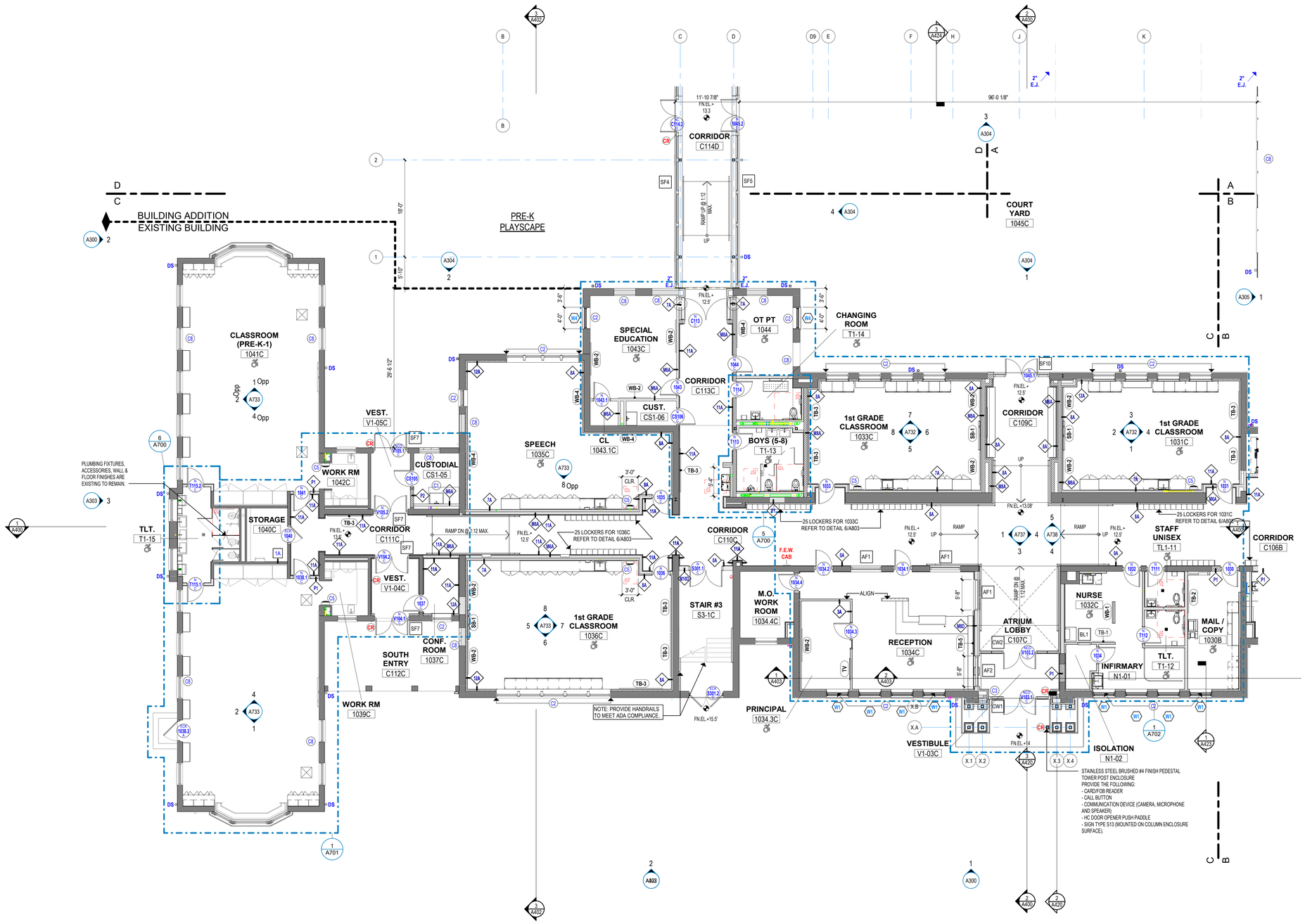
Revision:	Description:	Date:	Revised By:

Drawing Title: FIRST FLOOR PLAN - PART "B"

Date: 8/29/2024
Scale: As indicated
Drawn By: JM
Project Number: 22-382

Drawing Number: A112

8/30/2024 7:42:48 AM



1 1st FLOOR PLAN - PART "C"
1/8" = 1'-0"

SYMBOL LEGEND

- NEW METAL STUD PARTITIONS
- NEW MASONRY WALL (4" BRICK VENEER)
- NEW CMU WALL
- 101 / A — DOOR NUMBER
- # — WINDOW TYPE (SEE A600s DRAWINGS)
- Room Name / 101 — ROOM NAME / ROOM NUMBER
- # — PARTITION TYPE (SEE A900s DRAWINGS)
- # — CONSTRUCTION KEY NOTE
- # — EXTERIOR DOOR LABEL, SEE DWG. A910
- 1Ref / 2 / A101 — ELEVATION/SECTION NUMBER / SHEET NUMBER
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- 2 / A101 — WALL SECTION NUMBER / SHEET NUMBER
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GENERAL NOTES

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CONSTRUCTION KEYNOTES

No.	NOTE DESCRIPTION
C1	PROVIDE 4' x 8' 20 GA. STAINLESS STEEL PANEL BEHIND MOP SINK.
C2	PROVIDE BLACKOUT ROLLER SHADES IN ALL ROOMS WITH NEW EXTERIOR WINDOWS EXCEPT LOBBIES, VESTIBULES, CORRIDORS, AND TOILET ROOMS.
C3	PROVIDE MOTORIZED LIGHT FILTERING ROLLER SHADES.
C4	PROVIDE PRIVACY FILM IN ALL TOILET ROOMS WITH EXTERIOR WINDOWS.
C5	PROVIDE RECESSED BOTTLE FILLING STATION AS INDICATED ON PLAN.
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C7	PROVIDE CEILLING MOUNTED FOLDING SECTIONAL METAL LOFT LADDER.
C8	INFILL EXTERIOR WALL AT LOUVER REMOVAL. BRICK VENEER INFILL AS DETAILED. SEE TYPICAL ELEVATION DETAIL 14 ON A610..
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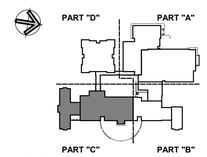


KEY PLAN

Project Title:
ADDITION & ALTERATIONS TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

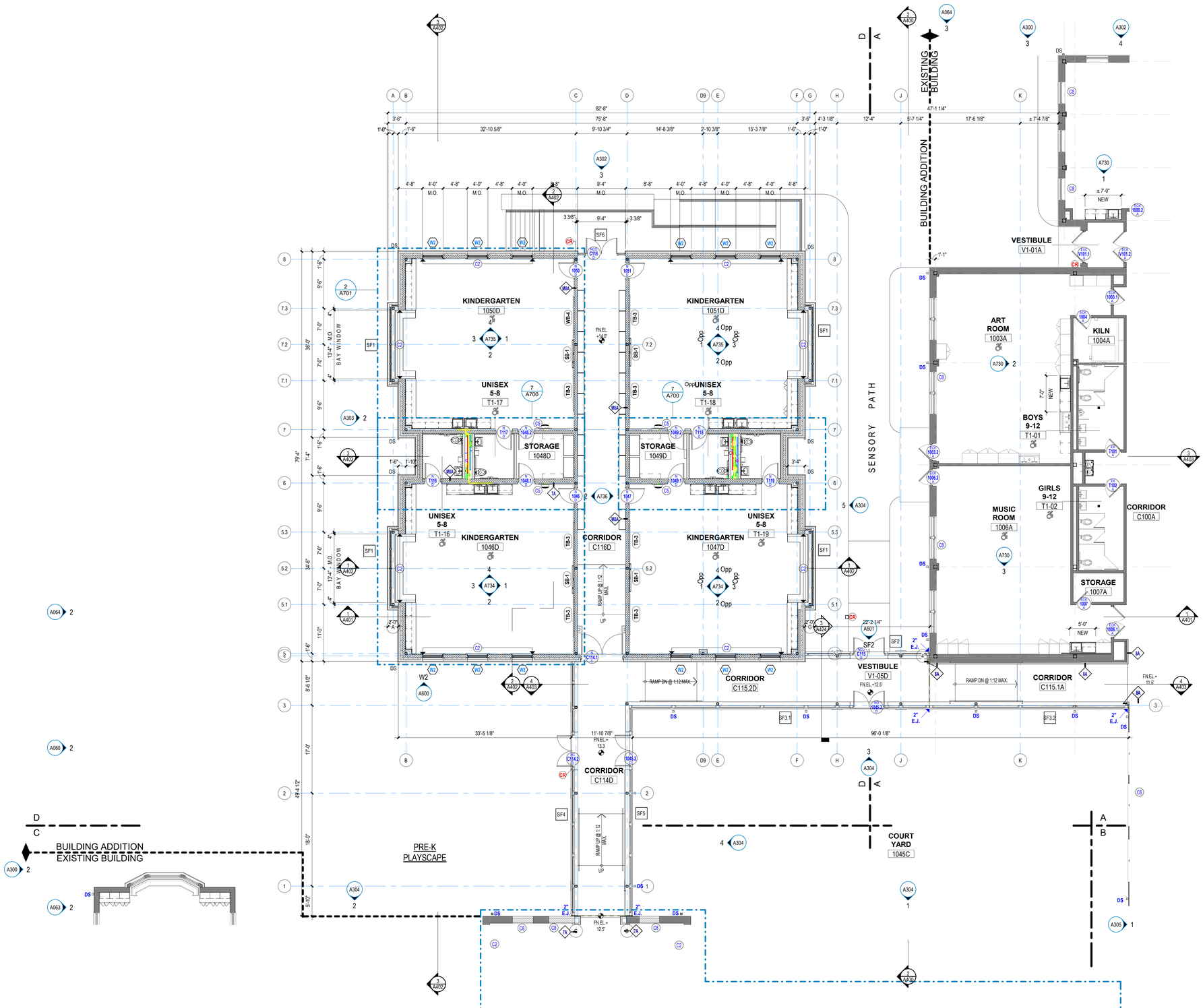
SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
311 STATE STREET NEW LONDON CT 06320
203 230 9007 silverpetrucelli.com

Revision:	Description:	Date:	Revised By:

Drawing Title: FIRST FLOOR PLAN - PART "C"

Date: 8/29/2024
Scale: As indicated
Drawn By: JM
Project Number: 22-382
Drawing Number: A113

8/30/2024 7:42:59 AM



1 1st FLOOR PLAN - PART "D"
1/8" = 1'-0"

SYMBOL LEGEND

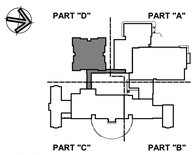
- NEW METAL STUD PARTITIONS
- NEW MASONRY WALL (4" BRICK VENEER)
- NEW CMU WALL
- 101 / A — DOOR NUMBER
- # — WINDOW TYPE (SEE A600s DRAWINGS)
- Room Name / 101 — ROOM NAME / ROOM NUMBER
- # — PARTITION TYPE (SEE A900s DRAWINGS)
- # — CONSTRUCTION KEY NOTE
- # — EXTERIOR DOOR LABEL, SEE DWG. A910
- 1Ref / 2 A101 / 1Ref — ELEVATION/SECTION NUMBER / SHEET NUMBER
- 1Ref / 2 A101 / 1Ref — INTERIOR ELEVATION NUMBER / SHEET NUMBER
- 2 A101 — WALL SECTION NUMBER / SHEET NUMBER
- 2 A101 — BUILDING SECTION NUMBER / SHEET NUMBER
- A.W.C. — ACCESSIBLE WATER COOLER/S
- RL — ROOF LEADER - REFER TO ROOF PLAN / EXTERIOR ELEVATIONS
- WB/TB/PB — WHITE BOARD / TACK BOARD / PEG BOARD
- SB — SMART BOARD
- F.E.C. — FIRE EXTINGUISHER AND CABINET
- F.D. — FLOOR DRAIN. SLOPE FLOOR TO DRAIN

GENERAL NOTES

1. READ ALL GENERAL NOTES ON DRAWINGS A001.
2. CONTRACTORS SHALL FIELD VERIFY ALL CONDITIONS AND DIMENSIONS.
3. PATCH TO MATCH ALL EXISTING WALLS AND CEILINGS TO REMAIN AFFECTED BY ANY DEMOLITION AND/OR NEW WORK.
4. ALL DIMENSIONS ARE OUTSIDE FACE OF BRICK, CONCRETE MASONRY UNITS AND FACE OF GYPSUM BOARD UNLESS OTHERWISE NOTED.
5. ALL NEW WALL AND PARTITION ASSEMBLIES SHALL EXTEND TO UNDERSIDE OF DECK ABOVE UNLESS OTHERWISE NOTED.
6. PROVIDE CMU WITH PRE-MANUFACTURED BULLNOSE AT ALL EXPOSED CORNERS.
7. PROVIDE CORNER GUARDS AT ALL GYPSUM WALL BOARD EXPOSED CORNERS.
8. WHERE THE WORD "ALIGN" IS INDICATED IT SHALL MEAN TO ALIGN BOTH SIDES OF THE WALL.
9. SEE M.E.P. DRAWINGS TO COORDINATE ALL REQUIRED TRENCHING AT CONCRETE SLABS. SAW CUT SLAB TO THE REQUIRED EXTENT, INSTALL UTILITIES, INFILL SLAB FLUSH WITH ADJACENT. SEE ALSO OTHER DETAILS IN THE DRAWINGS AS APPLICABLE.
10. PROVIDE STRUCTURAL ANCHORS TO TOP OF ALL CURTAIN WALL FRAMES, AND AT INTERMEDIATE STRUCTURAL MEMBERS OR WALLS AS REQUIRED TO RESIST WIND LOADS. SECURE ANCHORS TO STRUCTURAL MEMBERS AND/OR WALLS.

CONSTRUCTION KEYNOTES

No.	NOTE DESCRIPTION
C1	PROVIDE 4' x 8' 20 GA. STAINLESS STEEL PANEL BEHIND MOP SINK.
C2	PROVIDE BLACKOUT ROLLER SHADES IN ALL ROOMS WITH NEW EXTERIOR WINDOWS EXCEPT LOBBIES, VESTIBULES, CORRIDORS, AND TOILET ROOMS.
C3	PROVIDE MOTORIZED LIGHT FILTERING ROLLER SHADES.
C4	PROVIDE PRIVACY FILM IN ALL TOILET ROOMS WITH EXTERIOR WINDOWS.
C5	PROVIDE RECESSED BOTTLE FILLING STATION AS INDICATED ON PLAN.
C6	PROVIDE REMOVABLE FLOOR HATCH RECESSED 1/8" FOR VINYL/CARPET. REFER TO FINISH SCHEDULE.
C7	PROVIDE CEILLING MOUNTED FOLDING SECTIONAL METAL LOFT LADDER.
C8	INFILL EXTERIOR WALL AT LOUVER REMOVAL. BRICK VENEER INFILL AS DETAILED. SEE TYPICAL ELEVATION DETAIL 14 ON A610.
C9	WRAP COLUMN WITH SHEET OF STAINLESS STEEL



KEY PLAN

Project Title:
ADDITION & ALTERATIONS TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

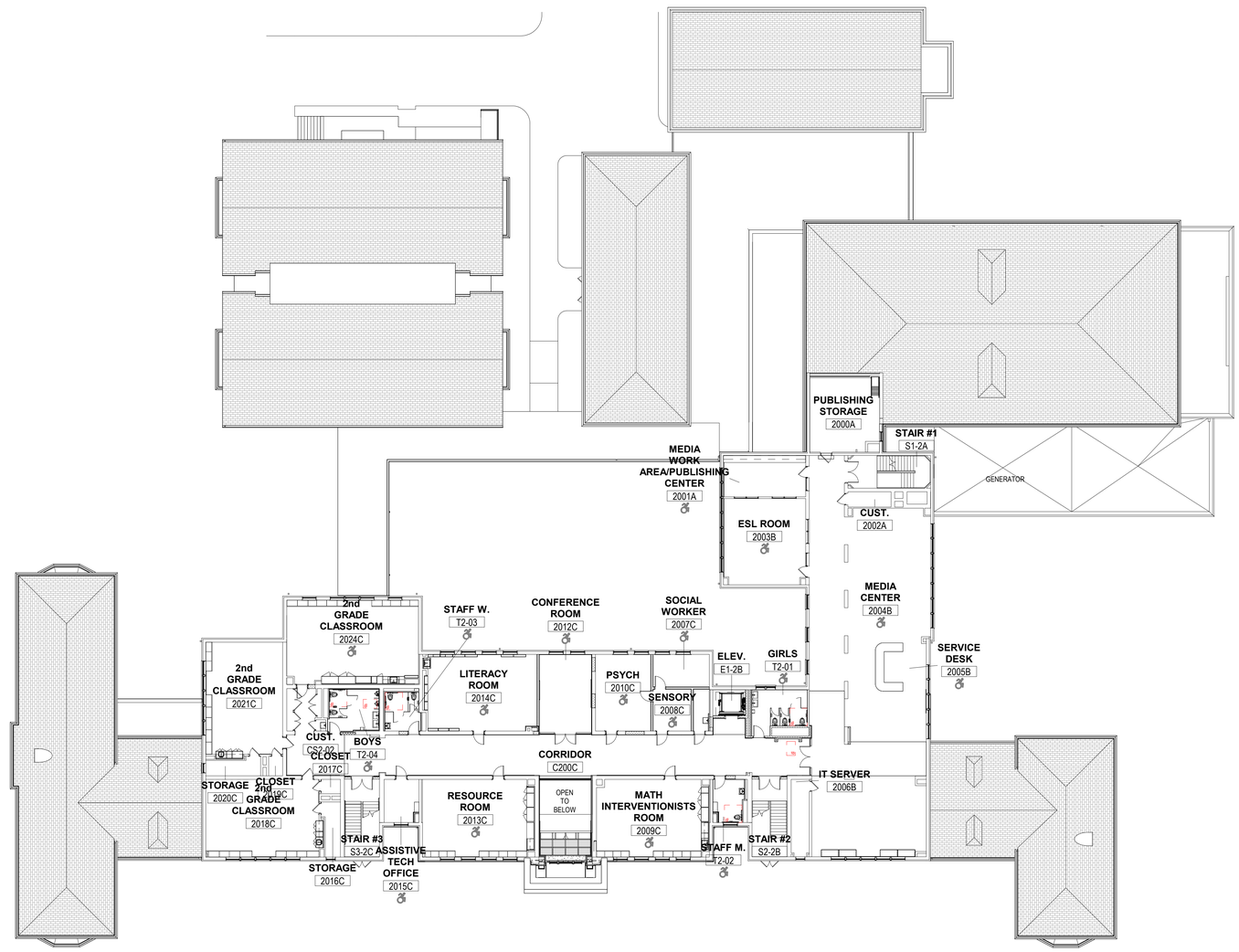
SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
311 STATE STREET NEW LONDON CT 06320
203 230 9007 silverpetrucelli.com

Revision:	Description:	Date:	Revised By:

Drawing Title: FIRST FLOOR PLAN - PART "D"

Date: 8/29/2024
Scale: As indicated
Drawn By: JM
Project Number: 22-382
Drawing Number: A114

8/30/2024 7:43:09 AM



1 2nd FLOOR - OVERALL FLOOR PLAN

1/16" = 1'-0"

SYMBOL LEGEND

- NEW METAL STUD PARTITIONS
- NEW MASONRY WALL (4" BRICK VENEER)
- NEW CMU WALL
- 101 / A - DOOR NUMBER
- # - WINDOW TYPE (SEE A600s DRAWINGS)
- Room Name / 101 - ROOM NAME / ROOM NUMBER
- # - PARTITION TYPE (SEE A900s DRAWINGS)
- # - CONSTRUCTION KEY NOTE
- # - EXTERIOR DOOR LABEL, SEE DWG. A910
- 1Ref / 2 A101 / 1Ref - ELEVATION/SECTION NUMBER / SHEET NUMBER
- 1Ref / 2 A101 / 1Ref - INTERIOR ELEVATION NUMBER / SHEET NUMBER
- 2 A101 - WALL SECTION NUMBER / SHEET NUMBER
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- F.D. - FLOOR DRAIN. SLOPE FLOOR TO DRAIN

GENERAL NOTES

1. READ ALL GENERAL NOTES ON DRAWINGS A001.
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3. PATCH TO MATCH ALL EXISTING WALLS AND CEILINGS TO REMAIN AFFECTED BY ANY DEMOLITION AND/OR NEW WORK.
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5. ALL NEW WALL AND PARTITION ASSEMBLIES SHALL EXTEND TO UNDERSIDE OF DECK ABOVE UNLESS OTHERWISE NOTED.
6. PROVIDE CMU WITH PRE-MANUFACTURED BULLNOSE AT ALL EXPOSED CORNERS.
7. PROVIDE CORNER GUARDS AT ALL GYPSUM WALL BOARD EXPOSED CORNERS.
8. WHERE THE WORD "ALIGN" IS INDICATED IT SHALL MEAN TO ALIGN BOTH SIDES OF THE WALL.
9. SEE M.E.P. DRAWINGS TO COORDINATE ALL REQUIRED TRENCHING AT CONCRETE SLABS. SAW CUT SLAB TO THE REQUIRED EXTENT, INSTALL UTILITIES, INFILL SLAB FLUSH WITH ADJACENT. SEE ALSO OTHER DETAILS IN THE DRAWINGS AS APPLICABLE.
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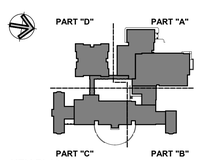


KEY PLAN

Project Title:

ADDITION & ALTERATIONS TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

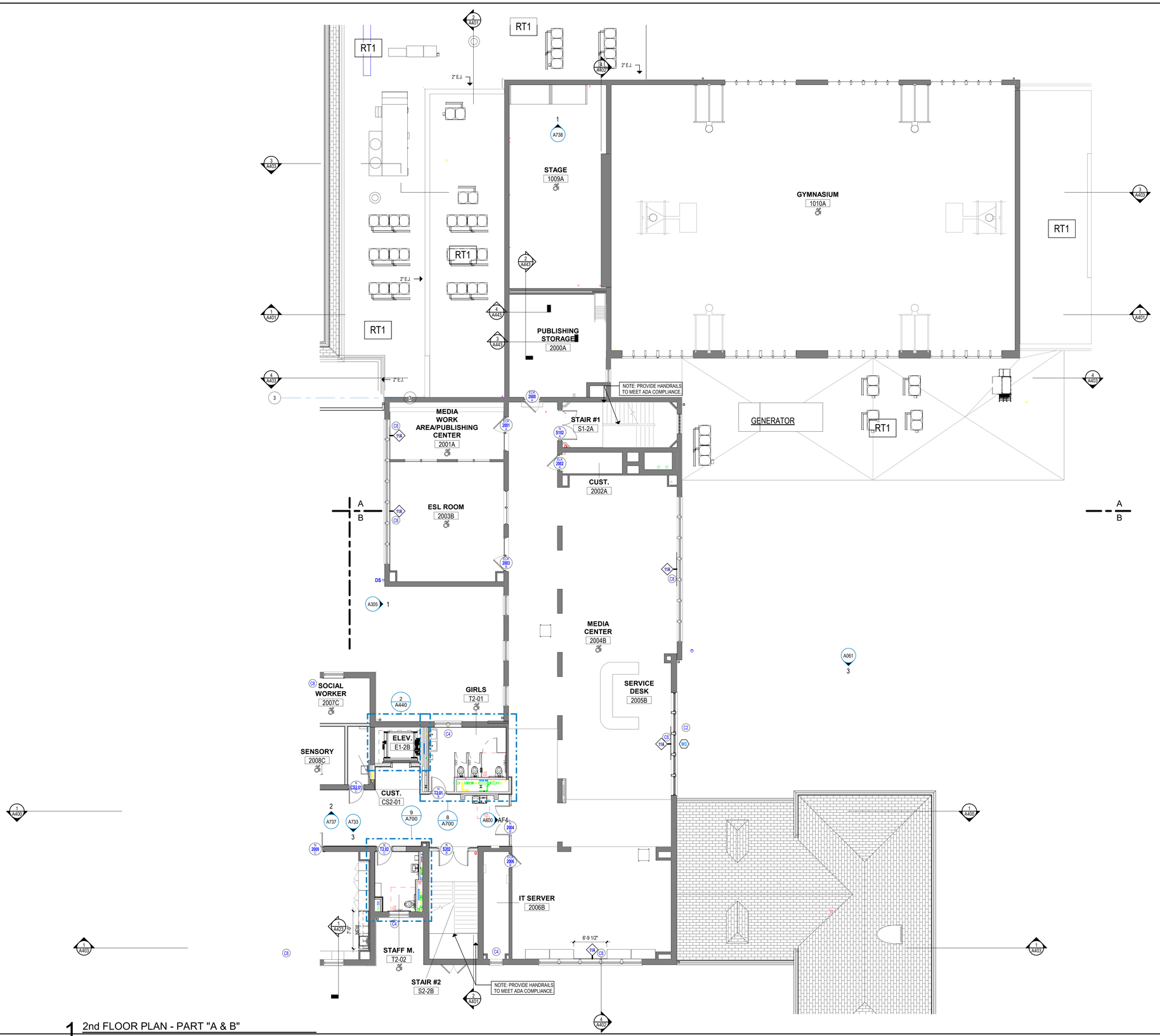
SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
311 STATE STREET NEW LONDON CT 06320
203 230 9007 silverpetrucelli.com

Revision:	Description:	Date:	Revised By:

Drawing Title: OVERALL SECOND FLOOR PLAN

Date: 8/29/2024
Scale: As indicated
Drawn By: JM
Project Number: 22-382
Drawing Number: A120

8/30/2024 7:43:16 AM



1 2nd FLOOR PLAN - PART "A & B"
1/8" = 1'-0"

SYMBOL LEGEND

- NEW METAL STUD PARTITIONS
- NEW MASONRY WALL (4" BRICK VENEER)
- NEW CMU WALL
- 101 / A — DOOR NUMBER
- # — WINDOW TYPE (SEE A600s DRAWINGS)
- Room Name / 101 — ROOM NAME / ROOM NUMBER
- # — PARTITION TYPE (SEE A900s DRAWINGS)
- # — CONSTRUCTION KEY NOTE
- # — EXTERIOR DOOR LABEL, SEE DWG. A910
- 1Ref / 2 A101 — ELEVATION/SECTION NUMBER / SHEET NUMBER
- 1Ref / 2 A101 — INTERIOR ELEVATION NUMBER / SHEET NUMBER
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CONSTRUCTION KEYNOTES

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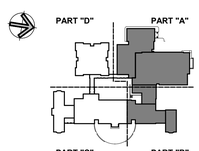
C4	PROVIDE PRIVACY FILM IN ALL TOILET ROOMS WITH EXTERIOR WINDOWS.
C5	PROVIDE RECESSED BOTTLE FILLING STATION AS INDICATED ON PLAN.
C6	PROVIDE REMOVABLE FLOOR HATCH RECESSED 1/8" FOR VINYL/CARPET. REFER TO FINISH SCHEDULE.
C7	PROVIDE CEILING MOUNTED FOLDING SECTIONAL METAL LOFT LADDER.
C8	INFILL EXTERIOR WALL AT LOUVER REMOVAL. BRICK VENEER INFILL AS DETAILED. SEE TYPICAL ELEVATION DETAIL 14 ON A610..
C9	WRAP COLUMN WITH SHEET OF STAINLESS STEEL



KEY PLAN

Project Title:
ADDITION & ALTERATIONS TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

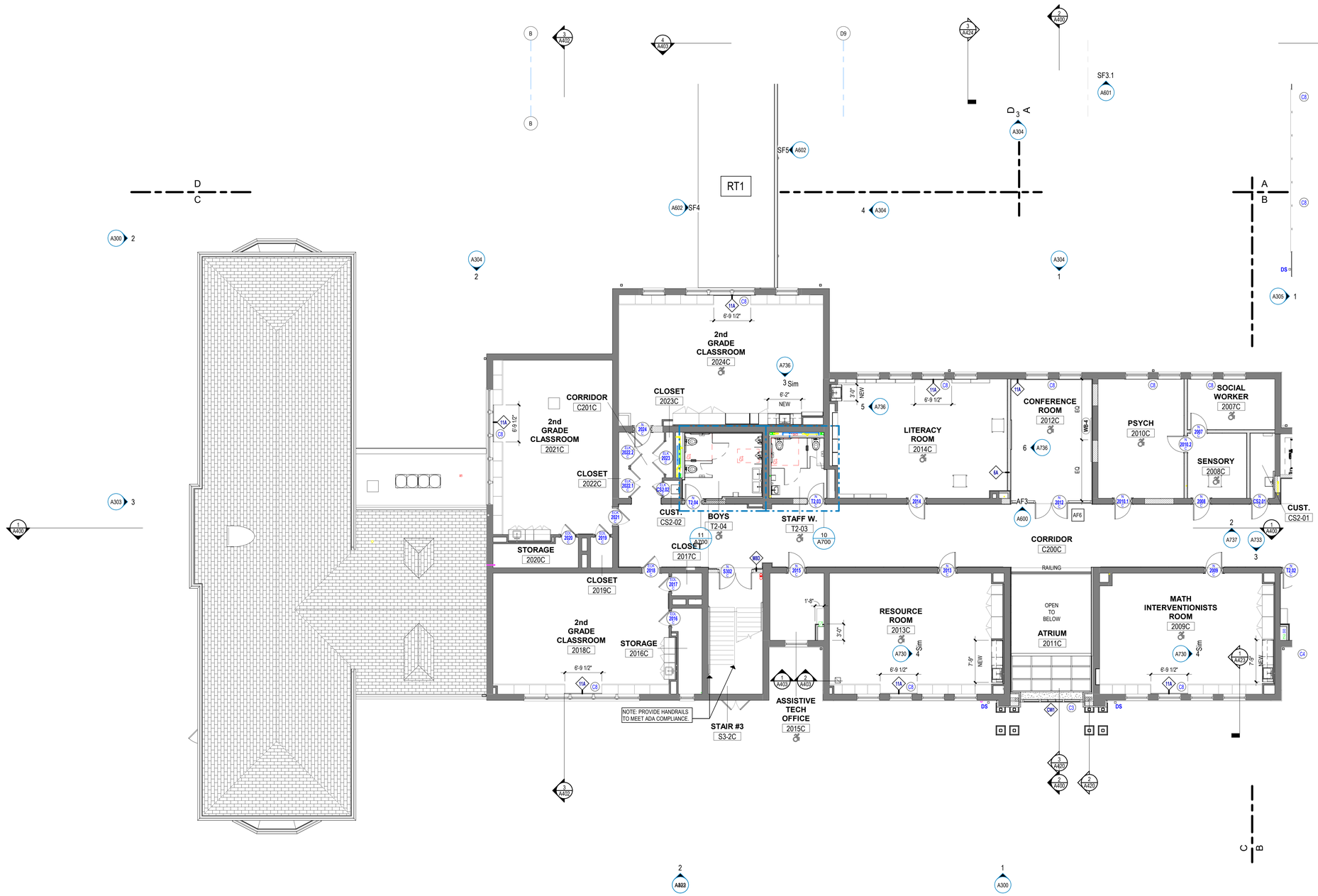
SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
311 STATE STREET NEW LONDON CT 06320
203 230 9007 silverpetrucelli.com

Revision:	Description:	Date:	Revised By:

Drawing Title: SECOND FLOOR PLAN - PART "A & B"

Date: 8/29/2024
Scale: As indicated
Drawn By: JM
Project Number: 22-382
Drawing Number: A121

8/30/2024 7:43:29 AM



1 2nd FLOOR PLAN - PART "C"

1/8" = 1'-0"

SYMBOL LEGEND

- NEW METAL STUD PARTITIONS
- NEW MASONRY WALL (4" BRICK VENEER)
- NEW CMU WALL
- 101 / A — DOOR NUMBER
- # — WINDOW TYPE (SEE A600s DRAWINGS)
- Room Name / 101 — ROOM NAME / ROOM NUMBER
- # — PARTITION TYPE (SEE A900s DRAWINGS)
- # — CONSTRUCTION KEY NOTE
- # — EXTERIOR DOOR LABEL, SEE DWG. A910
- 2 / A101 — ELEVATION/SECTION NUMBER / SHEET NUMBER
- 2 / A101 — INTERIOR ELEVATION NUMBER / SHEET NUMBER
- 2 / A101 — WALL SECTION NUMBER / SHEET NUMBER
- 2 / A101 — BUILDING SECTION NUMBER / SHEET NUMBER
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GENERAL NOTES

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7. PROVIDE CORNER GUARDS AT ALL GYPSUM WALL BOARD EXPOSED CORNERS.
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CONSTRUCTION KEYNOTES

No.	NOTE DESCRIPTION
C1	PROVIDE 4' x 8' 20 GA. STAINLESS STEEL PANEL BEHIND MOP SINK.
C2	PROVIDE BLACKOUT ROLLER SHADES IN ALL ROOMS WITH NEW EXTERIOR WINDOWS EXCEPT LOBBIES, VESTIBULES, CORRIDORS, AND TOILET ROOMS.
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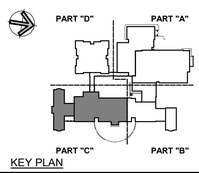
C4	PROVIDE PRIVACY FILM IN ALL TOILET ROOMS WITH EXTERIOR WINDOWS.
C5	PROVIDE RECESSED BOTTLE FILLING STATION AS INDICATED ON PLAN.
C6	PROVIDE REMOVABLE FLOOR HATCH RECESSED 1/8" FOR VINYL/CARPET. REFER TO FINISH SCHEDULE.
C7	PROVIDE CEILLING MOUNTED FOLDING SECTIONAL METAL LOFT LADDER.
C8	INFILL EXTERIOR WALL AT LOUVER REMOVAL. BRICK VENEER INFILL AS DETAILED. SEE TYPICAL ELEVATION DETAIL 14 ON A610.
C9	WRAP COLUMN WITH SHEET OF STAINLESS STEEL



KEY PLAN

Project Title:

ADDITION & ALTERATIONS TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

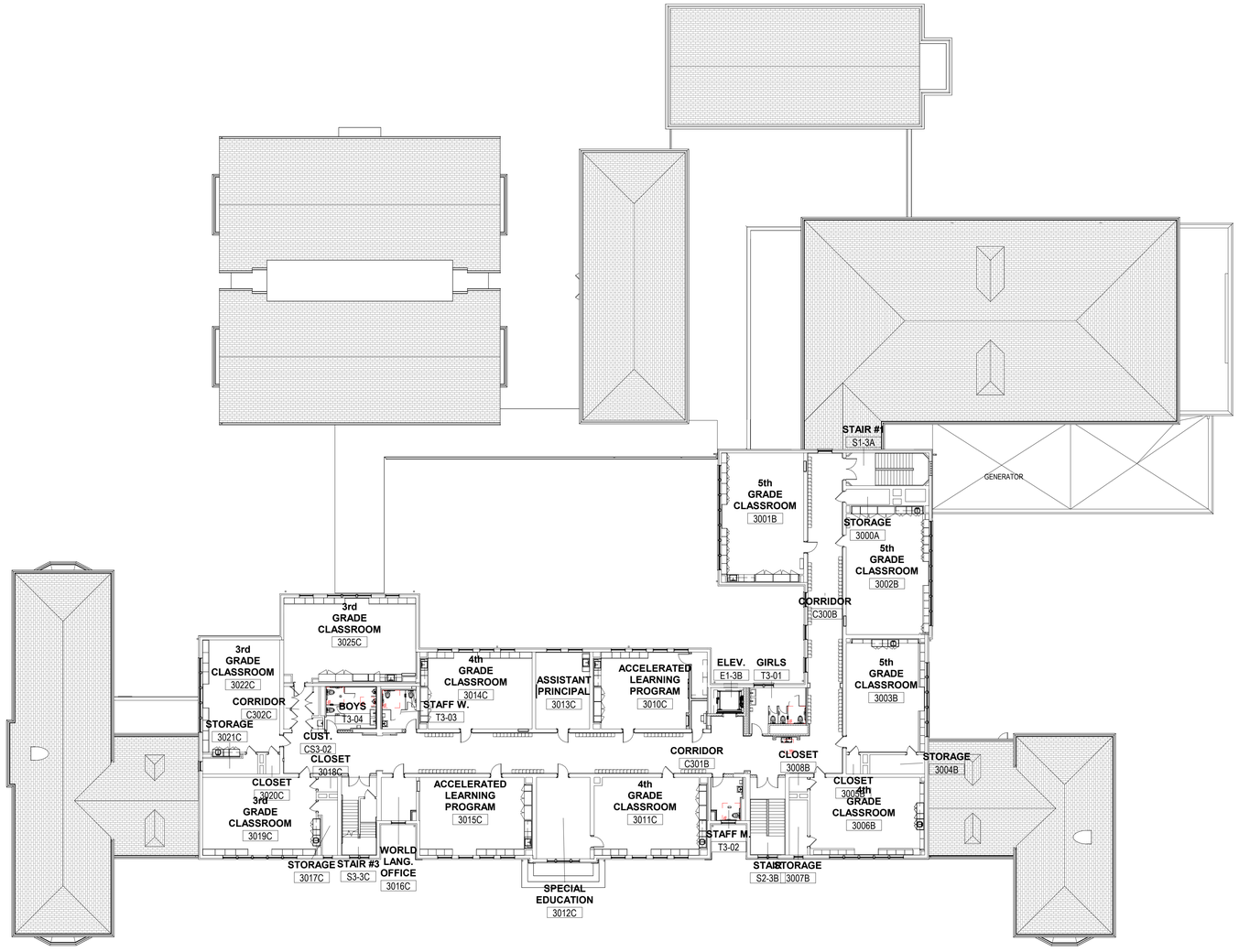
SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
311 STATE STREET NEW LONDON CT 06320
203 230 9007 silverpetrucelli.com

Revision:	Description:	Date:	Revised By:

Drawing Title: SECOND FLOOR PLAN - PART "C"

Date: 8/29/2024
Scale: As indicated
Drawn By: JM
Project Number: 22-382
Drawing Number: A123

8/30/2024 7:43:34 AM



1 3rd FLOOR - OVERALL FLOOR PLAN

1/16" = 1'-0"

SYMBOL LEGEND

- NEW METAL STUD PARTITIONS
- NEW MASONRY WALL (4" BRICK VENEER)
- NEW CMU WALL
- 101 / A - DOOR NUMBER
- # - WINDOW TYPE (SEE A600s DRAWINGS)
- Room Name / 101 - ROOM NAME / ROOM NUMBER
- # - PARTITION TYPE (SEE A900s DRAWINGS)
- # - CONSTRUCTION KEY NOTE
- # - EXTERIOR DOOR LABEL, SEE DWG. A910
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GENERAL NOTES

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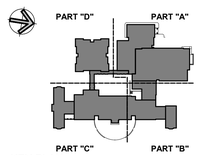


KEY PLAN

Project Title:

ADDITION & ALTERATIONS TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
311 STATE STREET NEW LONDON CT 06320
203 230 9007 silverpetrucelli.com

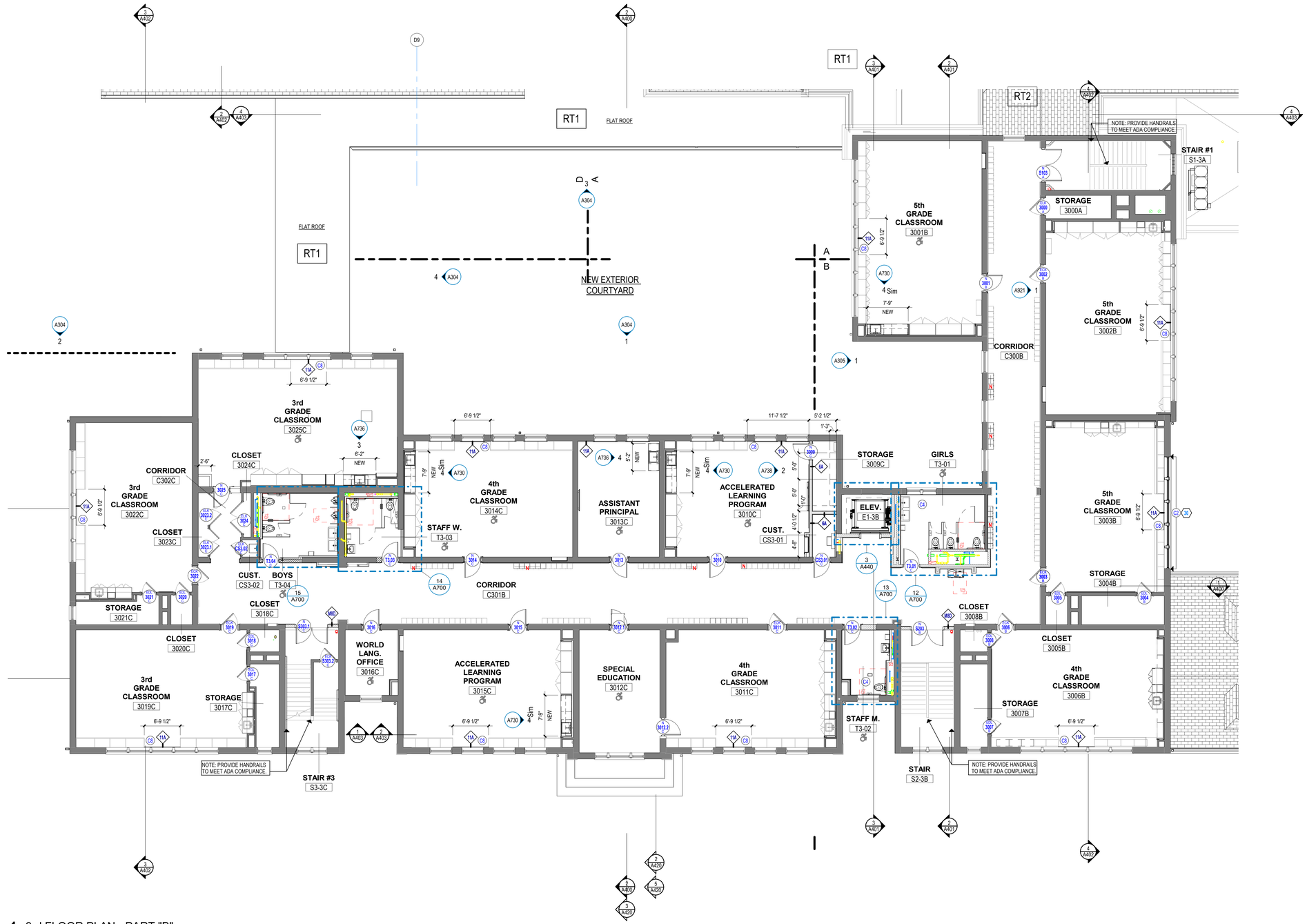
Revision:	Description:	Date:	Revised By:

Drawing Title: OVERALL THIRD FLOOR PLAN

Date: 8/29/2024
Scale: As indicated
Drawn By: JM
Project Number: 22-382

Drawing Number: A130

8/30/2024 7:43:41 AM



1 3rd FLOOR PLAN - PART "B"
1/8" = 1'-0"

SYMBOL LEGEND

- NEW METAL STUD PARTITIONS
- NEW MASONRY WALL (4" BRICK VENEER)
- NEW CMU WALL
- 101 / A — DOOR NUMBER
- # — WINDOW TYPE (SEE A600s DRAWINGS)
- Room Name / 101 — ROOM NAME / ROOM NUMBER
- # — PARTITION TYPE (SEE A900s DRAWINGS)
- # — CONSTRUCTION KEY NOTE
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- 2 / A101 — ELEVATION/SECTION NUMBER / SHEET NUMBER
- 2 / A101 — INTERIOR ELEVATION NUMBER / SHEET NUMBER
- 2 / A101 — WALL SECTION NUMBER / SHEET NUMBER
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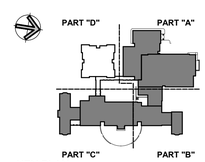
9. SEE M.E.P. DRAWINGS TO COORDINATE ALL REQUIRED TRENCHING AT CONCRETE SLABS. SAW CUT SLAB TO THE REQUIRED EXTENT, INSTALL UTILITIES, INFILL SLAB FLUSH WITH ADJACENT. SEE ALSO OTHER DETAILS IN THE DRAWINGS AS APPLICABLE.
10. PROVIDE STRUCTURAL ANCHORS TO TOP OF ALL CURTAIN WALL FRAMES, AND AT INTERMEDIATE STRUCTURAL MEMBERS OR WALLS AS REQUIRED TO RESIST WIND LOADS. SECURE ANCHORS TO STRUCTURAL MEMBERS AND/OR WALLS.

CONSTRUCTION KEYNOTES

No.	NOTE DESCRIPTION
C1	PROVIDE 4' x 8' 20 GA. STAINLESS STEEL PANEL BEHIND MOP SINK.
C2	PROVIDE BLACKOUT ROLLER SHADES IN ALL ROOMS WITH NEW EXTERIOR WINDOWS EXCEPT LOBBIES, VESTIBULES, CORRIDORS, AND TOILET ROOMS.
C3	PROVIDE MOTORIZED LIGHT FILTERING ROLLER SHADES.
C4	PROVIDE PRIVACY FILM IN ALL TOILET ROOMS WITH EXTERIOR WINDOWS.
C5	PROVIDE RECESSED BOTTLE FILLING STATION AS INDICATED ON PLAN.
C6	PROVIDE REMOVABLE FLOOR HATCH RECESSED 1/8" FOR VINYL/CARPET. REFER TO FINISH SCHEDULE.
C7	PROVIDE CEILLING MOUNTED FOLDING SECTIONAL METAL LOFT LADDER.
C8	INFILL EXTERIOR WALL AT LOUVER REMOVAL. BRICK VENEER INFILL AS DETAILED. SEE TYPICAL ELEVATION DETAIL 14 ON A610..
C9	WRAP COLUMN WITH SHEET OF STAINLESS STEEL



KEY PLAN

Project Title:
ADDITION & ALTERATIONS TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

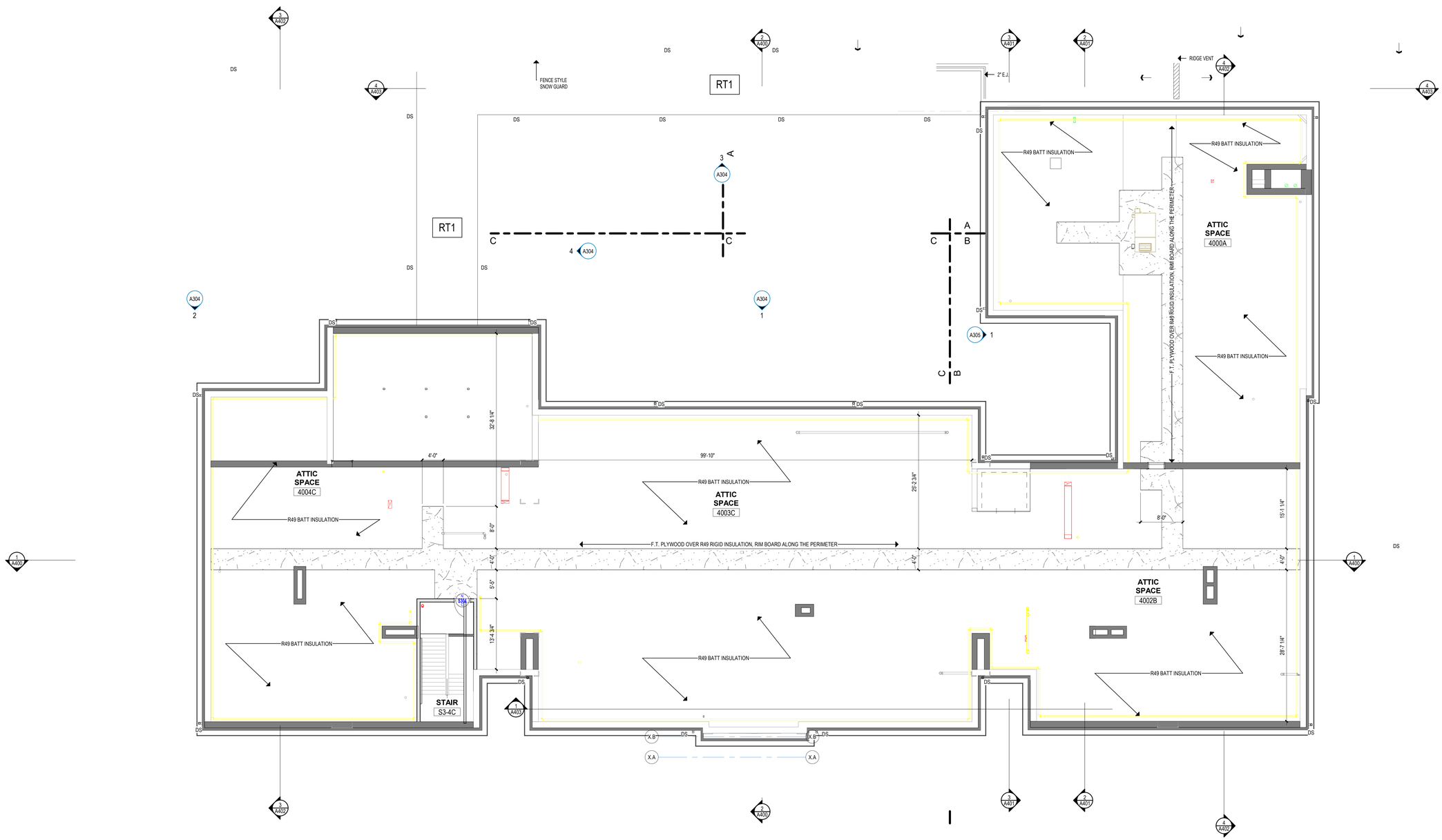
SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
311 STATE STREET NEW LONDON CT 06320
203 230 9007 silverpetrucelli.com

Revision:	Description:	Date:	Revised By:

Drawing Title: THIRD FLOOR PLAN - PART "B & C"

Date: 8/29/2024
Scale: As indicated
Drawn By: JM
Project Number: 22-382
Drawing Number: A132

8/30/2024 7:43:50 AM



1 Attic FLOOR PLAN - PART "B"
1/8" = 1'-0"

SYMBOL LEGEND

- NEW METAL STUD PARTITIONS
- NEW MASONRY WALL (4" BRICK VENEER)
- NEW CMU WALL
- 101 / A — DOOR NUMBER
- # — WINDOW TYPE (SEE A600s DRAWINGS)
- Room Name / 101 — ROOM NAME / ROOM NUMBER
- # — PARTITION TYPE (SEE A900s DRAWINGS)
- # — CONSTRUCTION KEY NOTE
- # — EXTERIOR DOOR LABEL, SEE DWG. A910
- 1Ref / 2 A101 — ELEVATION/SECTION NUMBER / SHEET NUMBER
- 1Ref / 2 A101 — INTERIOR ELEVATION NUMBER / SHEET NUMBER
- 2 A101 — WALL SECTION NUMBER / SHEET NUMBER
- 2 A101 — BUILDING SECTION NUMBER / SHEET NUMBER
- A.W.C. — ACCESSIBLE WATER COOLER/S
- RL — ROOF LEADER - REFER TO ROOF PLAN / EXTERIOR ELEVATIONS
- WB/TB/PB — WHITE BOARD / TACK BOARD / PEG BOARD
- SB — SMART BOARD
- F.E.C. — FIRE EXTINGUISHER AND CABINET
- F.D. — FLOOR DRAIN. SLOPE FLOOR TO DRAIN

GENERAL NOTES

1. READ ALL GENERAL NOTES ON DRAWINGS A001.
2. CONTRACTORS SHALL FIELD VERIFY ALL CONDITIONS AND DIMENSIONS.
3. PATCH TO MATCH ALL EXISTING WALLS AND CEILINGS TO REMAIN AFFECTED BY ANY DEMOLITION AND/OR NEW WORK.
4. ALL DIMENSIONS ARE OUTSIDE FACE OF BRICK, CONCRETE MASONRY UNITS AND FACE OF GYPSUM BOARD UNLESS OTHERWISE NOTED.
5. ALL NEW WALL AND PARTITION ASSEMBLIES SHALL EXTEND TO UNDERSIDE OF DECK ABOVE UNLESS OTHERWISE NOTED.
6. PROVIDE CMU WITH PRE-MANUFACTURED BULLNOSE AT ALL EXPOSED CORNERS.
7. PROVIDE CORNER GUARDS AT ALL GYPSUM WALL BOARD EXPOSED CORNERS.
8. WHERE THE WORD "ALIGN" IS INDICATED IT SHALL MEAN TO ALIGN BOTH SIDES OF THE WALL.
9. SEE M.E.P. DRAWINGS TO COORDINATE ALL REQUIRED TRENCHING AT CONCRETE SLABS. SAW CUT SLAB TO THE REQUIRED EXTENT, INSTALL UTILITIES, INFILL SLAB FLUSH WITH ADJACENT. SEE ALSO OTHER DETAILS IN THE DRAWINGS AS APPLICABLE.
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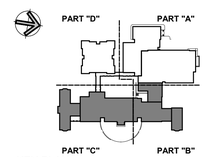

KEY PLAN

Project Title:
ADDITION & ALTERATIONS TO:
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285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

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3190 WHITNEY AVENUE HAMDEN CT 06518
311 STATE STREET NEW LONDON CT 06320
203 230 9007 silverpetrucelli.com

Revision:	Description:	Date:	Revised By:

Drawing Title: ATTIC FLOOR PLAN - PART "B & C"

Date: 8/29/2024
Scale: As indicated
Drawn By: JM
Project Number: 22-382
Drawing Number: A142

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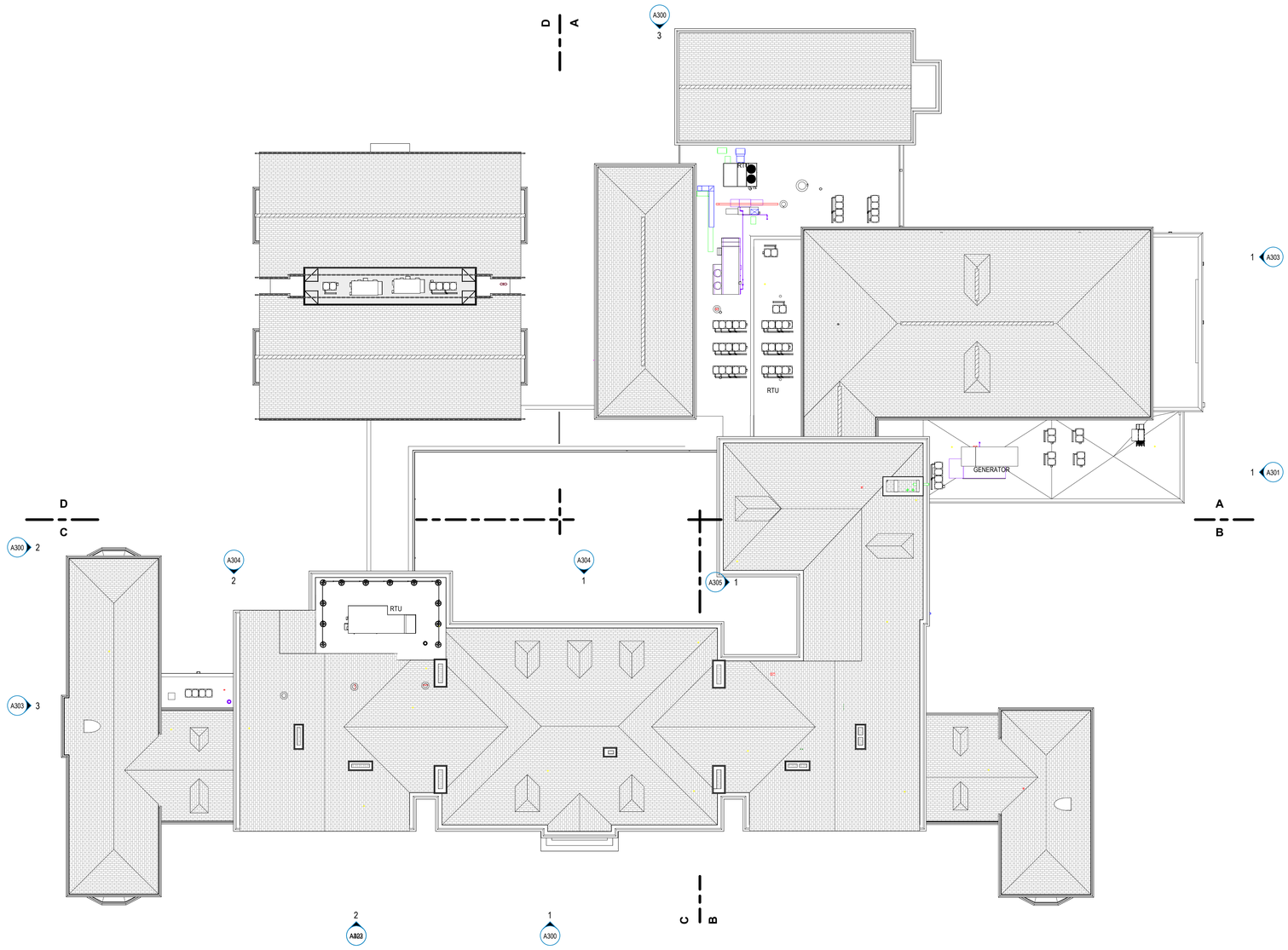


1 ROOF LEVEL - OVERALL PLAN

1/16" = 1'-0"

ROOF LEGEND

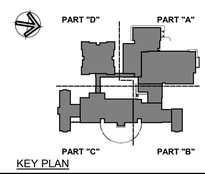
X / XX	- PLAN, SEC., DETAIL OR ELEV. NUMBER - SHEET NUMBER
@ 12" 5" SLOPE	- ROOF SLOPE AND DIRECTION
	- CRICKET
M.G.	- METAL GUTTER
R.V.	- RIDGE VENT
H.P.	- INDICATES HIGH POINT OF GUTTER
V.S.	-VENT STACK
E.C.	- EXISTING CHIMNEY
E.V.	- EXHAUST VENT / LOUVER
D.S.	- 3 x 4 ALUMINUM DOWNSPOUT

ROOF DEMO/CONSTRUCTION NOTES

1. FIELD VERIFY ALL DIMENSIONS @ EACH ROOF PRIOR TO BID.
2. REMOVE EXISTING ROOFING MATERIAL DOWN TO ROOF DECK. PATCH AND REPAIR ANY DAMAGED AREA OF ROOF RAFTERS OR DECKING. CONTRACTOR TO INSTALL ARCHITECTURAL ASPHALT SHINGLES OVER ICE & WATER SHIELD (ENTIRE ROOF)
3. REMOVE EXISTING METAL FLASHINGS, FASCIA, RAKES, DRIP EDGES, SOFFITS, ETC. DOWN TO EXISTING FRAMING.
4. ALL MATERIALS ARE NEW UNLESS OTHERWISE NOTED "EXISTING".
5. ALL WOOD BLOCKING (P.T.), PLYWOOD & NAILERS ARE TO BE PRESSURE TREATED (P.T.)
6. ALL WOOD BLOCKING (P.T.) INDICATED IN DETAILS ARE TO BE ANCHORED TO THE EXISTING STRUCTURE
7. CONTRACTOR TO INSPECT THE UNDERSIDE OF ALL ROOFS PRIOR TO ROOFING OPERATIONS TO INSURE THAT NO INTERIOR MATERIALS, EQUIPMENT, FINISHES OR OBJECTS WILL BE DAMAGED
8. CONTRACTOR ASSUMES ALL RESPONSIBILITY DURING PROJECT & WILL REPLACE ANY & ALL DAMAGED EQUIPMENT AT NO ADDITIONAL COST TO THE OWNER
9. SITE AREAS DISTURBED SHALL BE CLEANED & RE-LEVELED, W/ LAWN AREAS MAGNETICALLY RAKED TO REMOVE ANY METAL DEBRIS & RE-SEEDED AS REQUIRED TO MATCH ADJACENT CONDITIONS
10. SNAKE/ CLEAN OUT ALL VENT STACKS PRIOR TO INSTALLATION OF METAL SLEEVES.
11. ALL ANTENNAS, CONDUITS & ANY OTHER OBJECTS TO REMAIN AFFECTED BY THE SCOPE OF WORK TO BE TEMPORARILY REMOVED & REINSTALLED
12. SEE PROJ. MAN. FOR ALLOWANCES, UNIT PRICES AND ALTERNATES
13. CONTRACTOR TO FIELD VERIFY ALL EXISTING ROOF SLOPES IN FIELD
14. CONTRACTOR IS TO MAKE ROOF WATER TIGHT AT THE END OF EACH WORK DAY, INCLUDING ALL ROOF PENETRATIONS.
15. FOR NEW ROOF TOP EQUIPMENT AT ADDITION SEE MECHANICAL DRAWINGS. PROVIDE NEW CURB AS REQUIRED AND ROOF FLASHING FOR ALL NEW ROOF MECHANICAL EQUIPMENT, TYPICAL.

ROOF LEGEND

RT1	FULLY-ADHERED TPO MEMBRANE ROOFING OVER 1/2" PROTECTION COVERBOARD ON TAPERED RIGID INSULATION OVER 5/8" GYPSUM SHEATHING OVER METAL DECK (5" BASE RIGID INSULATION WITH TAPERED @ ¼"/FT SLOPING TO GUTTER).
RT1 E	FULLY-ADHERED TPO MEMBRANE ROOFING OVER 1/2" PROTECTION COVERBOARD ON TAPERED RIGID INSULATION OVER 5/8" GYPSUM SHEATHING OVER EXISTING METAL DECK (5" MINIMUM BASE RIGID INSULATION WITH TAPERED @ ¼"/FT SLOPING TO GUTTER).
RT2	ARCHITECTURAL ASPHALT ROOF SHIGLES OVER 1/2" PROTECTION COVERBOARD OVER INSULATED VENTED ROOF DECK INSULATION OVER 1/2" COVERBOARD OVER 1½" ACOUSTIC METAL DECK (5" MINIMUM BASE RIGID INSULATION SLOPING TO GUTTER). PROVIDE ACOUSTICAL INSULATION BETWEEN DECK WEBS.
RT2 E	ARCHITECTURAL ASPHALT ROOF SHIGLES OVER 1/2" PROTECTION COVERBOARD OVER INSULATED VENTED ROOF DECK INSULATION OVER 1/2" COVERBOARD OVER EXISTING METAL DECK (5" MINIMUM BASE RIGID INSULATION SLOPING TO GUTTER).
RT3	ARCHITECTURAL ASPHALT ROOF SHIGLES AND UNDERLAYMENT. REPAIR AND EXISTING ROOF AND REBUILD DORMER ACCORDINGLY TO MATCH EXISTING TO REMAIN ROOF.



KEY PLAN

Project Title:

ADDITION & ALTERATIONS TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
311 STATE STREET NEW LONDON CT 06320
203 230 9007 silverpetrucelli.com

Revision:	Description:	Date:	Revised By:

Drawing Title: OVERALL ROOF PLAN

Date: 8/29/2024
Scale: As indicated
Drawn By: JM
Project Number: 22-382

Drawing Number: A150

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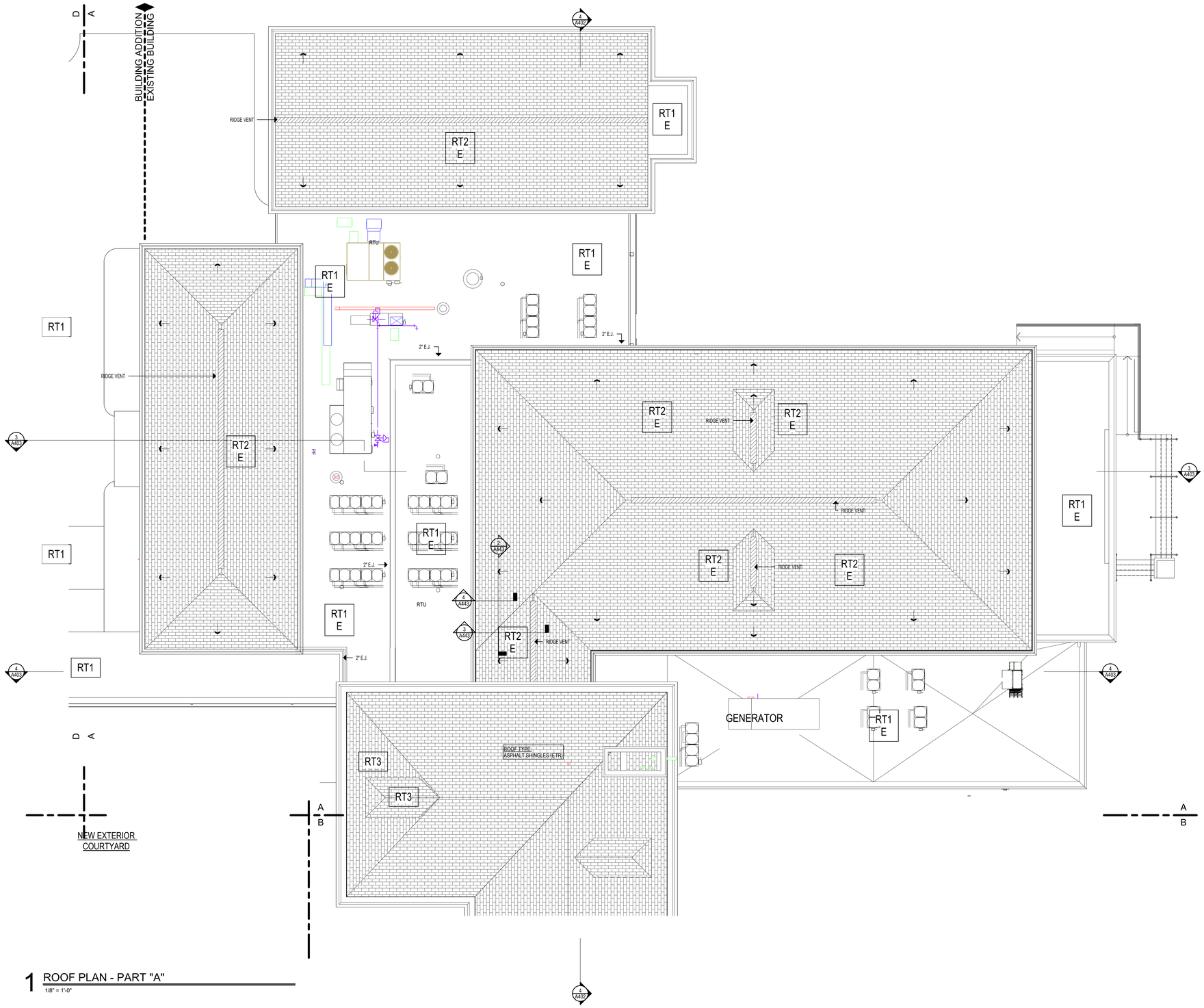

1 ROOF PLAN - PART "A"

1/8" = 1'-0"

ROOF LEGEND

- X / XX - PLAN, SEC., DETAIL OR ELEV. NUMBER / SHEET NUMBER
- @ 12" 5" SLOPE → - ROOF SLOPE AND DIRECTION
- - CRICKET
- M.G. - METAL GUTTER
- R.V. - RIDGE VENT
- H.P. - INDICATES HIGH POINT OF GUTTER
- V.S. - VENT STACK
- E.C. - EXISTING CHIMNEY
- E.V. - EXHAUST VENT / LOUVER
- D.S. - 3 x 4 ALUMINUM DOWNSPOUT

ROOF DEMO/CONSTRUCTION NOTES

1. FIELD VERIFY ALL DIMENSIONS @ EACH ROOF PRIOR TO BID.
2. REMOVE EXISTING ROOFING MATERIAL DOWN TO ROOF DECK. PATCH AND REPAIR ANY DAMAGED AREA OF ROOF RAFTERS OR DECKING. CONTRACTOR TO INSTALL ARCHITECTURAL ASPHALT SHINGLES OVER ICE & WATER SHIELD (ENTIRE ROOF)
3. REMOVE EXISTING METAL FLASHINGS, FASCIA, RAKES, DRIP EDGES, SOFFITS, ETC. DOWN TO EXISTING FRAMING.
4. ALL MATERIALS ARE NEW UNLESS OTHERWISE NOTED "EXISTING".
5. ALL WOOD BLOCKING (P.T.), PLYWOOD & NAILERS ARE TO BE PRESSURE TREATED (P.T.)
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9. SITE AREAS DISTURBED SHALL BE CLEANED & RE-LEVELED, WI LAWN AREAS MAGNETICALLY RAKED TO REMOVE ANY METAL DEBRIS & RE-SEEDED AS REQUIRED TO MATCH ADJACENT CONDITIONS
10. SNAKE/ CLEAN OUT ALL VENT STACKS PRIOR TO INSTALLATION OF METAL SLEEVES.
11. ALL ANTENNAS, CONDUITS & ANY OTHER OBJECTS TO REMAIN AFFECTED BY THE SCOPE OF WORK TO BE TEMPORARILY REMOVED & REINSTALLED
12. SEE PROJ. MAN. FOR ALLOWANCES, UNIT PRICES AND ALTERNATES
13. CONTRACTOR TO FIELD VERIFY ALL EXISTING ROOF SLOPES IN FIELD
14. CONTRACTOR IS TO MAKE ROOF WATER TIGHT AT THE END OF EACH WORK DAY, INCLUDING ALL ROOF PENETRATIONS.
15. FOR NEW ROOF TOP EQUIPMENT AT ADDITION SEE MECHANICAL DRAWINGS. PROVIDE NEW CURB AS REQUIRED AND ROOF FLASHING FOR ALL NEW ROOF MECHANICAL EQUIPMENT, TYPICAL.

ROOF LEGEND

RT1	FULLY-ADHERED TPO MEMBRANE ROOFING OVER 1/2" PROTECTION COVERBOARD ON TAPERED RIGID INSULATION OVER 5/8" GYPSUM SHEATHING OVER METAL DECK (5" BASE RIGID INSULATION WITH TAPERED @ ¼"/FT SLOPING TO GUTTER).
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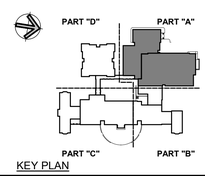

KEY PLAN

Project Title:

ADDITION & ALTERATIONS TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
311 STATE STREET NEW LONDON CT 06320
203 230 9007 silverpetrucelli.com

Revision:	Description:	Date:	Revised By:

Drawing Title: ROOF PLAN - PART "A"

Date: 8/29/2024
Scale: As indicated
Drawn By: JM
Project Number: 22-382
Drawing Number: A151

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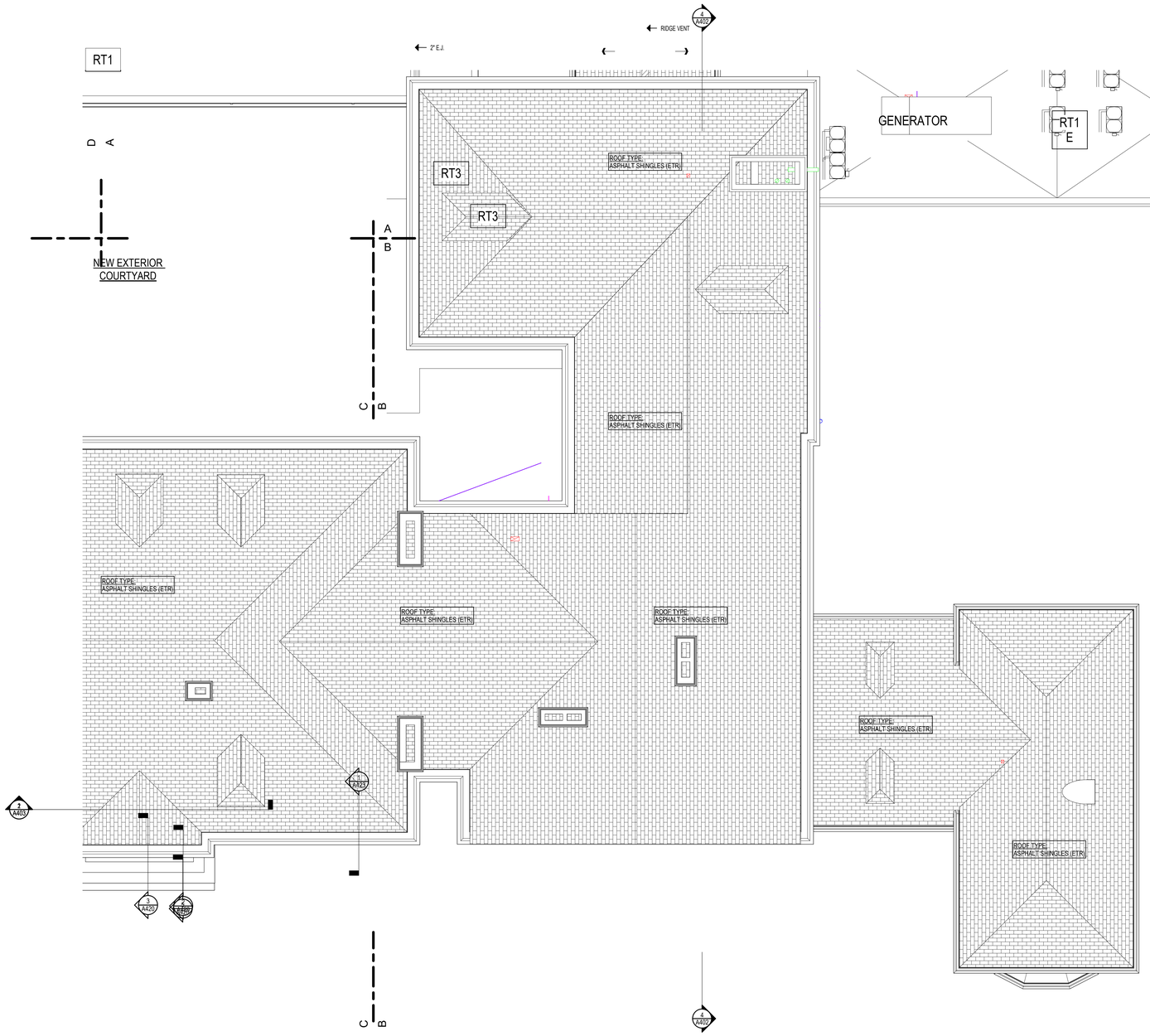

1 ROOF PLAN - PART "B"
1/8" = 1'-0"

ROOF LEGEND

- X / XX - PLAN, SEC., DETAIL OR ELEV. NUMBER / - SHEET NUMBER
- @ 12" 5" SLOPE - ROOF SLOPE AND DIRECTION
- - CRICKET
- M.G. - METAL GUTTER
- R.V. - RIDGE VENT
- H.P. - INDICATES HIGH POINT OF GUTTER
- V.S. - VENT STACK
- E.C. - EXISTING CHIMNEY
- E.V. - EXHAUST VENT / LOUVER
- D.S. - 3 x 4 ALUMINUM DOWNSPOUT

ROOF DEMO/CONSTRUCTION NOTES

1. FIELD VERIFY ALL DIMENSIONS @ EACH ROOF PRIOR TO BID.
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3. REMOVE EXISTING METAL FLASHINGS, FASCIA, RAKES, DRIP EDGES, SOFFITS, ETC. DOWN TO EXISTING FRAMING.
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ROOF LEGEND

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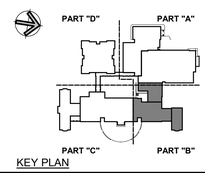

KEY PLAN

Project Title:
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Revision:	Description:	Date:	Revised By:

Drawing Title: ROOF PLAN - PART "B"

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Scale: As indicated
Drawn By: JM
Project Number: 22-382
Drawing Number: A152

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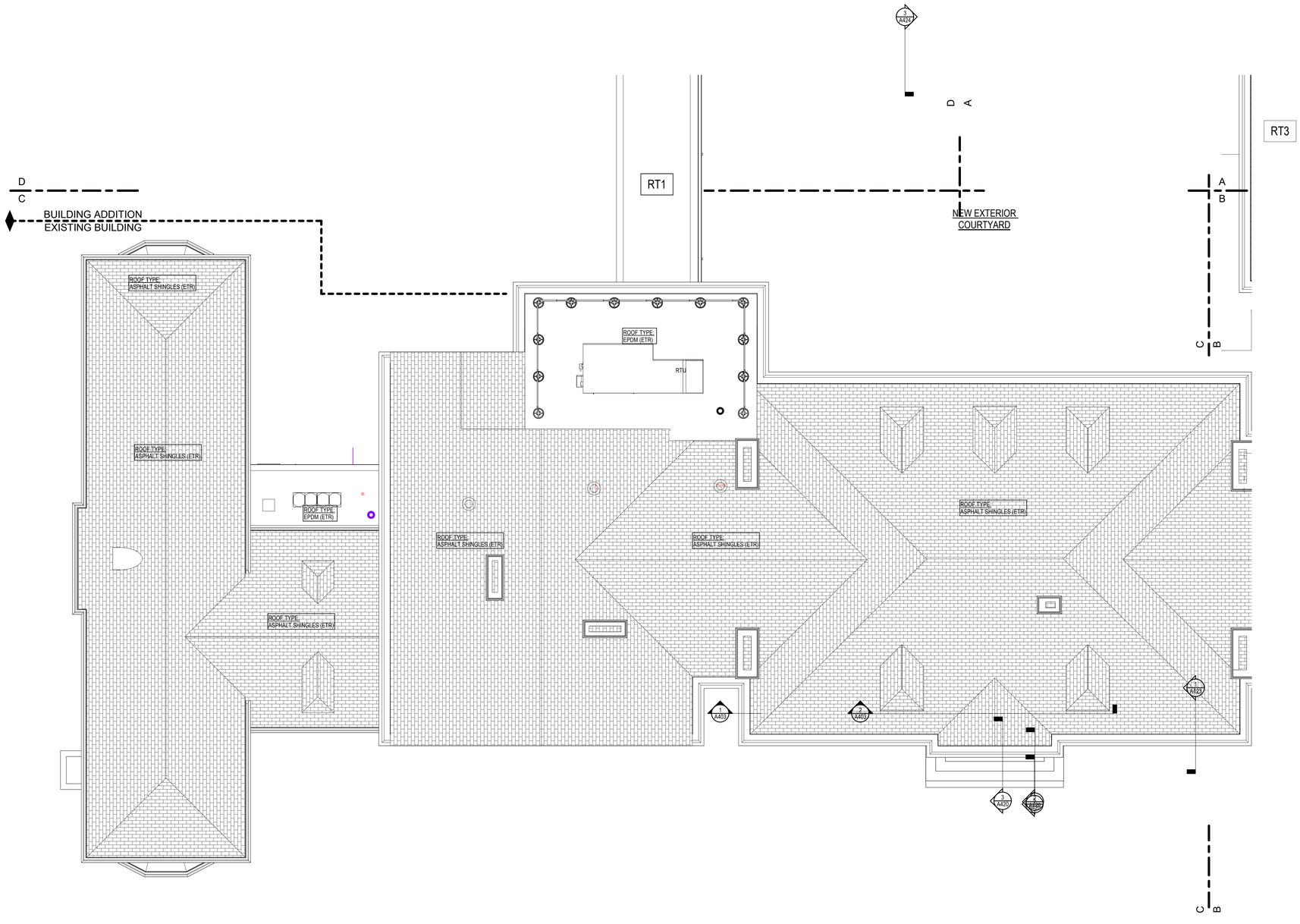

1 ROOF PLAN - PART "C"

1/8" = 1'-0"

ROOF LEGEND

- X / XX - PLAN, SEC., DETAIL OR ELEV. NUMBER / - SHEET NUMBER
- @ 12" 5" SLOPE - ROOF SLOPE AND DIRECTION
- - CRICKET
- M.G. - METAL GUTTER
- R.V. - RIDGE VENT
- H.P. - INDICATES HIGH POINT OF GUTTER
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ROOF DEMO/CONSTRUCTION NOTES

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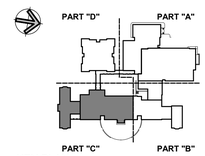
10. SNAKE/ CLEAN OUT ALL VENT STACKS PRIOR TO INSTALLATION OF METAL SLEEVES.
11. ALL ANTENNAS, CONDUITS & ANY OTHER OBJECTS TO REMAIN AFFECTED BY THE SCOPE OF WORK TO BE TEMPORARILY REMOVED & REINSTALLED
12. SEE PROJ. MAN. FOR ALLOWANCES, UNIT PRICES AND ALTERNATES
13. CONTRACTOR TO FIELD VERIFY ALL EXISTING ROOF SLOPES IN FIELD
14. CONTRACTOR IS TO MAKE ROOF WATER TIGHT AT THE END OF EACH WORK DAY, INCLUDING ALL ROOF PENETRATIONS.
15. FOR NEW ROOF TOP EQUIPMENT AT ADDITION SEE MECHANICAL DRAWINGS. PROVIDE NEW CURB AS REQUIRED AND ROOF FLASHING FOR ALL NEW ROOF MECHANICAL EQUIPMENT, TYPICAL.

ROOF LEGEND

RT1	FULLY-ADHERED TPO MEMBRANE ROOFING OVER 1/2" PROTECTION COVERBOARD ON TAPERED RIGID INSULATION OVER 5/8" GYPSUM SHEATHING OVER METAL DECK (5" BASE RIGID INSULATION WITH TAPERED @ ¼"/FT SLOPING TO GUTTER).
RT1 E	FULLY-ADHERED TPO MEMBRANE ROOFING OVER 1/2" PROTECTION COVERBOARD ON TAPERED RIGID INSULATION OVER 5/8" GYPSUM SHEATHING OVER EXISTING METAL DECK (5" MINIMUM BASE RIGID INSULATION WITH TAPERED @ ¼"/FT SLOPING TO GUTTER).
RT2	ARCHITECTURAL ASPHALT ROOF SHIGLES OVER 1/2" PROTECTION COVERBOARD OVER INSULATED VENTED ROOF DECK INSULATION OVER 1/2" COVERBOARD OVER 1½" ACOUSTIC METAL DECK (5" MINIMUM BASE RIGID INSULATION SLOPING TO GUTTER). PROVIDE ACOUSTICAL INSULATION BETWEEN DECK WEBS.
RT2 E	ARCHITECTURAL ASPHALT ROOF SHIGLES OVER 1/2" PROTECTION COVERBOARD OVER INSULATED VENTED ROOF DECK INSULATION OVER 1/2" COVERBOARD OVER EXISTING METAL DECK (5" MINIMUM BASE RIGID INSULATION SLOPING TO GUTTER).
RT3	ARCHITECTURAL ASPHALT ROOF SHIGLES AND LINDERLAYMENT. REPAIR AND EXISTING ROOF AND REBUILD DORMER ACCORDINGLY TO MATCH EXISTING TO REMAIN ROOF.



KEY PLAN

Project Title:

ADDITION & ALTERATIONS TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

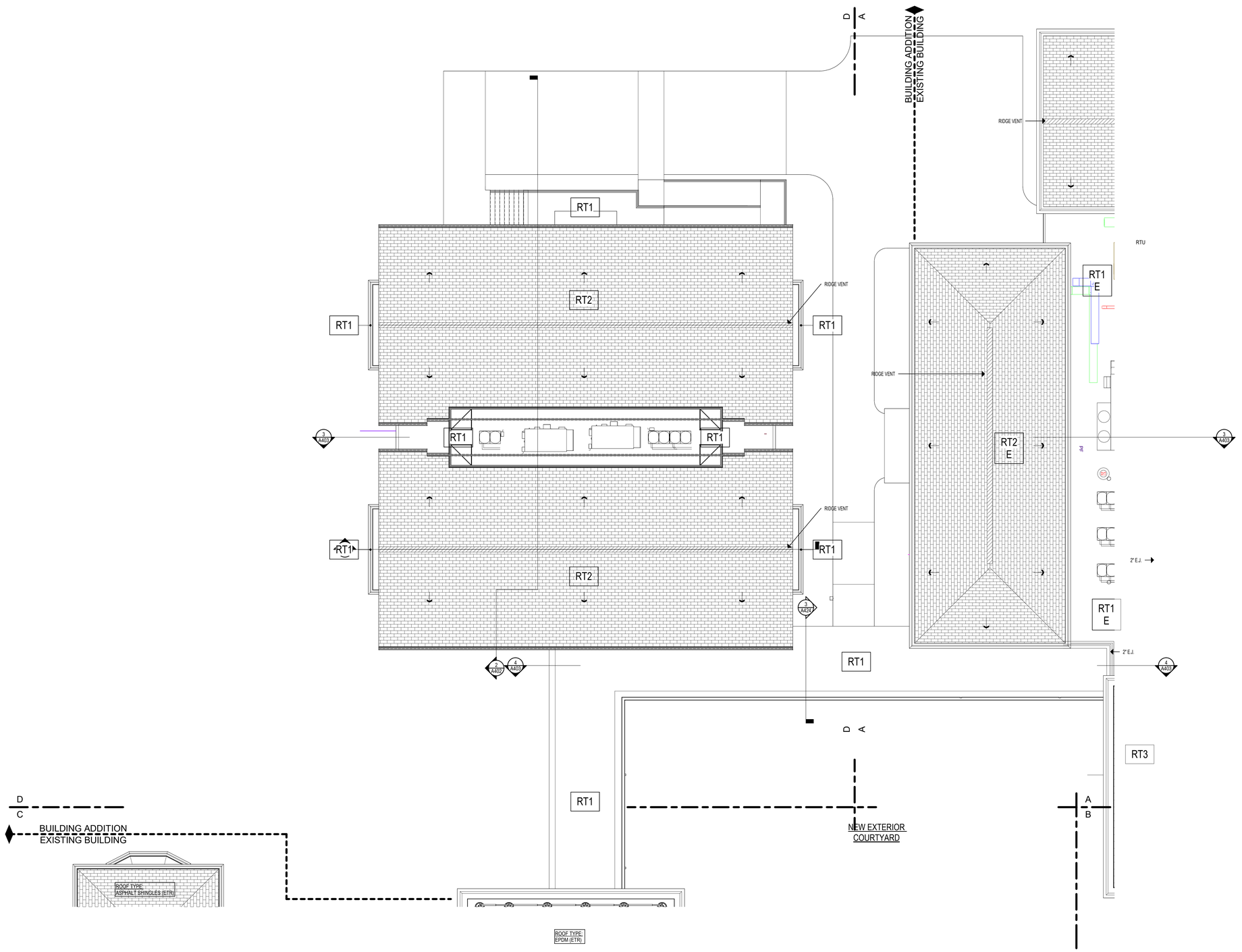
SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
311 STATE STREET NEW LONDON CT 06320
203 230 9007 silverpetrucelli.com

Revision:	Description:	Date:	Revised By:

Drawing Title: ROOF PLAN - PART "C"

Date: 8/29/2024
Scale: As indicated
Drawn By: JM
Project Number: 22-382
Drawing Number: A153

8/30/2024 7:44:26 AM



1 ROOF PLAN - PART "D"
1/8" = 1'-0"

ROOF LEGEND

- X / XX - PLAN, SEC., DETAIL OR ELEV. NUMBER / - SHEET NUMBER
- @ 12" 5" SLOPE - ROOF SLOPE AND DIRECTION
- - CRICKET
- M.G. - METAL GUTTER
- R.V. - RIDGE VENT
- H.P. - INDICATES HIGH POINT OF GUTTER
- V.S. - VENT STACK
- E.C. - EXISTING CHIMNEY
- E.V. - EXHAUST VENT / LOUVER
- D.S. - 3 x 4 ALUMINUM DOWNSPOUT

ROOF DEMO/CONSTRUCTION NOTES

1. FIELD VERIFY ALL DIMENSIONS @ EACH ROOF PRIOR TO BID.
2. REMOVE EXISTING ROOFING MATERIAL DOWN TO ROOF DECK. PATCH AND REPAIR ANY DAMAGED AREA OF ROOF RAFTERS OR DECKING. CONTRACTOR TO INSTALL ARCHITECTURAL ASPHALT SHINGLES OVER ICE & WATER SHIELD (ENTIRE ROOF)
3. REMOVE EXISTING METAL FLASHINGS, FASCIA, RAKES, DRIP EDGES, SOFFITS, ETC. DOWN TO EXISTING FRAMING.
4. ALL MATERIALS ARE NEW UNLESS OTHERWISE NOTED "EXISTING".
5. ALL WOOD BLOCKING (P.T.), PLYWOOD & NAILERS ARE TO BE PRESSURE TREATED (P.T.)
6. ALL WOOD BLOCKING (P.T.) INDICATED IN DETAILS ARE TO BE ANCHORED TO THE EXISTING STRUCTURE
7. CONTRACTOR TO INSPECT THE UNDERSIDE OF ALL ROOFS PRIOR TO ROOFING OPERATIONS TO INSURE THAT NO INTERIOR MATERIALS, EQUIPMENT, FINISHES OR OBJECTS WILL BE DAMAGED
8. CONTRACTOR ASSUMES ALL RESPONSIBILITY DURING PROJECT & WILL REPLACE ANY & ALL DAMAGED EQUIPMENT AT NO ADDITIONAL COST TO THE OWNER
9. SITE AREAS DISTURBED SHALL BE CLEANED & RE-LEVELED, W/ LAWN AREAS MAGNETICALLY RAKED TO REMOVE ANY METAL DEBRIS & RE-SEEDED AS REQUIRED TO MATCH ADJACENT CONDITIONS
10. SNAKE/ CLEAN OUT ALL VENT STACKS PRIOR TO INSTALLATION OF METAL SLEEVES.
11. ALL ANTENNAS, CONDUITS & ANY OTHER OBJECTS TO REMAIN AFFECTED BY THE SCOPE OF WORK TO BE TEMPORARILY REMOVED & REINSTALLED
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ROOF LEGEND

- RT1 - FULLY-ADHERED TPO MEMBRANE ROOFING OVER 1/2" PROTECTION COVERBOARD ON TAPERED RIGID INSULATION OVER 5/8" GYPSUM SHEATHING OVER METAL DECK (5" BASE RIGID INSULATION WITH TAPERED @ ¼"/FT SLOPING TO GUTTER).
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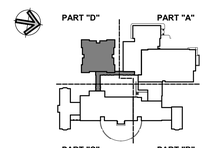
- RT2 E - ARCHITECTURAL ASPHALT ROOF SHIGLES OVER 1/2" PROTECTION COVERBOARD OVER INSULATED VENTED ROOF DECK INSULATION OVER 1/2" COVERBOARD OVER EXISTING METAL DECK (5" MINIMUM BASE RIGID INSULATION SLOPING TO GUTTER).
- RT3 - ARCHITECTURAL ASPHALT ROOF SHIGLES AND UNDERLAYMENT. REPAIR AND EXISTING ROOF AND REBUILD DORMER ACCORDINGLY TO MATCH EXISTING TO REMAIN ROOF.



KEY PLAN

Project Title:
ADDITION & ALTERATIONS TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

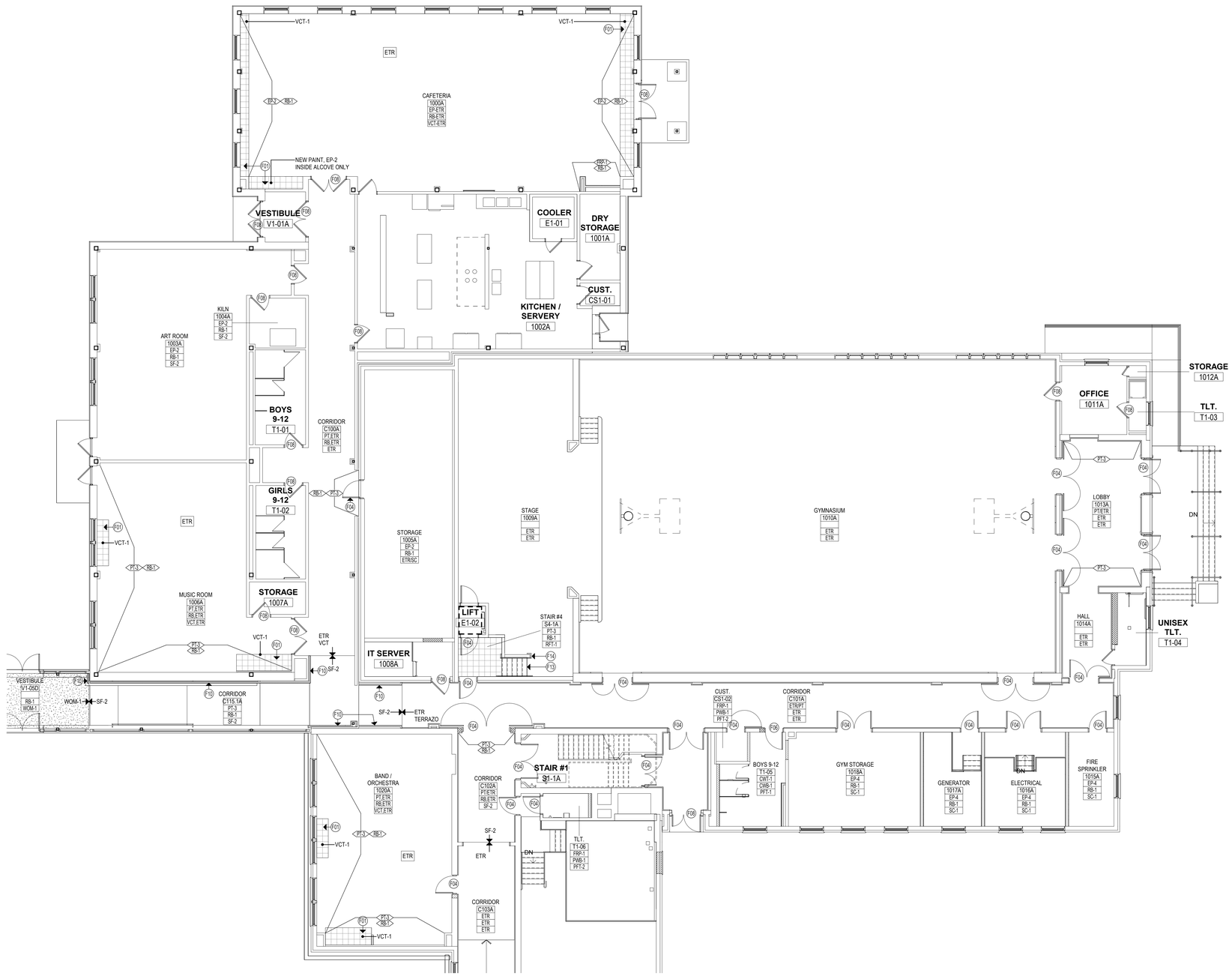
SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
311 STATE STREET NEW LONDON CT 06320
203 230 9007 silverpetrucelli.com

Revision:	Description:	Date:	Revised By:

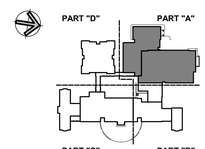
Drawing Title: ROOF PLAN - PART "D"

Date: 8/29/2024
Scale: As indicated
Drawn By: JM
Project Number: 22-382
Drawing Number: A154

8/30/2024 7:44:31 AM



1 FINISH PLAN - 1st FLOOR PART "A"
1/8" = 1'-0"



KEY PLAN

FINISH PLAN LEGEND

ROOM FINISH TAG



* IF TWO FINISHES ARE LISTED TOGETHER, THE FIRST IS THE FIELD

ROOM ACCENT TAG



GENERAL FINISH NOTES

- REFER TO FINISH SCHEDULE AND FINISH PLAN FOR GENERAL FINISHES. REFER TO ALL INTERIOR FINISH NOTES, INTERIOR DRAWINGS (INCLUDING PLANS, ELEVATIONS & DETAILS) AND OWNERS DESIGN STANDARD MANUALS FOR COMPLETE INTERIORS INFORMATION.
- REFER TO ANSI 117.1 FOR MOUNTING HEIGHTS & FLOOR CLEARANCES.
- ALIGN TRANSITION OF FLOOR MATERIAL WITH CENTER OF HINGE IN DOORWAY. IN A WRAPPED OPENING WITHOUT HINGES, REFERENCE FINISH PLANS FOR TRANSITION LOCATIONS.
- PROVIDE MANUFACTURER'S RECOMMENDATIONS FOR TRANSITION BETWEEN UNLIKE FLOORING MATERIALS.
- FLOOR FINISHES TO EXTEND BENEATH MILLWORK.
- GC TO INSTALL BASE ON ALL WALLS UNLESS OTHERWISE NOTED.
- GC TO DETERMINE TAKE-OFF QUANTITIES AND ADHESIVE REQUIREMENTS FOR ALL FINISHES.
- CONTRACTOR TO INSTALL A SINGLE-PIECE, ADA-COMPLIANT, SOLID MARBLE THRESHOLD AT ALL FLOORING TRANSITIONS TO TOILET ROOMS.
- AT AREAS OF CASEWORK AND / OR UNIT VENTILATOR REMOVAL WHERE NEW FINISHED FLOORING IS BEING PATCHED INTO EXISTING, REMOVE EXISTING FLOORING TO CREATE A CLEAN DELINEATION, SIMILAR TO PATTERN SHOWN IN PLAN, AND PATCH IN NEW TO ALIGN WITH EXISTING SEAMS.
- PAINT ALL MODIFIED STAIR HAND RAILS EP-3

FINISH KEYNOTES

No.	NOTE DESCRIPTION
F01	REMOVE EXISTING FLOORING AND PATCH IN NEW VCT TO ALIGN WITH EXISTING SEAMS.
F02	REMOVE EXISTING FLOORING AND PATCH IN NEW CARPET TILES TO ALIGN WITH EXISTING SEAMS.
F03	WALL TO RECEIVE MAGNETIC DRY-ERASE WALLCOVERING, WC-1. SEE INTERIOR ELEVATION.
F04	DOOR TRIM SHALL BE PAINTED (EP-3).
F05	DOOR TRIM SHALL BE PAINTED (PT-7).
F06	DOOR TRIM SHALL BE PAINTED (EP-1).
F07	DOOR TRIM SHALL BE PAINTED (PT-2).
F08	EXISTING DOOR TRIM COLOR TO REMAIN.
F09	NEW WOOD DOOR TRIM SHALL BE PAINTED (PT-3 IN SEMI-GLOSS FINISH)
F10	WALL SHALL RECEIVE WALL PROTECTION (WP-1) W/ TOP CAP. HEIGHT TO BE CUT TO ALIGN WITH EXISTING WAINSCOT/ GLAZING IN SAME AREA. PAINT COLOR ABOVE.
F11	WALL SHALL RECEIVE BULLETIN BOARD (BB-#). REFFER TO INTERIOR ELEVATION FOR HEIGHT INDICATION.
F12	INFILL FLOORING GAP AFTER GLAZING AND TERAZZO REMOVAL W/ POLISHED CONCRETE.
F13	PROVIDE AND INSTALL RUBBER STAIR TREADS RST-1
F14	PAINT HAND RAILS EP-3

Project Title:

ADDITION & ALTERATIONS TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

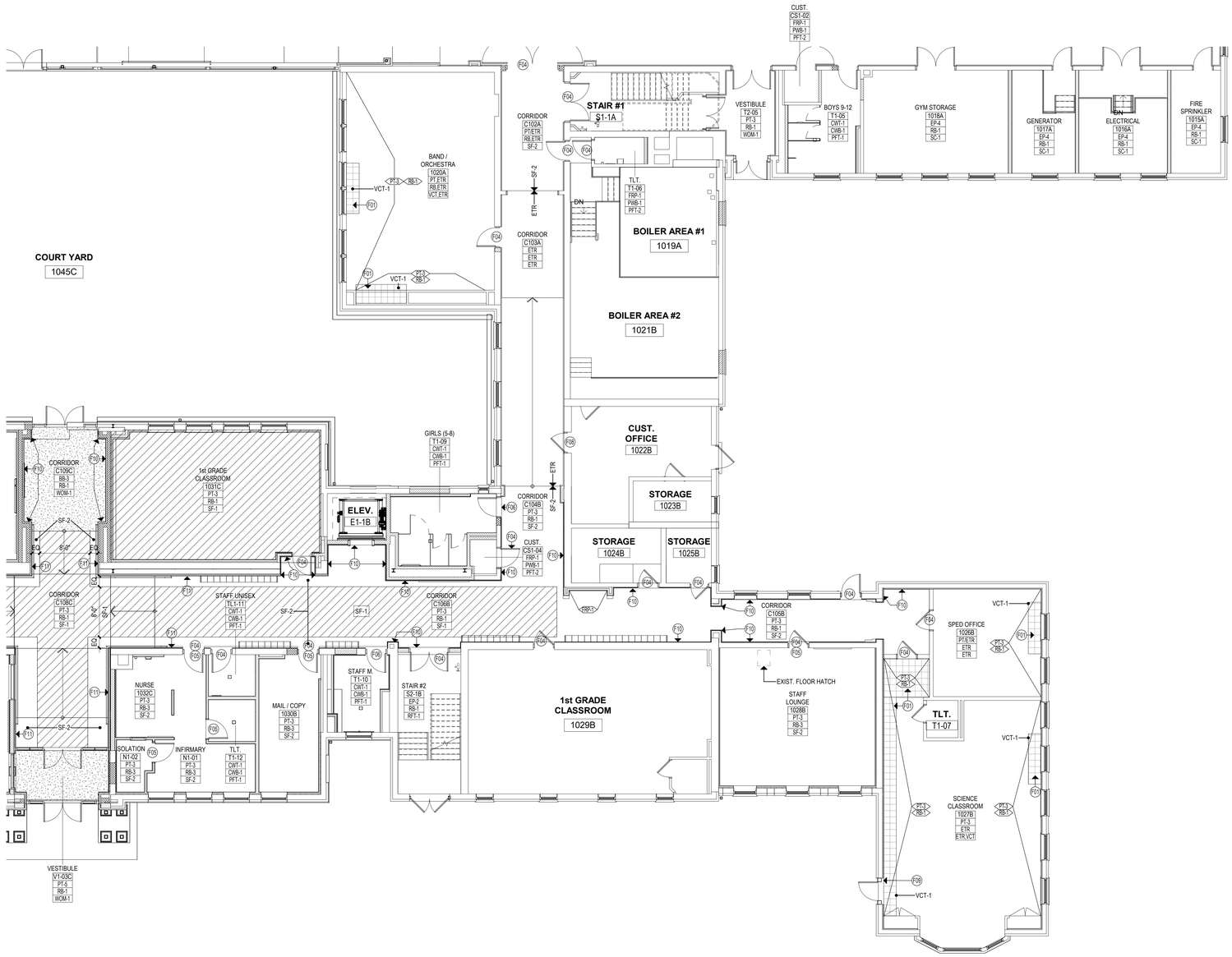
SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
311 STATE STREET NEW LONDON CT 06320
203 230 9007 silverpetrucelli.com

Revision:	Description:	Date:	Revised By:

Drawing Title: FINISH PLAN - FIRST FLOOR - PART "A"

Date: 8/29/2024
Scale: As indicated
Drawn By: JAL
Project Number: 22-382
Drawing Number: A211

8/29/2024 12:16:24 PM



1 FINISH PLAN - 1st FLOOR PART "B"

1/8" = 1'-0"

FINISH PLAN LEGEND

ROOM FINISH TAG

ROOM NAME
ROOM NUMBER — 101
WALL FINISH — PT-1
BASE FINISH — RB-1
FLOOR FINISH — CPT-1

* IF TWO FINISHES ARE LISTED TOGETHER, THE FIRST IS THE FIELD

ROOM ACCENT TAG

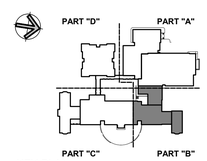
WALL ACCENT — PT-3
BASE ACCENT — RB-3

GENERAL FINISH NOTES

- REFER TO FINISH SCHEDULE AND FINISH PLAN FOR GENERAL FINISHES. REFER TO ALL INTERIOR FINISH NOTES, INTERIOR DRAWINGS (INCLUDING PLANS, ELEVATIONS & DETAILS) AND OWNERS DESIGN STANDARD MANUALS FOR COMPLETE INTERIORS INFORMATION.
- REFER TO ANSI 117.1 FOR MOUNTING HEIGHTS & FLOOR CLEARANCES.
- ALIGN TRANSITION OF FLOOR MATERIAL WITH CENTER OF HINGE IN DOORWAY. IN A WRAPPED OPENING WITHOUT HINGES, REFERENCE FINISH PLANS FOR TRANSITION LOCATIONS.
- PROVIDE MANUFACTURER'S RECOMMENDATIONS FOR TRANSITION BETWEEN UNLIKE FLOORING MATERIALS.
- FLOOR FINISHES TO EXTEND BENEATH MILLWORK.
- GC TO INSTALL BASE ON ALL WALLS UNLESS OTHERWISE NOTED.
- GC TO DETERMINE TAKE-OFF QUANTITIES AND ADHESIVE REQUIREMENTS FOR ALL FINISHES.
- CONTRACTOR TO INSTALL A SINGLE-PIECE, ADA-COMPLIANT, SOLID MARBLE THRESHOLD AT ALL FLOORING TRANSITIONS TO TOILET ROOMS.
- AT AREAS OF CASEWORK AND / OR UNIT VENTILATOR REMOVAL WHERE NEW FINISHED FLOORING IS BEING PATCHED INTO EXISTING, REMOVE EXISTING FLOORING TO CREATE A CLEAN DELINEATION, SIMILAR TO PATTERN SHOWN IN PLAN, AND PATCH IN NEW TO ALIGN WITH EXISTING SEAMS.
- PAINT ALL MODIFIED STAIR HAND RAILS EP-3

FINISH KEYNOTES

No.	NOTE DESCRIPTION
F01	REMOVE EXISTING FLOORING AND PATCH IN NEW VCT TO ALIGN WITH EXISTING SEAMS.
F02	REMOVE EXISTING FLOORING AND PATCH IN NEW CARPET TILES TO ALIGN WITH EXISTING SEAMS.
F03	WALL TO RECEIVE MAGNETIC DRY-ERASE WALLCOVERING, WC-1. SEE INTERIOR ELEVATION.
F04	DOOR TRIM SHALL BE PAINTED (EP-3).
F05	DOOR TRIM SHALL BE PAINTED (PT-7).
F06	DOOR TRIM SHALL BE PAINTED (EP-1).
F07	DOOR TRIM SHALL BE PAINTED (PT-2).
F08	EXISTING DOOR TRIM COLOR TO REMAIN.
F09	NEW WOOD DOOR TRIM SHALL BE PAINTED (PT-3 IN SEMI-GLOSS FINISH)
F10	WALL SHALL RECEIVE WALL PROTECTION (WP-1) W/ TOP CAP. HEIGHT TO BE CUT TO ALIGN WITH EXISTING WAINSCOT/ GLAZING IN SAME AREA. PAINT COLOR ABOVE
F11	WALL SHALL RECEIVE BULLETIN BOARD (BB-#). REFFER TO INTERIOR ELEVATION FOR HEIGHT INDICATION.
F12	INFILL FLOORING GAP AFTER GLAZING AND TERAZZO REMOVAL W/ POLISHED CONCRETE.
F13	PROVIDE AND INSTALL RUBBER STAIR TREADS RST-1
F14	PAINT HAND RAILS EP-3



KEY PLAN

Project Title:

ADDITION & ALTERATIONS TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

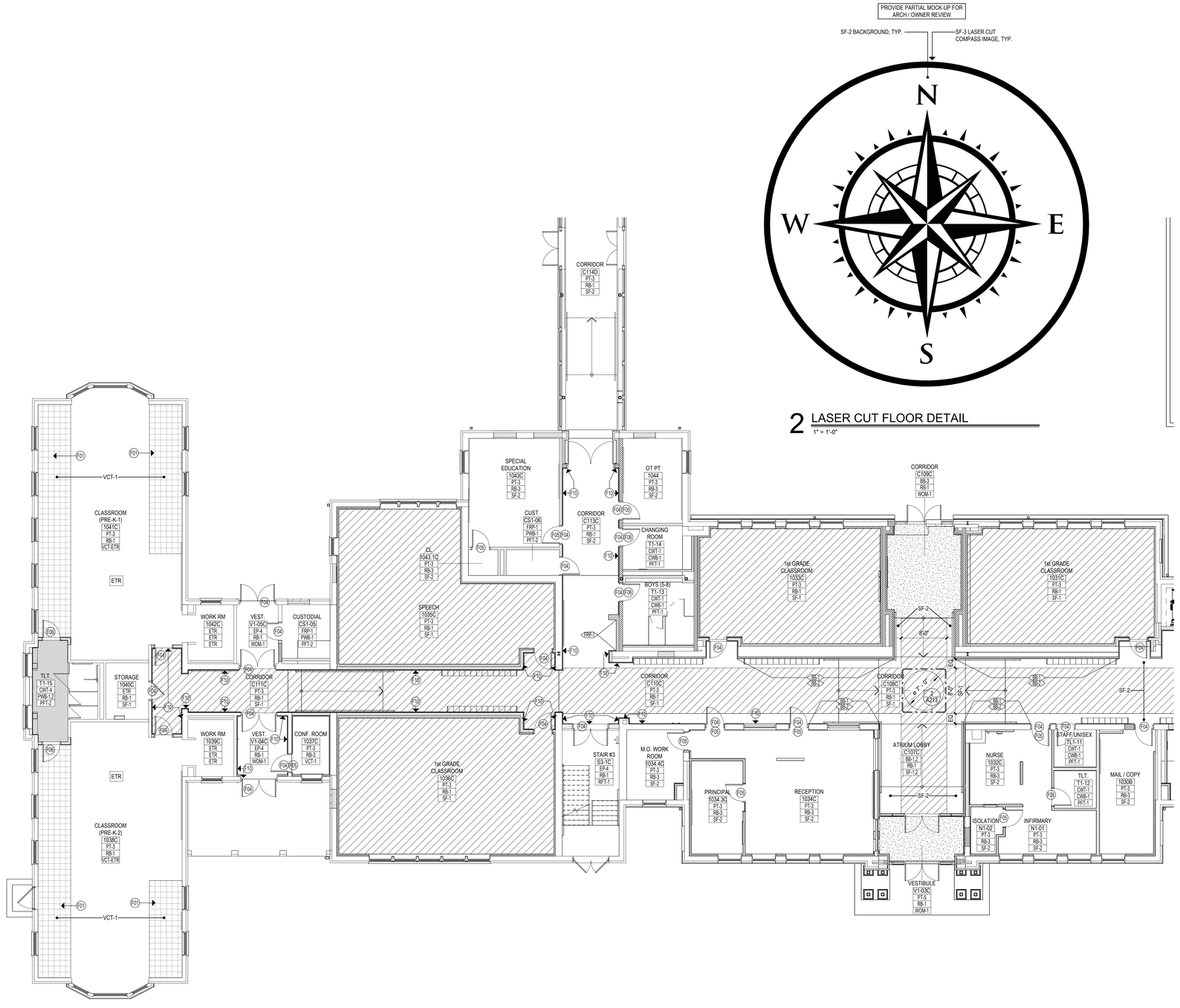
SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
311 STATE STREET NEW LONDON CT 06320
203 230 9007 silverpetrucelli.com

Revision:	Description:	Date:	Revised By:

Drawing Title: FINISH PLAN - FIRST FLOOR - PART "B"

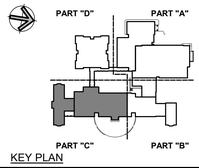
Date: 8/29/2024
Scale: As indicated
Drawn By: JAL
Project Number: 22-382
Drawing Number: A212

8/29/2024 12:16:40 PM



1 FINISH PLAN - 1st FLOOR PART "C"
1/8" = 1'-0"

2 LASER CUT FLOOR DETAIL
1" = 1'-0"



KEY PLAN

FINISH PLAN LEGEND

ROOM FINISH TAG

ROOM NAME
ROOM NUMBER — 101
WALL FINISH — PT-1
BASE FINISH — RB-1
FLOOR FINISH — CPT-1

* IF TWO FINISHES ARE LISTED TOGETHER, THE FIRST IS THE FIELD

ROOM ACCENT TAG
WALL ACCENT — PT-3
BASE ACCENT — RB-3

GENERAL FINISH NOTES

- REFER TO FINISH SCHEDULE AND FINISH PLAN FOR GENERAL FINISHES. REFER TO ALL INTERIOR FINISH NOTES, INTERIOR DRAWINGS (INCLUDING PLANS, ELEVATIONS & DETAILS) AND OWNERS DESIGN STANDARD MANUALS FOR COMPLETE INTERIORS INFORMATION.
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- AT AREAS OF CASEWORK AND / OR UNIT VENTILATOR REMOVAL WHERE NEW FINISHED FLOORING IS BEING PATCHED INTO EXISTING, REMOVE EXISTING FLOORING TO CREATE A CLEAN DELINEATION, SIMILAR TO PATTERN SHOWN IN PLAN, AND PATCH IN NEW TO ALIGN WITH EXISTING SEAMS.
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FINISH KEYNOTES

No.	NOTE DESCRIPTION
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F14	PAINT HAND RAILS EP-3

Project Title:
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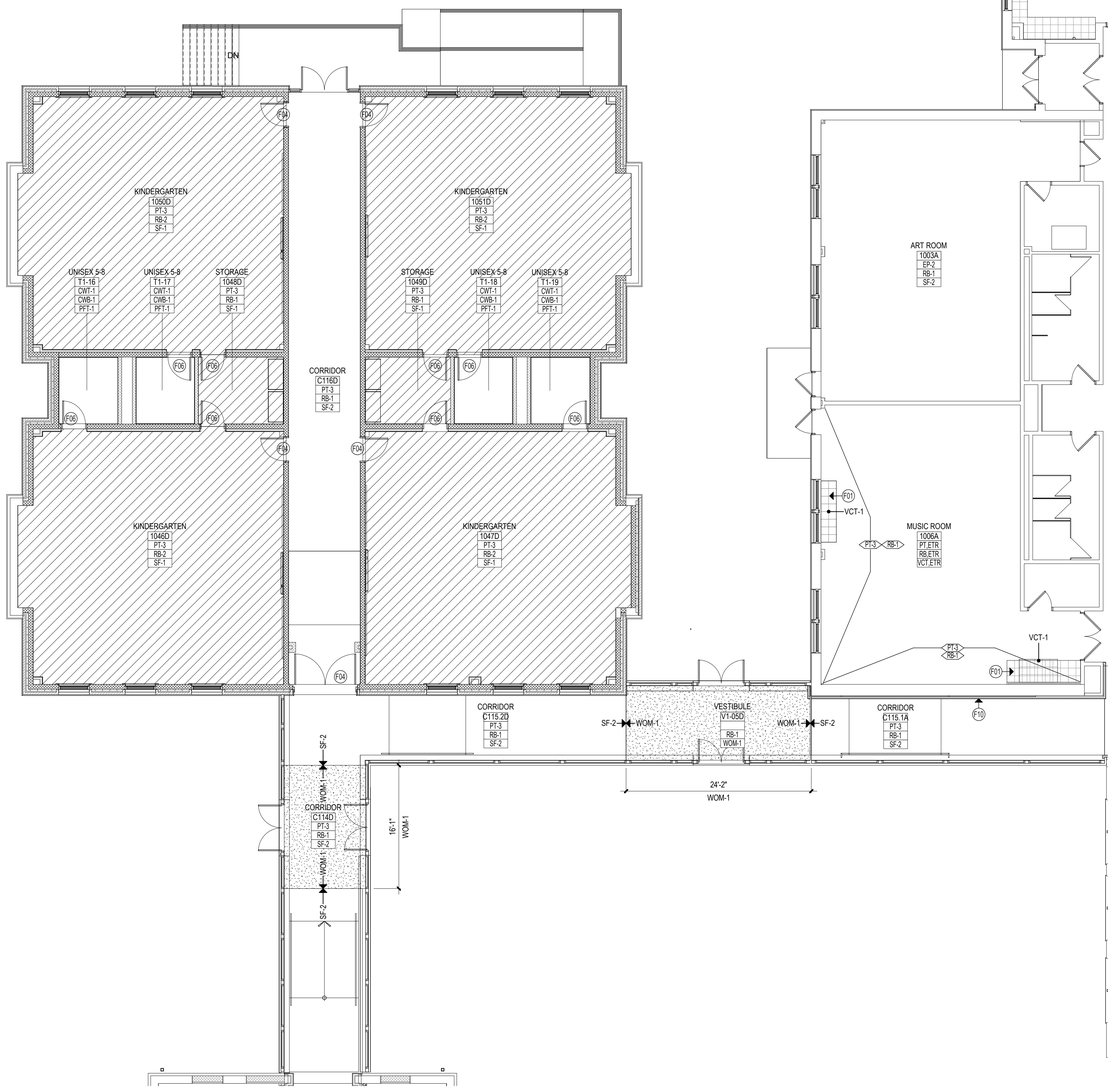
Revision: | Description: | Date: | Revised By:

Drawing Title: FINISH PLAN - FIRST FLOOR - PART "C"

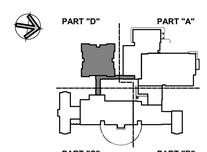
Date: 8/29/2024
Scale: As indicated
Drawn By: JAL
Project Number: 22-382
Drawing Number: A213

8/29/2024 12:28:05 PM



1 FINISH PLAN - 1st FLOOR PART "D"
1/8" = 1'-0"

KEY PLAN



FINISH PLAN LEGEND

ROOM FINISH TAG

ROOM NAME
ROOM NUMBER — 101
WALL FINISH — PT-1
BASE FINISH — RB-1
FLOOR FINISH — CPT-1

* IF TWO FINISHES ARE LISTED TOGETHER, THE FIRST IS THE FIELD

ROOM ACCENT TAG

WALL ACCENT — PT-3
BASE ACCENT — RB-2

GENERAL FINISH NOTES

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- PAINT ALL MODIFIED STAIR HAND RAILS EP-3

FINISH KEYNOTES

No.	NOTE DESCRIPTION
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F05	DOOR TRIM SHALL BE PAINTED (PT-7).
F06	DOOR TRIM SHALL BE PAINTED (EP-1).
F07	DOOR TRIM SHALL BE PAINTED (PT-2).
F08	EXISTING DOOR TRIM COLOR TO REMAIN.
F09	NEW WOOD DOOR TRIM SHALL BE PAINTED (PT-3 IN SEMI-GLOSS FINISH)
F10	WALL SHALL RECEIVE WALL PROTECTION (WP-1) W/ TOP CAP. HEIGHT TO BE CUT TO ALIGN WITH EXISTING WAINSCOT/ GLAZING IN SAME AREA. PAINT COLOR ABOVE.
F11	WALL SHALL RECEIVE BULLETIN BOARD (BB-#). REFFER TO INTERIOR ELEVATION FOR HEIGHT INDICATION.
F12	INFILL FLOORING GAP AFTER GLAZING AND TERAZZO REMOVAL W/ POLISHED CONCRETE.
F13	PROVIDE AND INSTALL RUBBER STAIR TREADS RST-1
F14	PAINT HAND RAILS EP-3

Project Title:
ADDITION & ALTERATIONS TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

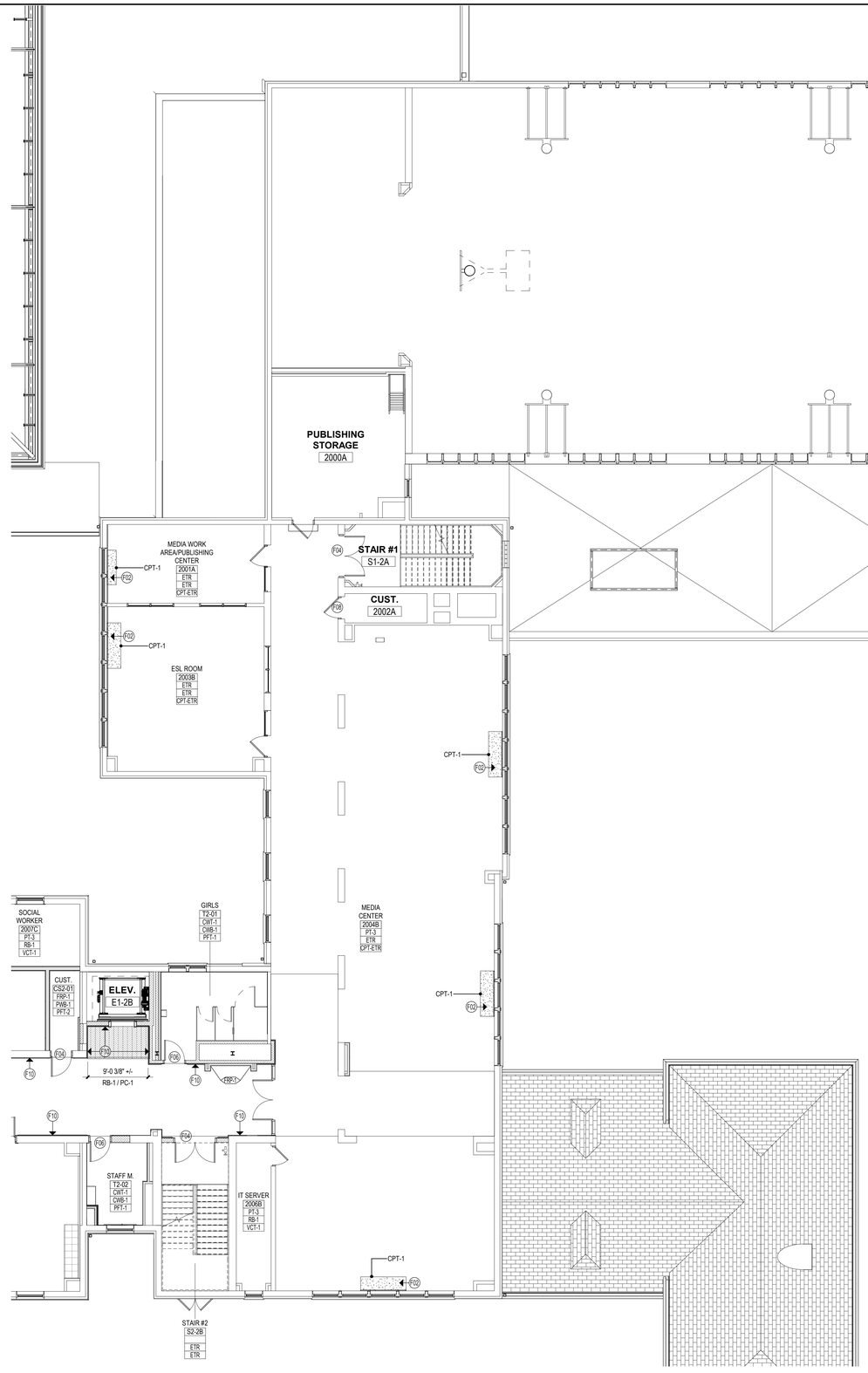
SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
311 STATE STREET NEW LONDON CT 06320
203 230 9007 silverpetrucelli.com

Revision:	Description:	Date:	Revised By:

Drawing Title: FINISH PLAN - FIRST FLOOR - PART "D"

Date: 8/29/2024
Scale: As indicated
Drawn By: JAL
Project Number: 22-382
Drawing Number: A214

8/29/2024 12:17:09 PM



FINISH PLAN LEGEND

ROOM FINISH TAG

ROOM NAME

ROOM NUMBER — 101
WALL FINISH — PT-1
BASE FINISH — RB-1
FLOOR FINISH — CPT-1

* IF TWO FINISHES ARE LISTED TOGETHER, THE FIRST IS THE FIELD

ROOM ACCENT TAG

WALL ACCENT — PT-3
BASE ACCENT — RB-3

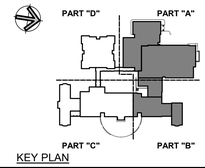
GENERAL FINISH NOTES

- REFER TO FINISH SCHEDULE AND FINISH PLAN FOR GENERAL FINISHES. REFER TO ALL INTERIOR FINISH NOTES, INTERIOR DRAWINGS (INCLUDING PLANS, ELEVATIONS & DETAILS) AND OWNERS DESIGN STANDARD MANUALS FOR COMPLETE INTERIORS INFORMATION.
- REFER TO ANSI 117.1 FOR MOUNTING HEIGHTS & FLOOR CLEARANCES.
- ALIGN TRANSITION OF FLOOR MATERIAL WITH CENTER OF HINGE IN DOORWAY. IN A WRAPPED OPENING WITHOUT HINGES, REFERENCE FINISH PLANS FOR TRANSITION LOCATIONS.
- PROVIDE MANUFACTURER'S RECOMMENDATIONS FOR TRANSITION BETWEEN UNLIKE FLOORING MATERIALS.
- FLOOR FINISHES TO EXTEND BENEATH MILLWORK.
- GC TO INSTALL BASE ON ALL WALLS UNLESS OTHERWISE NOTED.
- GC TO DETERMINE TAKE-OFF QUANTITIES AND ADHESIVE REQUIREMENTS FOR ALL FINISHES.
- CONTRACTOR TO INSTALL A SINGLE-PIECE, ADA-COMPLIANT, SOLID MARBLE THRESHOLD AT ALL FLOORING TRANSITIONS TO TOILET ROOMS.
- AT AREAS OF CASEWORK AND / OR UNIT VENTILATOR REMOVAL WHERE NEW FINISHED FLOORING IS BEING PATCHED INTO EXISTING, REMOVE EXISTING FLOORING TO CREATE A CLEAN DELINEATION, SIMILAR TO PATTERN SHOWN IN PLAN, AND PATCH IN NEW TO ALIGN WITH EXISTING SEAMS.
- PAINT ALL MODIFIED STAIR HAND RAILS EP-3

FINISH KEYNOTES

No.	NOTE DESCRIPTION
F01	REMOVE EXISTING FLOORING AND PATCH IN NEW VCT TO ALIGN WITH EXISTING SEAMS.
F02	REMOVE EXISTING FLOORING AND PATCH IN NEW CARPET TILES TO ALIGN WITH EXISTING SEAMS.
F03	WALL TO RECEIVE MAGNETIC DRY-ERASE WALLCOVERING, WC-1. SEE INTERIOR ELEVATION.
F04	DOOR TRIM SHALL BE PAINTED (EP-3).
F05	DOOR TRIM SHALL BE PAINTED (PT-7).
F06	DOOR TRIM SHALL BE PAINTED (EP-1).
F07	DOOR TRIM SHALL BE PAINTED (PT-2).
F08	EXISTING DOOR TRIM COLOR TO REMAIN.
F09	NEW WOOD DOOR TRIM SHALL BE PAINTED (PT-3 IN SEMI-GLOSS FINISH)
F10	WALL SHALL RECEIVE WALL PROTECTION (WP-1) W/ TOP CAP. HEIGHT TO BE CUT TO ALIGN WITH EXISTING WAINSCOT/ GLAZING IN SAME AREA. PAINT COLOR ABOVE.
F11	WALL SHALL RECEIVE BULLETIN BOARD (BB-#). REFFER TO INTERIOR ELEVATION FOR HEIGHT INDICATION.
F12	INFILL FLOORING GAP AFTER GLAZING AND TERAZZO REMOVAL W/ POLISHED CONCRETE.
F13	PROVIDE AND INSTALL RUBBER STAIR TREADS RST-1
F14	PAINT HAND RAILS EP-3

1 FINISH PLAN - 2nd FLOOR PART "A & B"
1/8" = 1'-0"



KEY PLAN

Project Title:
ADDITION & ALTERATIONS TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

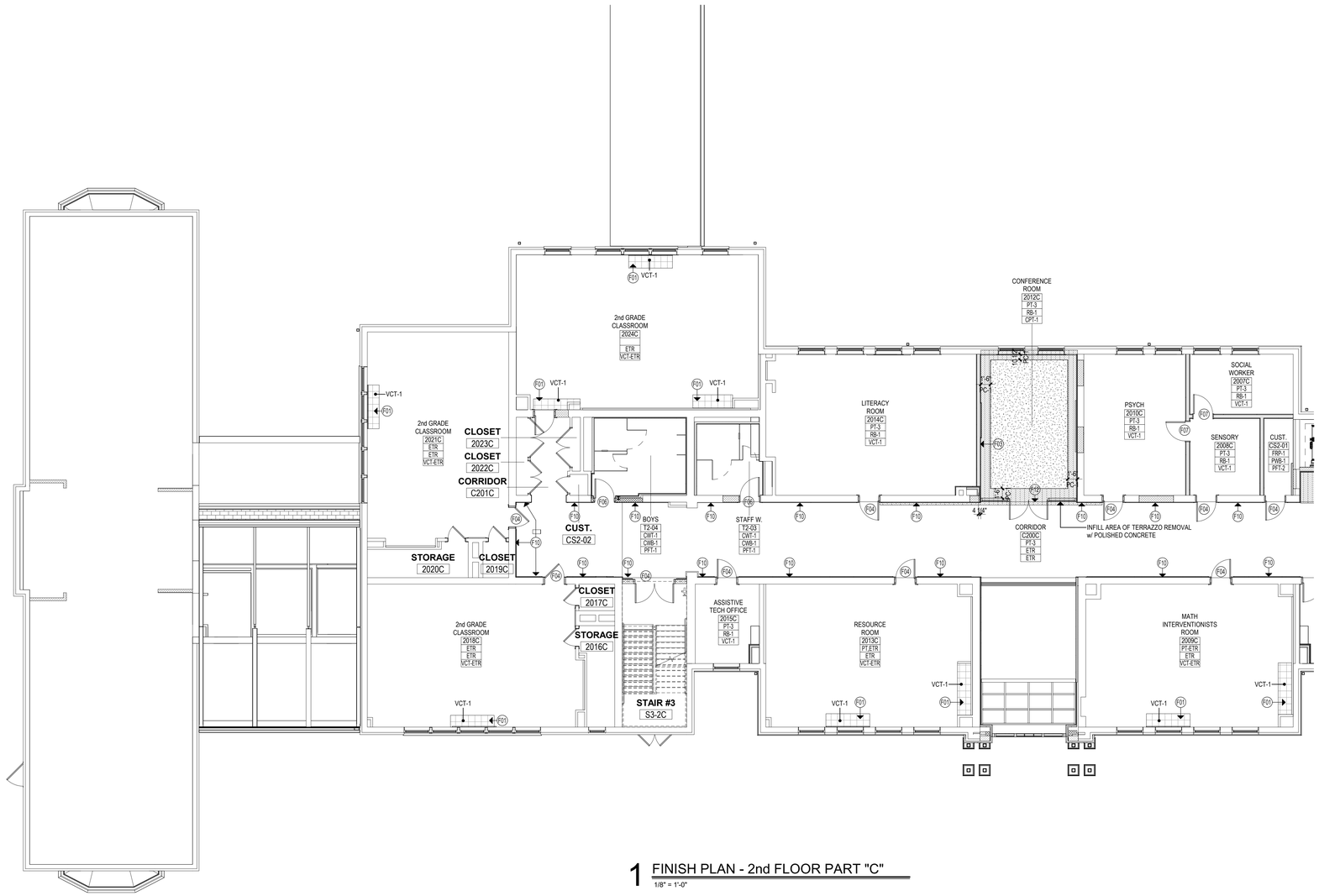
SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
311 STATE STREET NEW LONDON CT 06320
203 230 9007 silverpetrucelli.com

Revision: | Description: | Date: | Revised By:

Drawing Title:
FINISH PLAN - SECOND FLOOR - PART "A & B"

Date: 8/29/2024
Scale: As indicated
Drawn By: JAL
Project Number: 22-382
Drawing Number: A215

8/29/2024 12:17:29 PM



1 FINISH PLAN - 2nd FLOOR PART "C"
1/8" = 1'-0"

FINISH PLAN LEGEND

ROOM FINISH TAG

ROOM NAME
ROOM NUMBER — 101
WALL FINISH — PT-1
BASE FINISH — RB-1
FLOOR FINISH — CPT-1

* IF TWO FINISHES ARE LISTED TOGETHER, THE FIRST IS THE FIELD

ROOM ACCENT TAG

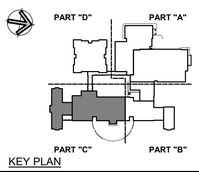
WALL ACCENT — PT-3
BASE ACCENT — RB-2

GENERAL FINISH NOTES

- REFER TO FINISH SCHEDULE AND FINISH PLAN FOR GENERAL FINISHES. REFER TO ALL INTERIOR FINISH NOTES, INTERIOR DRAWINGS (INCLUDING PLANS, ELEVATIONS & DETAILS) AND OWNERS DESIGN STANDARD MANUALS FOR COMPLETE INTERIORS INFORMATION.
- REFER TO ANSI 117.1 FOR MOUNTING HEIGHTS & FLOOR CLEARANCES.
- ALIGN TRANSITION OF FLOOR MATERIAL WITH CENTER OF HINGE IN DOORWAY. IN A WRAPPED OPENING WITHOUT HINGES, REFERENCE FINISH PLANS FOR TRANSITION LOCATIONS.
- PROVIDE MANUFACTURER'S RECOMMENDATIONS FOR TRANSITION BETWEEN UNLIKE FLOORING MATERIALS.
- FLOOR FINISHES TO EXTEND BENEATH MILLWORK.
- GC TO INSTALL BASE ON ALL WALLS UNLESS OTHERWISE NOTED.
- GC TO DETERMINE TAKE-OFF QUANTITIES AND ADHESIVE REQUIREMENTS FOR ALL FINISHES.
- CONTRACTOR TO INSTALL A SINGLE-PIECE, ADA-COMPLIANT, SOLID MARBLE THRESHOLD AT ALL FLOORING TRANSITIONS TO TOILET ROOMS.
- AT AREAS OF CASEWORK AND / OR UNIT VENTILATOR REMOVAL WHERE NEW FINISHED FLOORING IS BEING PATCHED INTO EXISTING, REMOVE EXISTING FLOORING TO CREATE A CLEAN DELINEATION, SIMILAR TO PATTERN SHOWN IN PLAN, AND PATCH IN NEW TO ALIGN WITH EXISTING SEAMS.
- PAINT ALL MODIFIED STAIR HAND RAILS EP-3

FINISH KEYNOTES

No.	NOTE DESCRIPTION
F01	REMOVE EXISTING FLOORING AND PATCH IN NEW VCT TO ALIGN WITH EXISTING SEAMS.
F02	REMOVE EXISTING FLOORING AND PATCH IN NEW CARPET TILES TO ALIGN WITH EXISTING SEAMS.
F03	WALL TO RECEIVE MAGNETIC DRY-ERASE WALLCOVERING, WC-1. SEE INTERIOR ELEVATION.
F04	DOOR TRIM SHALL BE PAINTED (EP-3).
F05	DOOR TRIM SHALL BE PAINTED (PT-7).
F06	DOOR TRIM SHALL BE PAINTED (EP-1).
F07	DOOR TRIM SHALL BE PAINTED (PT-2).
F08	EXISTING DOOR TRIM COLOR TO REMAIN.
F09	NEW WOOD DOOR TRIM SHALL BE PAINTED (PT-3 IN SEMI-GLOSS FINISH)
F10	WALL SHALL RECEIVE WALL PROTECTION (WP-1) W/ TOP CAP. HEIGHT TO BE CUT TO ALIGN WITH EXISTING WAINSCOT/ GLAZING IN SAME AREA. PAINT COLOR ABOVE.
F11	WALL SHALL RECEIVE BULLETIN BOARD (BB-#). REFFER TO INTERIOR ELEVATION FOR HEIGHT INDICATION.
F12	INFILL FLOORING GAP AFTER GLAZING AND TERAZZO REMOVAL W/ POLISHED CONCRETE.
F13	PROVIDE AND INSTALL RUBBER STAIR TREADS RST-1
F14	PAINT HAND RAILS EP-3



KEY PLAN

Project Title:
ADDITION & ALTERATIONS TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
311 STATE STREET NEW LONDON CT 06320
203 230 9007 silverpetrucelli.com

Revision:	Description:	Date:	Revised By:

Drawing Title: FINISH PLAN - SECOND FLOOR - PART "C"

Date: 8/29/2024
Scale: As indicated
Drawn By: JAL
Project Number: 22-382
Drawing Number: A216

8/29/2024 12:16:07 PM

FINISH PLAN LEGEND

ROOM FINISH TAG

ROOM NAME

ROOM NUMBER → 101
WALL FINISH → PT-1
BASE FINISH → RB-1
FLOOR FINISH → CPT-1

* IF TWO FINISHES ARE LISTED TOGETHER, THE FIRST IS THE FIELD

ROOM ACCENT TAG

WALL ACCENT → PT-3
BASE ACCENT → RB-3

GENERAL FINISH NOTES

- REFER TO FINISH SCHEDULE AND FINISH PLAN FOR GENERAL FINISHES. REFER TO ALL INTERIOR FINISH NOTES, INTERIOR DRAWINGS (INCLUDING PLANS, ELEVATIONS & DETAILS) AND OWNERS DESIGN STANDARD MANUALS FOR COMPLETE INTERIORS INFORMATION.
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FINISH KEYNOTES

No.	NOTE DESCRIPTION
F01	REMOVE EXISTING FLOORING AND PATCH IN NEW VCT TO ALIGN WITH EXISTING SEAMS.
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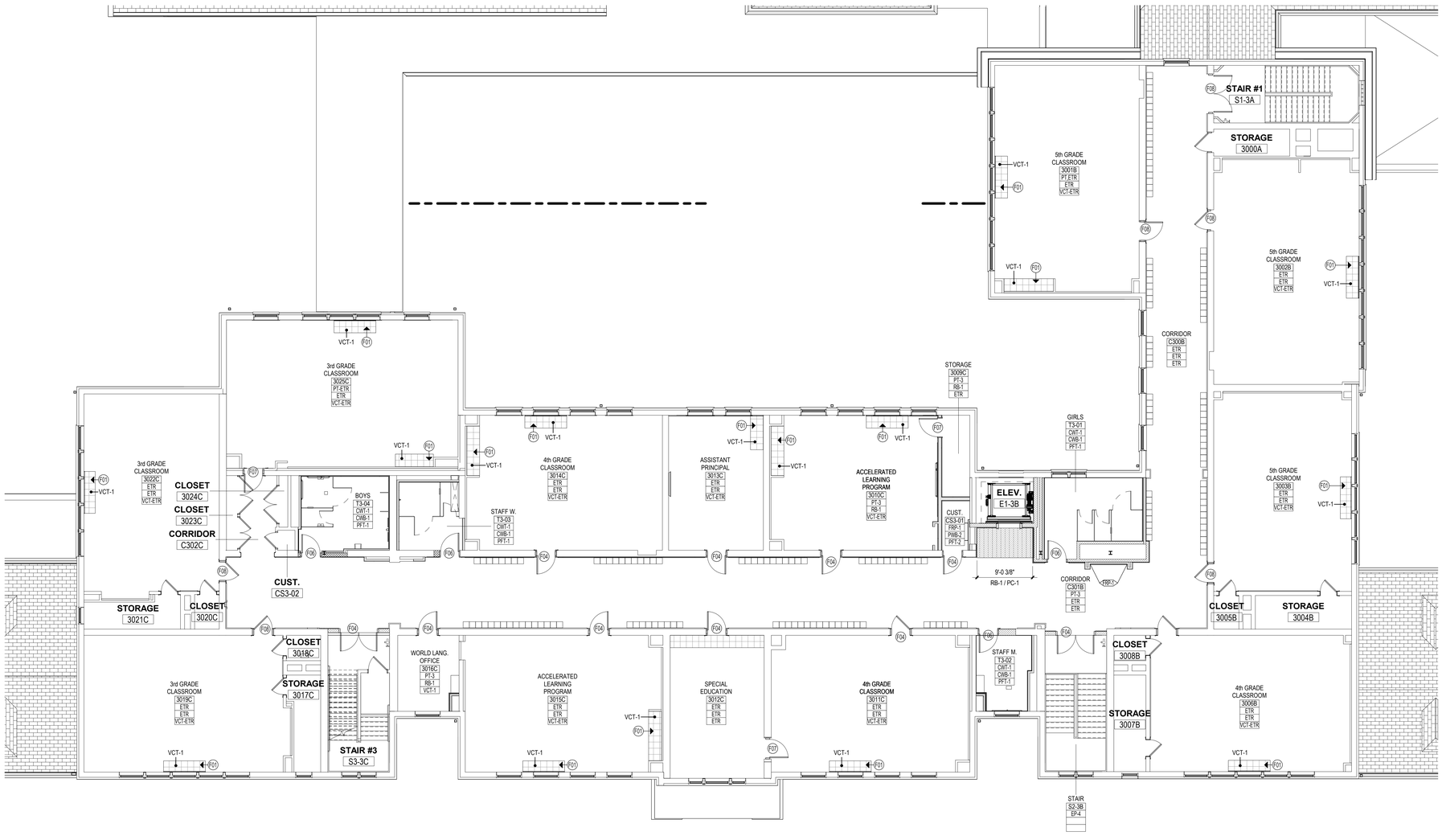
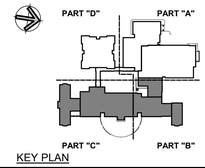
F13	PROVIDE AND INSTALL RUBBER STAIR TREADS RST-1
F14	PAINT HAND RAILS EP-3



1 FINISH PLAN - 3rd FLOOR PART "B & C"
1/8" = 1'-0"



KEY PLAN

Project Title:
ADDITION & ALTERATIONS TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

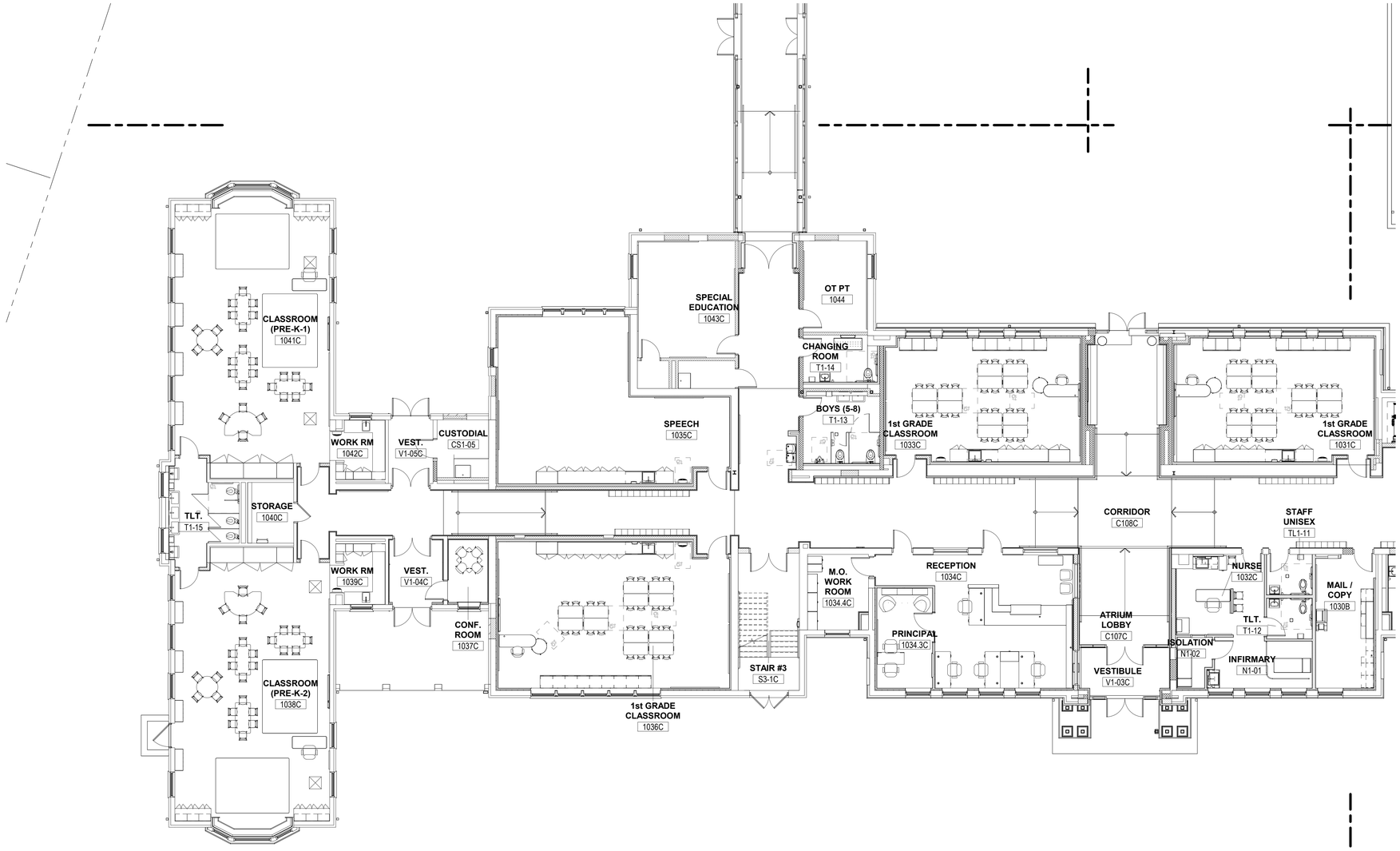
SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
311 STATE STREET NEW LONDON CT 06320
203 230 9007 silverpetrucelli.com

Revision:	Description:	Date:	Revised By:

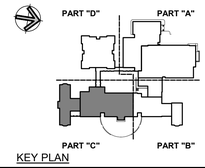
Drawing Title:
FINISH PLAN - THIRD FLOOR - PART "B & C"

Date: 8/29/2024
Scale: As indicated
Drawn By: JAL
Project Number: 22-382
Drawing Number: A217

8/29/2024 12:18:38 PM



1 1st FLOOR FF&E PLAN - PART "C"
1/8" = 1'-0"



KEY PLAN

Project Title:

ADDITION & ALTERATIONS TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
311 STATE STREET NEW LONDON CT 06320
203 230 9007 silverpetrucelli.com

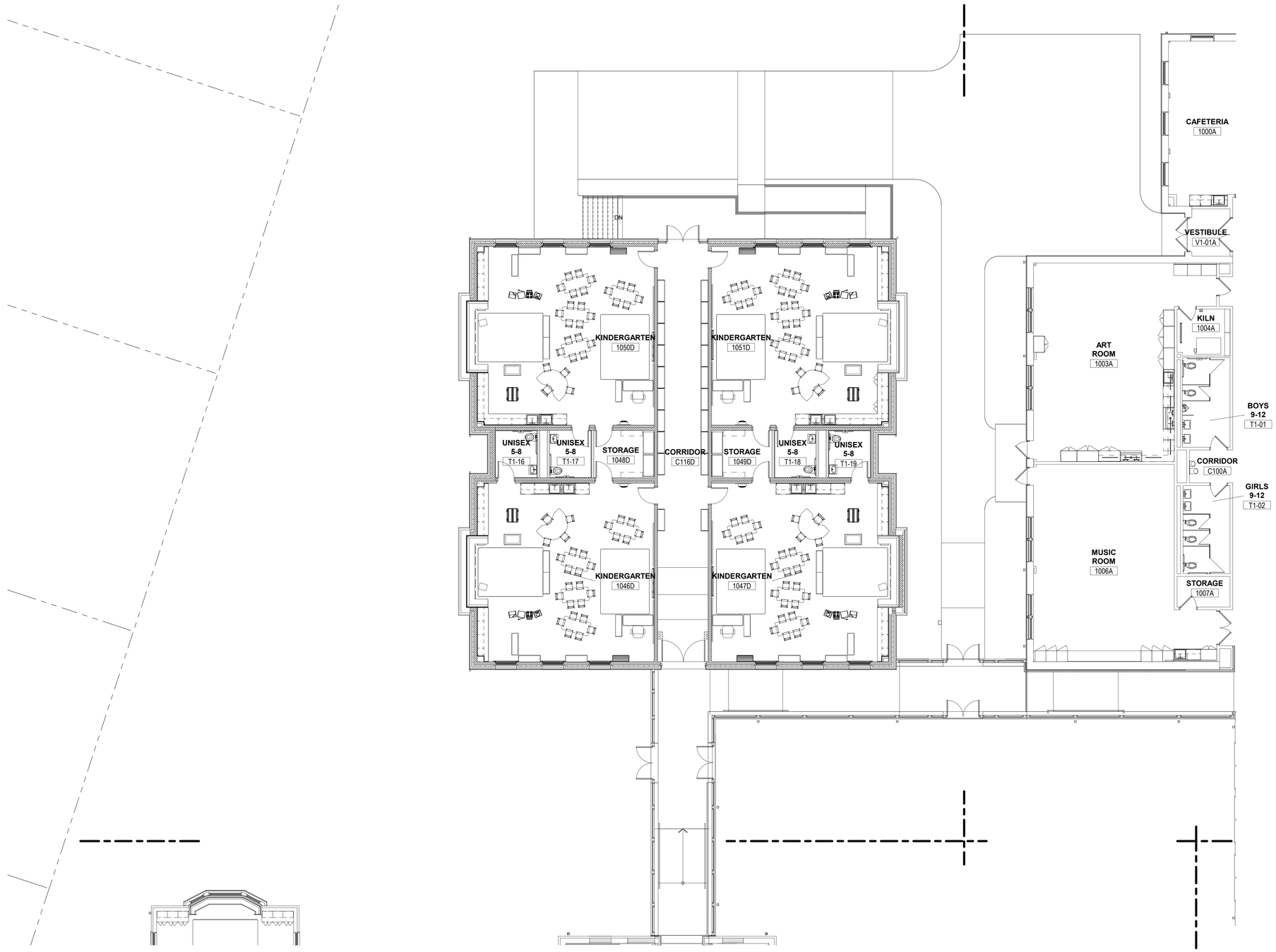
Revision:	Description:	Date:	Revised By:

Drawing Title: FF&E PLAN - FIRST FLOOR - PART "C"

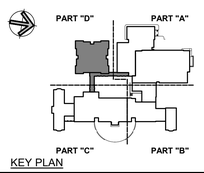
Date: 8/29/2024
Scale: 1/8" = 1'-0"
Drawn By: JAL
Project Number: 22-382

Drawing Number: A233

8/29/2024 12:19:03 PM



1 1st FLOOR FF&E PLAN - PART "D"
1/8" = 1'-0"



KEY PLAN

Project Title:

ADDITION & ALTERATIONS TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
311 STATE STREET NEW LONDON CT 06320
203 230 9007 silverpetrucelli.com

Revision:	Description:	Date:	Revised By:

Drawing Title: FF&E PLAN - FIRST FLOOR - PART "D"

Date: 8/29/2024
Scale: 1/8" = 1'-0"
Drawn By: JAL
Project Number: 22-382

Drawing Number: A234

8/29/2024 12:19:26 PM



RCP SYMBOL LEGEND

Room name
101
- ROOM NAME
- ROOM NUMBER

(10'-0") - CEILING HEIGHT

- 2' X 2' ACOUSTICAL CEILING TILES & GRID W/ SUPPORTS

- PAINTED GYPSUM BOARD CEILING

- EXIT SIGN, REFER TO ELECTRICAL DRAWINGS

- RECESSED LIGHT FIXTURES, REFER TO ELECTRICAL DRAWINGS

- 2' X 2' LIGHT FIXTURE, REFER TO ELECTRICAL DRAWINGS

- PENDENT STYLE LIGHT FIXTURE, REFER TO ELECTRICAL DRAWINGS

- SUPPLY DIFFUSER, REFER TO MECHANICAL DRAWINGS

- RETURN DIFFUSER, REFER TO MECHANICAL DRAWINGS

- CONCEALED SPINKLER HEAD, REFER TO FIRE PROTECTION DRAWINGS

- EXPOSED SPINKLER HEAD, REFER TO FIRE PROTECTION DRAWINGS

X - CONSTRUCTION NOTE

X
Axxx
- PLAN/SECTION/DETAIL NUMBER
- SHEET NUMBER

GENERAL NOTES

1. "EXPOSED CONSTRUCTION" OR "EXP. CONST." INDICATES NO CEILING, EXPOSED TO DECK, PTD.

2. CENTER LIGHT FIXTURES AND OTHER DEVICES IN ACOUSTICAL PANEL "PATTERN" UNLESS OTHERWISE INDICATED. REFER TO DETAIL BELOW.

3. CENTER ACOUSTICAL PANELS OR GRID IN SPACES UNLESS OTHERWISE INDICATED. ALL ACOUSTIC PANEL "CLOUDS" USE EXTRUDED ALUMINUM PERIMETER RIM @ ALL EDGES. SEE SPECIFICATION.

4. SEE DRAWING A260 FOR TYPICAL SEISMIC RESTRAINT DETAILS.

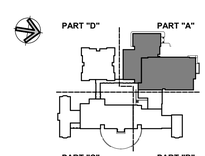
5. SEE DRAWING A211-A212 FOR CEILING AND SOFFIT DETAILS.

6. SPRINKLER HEAD LOCATIONS ARE SHOWN FOR COORDINATION PURPOSES ONLY. NOT ALL SPRINKLER HEADS ARE SHOWN. FIRE PROTECTION SYSTEM INSTALLER SHALL COORDINATE SPRINKLER HEADS. IN AREAS WITHOUT SUSPENDED CEILINGS, COORDINATE LOCATIONS OF SPRINKLER HEADS WITH HVAC DUCTS, EQUIPMENT, BEAMS, COLUMNS, LIGHTS, AND ANY OTHER OBSTRUCTIONS IN ACCORDANCE WITH NFPA 13. IN AREAS WITH SUSPENDED CEILINGS, COORDINATE SPRINKLER MAINS, RUNS AND SPRINKLER HEAD LOCATIONS WITH OTHER WORK TO INSURE CEILING HEIGHTS, LIGHTING, DIFFUSER AND OTHER CEILING DEVICE LOCATIONS ARE MAINTAINED AS SHOWN OR AS REQUIRED TO COMPLY WITH APPLICABLE CODE REQUIREMENTS. ADVISE ARCHITECT OF ANY CONFLICTS WHICH MUST BE RESOLVED PRIOR TO INSTALLATION.

7. LIGHT FIXTURES, FIRE PROTECTION DEVICES AND DIFFUSERS ARE SHOWN FOR LOCATION AND COORDINATION PURPOSES ONLY. REFER TO ELECTRICAL AND HVAC DWGS. FOR ACTUAL LIGHT FIXTURE, DIFFUSER AND FIRE PROTECTION SCHEDULES.

8. REFER TO ELECTRICAL, HVAC AND FIRE PROTECTION DWGS. FOR LIGHT FIXTURES, DIFFUSERS AND FIRE PROTECTION DEVICES IN UNFINISHED AREAS OR AREAS WITH EXPOSED STRUCTURE.

9. COORDINATE ACCESS PANEL LOCATIONS WITH MECHANICAL TRADES; SUBMIT PROPOSED LOCATIONS TO ARCHITECT FOR APPROVAL.



KEY PLAN

Project Title:
ADDITION & ALTERATIONS TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
311 STATE STREET NEW LONDON CT 06320
203 230 9007 silverpetrucelli.com

Revision:	Description:	Date:	Revised By:

Drawing Title:
FIRST FLOOR REFLECTED CEILING PLAN - PART "A"

Date: 8/29/2024
Scale: As indicated
Drawn By: JM
Project Number: 22-382
Drawing Number: A251

8/30/2024 7:55:34 AM



RCP SYMBOL LEGEND

- Room name / 101 - ROOM NAME / ROOM NUMBER
- (10'-0") - CEILING HEIGHT
- 2' X 2' ACOUSTICAL CEILING TILES & GRID W/ SUPPORTS
- PAINTED GYPSUM BOARD CEILING
- EXIT SIGN, REFER TO ELECTRICAL DRAWINGS
- RECESSED LIGHT FIXTURES, REFER TO ELECTRICAL DRAWINGS
- 2' X 2' LIGHT FIXTURE, REFER TO ELECTRICAL DRAWINGS
- PENDENT STYLE LIGHT FIXTURE, REFER TO ELECTRICAL DRAWINGS
- SUPPLY DIFFUSER, REFER TO MECHANICAL DRAWINGS
- RETURN DIFFUSER, REFER TO MECHANICAL DRAWINGS
- CONCEALED SPINKLER HEAD, REFER TO FIRE PROTECTION DRAWINGS
- EXPOSED SPINKLER HEAD, REFER TO FIRE PROTECTION DRAWINGS
- X - CONSTRUCTION NOTE
- X / Axxx - PLAN/SECTION/DETAIL NUMBER / SHEET NUMBER

GENERAL NOTES

1. "EXPOSED CONSTRUCTION" OR "EXP. CONST." INDICATES NO CEILING, EXPOSED TO DECK, PTD.

2. CENTER LIGHT FIXTURES AND OTHER DEVICES IN ACOUSTICAL PANEL "PATTERN" UNLESS OTHERWISE INDICATED. REFER TO DETAIL BELOW.

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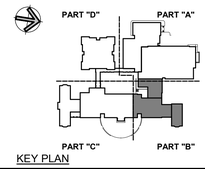


KEY PLAN

Project Title:

ADDITION & ALTERATIONS TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
311 STATE STREET NEW LONDON CT 06320
203 230 9007 silverpetrucelli.com

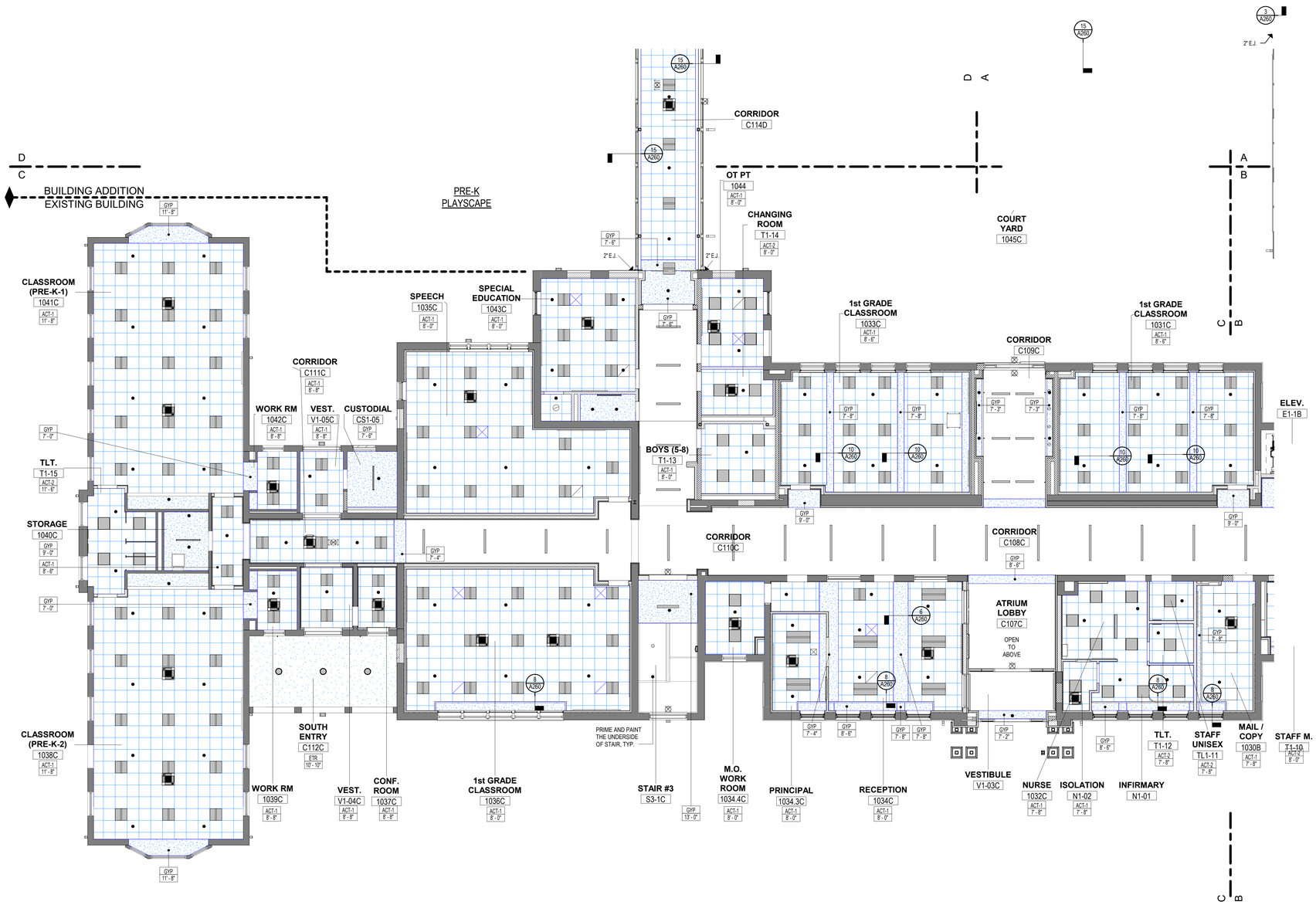
Revision:	Description:	Date:	Revised By:

Drawing Title:

FIRST FLOOR REFLECTED CEILING PLAN - PART "B"

Date: 8/29/2024
Scale: As indicated
Drawn By: JM
Project Number: 22-382
Drawing Number: A252

8/30/2024 7:55:41 AM

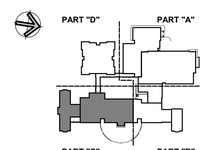


RCP SYMBOL LEGEND

- Room name / 101 - ROOM NAME / ROOM NUMBER
- (10'-0") - CEILING HEIGHT
- 2' X 2' ACOUSTICAL CEILING TILES & GRID W/ SUPPORTS
- PAINTED GYPSUM BOARD CEILING
- EXIT SIGN, REFER TO ELECTRICAL DRAWINGS
- RECESSED LIGHT FIXTURES, REFER TO ELECTRICAL DRAWINGS
- 2' X 2' LIGHT FIXTURE, REFER TO ELECTRICAL DRAWINGS
- PENDENT STYLE LIGHT FIXTURE, REFER TO ELECTRICAL DRAWINGS
- SUPPLY DIFFUSER, REFER TO MECHANICAL DRAWINGS
- RETURN DIFFUSER, REFER TO MECHANICAL DRAWINGS
- CONCEALED SPINKLER HEAD, REFER TO FIRE PROTECTION DRAWINGS
- EXPOSED SPINKLER HEAD, REFER TO FIRE PROTECTION DRAWINGS
- (X) - CONSTRUCTION NOTE
- X / Axxx - PLAN/SECTION/DETAIL NUMBER / SHEET NUMBER

GENERAL NOTES

1. "EXPOSED CONSTRUCTION" OR "EXP. CONST." INDICATES NO CEILING, EXPOSED TO DECK, PTD.
2. CENTER LIGHT FIXTURES AND OTHER DEVICES IN ACOUSTICAL PANEL "PATTERN" UNLESS OTHERWISE INDICATED. REFER TO DETAIL BELOW.
3. CENTER ACOUSTICAL PANELS OR GRID IN SPACES UNLESS OTHERWISE INDICATED. ALL ACOUSTIC PANEL "CLOUDS" USE EXTRUDED ALUMINUM PERIMETER RIM @ ALL EDGES. SEE SPECIFICATION.
4. SEE DRAWING A260 FOR TYPICAL SEISMIC RESTRAINT DETAILS.
5. SEE DRAWING A211-A212 FOR CEILING AND SOFFIT DETAILS.
6. SPRINKLER HEAD LOCATIONS ARE SHOWN FOR COORDINATION PURPOSES ONLY. NOT ALL SPRINKLER HEADS ARE SHOWN. FIRE PROTECTION SYSTEM INSTALLER SHALL COORDINATE SPRINKLER HEADS. IN AREAS WITHOUT SUSPENDED CEILINGS, COORDINATE LOCATIONS OF SPRINKLER HEADS WITH HVAC DUCTS, EQUIPMENT, BEAMS, COLUMNS, LIGHTS, AND ANY OTHER OBSTRUCTIONS IN ACCORDANCE WITH NFPA 13. IN AREAS WITH SUSPENDED CEILINGS, COORDINATE SPRINKLER MAINS, RUNS AND SPRINKLER HEAD LOCATIONS WITH OTHER WORK TO INSURE CEILING HEIGHTS, LIGHTING, DIFFUSER AND OTHER CEILING DEVICE LOCATIONS ARE MAINTAINED AS SHOWN OR AS REQUIRED TO COMPLY WITH APPLICABLE CODE REQUIREMENTS. ADVISE ARCHITECT OF ANY CONFLICTS WHICH MUST BE RESOLVED PRIOR TO INSTALLATION.
7. LIGHT FIXTURES, FIRE PROTECTION DEVICES AND DIFFUSERS ARE SHOWN FOR LOCATION AND COORDINATION PURPOSES ONLY. REFER TO ELECTRICAL AND HVAC DWGS. FOR ACTUAL LIGHT FIXTURE, DIFFUSER AND FIRE PROTECTION SCHEDULES.
8. REFER TO ELECTRICAL, HVAC AND FIRE PROTECTION DWGS. FOR LIGHT FIXTURES, DIFFUSERS AND FIRE PROTECTION DEVICES IN UNFINISHED AREAS OR AREAS WITH EXPOSED STRUCTURE.
9. COORDINATE ACCESS PANEL LOCATIONS WITH MECHANICAL TRADES; SUBMIT PROPOSED LOCATIONS TO ARCHITECT FOR APPROVAL.



KEY PLAN

Project Title:

ADDITION & ALTERATIONS TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
311 STATE STREET NEW LONDON CT 06320
203 230 9007 silverpetrucelli.com

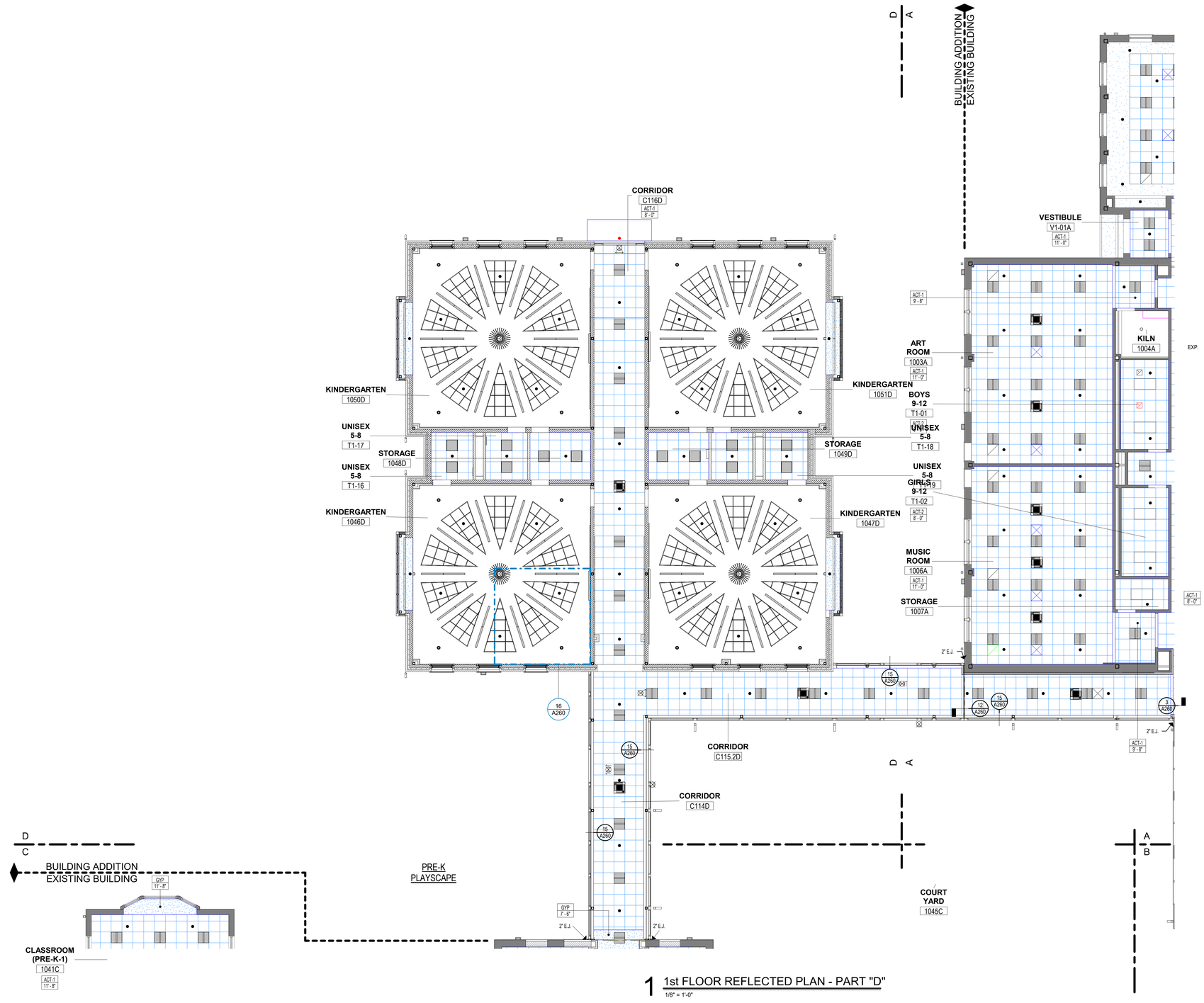
Revision:	Description:	Date:	Revised By:

Drawing Title:

FIRST FLOOR REFLECTED CEILING PLAN - PART "C"

Date: 8/29/2024
Scale: As indicated
Drawn By: JM
Project Number: 22-382
Drawing Number: A253

8/30/2024 7:55:48 AM



1 1st FLOOR REFLECTED PLAN - PART "D"
1/8" = 1'-0"

RCP SYMBOL LEGEND

- Room name / 101 - ROOM NAME / ROOM NUMBER
- (10'-0") - CEILING HEIGHT
- 2' X 2' ACOUSTICAL CEILING TILES & GRID W/ SUPPORTS
- PAINTED GYPSUM BOARD CEILING
- EXIT SIGN, REFER TO ELECTRICAL DRAWINGS
- RECESSED LIGHT FIXTURES, REFER TO ELECTRICAL DRAWINGS
- 2' X 2' LIGHT FIXTURE, REFER TO ELECTRICAL DRAWINGS
- PENDENT STYLE LIGHT FIXTURE, REFER TO ELECTRICAL DRAWINGS
- SUPPLY DIFFUSER, REFER TO MECHANICAL DRAWINGS
- RETURN DIFFUSER, REFER TO MECHANICAL DRAWINGS
- CONCEALED SPINKLER HEAD, REFER TO FIRE PROTECTION DRAWINGS
- EXPOSED SPINKLER HEAD, REFER TO FIRE PROTECTION DRAWINGS
- X - CONSTRUCTION NOTE
- X / Axxx - PLAN/SECTION/DETAIL NUMBER / SHEET NUMBER

GENERAL NOTES

1. "EXPOSED CONSTRUCTION" OR "EXP. CONST." INDICATES NO CEILING, EXPOSED TO DECK, PTD.

2. CENTER LIGHT FIXTURES AND OTHER DEVICES IN ACOUSTICAL PANEL "PATTERN" UNLESS OTHERWISE INDICATED. REFER TO DETAIL BELOW.

3. CENTER ACOUSTICAL PANELS OR GRID IN SPACES UNLESS OTHERWISE INDICATED. ALL ACOUSTIC PANEL "CLOUDS" USE EXTRUDED ALUMINUM PERIMETER RIM @ ALL EDGES. SEE SPECIFICATION.

4. SEE DRAWING A260 FOR TYPICAL SEISMIC RESTRAINT DETAILS.

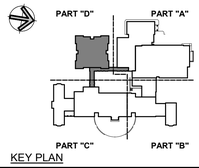
5. SEE DRAWING A211-A212 FOR CEILING AND SOFFIT DETAILS.

6. SPRINKLER HEAD LOCATIONS ARE SHOWN FOR COORDINATION PURPOSES ONLY. NOT ALL SPRINKLER HEADS ARE SHOWN. FIRE PROTECTION SYSTEM INSTALLER SHALL COORDINATE SPRINKLER HEADS. IN AREAS WITHOUT SUSPENDED CEILINGS, COORDINATE LOCATIONS OF SPRINKLER HEADS WITH HVAC DUCTS, EQUIPMENT, BEAMS, COLUMNS, LIGHTS, AND ANY OTHER OBSTRUCTIONS IN ACCORDANCE WITH NFPA 13. IN AREAS WITH SUSPENDED CEILINGS, COORDINATE SPRINKLER MAINS, RUNS AND SPRINKLER HEAD LOCATIONS WITH OTHER WORK TO INSURE CEILING HEIGHTS, LIGHTING, DIFFUSER AND OTHER CEILING DEVICE LOCATIONS ARE MAINTAINED AS SHOWN OR AS REQUIRED TO COMPLY WITH APPLICABLE CODE REQUIREMENTS. ADVISE ARCHITECT OF ANY CONFLICTS WHICH MUST BE RESOLVED PRIOR TO INSTALLATION.

7. LIGHT FIXTURES, FIRE PROTECTION DEVICES AND DIFFUSERS ARE SHOWN FOR LOCATION AND COORDINATION PURPOSES ONLY. REFER TO ELECTRICAL AND HVAC DWGS. FOR ACTUAL LIGHT FIXTURE, DIFFUSER AND FIRE PROTECTION SCHEDULES.

8. REFER TO ELECTRICAL, HVAC AND FIRE PROTECTION DWGS. FOR LIGHT FIXTURES, DIFFUSERS AND FIRE PROTECTION DEVICES IN UNFINISHED AREAS OR AREAS WITH EXPOSED STRUCTURE.

9. COORDINATE ACCESS PANEL LOCATIONS WITH MECHANICAL TRADES; SUBMIT PROPOSED LOCATIONS TO ARCHITECT FOR APPROVAL.



KEY PLAN

Project Title:

ADDITION & ALTERATIONS TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

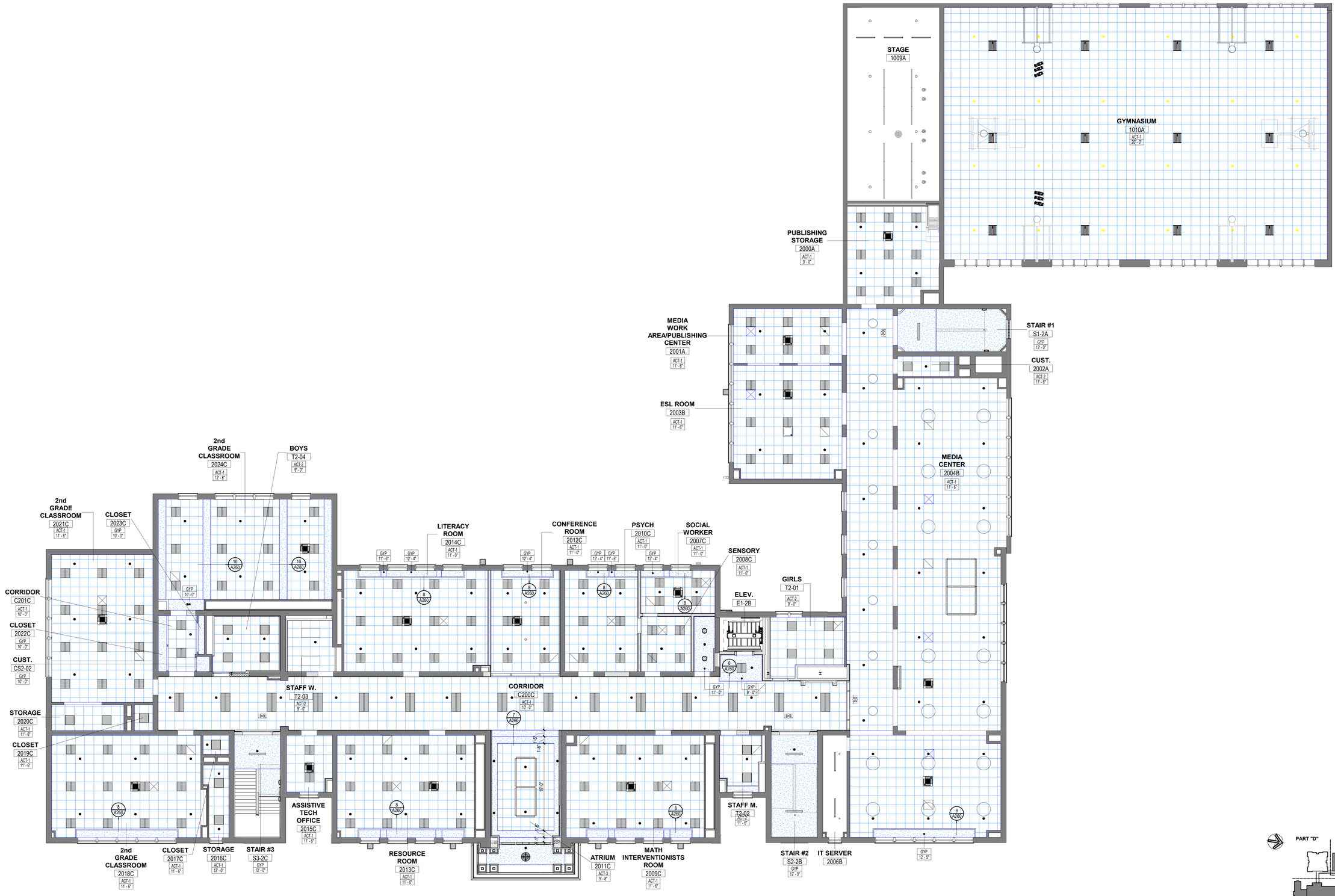
SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
311 STATE STREET NEW LONDON CT 06320
203 230 9007 silverpetrucelli.com

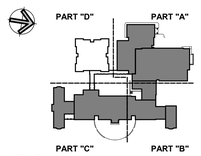
Revision:	Description:	Date:	Revised By:

Drawing Title:
FIRST FLOOR REFLECTED CEILING PLAN - PART "D"

Date: 8/29/2024
Scale: As indicated
Drawn By: JM
Project Number: 22-382
Drawing Number: A254

8/30/2024 7:55:53 AM





KEY PLAN

Project Title:

ADDITION & ALTERATIONS TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
311 STATE STREET NEW LONDON CT 06320
203 230 9007 silverpetrucelli.com

Revision:	Description:	Date:	Revised By:

Drawing Title:

SECOND FLOOR REFLECTED CEILING PLAN - PART "A - C"

Date: 8/29/2024
Scale: 1/8" = 1'-0"
Drawn By: JM
Project Number: 22-382
Drawing Number: A255

8/30/2024 7:56:10 AM



RCP SYMBOL LEGEND

- Room name / 101 - ROOM NAME / ROOM NUMBER
- (10'-0") - CEILING HEIGHT
- 2' X 2' ACOUSTICAL CEILING TILES & GRID W/ SUPPORTS
- PAINTED GYPSUM BOARD CEILING
- EXIT SIGN, REFER TO ELECTRICAL DRAWINGS
- RECESSED LIGHT FIXTURES, REFER TO ELECTRICAL DRAWINGS
- 2' X 2' LIGHT FIXTURE, REFER TO ELECTRICAL DRAWINGS
- PENDENT STYLE LIGHT FIXTURE, REFER TO ELECTRICAL DRAWINGS
- SUPPLY DIFFUSER, REFER TO MECHANICAL DRAWINGS
- RETURN DIFFUSER, REFER TO MECHANICAL DRAWINGS
- CONCEALED SPINKLER HEAD, REFER TO FIRE PROTECTION DRAWINGS
- EXPOSED SPINKLER HEAD, REFER TO FIRE PROTECTION DRAWINGS
- X - CONSTRUCTION NOTE
- X / Axxx - PLAN/SECTION/DETAIL NUMBER / SHEET NUMBER

GENERAL NOTES

1. "EXPOSED CONSTRUCTION" OR "EXP. CONST." INDICATES NO CEILING, EXPOSED TO DECK, PTD.

2. CENTER LIGHT FIXTURES AND OTHER DEVICES IN ACOUSTICAL PANEL "PATTERN" UNLESS OTHERWISE INDICATED. REFER TO DETAIL BELOW.

3. CENTER ACOUSTICAL PANELS OR GRID IN SPACES UNLESS OTHERWISE INDICATED. ALL ACOUSTIC PANEL "CLOUDS" USE EXTRUDED ALUMINUM PERIMETER RIM @ ALL EDGES. SEE SPECIFICATION.

4. SEE DRAWING A260 FOR TYPICAL SEISMIC RESTRAINT DETAILS.

5. SEE DRAWING A211-A212 FOR CEILING AND SOFFIT DETAILS.

6. SPRINKLER HEAD LOCATIONS ARE SHOWN FOR COORDINATION PURPOSES ONLY. NOT ALL SPRINKLER HEADS ARE SHOWN. FIRE PROTECTION SYSTEM INSTALLER SHALL COORDINATE SPRINKLER HEADS. IN AREAS WITHOUT SUSPENDED CEILINGS, COORDINATE LOCATIONS OF SPRINKLER HEADS WITH HVAC DUCTS, EQUIPMENT, BEAMS, COLUMNS, LIGHTS, AND ANY OTHER OBSTRUCTIONS IN ACCORDANCE WITH NFPA 13. IN AREAS WITH SUSPENDED CEILINGS, COORDINATE SPRINKLER MAINS, RUNS AND SPRINKLER HEAD LOCATIONS WITH OTHER WORK TO INSURE CEILING HEIGHTS, LIGHTING, DIFFUSER AND OTHER CEILING DEVICE LOCATIONS ARE MAINTAINED AS SHOWN OR AS REQUIRED TO COMPLY WITH APPLICABLE CODE REQUIREMENTS. ADVISE ARCHITECT OF ANY CONFLICTS WHICH MUST BE RESOLVED PRIOR TO INSTALLATION.

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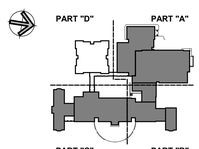
9. COORDINATE ACCESS PANEL LOCATIONS WITH MECHANICAL TRADES; SUBMIT PROPOSED LOCATIONS TO ARCHITECT FOR APPROVAL.



KEY PLAN

Project Title:

ADDITION & ALTERATIONS TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
311 STATE STREET NEW LONDON CT 06320
203 230 9007 silverpetrucelli.com

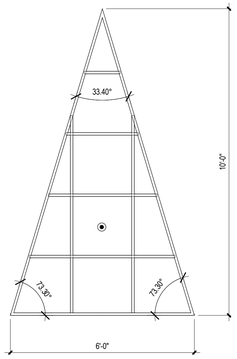
Revision:	Description:	Date:	Revised By:

Drawing Title:

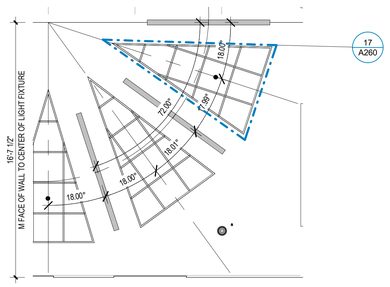
THIRD FLOOR REFLECTED CEILING PLAN - PART "A - C"

Date: 8/29/2024
Scale: As indicated
Drawn By: JM
Project Number: 22-382
Drawing Number: A256

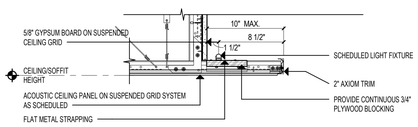
8/30/2024 7:56:16 AM



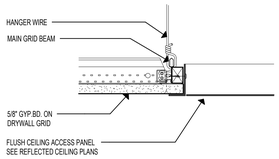
17 CEILING DETAIL @ TRIANGLE ACT
1/2" = 1'-0"



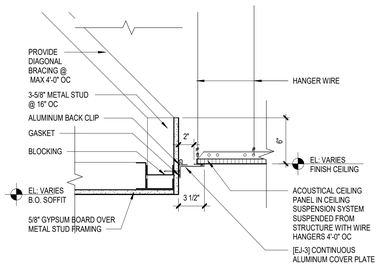
16 1st FLOOR PARTIAL RCP - PART "D"
1/4" = 1'-0"



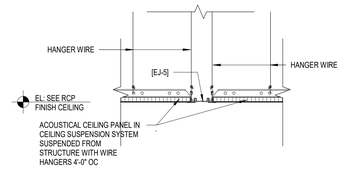
15 CEILING DETAIL @ CORRIDORS
1 1/2" = 1'-0"



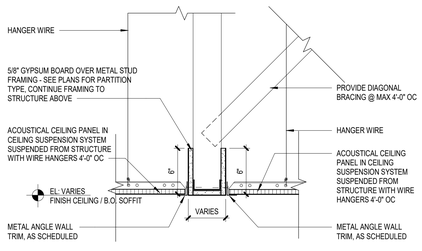
14 CEILING ACCESS PANEL DETAIL (AC)
3" = 1'-0"



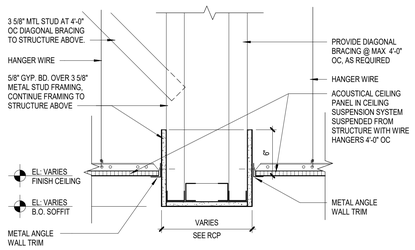
13 GYPSUM BOARD SOFFIT & EXP. JOINT 3
1 1/2" = 1'-0"



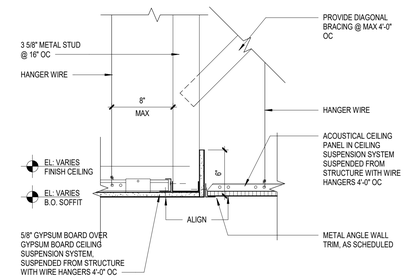
12 CEILING EXPANSION JOINT 5
1 1/2" = 1'-0"



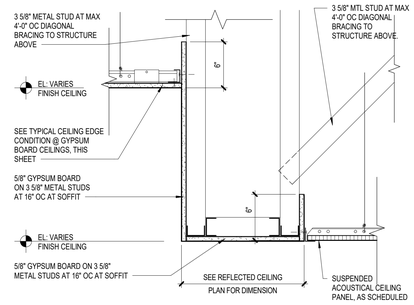
11 GYPSUM BOARD SOFFIT
1 1/2" = 1'-0"



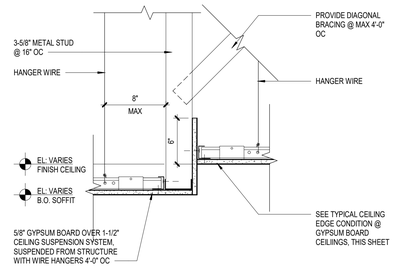
10 GYPSUM BOARD SOFFIT
1 1/2" = 1'-0"



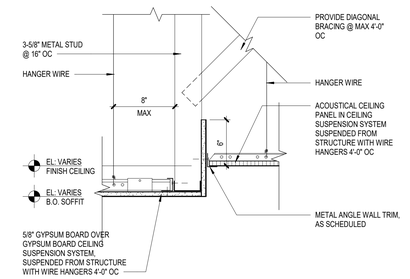
9 CEILING DETAIL
1 1/2" = 1'-0"



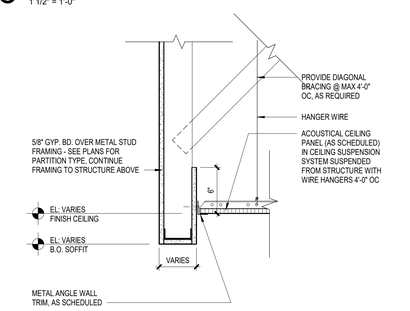
8 GYPSUM BOARD SOFFIT
1 1/2" = 1'-0"



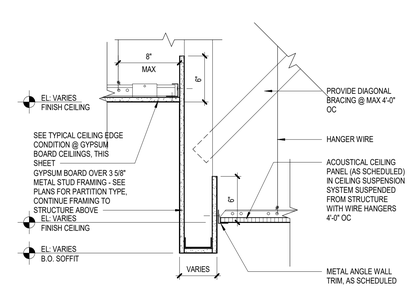
7 GYPSUM BOARD SOFFIT
1 1/2" = 1'-0"



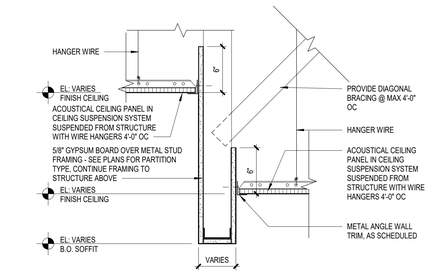
6 GYPSUM BOARD SOFFIT
1 1/2" = 1'-0"



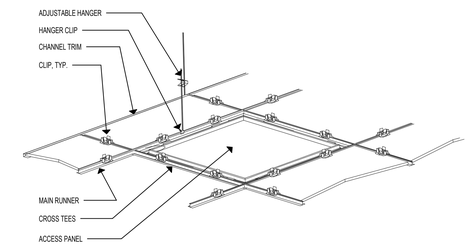
5 GYPSUM BOARD SOFFIT
1 1/2" = 1'-0"



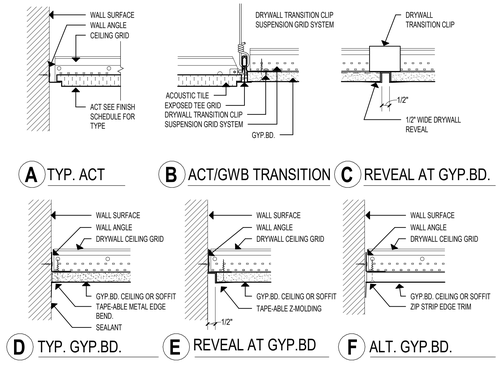
4 GYPSUM BOARD SOFFIT
1 1/2" = 1'-0"



3 GYPSUM BOARD SOFFIT
1 1/2" = 1'-0"



2 CEILING ACCESS PANEL DETAIL (CP)
3" = 1'-0"



1 CEILING/WALL DETAILS
3" = 1'-0"

Project Title:

ADDITION & ALTERATIONS TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

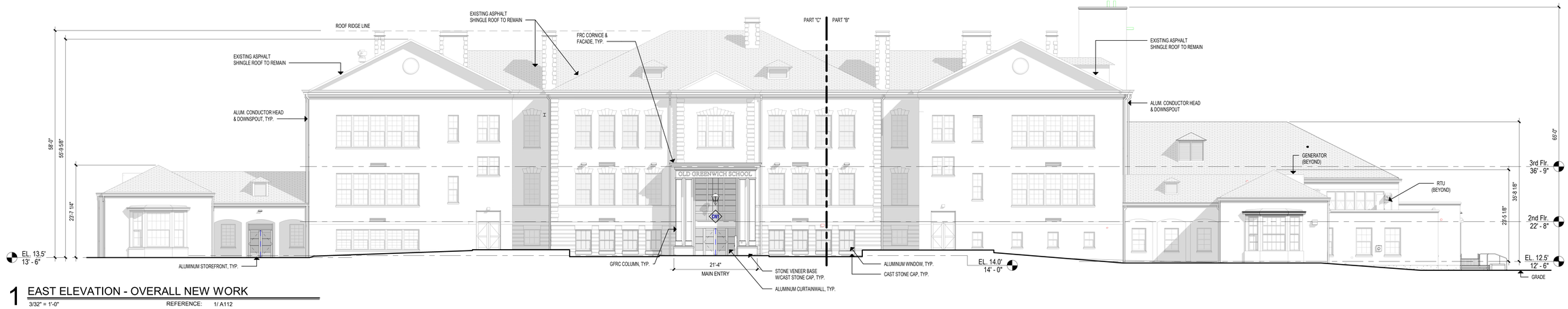
SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
311 STATE STREET NEW LONDON CT 06320
203 230 9007 silverpetrucelli.com

Revision:	Description:	Date:	Revised By:

Drawing Title: CEILING DETAILS

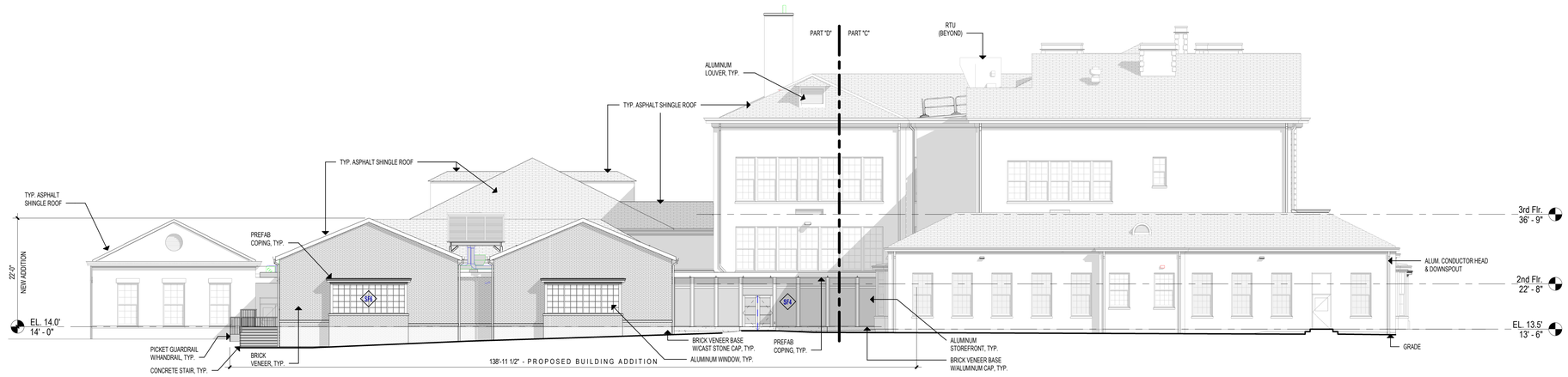
Date: 8/29/2024
Scale: As indicated
Drawn By: JM
Project Number: 22-382
Drawing Number: A260

8/30/2024 7:56:21 AM



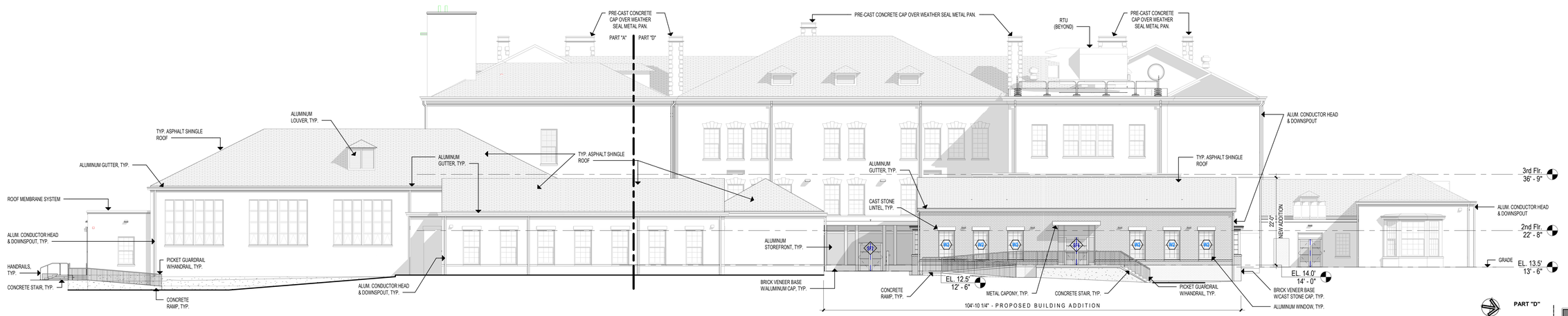
1 EAST ELEVATION - OVERALL NEW WORK

3/32" = 1'-0" REFERENCE: 1/ A112



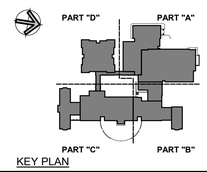
2 SOUTH ELEVATION - OVERALL NEW WORK.

3/32" = 1'-0" REFERENCE: 1/ A113



3 WEST ELEVATION - OVERALL NEW WORK

3/32" = 1'-0"



KEY PLAN

Project Title:

ADDITION & ALTERATIONS TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
311 STATE STREET NEW LONDON CT 06320
203 230 9007 silverpetrucelli.com

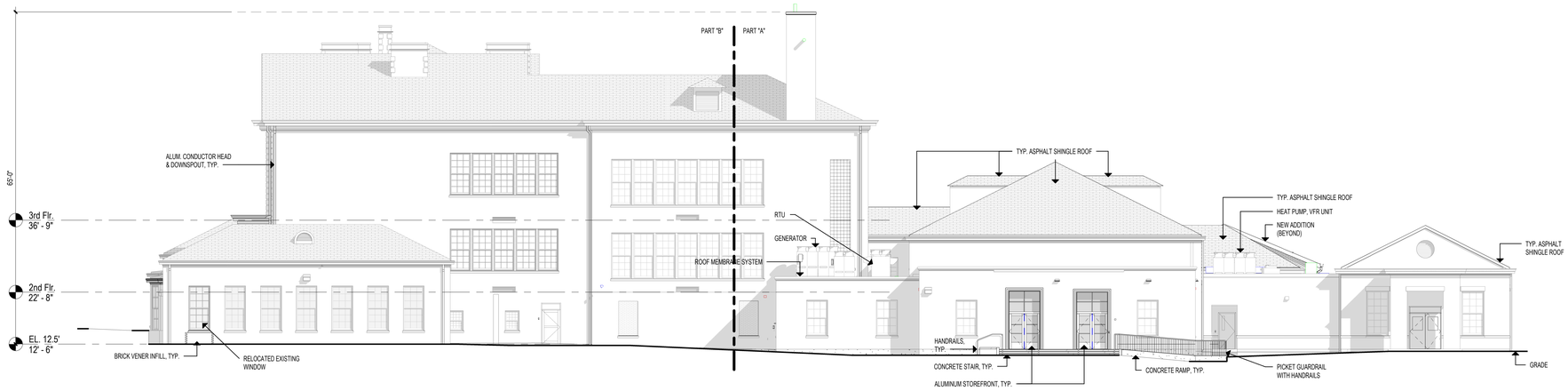
Revision:	Description:	Date:	Revised By:

Drawing Title: OVERALL EXTERIOR ELEVATIONS

Date: 8/29/2024
Scale: 3/32" = 1'-0"
Drawn By: JM
Project Number: 22-382

Drawing Number: A300

8/30/2024 7:58:45 AM



1 NORTH ELEVATON - OVERALL NEW WORK

3/32" = 1'-0" REFERENCE: 1/ A111

Project Title:

ADDITION & ALTERATIONS TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
311 STATE STREET NEW LONDON CT 06320
203 230 9007 silverpetrucelli.com

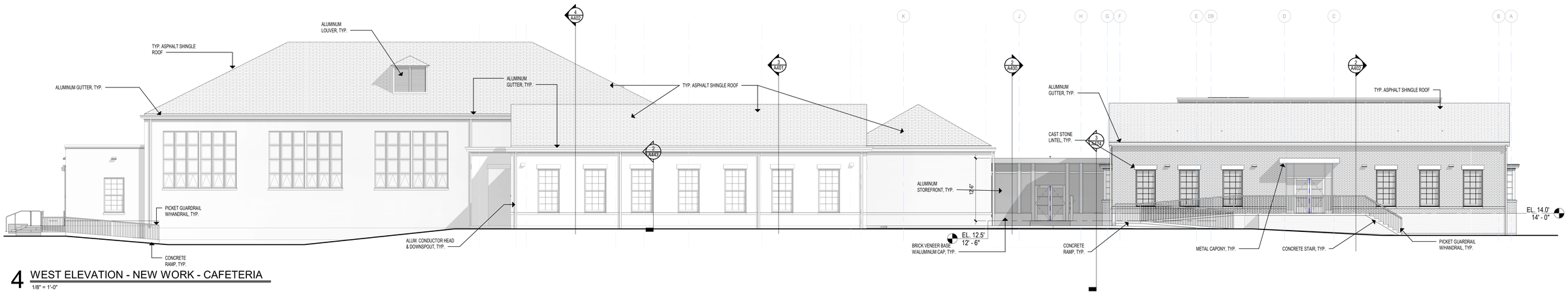
Revision:	Description:	Date:	Revised By:

Drawing Title: EXTERIOR ELEVATIONS

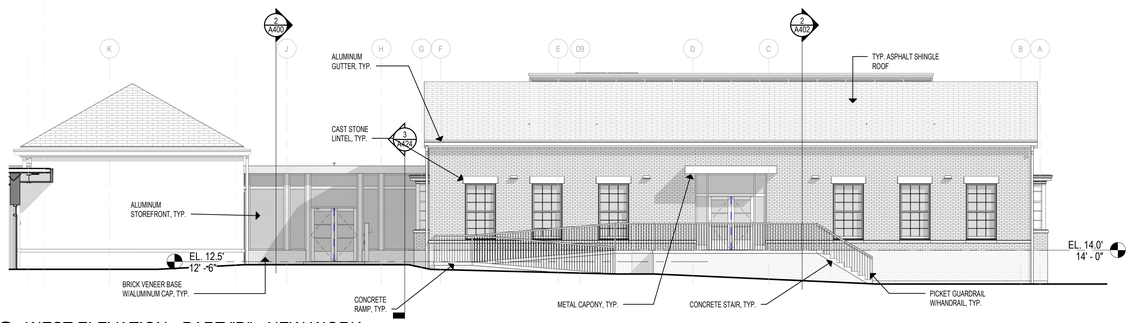
Date: 8/29/2024
Scale: 3/32" = 1'-0"
Drawn By: JM
Project Number: 22-382

Drawing Number: A301

8/30/2024 7:59:39 AM



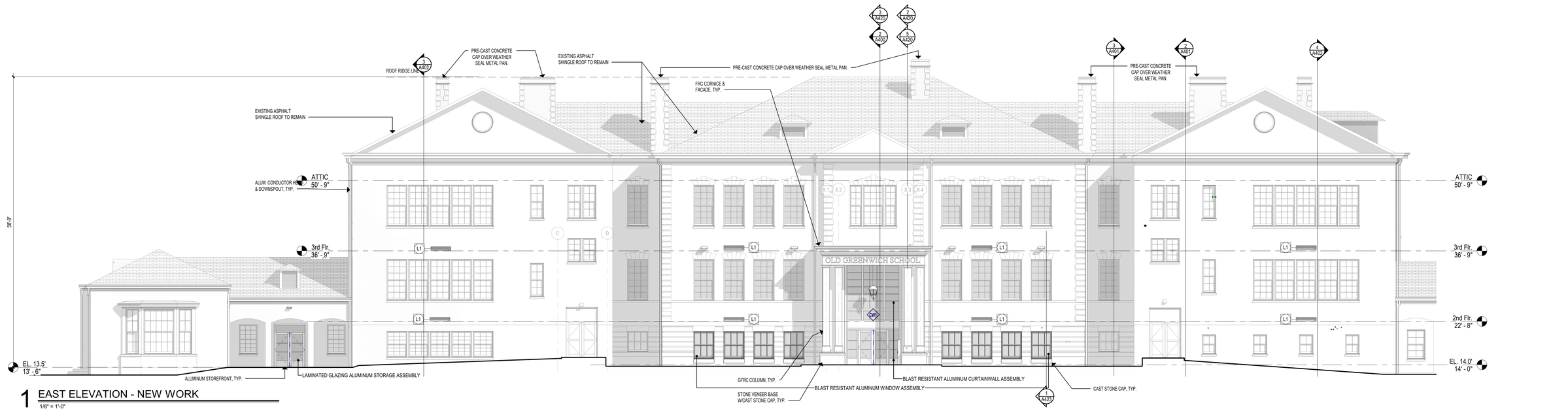
4 WEST ELEVATION - NEW WORK - CAFETERIA
1/8" = 1'-0"



3 WEST ELEVATION - PART "D" - NEW WORK
1/8" = 1'-0"



2 EAST ELEVATION - NEW WORK - SCIENCE WING
1/8" = 1'-0"



1 EAST ELEVATION - NEW WORK
1/8" = 1'-0"

Project Title:

ADDITION & ALTERATIONS TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
311 STATE STREET NEW LONDON CT 06320
203 230 9007 silverpetrucelli.com

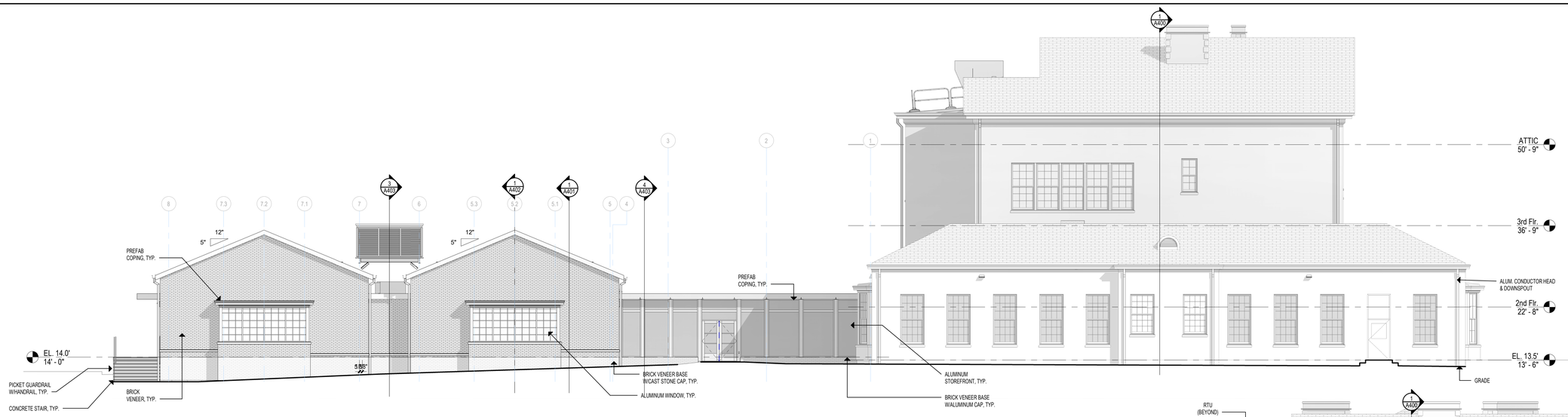
Revision:	Description:	Date:	Revised By:

Drawing Title: EXTERIOR ELEVATIONS

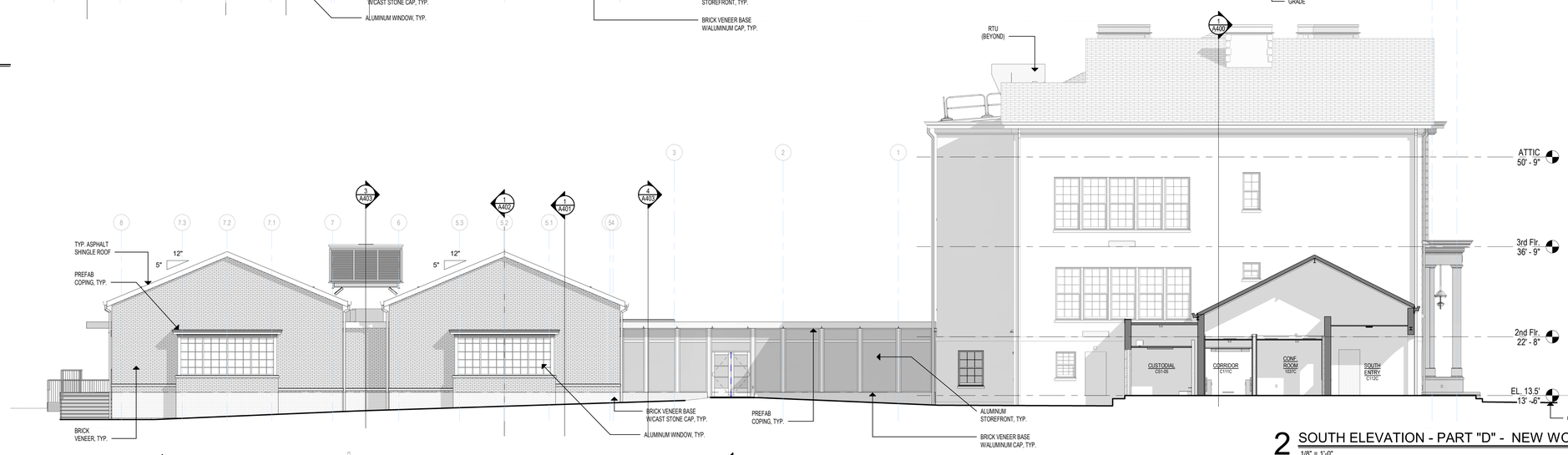
Date: 8/29/2024
Scale: 1/8" = 1'-0"
Drawn By: JM
Project Number: 22-382

Drawing Number: A302

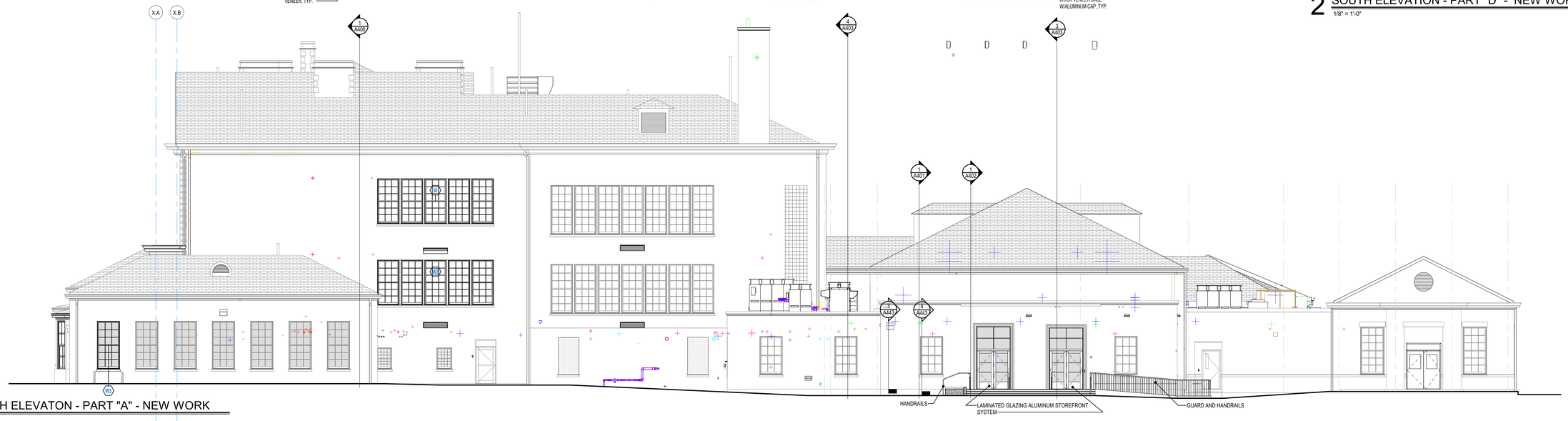
8/30/2024 8:03:41 AM



3 SOUTH ELEVATION - PART "C" - NEW WORK
1/8" = 1'-0"



2 SOUTH ELEVATION - PART "D" - NEW WORK
1/8" = 1'-0"



1 NORTH ELEVATON - PART "A" - NEW WORK
1/8" = 1'-0"

Project Title:

ADDITION & ALTERATIONS TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

SILVER PETRUCELLI + ASSOCIATES
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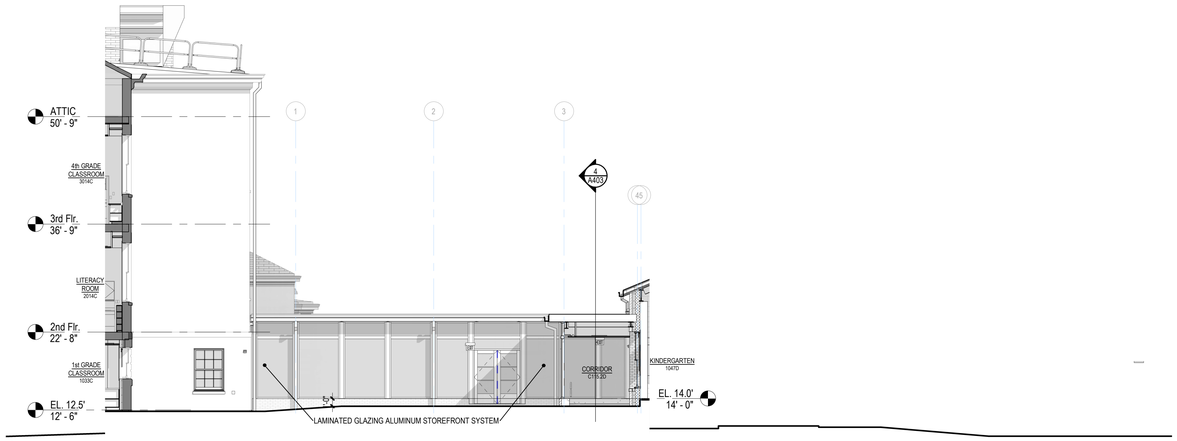
Revision:	Description:	Date:	Revised By:

Drawing Title: EXTERIOR ELEVATIONS

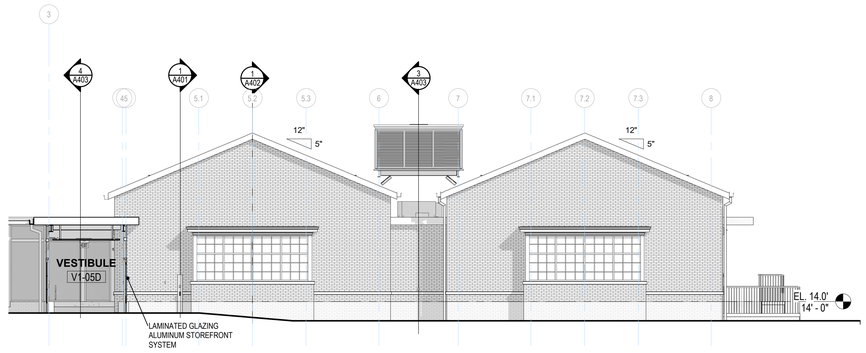
Date: 8/29/2024
Scale: 1/8" = 1'-0"
Drawn By: JM
Project Number: 22-382

Drawing Number: A303

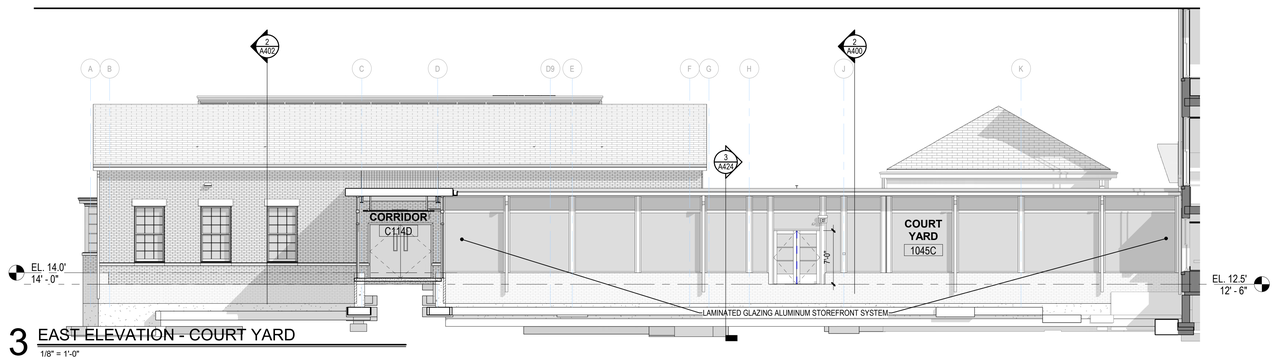
8/30/2024 8:06:47 AM



4 NORTH ELEVATION - CONNECTOR
1/8" = 1'-0"



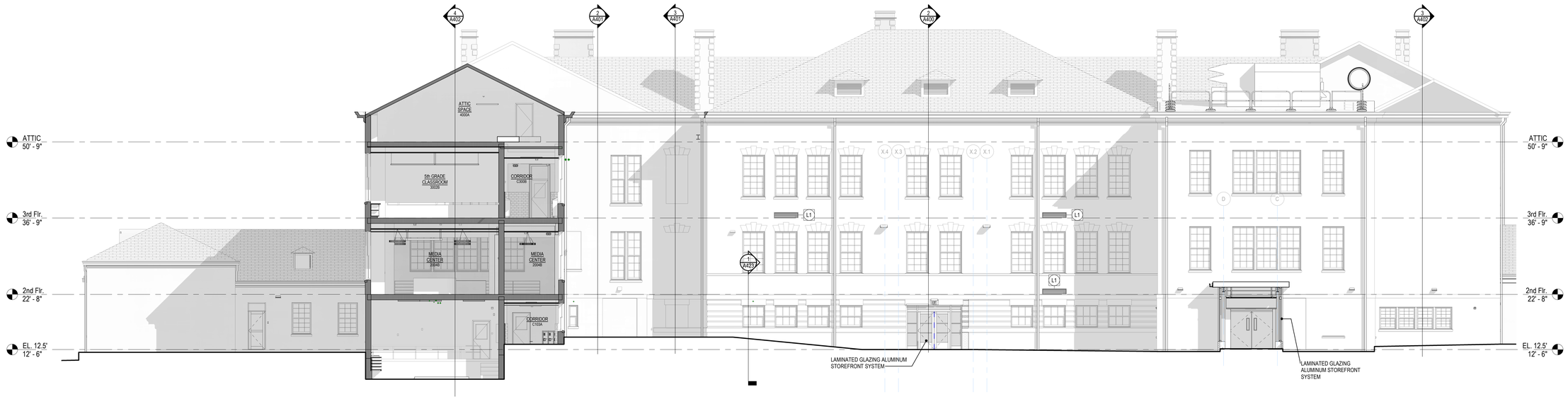
5 NEW ADDITION - NORTH ELEVATION
1/8" = 1'-0"



3 EAST ELEVATION - COURT YARD
1/8" = 1'-0"



2 WEST ELEVATION - NEW WORK - COURT YARD (cont.)
1/8" = 1'-0"



1 WEST ELEVATION - NEW WORK - COURT YARD
1/8" = 1'-0"

Project Title:

ADDITION & ALTERATIONS TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
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203 230 9007 silverpetrucelli.com

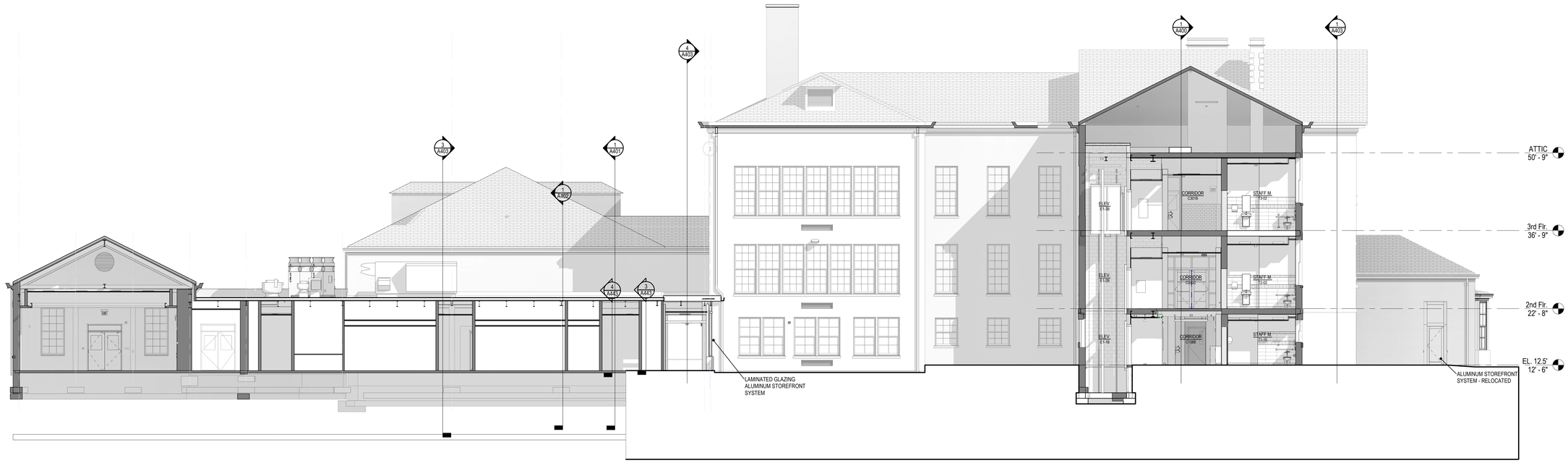
Revision:	Description:	Date:	Revised By:

Drawing Title: EXTERIOR ELEVATIONS

Date: 8/29/2024
Scale: 1/8" = 1'-0"
Drawn By: JM
Project Number: 22-382

Drawing Number: A304

8/30/2024 6:09:59 AM



1 SOUTH ELEVATION - CONNECTOR

1/8" = 1'-0"

Project Title:

ADDITION & ALTERATIONS TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
311 STATE STREET NEW LONDON CT 06320
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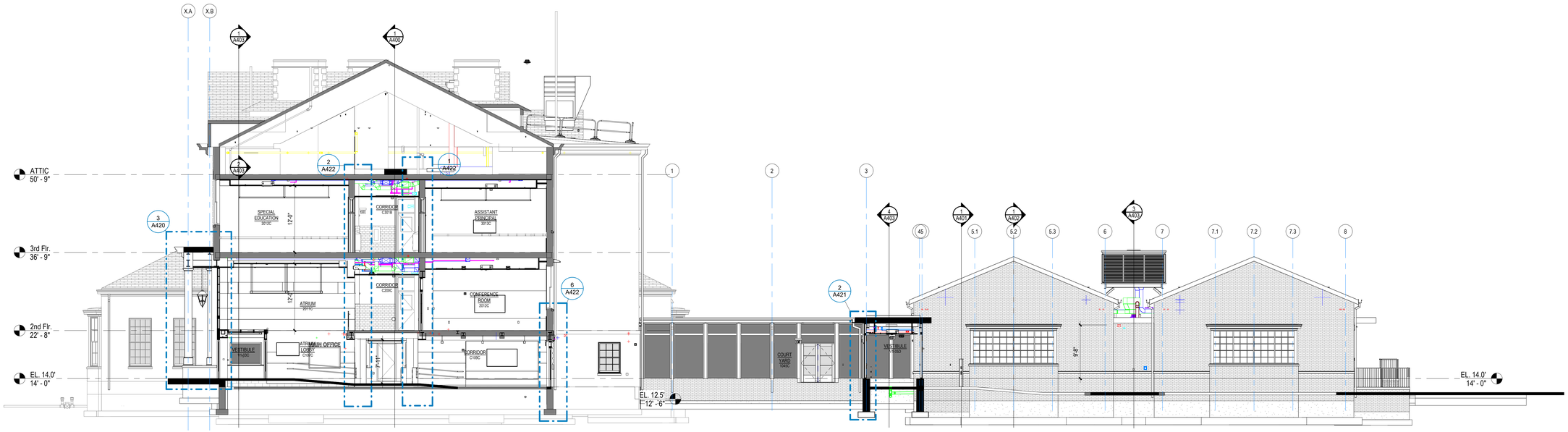
Revision:	Description:	Date:	Revised By:

Drawing Title: EXTERIOR ELEVATIONS

Date: 8/29/2024
Scale: 1/8" = 1'-0"
Drawn By: JM
Project Number: 22-382

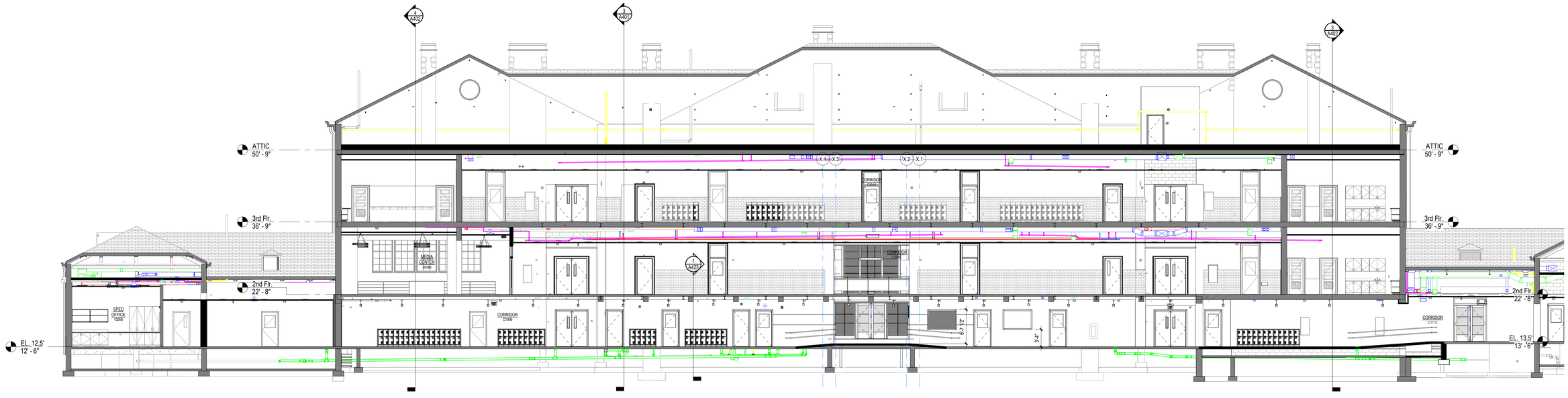
Drawing Number: A305

8/30/2024 8:15:34 AM



2 EAST / WEST BUILDING SECTION - MAIN ENTRY

1/8" = 1'-0"



1 NORTH / SOUTH BUILDING SECTION - MAIN CORRIDOR

1/8" = 1'-0"

Project Title:

ADDITION & ALTERATIONS TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
311 STATE STREET NEW LONDON CT 06320
203 230 9007 silverpetrucelli.com

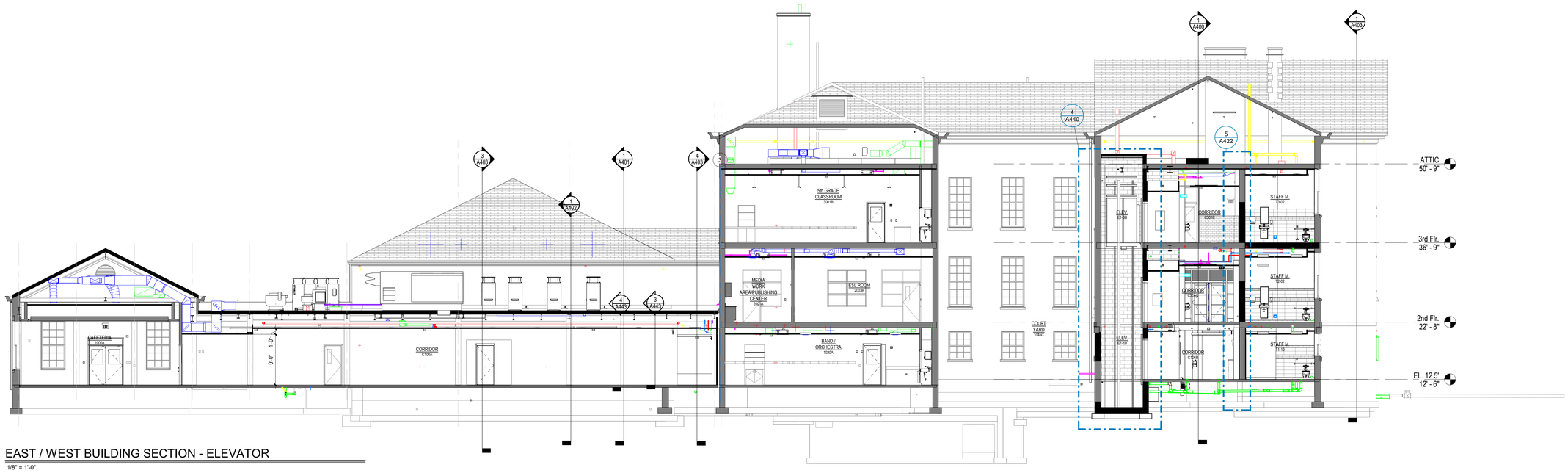
Revision:	Description:	Date:	Revised By:

Drawing Title: BUILDING SECTIONS

Date: 8/29/2024
Scale: 1/8" = 1'-0"
Drawn By: JM
Project Number: 22-382

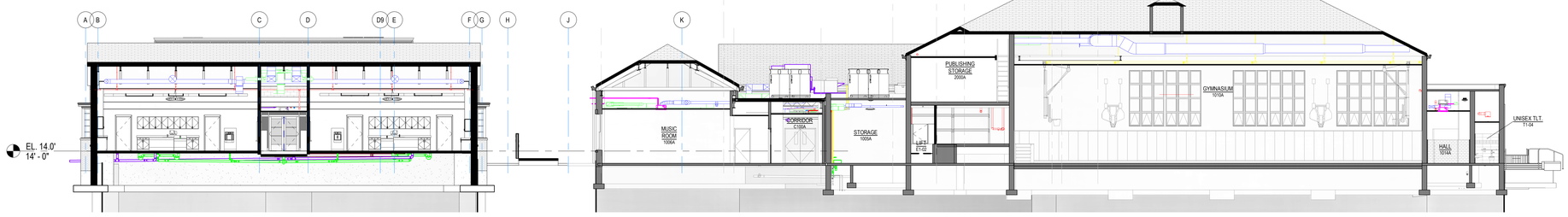
Drawing Number: A400

8/30/2024 8:15:47 AM



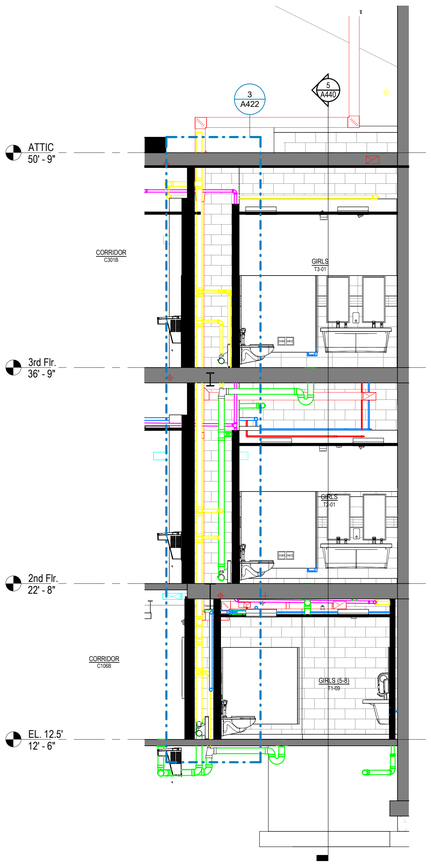
3 EAST / WEST BUILDING SECTION - ELEVATOR

1/8" = 1'-0"



1 NORTH / SOUTH BUILDING SECTION - CORRIDOR

3/32" = 1'-0"



2 EAST / WEST BUILDING SECTION - MEDIA CENTER

1/4" = 1'-0"

Project Title:

ADDITION & ALTERATIONS TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
311 STATE STREET NEW LONDON CT 06320
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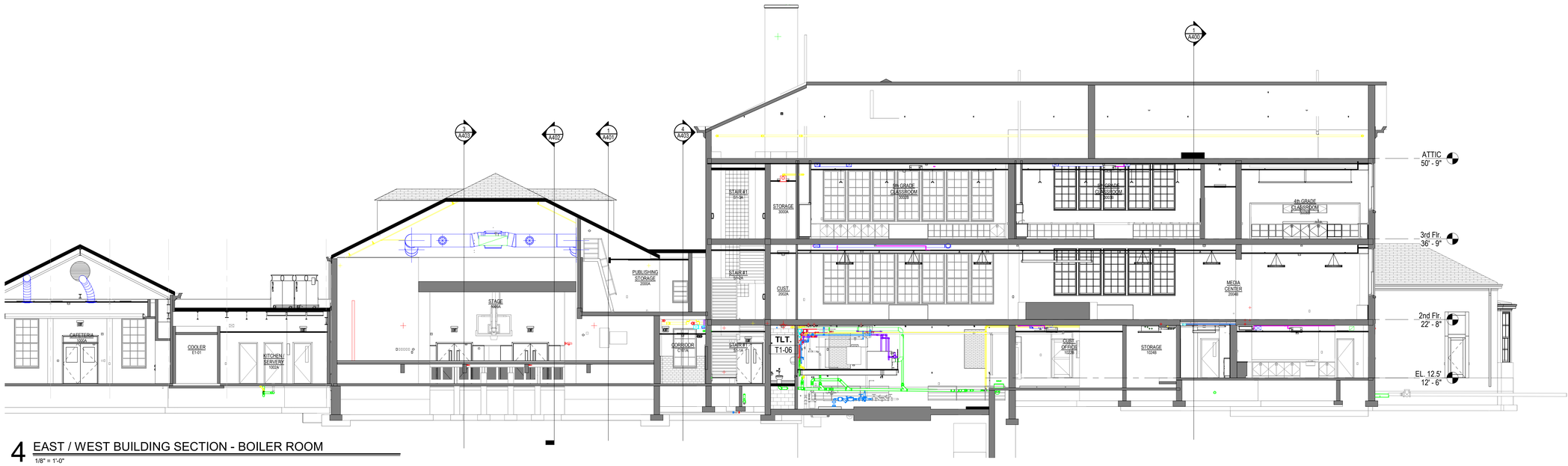
Revision:	Description:	Date:	Revised By:

Drawing Title: BUILDING SECTIONS

Date: 8/29/2024
Scale: As indicated
Drawn By: JM
Project Number: 22-382

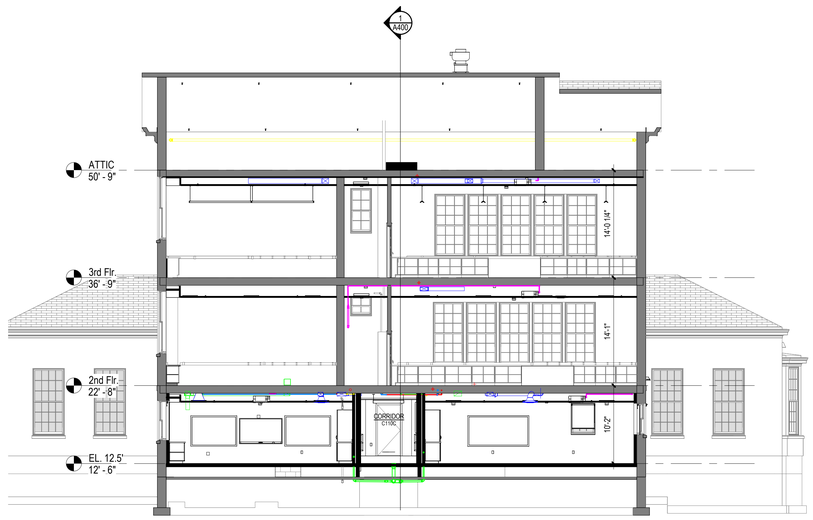
Drawing Number: A401

8/30/2024 8:17:24 AM



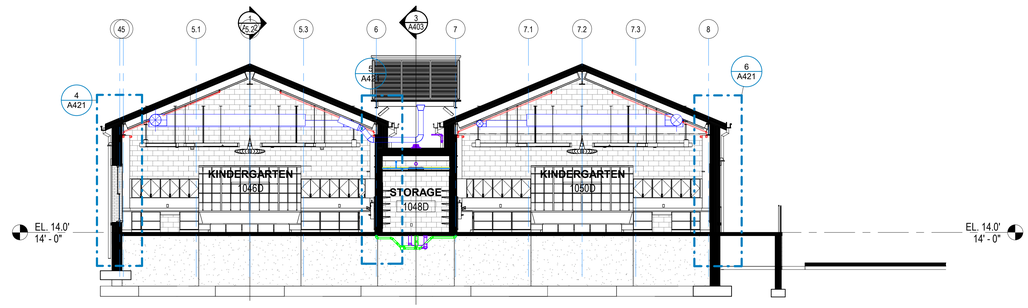
4 EAST / WEST BUILDING SECTION - BOILER ROOM

1/8" = 1'-0"



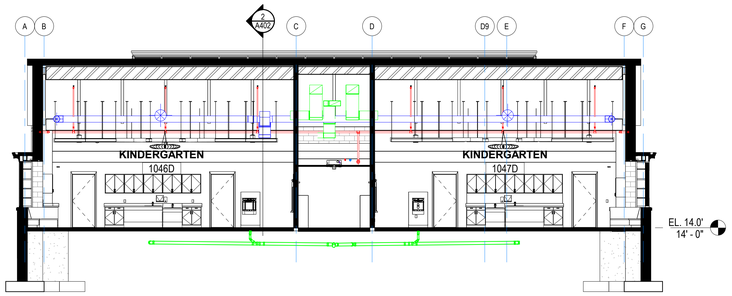
3 EAST / WEST BUILDING SECTION - CONNECTING CORRIDOR

1/8" = 1'-0"



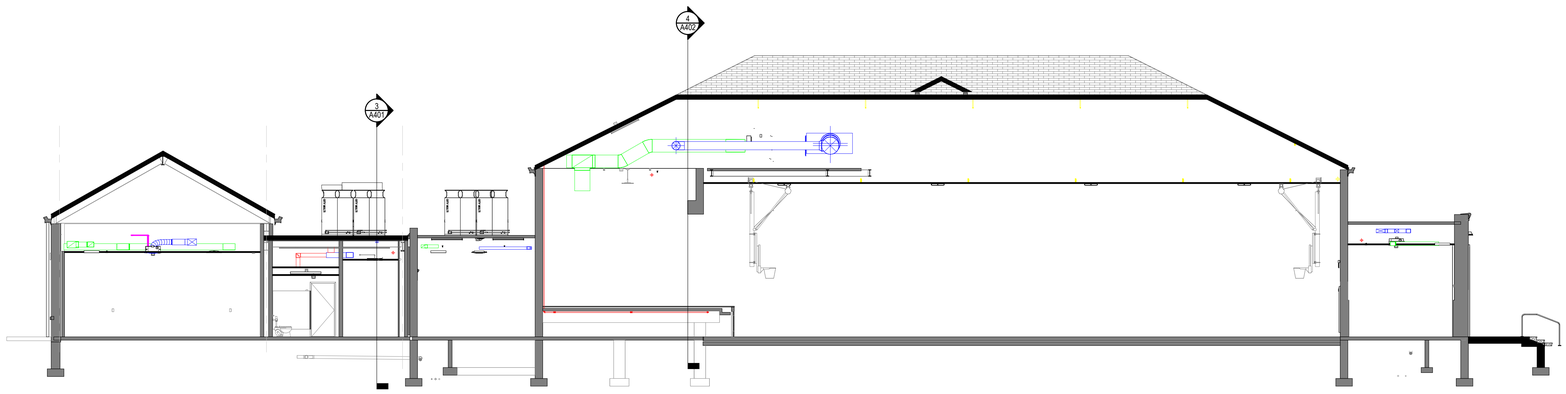
2 EAST / WEST BUILDING SECTION - KINDERGARTEN

1/8" = 1'-0"



1 NORTH / SOUTH BUILDING SECTION - KINDERGARTEN

1/8" = 1'-0"



Project Title:

ADDITION & ALTERATIONS TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
311 STATE STREET NEW LONDON CT 06320
203 230 9007 silverpetrucelli.com

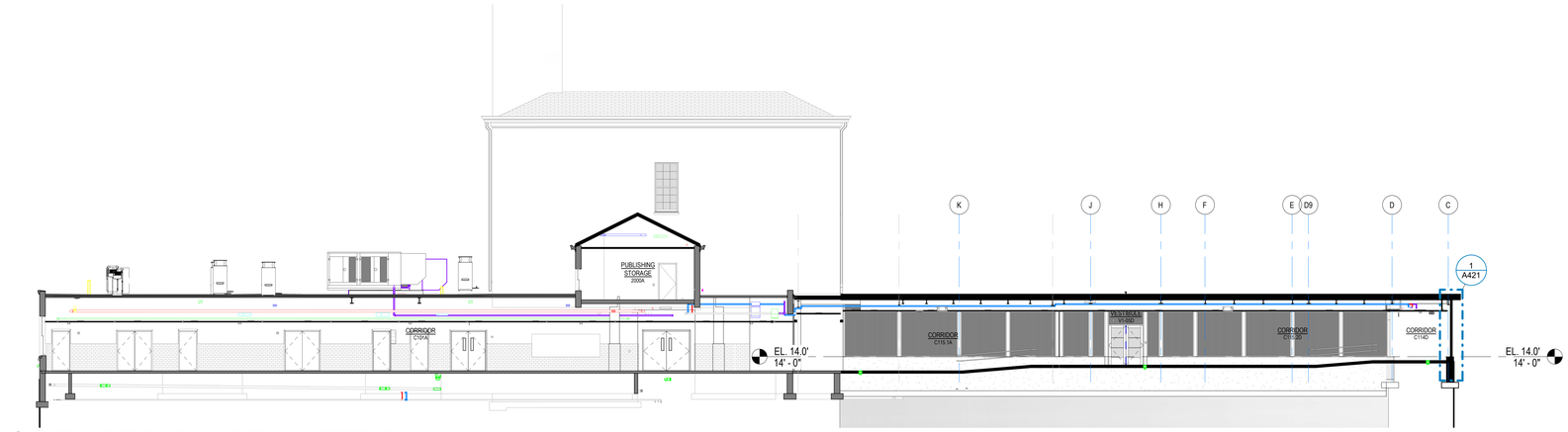
Revision:	Description:	Date:	Revised By:

Drawing Title: BUILDING SECTIONS

Date: 8/29/2024
Scale: 1/8" = 1'-0"
Drawn By: JM
Project Number: 22-382

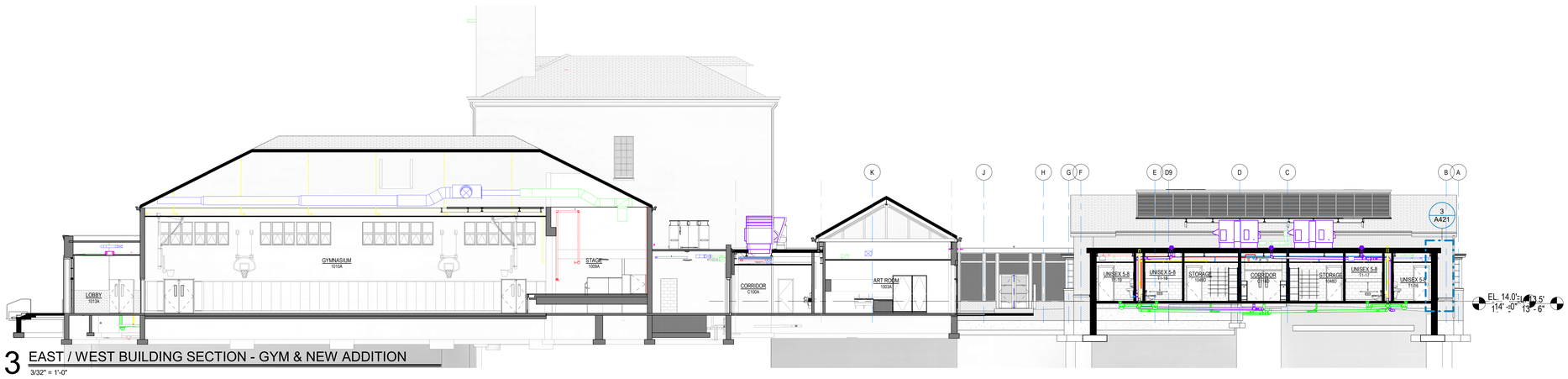
Drawing Number: A402

8/30/2024 8:17:39 AM



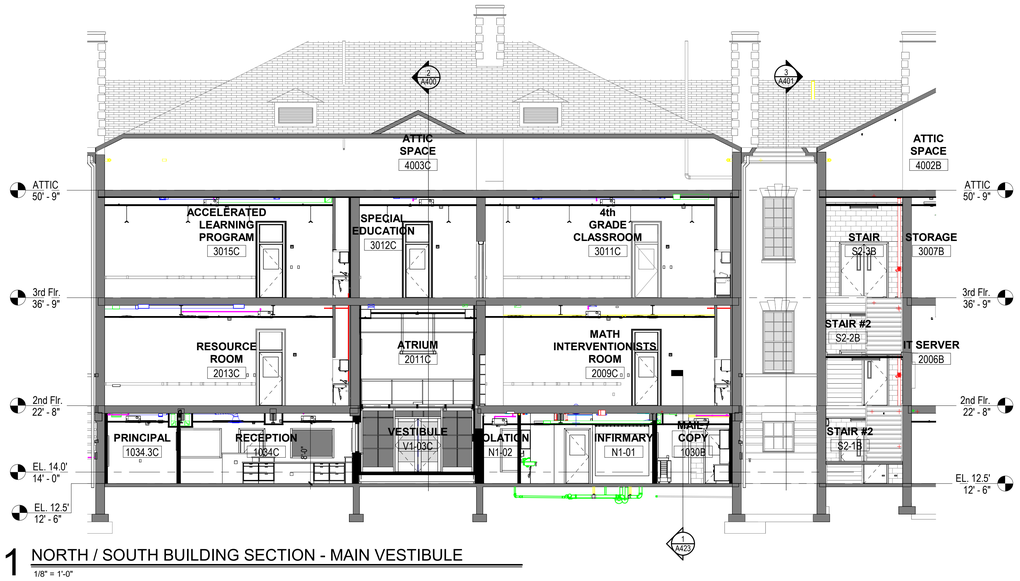
4 EAST / WEST BUILDING SECTION - CORRIDOR

3/32" = 1'-0"



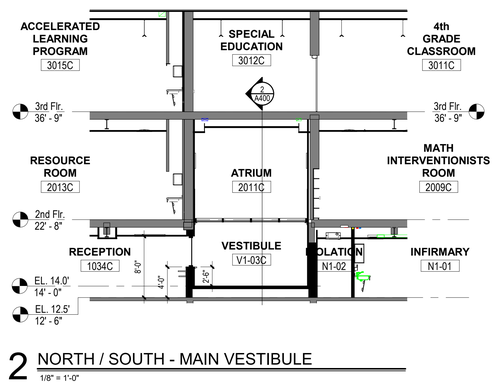
3 EAST / WEST BUILDING SECTION - GYM & NEW ADDITION

3/32" = 1'-0"



1 NORTH / SOUTH BUILDING SECTION - MAIN VESTIBULE

1/8" = 1'-0"



2 NORTH / SOUTH - MAIN VESTIBULE

1/8" = 1'-0"

Project Title:

ADDITION & ALTERATIONS TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
311 STATE STREET NEW LONDON CT 06320
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Revision:	Description:	Date:	Revised By:

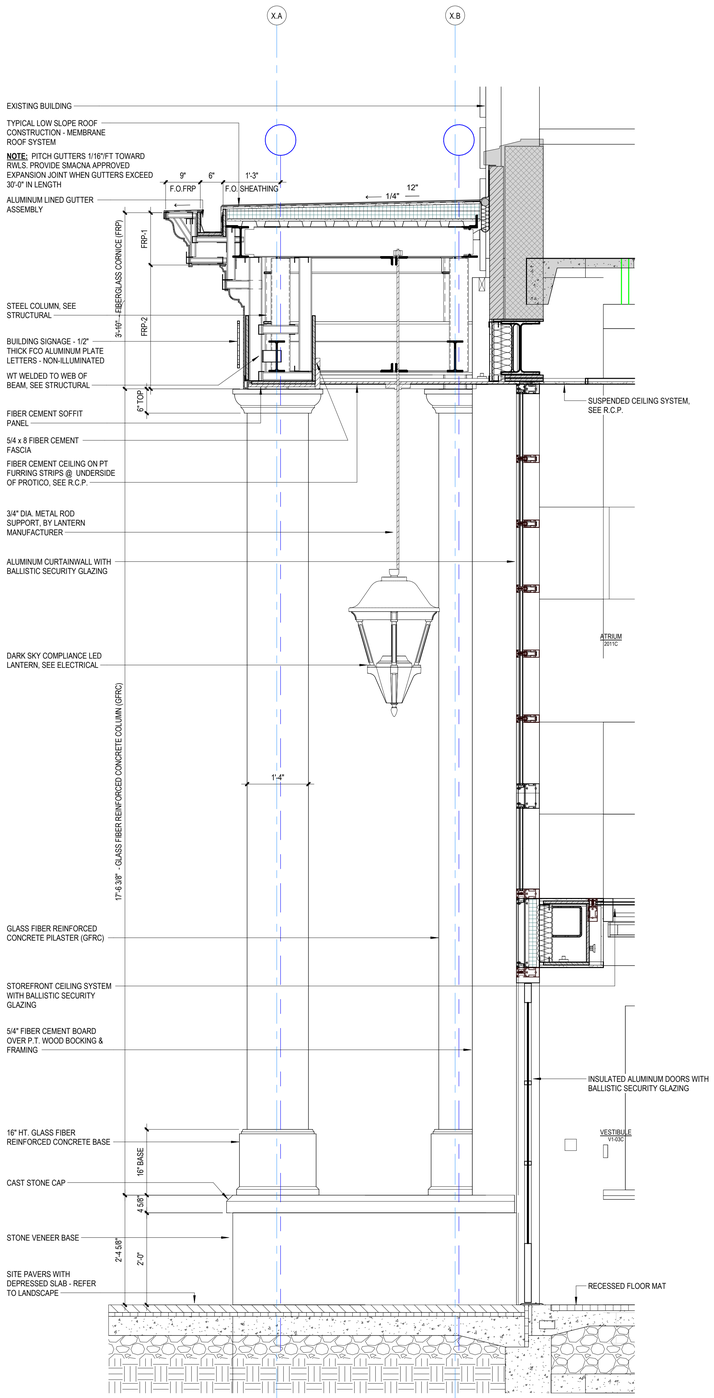
Drawing Title:

BUILDING SECTIONS

Date: 8/29/2024
Scale: As indicated
Drawn By: JM
Project Number: 22-382

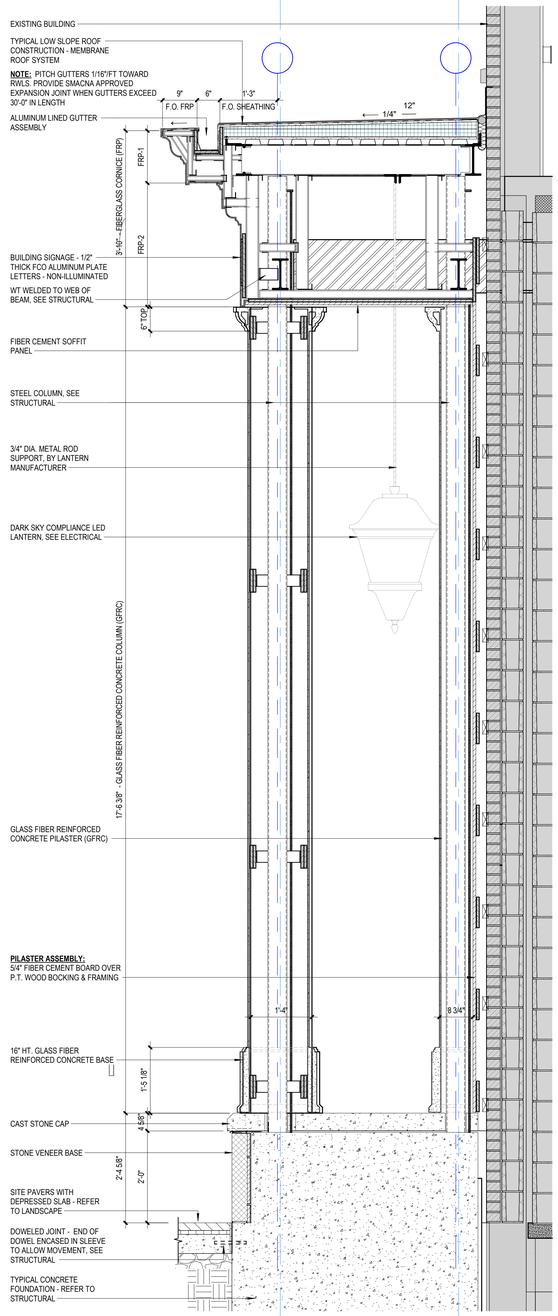
Drawing Number: A403

8/30/2024 8:19:39 AM



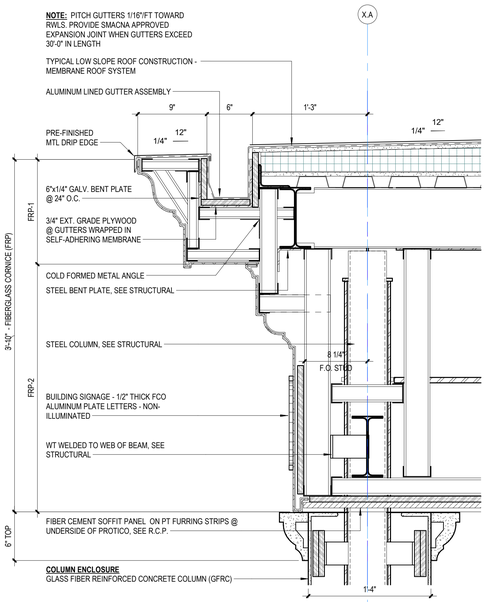
3 WALL SECTION @ PROTICO/ENTRY VESTIBULE

3/4" = 1'-0"



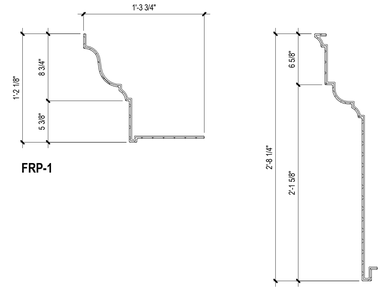
2 WALL SECTION @ PORTICO

3/4" = 1'-0"



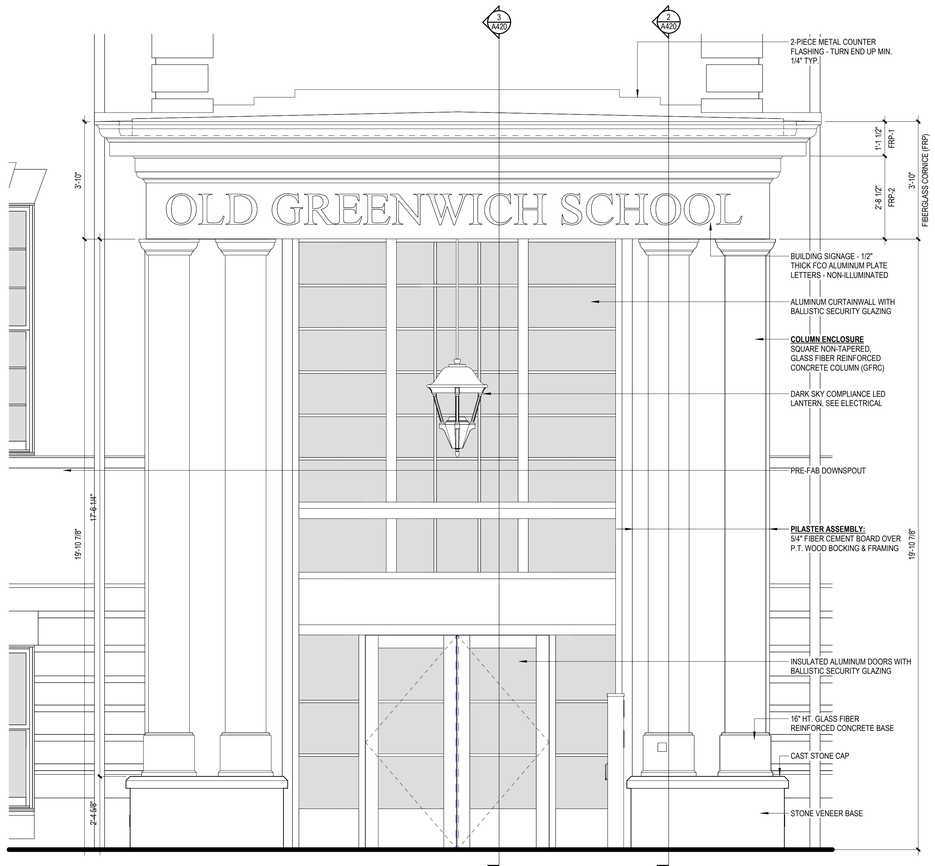
5 FIBERGLASS CORNICE (FRP) w/INTEGRATED GUTTER

1 1/2" = 1'-0"



4 FIBERGLASS CORNICE (FRP) PROFILES

1 1/2" = 1'-0"



1 PORTICO ELEVATION

1/2" = 1'-0"

Project Title:

ADDITION & ALTERATIONS TO:
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OLD GREENWICH, CONNECTICUT 06870

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311 STATE STREET NEW LONDON CT 06320
203 230 9007 silverpetrucelli.com

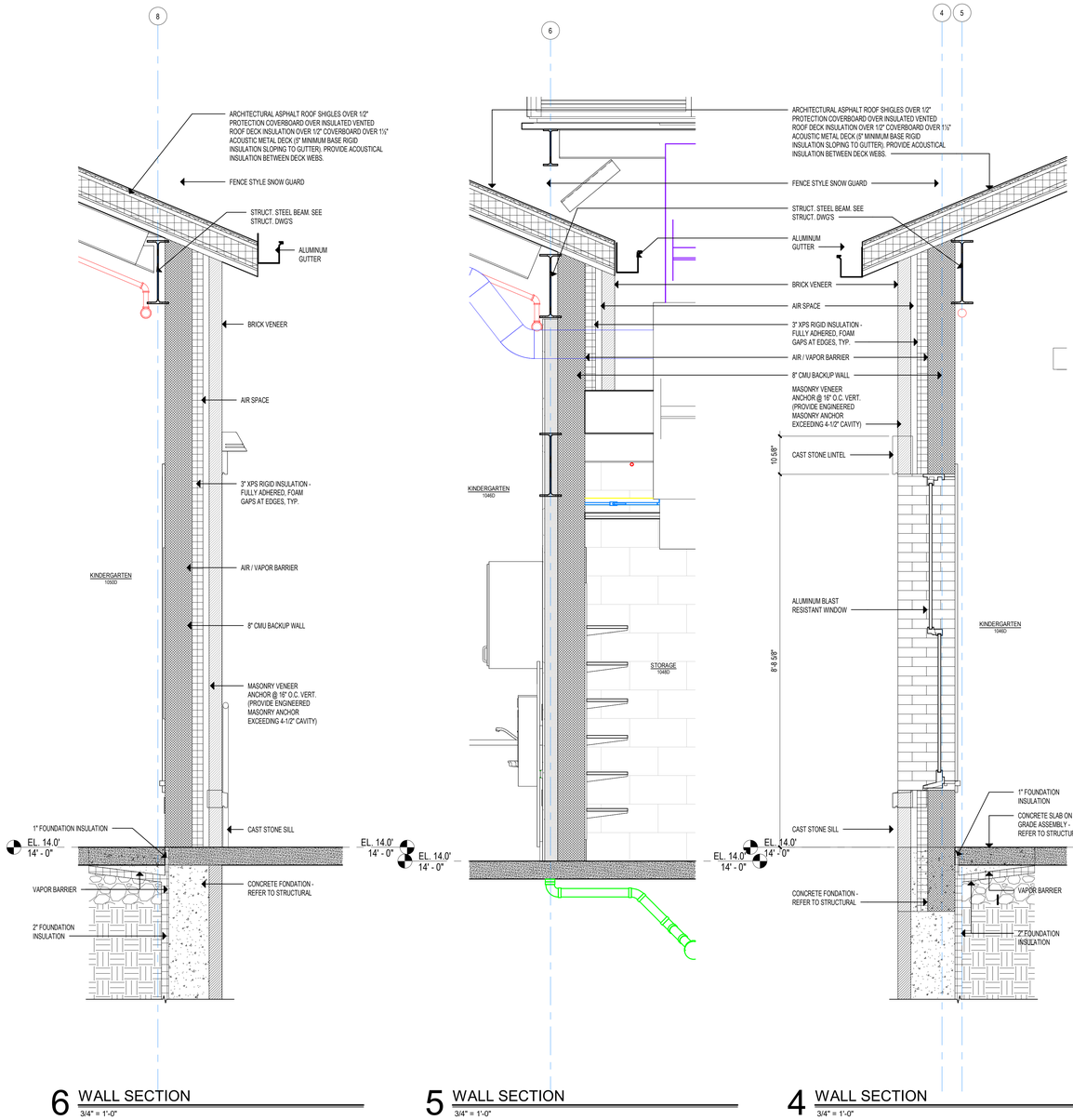
Revision:	Description:	Date:	Revised By:

Drawing Title: WALL SECTIONS

Date: 8/29/2024
Scale: As indicated
Drawn By: JM
Project Number: 22-382

Drawing Number: A420

8/30/2024 8:19:47 AM



6 WALL SECTION
3/4" = 1'-0"

5 WALL SECTION
3/4" = 1'-0"

4 WALL SECTION
3/4" = 1'-0"

3 WALL SECTION
3/4" = 1'-0"

2 WALL SECTION
3/4" = 1'-0"

1 WALL SECTION
3/4" = 1'-0"

Project Title:

ADDITION & ALTERATIONS TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
311 STATE STREET NEW LONDON CT 06320
203 230 9007 silverpetrucelli.com

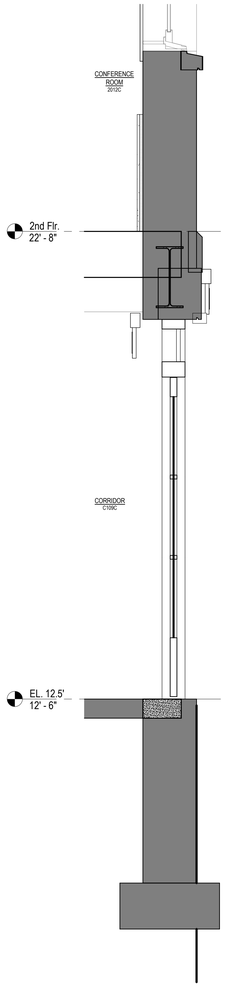
Revision:	Description:	Date:	Revised By:

Drawing Title: WALL SECTIONS

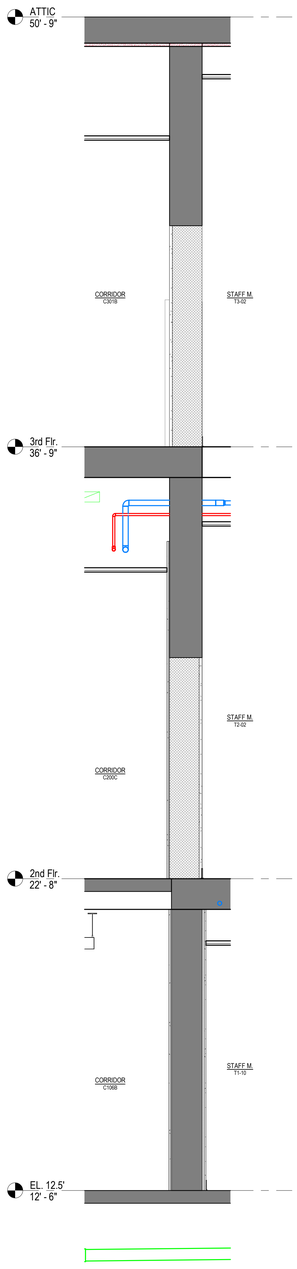
Date: 8/29/2024
Scale: 3/4" = 1'-0"
Drawn By: JM
Project Number: 22-382

Drawing Number: A421

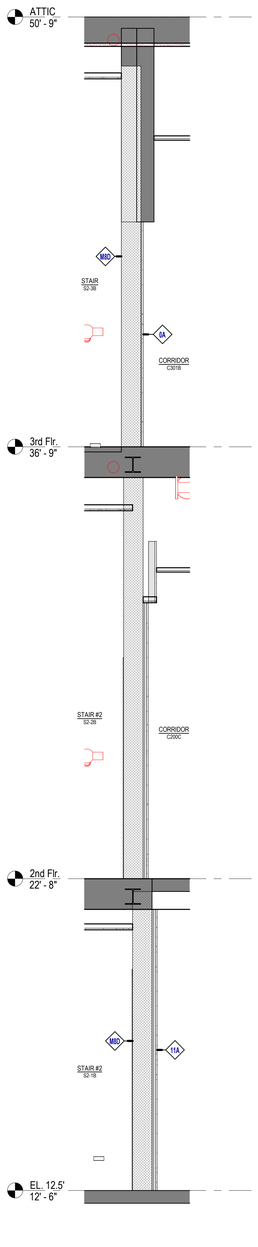
8/30/2024 8:19:54 AM



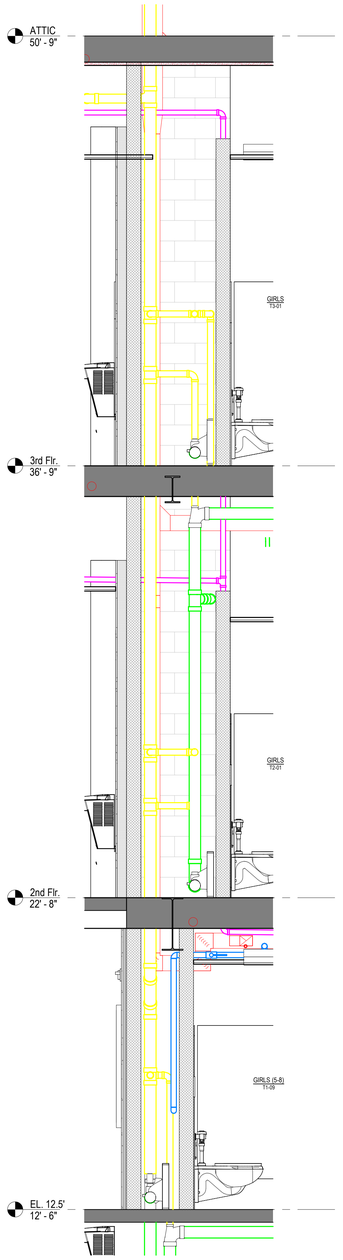
6 WALL SECTION
3/4" = 1'-0"



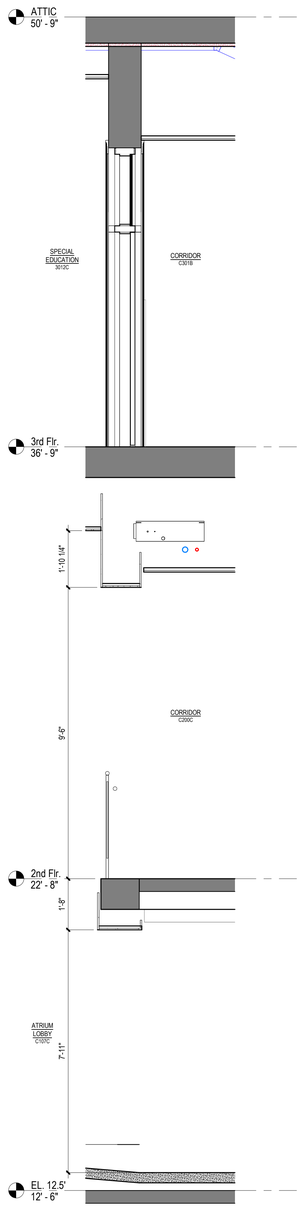
5 WALL SECTION
1/2" = 1'-0"



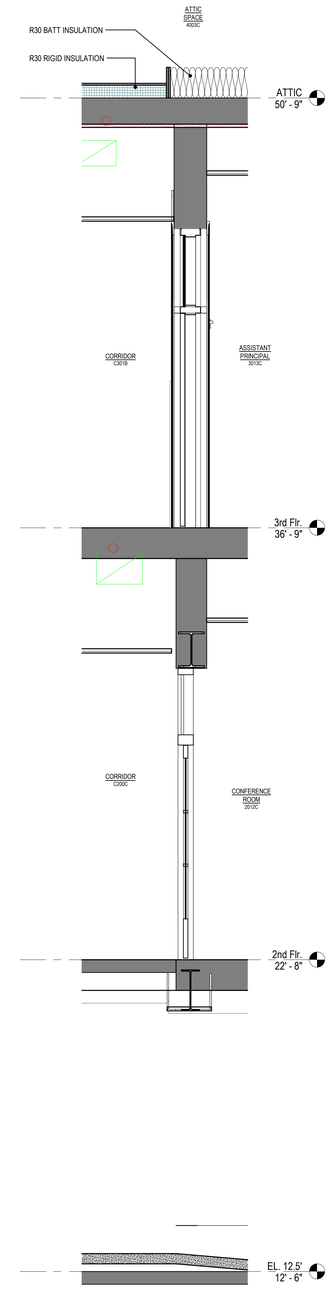
4 WALL SECTION
1/2" = 1'-0"



3 WALL SECTION
1/2" = 1'-0"



2 WALL SECTION
1/2" = 1'-0"



1 WALL SECTION
1/2" = 1'-0"

Project Title:

ADDITION & ALTERATIONS TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
311 STATE STREET NEW LONDON CT 06320
203 230 9007 silverpetrucelli.com

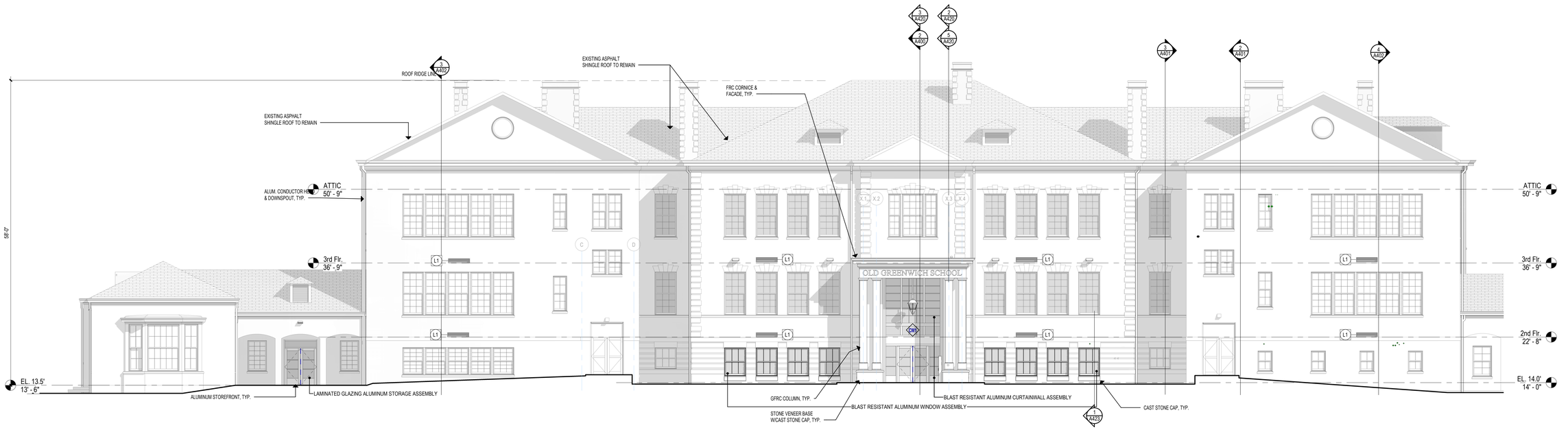
Revision:	Description:	Date:	Revised By:

Drawing Title: WALL SECTIONS

Date: 8/29/2024
Scale: As indicated
Drawn By: JM
Project Number: 22-382

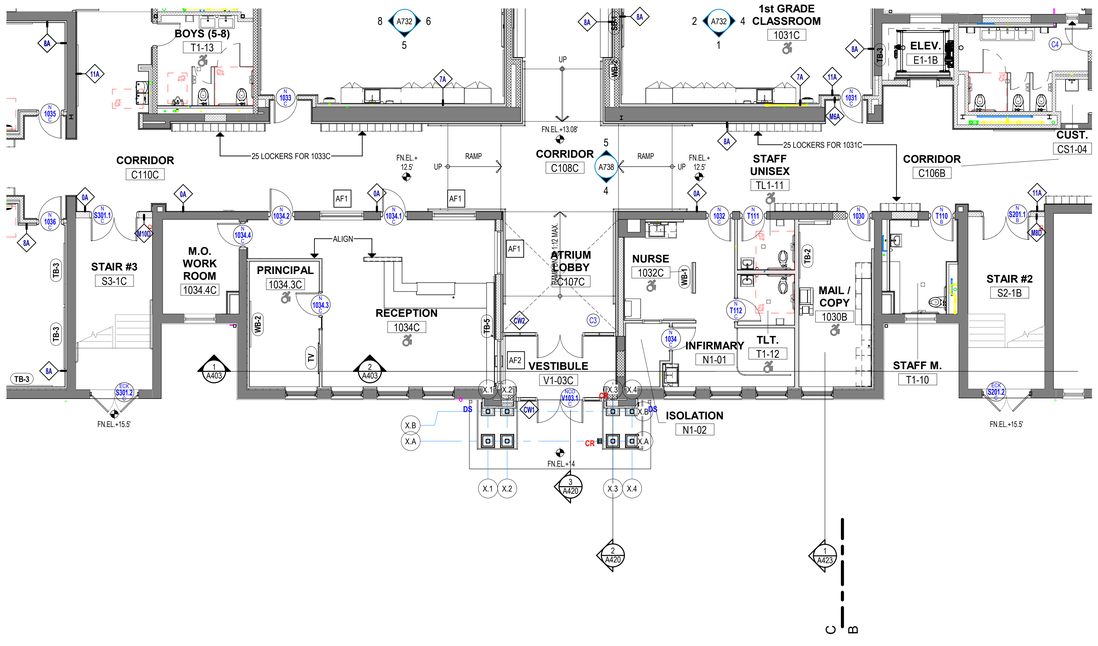
Drawing Number: A422

8/30/2024 8:20:02 AM



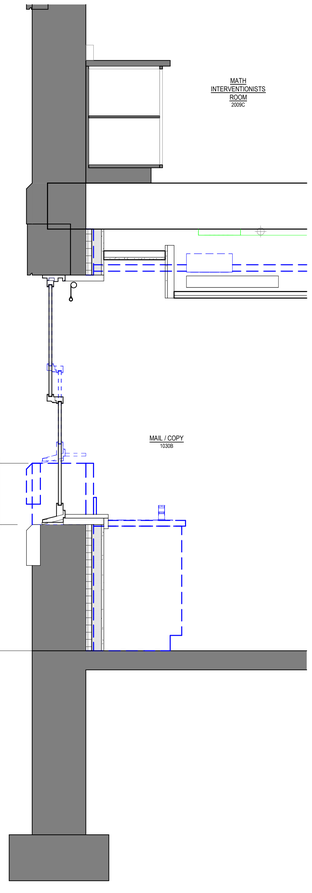
2 PARTIAL EAST ELEVATION

1/8" = 1'-0"



3 1st FLOOR PLAN - PARTIAL PLAN

1/8" = 1'-0"



1 SECTION - WINDOW WELL

3/4" = 1'-0"

Project Title:

ADDITION & ALTERATIONS TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
311 STATE STREET NEW LONDON CT 06320
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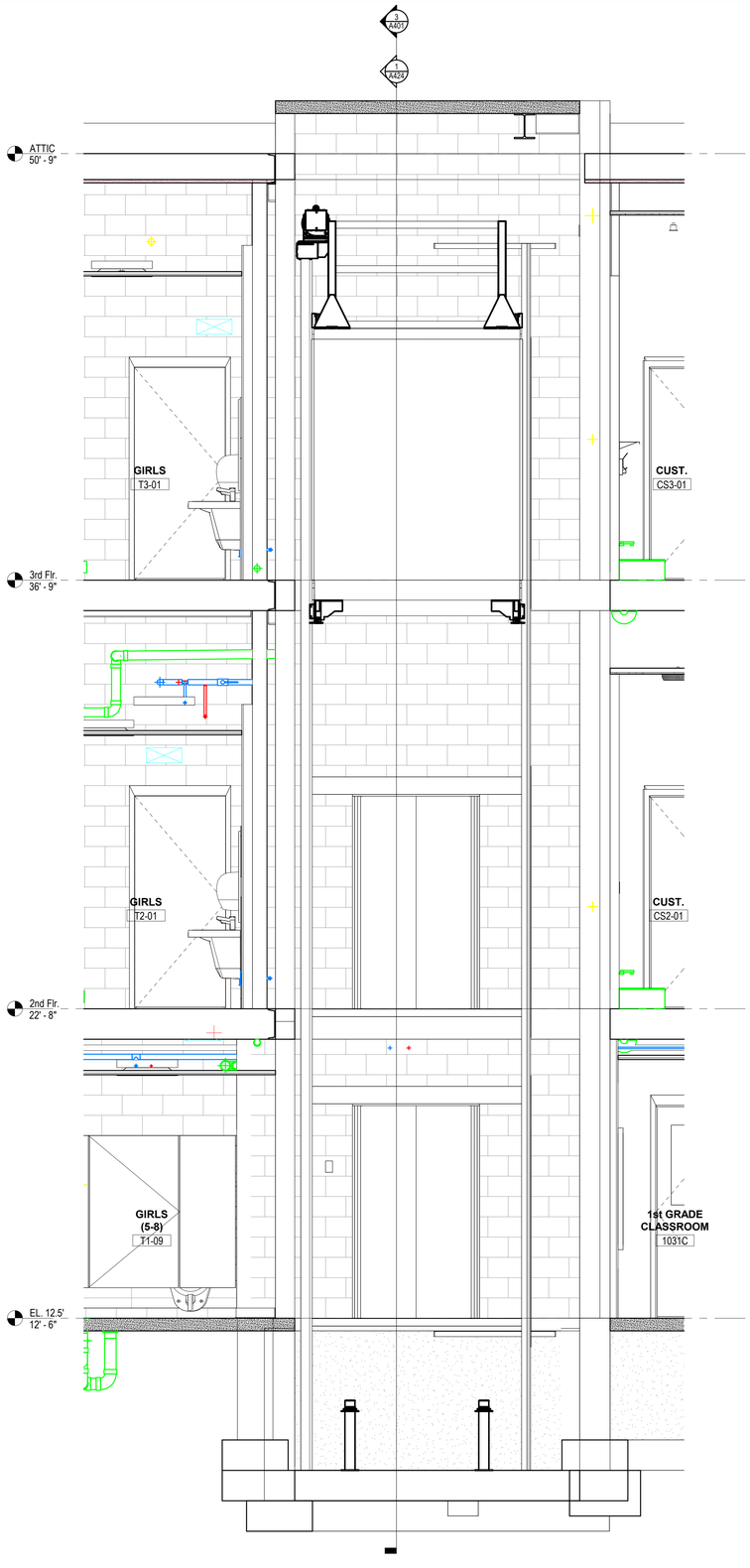
Revision:	Description:	Date:	Revised By:

Drawing Title: WALL SECTIONS

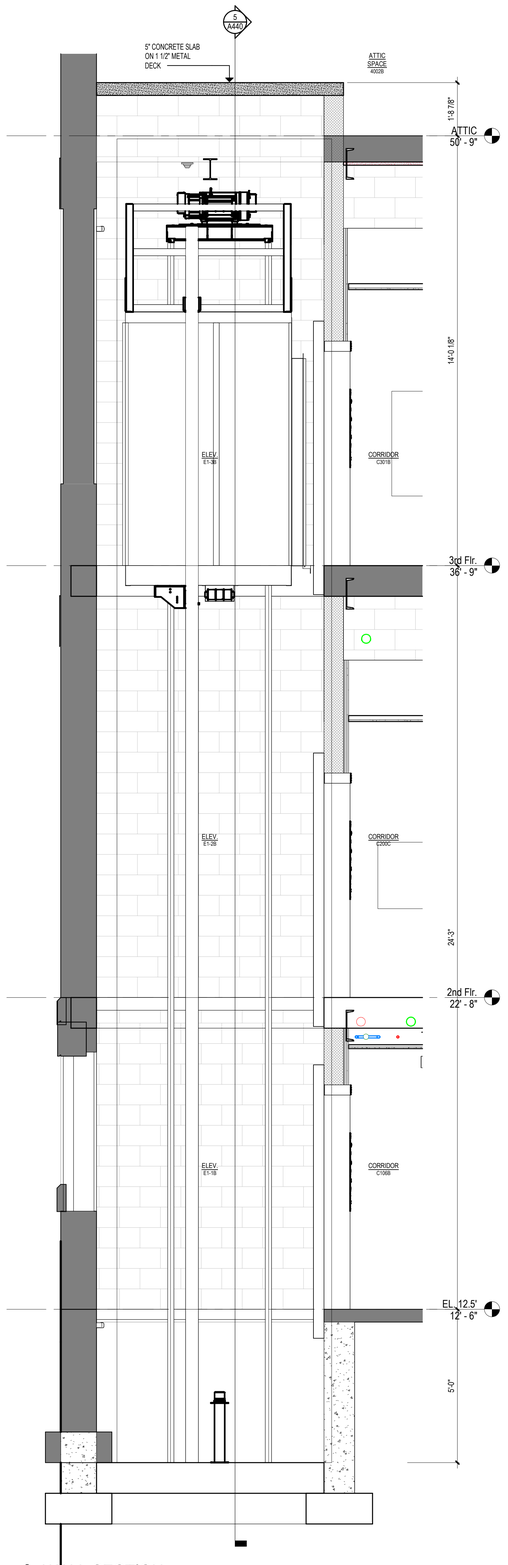
Date: 8/29/2024
Scale: As indicated
Drawn By: JM
Project Number: 22-382

Drawing Number: A423

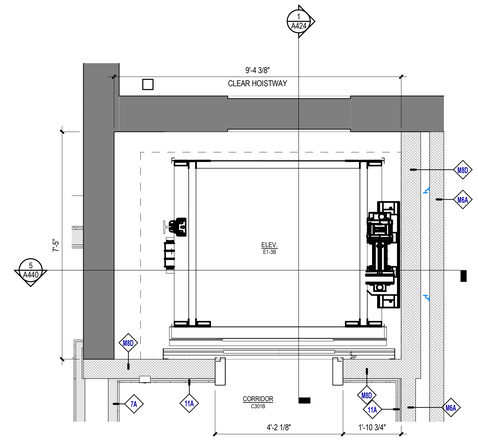
8/30/2024 8:22:31 AM



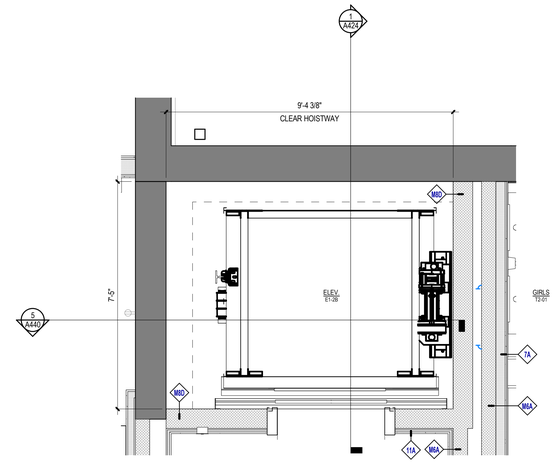
5 WALL SECTION
1/2" = 1'-0"



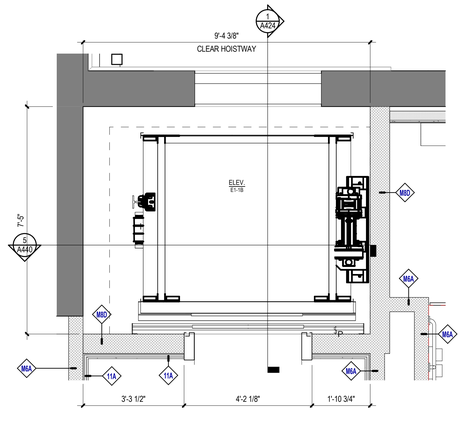
4 WALL SECTION
1/2" = 1'-0"



3 ENLARGED ELEVATOR - 3rd FLOOR
1/2" = 1'-0"



2 ENLARGED ELEVATOR - 2nd FLOOR
1/2" = 1'-0"



1 ENLARGED ELEVATOR - 1st FLOOR
1/2" = 1'-0"

Project Title:

ADDITION & ALTERATIONS TO:
Old Greenwich School
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3190 WHITNEY AVENUE HAMDEN CT 06518
311 STATE STREET NEW LONDON CT 06320
203 230 9007 silverpetrucelli.com

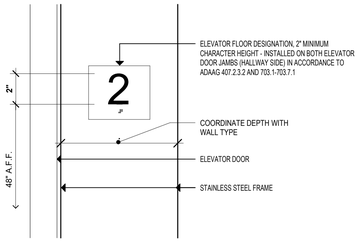
Revision:	Description:	Date:	Revised By:

Drawing Title:
ENLARGED ELEVATOR PLANS AND DETAILS

Date: 8/29/2024
Scale: 1/2" = 1'-0"
Drawn By: JM
Project Number: 22-382

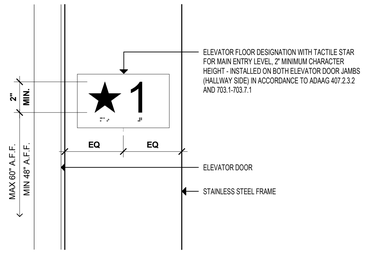
Drawing Number: A440

8/30/2024 8:22:45 AM



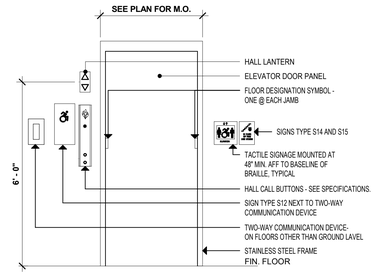
9 ELEVATOR JAMB TYPICAL FLOOR DESIGNATION

3" = 1'-0"



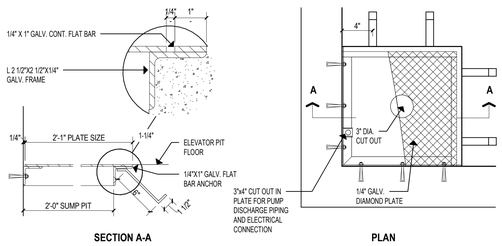
8 ELEVATOR JAMB PRIMARY FLOOR

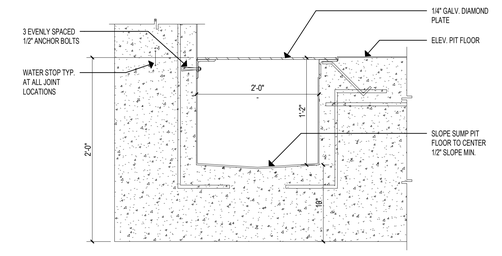
3" = 1'-0"



7 ELEVATOR DOOR ELEVATION

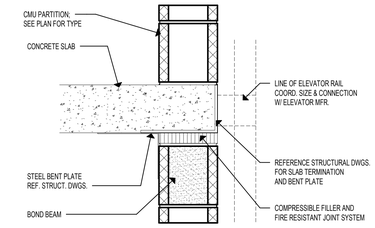
1/2" = 1'-0"





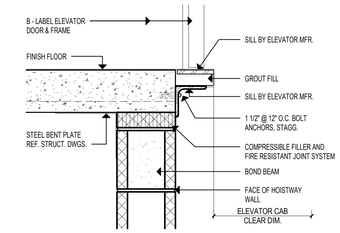
6 SUMP PIT COVER DETAIL

1 1/2" = 1'-0"



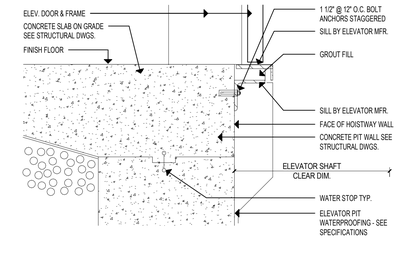
5 EELEVATOR RAIL DETAIL @ INTERMEDIATE FLOOR

1 1/2" = 1'-0"



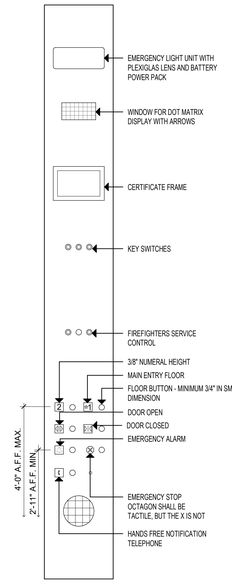
4 ELEVATOR SILL DETAIL @ INTERMEDIATE FLOOR

1 1/2" = 1'-0"



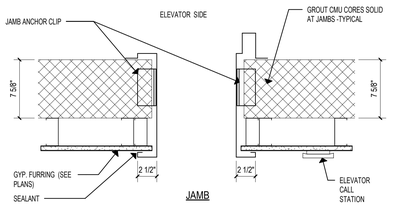
3 ELEVATOR SILL DETAIL

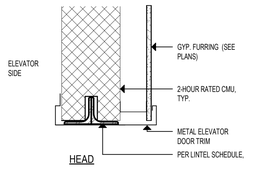
1 1/2" = 1'-0"



2 ELEVATOR CONTROL PANEL

1 1/2" = 1'-0"





1 ELEVATOR PLAN DETAILS

1 1/2" = 1'-0"

Project Title:

ADDITION & ALTERATIONS TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
311 STATE STREET NEW LONDON CT 06320
203 230 9007 silverpetrucelli.com

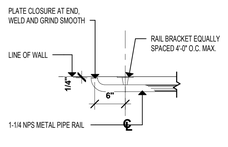
Revision:	Description:	Date:	Revised By:

Drawing Title: ELEVATOR DETAILS

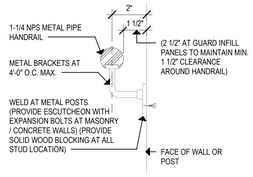
Date: 8/29/2024
Scale: As indicated
Drawn By: JM
Project Number: 22-382

Drawing Number: A441

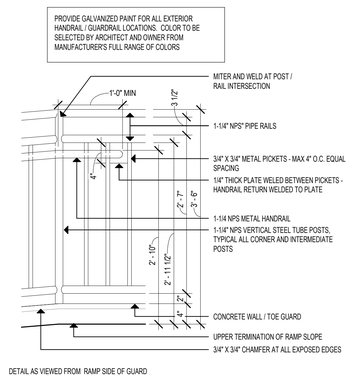
8/30/2024 8:22:49 AM



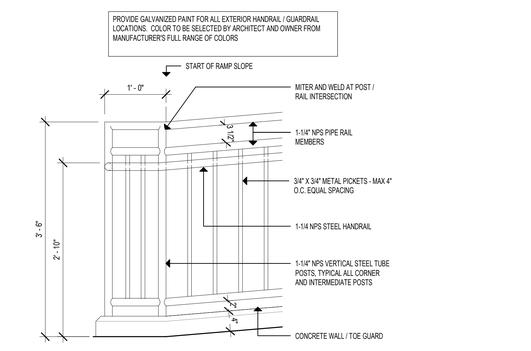
8 HANDRAIL RETURN PLAN DETAIL
1" = 1'-0"



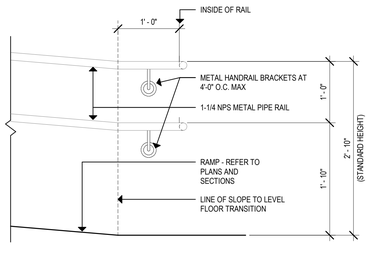
7 HANDRAIL SECTION
3" = 1'-0"



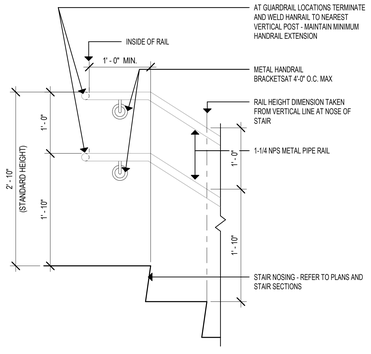
6 HANDRAIL / GUARDRAIL AT TOP OF EXTERIOR RAMP
1" = 1'-0"



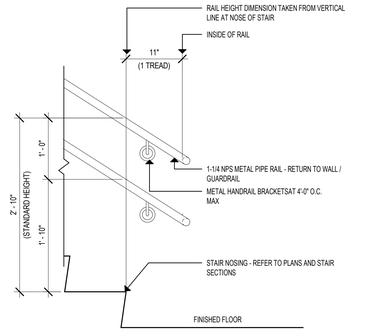
5 HANDRAIL / GUARDRAIL AT BOTTOM OF EXTERIOR RAMP
1" = 1'-0"



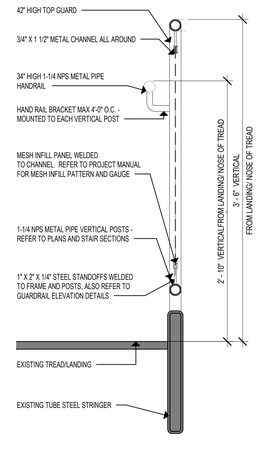
4 DOUBLE HANDRAIL TERMINATION AT BOTTOM OF RAMP
1" = 1'-0"



3 DOUBLE HANDRAIL TERMINATION AT TOP OF STAIRS
1" = 1'-0"



2 DOUBLE HANDRAIL TERMINATION AT BOTTOM OF STAIR
1" = 1'-0"



1 GUARDRAIL DETAIL SECTION AT EXISTING STEEL STAIR
1 1/2" = 1'-0"

Project Title:

ADDITION & ALTERATIONS TO:
Old Greenwich School
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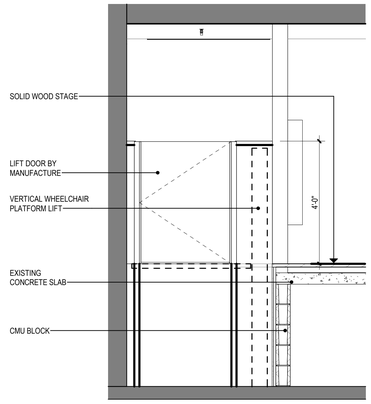
Revision: | Description: | Date: | Revised By:

Drawing Title: HANDRAIL AND GUARDRAIL DETAILS

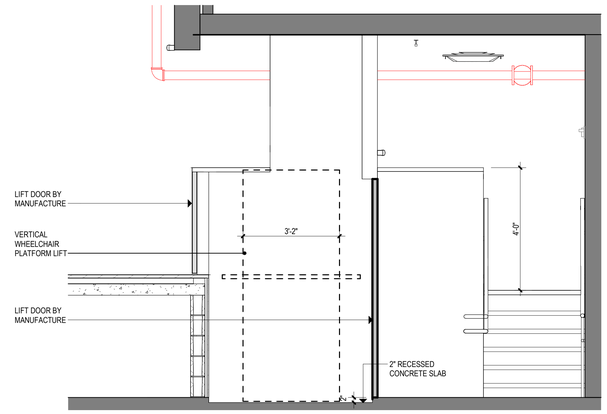
Date: 8/29/2024
Scale: As indicated
Drawn By: JM
Project Number: 22-382

Drawing Number: A442

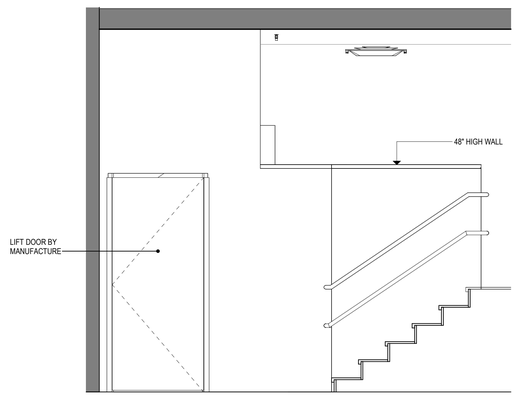
8/30/2024 8:22:53 AM



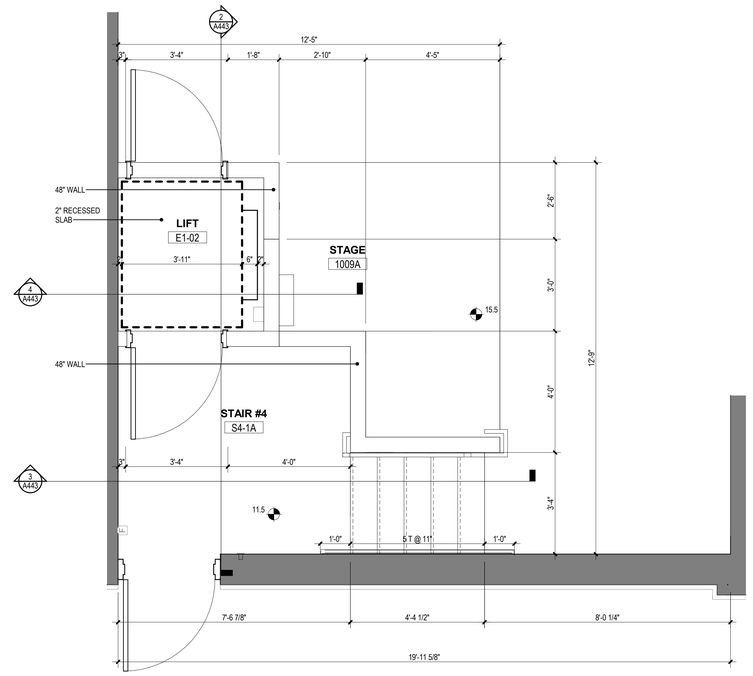
4 VERTICAL WHEEL CHAIR LIFT DOOR- @ STAGE
1/2" = 1'-0"



2 VERTICAL WHEEL CHAIR LIFT - @ STAGE
1/2" = 1'-0"



3 VERTICAL WHEEL CHAIR LIFT - @ STAIR #4
1/2" = 1'-0"



1 ENLARGED VERTICAL WHEEL CHAIR LIFT- 1ST FLOOR
1/2" = 1'-0"

Project Title:

ADDITION & ALTERATIONS TO:
Old Greenwich School
285 SOUND BEACH AVENUE
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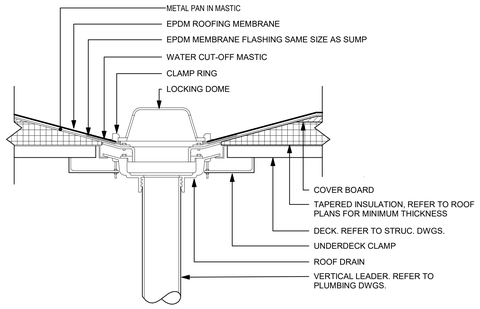
Revision:	Description:	Date:	Revised By:

Drawing Title:
STAIR AND LIFT DETAILS

Date: 8/29/2024
Scale: 1/2" = 1'-0"
Drawn By: Author
Project Number: 22-382

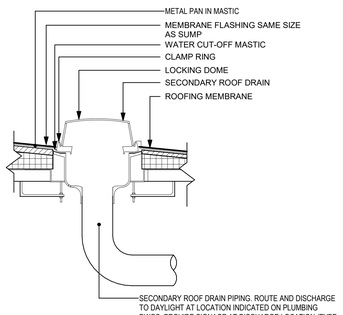
Drawing Number:
A443

8/30/2024 9:22:57 AM

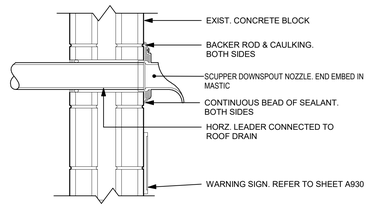


NOTE: 5" MINIMUM BASE RIGID INSULATION W/ TAPERED @ ¼"/FT SLOPING TO GUTTER

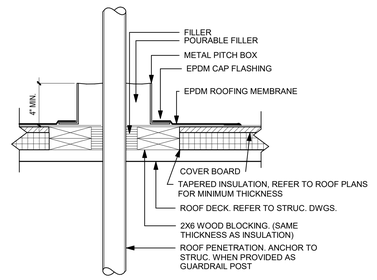
1 ROOF DRAIN DETAIL
SCALE: 1 1/2" = 1' - 0"



2 DUAL PRIMARY & SECONDARY ROOF DRAIN
SCALE: 1 1/2" = 1' - 0"

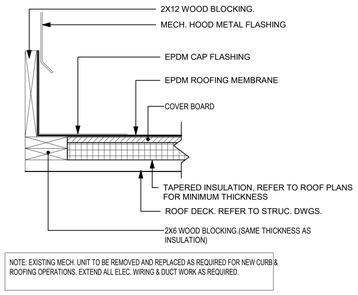


3 OVERFLOW SCUPPER DETAIL
SCALE: 1 1/2" = 1' - 0"



NOTE: 5" MINIMUM BASE RIGID INSULATION W/ TAPERED @ ¼"/FT SLOPING TO GUTTER

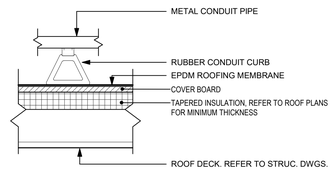
4 PITCH POCKET DETAIL
SCALE: 1 1/2" = 1' - 0"



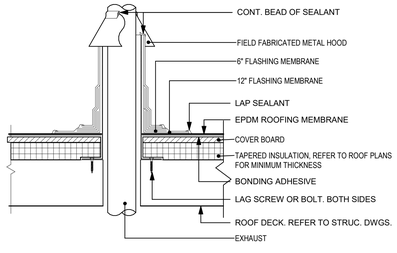
NOTE: EXISTING MECH. UNIT TO BE REMOVED AND REPLACED AS REQUIRED FOR NEW CURB & ROOFING OPERATIONS. EXTEND ALL ELEC. WIRING & DUCT WORK AS REQUIRED.

NOTE: 5" MINIMUM BASE RIGID INSULATION W/ TAPERED @ ¼"/FT SLOPING TO GUTTER

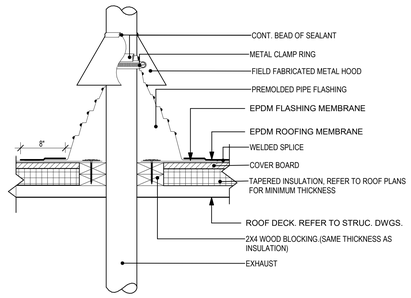
5 CURB DETAIL
SCALE: 1 1/2" = 1' - 0"

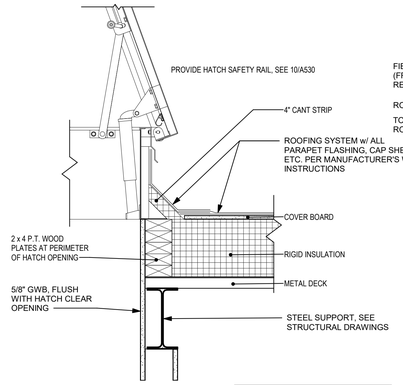


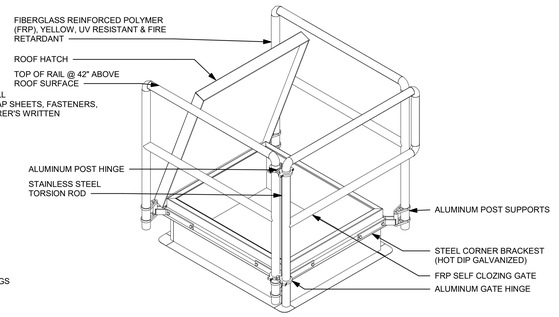
NOTE: EXTEND ALL ELECTRICAL WIRING AS REQUIRED. ALL WIRING IS TO BE RE-INSTALLED W/ CONDUIT PIPE. PIPE IS TO BE LABELED W/ SERVICE TYPE.



NOTE: FUME HOOD EXHAUST DUCTWORK TO BE DISCONNECTED AS REQUIRED TO FLASH & INSTALL COLLAR. INSTALL 2" DUCT WRAP @ REMOVED LOCATIONS







NOTE: 5" MINIMUM BASE RIGID INSULATION W/ TAPERED @ ¼"/FT SLOPING TO GUTTER

6 PIPE SUPPORT CURB DETAIL
SCALE: 1 1/2" = 1' - 0"

NOTE: 5" MINIMUM BASE RIGID INSULATION W/ TAPERED @ ¼"/FT SLOPING TO GUTTER

7 EXHAUST / HOT VENT DETAIL
SCALE: 1 1/2" = 1' - 0"

NOTE: 5" MINIMUM BASE RIGID INSULATION W/ TAPERED @ ¼"/FT SLOPING TO GUTTER

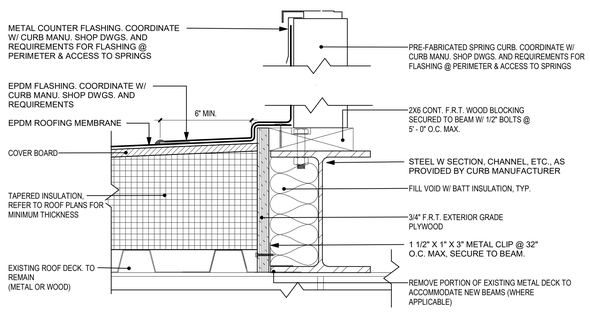
8 VENT STACK DETAIL
SCALE: 1 1/2" = 1' - 0"

NOTE: 5" MINIMUM BASE RIGID INSULATION W/ TAPERED @ ¼"/FT SLOPING TO GUTTER

9 ROOF HATCH DETAIL
SCALE: 1 1/2" = 1' - 0"

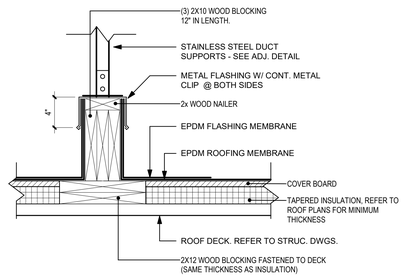
NOTE: 5" MINIMUM BASE RIGID INSULATION W/ TAPERED @ ¼"/FT SLOPING TO GUTTER

10 ROOF HATCH SAFETY RAIL
SCALE: N.T.S.



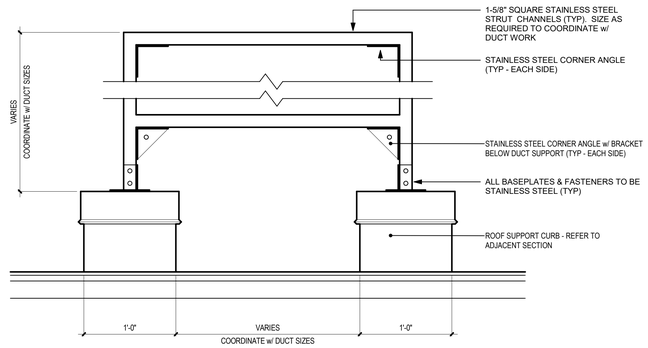
NOTE: 5" MINIMUM BASE RIGID INSULATION W/ TAPERED @ ¼"/FT SLOPING TO GUTTER

11 PRE-FABRICATED MECH. EQUIP. SPRING CURB
SCALE: 1 1/2" = 1' - 0"



NOTE: 5" MINIMUM BASE RIGID INSULATION W/ TAPERED @ ¼"/FT SLOPING TO GUTTER

12 DUCT SUPPORT (SECTION)
SCALE: 1 1/2" = 1' - 0"



13 DUCT SUPPORT (ELEVATION)
SCALE: 1 1/2" = 1' - 0"

Project Title:

ADDITION & ALTERATIONS TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
311 STATE STREET NEW LONDON CT 06320
203 230 9007 silverpetrucelli.com

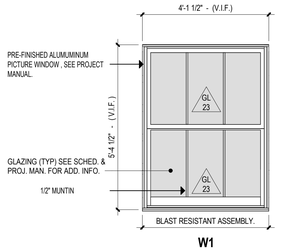
Revision:	Description:	Date:	Revised By:

Drawing Title: TYPICAL ROOF DETAILS

Date: 8/29/2024
Scale: 1 1/2" = 1'-0"
Drawn By: JM
Project Number: 22-382

Drawing Number: A530

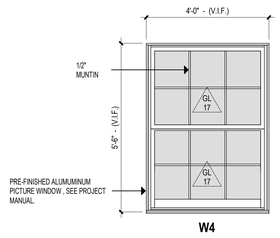
8/30/2024 8:23:09 AM



W1

W1 - ALUMINUM PICTURE WINDOW

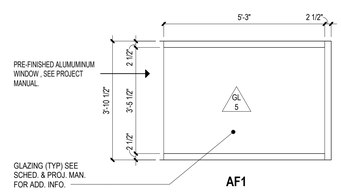
1/2" = 1'-0"



W4

W4 - ALUMINUM WINDOW

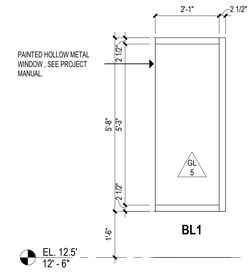
1/2" = 1'-0"



AF1

AF1 - ALUM. INTERIOR STOREFRONT

1/2" = 1'-0"



BL1

BL1 - HM BORROWED LITE

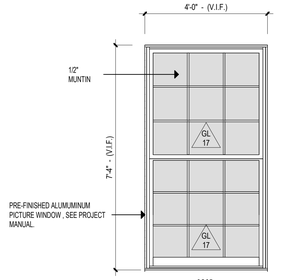
1/2" = 1'-0"

GLAZING TYPE SCHEDULE	
GL-0	FILM
GL-1	CLEAR
GL-2	CLEAR, TEMPERED
GL-3	CLEAR, TEMPERED, FROSTED
GL-4	CLEAR, TEMPERED, PATTERNED
GL-5	CLEAR, LAMINATED
GL-6	CLEAR, FIRE RATED
GL-7	CLEAR, BALLISTIC
GL-13	INSULATED, TINTED, TEMPERED
GL-17	INSULATED, TINTED, LAMINATED
GL-23	INSULATED, BLAST RESISTANT, TINTED
GL-28	INSULATED, TINTED, BALLISTIC

NOTES:

1. CURTAIN WALL DEPTH TO BE DELEGATED BY CURTAIN WALL MANUFACTURER. BASIS OF DESIGN IS A 2 1/2" X 7 1/2" SYSTEM.

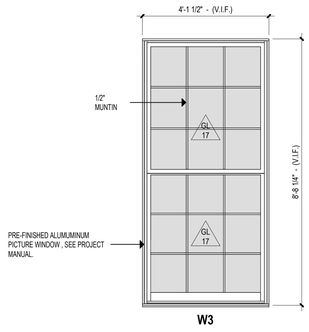
2. DECORATIVE 1" MUNTINS (NON-DIVIDED LITES), WHERE INDICATED.



W2

W2 - ALUMINUM PICTURE WINDOW

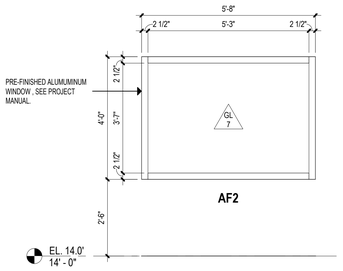
1/2" = 1'-0"



W3

W3 - ALUMINUM WINDOW

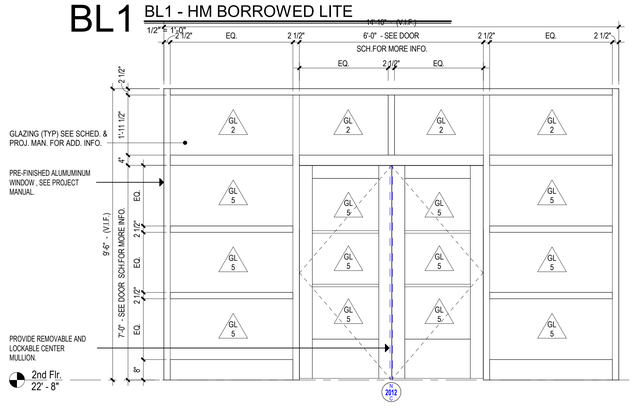
1/2" = 1'-0"



AF2

AF2 - ALUM.INTERIOR STOREFRONT

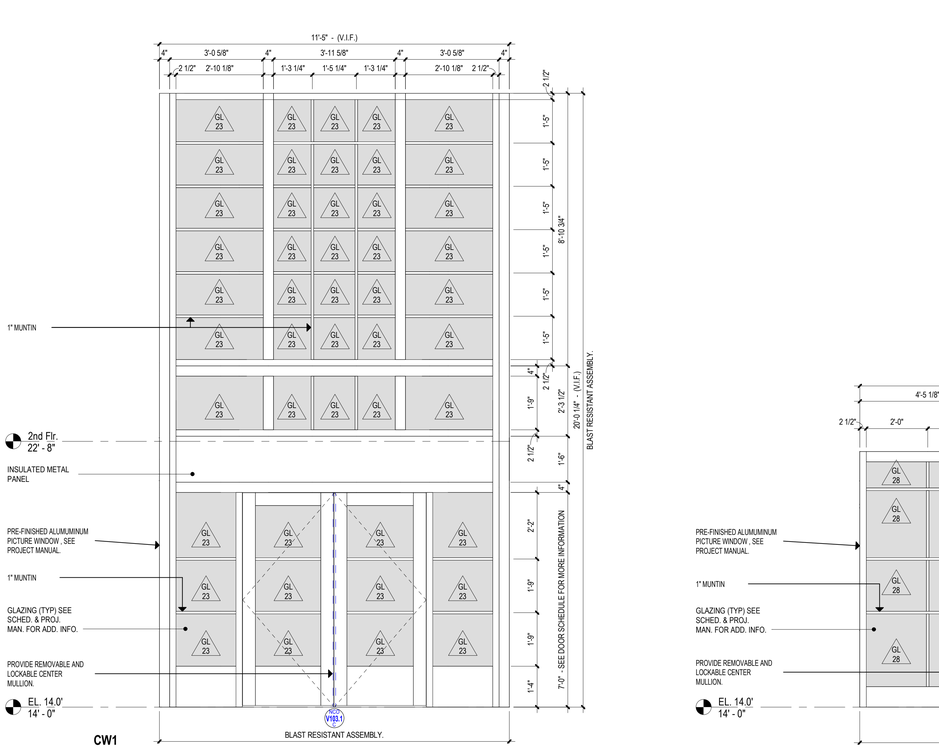
1/2" = 1'-0"



AF3

AF3 - STOREFRONT FRAME

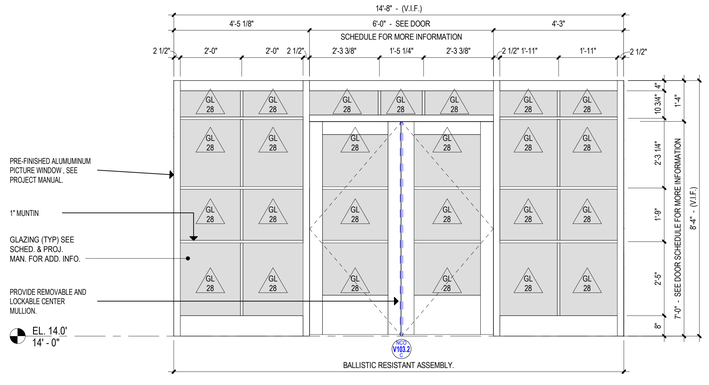
1/2" = 1'-0"



CW1

CW1 - EXTERIOR ALUMINUM CURTAINWALL

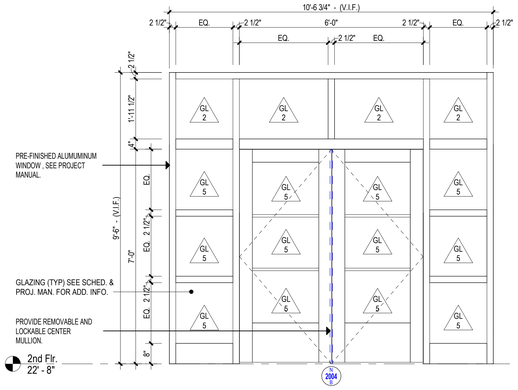
1/2" = 1'-0"



CW2

CW2 - INTERIOR ALUMINUM CURTAINWALL

1/2" = 1'-0"



AF4

AF4 - STOREFRONT FRAME

1/2" = 1'-0"



CW3

VESTIBULE CEILING #1062C

1/2" = 1'-0"

Project Title:

ADDITION & ALTERATIONS TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
311 STATE STREET NEW LONDON CT 06320
203 230 9007 silverpetrucelli.com

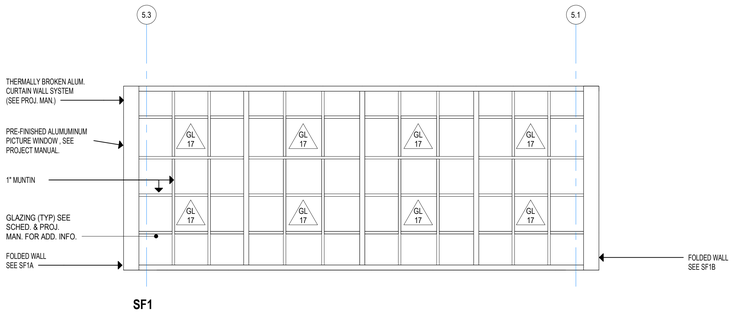
Revision:	Description:	Date:	Revised By:

Drawing Title:

EXTERIOR & INTERIOR STOREFRONT, CURTAIN WALL & WINDOWS ELEVATIONS

Date: 8/29/2024
Scale: As indicated
Drawn By: JM
Project Number: 22-382
Drawing Number: A600

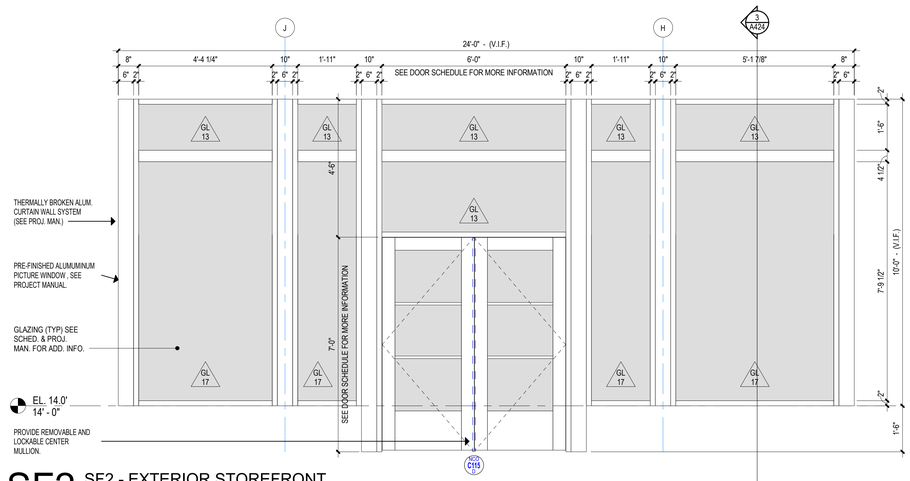
8/30/2024 8:23:12 AM



SF1

SF1 SF1 - EXTERIOR STOREFRONT

1/2" = 1'-0"

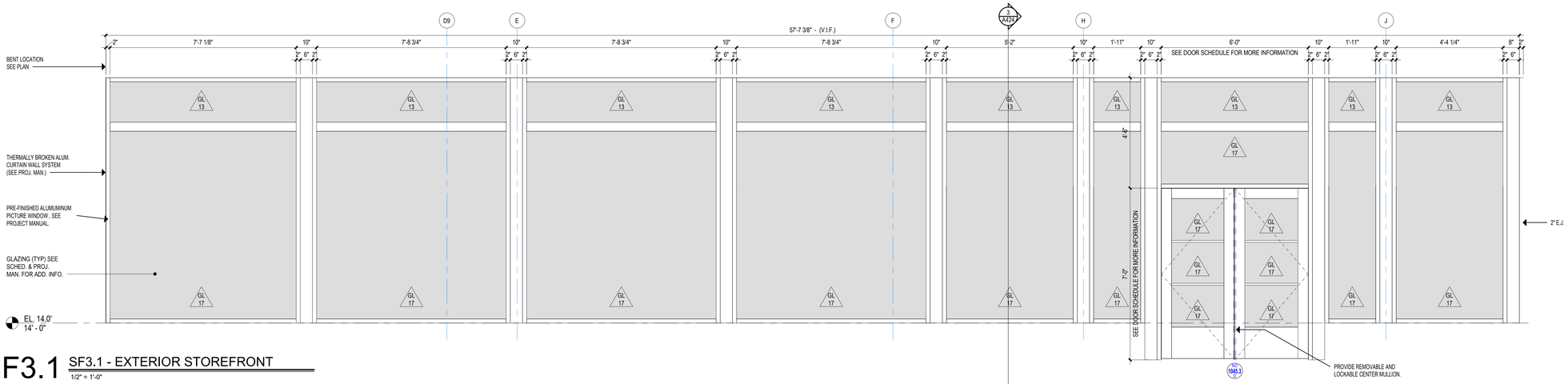


SF2 SF2 - EXTERIOR STOREFRONT

1/2" = 1'-0"

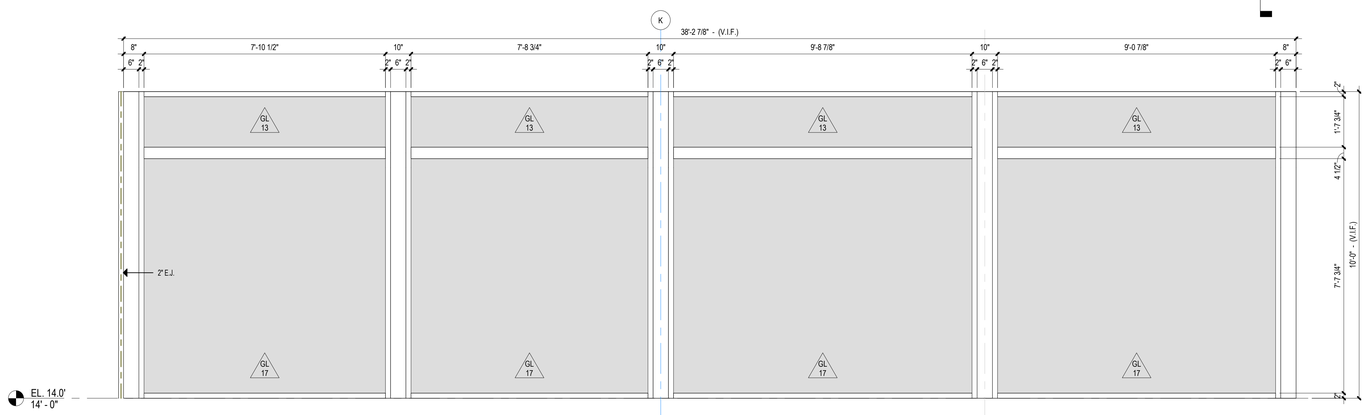
GLAZING TYPE SCHEDULE	
GL-0	FILM
GL-1	CLEAR
GL-2	CLEAR, TEMPERED
GL-3	CLEAR, TEMPERED, FROSTED
GL-4	CLEAR, TEMPERED, PATTERNED
GL-5	CLEAR, LAMINATED
GL-6	CLEAR, FIRE RATED
GL-7	CLEAR, BALLISTIC
GL-13	INSULATED, TINTED, TEMPERED
GL-17	INSULATED, TINTED, LAMINATED
GL-23	INSULATED, BLAST RESISTANT, TINTED
GL-28	INSULATED, TINTED, BALLISTIC

NOTES:
1. CURTAIN WALL DEPTH TO BE DELEGATED BY CURTAIN WALL MANUFACTURER. BASIS OF DESIGN IS A 2 1/2" X 7 1/2" SYSTEM.
2. DECORATIVE 1" MUNTINS (NON-DIVIDED LITES), WHERE INDICATED.



SF3.1 SF3.1 - EXTERIOR STOREFRONT

1/2" = 1'-0"



SF3.2 SF3.2 - EXTERIOR STOREFRONT

1/2" = 1'-0"

Project Title:

ADDITION & ALTERATIONS TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
311 STATE STREET NEW LONDON CT 06320
203 230 9007 silverpetrucelli.com

Revision:	Description:	Date:	Revised By:

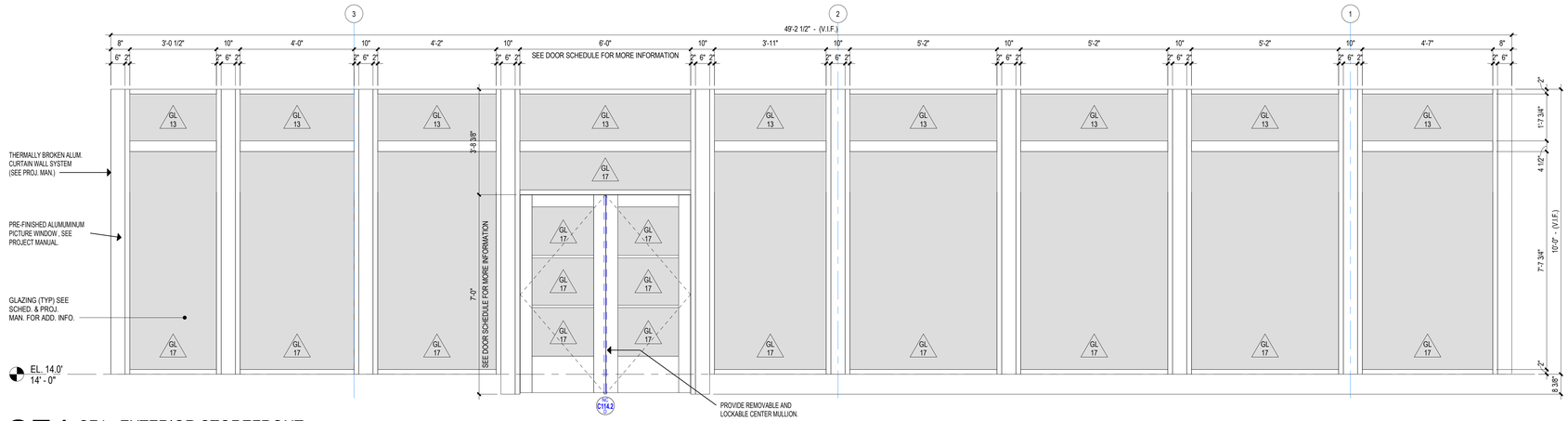
Drawing Title:

EXTERIOR & INTERIOR STOREFRONT, CURTAIN WALL & WINDOWS ELEVATIONS

Date: 8/29/2024
Scale: As indicated
Drawn By: JM
Project Number: 22-382

Drawing Number: A601

8/30/2024 8:23:17 AM



SF4 SF4 - EXTERIOR STOREFRONT

1/2" = 1'-0"

GLAZING TYPE SCHEDULE	
GL-0	FILM
GL-1	CLEAR
GL-2	CLEAR, TEMPERED
GL-3	CLEAR, TEMPERED, FROSTED
GL-4	CLEAR, TEMPERED, PATTERNED
GL-5	CLEAR, LAMINATED
GL-6	CLEAR, FIRE RATED
GL-7	CLEAR, BALLISTIC
GL-13	INSULATED, TINTED, TEMPERED
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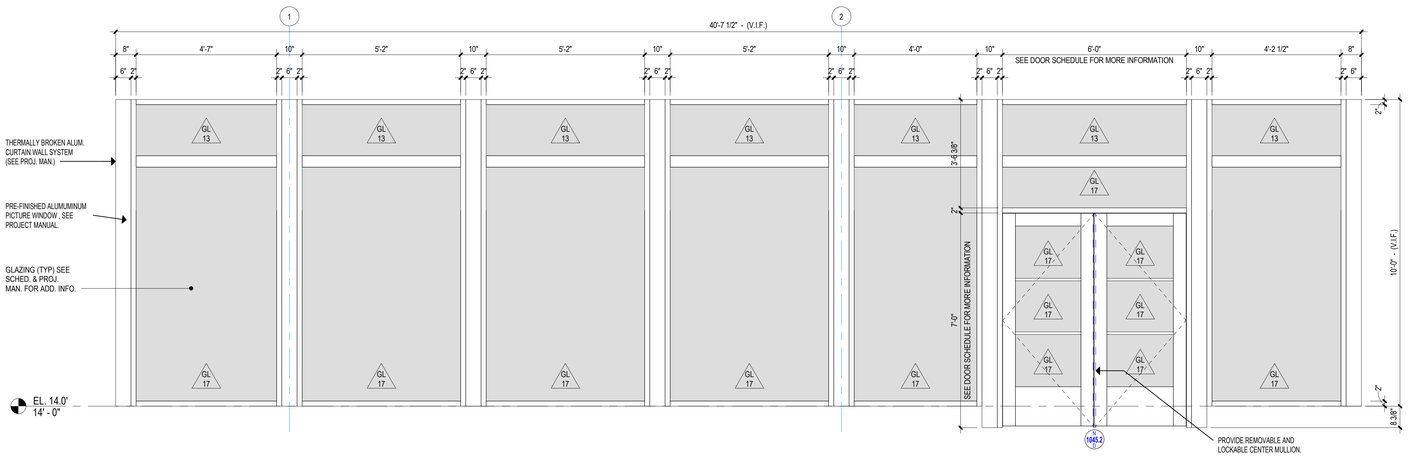
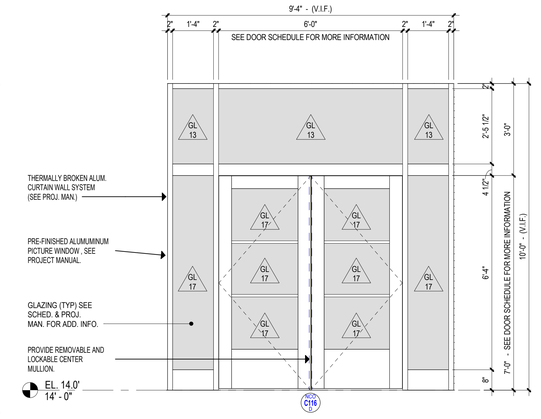
GL-23	INSULATED, BLAST RESISTANT, TINTED
GL-28	INSULATED, TINTED, BALLISTIC

NOTES:
1. CURTAIN WALL DEPTH TO BE DELEGATED BY CURTAIN WALL MANUFACTURER. BASIS OF DESIGN IS A 2 1/2" X 7 1/2" SYSTEM.
2. DECORATIVE 1" MUNTINS (NON-DIVIDED LITES), WHERE INDICATED.



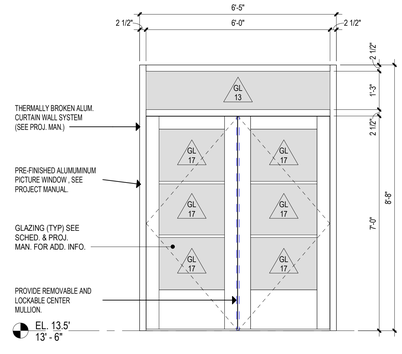
SF5 SF5 - EXTERIOR STOREFRONT

1/2" = 1'-0"



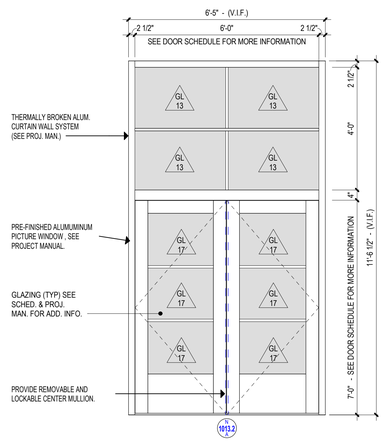
SF6 SF6 - EXTERIOR STOREFRONT

1/2" = 1'-0"



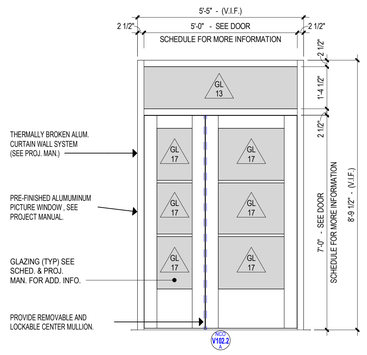
SF7 SF7 - EXTERIOR STOREFRONT

1/2" = 1'-0"



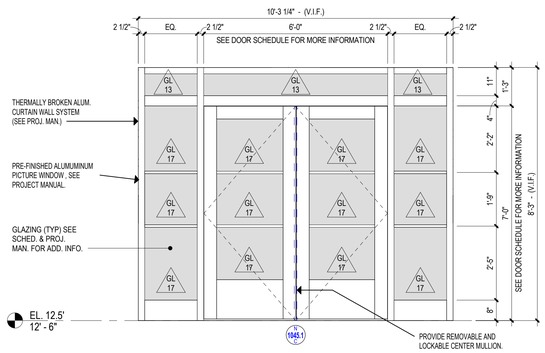
SF8 SF8 - EXTERIOR STOREFRONT

1/2" = 1'-0"



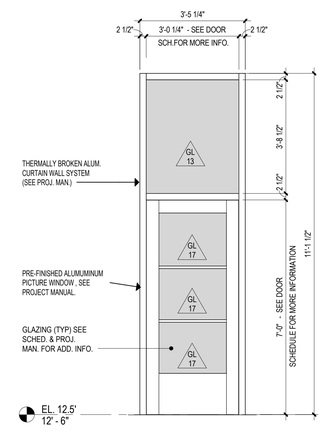
SF9 SF9 - EXTERIOR STOREFRONT

1/2" = 1'-0"



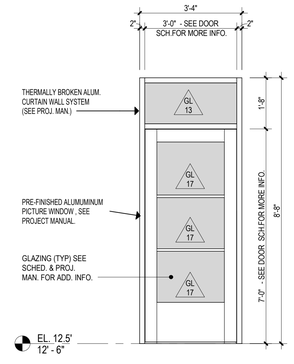
SF10 SF10 - EXTERIOR STOREFRONT

1/2" = 1'-0"



SF11 SF11 - EXTERIOR STOREFRONT

1/2" = 1'-0"



SF12 SF12 - EXTERIOR STOREFRONT

1/2" = 1'-0"

Project Title:

ADDITION & ALTERATIONS TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
311 STATE STREET NEW LONDON CT 06320
203 230 9007 silverpetrucelli.com

Revision:	Description:	Date:	Revised By:

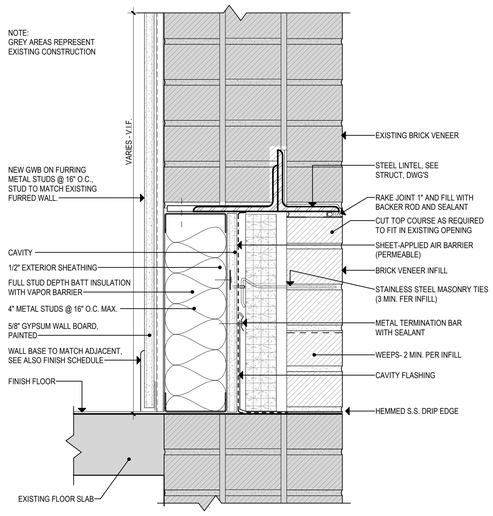
Drawing Title:

EXTERIOR & INTERIOR STOREFRONT, CURTAIN WALL & WINDOWS ELEVATIONS

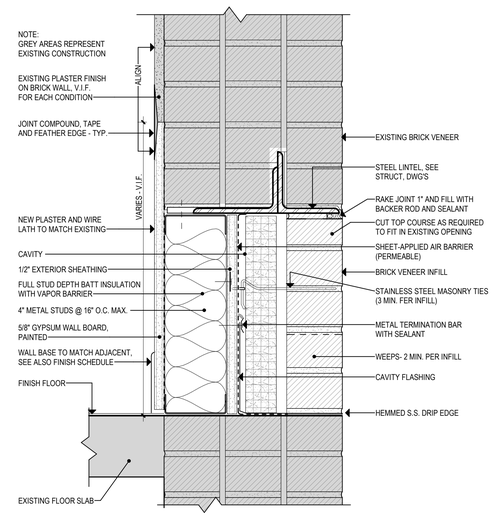
Date: 8/29/2024
Scale: As indicated
Drawn By: JM
Project Number: 22-382

Drawing Number: A602

8/30/2024 8:23:23 AM

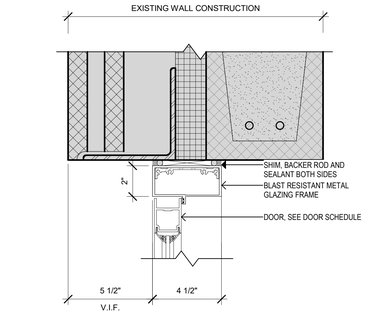


INFILL GWB @ BRICK VENEER AND BACKUP

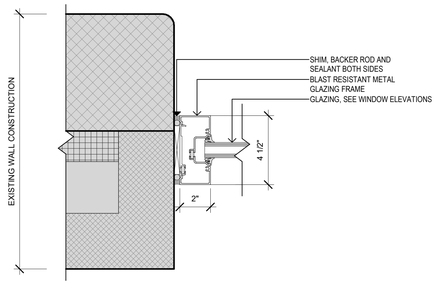


INFILL PLASTER @ BRICK VENEER AND BACKUP

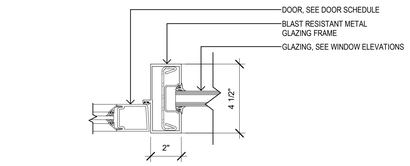
14 INFILL DETAILS AT LOUVER REMOVAL
3" = 1'-0"



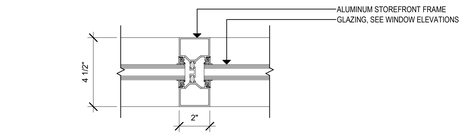
13 TYP. BL DOOR HEAD
3" = 1'-0"



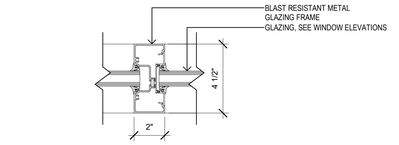
12 TYP. BL WINDOW JAMB
3" = 1'-0"



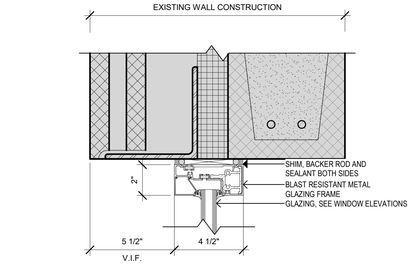
11 TYP. BL DOOR JAMB - MID FRAME
3" = 1'-0"



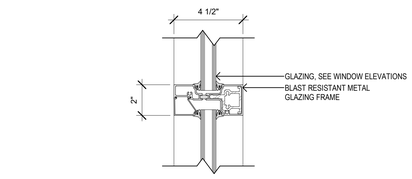
10 TYP. SF WINDOW MULLION
3" = 1'-0"



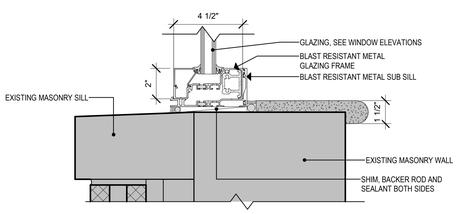
9 TYP. BL WINDOW MULLION
3" = 1'-0"



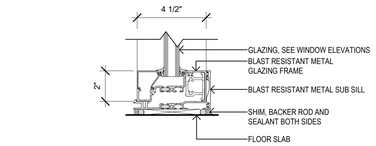
8 TYP. BL WINDOW HEAD TYPE A
3" = 1'-0"



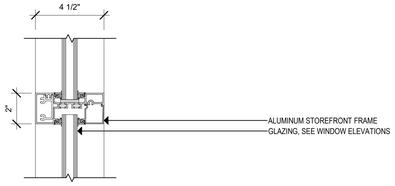
7 TYP. BL WINDOW RAIL
3" = 1'-0"



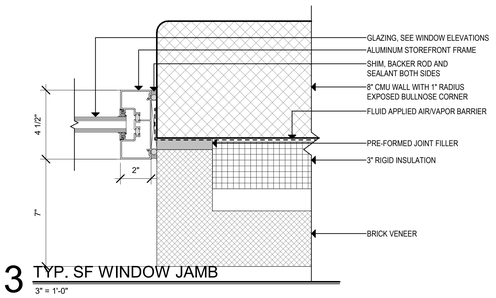
6 TYP. BL WINDOW SILL TYPE B
3" = 1'-0"



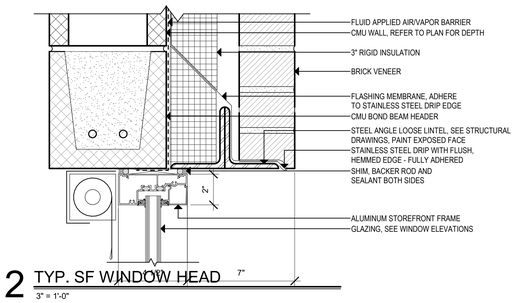
5 TYP. BL WINDOW SILL TYPE A
3" = 1'-0"



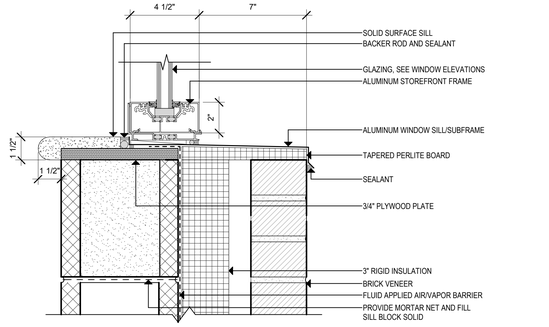
4 TYP. SF RAIL
3" = 1'-0"



3 TYP. SF WINDOW JAMB
3" = 1'-0"



2 TYP. SF WINDOW HEAD
3" = 1'-0"



1 TYP. SF WINDOW SILL
3" = 1'-0"

Project Title:

ADDITION & ALTERATIONS TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

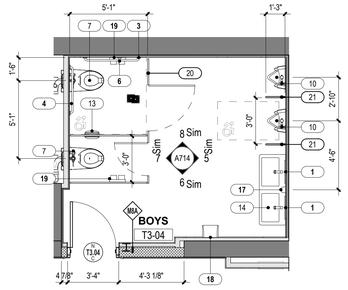
SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
311 STATE STREET NEW LONDON CT 06320
203 230 9007 silverpetrucelli.com

Revision:	Description:	Date:	Revised By:

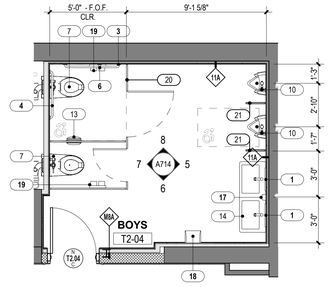
Drawing Title: TYPICAL WINDOW DETAILS

Date: 8/29/2024
Scale: 3" = 1'-0"
Drawn By: JM
Project Number: 22-382
Drawing Number: A610

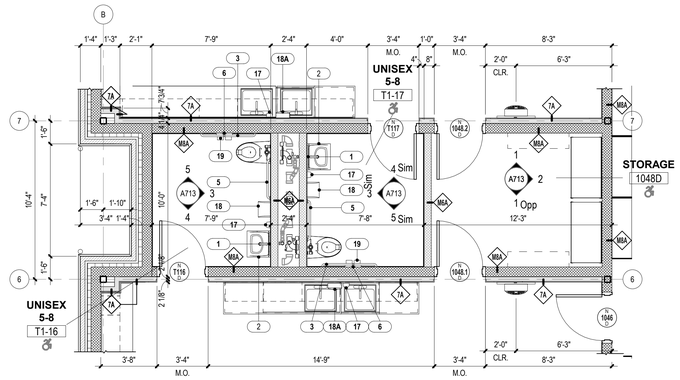
8/30/2024 8:23:27 AM



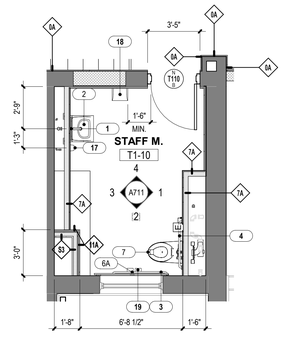
15 ENLARGED BOYS TL3-04
1/4" = 1'-0"



11 ENLARGED BOYS T2-04
1/4" = 1'-0"



7 ENLARGED K. TOILETS T1-16 AND T1-17
1/4" = 1'-0"

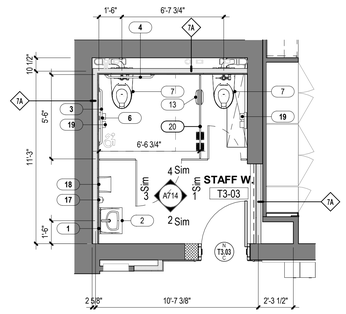


4 ENLARGED STAFF M. T1-10
1/4" = 1'-0"

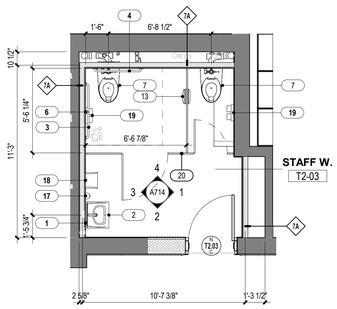
TOILET ROOM EQUIPMENT & ACCESSORIES

No.	NOTE DESCRIPTION
1	1'-6" X 3' MIRROR (CENTER ON LAV)
2	WALL MOUNTED H.C. LAV
3	42" HORIZ.GRAB BAR
4	36" HORIZ.GRAB BAR
5	30" HORIZ. GRAB BAR
6	18" VERT. GRAB BAR
6A	CUSTOM 18" VERT. GRAB BAR
7	WALL-MOUNTED H.C. WATER CLOSET
8	WALL-MOUNTED WATER CLOSET
9	WALL-MOUNTED H.C. URINAL
10	WALL-MOUNTED URINAL
11	FLOOR-MOUNTED ADULT WATER CLOSET
12	FLOOR-MOUNTED CHILD WATER CLOSET
13	PARTITION-MOUNTED SANITARY DISPOSAL
14	EXPRESS 2 STATION SINK H.C. LAV
15	EXPRESS 3 STATION SINK H.C. LAV
16	LAV GUARD
17	SURFACE-MOUNTED SOAP DISPENSER (OWNER PROVIDED, CONTRACTOR INSTALLED)
18	SURFACE-MOUNTED ROLL PAPER TOWEL DISPENSER (OWNER PROVIDED, CONTRACTOR INSTALLED)
18A	SURFACE-MOUNTED C-FOLD PAPER TOWEL DISPENSER
19	SURFACE-MOUNTED TOILET PAPER DISPENSER (OWNER PROVIDED, CONTRACTOR INSTALLED)
20	TOILET PARTITIONS; SEE PROJ. MAN.
21	URINAL SCREEN; SEE PROJ. MAN.
22	BABY CHANGING STATION
23	ADULT CHANGING STATION
24	WALL-MOUNTED STAINLESS-STEEL SERVICE SINK

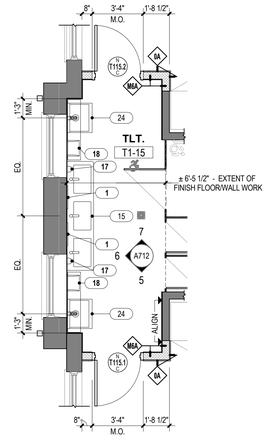
REFER TO SHEET G002 FOR TYPICAL ACCESSORY MOUNTING HEIGHTS AND LOCATIONS



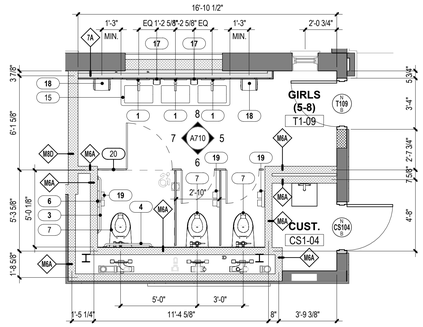
14 ENLARGED STAFF W. T3-03
1/4" = 1'-0"



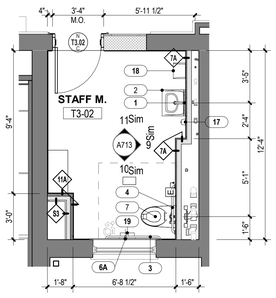
10 ENLARGED STAFF W. T2-03
1/4" = 1'-0"



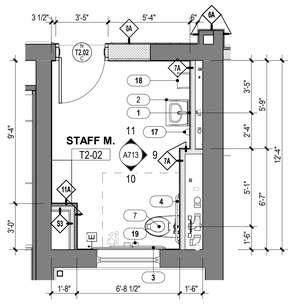
6 ENLARGED PRE-K TOILET T1-15
1/4" = 1'-0"



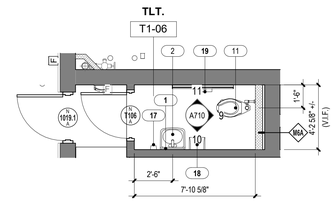
3 ENLARGED GIRLS (5-8) T1-09
1/4" = 1'-0"



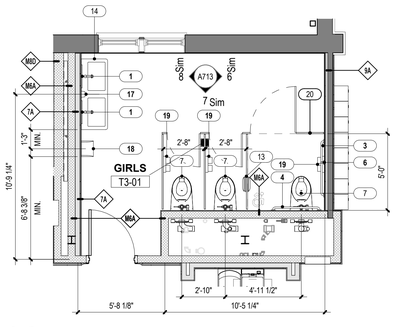
13 ENLARGED STAFF M. T3-02
1/4" = 1'-0"



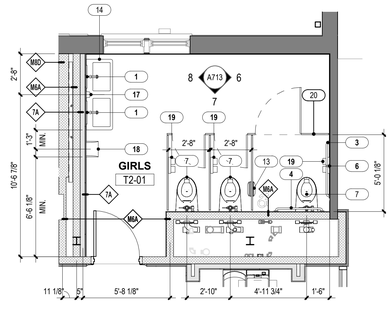
9 ENLARGED STAFF M. T2-02
1/4" = 1'-0"



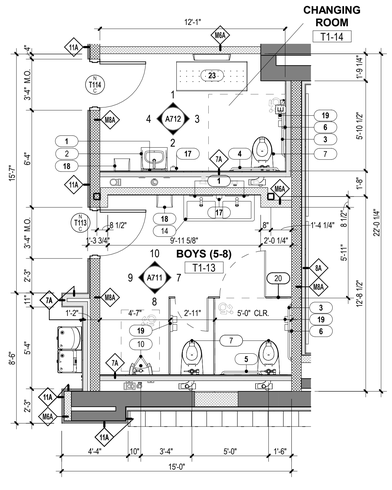
2 ENLARGED TLT. T1-06
1/4" = 1'-0"



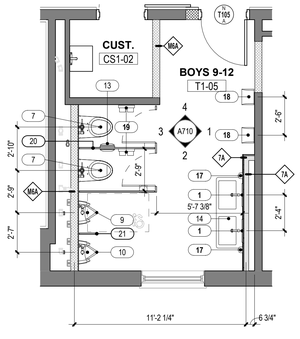
12 ENLARGED GIRLS T3-01
1/4" = 1'-0"



8 ENLARGED GIRLS TOILET T2-01
1/4" = 1'-0"



5 ENLARGED ROOMS T1-13 AND T1-14
1/4" = 1'-0"



1 ENLARGED BOYS 9-12 T1-05
1/4" = 1'-0"

Project Title:

ADDITION & ALTERATIONS TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
311 STATE STREET NEW LONDON CT 06320
203 230 9007 silverpetrucelli.com

Revision:	Description:	Date:	Revised By:

Drawing Title:
ENLARGED TOILET PLANS
SEE DWG 2 / A705 FOR ENLARGED TOILET PLAN 1056C & 1057C

Date: 8/29/2024
Scale: 1/4" = 1'-0"
Drawn By: JAL/JM
Project Number: 22-382

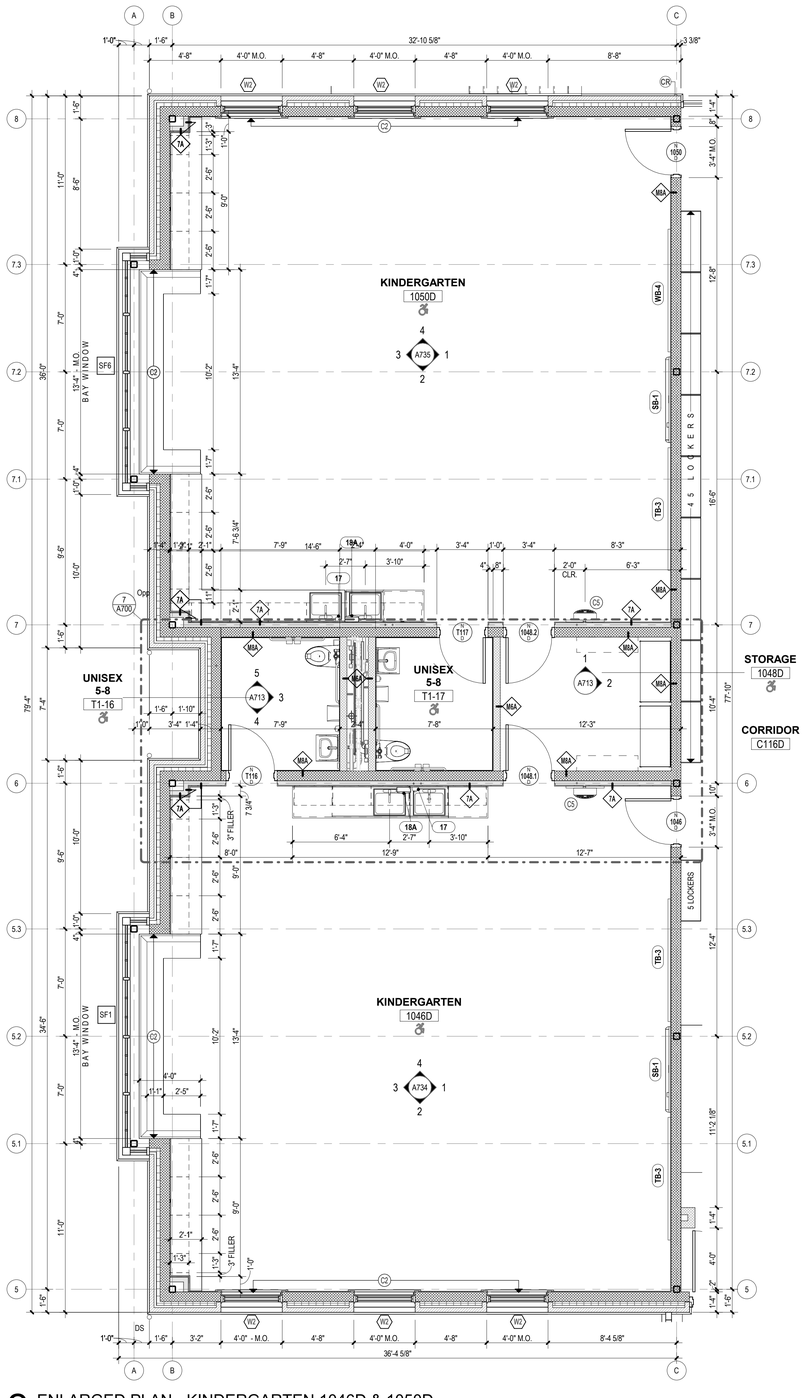
Drawing Number: A700

8/29/2024 12:19:42 PM

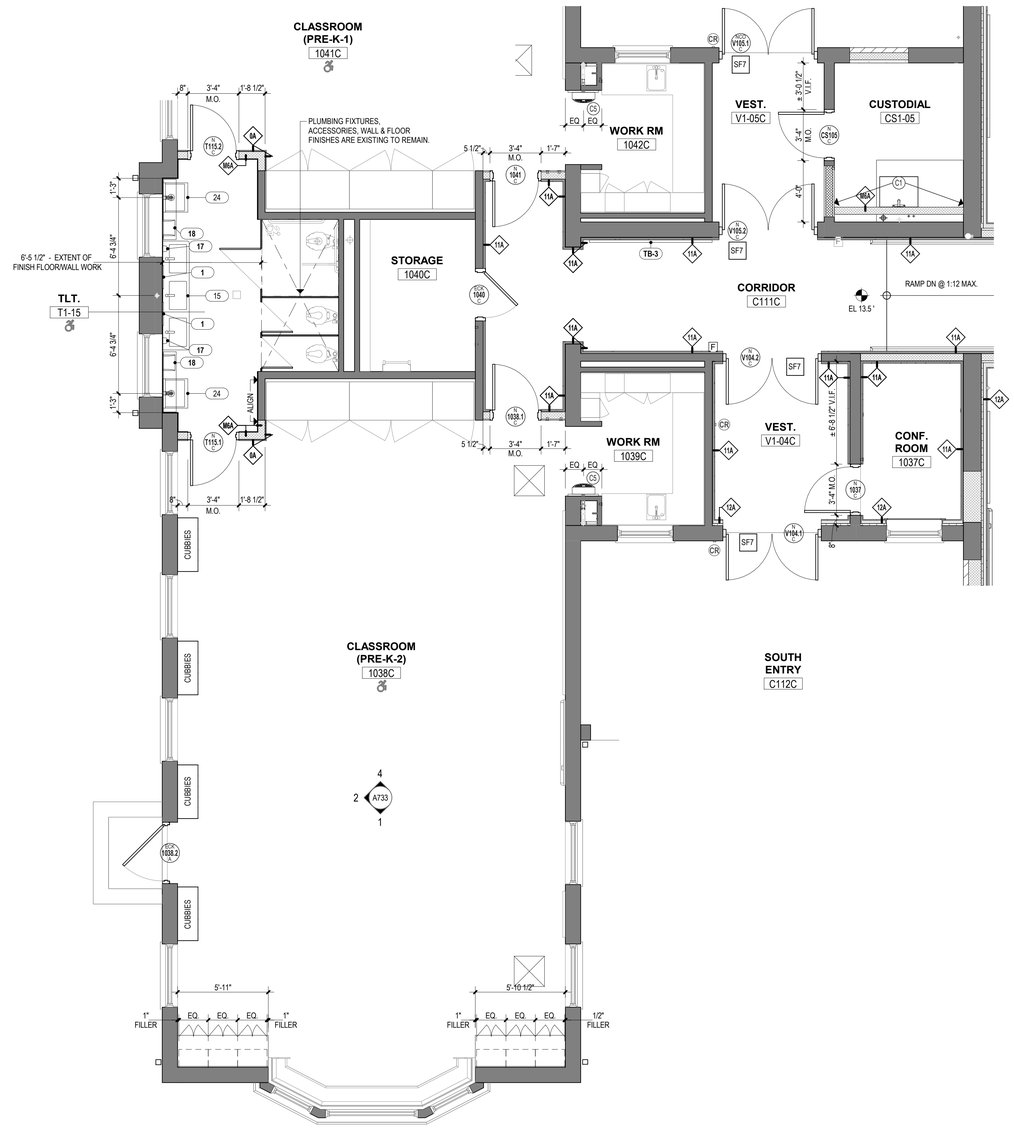
TOILET ROOM EQUIPMENT & ACCESSORIES

No.	NOTE DESCRIPTION
1	1'-6" X 3' MIRROR (CENTER ON LAV)
2	WALL MOUNTED H.C. LAV
3	42" HORIZ.GRAB BAR
4	36" HORIZ.GRAB BAR
5	30" HORIZ. GRAB BAR
6	18" VERT. GRAB BAR
6A	CUSTOM 18" VERT. GRAB BAR
7	WALL-MOUNTED H.C. WATER CLOSET
8	WALL-MOUNTED WATER CLOSET
9	WALL-MOUNTED H.C. URINAL
10	WALL-MOUNTED URINAL
11	FLOOR-MOUNTED ADULT WATER CLOSET
12	FLOOR-MOUNTED CHILD WATER CLOSET
13	PARTITION-MOUNTED SANITARY DISPOSAL
14	EXPRESS 2 STATION SINK H.C. LAV
15	EXPRESS 3 STATION SINK H.C. LAV
16	LAV GUARD
17	SURFACE-MOUNTED SOAP DISPENSER (OWNER PROVIDED, CONTRACTOR INSTALLED)
18	SURFACE-MOUNTED ROLL PAPER TOWEL DISPENSER (OWNER PROVIDED, CONTRACTOR INSTALLED)
18A	SURFACE-MOUNTED C-FOLD PAPER TOWEL DISPENSER
19	SURFACE-MOUNTED TOILET PAPER DISPENSER (OWNER PROVIDED, CONTRACTOR INSTALLED)
20	TOILET PARTITIONS; SEE PROJ. MAN.
21	URINAL SCREEN; SEE PROJ. MAN.
22	BABY CHANGING STATION
23	ADULT CHANGING STATION
24	WALL-MOUNTED STAINLESS-STEEL SERVICE SINK

REFER TO SHEET G002 FOR TYPICAL ACCESSORY MOUNTING HEIGHTS AND LOCATIONS



2 ENLARGED PLAN - KINDERGARTEN 1046D & 1050D
1/4" = 1'-0"



1 ENLARGED PRE-K CLASSROOM 1038C
1/4" = 1'-0"

Project Title:
ADDITION & ALTERATIONS TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
311 STATE STREET NEW LONDON CT 06320
203 230 9007 silverpetrucelli.com

Revision:	Description:	Date:	Revised By:

Drawing Title: PARTIAL ENLARGED PLANS

Date: 8/29/2024
Scale: 1/4" = 1'-0"
Drawn By: JM
Project Number: 22-382

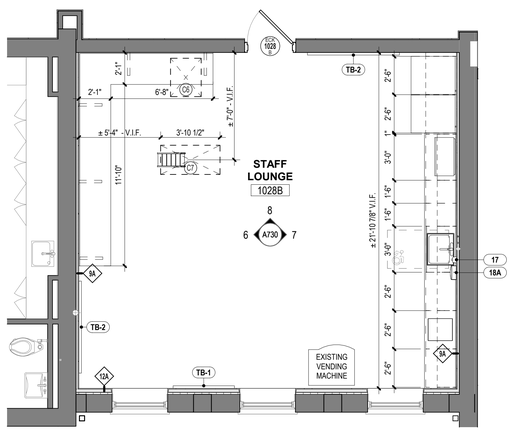
Drawing Number: A701

8/29/2024 12:19:56 PM

TOILET ROOM EQUIPMENT & ACCESSORIES

No.	NOTE DESCRIPTION
1	1'-6" X 3' MIRROR (CENTER ON LAV)
2	WALL MOUNTED H.C. LAV
3	42" HORIZ.GRAB BAR
4	36" HORIZ.GRAB BAR
5	30" HORIZ. GRAB BAR
6	18" VERT. GRAB BAR
6A	CUSTOM 18" VERT. GRAB BAR
7	WALL-MOUNTED H.C. WATER CLOSET
8	WALL-MOUNTED WATER CLOSET
9	WALL-MOUNTED H.C. URINAL
10	WALL-MOUNTED URINAL
11	FLOOR-MOUNTED ADULT WATER CLOSET
12	FLOOR-MOUNTED CHILD WATER CLOSET
13	PARTITION-MOUNTED SANITARY DISPOSAL
14	EXPRESS 2 STATION SINK H.C. LAV
15	EXPRESS 3 STATION SINK H.C. LAV
16	LAV GUARD
17	SURFACE-MOUNTED SOAP DISPENSER (OWNER PROVIDED, CONTRACTOR INSTALLED)
18	SURFACE-MOUNTED ROLL PAPER TOWEL DISPENSER (OWNER PROVIDED, CONTRACTOR INSTALLED)
18A	SURFACE-MOUNTED C-FOLD PAPER TOWEL DISPENSER
19	SURFACE-MOUNTED TOILET PAPER DISPENSER (OWNER PROVIDED, CONTRACTOR INSTALLED)
20	TOILET PARTITIONS; SEE PROJ. MAN.
21	URINAL SCREEN; SEE PROJ. MAN.
22	BABY CHANGING STATION
23	ADULT CHANGING STATION
24	WALL-MOUNTED STAINLESS-STEEL SERVICE SINK

REFER TO SHEET G002 FOR TYPICAL ACCESSORY MOUNTING HEIGHTS AND LOCATIONS



2 ENLARGED STAFF LOUNGE 1028B
1/4" = 1'-0"

1 ENLARGED MAIN OFFICE / NURSE SUITES
1/4" = 1'-0"

Project Title:
ADDITION & ALTERATIONS TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
311 STATE STREET NEW LONDON CT 06320
203 230 9007 silverpetrucelli.com

Revision:	Description:	Date:	Revised By:

Drawing Title: PARTIAL ENLARGED PLANS

Date: 8/29/2024
Scale: 1/4" = 1'-0"
Drawn By: JAL/JM
Project Number: 22-382

Drawing Number: A702

8/29/2024 12:20:14 PM

TOILET ROOM EQUIPMENT & ACCESSORIES

No.	NOTE DESCRIPTION
1	1'-6" X 3' MIRROR (CENTER ON LAV)
2	WALL MOUNTED H.C. LAV
3	42" HORIZ.GRAB BAR
4	36" HORIZ.GRAB BAR
5	30" HORIZ. GRAB BAR
6	18" VERT. GRAB BAR
6A	CUSTOM 18" VERT. GRAB BAR
7	WALL-MOUNTED H.C. WATER CLOSET
8	WALL-MOUNTED WATER CLOSET
9	WALL-MOUNTED H.C. URINAL
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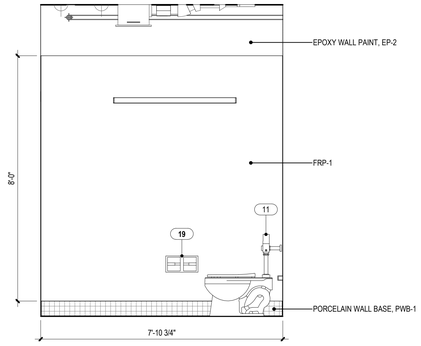
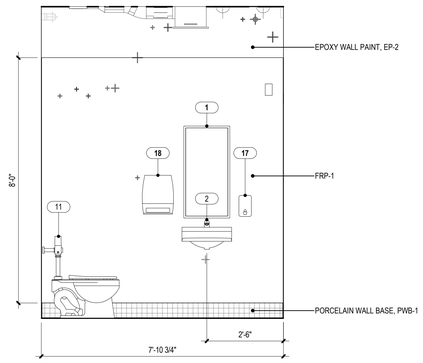
11	FLOOR-MOUNTED ADULT WATER CLOSET
12	FLOOR-MOUNTED CHILD WATER CLOSET
13	PARTITION-MOUNTED SANITARY DISPOSAL
14	EXPRESS 2 STATION SINK H.C. LAV
15	EXPRESS 3 STATION SINK H.C. LAV
16	LAV GUARD
17	SURFACE-MOUNTED SOAP DISPENSER (OWNER PROVIDED, CONTRACTOR INSTALLED)
18	SURFACE-MOUNTED ROLL PAPER TOWEL DISPENSER (OWNER PROVIDED, CONTRACTOR INSTALLED)
18A	SURFACE-MOUNTED C-FOLD PAPER TOWEL DISPENSER
19	SURFACE-MOUNTED TOILET PAPER DISPENSER (OWNER PROVIDED, CONTRACTOR INSTALLED)
20	TOILET PARTITIONS; SEE PROJ. MAN.
21	URINAL SCREEN; SEE PROJ. MAN.
22	BABY CHANGING STATION
23	ADULT CHANGING STATION
24	WALL-MOUNTED STAINLESS-STEEL SERVICE SINK

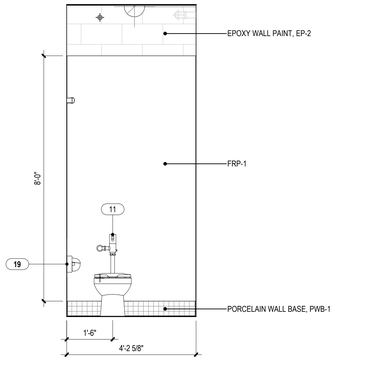
REFER TO SHEET G002 FOR TYPICAL ACCESSORY MOUNTING HEIGHTS AND LOCATIONS



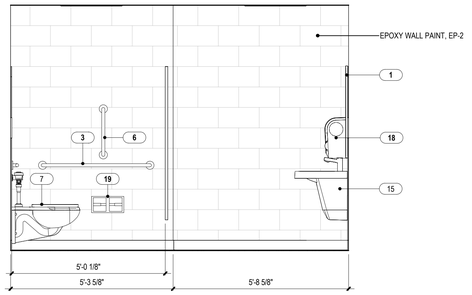
11 TLT. T1-06 - WEST
1/2" = 1'-0"



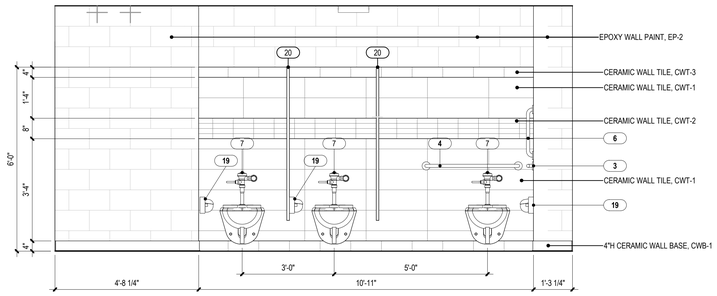
10 TLT. T1-06 - EAST
1/2" = 1'-0"



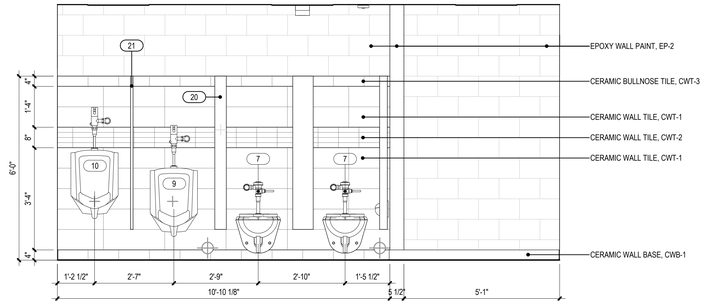
9 TLT. T1-06 -NORTH
1/2" = 1'-0"



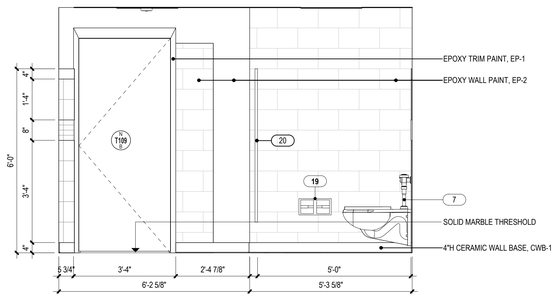
7 GIRLS (5-8) T1-09 - SOUTH
1/2" = 1'-0"



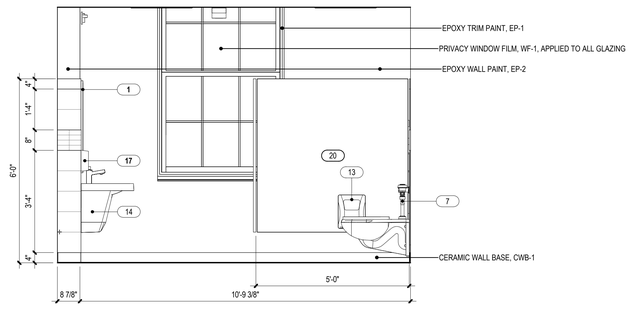
6 GIRLS (5-8) T1-09 - EAST
1/2" = 1'-0"



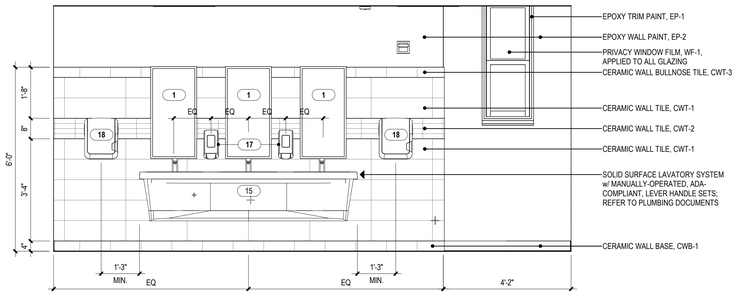
3 BOYS 9-12 T1-05- SOUTH
1/2" = 1'-0"



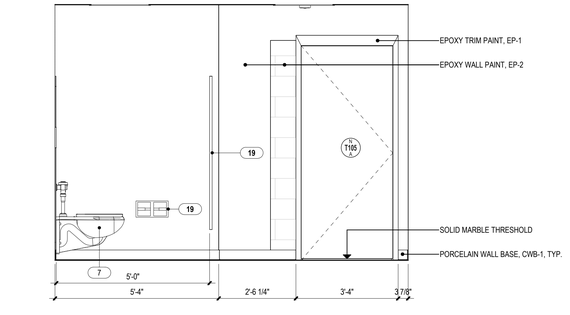
5 GIRLS (5-8) T1-09- NORTH
1/2" = 1'-0"



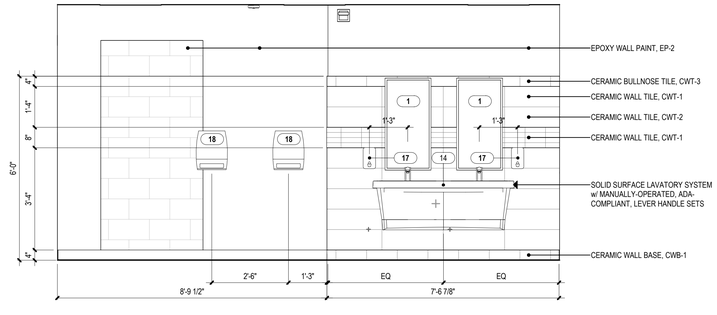
2 BOYS 9-12 T1-05 - EAST
1/2" = 1'-0"



8 GIRLS (5-8) T1-09 - WEST
1/2" = 1'-0"



4 BOYS 9-12 T1-05 - WEST
1/2" = 1'-0"



1 BOYS 9-12 T1-05 - NORTH
1/2" = 1'-0"

Project Title:

ADDITION & ALTERATIONS TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

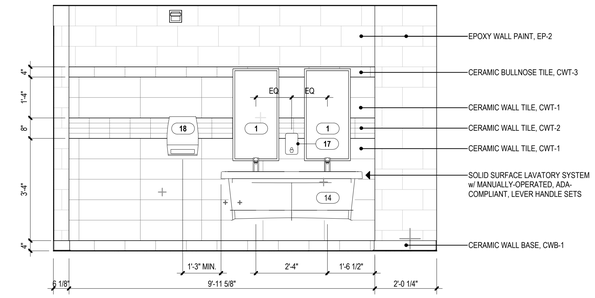
SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
311 STATE STREET NEW LONDON CT 06320
203 230 9007 silverpetrucelli.com

Revision:	Description:	Date:	Revised By:

Drawing Title: TOILET ROOM ELEVATIONS

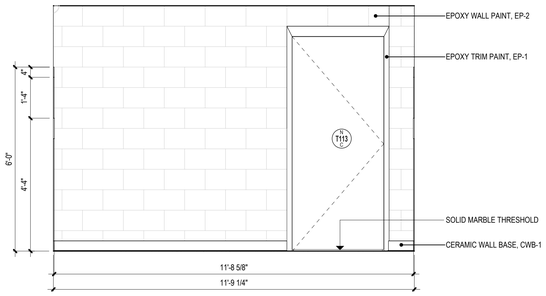
Date: 8/29/2024
Scale: 1/2" = 1'-0"
Drawn By: JAL
Project Number: 22-382
Drawing Number: A710

8/29/2024 12:20:30 PM



10 BOYS (5-8) T1-13 - WEST

1/2" = 1'-0"

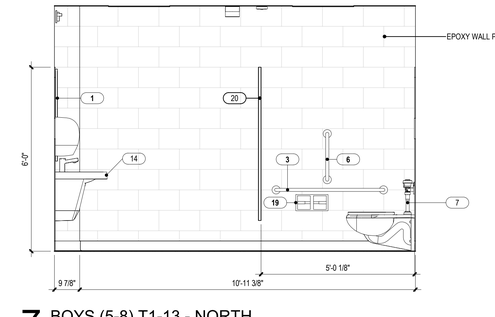


9 BOYS (5-8) T1-13 - SOUTH

1/2" = 1'-0"

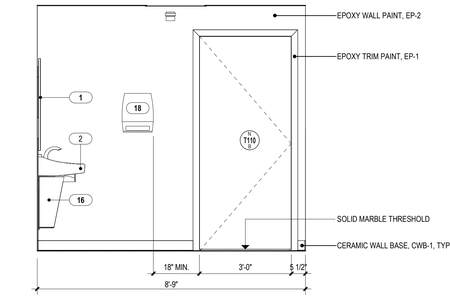
8 BOYS (5-8) T1-13 - EAST

1/2" = 1'-0"



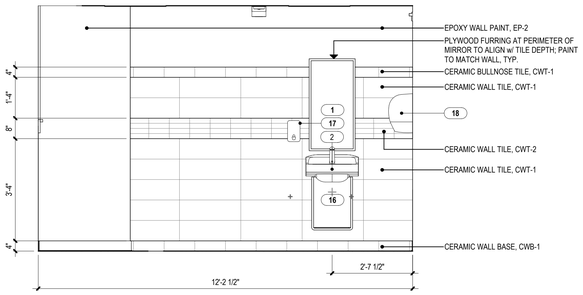
7 BOYS (5-8) T1-13 - NORTH

1/2" = 1'-0"



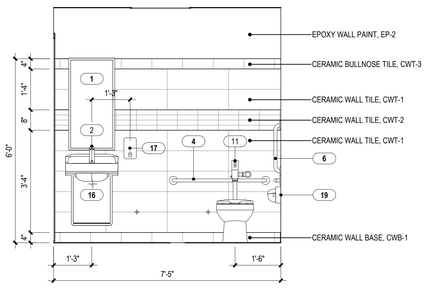
4 STAFF M. T1-10- WEST

1/2" = 1'-0"



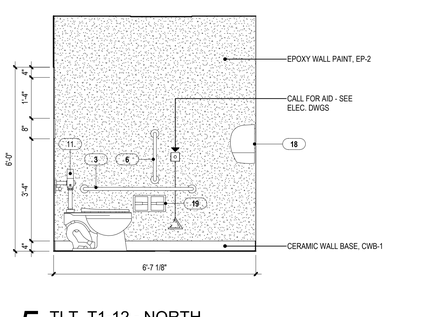
3 STAFF M. T1-10 - SOUTH

1/2" = 1'-0"



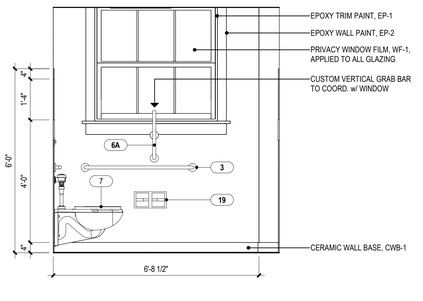
6 TLT. T1-12 - WEST

1/2" = 1'-0"



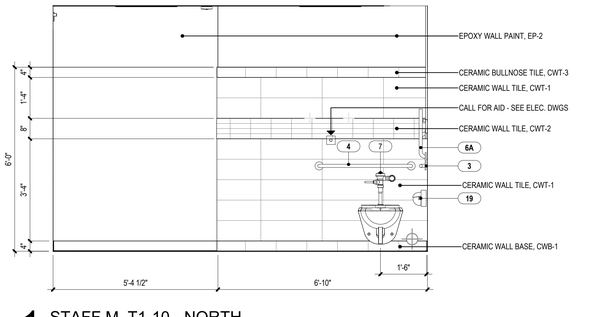
5 TLT. T1-12 - NORTH

1/2" = 1'-0"



2 STAFF M. T1-10 - EAST

1/2" = 1'-0"



1 STAFF M. T1-10 - NORTH

1/2" = 1'-0"

TOILET ROOM EQUIPMENT & ACCESSORIES

No.	NOTE DESCRIPTION
1	1'-6" X 3' MIRROR (CENTER ON LAV)
2	WALL MOUNTED H.C. LAV
3	42" HORIZ.GRAB BAR
4	36" HORIZ.GRAB BAR
5	30" HORIZ. GRAB BAR
6	18" VERT. GRAB BAR
6A	CUSTOM 18" VERT. GRAB BAR
7	WALL-MOUNTED H.C. WATER CLOSET
8	WALL-MOUNTED WATER CLOSET
9	WALL-MOUNTED H.C. URINAL
10	WALL-MOUNTED URINAL
11	FLOOR-MOUNTED ADULT WATER CLOSET
12	FLOOR-MOUNTED CHILD WATER CLOSET
13	PARTITION-MOUNTED SANITARY DISPOSAL
14	EXPRESS 2 STATION SINK H.C. LAV
15	EXPRESS 3 STATION SINK H.C. LAV
16	LAV GUARD
17	SURFACE-MOUNTED SOAP DISPENSER (OWNER PROVIDED, CONTRACTOR INSTALLED)
18	SURFACE-MOUNTED ROLL PAPER TOWEL DISPENSER (OWNER PROVIDED, CONTRACTOR INSTALLED)
18A	SURFACE-MOUNTED C-FOLD PAPER TOWEL DISPENSER
19	SURFACE-MOUNTED TOILET PAPER DISPENSER (OWNER PROVIDED, CONTRACTOR INSTALLED)
20	TOILET PARTITIONS; SEE PROJ. MAN.
21	URINAL SCREEN; SEE PROJ. MAN.
22	BABY CHANGING STATION
23	ADULT CHANGING STATION
24	WALL-MOUNTED STAINLESS-STEEL SERVICE SINK

REFER TO SHEET G002 FOR TYPICAL ACCESSORY MOUNTING HEIGHTS AND LOCATIONS

Project Title:

ADDITION & ALTERATIONS TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
311 STATE STREET NEW LONDON CT 06320
203 230 9007 silverpetrucelli.com

Revision:	Description:	Date:	Revised By:

Drawing Title: TOILET ROOM ELEVATIONS

Date: 8/29/2024
Scale: 1/2" = 1'-0"
Drawn By: JAL
Project Number: 22-382

Drawing Number: A711

8/29/2024 12:20:58 PM

TOILET ROOM EQUIPMENT & ACCESSORIES

No.	NOTE DESCRIPTION
1	1'-6" X 3' MIRROR (CENTER ON LAV)
2	WALL MOUNTED H.C. LAV
3	42" HORIZ.GRAB BAR
4	36" HORIZ.GRAB BAR
5	30" HORIZ. GRAB BAR
6	18" VERT. GRAB BAR
6A	CUSTOM 18" VERT. GRAB BAR
7	WALL-MOUNTED H.C. WATER CLOSET
8	WALL-MOUNTED WATER CLOSET
9	WALL-MOUNTED H.C. URINAL
10	WALL-MOUNTED URINAL
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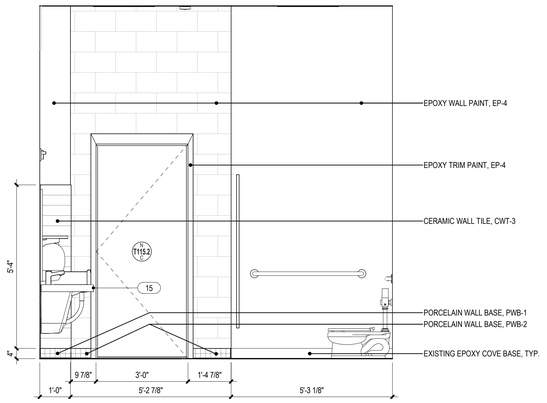
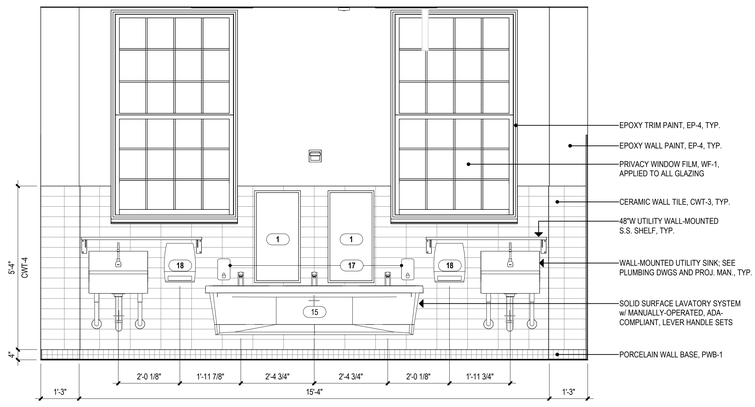
12	FLOOR-MOUNTED CHILD WATER CLOSET
13	PARTITION-MOUNTED SANITARY DISPOSAL
14	EXPRESS 2 STATION SINK H.C. LAV
15	EXPRESS 3 STATION SINK H.C. LAV
16	LAV GUARD
17	SURFACE-MOUNTED SOAP DISPENSER (OWNER PROVIDED, CONTRACTOR INSTALLED)
18	SURFACE-MOUNTED ROLL PAPER TOWEL DISPENSER (OWNER PROVIDED, CONTRACTOR INSTALLED)
18A	SURFACE-MOUNTED C-FOLD PAPER TOWEL DISPENSER
19	SURFACE-MOUNTED TOILET PAPER DISPENSER (OWNER PROVIDED, CONTRACTOR INSTALLED)
20	TOILET PARTITIONS: SEE PROJ. MAN.
21	URINAL SCREEN: SEE PROJ. MAN.
22	BABY CHANGING STATION
23	ADULT CHANGING STATION
24	WALL-MOUNTED STAINLESS-STEEL SERVICE SINK

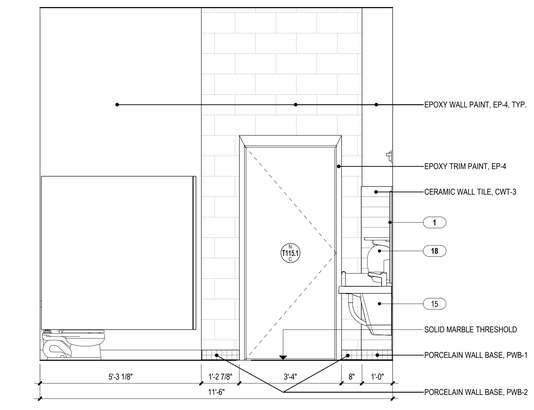
REFER TO SHEET G002 FOR TYPICAL ACCESSORY MOUNTING HEIGHTS AND LOCATIONS



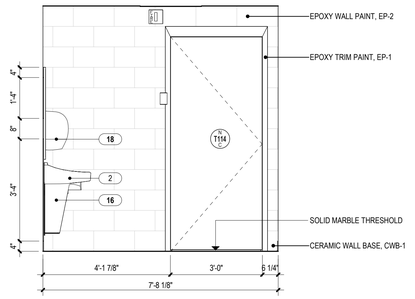
7 PRE-K TOILET T1-15 - WEST
1/2" = 1'-0"



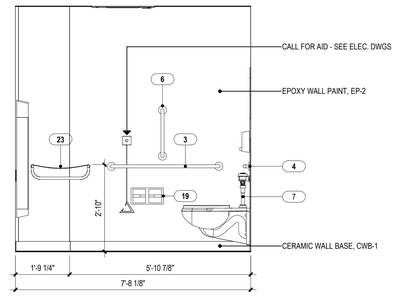
6 PRE-K TOILET T1-15 - SOUTH
1/2" = 1'-0"



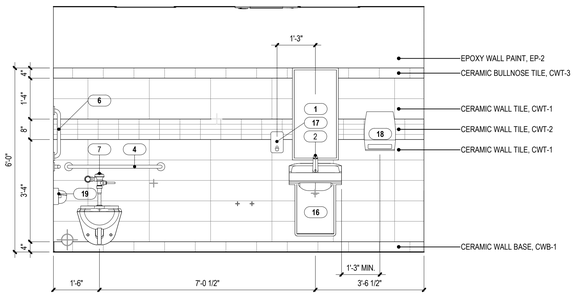
5 PRE-K TOILET T1-15 - EAST
1/2" = 1'-0"



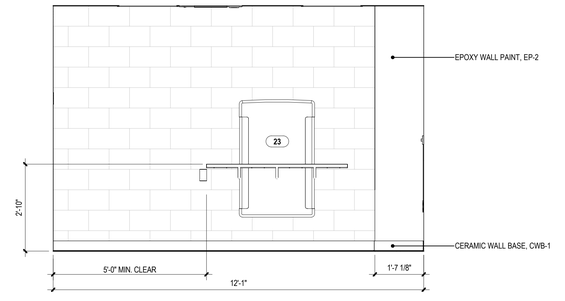
4 CHANGING ROOM T1-14 - SOUTH
1/2" = 1'-0"



3 CHANGING ROOM T1-14 - NORTH
1/2" = 1'-0"



2 CHANGING ROOM T1-14 - EAST
1/2" = 1'-0"



1 CHANGING ROOM T1-14 - WEST
1/2" = 1'-0"

Project Title:
ADDITION & ALTERATIONS TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
311 STATE STREET NEW LONDON CT 06320
203 230 9007 silverpetrucelli.com

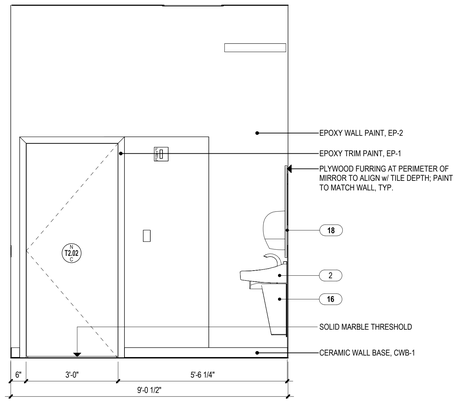
Revision:	Description:	Date:	Revised By:

Drawing Title: TOILET ROOM ELEVATIONS

Date: 8/29/2024
Scale: 1/2" = 1'-0"
Drawn By: JAL
Project Number: 22-382

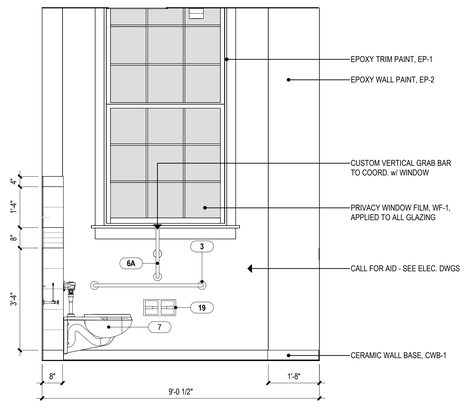
Drawing Number: A712

8/29/2024 12:21:12 PM



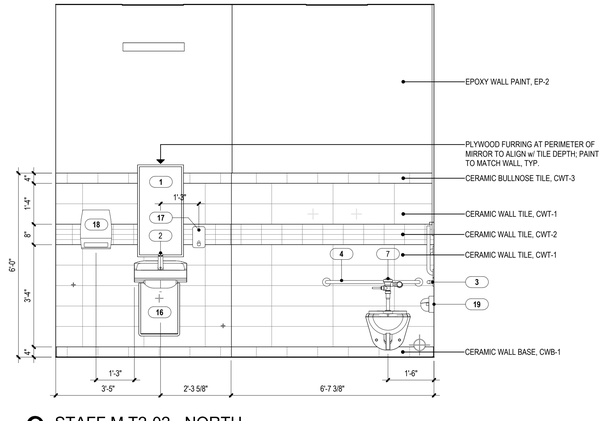
11 STAFF M T2-02 - WEST

1/2" = 1'-0"



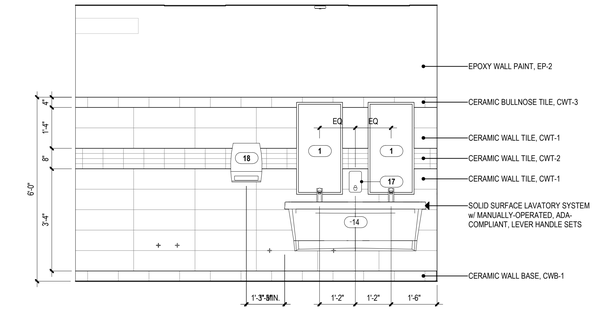
10 STAFF M T2-02 - EAST

1/2" = 1'-0"



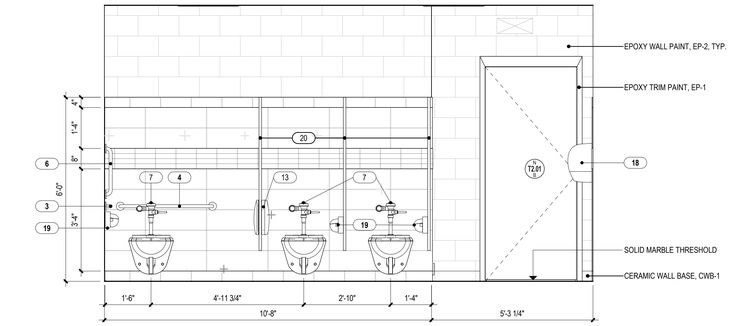
9 STAFF M T2-02 - NORTH

1/2" = 1'-0"



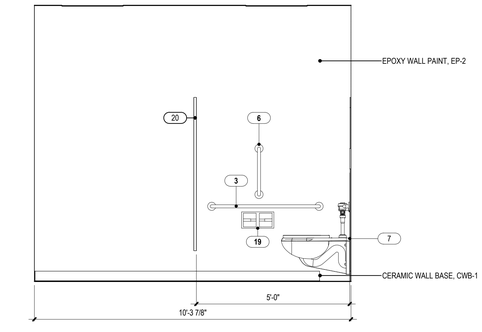
8 GIRLS T2-01 - SOUTH

1/2" = 1'-0"



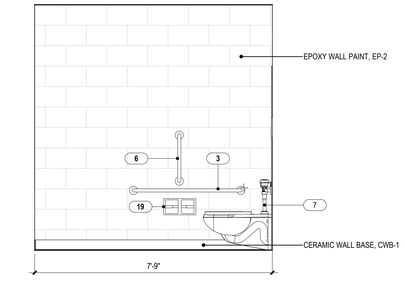
7 GIRLS T2-01 - EAST

1/2" = 1'-0"



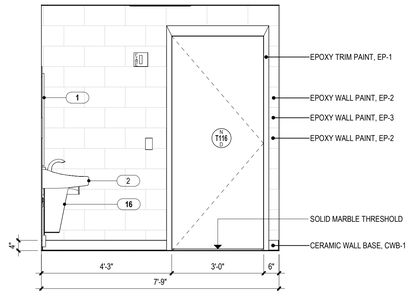
6 GIRLS T2-01 - NORTH

1/2" = 1'-0"



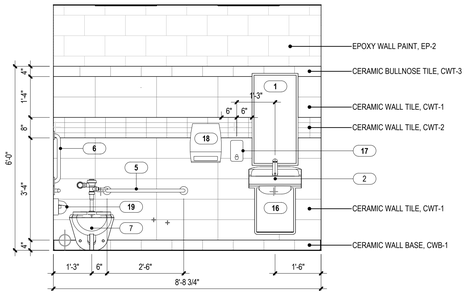
5 KINDERGARTEN TOILET T1-16 - WEST

1/2" = 1'-0"



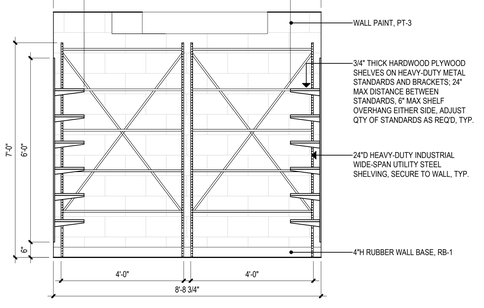
4 KINDERGARTEN TOILET T1-16 - EAST

1/2" = 1'-0"



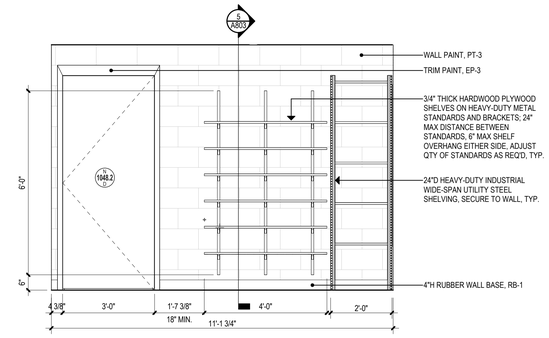
3 KINDERGARTEN TOILET T1-16 - NORTH

1/2" = 1'-0"



2 K. STORAGE 1048D - NORTH

1/2" = 1'-0"



1 K. STORAGE 1048D - WEST

1/2" = 1'-0"

TOILET ROOM EQUIPMENT & ACCESSORIES

No.	NOTE DESCRIPTION
1	1'-6" X 3' MIRROR (CENTER ON LAV)
2	WALL MOUNTED H.C. LAV
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6	18" VERT. GRAB BAR
6A	CUSTOM 18" VERT. GRAB BAR
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9	WALL-MOUNTED H.C. URINAL
10	WALL-MOUNTED URINAL
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13	PARTITION-MOUNTED SANITARY DISPOSAL
14	EXPRESS 2 STATION SINK H.C. LAV
15	EXPRESS 3 STATION SINK H.C. LAV
16	LAV GUARD
17	SURFACE-MOUNTED SOAP DISPENSER (OWNER PROVIDED, CONTRACTOR INSTALLED)
18	SURFACE-MOUNTED ROLL PAPER TOWEL DISPENSER (OWNER PROVIDED, CONTRACTOR INSTALLED)
18A	SURFACE-MOUNTED C-FOLD PAPER TOWEL DISPENSER
19	SURFACE-MOUNTED TOILET PAPER DISPENSER (OWNER PROVIDED, CONTRACTOR INSTALLED)
20	TOILET PARTITIONS; SEE PROJ. MAN.
21	URINAL SCREEN; SEE PROJ. MAN.
22	BABY CHANGING STATION
23	ADULT CHANGING STATION
24	WALL-MOUNTED STAINLESS-STEEL SERVICE SINK

REFER TO SHEET G002 FOR TYPICAL ACCESSORY MOUNTING HEIGHTS AND LOCATIONS

Project Title:

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OLD GREENWICH, CONNECTICUT 06870

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203 230 9007 silverpetrucelli.com

Revision: | Description: | Date: | Revised By:

Drawing Title: TOILET ROOM ELEVATIONS

Date: 8/29/2024
Scale: 1/2" = 1'-0"
Drawn By: JAL
Project Number: 22-382

Drawing Number: A713

8/29/2024 12:21:28 PM

TOILET ROOM EQUIPMENT & ACCESSORIES

No.	NOTE DESCRIPTION
1	1'-6" X 3' MIRROR (CENTER ON LAV)
2	WALL MOUNTED H.C. LAV
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4	36" HORIZ.GRAB BAR
5	30" HORIZ. GRAB BAR
6	18" VERT. GRAB BAR
6A	CUSTOM 18" VERT. GRAB BAR
7	WALL-MOUNTED H.C. WATER CLOSET
8	WALL-MOUNTED WATER CLOSET
9	WALL-MOUNTED H.C. URINAL
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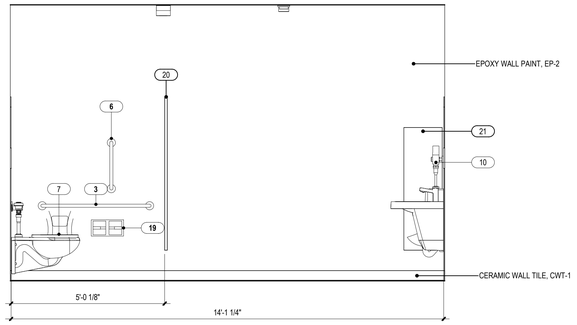
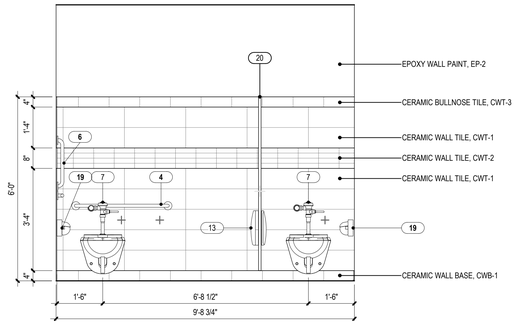
11	FLOOR-MOUNTED ADULT WATER CLOSET
12	FLOOR-MOUNTED CHILD WATER CLOSET
13	PARTITION-MOUNTED SANITARY DISPOSAL
14	EXPRESS 2 STATION SINK H.C. LAV
15	EXPRESS 3 STATION SINK H.C. LAV
16	LAV GUARD
17	SURFACE-MOUNTED SOAP DISPENSER (OWNER PROVIDED, CONTRACTOR INSTALLED)
18	SURFACE-MOUNTED ROLL PAPER TOWEL DISPENSER (OWNER PROVIDED, CONTRACTOR INSTALLED)
18A	SURFACE-MOUNTED C-FOLD PAPER TOWEL DISPENSER
19	SURFACE-MOUNTED TOILET PAPER DISPENSER (OWNER PROVIDED, CONTRACTOR INSTALLED)
20	TOILET PARTITIONS; SEE PROJ. MAN.
21	URINAL SCREEN; SEE PROJ. MAN.
22	BABY CHANGING STATION
23	ADULT CHANGING STATION
24	WALL-MOUNTED STAINLESS-STEEL SERVICE SINK

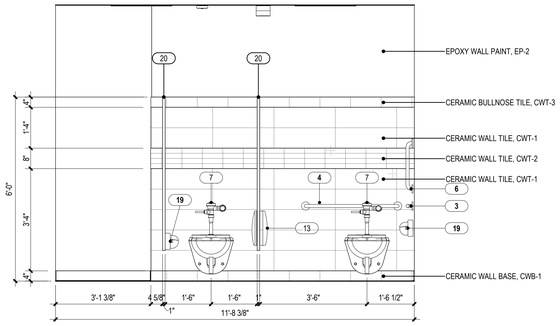
REFER TO SHEET G002 FOR TYPICAL ACCESSORY MOUNTING HEIGHTS AND LOCATIONS



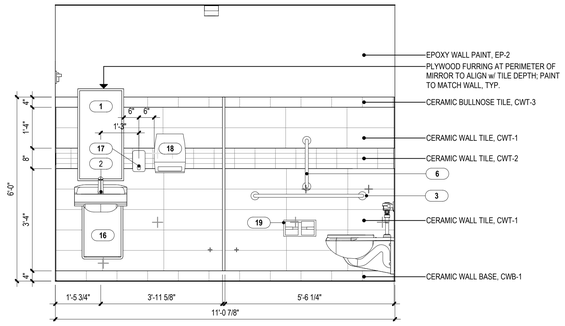
8 BOYS T2-04 - WEST
1/2" = 1'-0"



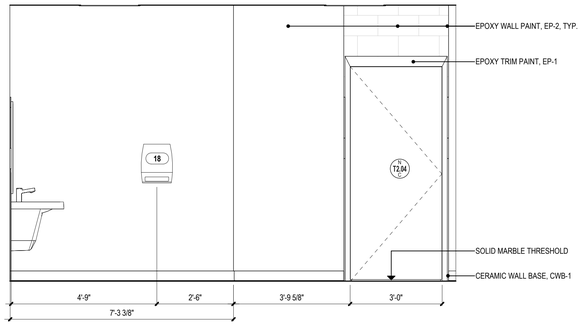
4 STAFF W T2-03 - WEST
1/2" = 1'-0"



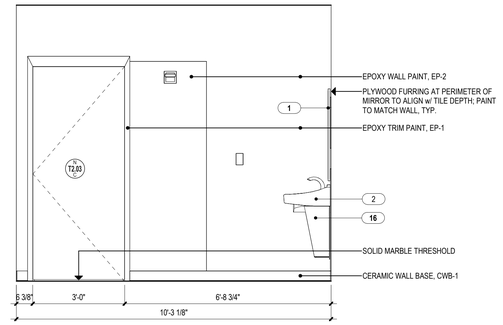
7 BOYS T2-04 - SOUTH
1/2" = 1'-0"



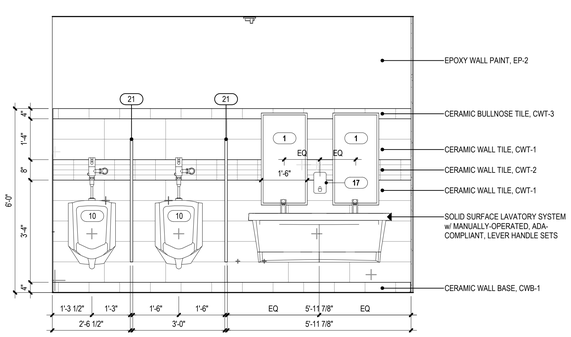
3 STAFF W T2-03 - SOUTH
1/2" = 1'-0"



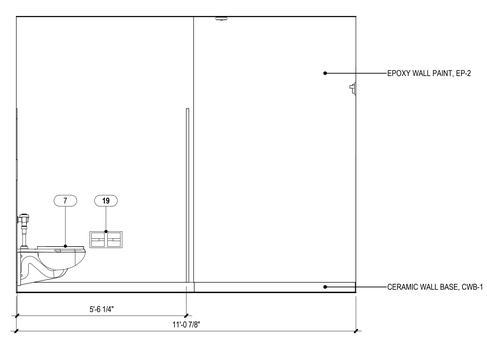
6 BOYS T2-04 - EAST
1/2" = 1'-0"



2 STAFF W T2-03 - EAST
1/2" = 1'-0"



5 BOYS T2-04 - NORTH
1/2" = 1'-0"



1 STAFF W T2-03 - NORTH
1/2" = 1'-0"

Project Title:
ADDITION & ALTERATIONS TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

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3190 WHITNEY AVENUE HAMDEN CT 06518
311 STATE STREET NEW LONDON CT 06320
203 230 9007 silverpetrucelli.com

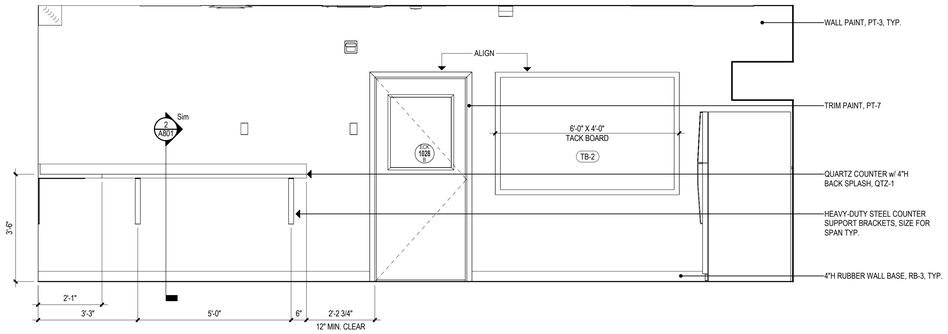
Revision:	Description:	Date:	Revised By:

Drawing Title: TOILET ROOM ELEVATIONS

Date: 8/29/2024
Scale: 1/2" = 1'-0"
Drawn By: JAL
Project Number: 22-382

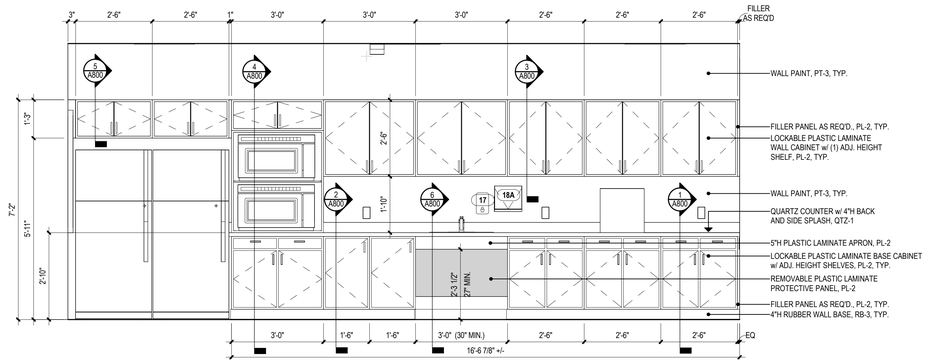
Drawing Number: A714

8/29/2024 12:21:43 PM



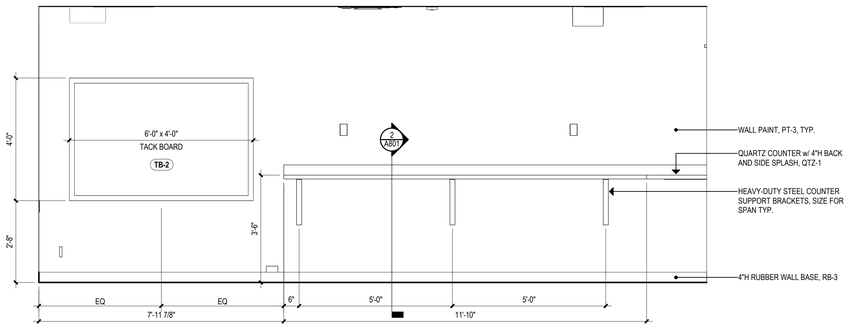
8 STAFF LOUNGE 1028B - WEST

1/2" = 1'-0"



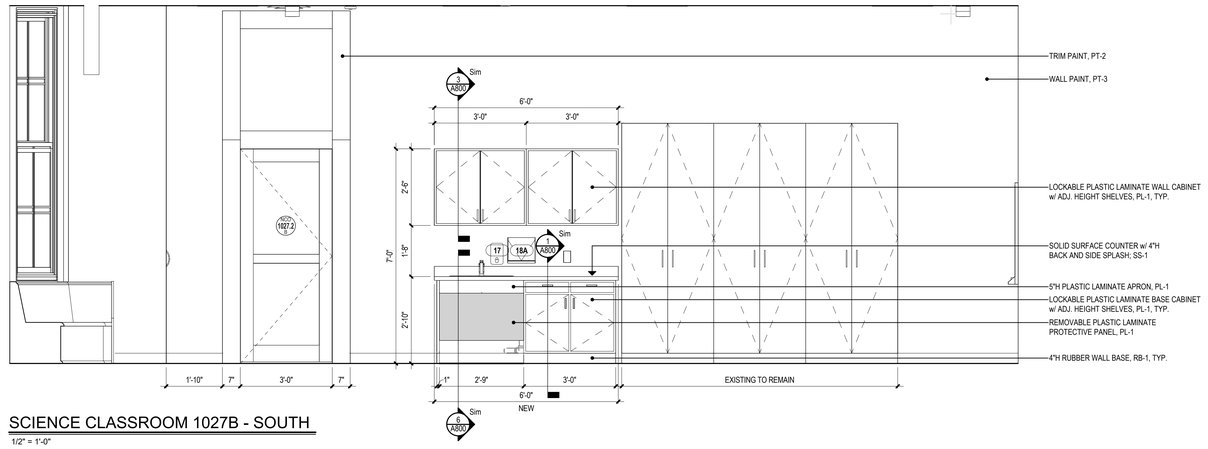
7 STAFF LOUNGE 1028B - NORTH

1/2" = 1'-0"



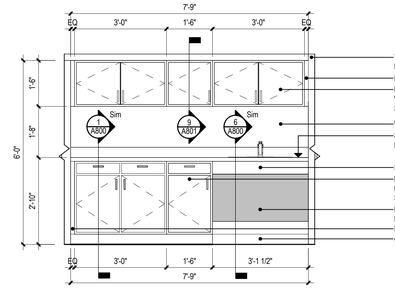
6 STAFF LOUNGE 1028B - SOUTH

1/2" = 1'-0"



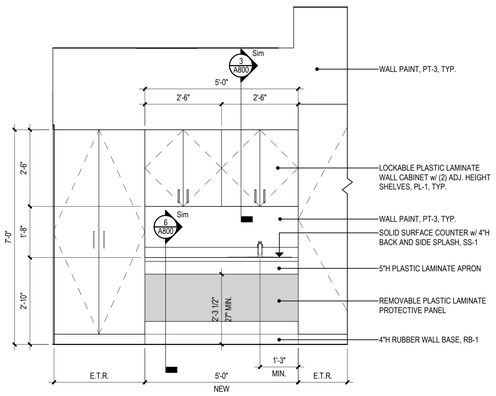
5 SCIENCE CLASSROOM 1027B - SOUTH

1/2" = 1'-0"



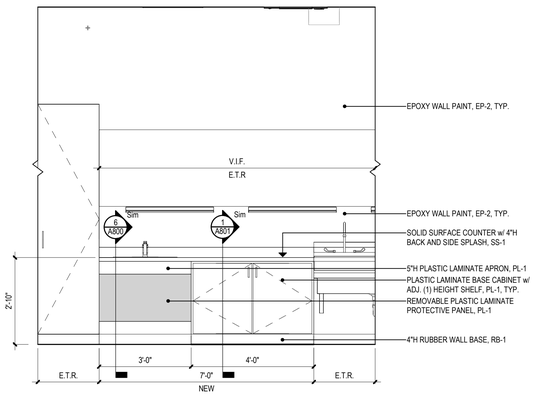
4 TYPICAL ADA CLASSROOM SINK CASEWORK

1/2" = 1'-0"



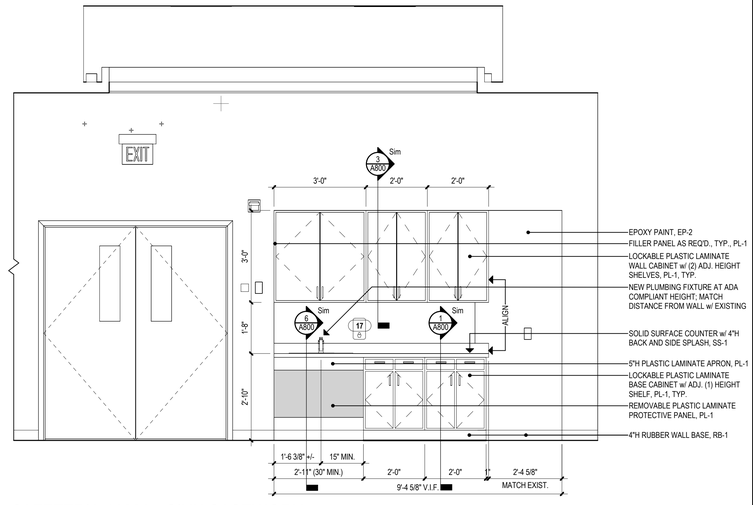
3 MUSIC ROOM 1006A - SINK CASEWORK

1/2" = 1'-0"



2 ART ROOM 1003A - SINK CASEWORK

1/2" = 1'-0"



1 CAFETERIA 1000A - SINK CASEWORK

1/2" = 1'-0"

Project Title:

ADDITION & ALTERATIONS TO:
Old Greenwich School
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OLD GREENWICH, CONNECTICUT 06870

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Revision:	Description:	Date:	Revised By:

Drawing Title: INTERIOR ELEVATIONS

Date: 8/29/2024
Scale: 1/2" = 1'-0"
Drawn By: JAL
Project Number: 22-382

Drawing Number: A730

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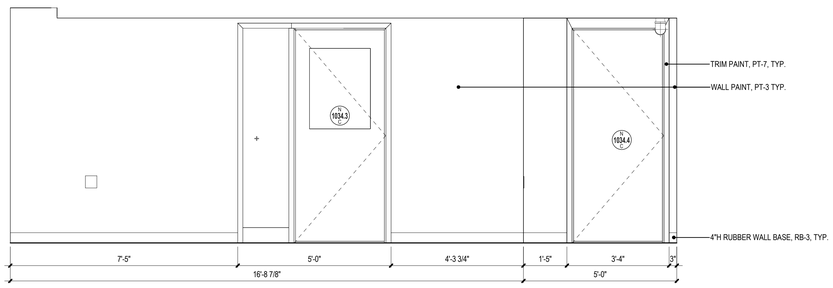
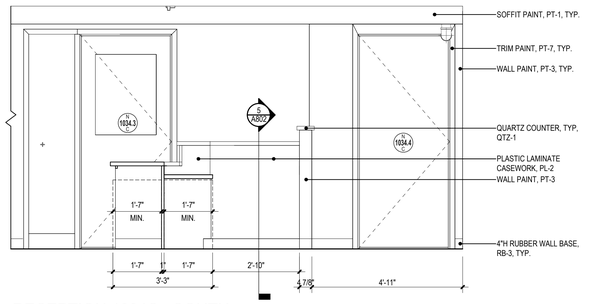
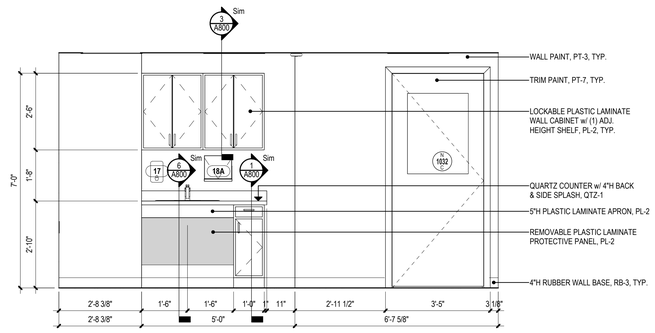


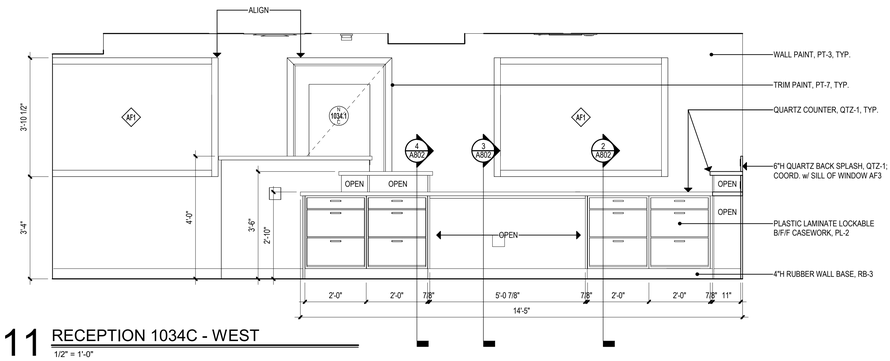
12 RECEPTION 1065C - SOUTH
1/2" = 1'-0"



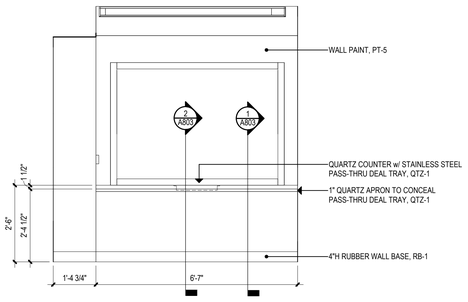
8 RECEPTION 1034C - SOUTH
1/2" = 1'-0"



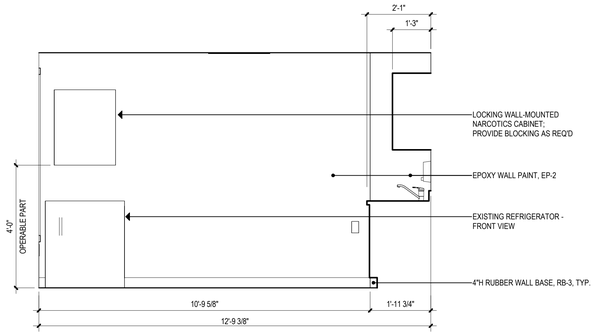
4 NURSE 1032C - WEST
1/2" = 1'-0"



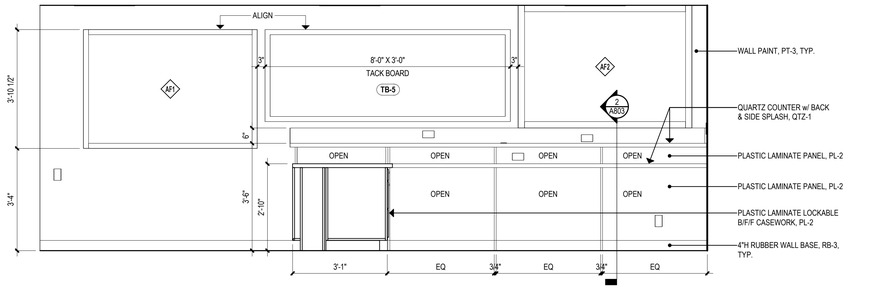
11 RECEPTION 1034C - WEST
1/2" = 1'-0"



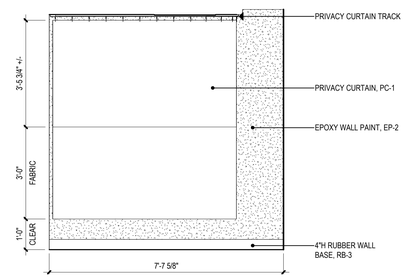
7 VESTIBULE V1-03C - SOUTH
1/2" = 1'-0"



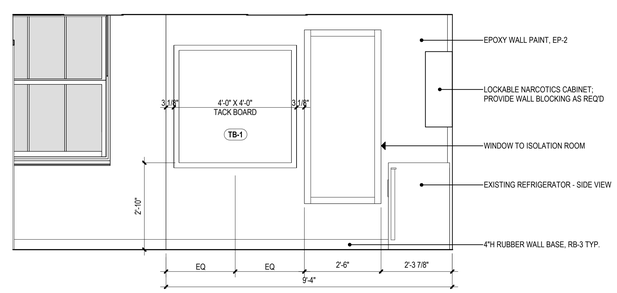
3 NURSE 1032C - SOUTH
1/2" = 1'-0"



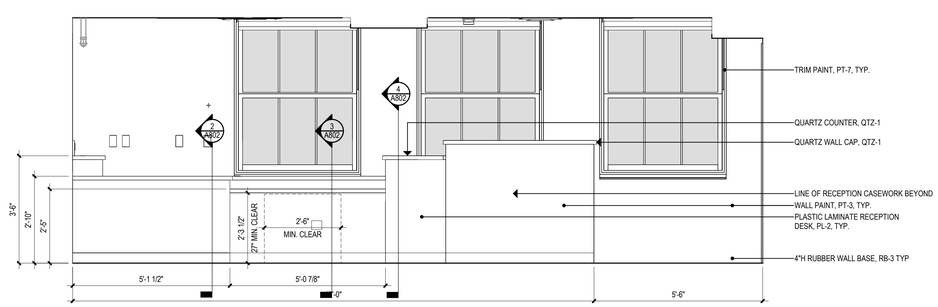
10 RECEPTION 1034C - NORTH
1/2" = 1'-0"



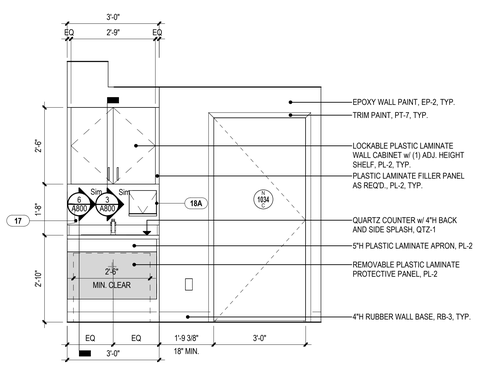
6 INFIRMARY N1-01 - NORTH
1/2" = 1'-0"



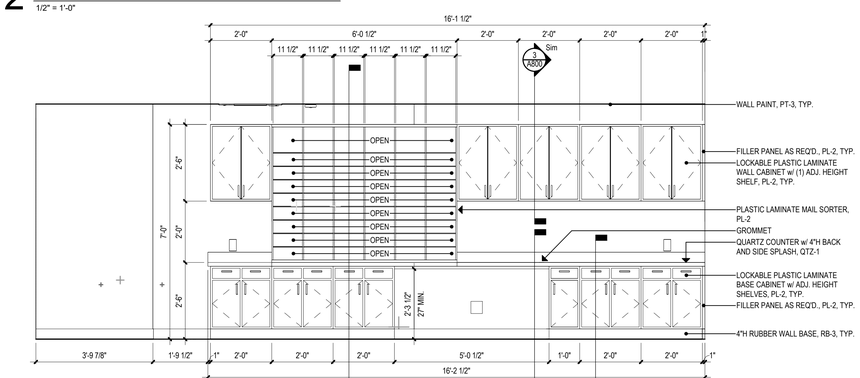
2 NURSE 1032C - EAST
1/2" = 1'-0"



9 RECEPTION 1034C - EAST
1/2" = 1'-0"



5 INFIRMARY N1-01 - SOUTH
1/2" = 1'-0"



1 MAIL / COPY 1030B - NORTH
1/2" = 1'-0"

Project Title:
ADDITION & ALTERATIONS TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

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203 230 9007 silverpetrucelli.com

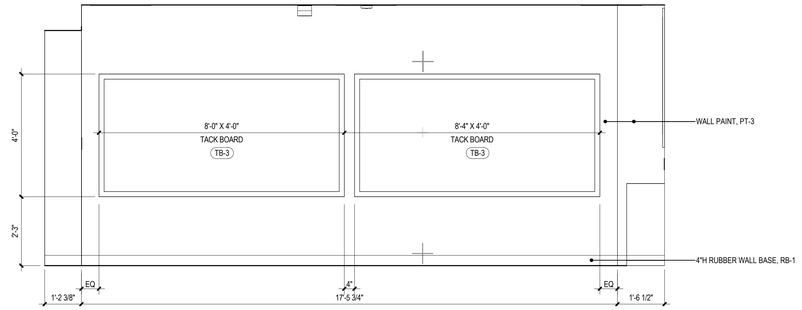
Revision:	Description:	Date:	Revised By:

Drawing Title: INTERIOR ELEVATIONS

Date: 8/29/2024
Scale: 1/2" = 1'-0"
Drawn By: JAL
Project Number: 22-382

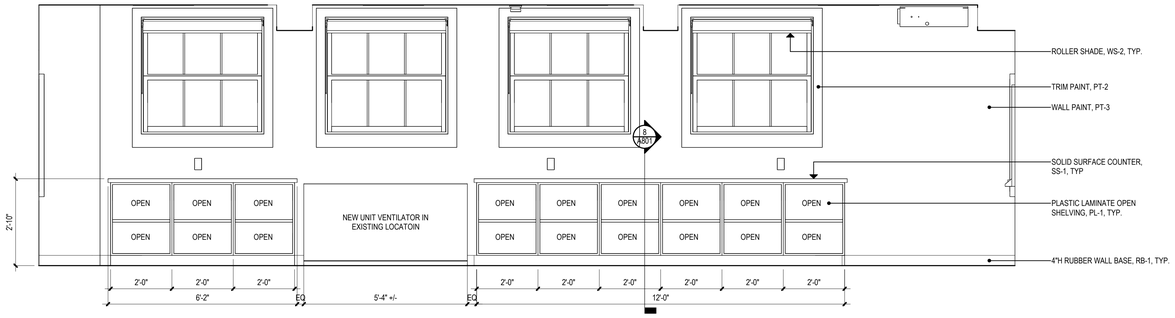
Drawing Number: A731

8/29/2024 12:22:13 PM



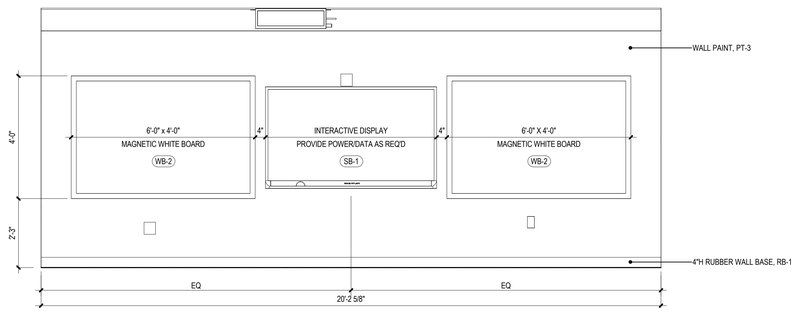
8 1st GRADE CLASSROOM 1033C - SOUTH

1/2" = 1'-0"



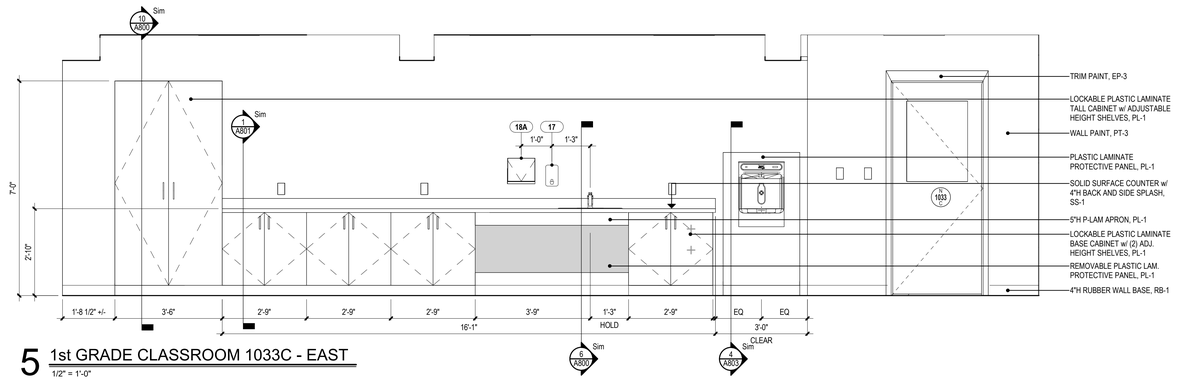
7 1st GRADE CLASSROOM 1033C - WEST

1/2" = 1'-0"



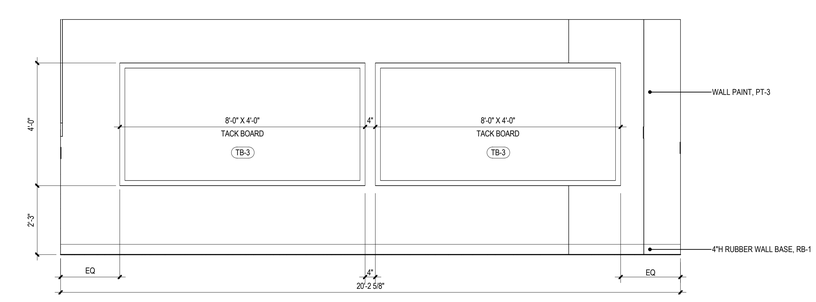
6 1st GRADE CLASSROOM 1033C - NORTH

1/2" = 1'-0"



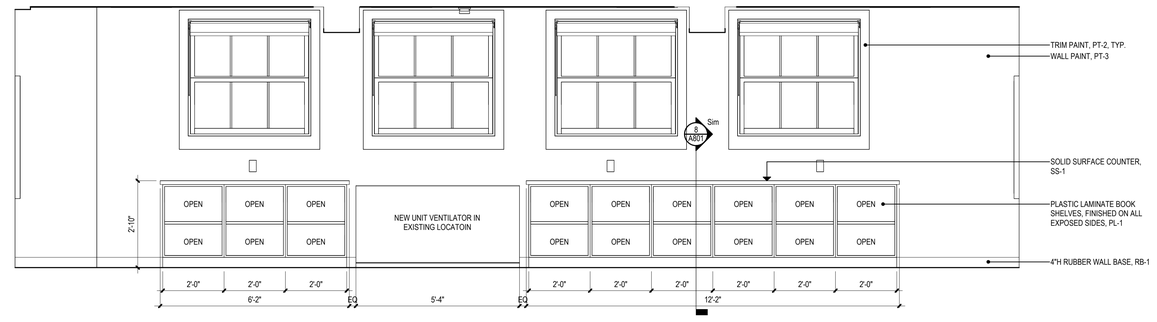
5 1st GRADE CLASSROOM 1033C - EAST

1/2" = 1'-0"



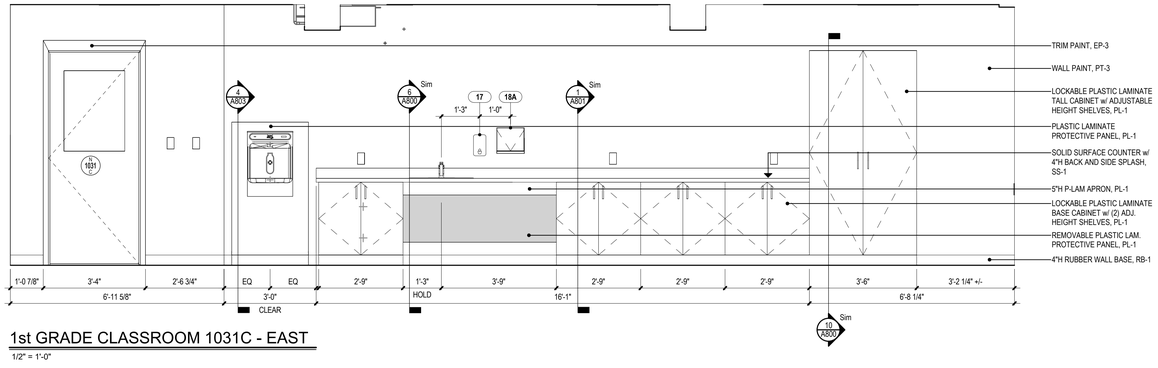
4 1st GRADE CLASSROOM 1031C - NORTH

1/2" = 1'-0"



3 1st GRADE CLASSROOM 1031C - WEST

1/2" = 1'-0"



2 1st GRADE CLASSROOM 1031C - SOUTH

1/2" = 1'-0"

1 1st GRADE CLASSROOM 1031C - EAST

1/2" = 1'-0"

Project Title:

ADDITION & ALTERATIONS TO:
Old Greenwich School
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OLD GREENWICH, CONNECTICUT 06870

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3190 WHITNEY AVENUE HAMDEN CT 06518
311 STATE STREET NEW LONDON CT 06320
203 230 9007 silverpetrucelli.com

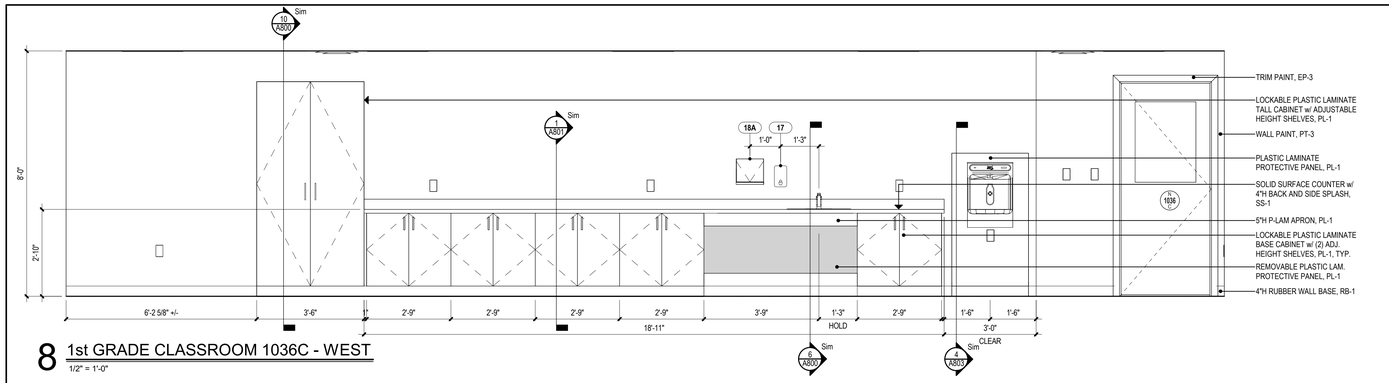
Revision:	Description:	Date:	Revised By:

Drawing Title: INTERIOR ELEVATIONS

Date: 8/29/2024
Scale: 1/2" = 1'-0"
Drawn By: JAL
Project Number: 22-382

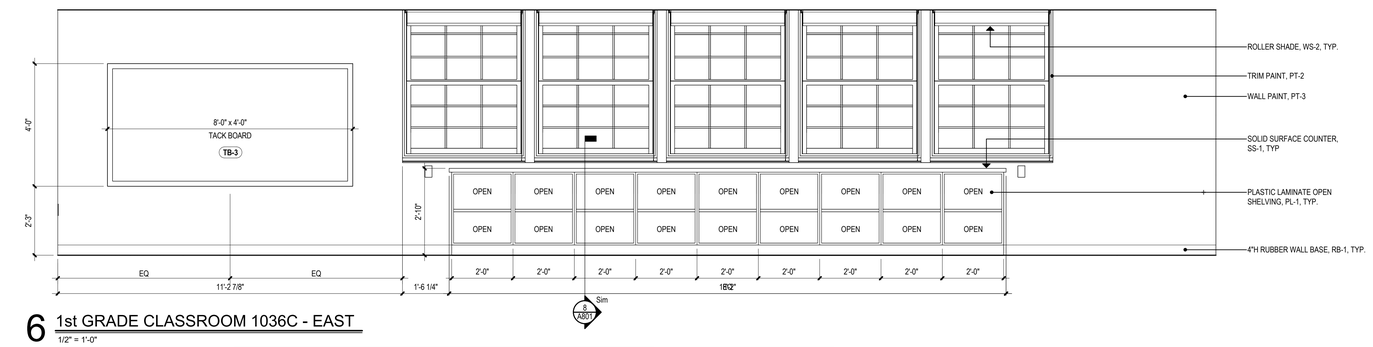
Drawing Number: A732

8/29/2024 12:22:26 PM



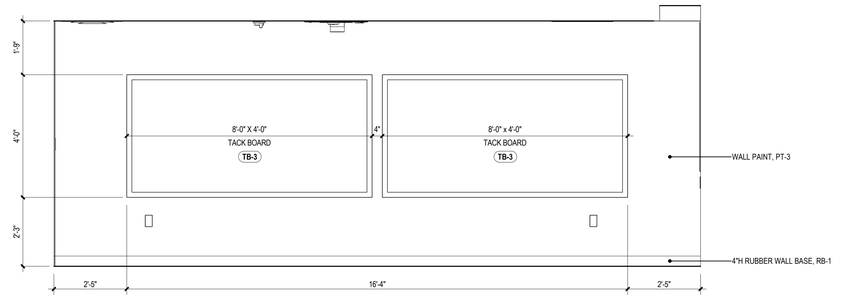
8 1st GRADE CLASSROOM 1036C - WEST

1/2" = 1'-0"



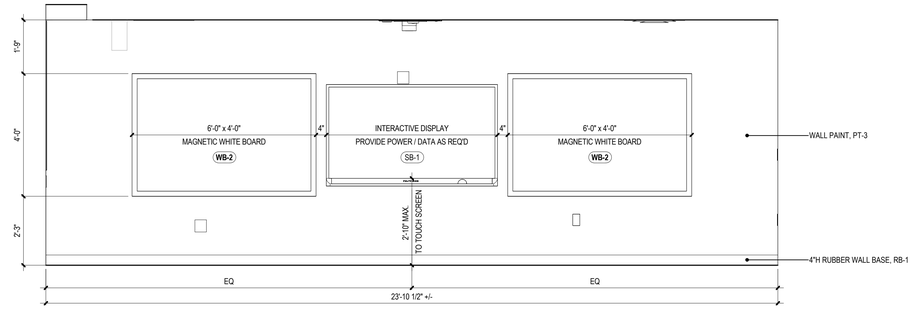
6 1st GRADE CLASSROOM 1036C - EAST

1/2" = 1'-0"



7 1st GRADE CLASSROOM 1036C - NORTH

1/2" = 1'-0"



5 1st GRADE CLASSROOM 1036C - SOUTH

1/2" = 1'-0"

4 PRE-K CLASSROOM - WEST

1/2" = 1'-0"

3 CORRIDOR C200C-EAST

1/2" = 1'-0"

2 PRE-K CLASSROOM - SOUTH

1/2" = 1'-0"

1 PRE-K CLASSROOM - EAST

1/2" = 1'-0"

Project Title:

ADDITION & ALTERATIONS TO:
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OLD GREENWICH, CONNECTICUT 06870

SILVER PETRUCELLI + ASSOCIATES
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311 STATE STREET NEW LONDON CT 06320
203 230 9007 silverpetrucelli.com

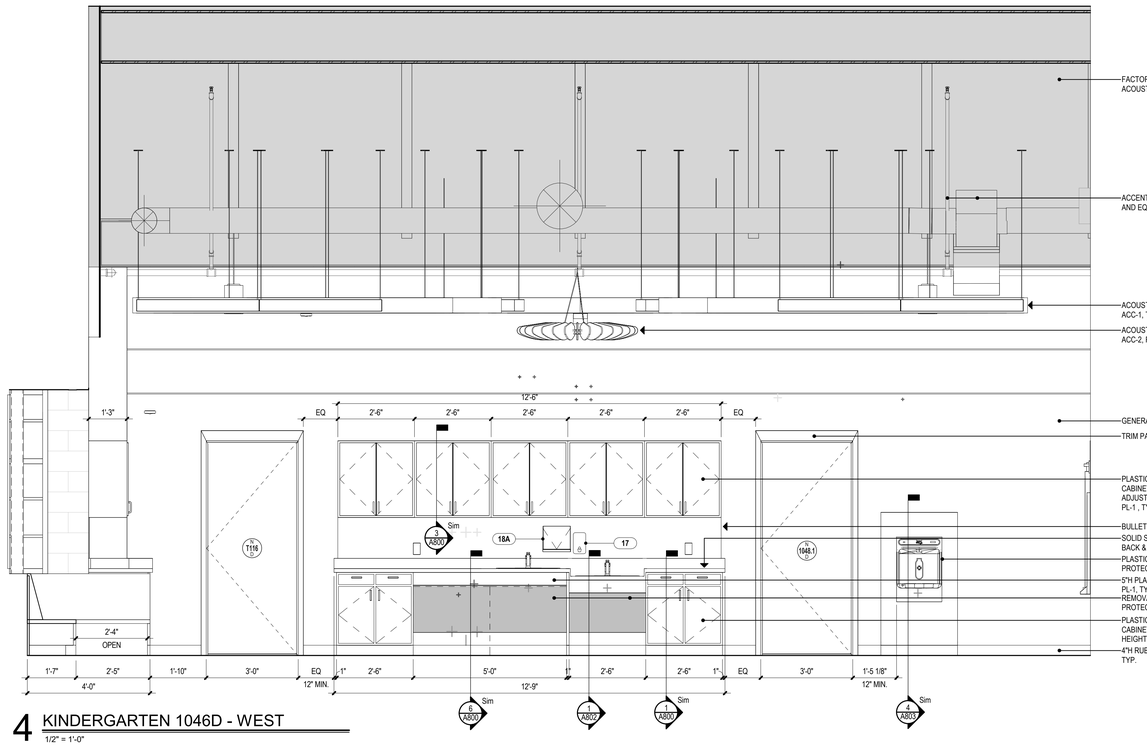
Revision:	Description:	Date:	Revised By:

Drawing Title: INTERIOR ELEVATIONS

Date: 8/29/2024
Scale: 1/2" = 1'-0"
Drawn By: JAL
Project Number: 22-382

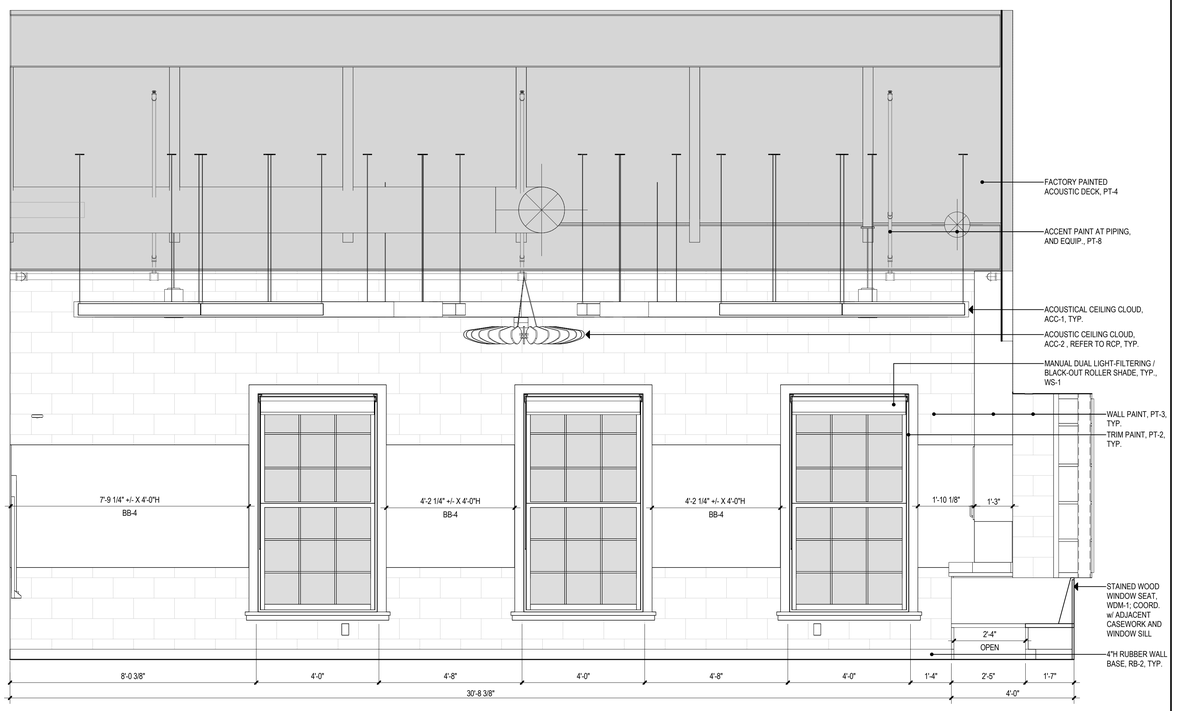
Drawing Number: A733

8/29/2024 12:22:39 PM



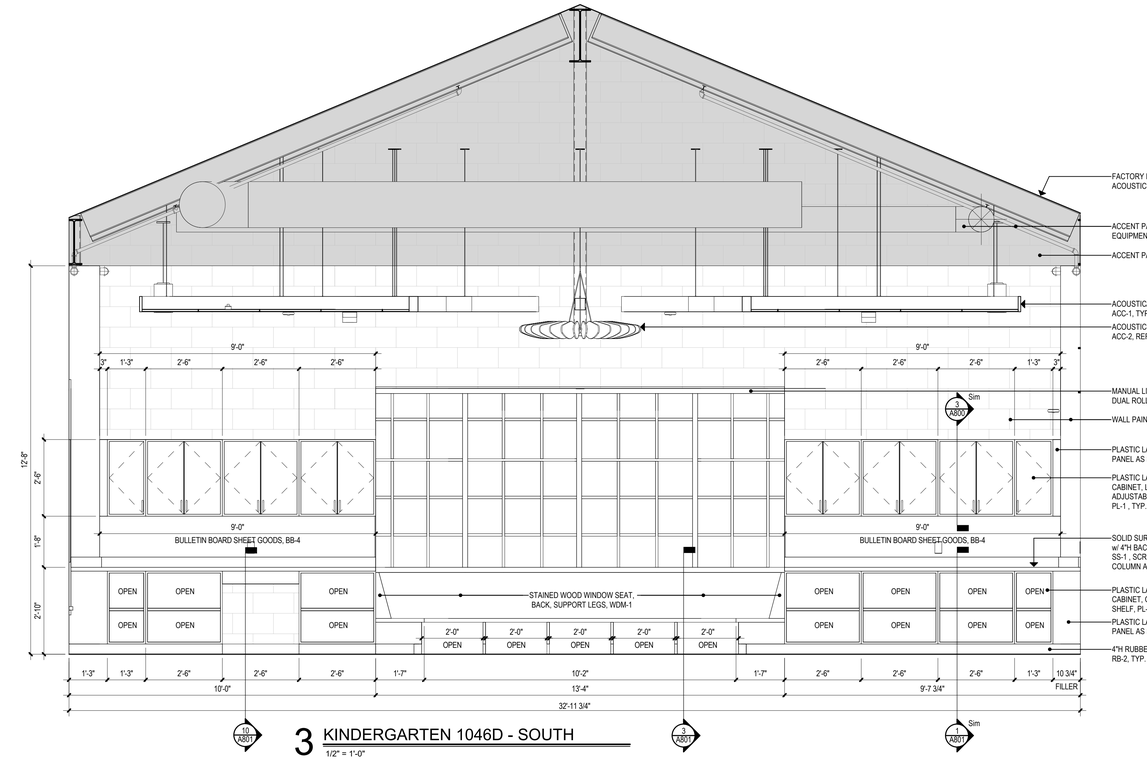
4 KINDERGARTEN 1046D - WEST

1/2" = 1'-0"



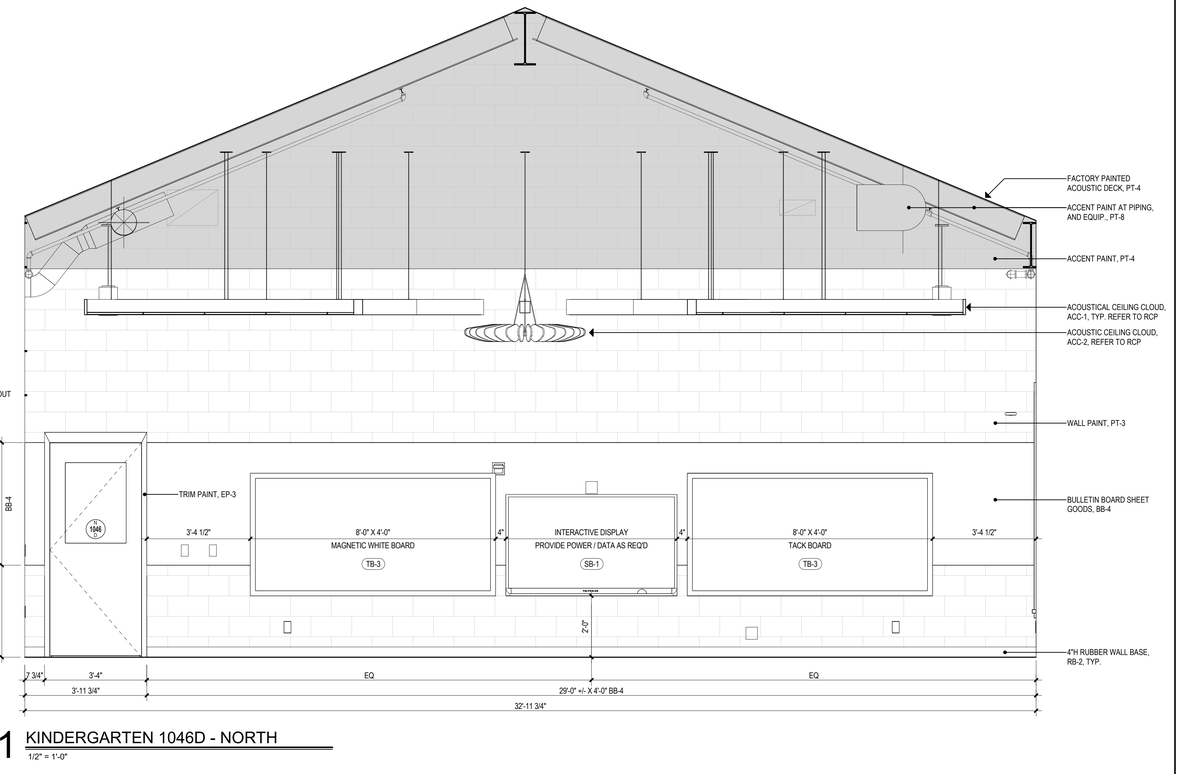
2 KINDERGARTEN 1046D - EAST

1/2" = 1'-0"



3 KINDERGARTEN 1046D - SOUTH

1/2" = 1'-0"



1 KINDERGARTEN 1046D - NORTH

1/2" = 1'-0"

Project Title:

ADDITION & ALTERATIONS TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
311 STATE STREET NEW LONDON CT 06320
203 230 9007 silverpetrucelli.com

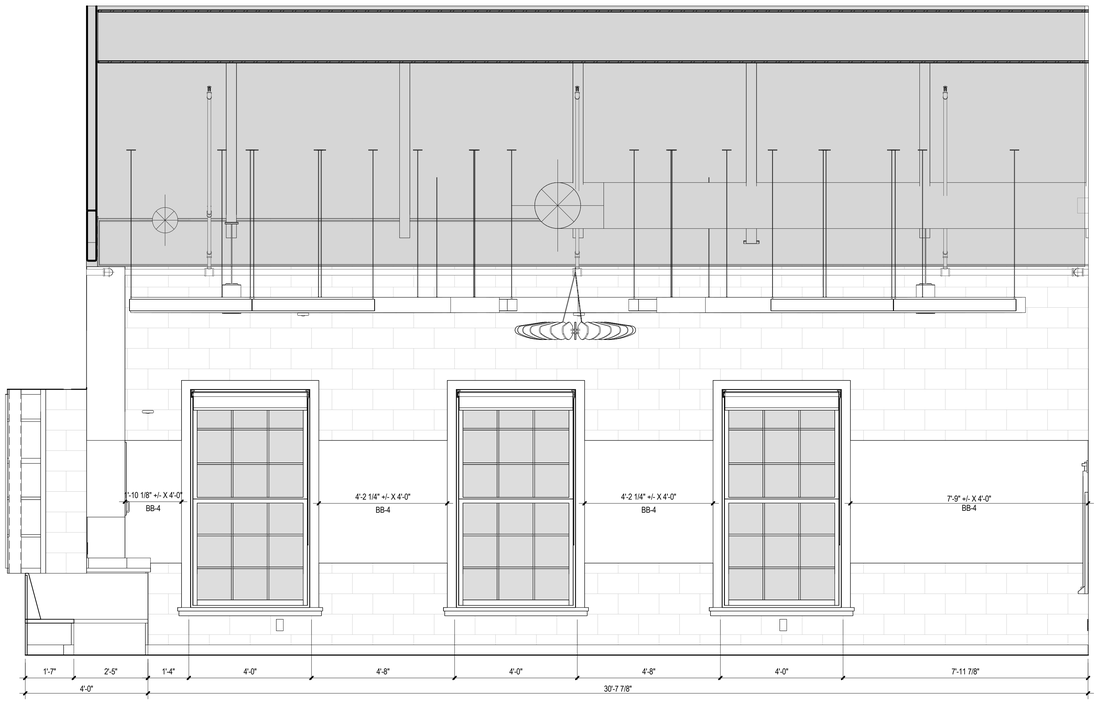
Revision: | Description: | Date: | Revised By:

Drawing Title: INTERIOR ELEVATIONS

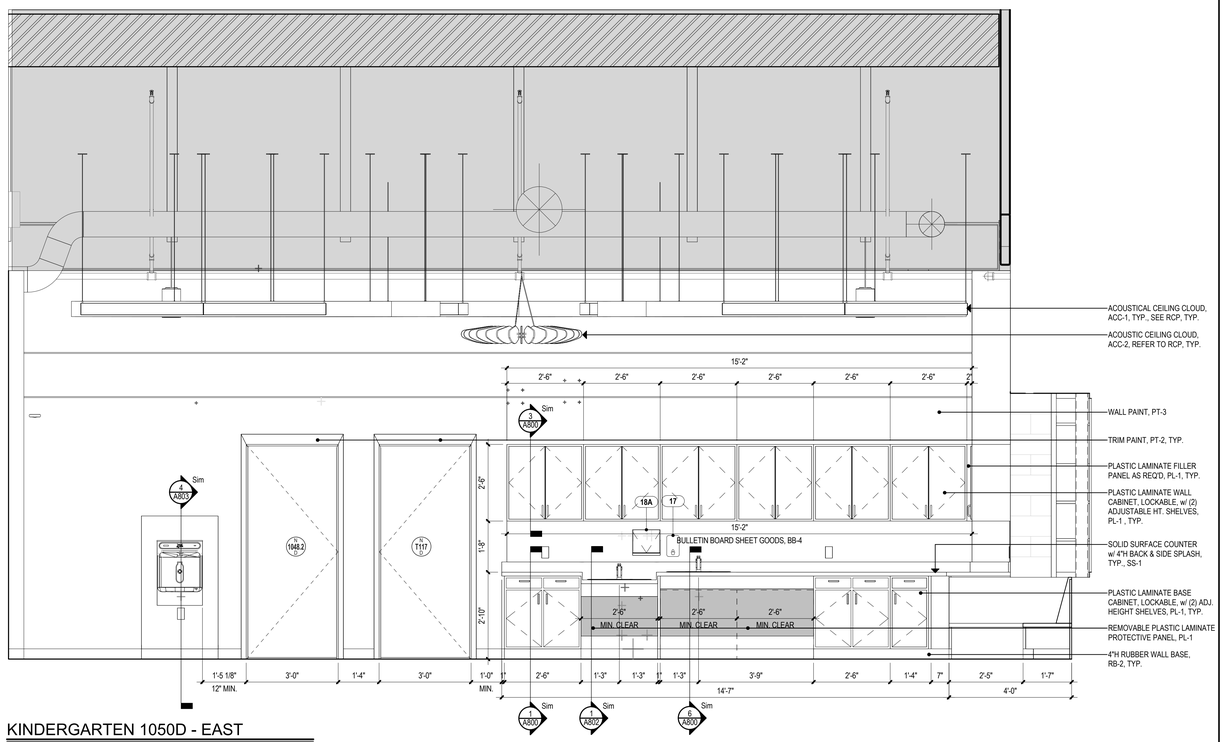
Date: 8/29/2024
Scale: 1/2" = 1'-0"
Drawn By: JAL
Project Number: 22-382

Drawing Number: A734

8/29/2024 12:22:51 PM

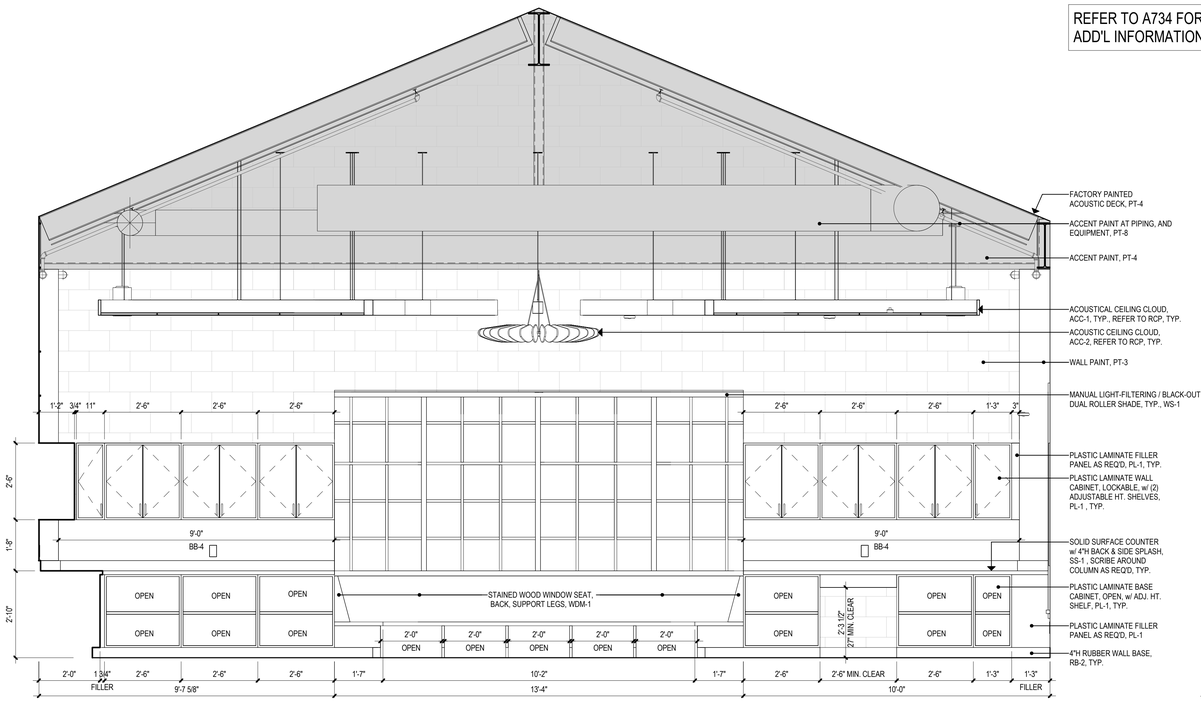


4 KINDERGARTEN 1050D- WEST
1/2" = 1'-0"

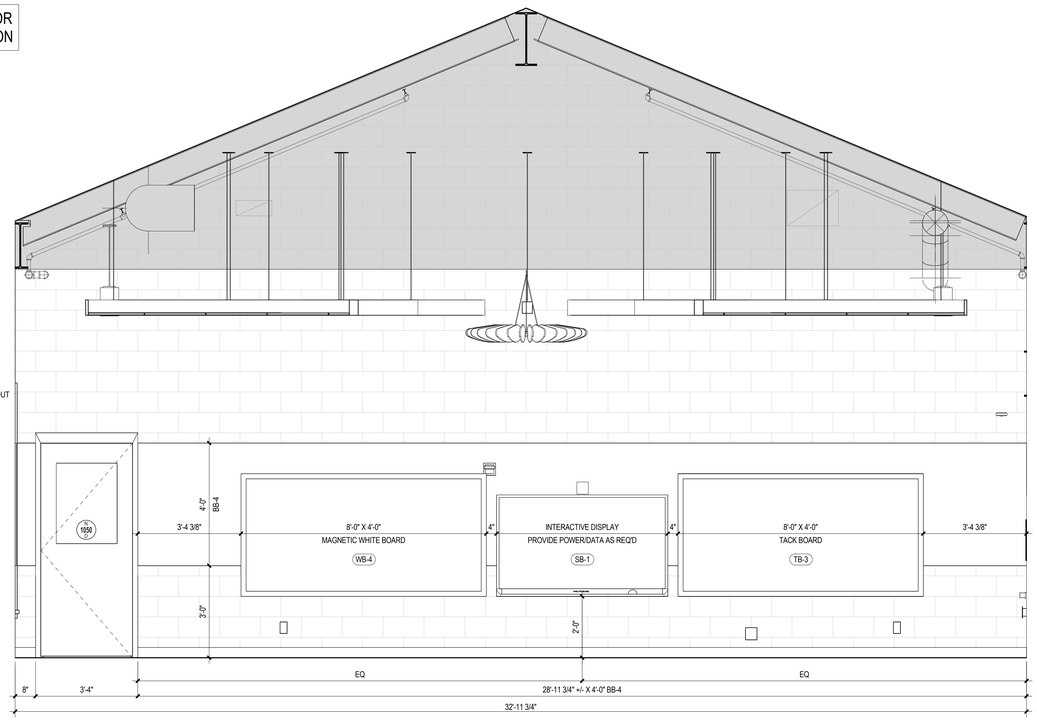


2 KINDERGARTEN 1050D - EAST
1/2" = 1'-0"

REFER TO A734 FOR ADD'L INFORMATION



3 KINDERGARTEN 1050D- SOUTH
1/2" = 1'-0"



1 KINDERGARTEN 1050D - NORTH
1/2" = 1'-0"

Project Title:

ADDITION & ALTERATIONS TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

SILVER PETRUCELLI + ASSOCIATES
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203 230 9007 silverpetrucelli.com

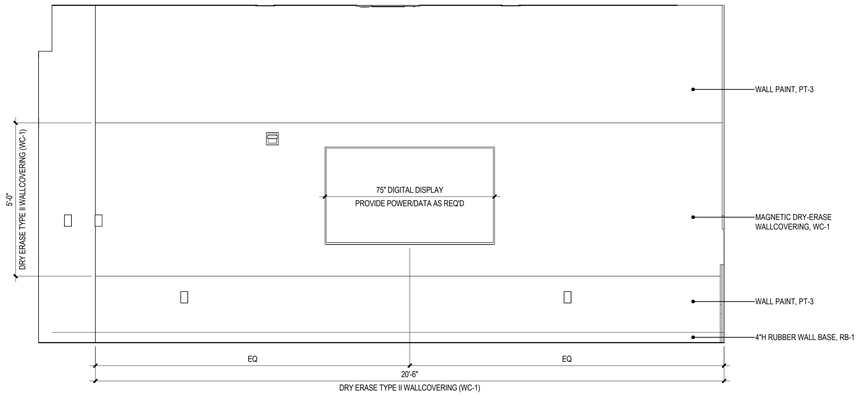
Revision:	Description:	Date:	Revised By:

Drawing Title: INTERIOR ELEVATIONS

Date: 8/29/2024
Scale: 1/2" = 1'-0"
Drawn By: JAL
Project Number: 22-382

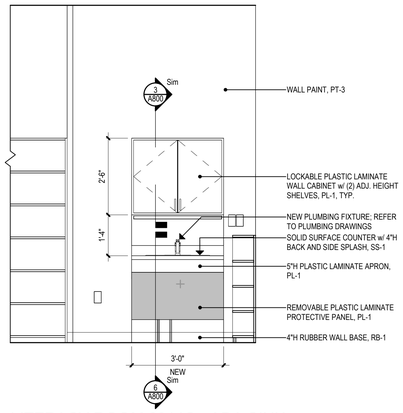
Drawing Number: A735

8/29/2024 12:23:04 PM



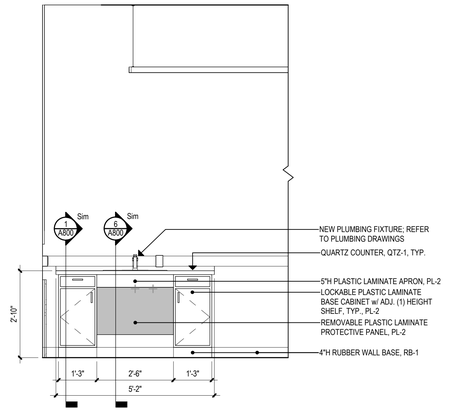
6 CONFERENCE ROOM 2012C - SOUTH

1/2" = 1'-0"



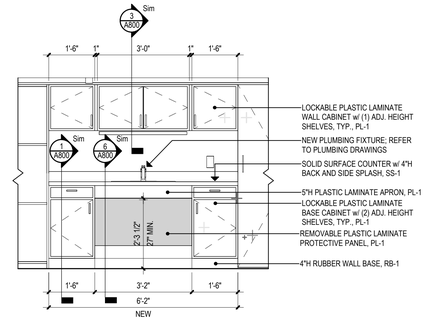
5 LITERACY ROOM 2014C - ADA SINK

1/2" = 1'-0"



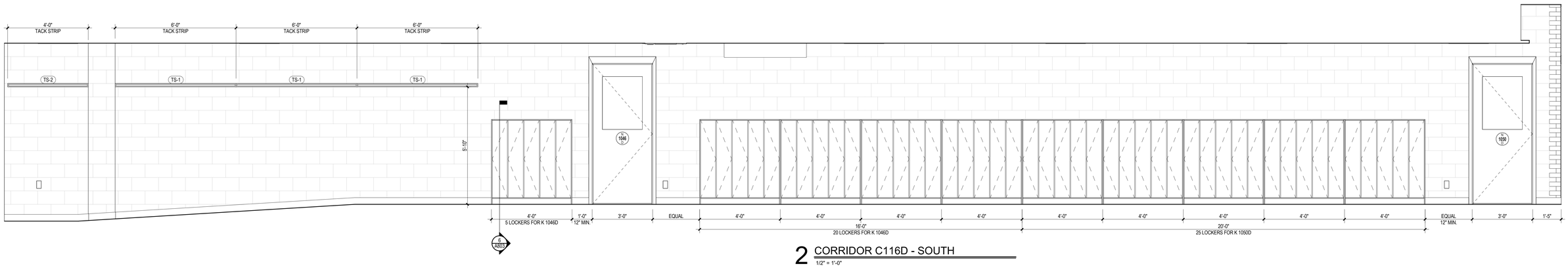
4 ASSISTANT PRINCIPAL - ADA SINK

1/2" = 1'-0"



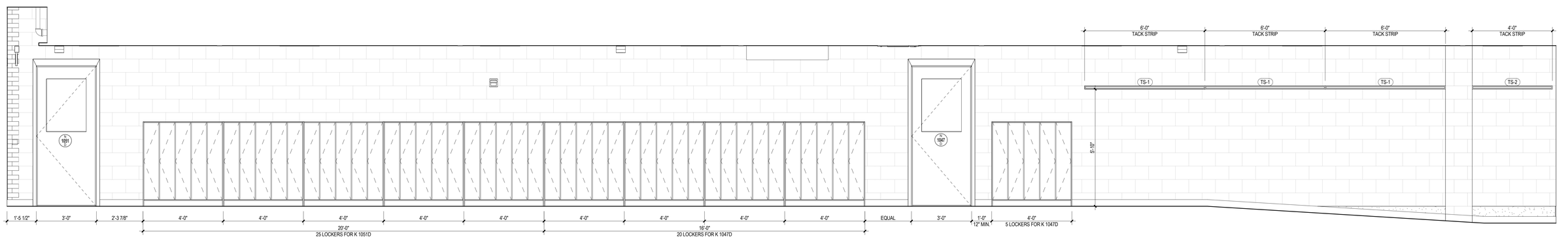
3 ALTERNATE ADA CLASSROOM SINK

1/2" = 1'-0"



2 CORRIDOR C116D - SOUTH

1/2" = 1'-0"



1 CORRIDOR C116D - NORTH

1/2" = 1'-0"

Project Title:

ADDITION & ALTERATIONS TO:
Old Greenwich School
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3190 WHITNEY AVENUE HAMDEN CT 06518
311 STATE STREET NEW LONDON CT 06320
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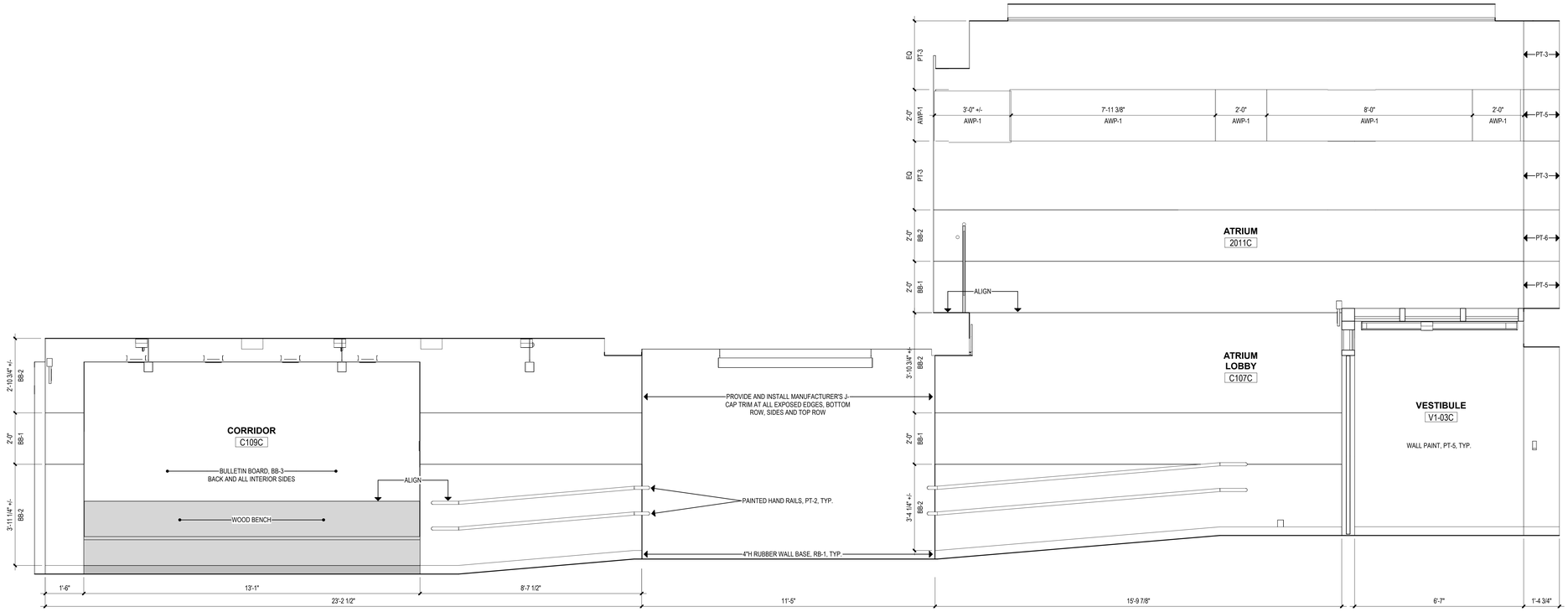
Revision:	Description:	Date:	Revised By:

Drawing Title:
INTERIOR ELEVATIONS

Date: 8/29/2024
Scale: 1/2" = 1'-0"
Drawn By: JAL
Project Number: 22-382

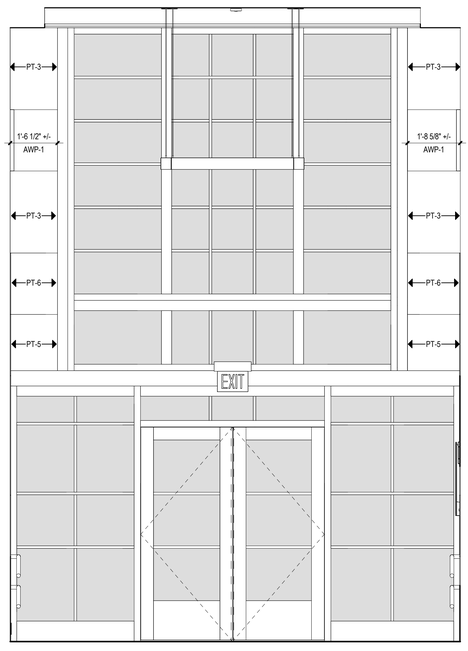
Drawing Number: A736

8/29/2024 12:23:16 PM



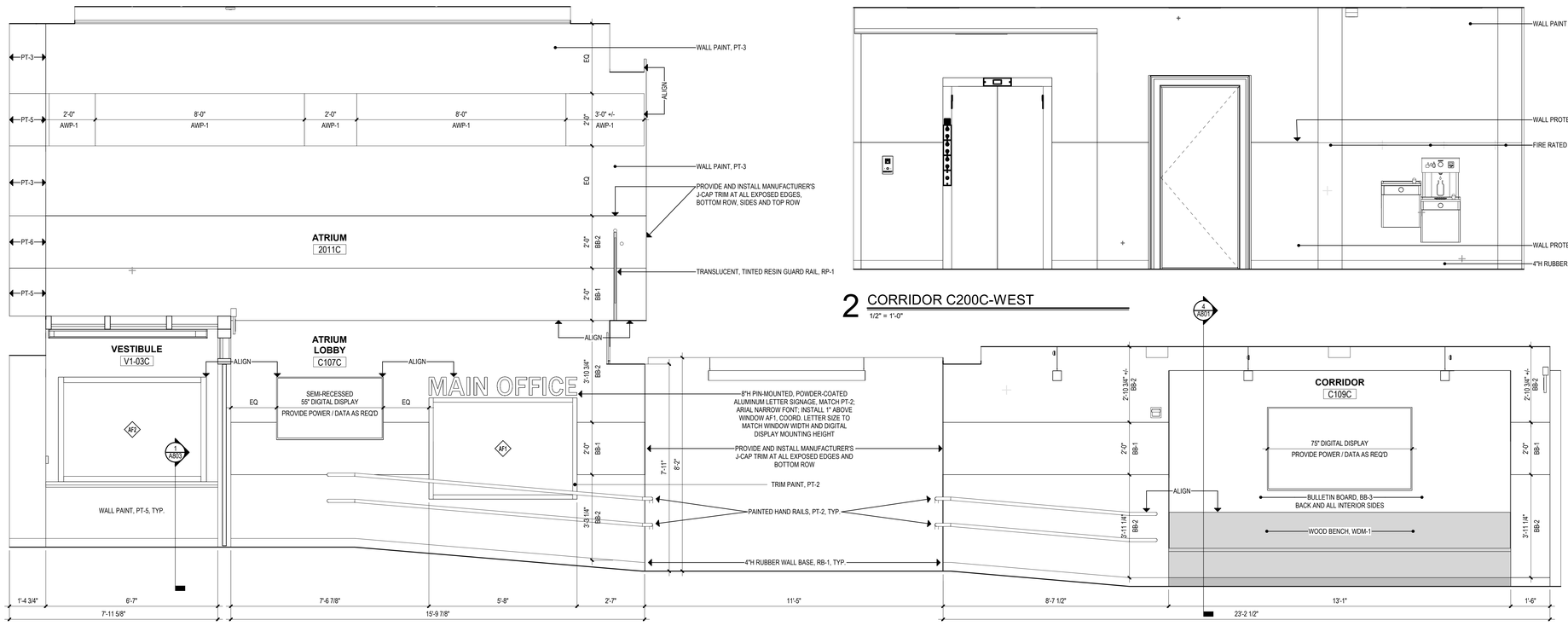
4 ATRIUM LOBBY & CORRIDOR - NORTH

1/2" = 1'-0"



3 ATRIUM LOBBY C107C - EAST

1/2" = 1'-0"



1 ATRIUM LOBBY & CORRIDOR - SOUTH

1/2" = 1'-0"

2 CORRIDOR C200C-WEST

1/2" = 1'-0"

Project Title:

ADDITION & ALTERATIONS TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

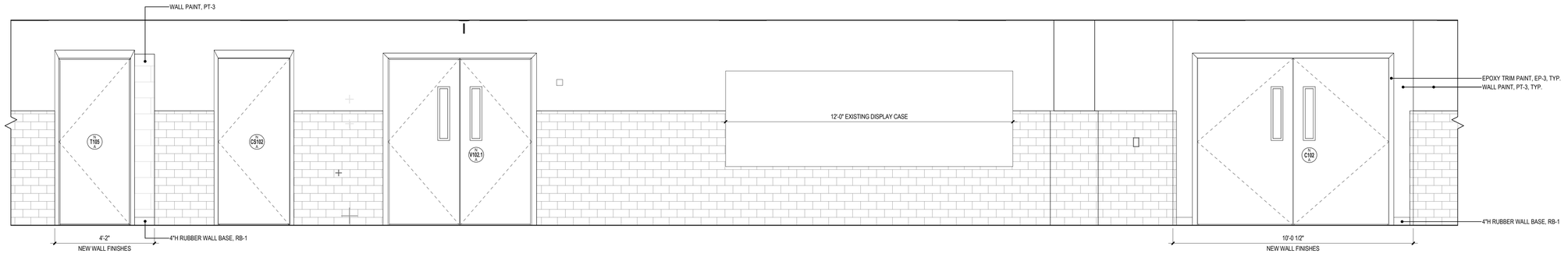
SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
311 STATE STREET NEW LONDON CT 06320
203 230 9007 silverpetrucelli.com

Revision:	Description:	Date:	Revised By:

Drawing Title: INTERIOR ELEVATIONS

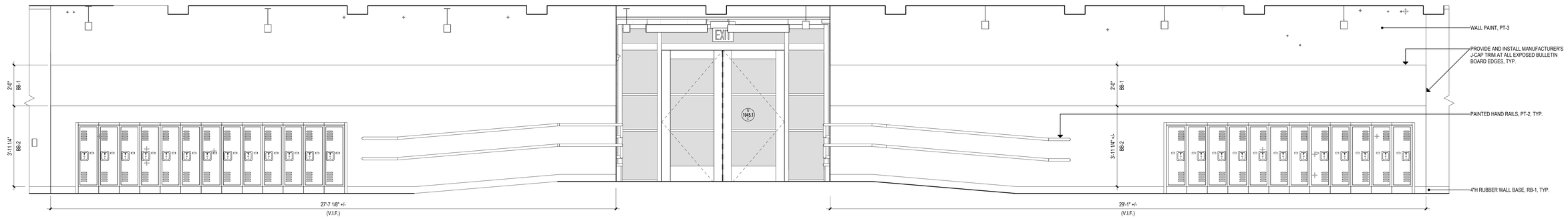
Date: 8/29/2024
Scale: 1/2" = 1'-0"
Drawn By: Author
Project Number: 22-382
Drawing Number: A737

8/29/2024 12:23:28 PM



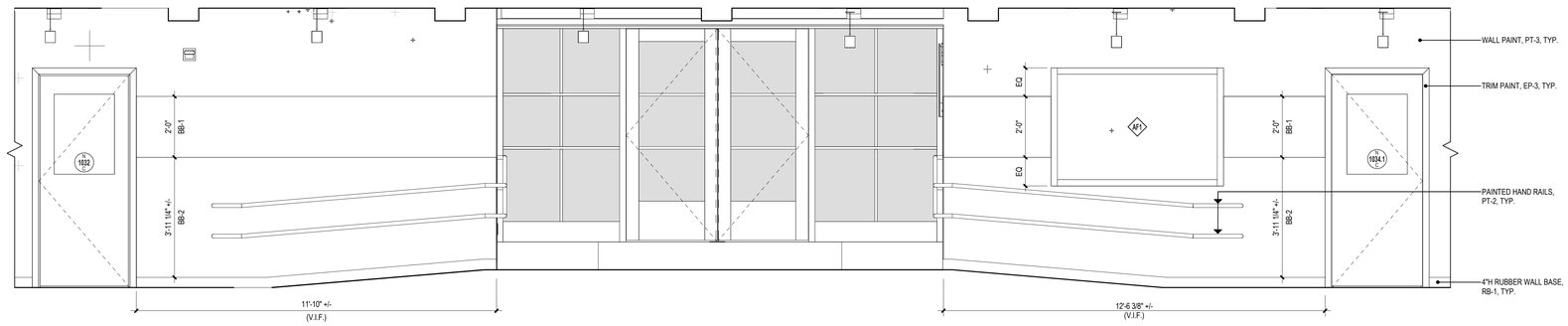
6 CORRIDOR C101A - PARTIAL ELEVATION

1/2" = 1'-0"



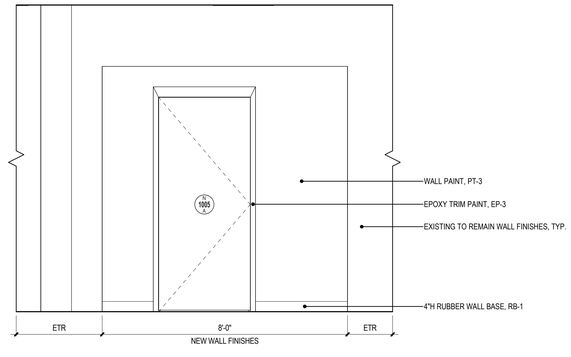
5 NORTH SOUTH CORRIDOR - WEST

1/2" = 1'-0"



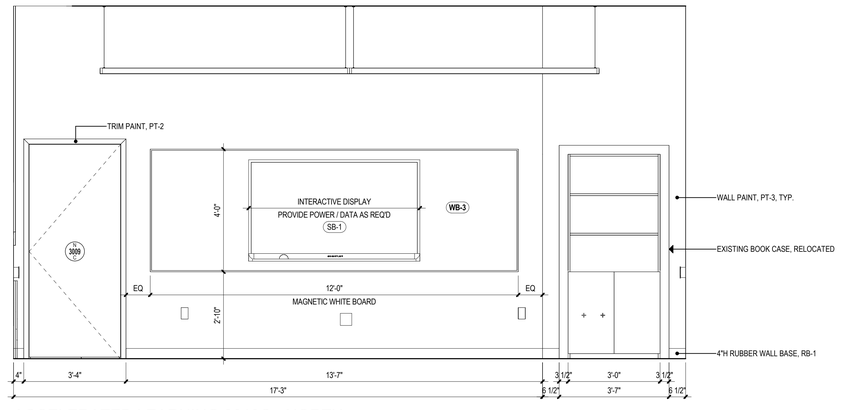
4 NORTH / SOUTH CORRIDOR - EAST

1/2" = 1'-0"



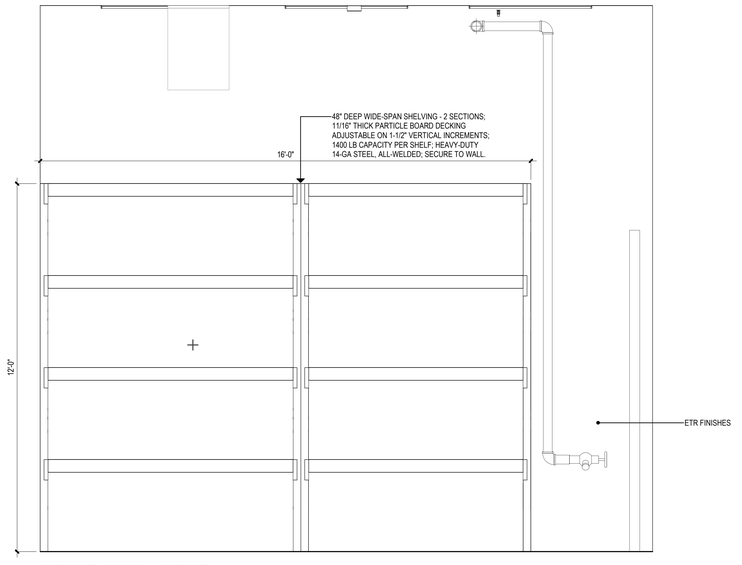
3 CORRIDOR C100A - PARTIAL ELEVATION

1/2" = 1'-0"



2 ACCELERATED LEARNING 3010C - NORTH

1/2" = 1'-0"



1 STAGE 1009A - WEST

1/2" = 1'-0"

Project Title:

ADDITION & ALTERATIONS TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

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3190 WHITNEY AVENUE HAMDEN CT 06518
311 STATE STREET NEW LONDON CT 06320
203 230 9007 silverpetrucelli.com

Revision:	Description:	Date:	Revised By:

Drawing Title: INTERIOR ELEVATIONS

Date: 8/29/2024
Scale: 1/2" = 1'-0"
Drawn By: JAL
Project Number: 22-382

Drawing Number: A738

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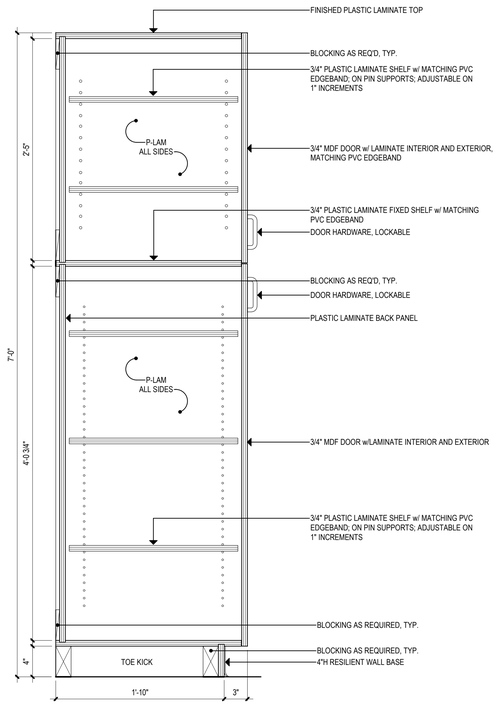
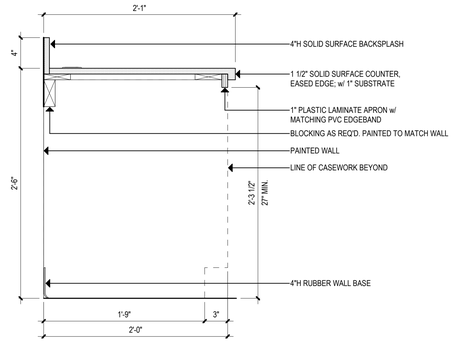
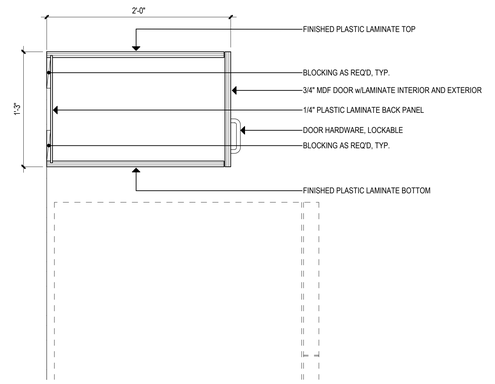


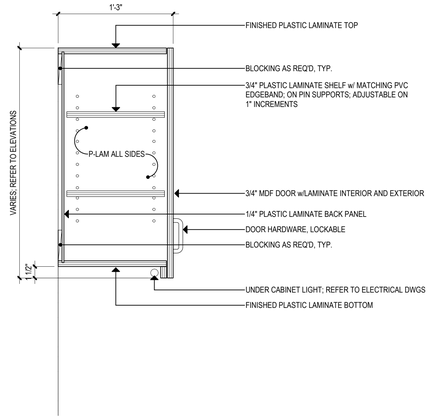
10 84"H TALL CABINET
1 1/2" = 1'-0"



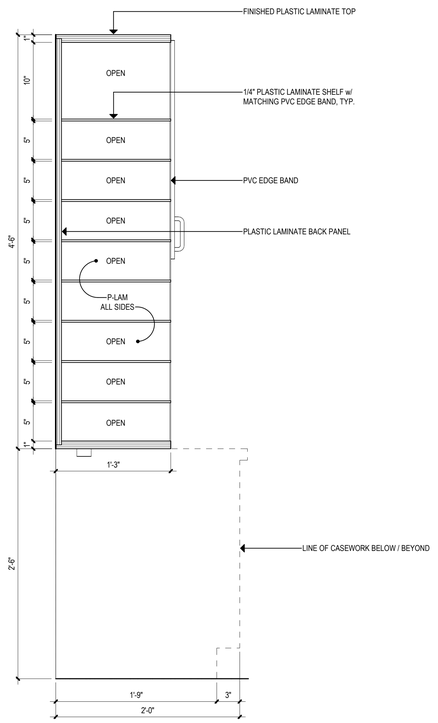
8 30"H COUNTER w/ APRON
1 1/2" = 1'-0"



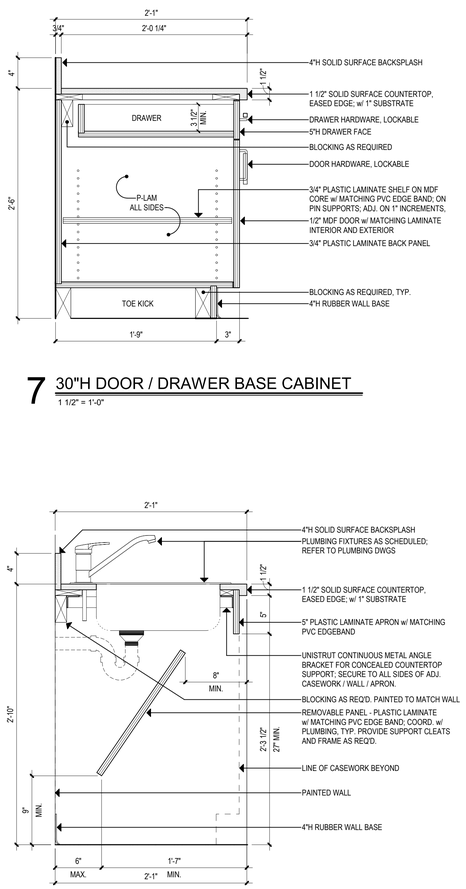
5 OVER-REFRIGERATOR WALL CABINET
1 1/2" = 1'-0"



3 TYPICAL WALL CABINET
1 1/2" = 1'-0"

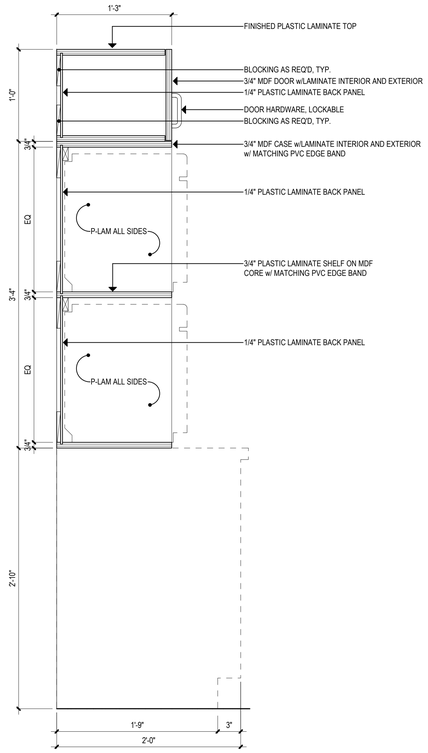


9 MAIL ROOM SORTER
1 1/2" = 1'-0"

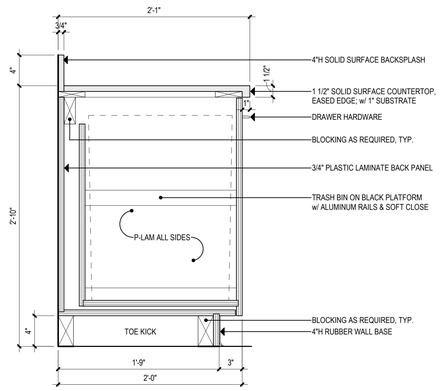


7 30"H DOOR / DRAWER BASE CABINET
1 1/2" = 1'-0"

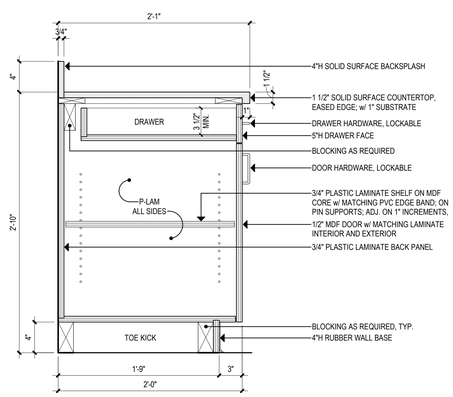
6 ADA SINK BASE CABINET
1 1/2" = 1'-0"



4 APPLIANCE CABINET
1 1/2" = 1'-0"



2 SLIDING DRAWER CABINET
1 1/2" = 1'-0"



1 TYPICAL DOOR / DRAWER BASE CABINET
1 1/2" = 1'-0"

Project Title:

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Old Greenwich School
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311 STATE STREET NEW LONDON CT 06320
203 230 9007 silverpetrucelli.com

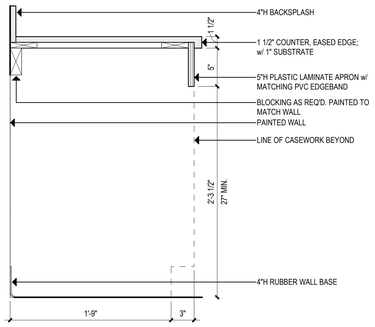
Revision:	Description:	Date:	Revised By:

Drawing Title: CASEWORK DETAILS

Date: 8/29/2024
Scale: 1 1/2" = 1'-0"
Drawn By: JAL
Project Number: 22-382

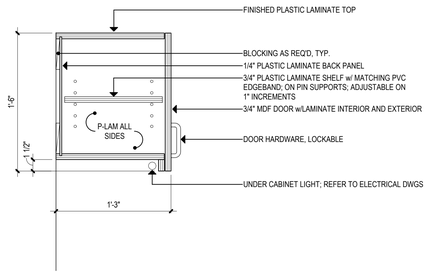
Drawing Number: A800

8/29/2024 12:23:54 PM



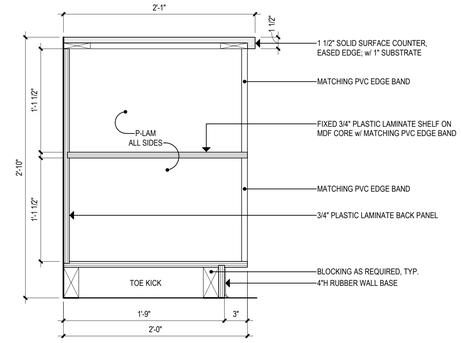
10 34"H COUNTER w/ 5" APRON

1 1/2" = 1'-0"



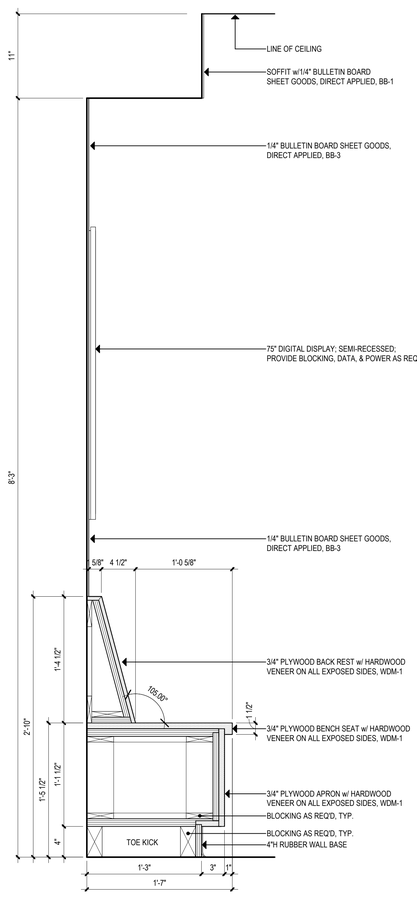
9 18"H WALL CABINET

1 1/2" = 1'-0"



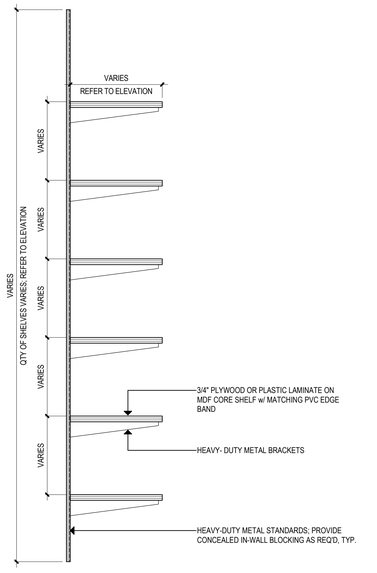
8 BOOKSHELF @ 1ST GRADE CLASSRM

1 1/2" = 1'-0"



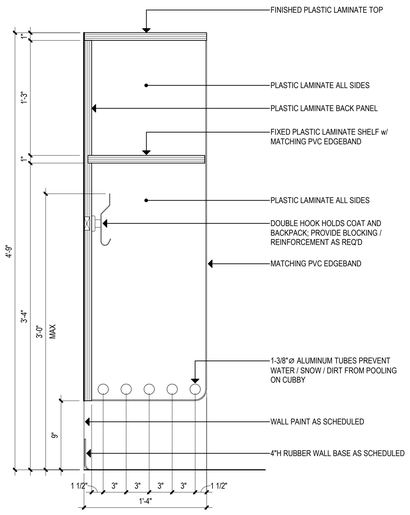
4 C109C BENCH ALCOVE

1 1/2" = 1'-0"



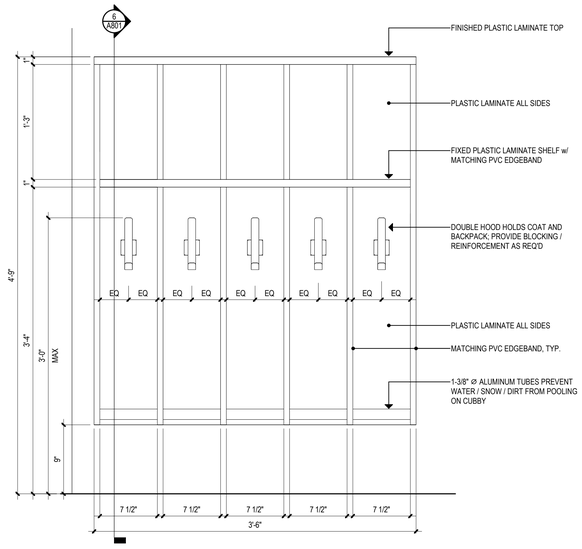
7 ADJ. HEIGHT SHELVES ON STANDARDS

1 1/2" = 1'-0"



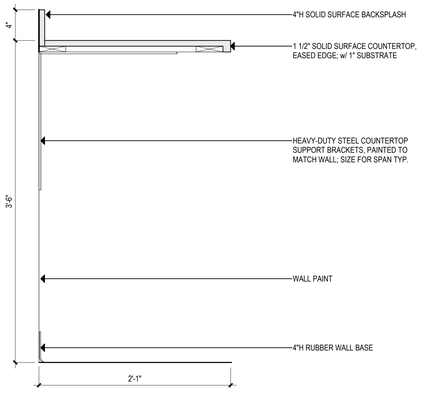
6 PRE-K CUBBIES

1 1/2" = 1'-0"



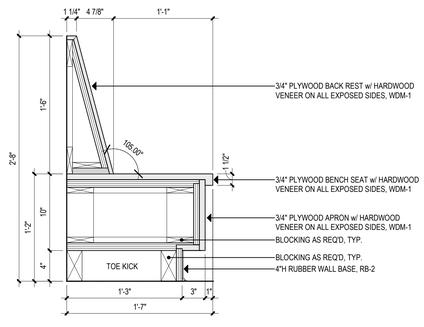
5 ENLARGED PRE-K CUBBIES

1 1/2" = 1'-0"



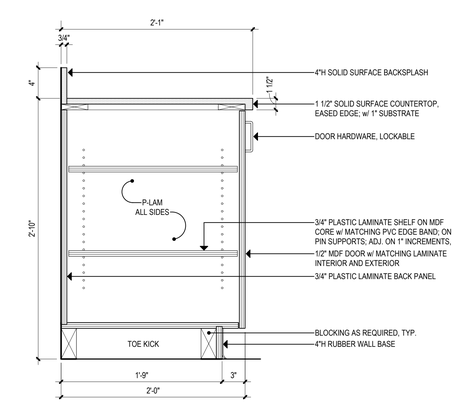
2 BAR HEIGHT COUNTER

1 1/2" = 1'-0"



3 KINDERGARTEN WINDOW BENCH

1 1/2" = 1'-0"



1 TYPICAL DOOR BASE CABINET

1 1/2" = 1'-0"

Project Title:

ADDITION & ALTERATIONS TO:
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203 230 9007 silverpetrucelli.com

Revision:	Description:	Date:	Revised By:

Drawing Title:

CASEWORK DETAILS

Date: 8/29/2024
Scale: 1 1/2" = 1'-0"
Drawn By: JAL
Project Number: 22-382

Drawing Number: A801

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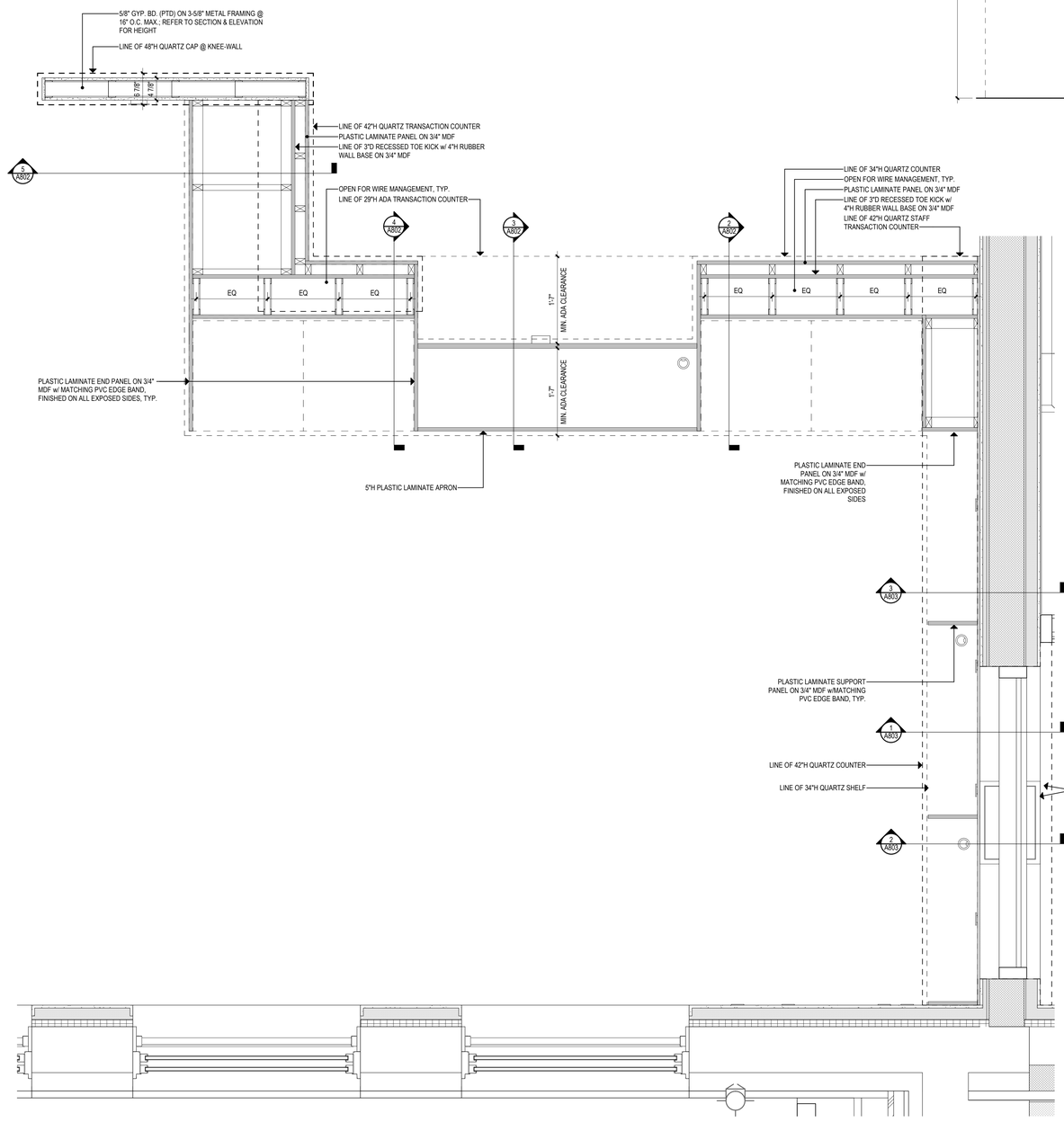
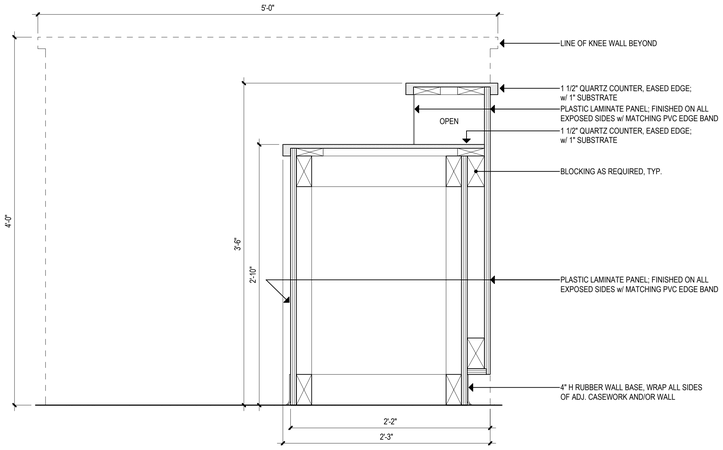


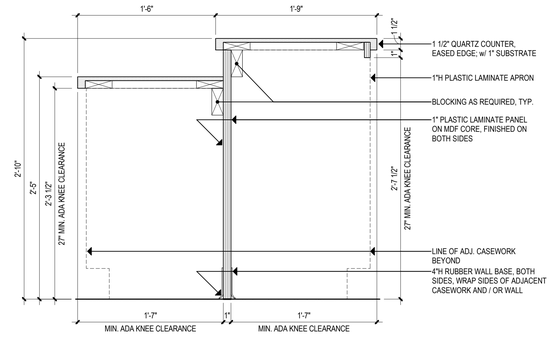
6 RECEPTION DESK CASEWORK

1" = 1'-0"



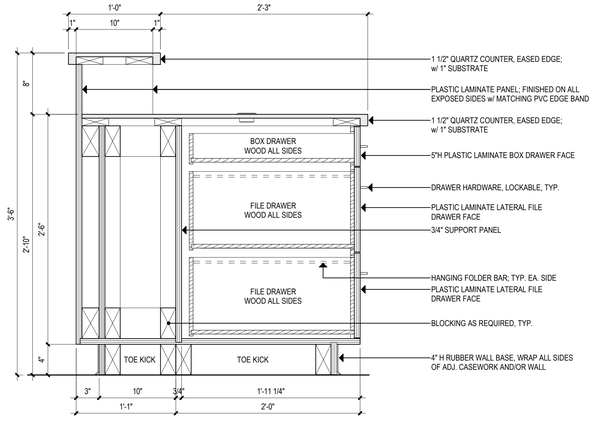
5 RECEPTION DESK - SOUTH

1 1/2" = 1'-0"



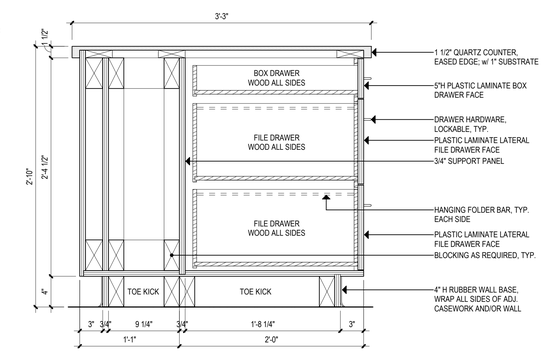
3 RECEPTION COUNTER - ADA ACCESS

1 1/2" = 1'-0"



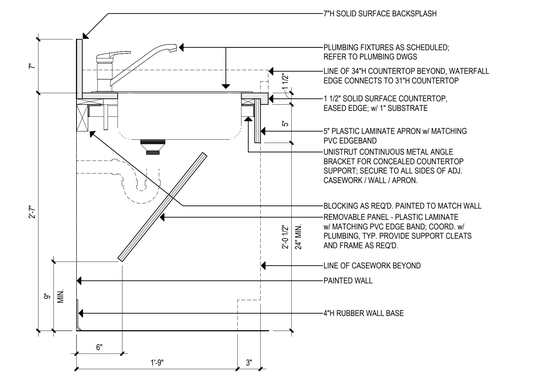
4 RECEPTION COUNTER - 42"H COUNTER

1 1/2" = 1'-0"



2 RECEPTION 34"H COUNTER - B/F/F

1 1/2" = 1'-0"



1 K CLASSROOM SINK BASE

1 1/2" = 1'-0"

Project Title:

ADDITION & ALTERATIONS TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

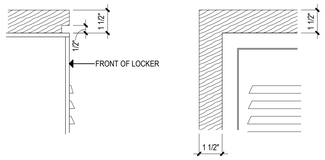
SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
311 STATE STREET NEW LONDON CT 06320
203 230 9007 silverpetrucelli.com

Revision:	Description:	Date:	Revised By:

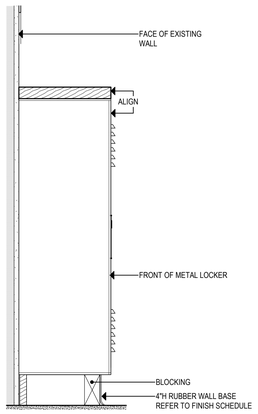
Drawing Title: CASEWORK DETAILS

Date: 8/29/2024
Scale: As indicated
Drawn By: JAL
Project Number: 22-382
Drawing Number: A802

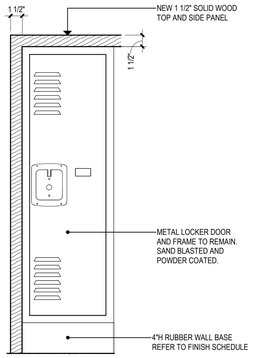
8/29/2024 12:24:33 PM



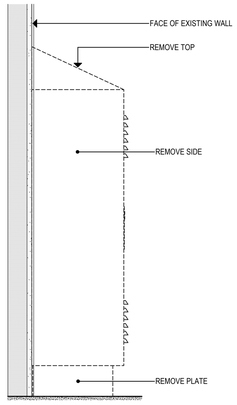
11 REFURBISHED LOCKER WOOD EDGE
3" = 1'-0"



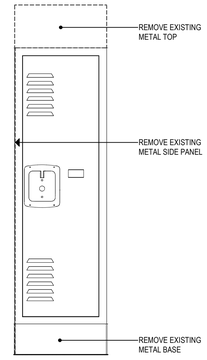
10 REFURBISHED LOCKER SECTION - NEW WORK
1 1/2" = 1'-0"



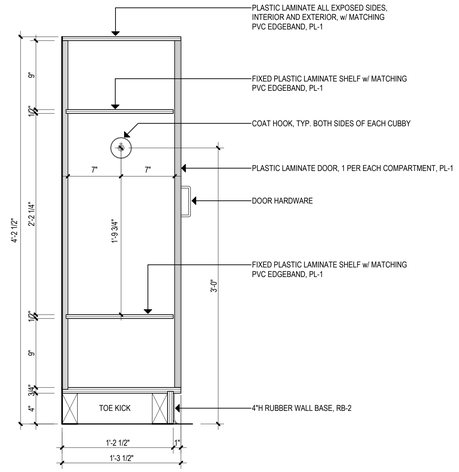
9 REFURBISHED LOCKER FRONT - NEW WORK
1 1/2" = 1'-0"



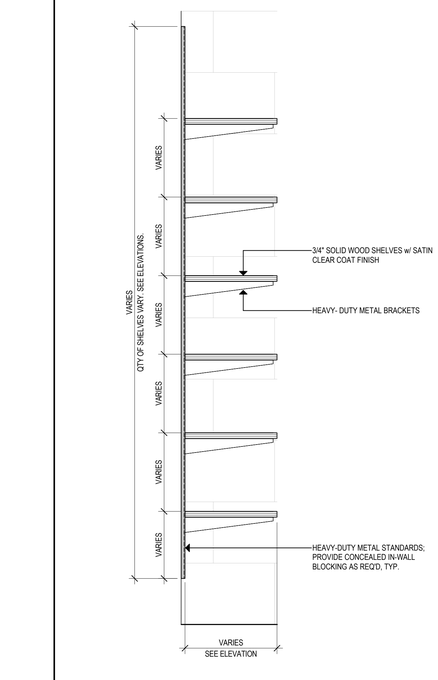
8 REFURBISHED LOCKER SIDE - DEMO
1 1/2" = 1'-0"



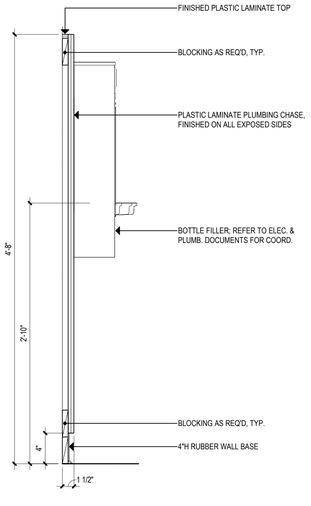
7 REFURBISHED LOCKER FRONT- DEMO
1 1/2" = 1'-0"



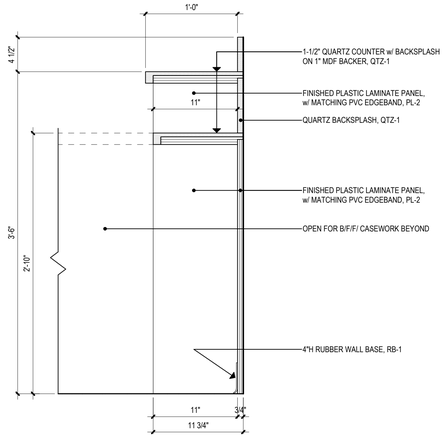
6 KINDERGARTEN LOCKERS
1 1/2" = 1'-0"



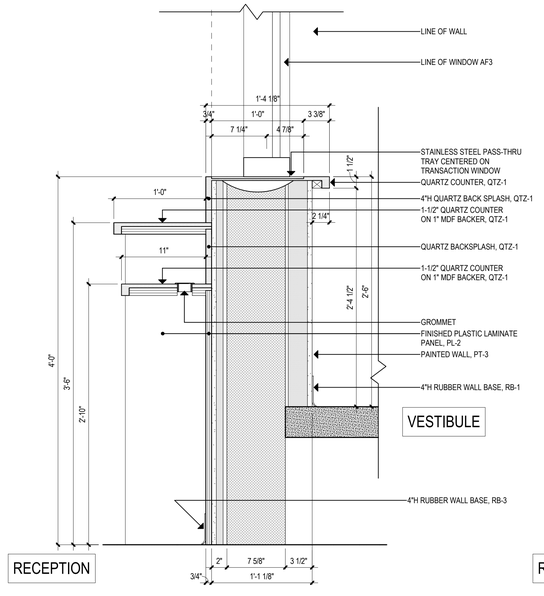
5 SHELVES ON STANDARDS
1 1/2" = 1'-0"



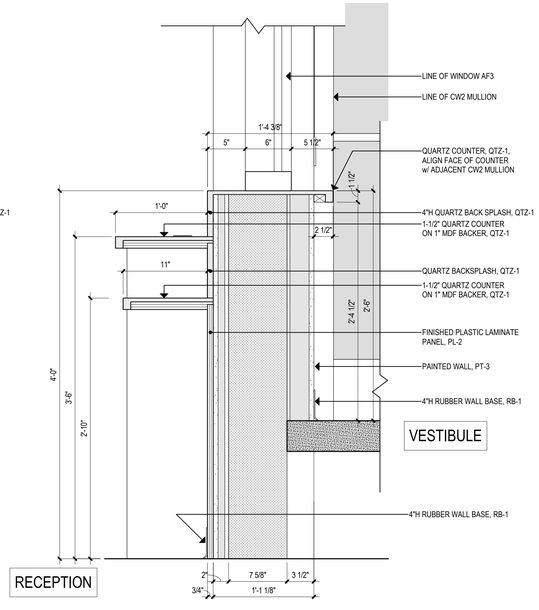
4 BOTTLE FILLER P-LAM PLUMBING CHASE
1 1/2" = 1'-0"



3 RECEPTION COUNTER - STAFF COUNTER
1 1/2" = 1'-0"



2 REC. COUNTER @ PASS-THRU TRAY
1 1/2" = 1'-0"



1 REC. COUNTER @ VEST. WINDOW
1 1/2" = 1'-0"

Project Title:

ADDITION & ALTERATIONS TO:
Old Greenwich School
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203 230 9007 silverpetrucelli.com

Revision: | Description: | Date: | Revised By:

Drawing Title: CASEWORK DETAILS

Date: 8/29/2024
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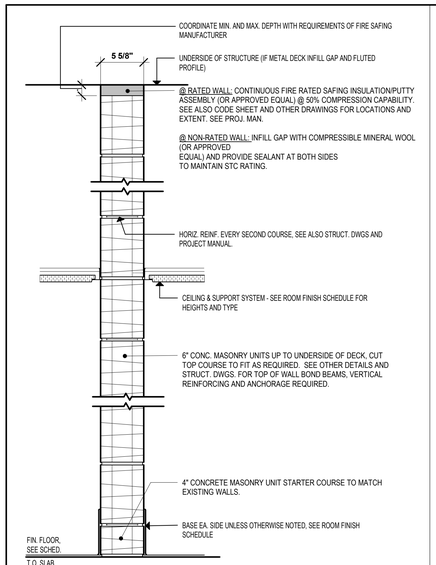
Drawn By: JAL
Project Number: 22-382
Drawing Number: A803

8/29/2024 12:24:54 PM



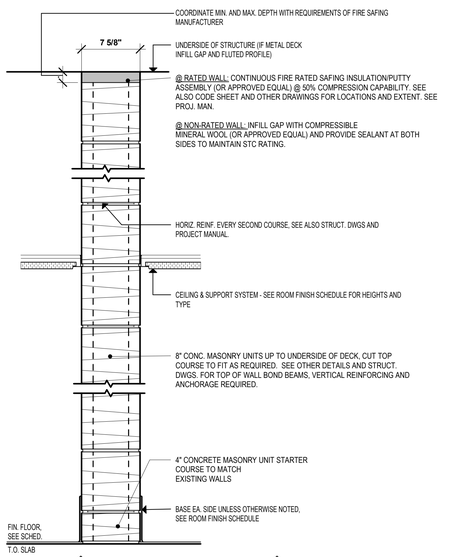
TYPE M6A — SEE GENERAL NOTES ON THIS SHEET
STC RATING: 46 MINIMUM

TYPE M6B — SEE GENERAL NOTES ON THIS SHEET
STC RATING: 51 MINIMUM
(ALL CORES GROUTED AND PACKED SOLID WITH MORTAR)

TYPE M6C — SEE GENERAL NOTES ON THIS SHEET
1HR RATED - UL #U905
STC RATING: 46 MINIMUM

TYPE M6D — SEE GENERAL NOTES ON THIS SHEET
1HR RATED - UL #U905, STC RATING: 51 MINIMUM (ALL CORES GROUTED AND PACKED SOLID WITH MORTAR)

TYPE M6E — SEE GENERAL NOTES ON THIS SHEET
2HR RATED - UL #U906, STC RATING: 51 MINIMUM (ALL CORES GROUTED AND PACKED SOLID WITH MORTAR)



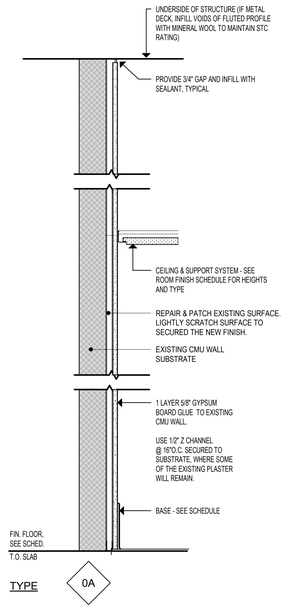
TYPE M8A — SEE GENERAL NOTES ON THIS SHEET
STC RATING: 48 MINIMUM

TYPE M8B — SEE GENERAL NOTES ON THIS SHEET
STC RATING: 55 MINIMUM
(ALL CORES GROUTED AND PACKED SOLID WITH MORTAR)

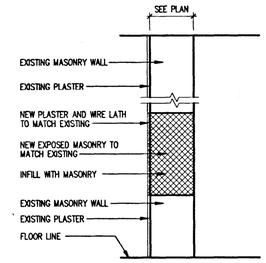
TYPE M8C — SEE GENERAL NOTES ON THIS SHEET
1HR RATED - UL #U905
STC RATING: 48 MINIMUM

TYPE M8D — SEE GENERAL NOTES ON THIS SHEET
1HR RATED - UL #U905, STC RATING: 55 MINIMUM (ALL CORES GROUTED AND PACKED SOLID WITH MORTAR)

TYPE M8E — SEE GENERAL NOTES ON THIS SHEET
2HR RATED - UL #U955, STC RATING: 55 MINIMUM (ALL CORES GROUTED AND PACKED SOLID WITH MORTAR)

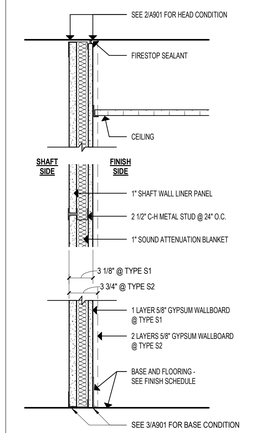


TYPE 0A



TYPE P1 — AS SHOWN

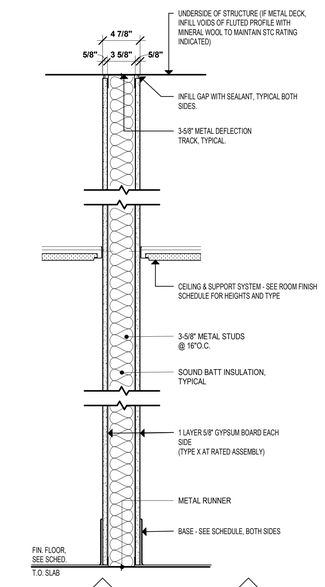
TYPE P2 — PLASTER FINISH ON BOTH SIDES



SOUND RATED SHAFT WALL - SEE BELOW FOR STC REFER TO NOTE 2

TYPE S1
AS SHOWN - 1 LAYER 5/8" GYPSUM WALLBOARD
1 HOUR RATED (UL DESIGN NO. U415, SYSTEM A) STC 41-44 EST.

TYPE S2
AS SHOWN - 2 LAYERS 5/8" GYPSUM WALLBOARD
2 HOUR RATED (UL DESIGN NO. U415, SYSTEM B)
STC 43-46 EST.

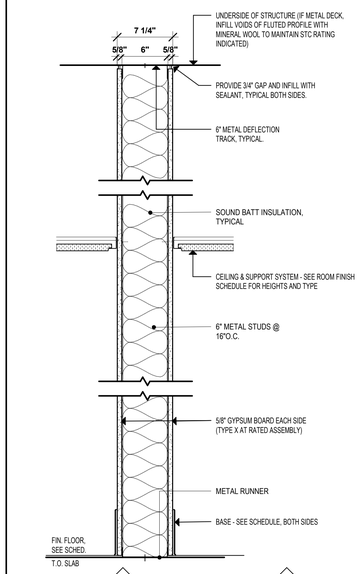


TYPE 3A
STC RATING: 45 MINIMUM

TYPE 3B
OMIT GWB LAYER ON CHASE SIDE

TYPE 3C
1HR RATED - UL #U419
STC RATING: 45 MINIMUM

SEE GENERAL NOTES ON THIS SHEET

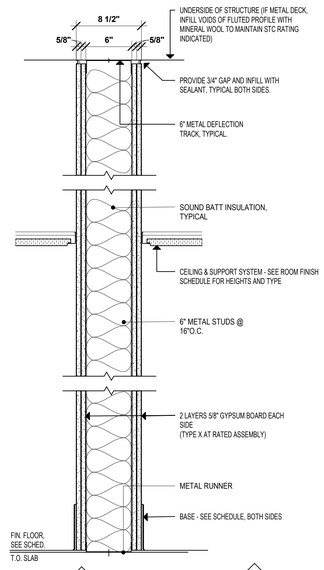


TYPE 5A
STC RATING: 45 MINIMUM

TYPE 5B
OMIT GWB LAYER ON CHASE SIDE

TYPE 5C
1HR RATED - UL #U419
STC RATING: 45 MINIMUM

SEE GENERAL NOTES ON THIS SHEET

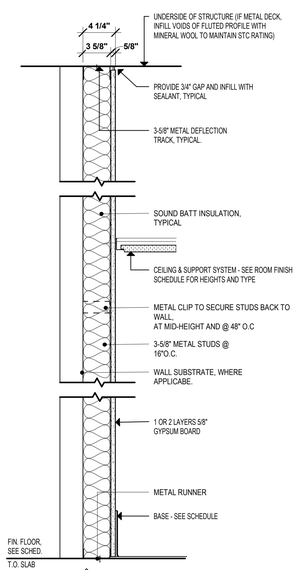


TYPE 6A
STC RATING: 53 MINIMUM

TYPE 6B
OMIT GWB LAYERS ON CHASE SIDE

TYPE 6C
2HR RATED - UL #U419
STC RATING: 53 MINIMUM

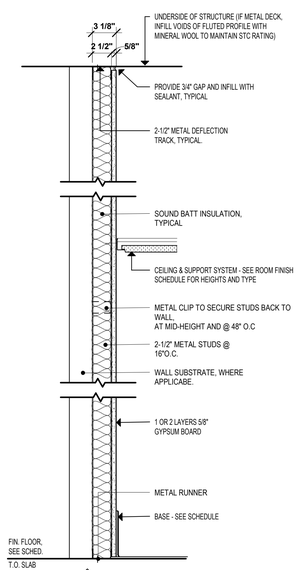
SEE GENERAL NOTES ON THIS SHEET



TYPE 7A

SEE GENERAL NOTES ON THIS SHEET

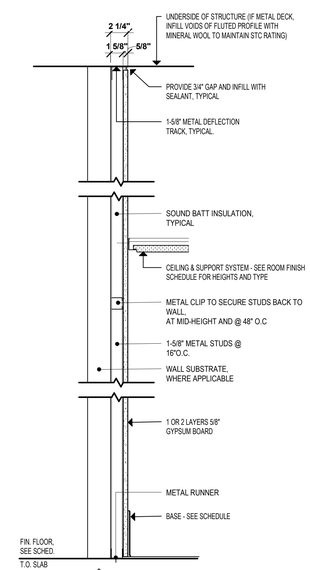
TYPE 7B
SAME AS 7A BUT PROVIDE TWO LAYERS OF 5/8" GWB ON ONE SIDE ONLY



TYPE 8A

SEE GENERAL NOTES ON THIS SHEET

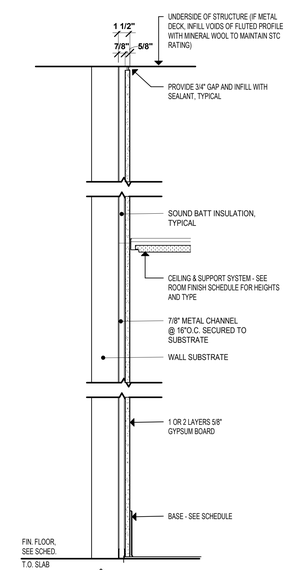
TYPE 8B
SAME AS 8A BUT PROVIDE TWO LAYERS OF 5/8" GWB ON ONE SIDE ONLY



TYPE 9A

SEE GENERAL NOTES ON THIS SHEET

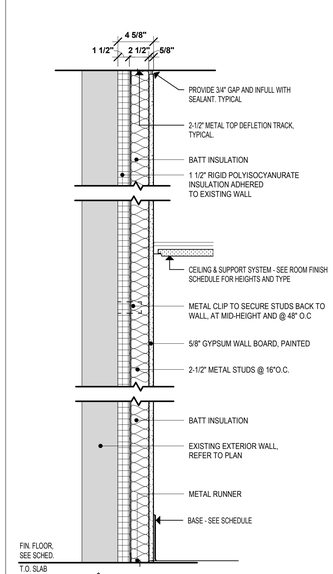
TYPE 9B
SAME AS 9A BUT PROVIDE TWO LAYERS OF 5/8" GWB ON ONE SIDE ONLY



TYPE 11A

SEE GENERAL NOTES ON THIS SHEET

TYPE 11B
SAME AS 8A BUT PROVIDE TWO LAYERS OF 5/8" GWB ON ONE SIDE ONLY



TYPE 12A
EXT.

SEE GENERAL NOTES ON THIS SHEET

Project Title:

ADDITION & ALTERATIONS TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
311 STATE STREET NEW LONDON CT 06320
203 230 9007 silverpetrucelli.com

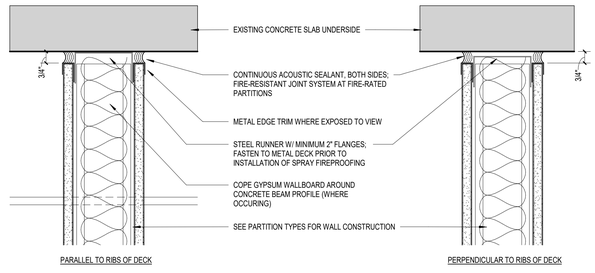
Revision:	Description:	Date:	Revised By:

Drawing Title:
PARTITION TYPES

Date: 8/29/2024
Scale: 1 1/2" = 1'-0"
Drawn By: JM
Project Number: 22-382

Drawing Number:
A900

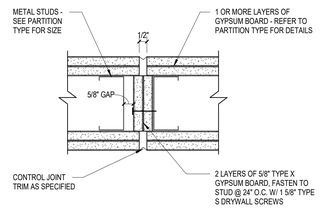
8/30/2024 8:42:27 AM



NOTE: FASTEN STEEL RUNNER TO CONCRETE DECK; FRICTION FIT METAL STUDS TO RUNNER AND FASTEN GYPSUM WALLBOARD TO STUDS (DO NOT FASTEN TO RUNNER); MAINTAIN GAP AS INDICATED BETWEEN CONCRETE DECK AND METAL STUD / GYPSUM WALLBOARD TO ACCOMODATE DEFLECTION OF STRUCTURE

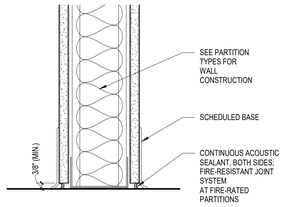
2 TYPICAL HEADS AT METAL STUD PARTITIONS

3" = 1'-0"



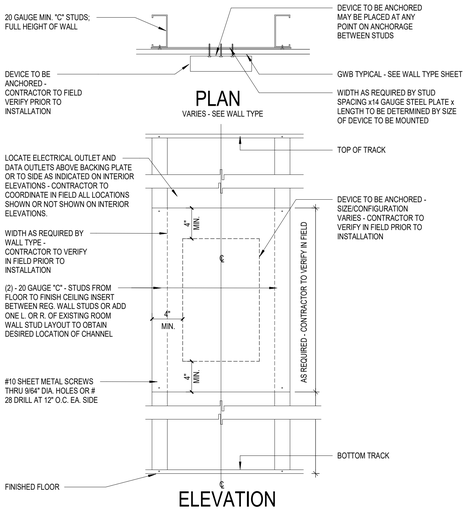
4 TYP CONTROL JT. @ MTL. STUD PARTITIONS

3" = 1'-0"



3 TYP BASE AT METAL STUD PARTITIONS

3" = 1'-0"



1 BLOCKING FOR WALL MOUNTED DEVICES

1 1/2" = 1'-0"

Project Title:

ADDITION & ALTERATIONS TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

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Revision:	Description:	Date:	Revised By:

Drawing Title: PARTITION TYPES

Date: 8/29/2024
Scale: As indicated
Drawn By: Author
Project Number: 22-382

Drawing Number: A901

8/30/2024 8:42:39 AM

DOOR SCHEDULE - 1st FLOOR

| DOOR | | | | | | | | | | | | | | | | | | FRAME | | | | | | | | | FIRE RATING | | | | HARDWARE - SEE SPECIFICATIONS | | | | | | | | | | | | | | | | | |

DOOR SCHEDULE - 2nd FLOOR

DOOR														FRAME							FIRE RATING				HARDWARE - SEE SPECIFICATIONS																		
																										FIRE CODE					DISABLED REQUIREMENTS											
DOOR NUMBER	DOOR KEYNOTE STATUS	BUILDING PART AREA	FROM ROOM No.	TO ROOM No.	DOUBLE LEAF DOOR	UNEVEN DOUBLE LEAF	WIDTH	HEIGHT	DOOR TYPE	DOOR MATERIAL	DOOR FINISH	DOOR GLAZING	FRAME TYPE	FRAME MATERIAL	FRAME FINISH	HEAD DETAIL	JAMB DETAIL	SADDLE DETAIL	FRAME GLAZING	20 MINUTE LABELED	45 MINUTE LABELED	60 MINUTE LABELED	90 MINUTE LABELED	NOT REQUIRED	PANIC/EXIT DEVICE	POSITIVE LATCHING	AUTOMATIC CLOSER	ELECTRO-MAGNETIC HOLD	DELAYED ACTION CLOSER	PUSH PLATE/PULL HANDLES	ALARMED EXIT - SEE ELEC.	POWER ASSIST. OPERATOR	LEVER HANDLES	KICK PLATE	TACTILE WARNING	ACCESSIBLE THRESHOLD	SIGNAGE TYPE - SEE A930	SIGNAGE TEXT	REMARKS
2000	ECK	A	2000A	2004B			3' - 0"	7' - 0"	N8	WD	STN	EX	HM-2	HM	PTD	EX	EX	B	N/A					○	○	○		○			○	○	○			S8		
2001	ECK	A	2004B	2001A			3' - 0"	7' - 0"	N8	WD	STN	EX	EX	HM	PTD	EX	EX	B	EX					○				○			○	○	○			S8		
2002	ELK	A	2002A	2004B			3' - 0"	7' - 0"	F	HM	PTD	EX	HM-2	HM	PTD	EX	EX	B	N/A					○	○	○		○			○	○	○			S8		
2003	ECK	B	2003B	2004B			3' - 0"	7' - 0"	N8	WD	STN	EX	EX	HM	PTD	EX	EX	B	EX					○		○		○			○	○				S8		
2004	N	B	2004B	C200C	●		6' - 0"	7' - 0"	AL1	AL	PRE-FIN	GL-5	AF4	AL	PRE-FIN			B	GL-5					●	●	●					●	●		●		S1		
2006	ECK	B	2004B	2006B			2' - 8"	7' - 0"	F	WD	STN	EX	HM-2	HM	PTD	EX	EX	B	N/A					○				○			○	○				S8		
2007	N	C	2008C	2007C			3' - 0"	7' - 0"	N8	WD	STN	GL-5	HM-2	HM	PTD			B	N/A					●					●			●	●				S8		
2008	N	C	C200C	2008C			3' - 0"	7' - 0"	F	WD	STN	N/A	HM-1	HM	PTD			B	N/A					●					●			●	●				S8		
2009	N	C	2009C	C200C			3' - 0"	7' - 0"	F	WD	STN	GL-5	HM-3	HM	PTD			B	N/A																			S8		
2010.1	N	C	C200C	2010C			3' - 0"	7' - 0"	N8	WD	STN	GL-5	HM-3	HM	PTD			B	N/A																			S8		
2010.2	N	C	2010C	2008C			3' - 0"	7' - 0"	N8	WD	STN	GL-5	HM-2	HM	PTD			B	N/A					●					●			●	●						
2012	N	C	2012C	C200C			6' - 0"	7' - 0"																																
2013	N	C	2013C	C200C			3' - 0"	7' - 0"	HG	WD	STN	GL-5	HM-3	HM	PTD			B	GL-5					●													S8		
2014	N	C	C200C	2014C			3' - 0"	7' - 0"	HG	WD	STN	GL-5	HM-3	HM	PTD			B	GL-5					●													S8		
2015	N	C	C200C	2015C			3' - 0"	7' - 0"	N8	WD	STN	GL-5	HM-1	HM	PTD			B	N/A					●					●			●	●				S8		
2016	EDL	C	2016C	2018C			2' - 8"	6' - 8"	EX	WD	PTD	N/A	EX	WD	PTD	EX	EX	B	N/A					○		●					●	●						
2017	EDL	C	2017C	2018C			2' - 8"	6' - 8"	EX	WD	PTD	N/A	EX	WD	PTD	EX	EX	B	N/A					○		●					●	●						
2018	EDL	C	2018C	C200C			3' - 0"	7' - 0"	HG	WD	STN	EX	EX	WD	PTD	EX	EX	B	N/A					○				○			●	●				S8	2nd GRADE	
2019	EDL	C	2019C	2021C			2' - 8"	6' - 8"	EX	WD	PTD	N/A	EX	WD	PTD	EX	EX	B	N/A					○		●					●	●						
2020	EDL	C	2020C	2021C			2' - 8"	6' - 8"	EX	WD	PTD	N/A	EX	WD	PTD	EX	EX	B	N/A					○		●					●	●						
2021	ECK	C	2021C	C200C			3' - 0"	7' - 0"	HG	WD	STN	EX	EX	WD	PTD	EX	EX	B	EX					○				○			●	○				S8	2nd GRADE	
2022.1	ELK	C	2022C	C201C			5' - 0"	7' - 0"	F	WD	STN	N/A	HM-2	HM	PTD	EX	EX	B	N/A					○							●		●					
2022.2	ELK	C	2022C	C201C			6' - 0"	7' - 0"	F	WD	STN	N/A	HM-2	HM	PTD	EX	EX	B	N/A					○							●		●					
2023	ELK	C		C201C			6' - 0"	7' - 0"	F	WD	STN	N/A	HM-2	HM	PTD	EX	EX	B	N/A					○							●		●					
2024	N	C	2024C	C201C			3' - 0"	7' - 0"	HG	WD	STN	N/A	HM-3	HM	PTD			B	GL-5																			S8	2nd GRADE	
CS2.01	N	C	CS2-01	C200C			3' - 0"	7' - 0"	F	WD	STN	N/A	HM-1	HM	PTD			C	N/A					●					●		●	●	●						
CS2.02	ELK	C	C201C	CS2-02			2' - 6"	7' - 0"	F	WD	STN	N/A	HM-2	HM	PTD	EX	EX	B	N/A					○							●		●					
S102	N	A	2004B	S1-2A	●		6' - 0"	7' - 0"	N4	WD	STN	GL-6	HM-2	HM	PTD			B	N/A		●				●	●	●					●	●		●	S1	STAIR #		
S202	N	B	C200C	S2-2B	●		6' - 0"	7' - 0"	N4	WD	STN	GL-6	HM-2	HM	PTD			B	N/A		●				●	●	●					●	●		●	S1	STAIR #		
S302	N	C	C200C	S3-2C	●		6' - 0"	7' - 0"	N4	WD	STN	GL-6	HM-2	HM	PTD			B	N/A					●		●	●					●	●		●	S1	STAIR #		
T2.01	N	B	C200C	T2-01			3' - 0"	7' - 0"	F	WD	STN	N/A	HM-2	HM	PTD			C	N/A					●						●									
T2.02	N	C	T2-02	C200C			3' - 0"	7' - 0"	F	WD	STN	N/A	HM-1	HM	PTD			C	N/A					●						●									
T2.03	N	C	C200C	T2-03			3' - 0"	7' - 0"	F	WD	STN	N/A	HM-2	HM	PTD			C	N/A					●						●									
T2.04	N	C	C200C	T2-04			3' - 0"	7' - 0"	F	WD	STN	N/A	HM-2	HM	PTD			C	N/A					●						●						S3	WOMEN		
T3.05			C200C	2010C																																		
T3.12			C200C	T2-01																																		

DOOR SCHEDULE - 3rd FLOOR

DOOR														FRAME							FIRE RATING				HARDWARE - SEE SPECIFICATIONS																		
																										FIRE CODE					DISABLED REQUIREMENTS											
DOOR NUMBER	DOOR KEYNOTE STATUS	BUILDING PART AREA	FROM ROOM No.	TO ROOM No.	DOUBLE LEAF DOOR	UNEVEN DOUBLE LEAF	WIDTH	HEIGHT	DOOR TYPE	DOOR MATERIAL	DOOR FINISH	DOOR GLAZING	FRAME TYPE	FRAME MATERIAL	FRAME FINISH	HEAD DETAIL	JAMB DETAIL	SADDLE DETAIL	FRAME GLAZING	20 MINUTE LABELED	45 MINUTE LABELED	60 MINUTE LABELED	90 MINUTE LABELED	NOT REQUIRED	PANIC/EXIT DEVICE	POSITIVE LATCHING	AUTOMATIC CLOSER	ELECTRO-MAGNETIC HOLD	DELAYED ACTION CLOSER	PUSH PLATE/PULL HANDLES	ALARMED EXIT - SEE ELEC.	POWER ASSIST. OPERATOR	LEVER HANDLES	KICK PLATE	TACTILE WARNING	ACCESSIBLE THRESHOLD	SIGNAGE TYPE - SEE A930	SIGNAGE TEXT	REMARKS
3000	ELK	A	3000A	C300B			3' - 0"	7' - 0"	F	HM	PTD	N/A	HM-2	HM	PTD	EX	EX	B	N/A						○	○						○	○	●			S1	STORAGE	
3001	N	B	3001B	C300B			3' - 0"	7' - 0"	HG	WD	STN	GL-5	HM-3	HM	PTD			B	N/A					●	●	●	●					●	●				S8	5th GRADE	
3002	ECK	B	3002B	C300B			3' - 0"	7' - 0"	HG	WD	STN	EX	EX	WD	PTD	EX	EX	B	EX					○		○	○					○	○				S8	5th GRADE	
3003	ECK	B	3003B	C301B			3' - 0"	7' - 0"	HG	WD	STN	EX	EX	WD	PTD	EX	EX	B	EX					○		○	○					○	○				S8	5th GRADE	
3004	EDL	B	3003B	3004B			2' - 8"	6' - 8"	EX	WD	PTD	N/A	EX	WD	PTD	EX	EX	B	N/A					○	●	●	●					●	●						
3005	EDL	B	3005B	3003B			2' - 8"	6' - 8"	EX	WD	PTD	N/A	EX	WD	PTD	EX	EX	B	N/A					○	●	●	●					●	●						
3006	ECK	B	3006B	C301B			3' - 0"	7' - 0"	HG	WD	STN	EX	EX	WD	PTD	EX	EX	B	EX					○		○	○					○	○				S8	4th GRADE	
3007	EDL	B	3007B	3006B			2' - 8"	6' - 8"	EX	WD	PTD	N/A	EX	WD	PTD	EX	EX	B	N/A					○	●	●	●					●	●						
3008	EDL	B	3008B	3006B			2' - 8"	6' - 8"	EX	WD	PTD	N/A	EX	WD	PTD	EX	EX	B	N/A					○	●	●	●					●	●						
3009	N	C	3009C	3010C			3' - 0"	7' - 0"	F	WD	STN	N/A	HM-2	HM	PTD			B	N/A					●		●	●					●	●	●					
3010	N	C	3010C	C301B			3' - 0"	7' - 0"	HG	WD	STN	GL-5	HM-3	HM	PTD			B	GL-5					●	●	●	●					●	●				S8	ACCELERATED LEARNING	
3011	ECK	C	3011C	C301B			3' - 0"	7' - 0"	HG	WD	STN	EX	EX	WD	PTD	EX	EX	B	EX					○		○	○					○	○				S8	4th GRADE	
3012.1	N	C	3012C	C301B			3' - 0"	7' - 0"	HG	WD	STN	GL-5	HM-3	HM	PTD			B	GL-5					●	●	●	●					●	●				S8	SPECIAL EDUCATION	
3012.2	N	C	3011C	3012C			3' - 0"	7' - 0"	NL	WD	STN	GL-5	HM-2	HM	PTD			B	N/A					●	●	●	●					●	●						
3013	N	C	3013C	C301B			3' - 0"	7' - 0"	HG	WD	STN	GL-5	HM-3	HM	PTD			B	GL-5					●	●	●	●					●	●				S8	ASSISTANT PRINCIPAL	
3014	N	C	3014C	C301B			3' - 0"	7' - 0"	HG	WD	STN	GL-5	HM-3	HM	PTD			B	GL-5					●	●	●	●					●	●				S8	4th GRADE	
3015	N	C	3015C	C301B			3' - 0"	7' - 0"	HG	WD	STN	GL-5	HM-3	HM	PTD			B	GL-5					●	●	●	●					●	●				S8	ACCELERATED LEARNING	
3016	N	C	3016C	C301B			3' - 0"	7' - 0"	HG	WD	STN	GL-5	HM-2	HM	PTD			B	N/A					●	●	●	●					●	●				S8	WORLD LANGUAGES	
3017	EDL	C	3017C	3019C			2' - 8"	6' - 8"	EX	WD	PTD	N/A	EX	WD	PTD	EX	EX	B	N/A					○	●	●	●					●	●						
3018	EDL	C	3018C	3019C			2' - 8"	6' - 8"	EX	WD	PTD	N/A	EX	WD	PTD	EX	EX	B	N/A					○	●	●	●					●	●						
3019	ECK	C	3019C	C301B			3' - 0"	7' - 0"	HG	WD	STN	EWG	EX	WD	PTD	EX	EX	B	EX					○		●	○					●	○				S8	3rd GRADE	
3020	EDL	C	3020C	3022C			2' - 8"	6' - 8"	EX	WD	PTD	N/A	EX	WD	PTD	EX	EX	B	N/A					○	●	●	●					●	●						
3021	EDL	C	3021C	3022C			2' - 8"	6' - 8"	EX	WD	PTD	N/A	EX	WD	PTD	EX	EX	B	N/A					○	●	●	●					●	●						
3022	ECK	C	3022C	C301B			3' - 0"	7' - 0"	HG	WD	STN	EWG	EX	WD	PTD	EX	EX	B	EX					○		●	○					●	○				S8	3rd GRADE	
3023.1	ELK	C	3023C	C302C	○		5' - 0"	7' - 0"	F	WD	STN	N/A	EX	HM	PTD	EX	EX	B	N/A					○		●	●					○	●	●					
3023.2	ELK	C	3023C	C302C	○		6' - 0"	7' - 0"	F	WD	STN	N/A	EX	HM	PTD	EX	EX	B	N/A					○		●						○	●						
3024	ELK	C	3024C	C302C	○		6' - 0"	7' - 0"	F	WD	STN	N/A	EX	HM	PTD	EX	EX	B	N/A					○		●						○	●						
3025	N	C	3025C	C302C			3' - 0"	7' - 0"	HG	WD	STN	GL-5	HM-3	HM	PTD			B	GL-5					●	●	●						●	●				S8	3rd GRADE	
CS3.01	N	C	CS3-01	C301B			3' - 0"	7' - 0"	F	WD	STN	N/A	HM-2	HM	PTD			C	N/A					●		●	●					●	●	●					
CS3.02	ELK	C	C302C	CS3-02			2' - 6"	7' - 0"	F	WD	STN	N/A	EX	HM	PTD	EX	EX	C	N/A					○		○	○					●	●	●			S1	CUSTODIAN CLOSET	
S103	N	A	C300B	S1-3A	●		6' - 0"	7' - 0"	N4	WD	STN	GL-6	HM-2	HM	PTD			B	N/A		●				●	●	●					●	●		●	S1	STAIR #		
S203	N	B	C301B	S2-3B	●		6' - 0"	7' - 0"	N4	WD	STN	GL-6	HM-2	HM	PTD			B	N/A		●				●	●	●					●	●		●	S1	STAIR #		
S303.1	N	C	C301B	S3-3C	●		6' - 0"	7' - 0"	N4	WD	STN	GL-6	HM-2	HM	PTD			B	N/A					●	●	●	●					●	●		●	S1	STAIR #		
S303.2	ECK	C	S3-3C	S3-3C																				○							○							
T3.01	N	C	C301B	T3-01			3' - 0"	7' - 0"	F	WD	STN	N/A	HM-2	HM	PTD			C	N/A					●		●		●				●		●					
T3.02	N	C	T3-02	C301B			3' - 0"	7' - 0"	F	WD	STN	N/A	HM-1	HM	PTD			C	N/A					●		●						●	●			●	S4	MEN'S RESTROOM	
T3.03	N	C	C301B	T3-03			3' - 0"	7' - 0"	F	WD	STN	N/A	HM-2	HM	PTD			C	N/A					●		●			●				●				S3	WOMEN	
T3.04	N	C	C301B	T3-04			3' - 0"	7' - 0"	F	WD	STN	N/A	HM-2	HM	PTD			C	N/A					●		●				●			●				S4	BOY'S RESTROOM	
T3.13			T3-04	C301B																																		

DOOR SCHEDULE - Attic FLOOR

DOOR														FRAME							FIRE RATING				HARDWARE - SEE SPECIFICATIONS																		
																										FIRE CODE					DISABLED REQUIREMENTS											
DOOR NUMBER	DOOR KEYNOTE STATUS	BUILDING PART AREA	FROM ROOM No.	TO ROOM No.	DOUBLE LEAF DOOR	UNEVEN DOUBLE LEAF	WIDTH	HEIGHT	DOOR TYPE	DOOR MATERIAL	DOOR FINISH	DOOR GLAZING	FRAME TYPE	FRAME MATERIAL	FRAME FINISH	HEAD DETAIL	JAMB DETAIL	SADDLE DETAIL	FRAME GLAZING	20 MINUTE LABELED	45 MINUTE LABELED	60 MINUTE LABELED	90 MINUTE LABELED	NOT REQUIRED	PANIC/EXIT DEVICE	POSITIVE LATCHING	AUTOMATIC CLOSER	ELECTRO-MAGNETIC HOLD	DELAYED ACTION CLOSER	PUSH PLATE/PULL HANDLES	ALARMED EXIT - SEE ELEC.	POWER ASSIST. OPERATOR	LEVER HANDLES	KICK PLATE	TACTILE WARNING	ACCESSIBLE THRESHOLD	SIGNAGE TYPE - SEE A930	SIGNAGE TEXT	REMARKS
S304	N	C	4004C	S3-4C			3' - 0"	6' - 8"	N4	HM	PTD	GL-6	HM-2	HM	PTD			A	N/A				●	●	●	●					●	●	●	●						

DOOR LEGEND

ECK	EXISTING DOOR & LEVER w/ NEW CORE & KEYING
ELK	EXISTING DOOR w/ NEW LEVER, CORE & KEYING
EDL	EXISTING DOOR w/ LEVER
EXC	EXISTING DOOR & LEVER w/ CORE, KEYING, CARD READER
ECO	EXISTING DOOR & LEVER w/ CORE, KEYING, CARD READER, DOOR OPERATOR
N	NEW DOOR w/ HARDWARE SET
NCR	NEW DOOR w/ HARDWARE SET & CARD READER
NCO	NEW DOOR w/ HARDWARE SET, CARD READER & DOOR OPERATOR
NO	NEW DOOR w/ HARDWARE SET & DOOR OPERATOR

GLAZING TYPE SCHEDULE

GL-0	FILM
GL-1	CLEAR
GL-2	CLEAR, TEMPERED
GL-3	CLEAR, TEMPERED, FROSTED
GL-4	CLEAR, TEMPERED, PATTERNED
GL-5	CLEAR, LAMINATED
GL-6	CLEAR, FIRE RATED
GL-7	CLEAR, BALLISTIC
GL-13	INSULATED, TINTED, TEMPERED
GL-17	INSULATED, TINTED, LAMINATED
GL-23	INSULATED, BLAST RESISTANT, TINTED
GL-28	INSULATED, TINTED, BALLISTIC

GENERAL DOOR NOTES

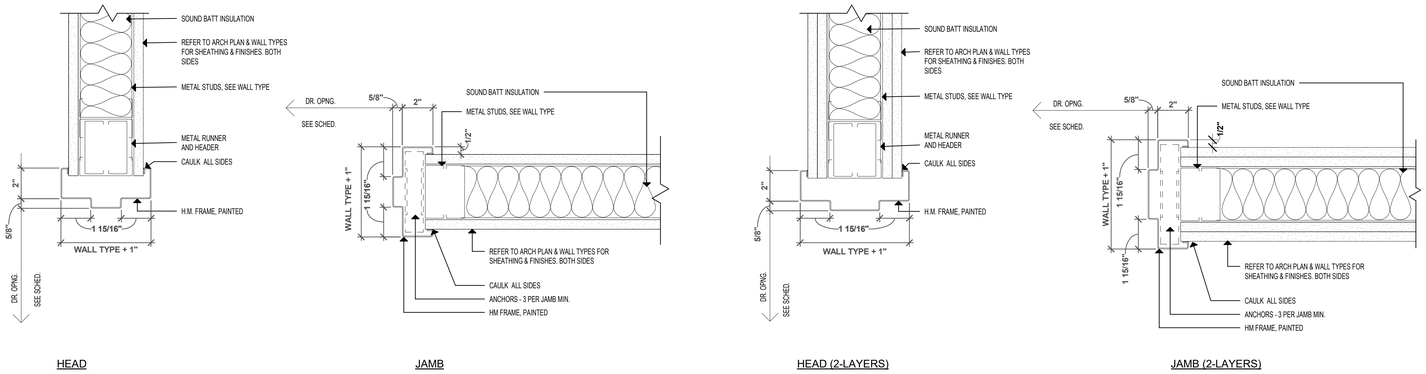
1. CONTRACTOR SHALL FIELD VERIFY ALL CONDITIONS AND DIMENSIONS PRIOR TO FABRICATION.
2. ALL NEW KICK PLATES SHALL BE 12" HIGH AND OFFSET 1" FROM EDGES OF DOOR UNLESS OTHERWISE NOTED. CENTERED AT BOTTOM OF DOOR.
3. ALL GLASS IN DOORS, SIDELIGHTS AND TRANSOMS SHALL BE SAFETY TYPE. SEE SCHEDULE FOR SPECIFIC TYPE AND THICKNESS. SEE ALSO PROJECT MANUAL.
4. ALL EXTERIOR DOORS SHALL RECEIVE FULL WEATHER STRIPPING AND SIDES, TOP AND BOTTOM.
5. PROVIDE CONTINUOUS HINGES AT ALL EXTERIOR DOORS AND OTHER LOCATIONS AS NOTED.
6. FOR ALL DOORS WITH FRAME TYPE DESIGNATION "ALUM." AND/OR C.W. / S.F. SEE STOREFRONT / CURTAIN WALL ELEVATIONS FOR HEAD, JAMBS AND GLAZING WITHIN FRAME.
7. AT EXTERIOR DOUBLE DOORS PROVIDE ONLY ONE PULL HANDLE ON ONE LEAF.
8. PROVIDE APPLIED DOOR NUMBER DECAL AT ALL EXTERIOR DOORS AS INDICATED ON PLANS.
9. CLOSER ARM/S SHALL NOT BE ON CORRIDOR SIDE OR ON EXTERIOR OF BUILDING.

DOOR SCHEDULE REMARKS (LAST COLUMN IN DOOR SCHEDULE)

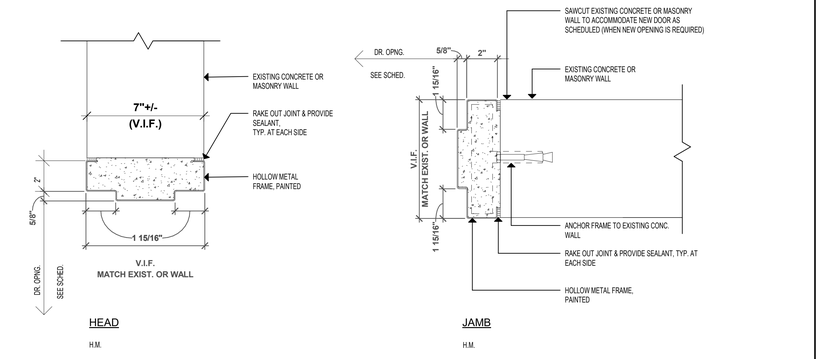
1. COORDINATE DOOR(S) SIZE WITH CURTAIN WALL / STORE FRONT SYSTEM. SEE EXTERIOR ELEVATIONS AND CURTAIN WALL TYPES, INCLUDING BALLISTIC TYPE.
2. PROVIDE PULL HANDLE/S HARDWARE ON EXTERIOR. OMIT PUSH PLATES.
3. PROVIDE REMOVABLE AND LOCKABLE CENTER MULLION.
4. DOOR AND CURTAIN WALL SYSTEMS SHALL BE BLAST RESISTANT.
5. PROVIDE CONTINUOUS HINGES.
6. PROVIDE ELECTRIC STRIKE. COORDINATE WITH CONTROLS AT MAIN OFFICE AND CARD/FOB READER AT EXTERIOR. SEE ALSO ELECTRICAL, SECURITY DRAWINGS AND PROJECT MANUAL.
7. ALL GLAZING, FRAMES, DOOR STYLES AND RAILS SHALL BE BALLISTIC TYPE. SEE ALSO PROJECT MANUAL.
8. PROVIDE SIGNS ON BOTH SIDES OF DOOR.
9. NEW FRAME AND DOOR THROUGH EXISTING MASONRY WALL. PROVIDE NEW OPENING. TEMPORARILY SHORE WALL AS REQUIRED AND INSTALL PERMANENT LINTEL.
10. NEW FRAME, DOOR AND HARDWARE IN EXISTING MASONRY OPENING. V.I.F. FOR EXACT MASONRY OPENING AFTER EXISTING FRAME AND DOOR ARE REMOVED.
11. INFILL JAMBS WITH MATCHING MASONRY TO REDUCE OPENING AS REQUIRED. TOOTH-IN MASONRY UNITS WITH EXISTING.
12. EXISTING HOLLOW METAL DOOR AND FRAME. PRIME AND PAINT.
13. UNEVEN LEAF DOORS AT EXIT STAIR. LARGE LEAF SHALL BE 3'-8" WIDE. MAGNETIC HOLD-OPEN DEVICE AT LARGE LEAF ONLY.
14. UNEVEN LEAF DOORS. LARGE LEAF SHALL BE 3'-0".
15. OMIT PULL HANDLES ON EXTERIOR SIDE.
16. PROVIDE POWER OPERATOR AT ONE DOOR AND ACCESSIBLE PUSH PADDLES ON BOTH SIDES OF DOOR. COORDINATE OPERATION WITH CONTROLS AT MAIN OFFICE AND CARD/FOB READER AT EXTERIOR.
17. PROVIDE WIRED DOOR CONTACTS TO MONITOR POSITION OF DOORS (FULLY CLOSED OR NOT).
18. INSTALL INDICATED SIGN ON ADJACENT SIDE WALL.
19. PROVIDE ELECTRONIC SYSTEM TO ALLOW DOOR/S TO BE REMOTELY LATCHED (LOCKED FROM EXTERIOR / PULL SIDE) FROM REMOTE LOCATION IN AN EMERGENCY LOCK-DOWN SITUATION. DISINGAGE HOLD-OPEN DEVICE/S WHERE PROVIDED.
20. PROVIDE WIRED ELECTRIC LATCHSET/HARWARE WITH INTEGRATED CARD/FOB READER.
21. SECLUTION ROOM DOOR. PROVIDE FULL-LENGTH MAGNETIC LOCKS HOUSING AT LATCH SIDE, TWO ELECTRO-MAGNETIC LOCKS, PLATES AT DOOR MOUNTED WITH ENERGY ABSORBING SEX BOLTS. MAGNETIC LOCKS SHALL BE ACTIVATED BY PUSH BUTTON IN ANTE ROOM. MAGNETIC LOCKS SHALL DISINGAGE ONCE THE PUSH BOTTON IS RELEASED. PROVIDE PADDING SYSTEM ON DOOR SIDE FACING THE SECLUTION ROOM. CLOSER AND ARM ON ANTE ROOM SIDE. PULL ON ANTE ROOM SIDE, OMIT PUSH PLATE.
22. PROVIDE VACANCY INDICATOR.
23. CARD/FOB READER ACCESS ON BOTH SIDES.
24. REPLACE LOCKSET ON STAIR SIDE WITH KEYED LOCKABLE SET TO PREVENT INTRUSION FROM STAIR SIDE.
25. PROVIDE EXTENDED CONTINUOUS HINGES.

DOOR SCHEDULE - STAIRS

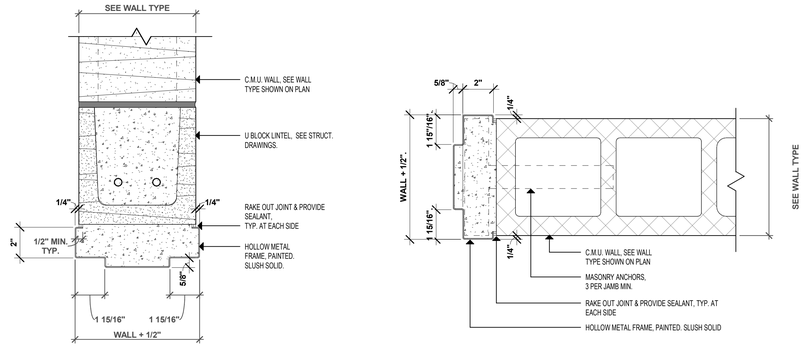
DOOR													FRAME							FIRE RATING				HARDWARE - SEE SPECIFICATIONS																		
																										FIRE CODE					DISABLED REQUIREMENTS											
DOOR NUMBER	Mark (Building)	Mark (Series)	FROM ROOM No.	TO ROOM No.	DOUBLE LEAF DOOR	UNEVEN DOUBLE LEAF	WIDTH	HEIGHT	DOOR TYPE	DOOR MATERIAL	DOOR FINISH	DOOR GLAZING	FRAME TYPE	FRAME MATERIAL	FRAME FINISH	HEAD DETAIL	JAMB DETAIL	SADDLE DETAIL	FRAME GLAZING	20 MINUTE LABELED	60 MINUTE LABELED	90 MINUTE LABELED	45 MINUTE LABELED	NOT REQUIRED	PANIC/EXIT DEVICE	POSITIVE LATCHING	ELECTRO-MAGNETIC HOLD	AUTOMATIC CLOSER	DELAYED ACTION CLOSER	PUSH PLATE/PULL HANDLES	ALARMED EXIT - SEE ELEC.	POWER ASSIST. OPERATOR	LEVER HANDLES	KICK PLATE	TACTILE WARNING	ACCESSIBLE THRESHOLD	SIGNAGE TYPE - SEE A930	SIGNAGE TEXT	REMARKS
S101.1	N	A	C102A	S1-1A	●		6' - 0"	7' - 0"	N4	WD	STN	N/A	HM-2	HM	PTD			B	GL-6			●			●	●		●				●	●				S1	STAIR #1	
S101.2	N	A	S1-1A	T2-05		●	5' - 0"	7' - 0"	N4	WD	STN	GL-6	HM-2	HM	PTD			B	GL-6			●			●	●		●				●	●				S1	STAIR #1	
S102	N	A	2004B	S1-2A	●		6' - 0"	7' - 0"	N4	WD	STN	GL-6	HM-2	HM	PTD			B	N/A			●			●	●		●				●	●				S1	STAIR #	
S103	N	A	C300B	S1-3A	●		6' - 0"	7' - 0"	N4	WD	STN	GL-6	HM-2	HM	PTD			B	N/A			●			●	●		●				●	●				S1	STAIR #	
S201.1	N	B	C106B	S2-1B	●		6' - 0"	7' - 0"	N4	WD	STN	N/A	HM-2	HM	PTD			B	GL-6			●			●	●	●	●				●	●				S1	STAIR #2	
S201.2	ECK	C	S2-1B		○		6' - 0"	7' - 0"	EX	AL	EX	N/A	HM-2	AL	PTD	EX	EX	A	EX						○	○		○				○	○					EXIT	
S202	N	B	C200C	S2-2B	●		6' - 0"	7' - 0"	N4	WD	STN	GL-6	HM-2	HM	PTD			B	N/A			●			●	●		●				●	●				S1	STAIR #	
S203	N	B	C301B	S2-3B	●		6' - 0"	7' - 0"	N4	WD	STN	GL-6	HM-2	HM	PTD			B	N/A			●			●	●		●				●	●				S1	STAIR #	
S301.1	N	C	C110C	S3-1C	●		6' - 0"	7' - 0"	N4	WD	STN	N/A	HM-2	HM	PTD			B	GL-6	●					●	●		●				●	●				S1	STAIR #3	
S301.2	ECK	C	S3-1C		○		6' - 0"	7' - 0"	EX	AL	EX	N/A	HM-2	AL	ANOD	EX	EX	A	EX						○	○		○				○	○					EXIT	
S302	N	C	C200C	S3-2C	●		6' - 0"	7' - 0"	N4	WD	STN	GL-6	HM-2	HM	PTD			B	N/A	●					●	●		●				●	●				S1	STAIR #	
S303.1	N	C	C301B	S3-3C	●		6' - 0"	7' - 0"	N4	WD	STN	GL-6	HM-2	HM	PTD			B	N/A	●					●	●		●				●	●				S1	STAIR #	
S303.2	ECK	C	S3-3C	S3-3C			3' - 0"	6' - 8"	F	WD	STN	N/A	EX	EX	PTD	EX	EX	B	N/A						○							○							
S304	N	C	4004C	S3-4C			3' - 0"	6' - 8"	N4	HM	PTD	GL-6	HM-2	HM	PTD			A	N/A	●					●	●		●				●	●	●	●					
V102.2	NCO	A		T2-05		●	5' - 0"	7' - 0"	AL1	AL	PRE-FIN	GL-17	SF9	AL	PRE-FIN			A	GL-17	



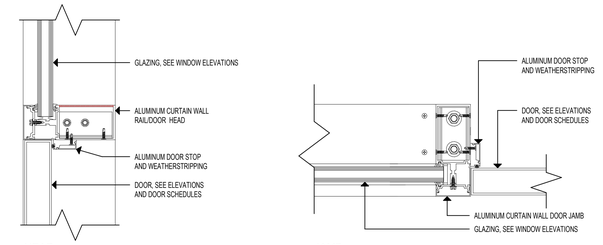
1 HM - 1
3" = 1'-0"



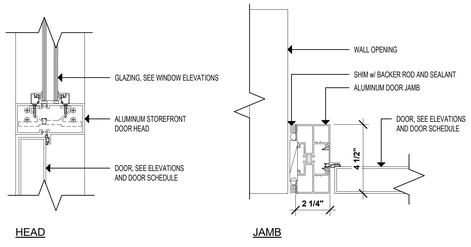
2 HM - 2
3" = 1'-0"



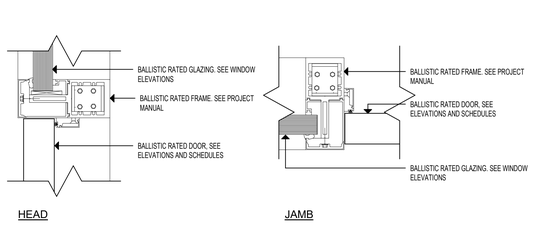
3 HM - 3 HEAD
3" = 1'-0"



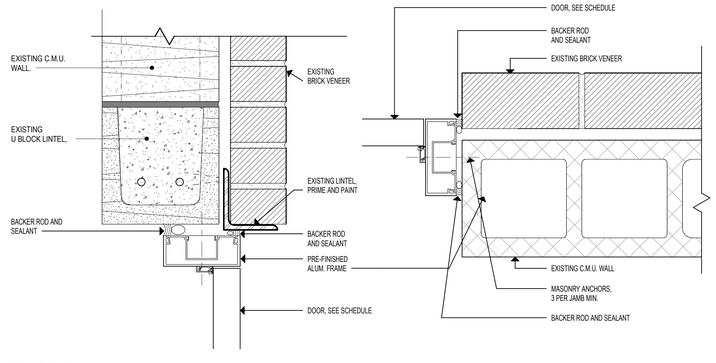
5 C.W.-TYPICAL CURTAIN WALL DOOR
3" = 1'-0"



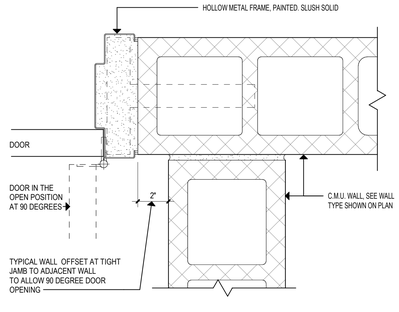
6 S.F.-TYPICAL STOREFRONT DOOR
3" = 1'-0"



4 BA.-BALLISTIC DOOR
3" = 1'-0"



8 AL-1 HEAD
3" = 1'-0"



9 TYPICAL DOOR JAMB DETAIL AT TIGHT ADJACENT WALL
3" = 1'-0"

Project Title:

ADDITION & ALTERATIONS TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
311 STATE STREET NEW LONDON CT 06320
203 230 9007 silverpetrucelli.com

Revision:	Description:	Date:	Revised By:

Drawing Title: DOOR DETAILS

Date: 8/29/2024
Scale: 3" = 1'-0"
Drawn By: JM
Project Number: 22-382

Drawing Number: A920

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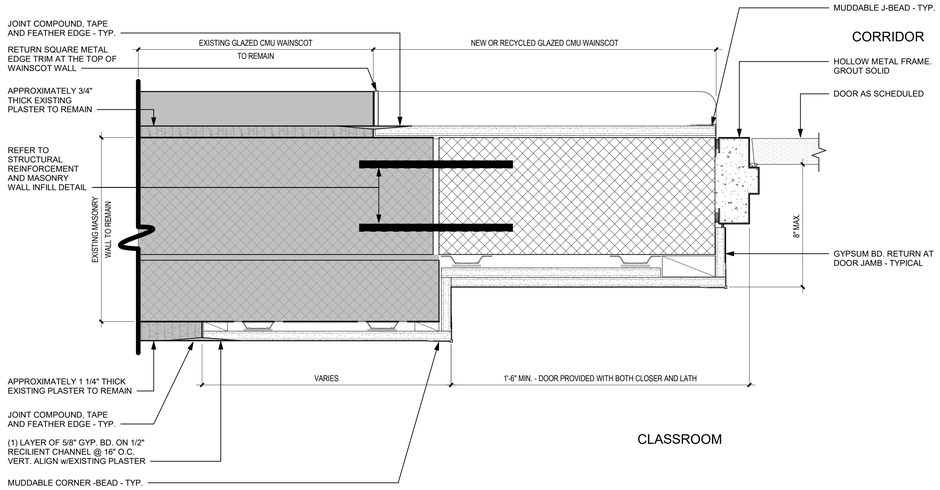
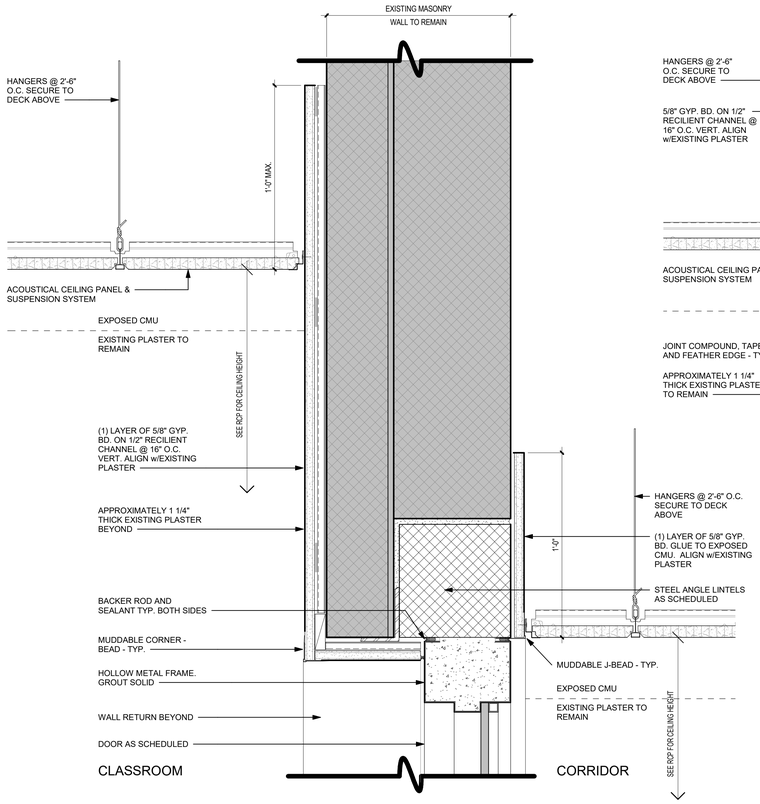
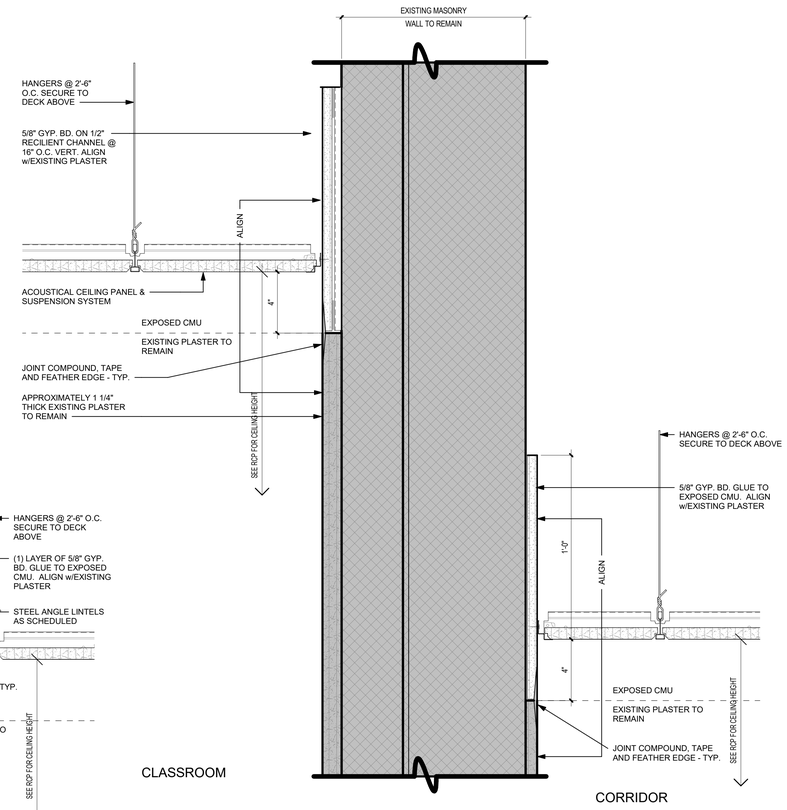


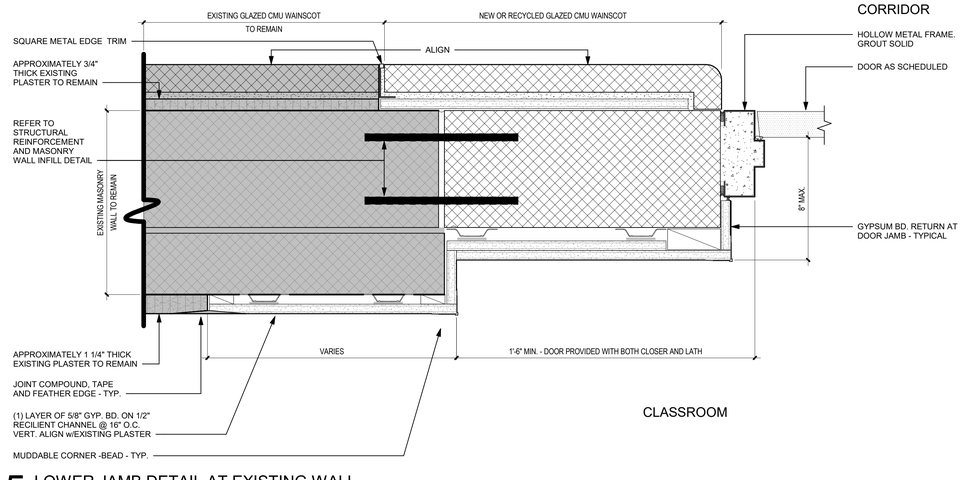
6 UPPER JAMB DETAIL AT EXISTING WALL
3" = 1'-0"



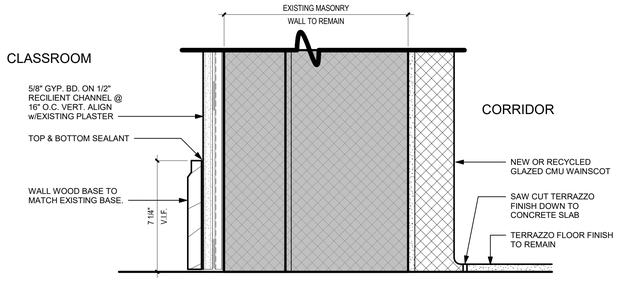
4 DOOR HEAD ON EXISTING WALL DETAIL
3" = 1'-0"



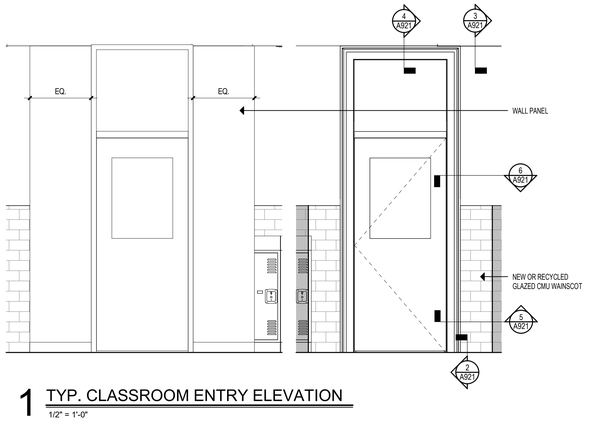
3 EXISTING WALL TO CEILING DETAIL
3" = 1'-0"



5 LOWER JAMB DETAIL AT EXISTING WALL
3" = 1'-0"



2 EXISTING WALL BASE DETAIL
3" = 1'-0"



1 TYP. CLASSROOM ENTRY ELEVATION
1/2" = 1'-0"

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311 STATE STREET NEW LONDON CT 06320
203 230 9007 silverpetrucelli.com

Revision:	Description:	Date:	Revised By:

Drawing Title: DOOR DETAILS

Date: 8/29/2024
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Drawn By: JM
Project Number: 22-382
Drawing Number: A921

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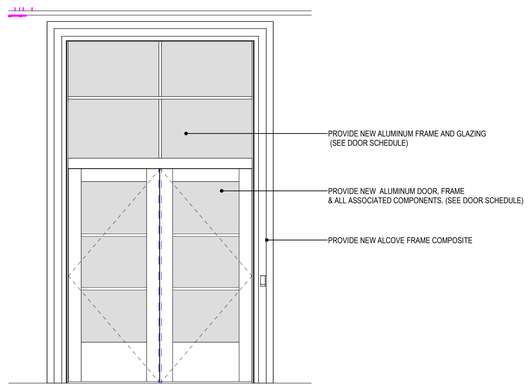
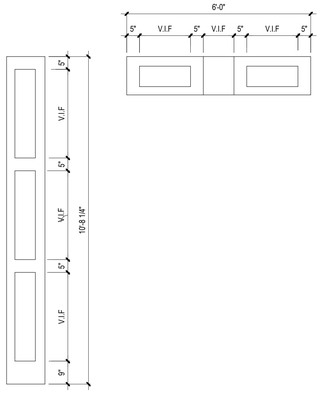
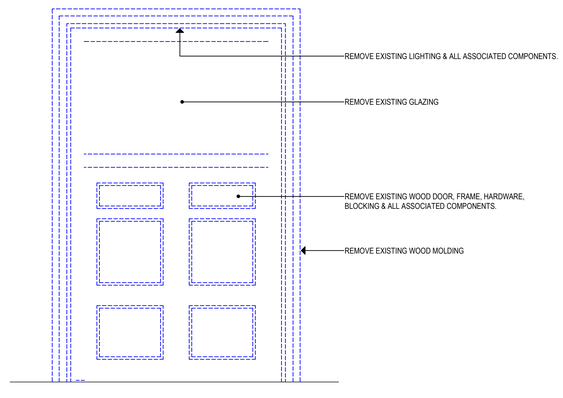
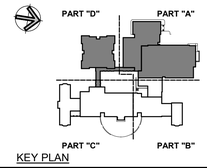


2 ENTRANCE ALCOVE TRIM MOLDING - NEW WORK
1/2" = 1'-0"





1 ENTRANCE ALCOVE TRIM MOLDING - DEMO
1/2" = 1'-0"



KEY PLAN

Project Title:

ADDITION & ALTERATIONS TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
311 STATE STREET NEW LONDON CT 06320
203 230 9007 silverpetrucelli.com

Revision:	Description:	Date:	Revised By:

Drawing Title: DOOR DETAILS

Date: 8/29/2024
Scale: 1/2" = 1'-0"
Drawn By: Author
Project Number: 22-382

Drawing Number: A925

8/30/2024 8:42:58 AM

WALL BOARD SCHEDULE

TAG	DESCRIPTION
TB-1	4'-0" x 4'-0" TACK BOARD
1	
TB-2	6'-0" x 4'-0" TACK BOARD
3	
TB-3	8'-0" X 4'-0" WHITE BOARD
6	
TB-4	5'-0" x 3'-0" TACK BOARD
1	
WB-1	4'-0" X 4'-0" WHITE BOARD
1	
WB-2	6'-0" X 4'-0" WHITE BOARD
5	
WB-3	12'-0" X 4'-0" WHITE BOARD
1	
WB-4	8'-0" X 4'-0" WHITE BOARD
4	
Grand total: 22	

FINISH SCHEDULE

No.	ROOM NAME	FLOOR FINISH	BASE FINISH	NORTH WALL FINISH	EAST WALL FINISH	SOUTH WALL FINISH	WEST WALL FINISH	CEILING FINISH	COMMENTS
1000A	CAFETERIA	VCT-ETR	RB-ETR	EP-2	ETR, EP-2	EP-2	ETR	ACT-3, PT-1	SELECTIVE FINISHES SCOPE; TO FINISH PLAN AND ELEVATIONS FOR MORE INFORMATION
1001A	DRY STORAGE	ETR	ETR	ETR	ETR	ETR	ETR	ACT-2	
1002A	KITCHEN / SERVERY	ETR	ETR	ETR	ETR	ETR	ETR	ACT-2, EP-2	PROVIDE 5'-0"H STAINLESS STEEL CLADDING AND RB-1 AT NEW SERVERY CHASE WALL
1003A	ART ROOM	SF-2	RB-1	ETR, EP-2	ETR	ETR	ETR	ACT-1	NEW PAINT ONLY AT WALL w/ NEW ADA CASEWORK INSTALLATION
1004A	KILN	SF-2	RB-1	ETR	ETR	ETR	ETR	ETR	
1005A	STORAGE	ETR/SC	RB-1	EP-2	EP-2	EP-2	EP-2	PT-1	INFILL FLOORING w/ SEALED CONCRETE UNTIL FLUSH w/ TILE FLOORING AT AREAS OF WALL AND CURB REMOVAL
1006A	MUSIC ROOM	VCT,ETR	RB,ETR	ETR	PT-3	PT-3	ETR	ACT-1	SELECTIVE FINISHES SCOPE; REFER TO FINISH PLAN AND ELEVATIONS FOR MORE INFORMATION
1007A	STORAGE	ETR	ETR	ETR	ETR	ETR	ETR	ACT-1	
1008A	IT SERVER	ETR	ETR	ETR	ETR	ETR	ETR	ETR	
1009A	STAGE	ETR	ETR	ETR	ETR	ETR	ETR	ETR	
1010A	GYMNASIUM	ETR	ETR	ETR	ETR	ETR	ETR	ACT-1	
1011A	OFFICE	ETR	ETR	ETR	ETR	ETR	ETR	ACT-1	
1012A	STORAGE	ETR	ETR	ETR	ETR	ETR	ETR	PT-1	
1013A	LOBBY	ETR	ETR	ETR	PT-3	ETR	PT-3	ACT-1	
1014A	HALL	ETR	ETR	ETR	ETR	ETR	ETR	ACT-1	
1015A	FIRE SPRINKLER	SC-1	RB-1	EP-4	EP-4	EP-4	EP-4	PT-1	
1016A	ELECTRICAL	SC-1	RB-1	EP-4	EP-4	EP-4	EP-4	PT-1	
1017A	GENERATOR	SC-1	RB-1	EP-4	EP-4	EP-4	EP-4	PT-1	
1018A	GYM STORAGE	SC-1	RB-1	EP-4	EP-4	EP-4	EP-4	PT-1	
1019A	BOILER AREA #1	ETR	ETR	ETR	ETR	ETR	ETR	ETR	
1020A	BAND / ORCHESTRA	VCT,ETR	RB,ETR	ETR	PT-3	PT-3	ETR	ACT-3	SELECTIVE FINISHES SCOPE; TO FINISH PLAN AND ELEVATIONS FOR MORE INFORMATION
1021B	BOILER AREA #2	ETR	ETR	ETR	ETR	ETR	ETR	ETR	
1022B	CUST. OFFICE	ETR	ETR	ETR	ETR	ETR	ETR	ACT-1	
1023B	STORAGE	ETR	ETR	ETR	ETR	ETR	ETR	ETR	
1024B	STORAGE	ETR	ETR	ETR	ETR	ETR	ETR	ETR	
1025B	STORAGE	ETR	ETR	ETR	ETR	ETR	ETR	ETR	
1026B	SPED OFFICE	ETR	ETR	PT-3	ETR	ETR	ETR	ACT-1	SELECTIVE FINISHES SCOPE; REFER TO FINISH PLAN AND ELEVATIONS FOR MORE INFORMATION
1027B	SCIENCE CLASSROOM	ETR,VCT	ETR	PT-2, 3	PT-2, 3	PT-3	PT-3	ACT-1	SELECTIVE FINISHES SCOPE; REFER TO FINISH PLAN AND ELEVATIONS FOR MORE INFORMATION
1028B	STAFF LOUNGE	SF-2	RB-3	PT-3	PT-3, 7	PT-3	PT-3, 7	ACT-1	
1029B	1st GRADE CLASSROOM	ETR	ETR	ETR	ETR	ETR	ETR	ACT-1	
1030B	MAIL / COPY	SF-2	RB-3	PT-3	PT-3, 7	PT-3	PT-3, 7	ACT-1, PT-1	
1031C	1st GRADE CLASSROOM	SF-1	RB-1	PT-3	PT-3	PT-3	PT-2, 3	ACT-1, PT-1	
1032C	NURSE	SF-2	RB-3	PT-3, 7	PT-3, 7	PT-3	PT-3, 7	ACT-2, PT-1	
1033C	1st GRADE CLASSROOM	SF-1	RB-1	PT-3	PT-3	PT-3	PT-2, 3	ACT-1; PT-1	
1034.3C	PRINCIPAL	SF-2	RB-3	PT-3, 7	PT-3, 7	PT-3	PT-3	ACT-1, PT-1	
1034.4C	M.O. WORK ROOM	SF-2	RB-3	PT-3, 7	PT-3, 7	PT-3	PT-3	ACT-1	
1034C	RECEPTION	SF-2	RB-3	PT-3	PT-3, 7	PT-3, 7	PT-3, 7	ACT-1; PT-1	
1035C	SPEECH	SF-1	RB-1	PT-3	PT-3	PT-2, 3	PT-2, 3	ACT-1	
1036C	1st GRADE CLASSROOM	SF-1	RB-1	PT-3	PT-2, 3	PT-3	PT-3	ACT-1, PT-1	
1037C	CONF. ROOM	VCT-1	RB-3	PT-3	PT-3, 7	PT-3, 7	PT-3	ACT-1	
1038C	CLASSROOM (PRE-K-2)	VCT-ETR	RB-1	PT-2, 3	PT-2, 3	PT-2, 3	PT-3	ACT-1, PT-1	SELECTIVE FLOORING SCOPE; REFER TO FINISH PLAN FOR MORE INFORMATION
1039C	WORK RM	ETR	ETR	ETR	ETR	ETR	ETR	ACT-1, PT-1	
1040C	STORAGE	SF-1	RB-1	ETR	ETR	ETR	ETR	PT-1	
1041C	CLASSROOM (PRE-K-1)	VCT-ETR	RB-1	PT-2, 3	PT-3	PT-2, 3	PT-2, 3	ACT-1	SELECTIVE FLOORING SCOPE; REFER TO FINISH PLAN FOR MORE INFORMATION
1042C	WORK RM	ETR	ETR	ETR	ETR	ETR	ETR	ACT-1, PT-1	
1043.1C	CL	SF-2	RB-3	PT-3	PT-3	PT-3	PT-3, 7	ACT-1	
1043C	SPECIAL EDUCATION	SF-2	RB-3	PT-3, 7	PT-3,7	PT-3,7	PT-3	ACT-1	
1044	OT PT	SF-2	RB-3	PT-3, 7	PT-3	PT-3, 7	PT-3	ACT-1	
1045C	COURT YARD								
1046D	KINDERGARTEN	SF-1	RB-2	BB-4; PT-3,EP-3	BB-4; PT-2, 3	BB-4; PT-2, 3	BB-4; PT-3,EP-1	ACC-1	PAINTED DECK, PT-4; ACC-2; REFER TO RCP AND ELEVATIONS FOR MORE INFORMATION
1047D	KINDERGARTEN	SF-1	RB-2	BB-4; PT-2, 3	BB-4; PT-2, 3	BB-4; PT-3,EP-3	BB-4; PT-3,EP-3	ACC-1	PAINTED DECK, PT-4; ACC-2; REFER TO RCP AND ELEVATIONS FOR MORE INFORMATION
1048D	STORAGE	SF-1	RB-1	PT-3	EP-1, PT-3	PT-3	EP-1, PT-3	ACT-1	
1049D	STORAGE	SF-1	RB-1	PT-3	EP-1, PT-3	PT-3	EP-1, PT-3	ACT-1	
1050D	KINDERGARTEN	SF-1	RB-2	BB-4; PT-3,EP-3	BB-4; PT-3 ,EP-1	BB-4; PT-2, 3	BB-4; PT-2, 3	ACC-1	PAINTED DECK, PT-4; ACC-2; REFER TO RCP AND ELEVATIONS FOR MORE INFORMATION
1051D	KINDERGARTEN	SF-1	RB-2	BB-4; PT-2, 3	BB-4; PT-3 ,EP-1	BB-4; PT-3,EP-3	BB-4; PT-2, 3	ACC-1	PAINTED DECK, PT-4; ACC-2; REFER TO RCP AND ELEVATIONS FOR MORE INFORMATION
2000A	PUBLISHING STORAGE	ETR	ETR	ETR	ETR	ETR	ETR	ACT-1	
2001A	MEDIA WORK AREA/PUBLISHING CENTER	CPT-ETR	ETR	ETR	ETR	ETR	ETR	ACT-1	SELECTIVE FLOORING SCOPE; REFER TO FINISH PLAN FOR MORE INFORMATION
2002A	CUST.	ETR	ETR	ETR	ETR	ETR	ETR	ACT-2	
2003B	ESL ROOM	CPT-ETR	ETR	ETR	ETR	ETR	ETR	ACT-1	SELECTIVE FLOORING SCOPE; REFER TO FINISH PLAN FOR MORE INFORMATION
2004B	MEDIA CENTER	CPT-ETR	ETR	PT-2, 3	PT-2, 3	PT-2, 3	PT-2, 3	ACT-1; PT-1	SELECTIVE FLOORING SCOPE; REFER TO FINISH PLAN FOR MORE INFORMATION
2005B	SERVICE DESK	ETR	ETR	ETR	ETR	ETR	ETR	ACT-1	
2006B	IT SERVER	VCT-1	RB-1	PT-2, 3	PT-2, 3	PT-3	PT-3	PT-1	
2007C	SOCIAL WORKER	VCT-1	RB-1	PT-3	PT-2, 3	PT-2, 3	PT-2, 3	ACT-1	
2008C	SENSORY	VCT-1	RB-1	PT-3	PT-3	PT-2, 3	PT-2, 3	ACT-1	
2009C	MATH INTERVENTIONISTS ROOM	VCT-ETR	ETR	PT-3	PT-2, 3	ETR	ETR	ACT-1	SELECTIVE FINISHES SCOPE; REFER TO FINISH PLAN AND ELEVATIONS FOR MORE INFORMATION
2010C	PSYCH	VCT-1	RB-1	PT-2, 3	PT-3	PT-2	PT-2,3	ACT-1	
2011C	ATRIUM							ACT-3; PT-1	REFER TO ELEVATIONS FOR MORE INFORMATION
2012C	CONFERENCE ROOM	CPT-1	RB-1	PT-3	PT-3	PT-3; WC-1	PT-2, 3	ACT-1	POLISHED CONCRETE BORDER AND AREA OF TERRAZO REMOVAL
2013C	RESOURCE ROOM	VCT-ETR	ETR	PT-3	PT-2, 3	ETR	ETR	ACT-1	SELECTIVE FINISHES SCOPE; REFER TO FINISH PLAN AND ELEVATIONS FOR MORE INFORMATION
2014C	LITERACY ROOM	VCT-1	RB-1	PT-3	PT-3	PT-3	PT-2, 3	ACT-1	
2015C	ASSISTIVE TECH OFFICE	VCT-1	RB-1	PT-3	PT-2, 3	PT-3	EP-3, PT-3	ACT-1	
2016C	STORAGE	ETR	ETR	ETR	ETR	ETR	ETR	ACT-1	
2017C	CLOSET	ETR	ETR	ETR	ETR	ETR	ETR	ACT-1	
2018C	2nd GRADE CLASSROOM	VCT-ETR	ETR	ETR	ETR	ETR	ETR	ACT-1	SELECTIVE FLOORING SCOPE; REFER TO FINISH PLAN FOR MORE INFORMATION
2019C	CLOSET	ETR	ETR	ETR	ETR	ETR	ETR	ACT-1	
2020C	STORAGE	ETR	ETR	ETR	ETR	ETR	ETR	ACT-1	
2021C	2nd GRADE CLASSROOM	VCT-ETR	ETR	ETR	ETR	ETR	ETR	ACT-1	SELECTIVE FLOORING SCOPE; REFER TO FINISH PLAN FOR MORE INFORMATION
2022C	CLOSET	ETR	ETR	ETR	ETR	ETR	ETR	PT-1	
2023C	CLOSET	ETR	ETR	ETR	ETR	ETR	ETR	PT-1	
2024C	2nd GRADE CLASSROOM	VCT-ETR	ETR	ETR	PT-2, 3	ETR	ETR	ACT-1, PT-1	SELECTIVE FINISHES SCOPE; REFER TO FINISH PLAN AND ELEVATIONS FOR MORE INFORMATION
3000A	STORAGE	ETR	ETR	ETR	ETR	ETR	ETR	ACT-1	
3001B	5th GRADE CLASSROOM	VCT-ETR	ETR	ETR	PT-3	PT-2, 3	ETR	ACT-1	SELECTIVE FINISHES SCOPE; REFER TO FINISH PLAN AND ELEVATIONS FOR MORE INFORMATION
3002B	5th GRADE CLASSROOM	VCT-ETR	ETR	ETR	ETR	ETR	ETR	ACT-1	SELECTIVE FLOORING SCOPE; REFER TO FINISH PLAN FOR MORE INFORMATION
3003B	5th GRADE CLASSROOM	VCT-ETR	ETR	ETR	ETR	ETR	ETR	ACT-1	SELECTIVE FLOORING SCOPE; REFER TO FINISH PLAN FOR MORE INFORMATION
3004B	STORAGE	ETR	ETR	ETR	ETR	ETR	ETR	ACT-1	
3005B	CLOSET	ETR	ETR	ETR	ETR	ETR	ETR	ACT-1	
3006B	4th GRADE CLASSROOM	VCT-ETR	ETR	ETR	ETR	ETR	ETR	ACT-1	SELECTIVE FLOORING SCOPE; REFER TO FINISH PLAN FOR MORE INFORMATION
3007B	STORAGE	ETR	ETR	ETR	ETR	ETR	ETR	ACT-1	
3008B	CLOSET	ETR	ETR	ETR	ETR	ETR	ETR	ACT-1	
3009C	STORAGE	ETR	RB-1	PT-3	PT-3	PT-2, 3	PT-3	ACT-1	
3010C	ACCELERATED LEARNING PROGRAM	VCT-ETR	RB-1	PT-2, 3	ETR	PT-3	ETR	ACT-1	SELECTIVE FINISHES SCOPE; REFER TO FINISH PLAN AND ELEVATIONS FOR MORE INFORMATION
3011C	4th GRADE CLASSROOM	VCT-ETR	ETR	ETR	ETR	ETR	ETR	ACT-1	SELECTIVE FLOORING SCOPE; REFER TO FINISH PLAN FOR MORE INFORMATION
3012C	SPECIAL EDUCATION	ETR	ETR	PT-2,3	PT-2, 3	PT-3	PT-3	ACT-1	SELECTIVE FLOORING SCOPE; REFER TO FINISH PLAN FOR MORE INFORMATION
3013C	ASSISTANT PRINCIPAL	VCT-ETR	ETR	PT-3	ETR	ETR	ETR	ACT-1	SELECTIVE FINISHES SCOPE; REFER TO FINISH PLAN AND ELEVATIONS FOR MORE INFORMATION
3014C	4th GRADE CLASSROOM	VCT-ETR	ETR	ETR	ETR	PT-3	PT-2, 3	ACT-1	SELECTIVE FINISHES SCOPE; REFER TO FINISH PLAN AND ELEVATIONS FOR MORE INFORMATION
3015C	ACCELERATED LEARNING PROGRAM	VCT-ETR	ETR	PT-3	PT-2, 3	PT-3	PT-3	ACT-1	SELECTIVE FINISHES SCOPE; REFER TO FINISH PLAN AND ELEVATIONS FOR MORE INFORMATION

FINISH SCHEDULE

No.	ROOM NAME	FLOOR FINISH	BASE FINISH	NORTH WALL FINISH	EAST WALL FINISH	SOUTH WALL FINISH	WEST WALL FINISH	CEILING FINISH	COMMENTS
3016C	WORLD LANG. OFFICE	VCT-1	RB-1	PT-3	PT-2, 3	PT-3	PT-2,3	ACT-1	
3017C	STORAGE	ETR	ETR	ETR	ETR	ETR	ETR	ACT-1	
3018C	CLOSET	ETR	ETR	ETR	ETR	ETR	ETR	ACT-1	
3019C	3rd GRADE CLASSROOM	VCT-ETR	ETR	ETR	ETR	ETR	ETR	ACT-1	SELECTIVE FLOORING SCOPE; REFER TO FINISH PLAN FOR MORE INFORMATION
3020C	CLOSET	ETR	ETR	ETR	ETR	ETR	ETR	ACT-1	
3021C	STORAGE	ETR	ETR	ETR	ETR	ETR	ETR	ACT-1	
3022C	3rd GRADE CLASSROOM	VCT-ETR	ETR	ETR	ETR	ETR	ETR	ACT-1	SELECTIVE FLOORING SCOPE; REFER TO FINISH PLAN FOR MORE INFORMATION
3023C	CLOSET	ETR	ETR	ETR	ETR	ETR	ETR	PT-1	
3024C	CLOSET	ETR	ETR	ETR	ETR	ETR	ETR	PT-1	
3025C	3rd GRADE CLASSROOM	VCT-ETR	ETR	ETR	PT-2, 3	ETR	ETR	ACT-1	SELECTIVE FINISHES SCOPE; REFER TO FINISH PLAN AND ELEVATIONS FOR MORE INFORMATION
4000A	ATTIC SPACE								
4002B	ATTIC SPACE								
4003C	ATTIC SPACE								
4004C	ATTIC SPACE								
C100A	CORRIDOR	ETR	RB,ETR	ETR,PT-3	ETR	ETR	ETR	ACT-1	SELECTIVE FINISHES SCOPE; REFER TO FINISH PLAN AND ELEVATIONS FOR MORE INFORMATION
C101A	CORRIDOR	ETR	ETR	ETR	ETR, PT-3	ETR	ETR	ACT-1	
C102A	CORRIDOR	SF-2	RB,ETR	ETR	ETR	ETR	PT-3	ACT-1; PT-1	
C103A	CORRIDOR	ETR	ETR	ETR			ETR	ACT-1	
C104B	CORRIDOR	SF-2	RB-1	PT-3, WP-1		PT-3, WP-1		PT-1; SAS-1	
C105B	CORRIDOR	SF-2	RB-1	PT-3	PT-3, WP-1	PT-3, WP-1	PT-3, WP-1	ACT-1; PT-1; SAS-1	
C106B	CORRIDOR	SF-1	RB-1	PT-3, WP-1	PT-3, WP-1		PT-3, WP-1	PT-1; SAS-1	
C107C	ATRIUM LOBBY	SF-1,2	RB-1	BB-1, 2; PT-3		BB-1, 2; PT-3		ACT-3; PT-1	REFER TO ELEVATIONS FOR MORE INFORMATION
C108C	CORRIDOR	SF-1	RB-1	BB-1, 2; PT-3		BB-1, 2; PT-3		SAS-1	
C109C	CORRIDOR	WOM-1	RB-1	BB-1, 2, 3; PT-3		BB-1, 2, 3; PT-3	PT-3	PT-1	SF-1, 2, 3 AT CENTER OF CONNECTING CORRIDORS, LASER CUT COMPASS AND ORIENT TRUE NORTH
C110C	CORRIDOR	SF-1	RB-1		PT-3; WP-1; BB-1,2	PT-3, WP-1; BB-T,2	PT-3	PT-1; SAS-1	
C111C	CORRIDOR	SF-1	RB-1		PT-3, WP-1	PT-3, WP-1	PT-3, WP-1	ACT-1; PT-1; SAS-1	
C112C	SOUTH ENTRY								
C113C	CORRIDOR	SF-2	RB-1	PT-3, WP-1		PT-3, WP-1	PT-3, WP-1	SAS-1	
C114D	CORRIDOR	SF-2	RB-1	PT-3		PT-3		ACT-1	
C115.1A	CORRIDOR	SF-2	RB-1	PT-3	PT-3, WP-1	PT-3	PT-3, WP-1	ACT-1	
C115.2D	CORRIDOR	SF-2	RB-1				PT-2, 3	ACT-1	
C116D	CORRIDOR	SF-2	RB-1	PT-3		PT-3	PT-3	ACT-1	
C200C	CORRIDOR	ETR	ETR		PT-3, WP-1	PT-3, WP-1	PT-3, WP-1	ACT-1	
C201C	CORRIDOR	ETR	ETR	ETR		ETR	ETR, PT-3	ACT-1	
C300B	CORRIDOR	ETR	ETR	ETR		ETR	ETR	ACT-1	
C301B	CORRIDOR	ETR	ETR	ETR	PT-3	PT-3	PT-3	ACT-1	
C302C	CORRIDOR	ETR	ETR	ETR		ETR	ETR,PT-3	ACT-1	
CS1-01	CUST.	ETR	ETR	ETR	ETR	ETR	ETR	EP-2	
CS1-02	CUST.	PFT-2	PWB-1	FRP-1	FRP-1	FRP-1	FRP-1	EP-2	EPOXY WALL PAINT EP-2 ABOVE FRP TO UNDERSIDE OF FINISHED CEILING
CS1-03	CUSTODIAL	ETR	ETR	ETR	ETR	ETR	ETR	ETR	
CS1-04	CUST.	PFT-2	PWB-1	FRP-1	FRP-1	FRP-1	FRP-1	EP-2	EPOXY WALL PAINT EP-2 ABOVE FRP TO UNDERSIDE OF FINISHED CEILING
CS1-05	CUSTODIAL	PFT-2	PWB-1	FRP-1	FRP-1	FRP-1	FRP-1	EP-2	EPOXY WALL PAINT EP-2 ABOVE FRP TO UNDERSIDE OF FINISHED CEILING
CS1-06	CUST.	PFT-2	PWB-1	FRP-1	FRP-1	FRP-1	FRP-1	EP-2	EPOXY WALL PAINT EP-2 ABOVE FRP TO UNDERSIDE OF FINISHED CEILING
CS2-01	CUST.	PFT-2	PWB-1	FRP-1	FRP-1	FRP-1	FRP-1	EP-2	EPOXY WALL PAINT EP-2 ABOVE FRP TO UNDERSIDE OF FINISHED CEILING
CS2-02	CUST.	ETR	ETR	ETR	ETR	ETR	ETR	EP-2	
CS3-01	CUST.	PFT-2	PWB-2	FRP-1	FRP-1	FRP-1	FRP-1	EP-2	EPOXY WALL PAINT EP-2 ABOVE FRP TO UNDERSIDE OF FINISHED CEILING
CS3-02	CUST.	ETR	ETR	ETR	ETR	ETR	ETR	EP-2	
E1-01	COOLER								
E1-1B	ELEV.								
E1-02	LIFT	VCT-1							
E1-2B	ELEV.								
E1-03	SWR.	ETR	ETR	ETR	ETR	ETR	ETR	EP-2	
E1-3B	ELEV.								
N1-01	INFIRMARY	SF-2	RB-3	PT-3, 7	PT-3, 7	PT-3, 7	PT-3, 7	ACT-2	
N1-02	ISOLATION	SF-2	RB-3	PT-3, 7	PT-3	PT-3	PT-3, 7	ACT-2	
S1-1A	STAIR #1	ETR	ETR	ETR	ETR	ETR	ETR	PT-1	
S1-2A	STAIR #1	ETR	ETR	ETR	ETR	ETR	ETR	PT-1	
S1-3A	STAIR #1	ETR	ETR	ETR	ETR	ETR	ETR	PT-1	
S2-1B	STAIR #2	RFT-1	RB-1	EP-2	EP-2	EP-2	EP-2	PT-1	PAINT DOOR TRIM AND HAND RAILS EP-3
S2-2B	STAIR #2	ETR	ETR	ETR	ETR	ETR	EP3, 4	PT-1	PAINT DOOR TRIM AND HAND RAILS EP-3
S2-3B	STAIR								
S3-1C	STAIR #3	RFT-1	RB-1	EP-4	EP-4	EP-4	EP-3, 4	PT-1	PAINT DOOR TRIM AND HAND RAILS EP-3
S3-2C	STAIR #3	ETR	ETR	ETR	ETR	ETR	EP-3, 4	PT-1	PAINT DOOR TRIM AND HAND RAILS EP-3
S3-3C	STAIR #3	ETR	ETR	ETR	ETR	ETR	EP-3, 4	PT-1	PAINT DOOR TRIM AND HAND RAILS EP-3
S3-4C	STAIR	RFT-1		EP-2	EP-2	EP-2	EP-2	EP-2	
S4-1A	STAIR #4	RFT-1	RB-1						
T1-01	BOYS 9-12	ETR	ETR	ETR	ETR	ETR	ETR	ACT-2	
T1-02	GIRLS 9-12	ETR	ETR	ETR	ETR	ETR	ETR	ACT-2	
T1-03	TLT.	ETR	ETR	ETR	ETR	ETR	ETR	ACT-2	
T1-04	UNISEX TLT.	ETR	ETR	ETR	ETR	ETR	ETR	ACT-2	
T1-05	BOYS 9-12	PFT-1	CWB-1	CWT-1, 2; EP-2	EP-1, 2	CWT-1, 2; EP-1, 2	EP-1, 2	ACT-2	TILE ON WET WALLS ONLY
T1-06	TLT.	PFT-2	PWB-1	FRP-1	FRP-1	FRP-1	FRP-1	ETR	EPOXY WALL PAINT EP-2 ABOVE FRP TO UNDERSIDE OF FINISHED CEILING
T1-07	TLT.	ETR	ETR	ETR	ETR	ETR	ETR	ACT-2	
T1-08	TLT.	ETR	ETR	ETR	ETR	ETR	ETR	ACT-2	
T1-09	GIRLS (5-8)	PFT-1	CWB-1	EP-1, 2	CWT-1, 2; EP-2	EP-2	CWT-1, 2; EP-1, 2	ACT-2	TILE ON WET WALLS ONLY
T1-10	STAFF M.	PFT-1	CWB-1	CWT-1, 2; EP-2	EP-1, 2	CWT-1, 2; EP-2	EP-1, 2	ACT-2	TILE ON WET WALLS ONLY
T1-12	TLT.	PFT-1	CWB-1	EP-2	EP-2	EP-1, 2	CWT-1, 2; EP-2	ACT-2	TILE ON WET WALL ONLY
T1-13	BOYS (5-8)	PFT-1	CWB-1	EP-2	CWT-1, 2; EP-2	EP-1, 2	CWT-1, 2; EP-2	ACT-2	TILE ON WET WALLS ONLY
T1-14	CHANGING ROOM	PFT-1	CWB-1	EP-2	CWT-1, 2; EP-2	EP-1, 2	EP-2	ACT-2	
T1-15	TLT.	PFT-2	PWB-1,2	EP-4	EP-2, 4	CWT-4	EP-2, 4	ACT-2	PFT-2 AT AREA OF EXISTING FLOOR REMOVAL ONLY, MAKE FLUSH w/ EXISTING EPOXY FLOORING
T1-16	UNISEX 5-8	PFT-1	CWB-1	CWT-1, 2; EP-2	EP-1, 2	EP-2	EP-2	ACT-2	TILE ON WET WALL ONLY
T1-17	UNISEX 5-8	PFT-1	CWB-1	EP-2	EP-2	CWT-1, 2; EP-2	EP-1, 2	ACT-2	TILE ON WET WALL ONLY
T1-18	UNISEX 5-8	PFT-1	CWB-1	CWT-1, 2; EP-2	EP-2	EP-2	EP-1, 2	ACT-2	TILE ON WET WALL ONLY
T1-19	UNISEX 5-8	PFT-1	CWB-1	EP-2	EP-1, 2	CWT-1, 2; EP-2	EP-2	ACT-2	TILE ON WET WALL ONLY
T2-01	GIRLS	PFT-1	CWB-1	EP-2	CWT-1, 2; EP-1, 2	CWT-1, 2; EP-2	EP-1, 2	ACT-2	TILE ON WET WALLS ONLY
T2-02	STAFF M.	PFT-1	CWB-1	CWT-1, 2; EP-2	EP-1, 2	EP-2	EP-1, 2	ACT-2	TILE ON WET WALL ONLY
T2-03	STAFF W.	PFT-1	CWB-1	EP-2	EP-1, 2	CWT-1, 2; EP-2	CWT-1, 2; EP-2	ACT-2	TILE ON WET WALLS ONLY
T2-04	BOYS	PFT-1	CWB-1	CWT-1, 2; EP-2	EP-1, 2	CWT-1, 2; EP-2	EP-2	ACT-2	TILE ON WET WALLS ONLY
T2-05	VESTIBULE	WOM-1	RB-1						
T3-01	GIRLS	PFT-1	CWB-1	EP-2	CWT-1, 2; EP-1, 2	CWT-1, 2; EP-2	EP-1, 2	ACT-2	TILE ON WET WALLS ONLY
T3-02	STAFF M.	PFT-1	CWB-1	CWT-1, 2; EP-2	EP-1, 2	EP-2	EP-1, 2	ACT-2	
T3-03	STAFF W.	PFT-1	CWB-1	EP-2	EP-1, 2	CWT-1, 2; EP-2	CWT-1, 2; EP-2	ACT-2	TILE ON WET WALLS ONLY
T3-04	BOYS	PFT-1	CWB-1	CWT-1, 2; EP-2	EP-1, 2	CWT-1, 2; EP-2	EP-2	ACT-2	TILE ON WET WALLS ONLY
TL1-11	STAFF UNISEX	PFT-1	CWB-1	EP-2	CWT-1, 2; EP-2	EP-2	EP-1, 2	ACT-2	TILE ON WET WALL ONLY
V1-01A	VESTIBULE	ETR	ETR	ETR	ETR	ETR	ETR	ACT-1	
V1-03C	VESTIBULE	WOM-1	RB-1	PT-5	PT-5	PT-5		PT-1	
V1-04C	VEST.	WOM-1	RB-1	EP-4, WP-1	EP-4, WP-1	EP-4, WP-1	EP-4, WP-1	ACT-1	
V1-05C	VEST.	WOM-1	RB-1	EP-3, 4	EP-3, 4	EP-4	EP-3, 4	ACT-1	
V1-05D	VESTIBULE	WOM-1	RB-1					ACT-1	

Project Title:

ADDITION & ALTERATIONS TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

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Municipal Improvement Application
Final Site Plan Review Set
ADDITION & ALTERATIONS TO:

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285 SOUND BEACH AVENUE
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OFFICIALS:

Volume No. 2

8/29/2024

PIPE AND FITTING SCHEDULE

DESCRIPTION	SIZE	PIPE		FITTING		REMARKS
		TYPE	SCHEDULE	TYPE	RATING	
UNDERGROUND FIRE PROTECTION SERVICE PIPING	ALL	CLDI	CLASS 52	DIMU	250	--
WET SPRINKLER PIPING	2" AND SMALLER	STL-BLK	40	MIT	STD	--
WET SPRINKLER PIPING	2-1/2" AND LARGER	STL-BLK	10	GRV	STD	--
DRY SPRINKLER PIPING	2" AND SMALLER	STL-BLK	40	MIT	STD	--
DRY SPRINKLER PIPING	2-1/2" AND LARGER	STL-BLK	40	GRV	STD	--
DRAIN PIPING	ALL	GALV.	40	MIT/GRV	STD	ALL FITTINGS MUST BE GALVANIZED

NOTES:

1. ALL EXPOSED PIPING AND FITTINGS WITHIN FINISHED AREAS SHALL BE CUSTOM PAINTED IN ACCORDANCE WITH NFPA, OWNERS PAINTING REQUIREMENTS AND COORDINATED WITH ARCHITECT.

2. ALL PIPING IN RETURN AIR CEILING PLENUM INSTALLATIONS SHALL BE UL LISTED FOR THIS APPLICATION

ABBREVIATIONS	DESCRIPTION	ABBREVIATIONS	DESCRIPTION
CI	CAST IRON	GRV	GROOVED JOINT SYSTEM FITTINGS/COUPLINGS
CLDI	CEMENT LINED DUCTILE IRON	GALV.	GALVANIZED STEEL
DI	DUCTILE IRON	MIT	MALLEABLE IRON THREADED
DIMJ	DUCTILE IRON MECHANICAL JOINT	STD	STANDARD
FL	FLANGED	STL-BLK	BLACK STEEL

VALVE SCHEDULE

DESCRIPTION	SIZE	TYPE				CLASS	REMARKS
		OS&Y	BUTTERFLY	CHECK	BALL		
WET SPRINKLER PIPING	2" AND SMALLER	OS&YT	BFVT	CVT	BVT	175PSI	--
WET SPRINKLER PIPING	2-1/2" AND LARGER	OS&YG	BFVG	CVG	BVG	175PSI	--
DRY SPRINKLER PIPING	2" AND SMALLER	OS&YT	BFVT	CVT	BVT	175PSI	--
DRY SPRINKLER PIPING	2-1/2" AND LARGER	OS&YG	BFVG	CVG	BVG	175PSI	--
DRAIN PIPING	ALL	--	--	--	BVT	175PSI	--
FIRE DEPARTMENT CONNECTION PIPING	ALL	--	--	CVG	--	175PSI	--

ABBREVIATION	DESCRIPTION	ABBREVIATION	DESCRIPTION
BVF	BALL VALVE FLANGED - FULL PORT, BRONZE	CVF	CHECK VALVE FLANGED
BVG	BALL VALVE GROOVED - FULL PORT, BRONZE	CVG	CHECK VALVE GROOVED
BVT	BALL VALVE THREADED - 2-PIECE, FULL PORT, 400PSI, BRONZE	CVT	CHECK VALVE THREADED - BRONZE
BFVF	BUTTERFLY VALVE FLANGED	OS&YF	OS&Y RAISING STEM VALVE FLANGED
BFVG	BUTTERFLY VALVE GROOVED	OS&YG	OS&Y RAISING STEM VALVE GROOVED
BFVT	BUTTERFLY VALVE THREADED	OS&YT	OS&Y RAISING STEM VALVE THREADED

SPRINKLER HEAD SCHEDULE

TYPE	STYLE	RESPONSE	COVERAGE	COLOR	DISCHARGE COEFFICENT (K)	ORIFICE	TEMP.	MANUFACTURE		REMARKS
								MODEL	SIN	
PENDENT	CONCEALED	QUICK	STANDARD	WHITE	5.6K	1/2"	155°F	VICTAULIC		
								V38	V3802	--
DRY PENDENT	CONCEALED	QUICK	STANDARD	WHITE	5.6K	1/2"	155°F	VICTAULIC		
								V33	V3302	--
SIDEWALL	EXPOSED	QUICK	STANDARD	CHROME PLATED	5.6K	1/2"	155°F	VICTAULIC		
								V27	V2710	--
SIDEWALL	CONCEALED	QUICK	STANDARD	WHITE	5.6K	1/2"	155°F	VICTAULIC		
								V56	V5613	16X20 @ 32 GPM/32.7 PSI
UPRIGHT	EXPOSED	QUICK	STANDARD	CHROME PLATED	5.6K	1/2"	155°F	VICTAULIC		
								V27	V2704	SEE NOTE #5
UPRIGHT	EXPOSED	QUICK	STANDARD	STAINLESS STEEL	5.6K	1/2"	175°F-225°F (INT TEMP)	VIKING		
								V27	V2704	SEE NOTE #5

NOTES:
1. FINIAL COLORS TO BE SELECTED BY ARCHITECT.

2. IN AREAS WITH FINISHED CEILINGS CONCEALED, PENDENT SPRINKLER HEADS AND CONCEALED PIPING SHALL BE UTILIZED, UNLESS OTHERWISE INDICATED ON PLANS

3. IN AREAS WITHOUT CEILINGS, EXPOSED UPRIGHT SPRINKLER HEADS AND EXPOSED PIPING SHALL BE UTILIZED. UL LISTED HEAD GUARDS SHALL BE PROVIDED IN AREAS SUBJECT TO DAMAGE (I.E. MECHANICAL ROOMS, GYMS, ETC...)

4. FLEXIBLE SPRINKLER HEADS ASSEMBLIES (IF USED) SHALL BE 6' IN LENGTH, UL LISTED AND HAVE A STAINLESS STEEL BRAID SIMILAR TO VICTAULIC "VICFLEX" AQB BRAIDED SERIES. FLEXIBLE SPRINKLER ASSEMBLIES EQUIVALENT LENGTH MUST BE TAKING IN ACCOUNT WHEN PRODUCING HYDRAULIC CALCULATIONS.

5. PROVIDE HIGH-TEMPERATURE CLASSIFICATION SPRINKLERS IN HIGH-TEMPERATRUE ZONES, AND PROVIDE INTERMEDIATE-TEMPERATURE CLASSIFICATION SPRINKLER IN-INTERMEDIATE TEMPERATURE ZONES ADJACENT TO FINALIZED UNIT HEATER LOCATION (BY MECH DIV.). INSTALL IN ACCORDANCE WITH NFPA 13.

FIRE PROTECTION DESIGN CRITERIA

FIRE PROTECTION CONTRACTOR SHALL OBTAIN RECENT AREA FLOW TEST RESULTS (WITHIN ONE YEAR OF START OF CONSTRUCTION) OR SHALL ARRANGE WITH THE WATER UTILITY FOR A NEW WATER FLOW TEST. SPRINKLER SYSTEMS SHALL BE HYDRAULICALLY CALCULATED BASED ON THE FOLLOWING CRITERIA. INCLUDE ANY/ALL FIRE MARSHAL AND OWNER REQUIREMENTS. CONTRACTOR RESPONSIBLE FOR DOCUMENTING SIZE AND LENGTH OF EXISTING FIRE PROTECTION WATER SUPPLY INCLUDING VALVING, ETC. AS NECESSARY IN ORDER TO PERFORM HYDRAULIC CALCULATIONS. THE FIRE PROTECTION WATER SERVICE SHALL BE CONNECTED TO AN EXISTING SPRINKLER FIRE MAIN. THE FIRE PROTECTION CONTRACTOR SHALL CONDUCT A CURRENT FLOW TEST FOR USE IN THE HYDRAULIC CALCULATIONS AND DOCUMENT THE RESULTS.

STANDARD DESIGN CRITERIA

LIGHT HAZARD AREAS: CLASSROOMS, OFFICES, HALLWAYS, LOBBYS, ETC. MINIMUM DENSITY OF 0.10 GPM/SQ.FT. OVER THE MOST REMOTE 1500 SQ.FT. PLUS 100 GPM FOR HOSE DEMAND. MAXIMUM COVERAGE PER SPRINKLER HEAD IS 196 SQ.FT.

ORDINARY HAZARD (GROUP I) AREAS: TELE/DATA, MECHANICAL/ELECTRICAL ROOMS, STAGE MINIMUM DENSITY OF 0.15 GPM/SQ.FT. OVER THE MOST REMOTE 1500 SQ.FT. PLUS 250 GPM FOR HOSE DEMAND. MAXIMUM COVERAGE PER SPRINKLER HEAD IS 130 SQ. FT,

ORDINARY HAZARD (GROUP II) AREAS: STORAGE ROOMS INCLUDING FILE ROOMS AND JANITOR CLOSETS, MEDIA CENTER, HIGH STACK AREAS, STAGE, MINIMUM DENSITY OF 0.20 GPM/SQ.FT. OVER THE MOST REMOTE 1500 SQ.FT. PLUS 250 GPM FOR HOSE DEMAND. MAXIMUM COVERAGE PER SPRINKLER HEAD IS 130 SQ. FT,

DRY AREAS: ATTICS, OUTDOOR STORAGE AREAS - INSTALL A HYDRAULICALLY BALANCED SPRINKLER SYSTEM TO PROVIDE A DENSITY OF 0.20 GPM PER SQUARE FOOT OVER THE MOST REMOTE AREA UP TO A MAXIMUM OF 1,950 SQUARE FOOT AREA WITH A 250 GPM ALLOWANCE FOR HOSE STREAMS. SPRINKLER HEAD SPACING; 130 SQUARE FT. PER HEAD MAX. SPRINKLER HEADS; 286 DEGREE F PENDENT OR UPRIGHT TO MEET CEILING CONDITION.

STANDPIPE SYSTEMS: HYDRAULICALLY DESIGNED STANDPIPE SYSTEMS SHALL BE DESIGNED TO PROVIDE A MINIMUM RESIDUAL PRESSURE OF 100 PSI AT THE OUTLET OF THE HYDRAULICALLY MOST REMOTE 2-1/2 INCH HOSE CONNECTION. FOR CLASS I AND CLASS III SYSTEMS, THE MINIMUM FLOW RATE FOR THE HYDRAULICALLY MOST REMOTE STANDPIPE SHALL BE 500 GPM,THE MINIMUM FLOW RATE FOR ADDITIONAL STANDPIPES SHALL BE 250 GPM PER STANDPIPE, WITH THE TOTAL NOT TO EXCEED 1,000 GPM.

WHERE DISTRIBUTION PIPING AND SPACE TO BE PROTECTED ARE EXPOSED TO FREEZING: PROVIDE DRY PIPE SPRINKLER SYSTEM; ALL PENDENT AND SIDEWALL HEADS SHALL BE DRY TYPE.

FIRE PROTECTION COMMISSIONING

THE FIRE PROTECTION CONTRACTOR IS REQUIRED TO PERFORM COMMISSIONING OF THE FIRE PROTECTION SYSTEM IN ACCORDANCE WITH SPECIFICATION SECTIONS 210800 AND 019113.

THE FIRE PROTECTION CONTRACTOR SHALL ATTEND COMMISSIONING MEETINGS, FILL OUT AND COMPLETE PRE-FUNCTIONAL CHECKLISTS TO DOCUMENT THAT THE EQUIPMENT AND SYSTEMS ARE INSTALLED PROPERLY. THE PLUMBING CONTRACTOR WILL BE PROVIDED WITH CONSTRUCTION CHECKLISTS FROM THE CA FOR COMPLETION. THE FIRE PROTECTION CONTRACTOR SHALL COMPLETE THE CHECKLISTS AND PROVIDE THE CA WITH COMPLETED COPIES IN ACCORDANCE WITH 019113.

THE FIRE PROTECTION CONTRACTOR WILL BE PROVIDED WITH FUNCTIONAL PERFORMANCE TEST PROCEDURES TO PERFORM WHILE THE CA WITNESSES. THE FIRE PROTECTION CONTRACTOR SHALL PERFORM FUNCTIONAL TESTS IN ACCORDANCE WITH 019113, REQUIREMENTS OF THE SPECIFICATION SECTION, CODE REQUIREMENTS, OR REQUIREMENTS OF THE AUTHORITY HAVING LOCAL JURISDICTION.

FIRE PROTECTION GENERAL NOTES

GENERAL

UTILIZE CONCEALED PENDENT SPRINKLERS AND PIPING IN AREAS WITH FINISHED CEILINGS, AND EXPOSED PIPING AND UPRIGHT SPRINKLERS IN AREAS WITHOUT CEILINGS. CONCEALED SPRINKLER HEADS LOCATED IN ACOUSTICAL TILES TO UTILIZE FLEX HOSE PIPING 6' IN LENGTH. PROVIDE AND INSTALL SPRINKLERS UNDER AND ABOVE ALL OBSTRUCTIONS IN ACCORDANCE WITH NFPA 13.

ACTIVATION OF A FLOW SWITCH SHALL RESULT AS AN "ALARM" INDICATION AT THE FIRE ALARM CONTROL PANEL AND THE FIRE ALARM ANNUNCIATOR PANEL. THE SPRINKLER CONTRACTOR SHALL EXAMINE ALL CONTRACT DOCUMENTS AND SHALL VERIFY ALL CONDITIONS IN THE FIELD. THE SPRINKLER

FIRE PROTECTION PLANS ARE INTENDED TO INDICATE TOTAL COVERAGE AND MAY OR MAY NOT INDICATE ALL SPRINKLER HEADS. SPRINKLER HEADS INDICATED ON DRAWINGS ARE DIAGRAMMATIC AND SHALL NOT BE NOT BE COUNTED FOR BID (IT IS NOT THE INTENT OF THESE DRAWINGS TO SHOW ENTIRE PIPING LAYOUT, PROPOSED MAINS AND DEVICES INDICATED ONLY). THE CONTRACTOR SHALL PROVIDE A COMPLETE SPRINKLER SYSTEM WITH COMPLETE SPRINKLER COVERAGE, INDICATED OR NOT. ITEMS AND SERVICES NOT SHOWN ON DRAWINGS OR SPECIFICATIONS BUT REQUIRED TO RENDER THE WORK COMPLETE, IN ACCORDANCE WITH NFPA, INSURANCE COMPANY REQUIREMENTS AND OWNERS, READY FOR OPERATION, SHALL BE PROVIDED AND INSTALLED. THE CONTRACTOR SHALL PROVIDE COMPLETE SPRINKLER COVERAGE AS REQUIRED INCLUDING BUT NOT LIMITED TO: CRAWL SPACES, CONCEALED COMBUSTIBLE SPACES, SHAFTS, AND ALL CLOSETS.

DRAWINGS ARE DIAGRAMMATIC AND INDICATE A GENERAL ARRANGEMENT OF WORK AND ARE NOT TO BE CONSIDERED SUBCONTRACTOR DOCUMENTS. IT IS THE INTENT OF THESE DOCUMENTS TO INCLUDE THE PROVISION AND INSTALLATION OF ALL NECESSARY WORK AND MATERIALS FOR COMPLETE, OPERATIONAL AND CODE COMPLIANT SYSTEMS BY THE CONTRACTOR. GENERAL DESIGN CONCEPTS INDICATED MUST BE FOLLOWED OR BETTERED. THE BID SHALL INCLUDE OFFSETS, ADDITIONAL PIPING, VALVES AND EQUIPMENT AND COMPONENTS AS REQUIRED TO MEET CONSTRUCTION CONDITIONS FOR PROPER OPERATION. DO NOT SCALE DRAWINGS, CONSULT ARCHITECTURAL AND STRUCTURAL DRAWINGS FOR SPACE CONDITIONS AND ADDITIONAL REQUIREMENTS.

WHEN A CONFLICT BETWEEN THE DRAWINGS, NOTES AND/OR SPECIFICATIONS OCCUR, THE MORE STRINGENT, AND/OR LARGER QUANTITY AND/OR MORE EXPENSIVE SHALL APPLY. THE REQUIREMENTS LISTED WITHIN NOTES OR SPECIFICATIONS SHALL BE REQUIRED, PROVIDED AND INSTALLED WHETHER SPECIFICALLY INDICATED ON THE DRAWINGS OR NOT.

THE CONTRACTOR SHALL COORDINATE SPRINKLER HEAD LOCATIONS WITH THE LATEST ARCHITECTURAL REFLECTED CEILING PLANS. ANY DISCREPANCIES SHALL BE BROUGHT BACK TO THE ARCHITECT/ ENGINEER. DO NOT SCALE DRAWINGS FOR DIMENSIONS NOT INDICATED. REFER TO ARCHITECT FOR RESOLUTION FOR ANY DIMENSIONS NOT INDICATED.

IT IS THE INTENTION OF THE SPECIFICATIONS AND DRAWINGS TO PROVIDE FOR FINISHED WORK, TESTED AND READY FOR OPERATION.

THE DESIGN OF ALL FIRE SUPPRESSION SYSTEMS WILL BE IN ACCORDANCE WITH THE LOCAL AND STATE BUILDING CODE, NFPA 13, FM GLOBAL. USE ONLY UL/FM SPRINKLERS, MATERIALS AND DEVICES, UNLESS NOTED OTHERWISE.

CONCEALED SPRINKLERS AND PIPING SHALL BE INSTALLED IN AREAS WITH FINISHED CEILINGS. AREAS WITH EXPOSED CONSTRUCTION SHALL HAVE EXPOSED PIPING AND SPRINKLERS (CUSTOM COLOR)

THE SPRINKLER CONTRACTOR IS REQUIRED TO VISIT THE SITE AT THE TIME OF BID, TO EXAMINE CONDITIONS AND BECOME FAMILIAR WITH THE JOB, NOTING DEGREE OF DIFFICULTY IN GETTING EQUIPMENT (INCLUDING LIFTS AND SCAFFOLDS) IN AND OUT OF THE BUILDING. ANY DISCREPANCIES SHALL BE BROUGHT TO THE ATTENTION OF THE ARCHITECT OR ENGINEER IN WRITING PRIOR TO SUBMITTING A BID.

NOTIFY PROPER AUTHORITIES (INCLUDING BUT NOT LIMITED TO: THE LOCAL A.H.J., INSURANCE COMPANY, ETC.) OF ANY FIRE PROTECTION "SHUT DOWNS". SCHEDULE ALL WORK TO MINIMIZE THE LENGTH OF TIME THAT THE FIRE PROTECTION SYSTEM(S) WILL BE OUT OF SERVICE. RETURN THE SPRINKLER SYSTEM BACK IN SERVICE AT THE END OF EACH WORKING DAY. IF A FIRE WATCH IS REQUIRED BY THE LOCAL A.H.J. BUILDING MANAGER, ETC. IT SHALL BE PROVIDED BY THE GENERAL CONTRACTOR. FIRE WATCH SCHEDULING AND PERSONNEL SHALL BE COORDINATED WITH THE LOCAL A.H.J., BUILDING MANAGER AND INSURANCE COMPANY.

ARRANGE PIPING TO FACILITATE FLUSHING. PROVIDE READILY ACCESSIBLE DRAIN AND FLUSHING CONNECTIONS AS REQUIRED BY NFPA 13. PROVIDE AND INSTALL AUXILIARY DRAINS WITH PROVISIONS FOR COMPLETE DRAINAGE. PIPE ALL DRAINS TO AN APPROVED LOCATION.

INSPECTOR'S TEST CONNECTIONS, DRAIN VALVES AND CONTROL VALVES SHALL BE READILY ACCESSIBLE AND INSTALLED NOT OVER +/-7'-0" ABOVE THE FINISHED FLOOR. PROVIDE ALL VALVES WITH IDENTIFICATION SIGNS. SUPERVISORY SWITCHES SHALL BE ON ALL CONTROL VALVES. PIPE ALL DRAIN PIPING, INSPECTORS TEST CONNECTIONS, ETC. TO THE EXTERIOR. ENSURE DRAINAGE DOES NOT CAUSE DAMAGE TO BUILDING OR SITE.

INSTALL A PRESSURE GAUGE WITH A BLEEDER MAINTENANCE VALVE AT THE TOP OF ALL RISERS.

PROVIDE A HEAD GUARD ON SPRINKLERS IN AREAS SUBJECT TO MECHANICAL DAMAGE (I.E. SPRINKLERS IN: GYMNASIUMS, MECHANICAL ROOMS, ETC.)

REFER TO ADDITIONAL NOTES ON ARCHITECTURAL DRAWINGS.

THE CONTRACTOR SHALL COORDINATE SPRINKLER WORK WITH THE OWNER'S PHASING SCHEDULE PRIOR TO COMMENCEMENT OF ANY WORK. ALL PHASED SECTIONS OF WORK SHALL COMPLY WITH THE OWNERS SCHEDULE AND BE TESTED, INSPECTED, READY FOR OPERATION IN ACCORDANCE WITH NFPA, OWNERS INSURANCE COMPANY AND A.H.J. REQUIREMENTS.

THE CONTRACTOR SHALL PROVIDE COMPLETE SIGNED AND SEALED (BY LICENSED P.E.) DRAWINGS INDICATING ALL PIPING AND SPRINKLER HEADS. CONTRACTOR SHALL SECURE AND PAY COSTS OF PERMITS, CERTIFICATES, LICENSES, INSPECTIONS AND APPROVALS.

INSTALL SPRINKLERS BELOW DUCTS, AND/OR COMBINATIONS OF DUCTS/EQUIPMENT IN ACCORDANCE WITH THE OBSTRUCTION REQUIREMENTS OF NFPA 13.

PROVIDE SPRINKLER PROTECTION IN ORDER TO AVOID ALL OBSTRUCTIONS IN ACCORDANCE WITH NFPA 13, INCLUDING: LIGHTING, CEILING FIXTURES, STRUCTURAL MEMBERS, ETC. WITHIN ALL HAZARD OCCUPANCIES.

ALL DRAIN PIPING AND ANY PIPING SUBJECT TO ALTERNATE WETTING AND DRYING WITHOUT NITROGEN SHALL BE GALVANIZED.

ALL SYSTEM COMPONENTS SHALL BE CAPABLE OF WITHSTANDING A MINIMUM WORKING PRESSURE OF 175 PSI.

THE CONTRACTOR SHALL SEAL AROUND ALL NEW PENETRATIONS THROUGHOUT THE BUILDING WITH SEALANT OF FIRE AND/OR SMOKE RETARDANT TYPE EQUAL IN FIRE RATING TO THE STRUCTURE BEING PENETRATED. SEALANT SHALL BE A UL LISTED ASSEMBLY.

WORK OF THIS SECTION SHALL BE GOVERNED BY THE CONTRACT DOCUMENTS. PROVIDE MATERIALS, LABOR, EQUIPMENT AND SERVICES NECESSARY TO FURNISH, DELIVER AND INSTALL ALL WORK AS SPECIFIED AND AS REQUIRED BY JOB CONDITIONS. WHERE A CONFLICT EXISTS BETWEEN THESE NOTES, THE DRAWINGS AND THE SPECIFICATIONS, THE MORE STRINGENT REQUIREMENT SHALL APPLY.

PERFORM THE WORK IN ACCORDANCE WITH THE REQUIREMENTS OF THE CONTRACT GENERAL CONDITIONS AND WITH THE PROVISIONS OF ALL APPLICABLE LOCAL, STATE, AND FEDERAL CODES AND LAWS.

WORK SHALL INCLUDE ALL INCIDENTALS, LABOR, MATERIAL, EQUIPMENT, APPLIANCES, SERVICES, HOISTING, SCAFFOLDING, SUPPORTS, TOOLS, CONSUMABLE ITEMS, FEES, LICENSES, AND ADMINISTRATIVE TASKS REQUIRED TO COMPLETE AND MAKE OPERABLE WORK SHOWN ON THE DRAWINGS, SPECIFIED HEREIN AND AS REQUIRED FOR A COMPLETE AND OPERATIONAL SYSTEM..

STORE MATERIALS INSIDE AND PROTECTED FROM DEBRIS, WEATHER AND MOISTURE.

THIS CONTRACTOR SHALL PROVIDE AND INSTALL ALL POWER AND CONTROL WIRING REQUIRED FOR EQUIPMENT OPERATION NOT SPECIFICALLY PROVIDED BY OTHERS BUT REQUIRED FOR A COMPLETE AND OPERATIONAL SYSTEM. THIS CONTRACTOR SHALL PROVIDE MOTOR STARTERS FOR INSTALLATION BY OTHERS. COORDINATE REQUIREMENTS.

COORDINATION DRAWINGS

DEVELOP AND SUBMIT COORDINATION DRAWINGS AS OUTLINED.

SHEET METAL, PLUMBING AND FIRE PROTECTION SHOP DRAWINGS THAT HAVE BEEN COORDINATED WITH ARCHITECTURAL AND STRUCTURAL DRAWINGS SHALL BE SUBMITTED TO ENGINEER FOR REVIEW. DRAWINGS MUST BE RETURNED FROM ENGINEER EITHER "REVIEWED" OR "FURNISH AS CORRECTED" PRIOR TO BEING USED AS BASIS FOR COORDINATION DRAWINGS.

AFTER SHEET METAL AND PIPING DRAWINGS HAVE BEEN REVISED PER ENGINEERS COMMENTS, REPRODUCIBLE COPIES SHALL BE SENT TO THE TRADES IN THE FOLLOWING SEQUENCE FOR THE INCLUSION OF THEIR WORK.

-MECHANICAL SHEET METAL
-PLUMBING PIPING
-MECHANICAL PIPING
-SPRINKLER PIPING
-ELECTRICAL WORK

AFTER ALL TRADES HAVE INCLUDED THEIR WORK ON THE COORDINATION DRAWING AND NOTED CONFLICTS, ALL TRADES SHALL MEET TO RESOLVE CONFLICTS AND AGREE TO ACCEPTABLE SOLUTIONS. EACH TRADE SHALL SIGN COORDINATION DRAWINGS. ITEMS NOT SHOWN ON COORDINATION DRAWING IS RESPONSIBILITY OF OMITTING CONTRACTOR AND CONTRACTOR IS SUBJECT TO ADDITIONAL COSTS INCURRED BY OTHER TRADES.

THE ARCHITECT AND ENGINEER ARE NOT PART OF THE COORDINATION DRAWING PROCESS. THE ENGINEER WILL PROVIDE ASSISTANCE FOR NOTED CONFLICTS ONLY. COORDINATION DRAWINGS ARE NOT TO BE CONSIDERED PIPING OR DUCT SHOP DRAWINGS. THE CONTRACTOR IS REQUIRED TO SUBMIT INDIVIDUAL PIPING AND DUCTWORK SHOP DRAWINGS FOR REVIEW BY THE ENGINEER. PIPING AND DUCTWORK SHOP DRAWINGS SHALL FOLLOW THE DESIGN INTENT OF THE CONTRACT DOCUMENTS.

SUBMIT FINAL SIGNED COORDINATION DRAWING TO ENGINEER FOR REVIEW. ENGINEER WILL REVIEW COORDINATION DRAWINGS FOR GENERAL ARRANGEMENT AND FOR NOTED CONFLICTS ONLY. SPECIFIC INSTALLATION REQUIREMENTS WILL BE REVIEWED ONLY IN INDIVIDUAL TRADE SHOP DRAWINGS.

WHERE CONFLICTS OCCUR BETWEEN DRAWINGS AND SPECIFICATIONS, OR WITHIN EITHER DOCUMENT, THE CONTRACTOR SHALL ASK FOR AND OBTAIN A WRITTEN CLARIFICATION FROM THE ENGINEER PRIOR TO SUBMITTING HIS BID. OTHERWISE, THE ITEMS OR ARRANGEMENTS OF SUPERIOR QUALITY, GREATER QUANTITY OR HIGHER COST SHALL PREVAIL AND BE INCLUDED IN THE CONTRACT PRICE.

ANY WORK FABRICATED OR INSTALLED PRIOR TO SIGN OFF BY ALL TRADES WHICH IS DEEMED TO BE IN CONFLICT WITH COORDINATION DRAWINGS SHALL BE REMOVED AND RE-INSTALLED IN CONFORMANCE WITH COORDINATION DRAWINGS.

EACH CONTRACTOR (MENTIONED ABOVE) IS RESPONSIBLE FOR THE COORDINATION OF HIS SUB-CONTRACTORS.

THE OVERALL COORDINATION OF THE COORDINATION PROCESS IS THE RESPONSIBILITY OF THE CONTRACTOR. THE ENGINEER IS NOT RESPONSIBLE FOR THE COORDINATION PROCESS. THE ENGINEER WILL RESPOND TO QUESTIONS THAT ARISE FROM THE COORDINATION PROCESS. DRAWINGS SUBMITTED WILL BE REVIEWED FOR CLEARLY IDENTIFIED CONFLICTS ONLY. SOLUTIONS TO CONFLICTS WILL NOT BEAR ADDITIONAL COST.

AS BUILT DRAWINGS

PROVIDE A COMPLETE SET OF AS-BUILT DRAWINGS REFLECTING AS INSTALLED CONDITIONS. AS-BUILT DRAWINGS SHALL INDICATE ALL INSTALLED CONDITIONS OF SYSTEMS WITHIN THIS DISCIPLINE. DRAWINGS SHALL BE OF SIMILAR SCALE AS THE CONSTRUCTION DOCUMENTS AND INCLUDE DETAILS AS NECESSARY TO CLEARLY REFLECT THE INSTALLED CONDITION. DRAWINGS SHALL BE BOUND IN A COMPLETE AND CONSECUTIVE SET. SUPPLEMENTAL SKETCHES AND LOOSE PAPERWORK WILL NOT BE ACCEPTABLE AND WILL BE RETURNED FOR REVISION. THE CONTRACTOR SHALL COMPLY WITH THE ENGINEERS COMMENTS TO PRODUCE A CLEAR AND CONCISE SET OF DRAWINGS. DRAWINGS SHALL BE SUBMITTED IN BOTH HARD COPY AND ELECTRONIC (AUTO-CAD AND VERSION AS REQUIRED BY THE OWNER) VERSION. NUMBER OF COPIES OF EACH AS REQUESTED BY THE OWNER.

INCLUDE ALL CHANGES OF ALL DEVIATIONS BETWEEN THE WORK INDICATED AND THE WORK INSTALLED INCLUDING APPROVED CONTRACT MODIFICATIONS AND SUBSTITUTIONS.

INDICATE VALVES AND CONTROL DEVICES LOCATED AND NUMBERED COORDINATED WITH SUBMITTED VALVE CHARTS.
SUBMIT A COMPLETE MAINTENANCE MANUAL OF ALL EQUIPMENT INSTALLED UNDER THIS CONTRACT.

PROVIDE AND INSTALL ACCESS DOORS FOR EACH VALVE, DRAIN, OR FIRE PROTECTION DEVICE REQUIRING ACCESS. ACCESS DOORS SHALL BE RIGID CONSTRUCTION WITH TWO HINGES AND A LATCH. IN PLENUM CEILINGS, PROVIDE FELT BETWEEN THE DOOR AND FRAME TO MAKE AN AIR TIGHT SEAL. ACCESS DOORS SHALL BE RATED TO THE SAME OR GREATER RATING OF THE PARTITION IN WHICH THEY ARE INSTALLED. ACCESS DOORS SHALL BE FLUSH MOUNTED, PRIME COATED WITH RUST INHIBITIVE PAINT, CONCEALED FRAME, FLUSH SCREW DRIVER OPERATED LOCKS WITH METAL CAMS AND ANCHORS AS REQUIRED.

ACCESS DOOR SIZES SHALL BE:
12" X 12" AT EASILY ACCESSIBLE ITEMS
16" X 16" WHERE PARTIAL BODY ACCESS IS REQUIRED
24" X 24" WHERE FULL BODY ACCESS IS REQUIRED

HANGERS AND SUPPORT
SPRINKLER PIPING IN A SUBSTANTIAL MANNER FROM BUILDING STRUCTURE, AND INDEPENDENT OF THE CEILING SYSTEM. PROVIDE EARTHQUAKE/SEISMIC BRACING IN ACCORDANCE WITH NFPA 13 AND THE LOCAL CODE. DO NOT USE SPRINKLER PIPING OR HANGERS TO SUPPORT NON-SYSTEM COMPONENTS.

SEISMIC RESTRAINT: PROVIDE SEISMIC RESTRAINT AND EXPANSION OF ALL FIRE PROTECTION EQUIPMENT AND SYSTEMS IN ACCORDANCE WITH APPLICABLE NFPA STANDARDS, OWNERS INSURANCE COMPANY, STATE, FEDERAL AND LOCAL BUILDING CODE REQUIREMENTS. SUBMIT SHOP DRAWINGS SIGNED AND SEALED BY A LICENSED PROFESSIONAL ENGINEER REGISTERED IN THE STATE OF THE PROJECT INDICATING ALL NECESSARY COMPONENT CUTS, PLAN LOCATIONS AND CALCULATIONS FOR A COMPLETE SYSTEM.

PROVIDE ALL NECESSARY STRUCTURAL MEMBERS INCLUDING ADDITIONAL STRUCTURAL SUPPORT TO SUPPORT PIPING AND EQUIPMENT. HANGERS AND SUPPORTS SHALL BE OF AN APPROVED DESIGN NECESSARY TO SUPPORT PIPING, EQUIPMENT AND TO KEEP PIPING IN PROPER ALIGNMENT AND PREVENT TRANSMISSION OF INJURIOUS THRUSTS AND VIBRATIONS. IN ALL CASES WHERE HANGERS, BRACKETS, ETC., ARE SUPPORTED FROM CONCRETE CONSTRUCTION, DO NOT WEAKEN CONCRETE OR PENETRATE WATERPROOFING. ALL HANGERS AND SUPPORTS SHALL BE CAPABLE OF SCREW ADJUSTMENT AFTER PIPING IS ERECTED. HANGERS SUPPORTING PIPING EXPANDING INTO LOOPS, BENDS AND OFFSETS SHALL BE SECURED TO THE BUILDING STRUCTURE IN SUCH A MANNER THAT HORIZONTAL ADJUSTMENT PERPENDICULAR TO THE RUN OF PIPING SUPPORTED MAY BE MADE TO ACCOMMODATE DISPLACEMENT DUE TO EXPANSION. ALL SUCH HANGERS SHALL BE FINALLY ADJUSTED BOTH IN THE VERTICAL AND HORIZONTAL DIRECTION, AS REQUIRED.

PROVIDE ADDITIONAL SUPPORT FOR PIPING AND EQUIPMENT WHEN DECK IS NOT CAPABLE OF SUPPORT.

BEAM CLAMPS - HANGERS SUPPORTED FROM STEEL SHALL BE CENTER LOADING BEAM CLAMPS FOR HANGERS SUPPORTING PIPING 2 INCHES. FOR PIPING 2-1/2 INCHES AND LARGER, I BEAM CLAMPS SHALL BE FORGED STEEL "C" CLAMPS ARE PERMITTED ONLY WHEN PROVIDED WITH RESTRAINING STRAP. BAR JOIST HANGERS SHOULD BE UTILIZED WHEN HANGING FROM BAR JOIST CONSTRUCTION.

ALL HANGERS AND SUPPORTS SHALL BE HOT DIPPED GALVANIZED. ALL THREADED ROD AND HARDWARE SHALL BE HOT DIPPED GALVANIZED.

PROVIDE AND INSTALL EXPANSION COMPENSATION FOR ALL PIPING. SUBMIT PLANS, CALCULATIONS AND EQUIPMENT DATA.

FIRE FLOW TEST DATA

FLOW HYDRANT #236, 207 SOUND BEACH AVE: 94 PSI
RESIDUAL HYDRANT #274, 279 SOUND BEACH AVE: 88 PSI FLOWING 1,407 GPM
PUBLIC MAIN SIZE: 8"
DATE: 10/10/2023 @ 5:15 AM

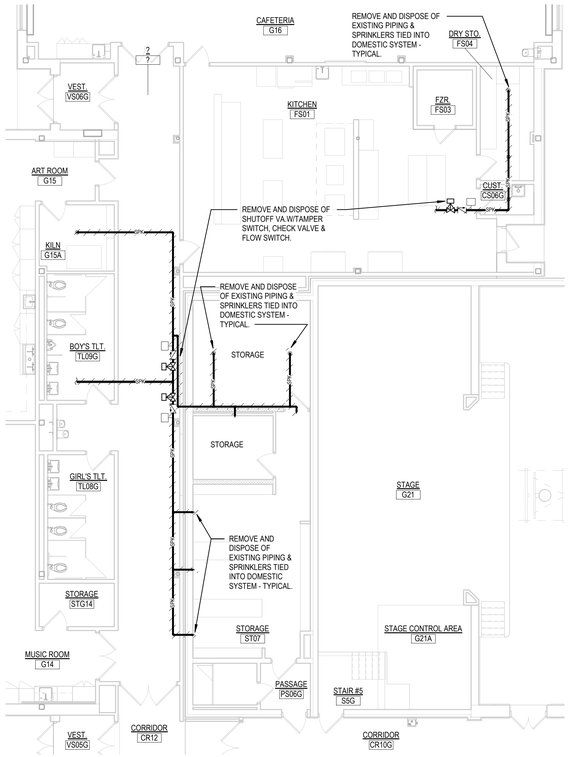
THE FIRE PROTECTION CONTRACTOR IS REQUIRED TO PERFORM HIS OWN WATER FLOW TEST FOR HIS HYDRAULIC CALCULATIONS. THE FLOW TEST DATA INFORMATION LISTED ABOVE IS FOR REFERENCE ONLY.

FIRE SERVICE BACKFLOW PREVENTER (DCDA)

LEAD-FREE (T0 NSF 61) DOUBLE CHECK DETECTOR ASSEMBLY (DCDA), 6" SIZE .WITH SUPERVISED OS&Y GATE VALVES AND METERED DETECTOR ASSEMBLY WITH DOUBLE CHECK BACKFLOW PREVENTER. BODY SHALL BE STAINLESS STEEL OR EPOXY-COATED CAST IRON, WITH STAINLESS STEEL INTERNAL PARTS. RATED FOR 33°F-140°F TEMP. RANGE, 175 PSI WORKING PRESSURE. FOR ALL FLOWS AT OR BELOW SERVICE FLOW (FLOW AT 7.5 FT/SEC), PRESSURE DROP SHALL NOT EXCEED 7 PSI. METER SHALL HAVE REGISTRATION IN CUBIC FEET. BASIS OF DESIGN: WATTS LF757DCDA-OSY, WILKINS 350DA-CFM OR 350ASTDA-CFM.

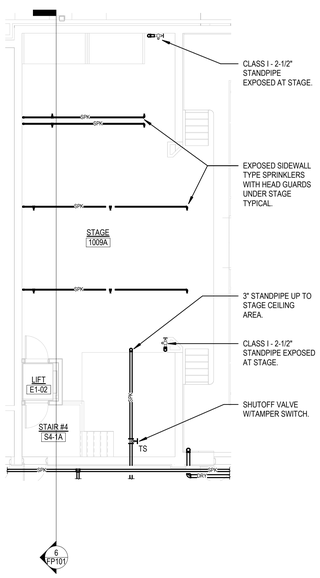
FIRE PROTECTION ABBREVIATIONS

ABBREVIATION	DESCRIPTION
A.F.F.	ABOVE FINISHED FLOOR
B.F.F.	BELOW FINISHED FLOOR
BLDG	BUILDING
CONT	CONTINUED
CV	CHECK VALVE
DIA.	DIAMETER
DN.	DOWN
DWG	DRAWING
EA	EACH
EX.	EXISTING
F.F.	FINISHED FLOOR
FLR.	FLOOR
F.P.C.	FIRE PROTECTION CONTRACTOR
FT.	FEET
GPM	GALLONS PER MINUTE
MAX.	MAXIMUM
MIN.	MINIMUM
MISC.	MISCELANNEOUS
NFPA	NATIONAL FIRE PROTECTION ASSOCIATION
NTS	NOT TO SCALE
OSY	OUTSIDE SCREW AND YOKE
PSI



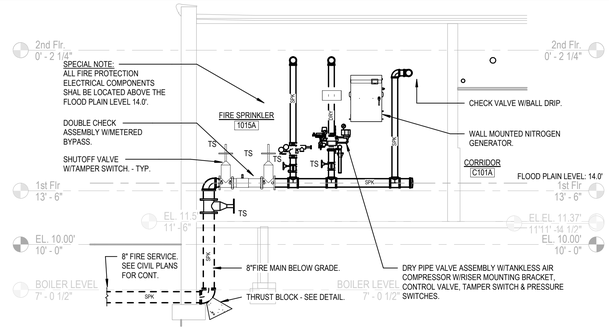
3 FIRST FLOOR DEMOLITION PLAN

1/8" = 1'-0"



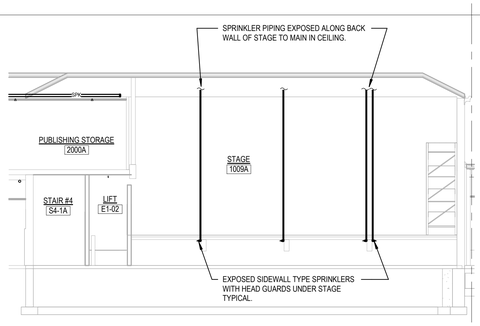
4 SPRINKLER UNDER STAGE PART PLAN

1/8" = 1'-0"



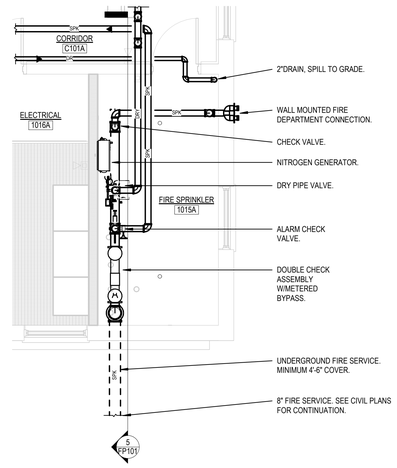
5 SECTION THRU SPRINKLER ROOM

1/4" = 1'-0"



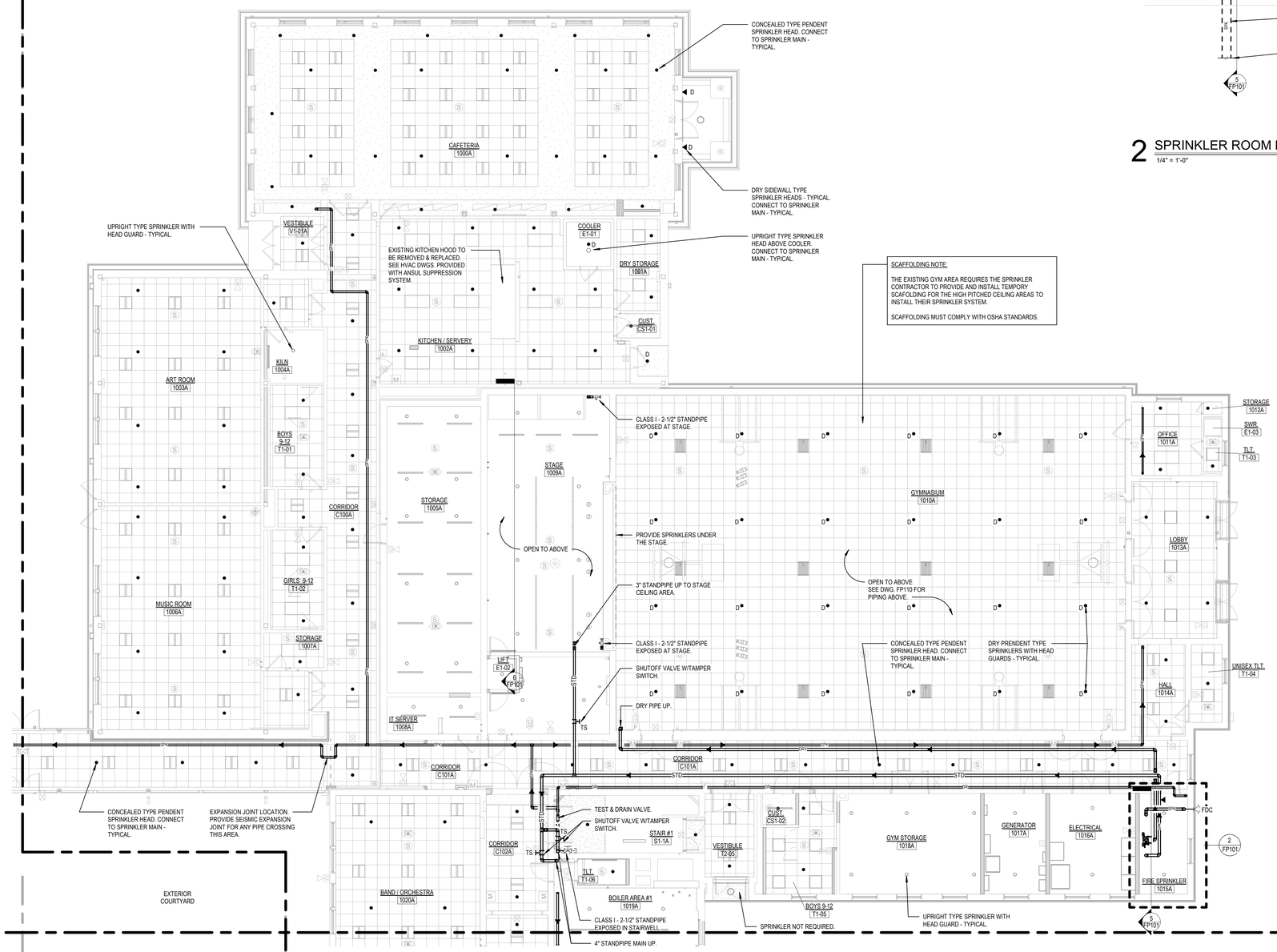
6 UNDER STAGE STORAGE SPRINKLERS

1/8" = 1'-0"



2 SPRINKLER ROOM PART PLAN

1/4" = 1'-0"



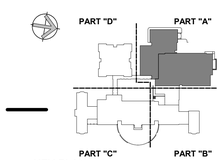
SCAFFOLDING NOTE:

THE EXISTING GYM AREA REQUIRES THE SPRINKLER CONTRACTOR TO PROVIDE AND INSTALL TEMPORY SCAFOLDING FOR THE HIGH PITCHED CEILING AREAS TO INSTALL THEIR SPRINKLER SYSTEM.

SCAFFOLDING MUST COMPLY WITH OSHA STANDARDS.

1 FIRST FLOOR PLAN - PART A

1/8" = 1'-0"



KEY PLAN

Project Title:

ADDITION & ALTERATIONS TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
311 STATE STREET NEW LONDON CT 06320
203 230 9007 silverpetrucelli.com

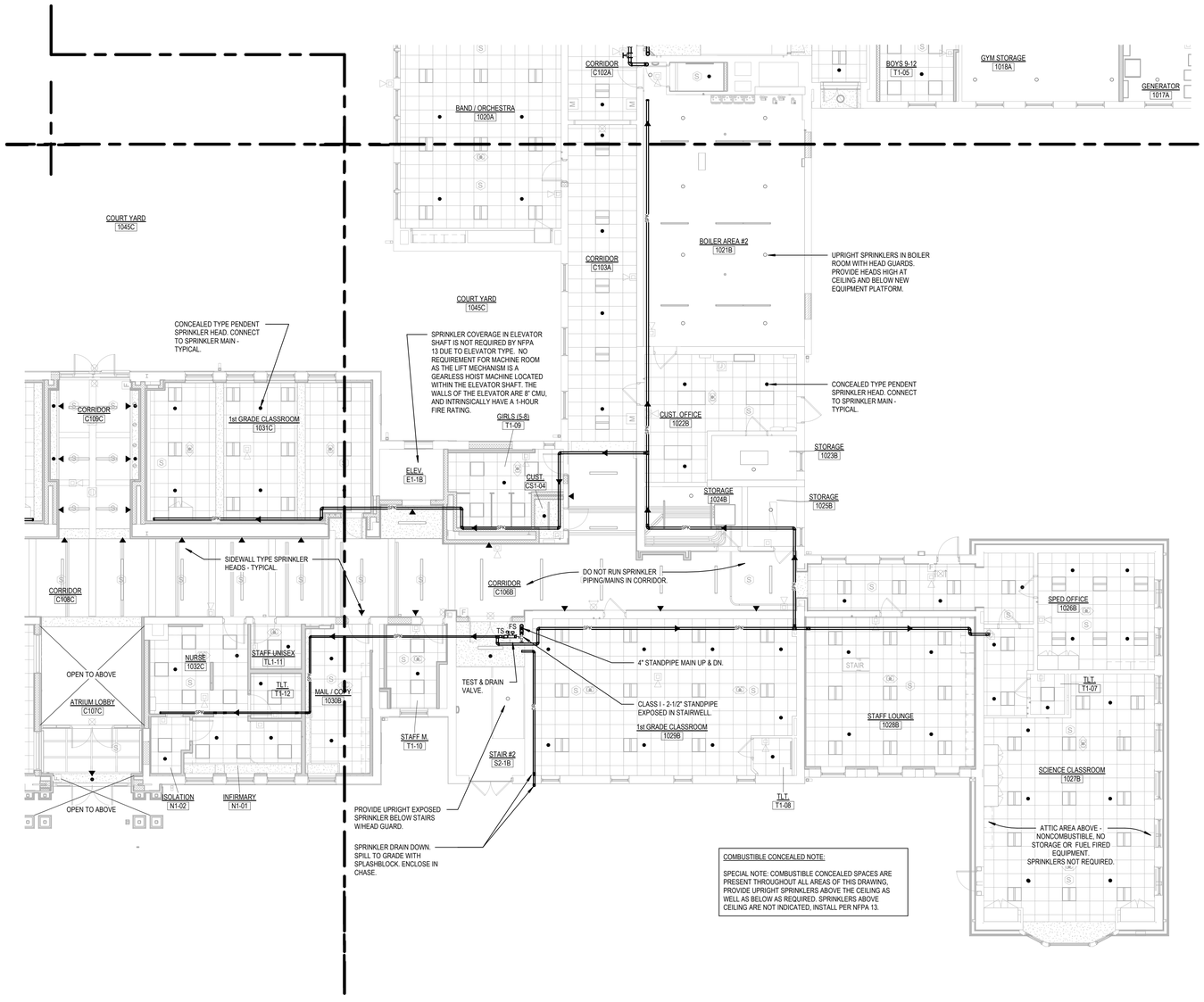
Revision:	Description:	Date:	Revised By:

Drawing Title:

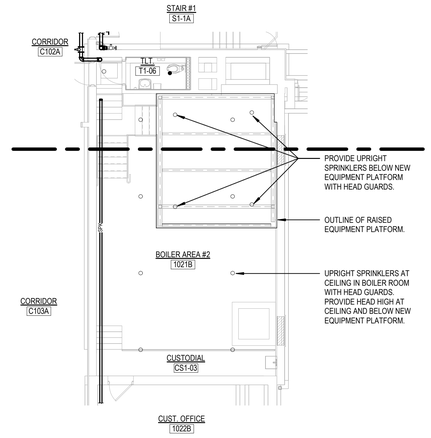
FIRST FLOOR PLAN - PART A - FIRE PROTECTION

Date: 8/29/2024
Scale: As indicated
Drawn By: MPB/JES
Project Number: 22-382
Drawing Number: FP101

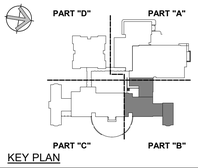
8/27/2024 4:11:22 PM



1 FIRST FLOOR PLAN - PART 'B'
1/8" = 1'-0"



2 SPRINKLER BOILER ROOM PLAN
1/8" = 1'-0"



KEY PLAN

Project Title:

ADDITION & ALTERATIONS TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

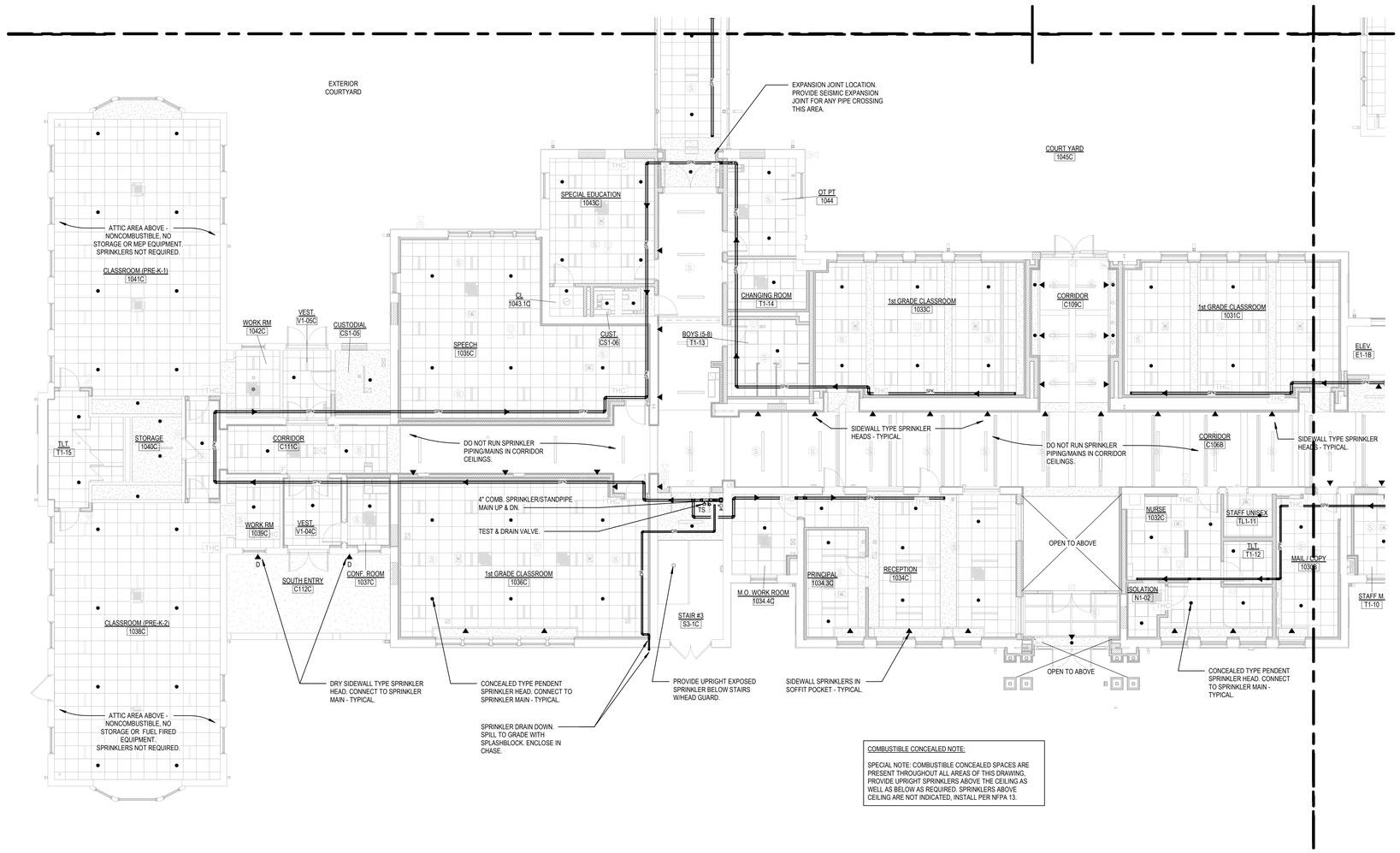
SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
311 STATE STREET NEW LONDON CT 06320
203 230 9007 silverpetrucelli.com

Revision:	Description:	Date:	Revised By:

Drawing Title:
FIRST FLOOR PLAN - PART B - FIRE PROTECTION

Date: 8/29/2024
Scale: 1/8" = 1'-0"
Drawn By: MPB/JES
Project Number: 22-382
Drawing Number: FP102

8/29/2024 8:24:23 AM

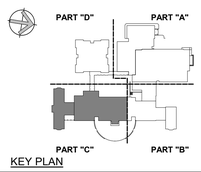


COMBUSTIBLE CONCEALED NOTE:

SPECIAL NOTE: COMBUSTIBLE CONCEALED SPACES ARE PRESENT THROUGHOUT ALL AREAS OF THIS DRAWING. PROVIDE UPRIGHT SPRINKLERS ABOVE THE CEILING AS WELL AS BELOW AS REQUIRED. SPRINKLERS ABOVE CEILING ARE NOT INDICATED, INSTALL PER NFPA 13.

1 FIRST FLOOR PLAN - PART 'C'

1/8" = 1'-0"



KEY PLAN

Project Title:

ADDITION & ALTERATIONS TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
311 STATE STREET NEW LONDON CT 06320
203 230 9007 silverpetrucelli.com

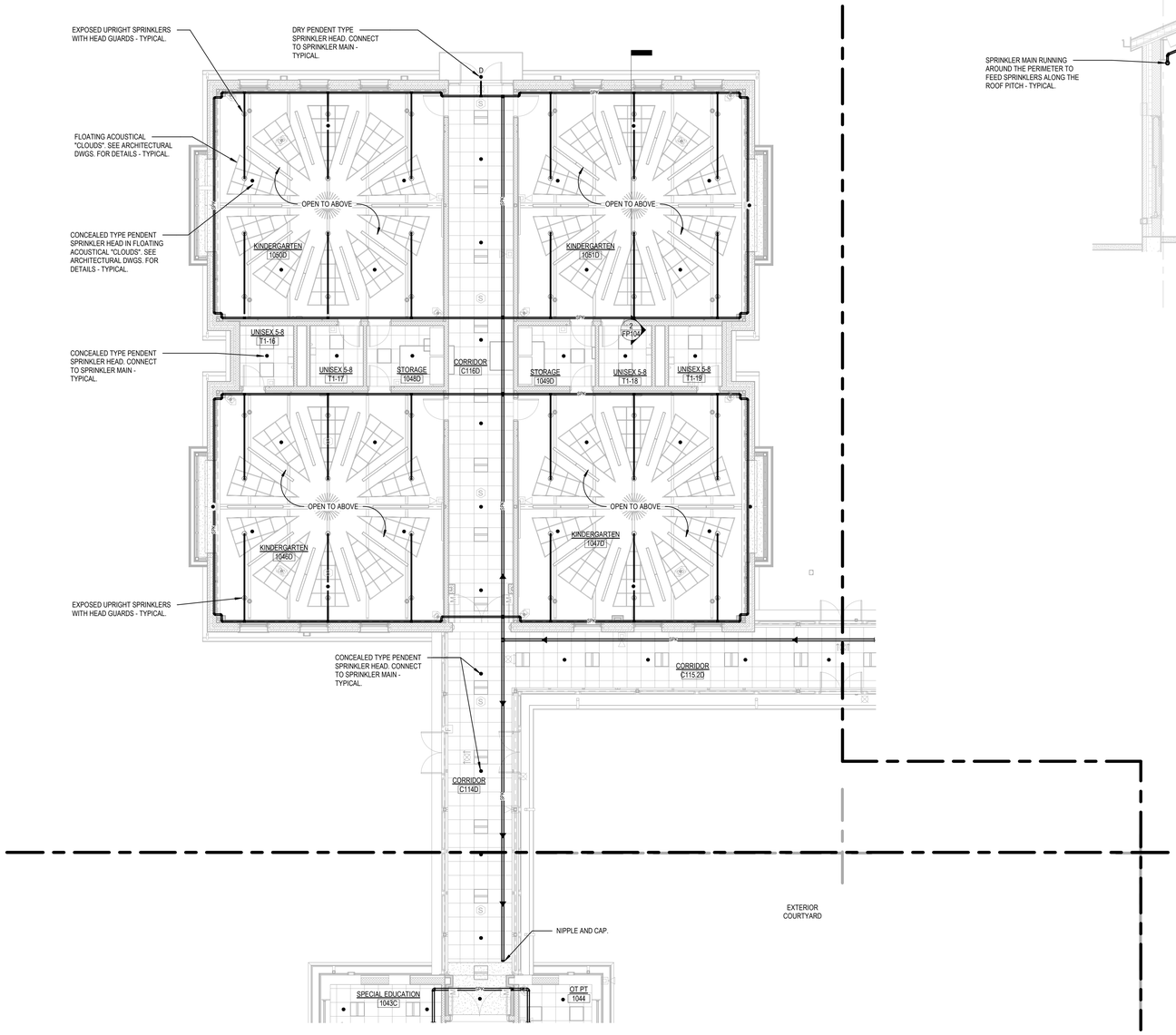
Revision:	Description:	Date:	Revised By:

Drawing Title:

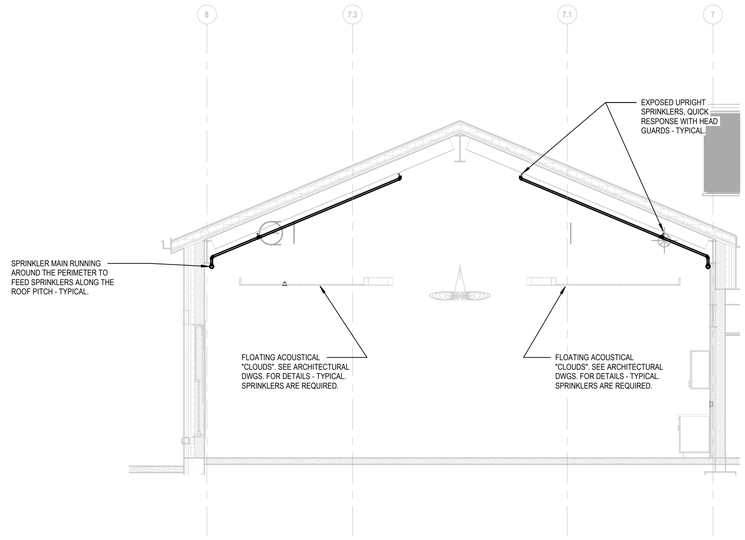
FIRST FLOOR PLAN - PART C - FIRE PROTECTION

Date: 8/29/2024
Scale: 1/8" = 1'-0"
Drawn By: Author
Project Number: 22-382
Drawing Number: FP103

8/29/2024 8:25:13 AM



1 FIRST FLOOR PLAN PART 'D'
1/8" = 1'-0"



2 SECTION THRU CLASSROOM
1/4" = 1'-0"

SPECIAL NOTE:

SEISMIC HANGERS AND SUPPORTS ARE REQUIRED FOR THE NEW ADDITION & CONNECTING CORRIDOR. SEE DETAILS ON DWG. FP300, NFPA 13 AND SPECIFICATION SECTION 210548.

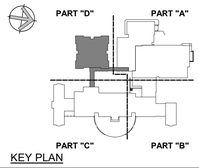
A. ALL MATERIALS AND EQUIPMENT SHALL BE INSTALLED, SUPPORTED, AND SEISMICALLY RESTRAINED ACCORDINGLY. VERIFY CURRENT SEISMIC REQUIREMENTS BASED ON PROJECT LOCATION AND WITH CODE REQUIREMENTS.

B. PROFESSIONAL ENGINEER QUALIFICATIONS: A PROFESSIONAL ENGINEER WHO IS LEGALLY QUALIFIED TO PRACTICE IN THE JURISDICTION WHERE THE PROJECT IS LOCATED AND WHO IS EXPERIENCED IN PROVIDING ENGINEERING SERVICES OF THE KIND INDICATED. ENGINEERING SERVICES ARE DEFINED AS THOSE PERFORMED FOR INSTALLATIONS OF VIBRATION ISOLATION BASES AND SEISMIC RESTRAINTS THAT ARE SIMILAR TO THOSE REQUIRED FOR THIS PROJECT IN MATERIAL, DESIGN, AND EXTENT.

C. SHOP DRAWINGS: SHOW DESIGNS AND CALCULATIONS, CERTIFIED BY PROFESSIONAL ENGINEER, FOR THE FOLLOWING:

1. DESIGN CALCULATIONS: CALCULATIONS FOR SELECTION OF VIBRATION ISOLATORS, DESIGN OF VIBRATION ISOLATION BASES, DESIGN OF SEISMIC SUPPORTS, AND SELECTION OF SEISMIC RESTRAINTS FOR ALL EQUIPMENT AND MATERIALS.
2. VIBRATION ISOLATION BASE DETAILS: DETAIL FABRICATION, INCLUDING ANCHORAGES AND ATTACHMENTS TO THE STRUCTURE AND TO THE SUPPORTED EQUIPMENT. INCLUDE AUXILIARY MOTOR SLIDES AND RAILS, AND BASE WEIGHTS.
3. SEISMIC RESTRAINT DETAILS: DETAIL FABRICATION AND ATTACHMENT OF RESTRAINTS, SUPPORTS AND SNUBBERS.

D. INSTALLATION: INSTALLATION SHALL BE CARRIED OUT IN STRICT ACCORDANCE WITH THE SEISMIC ENGINEER'S SUBMITTAL, CURRENT CODE, ACCEPTED STANDARDS, AND THE EQUIPMENT AND MATERIAL MANUFACTURERS' RECOMMENDATIONS.



KEY PLAN

Project Title:

ADDITION & ALTERATIONS TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

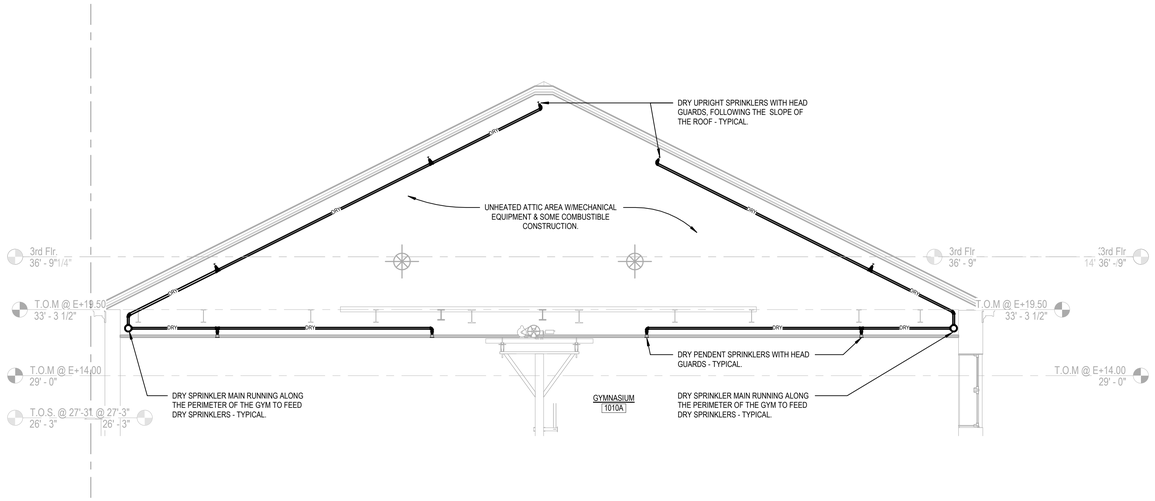
SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
311 STATE STREET NEW LONDON CT 06320
203 230 9007 silverpetrucelli.com

Revision:	Description:	Date:	Revised By:

Drawing Title:
FIRST FLOOR PLAN - PART D - FIRE PROTECTION

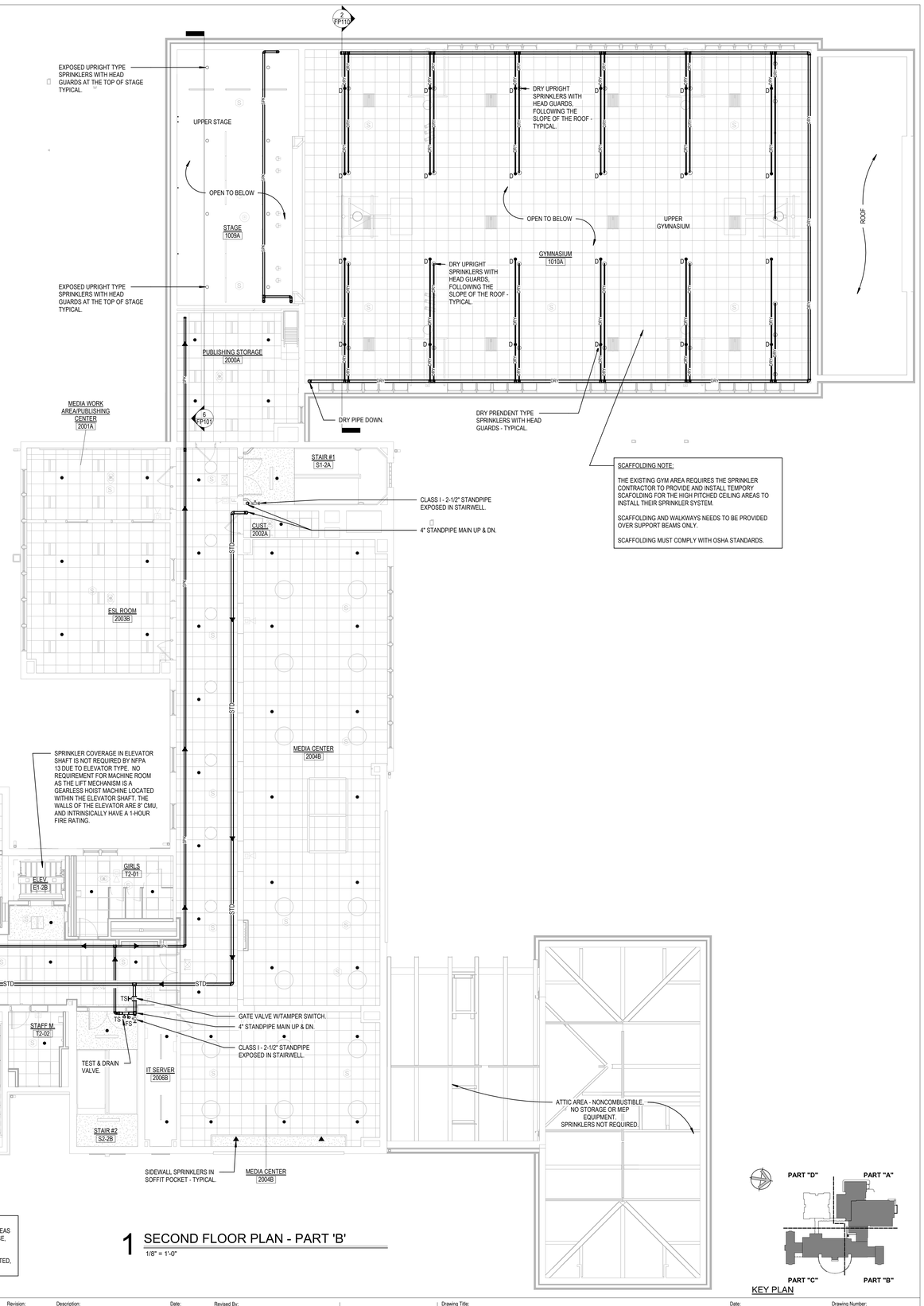
Date: 8/29/2024
Scale: As indicated
Drawn By: Author
Project Number: 22-382
Drawing Number: FP104

8/27/2024 4:15:26 PM



2 SECTION THRU GYMNASIUM

1/4" = 1'-0"



SPECIAL NOTE: COMBUSTIBLE CONCEALED SPACES ARE PRESENT. THROUGHOUT ALL AREAS OF THIS DRAWING, UNLESS NOTED OTHERWISE, PROVIDE UPRIGHT SPRINKLERS ABOVE THE CEILING AS WELL AS BELOW AS REQUIRED. SPRINKLERS ABOVE CEILING ARE NOT INDICATED. INSTALL PER NFPA 13.

1 SECOND FLOOR PLAN - PART 'B'

1/8" = 1'-0"

Project Title:

ADDITION & ALTERATIONS TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

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3190 WHITNEY AVENUE HAMDEN CT 06518
311 STATE STREET NEW LONDON CT 06320
203 230 9007 silverpetrucelli.com

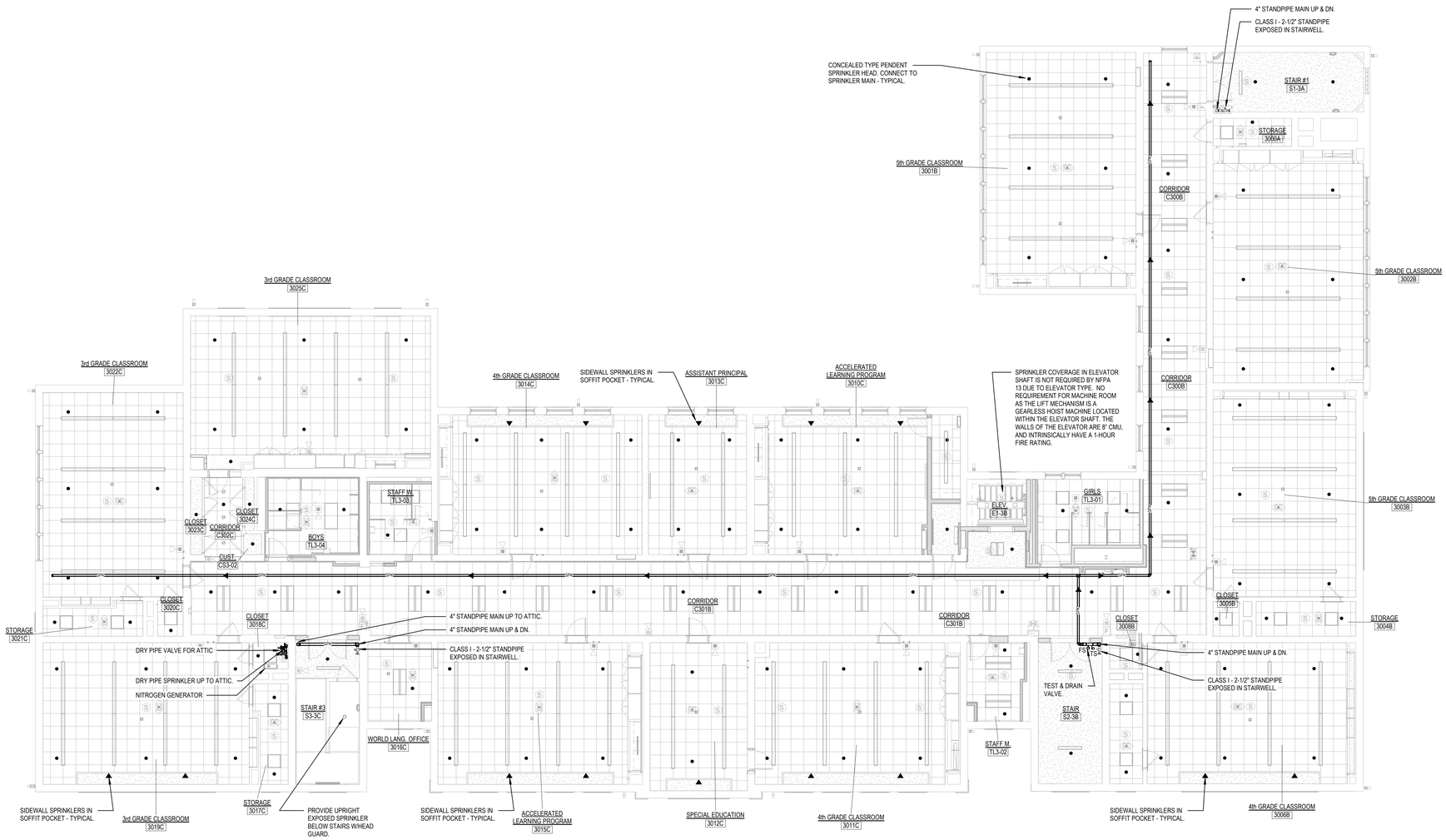
Revision:	Description:	Date:	Revised By:

Drawing Title:

SECOND FLOOR - PART A, B & C - FIRE PROTECTION

Date: 8/29/2024
Scale: As indicated
Drawn By: MPB/JES
Project Number: 22-382
Drawing Number: FP110

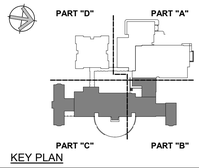
8/29/2024 8:22:57 AM



1 THIRD FLOOR PLAN - PART 'B & C'

1/8" = 1'-0"

SPECIAL NOTE: COMBUSTIBLE CONCEALED SPACES ARE PRESENT. THROUGHOUT ALL AREAS OF THIS DRAWING, PROVIDE UPRIGHT SPRINKLERS ABOVE THE CEILING AS WELL AS BELOW AS REQUIRED. SPRINKLERS ABOVE CEILING ARE NOT INDICATED, INSTALL PER NFPA 13.



KEY PLAN

Project Title:

ADDITION & ALTERATIONS TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

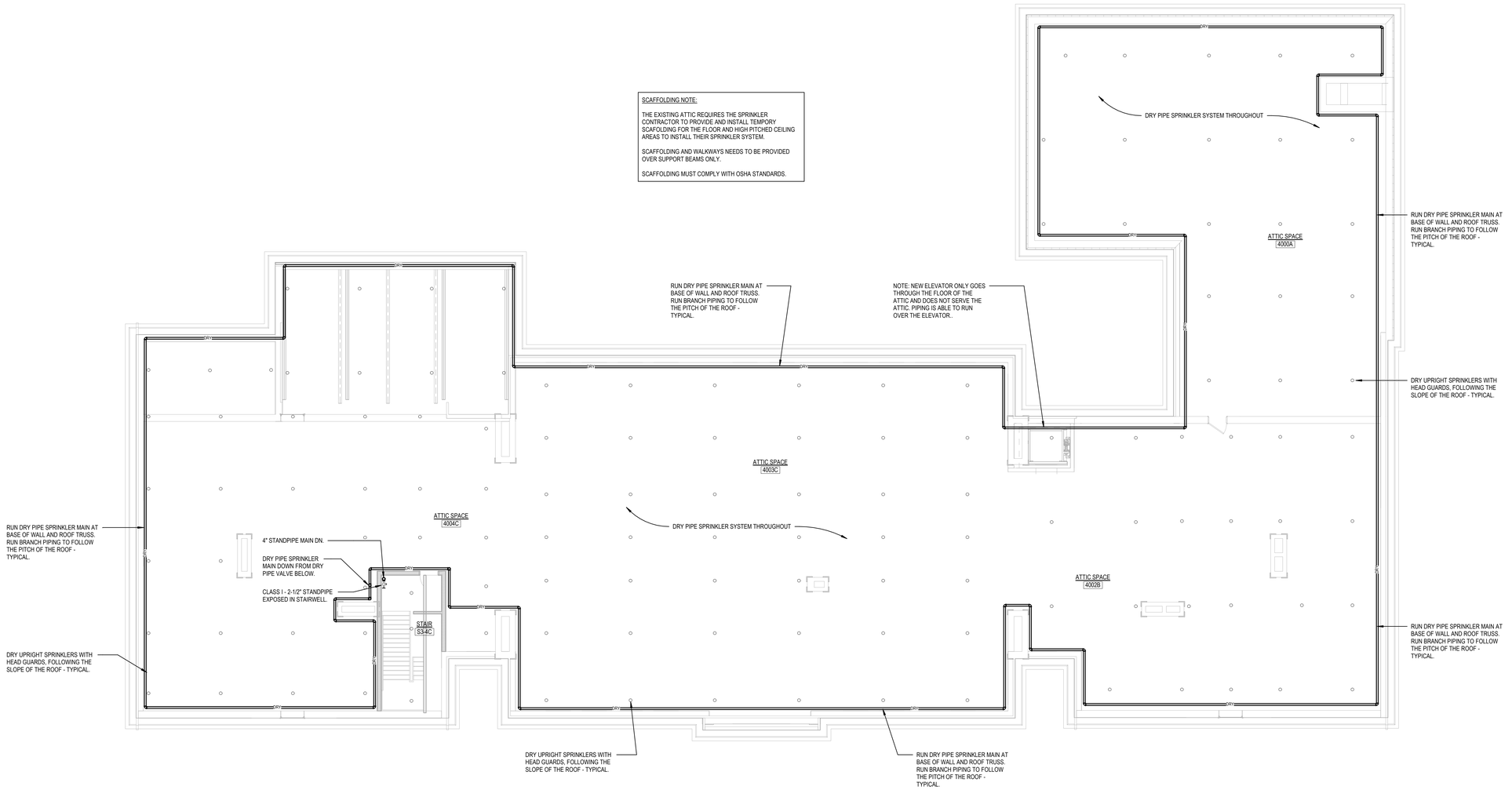
SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
311 STATE STREET NEW LONDON CT 06320
203 230 9007 silverpetrucelli.com

Revision:	Description:	Date:	Revised By:

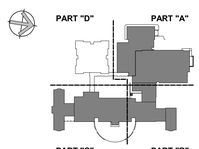
Drawing Title:
THIRD FLOOR PLAN - PART B & C - FIRE PROTECTION

Date: 8/29/2024
Scale: 1/8" = 1'-0"
Drawn By: JES
Project Number: 22-382
Drawing Number: FP120

8/29/2024 5:55:22 AM



1 ATTIC LEVEL PLAN
1/8" = 1'-0"



KEY PLAN

Project Title:

ADDITION & ALTERATIONS TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

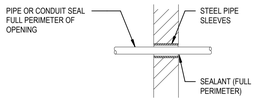
SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
311 STATE STREET NEW LONDON CT 06320
203 230 9007 silverpetrucelli.com

Revision:	Description:	Date:	Revised By:

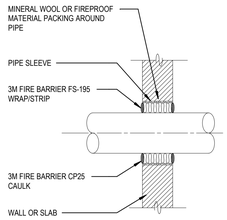
Drawing Title: ATTIC LEVEL PLAN - FIRE PROTECTION

Date: 8/29/2024
Scale: 1/8" = 1'-0"
Drawn By: JES
Project Number: 22-382
Drawing Number: FP130

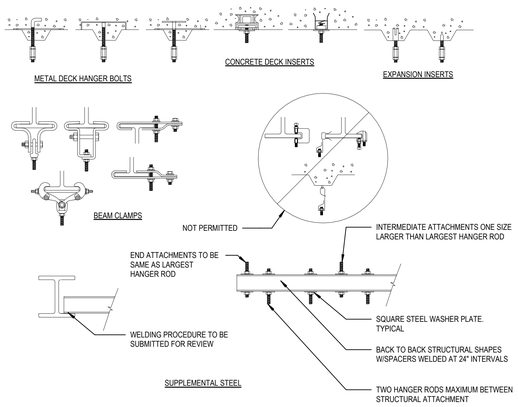
8/27/2024 4:32:10 PM

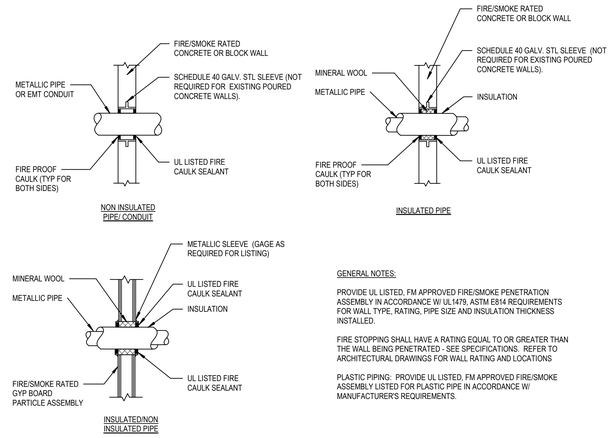


WALL PENETRATIONS AT NON-RATED WALLS



WALL PENETRATIONS AT RATED WALLS





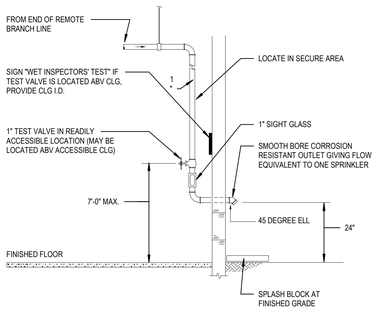
GENERAL NOTES:

PROVIDE UL LISTED, FM APPROVED FIRE/SMOKE PENETRATION ASSEMBLY IN ACCORDANCE W/ UL1479, ASTM E814 REQUIREMENTS FOR WALL TYPE, RATING, PIPE SIZE AND INSULATION THICKNESS INSTALLED.

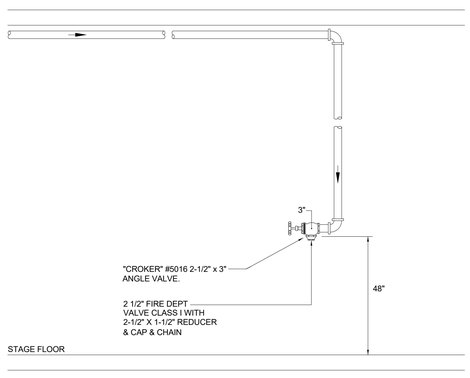
FIRE STOPPING SHALL HAVE A RATING EQUAL TO OR GREATER THAN THE WALL BEING PENETRATED - SEE SPECIFICATIONS. REFER TO ARCHITECTURAL DRAWINGS FOR WALL RATING AND LOCATIONS

PLASTIC PIPING: PROVIDE UL LISTED, FM APPROVED FIRE/SMOKE ASSEMBLY LISTED FOR PLASTIC PIPE IN ACCORDANCE W/ MANUFACTURER'S REQUIREMENTS.

7 WALL PENETRATIONS
NTS

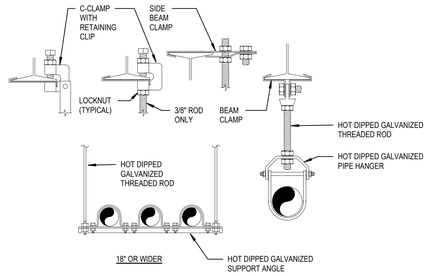


8 WET PIPE INSPECTOR'S TEST CONNECTION
NTS



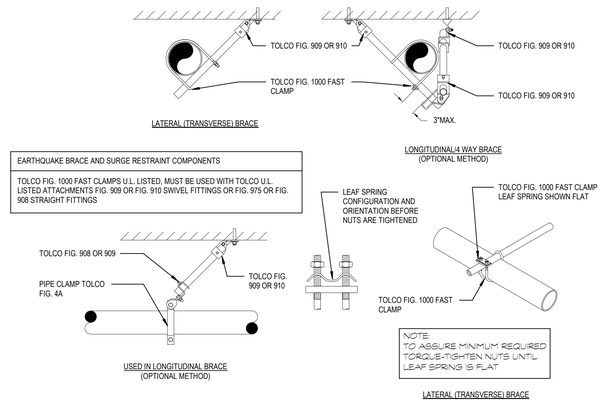
9 STAGE STANDPIPE DETAIL
NTS

4 PIPE HANGER ATTACHMENT
NTS

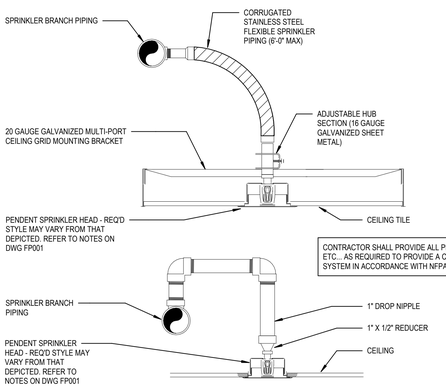


PIPE SIZE	MAX. SPACING STEEL PIPE EXCEPT THREADED LIGHTWALL	MAX. SPACING STEEL PIPE THREADED LIGHTWALL
1", 1-1/4"	12'-0"	12'-0"
1-1/2", 2", 2-1/2", 3"	15'-0"	12'-0"
4", 6", 8"	15'-0"	N/A
INSTALL HANGERS IN ACCORDANCE WITH NFPA 13 AND STRUCTURAL REQUIREMENTS		

5 PIPE SUPPORT DETAIL
NTS

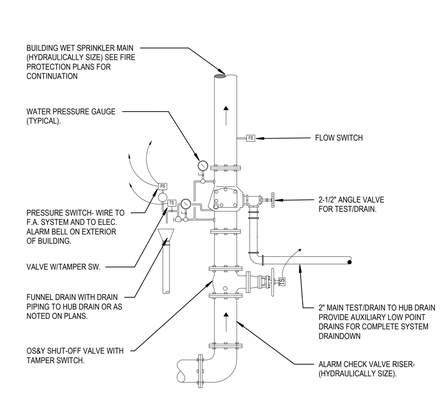


6 SEISMIC PIPING HANGER BRACING DETAIL
NTS



CONTRACTOR SHALL PROVIDE ALL PIPING, FITTINGS, HANGERS, ETC... AS REQUIRED TO PROVIDE A COMPLETE SPRINKLER SYSTEM IN ACCORDANCE WITH NFPA 13.

2 PENDENT SPRINKLER HEAD DETAILS
NTS



3 WET PIPE RISER ALARM CHECK VALVE
NTS

Project Title:

ADDITION & ALTERATIONS TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

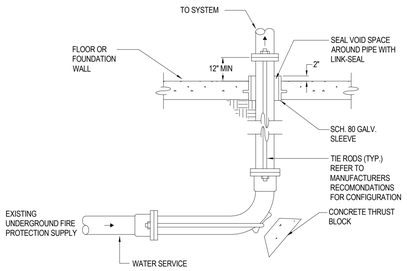
SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
311 STATE STREET NEW LONDON CT 06320
203 230 9007 silverpetrucelli.com

Revision:	Description:	Date:	Revised By:

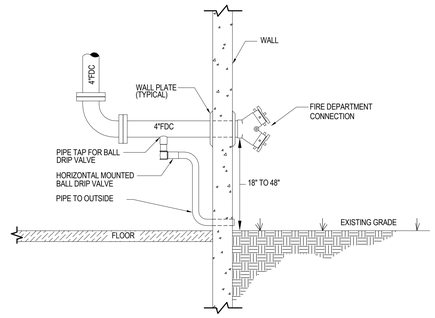
Drawing Title: FIRE PROTECTION DETAILS

Date: 8/29/2024
Scale: As indicated
Drawn By: JES
Project Number: 22-382
Drawing Number: FP300

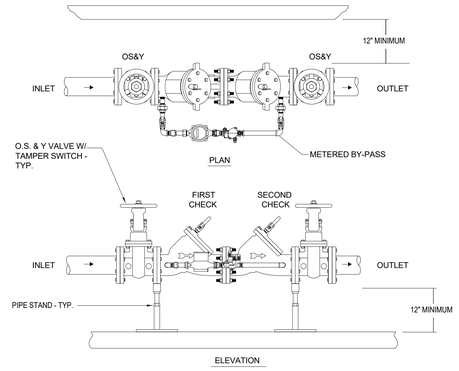
8/27/2024 4:33:17 PM



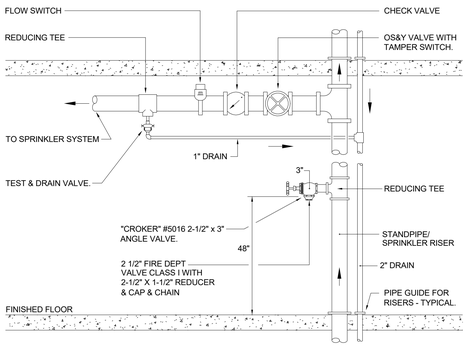
7 WATER SERVICE ENTRY DETAIL
NTS



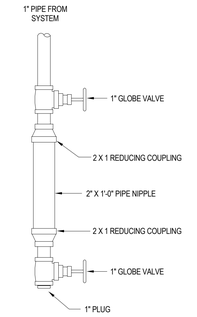
4 WALL MTD. FIRE DEPARTMENT CONN
NTS



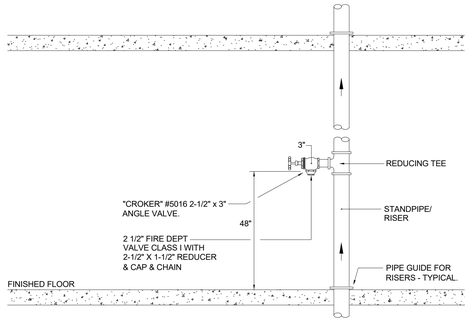
1 DOUBLE CHECK DETECTOR ASSEMBLY
NTS



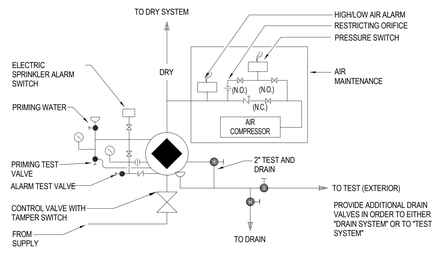
5 COMBINATION SPRINKLER/STANDPIPE
NTS



2 DRUM DRIP AUXILIARY DRAIN
NTS



6 SPRINKLER STANDPIPE
NTS



3 DRY PIPE VALVE SCHEMATIC
NTS

Project Title:

ADDITION & ALTERATIONS TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
311 STATE STREET NEW LONDON CT 06320
203 230 9007 silverpetrucelli.com

Revision:	Description:	Date:	Revised By:

Drawing Title: FIRE PROTECTION DETAILS

Date: 8/29/2024
Scale: NTS
Drawn By: JES
Project Number: 22-382

Drawing Number: FP301

8/27/2024 4:34:01 PM

PLUMBING GENERAL NOTES

GENERAL

THE INTENT OF THESE CONTRACT DOCUMENTS (SPECIFICATIONS AND DRAWINGS) IS FOR THE CONTRACTOR TO FURNISH AND INSTALL COMPLETE PLUMBING SYSTEMS. ALL SYSTEMS SHALL BE COMPLETE IN ALL RESPECTS, OPERATING, TESTED, ADJUSTED, APPROVED BY THE AUTHORITIES HAVING JURISDICTION AND READY FOR BENEFICIAL USE BY THE OWNER.

WHEN A CONFLICT BETWEEN THE DRAWINGS, NOTES AND/OR SPECIFICATIONS OCCUR, THE MORE STRINGENT, AND/OR LARGER QUANTITY AND/OR MORE EXPENSIVE SHALL APPLY. THE REQUIREMENTS LISTED WITHIN NOTES OR SPECIFICATIONS SHALL BE REQUIRED, PROVIDED AND INSTALLED WHETHER SPECIFICALLY INDICATED ON THE DRAWINGS OR NOT.

ITEMS AND SERVICES NOT SHOWN ON DRAWINGS OR SPECIFICATIONS BUT REQUIRED TO RENDER THE WORK COMPLETE AND READY FOR OPERATION, SHALL BE PROVIDED WITHOUT ADDITIONAL COST.

WORK OF THIS SECTION SHALL BE GOVERNED BY THE CONTRACT DOCUMENTS. PROVIDE MATERIALS, LABOR, EQUIPMENT AND SERVICES NECESSARY TO FURNISH, DELIVER AND INSTALL ALL WORK AS SPECIFIED AND AS REQUIRED BY JOB CONDITIONS. WHERE A CONFLICT EXISTS BETWEEN THESE NOTES, THE DRAWINGS AND THE SPECIFICATIONS, THE MORE STRINGENT REQUIREMENT SHALL APPLY.

DRAWINGS ARE DIAGRAMMATIC AND INDICATE A GENERAL ARRANGEMENT OF WORK AND ARE NOT TO BE CONSIDERED SUB-CONTRACTOR DOCUMENTS. IT IS THE INTENT OF THESE DOCUMENTS TO INCLUDE THE PROVISION AND INSTALLATION OF ALL NECESSARY WORK AND MATERIALS FOR COMPLETE, OPERATIONAL AND CODE COMPLIANT SYSTEMS BY THE CONTRACTOR. GENERAL DESIGN CONCEPTS INDICATED MUST BE FOLLOWED OR BETTERED. THE BID SHALL INCLUDE OFFSETS, ADDITIONAL PIPING, VALVES AND EQUIPMENT AND COMPONENTS AS REQUIRED TO MEET CONSTRUCTION CONDITIONS FOR PROPER OPERATION. DO NOT SCALE DRAWINGS. CONSULT ARCHITECTURAL AND STRUCTURAL DRAWINGS FOR SPACE CONDITIONS AND ADDITIONAL REQUIREMENTS.

PERFORM THE WORK IN ACCORDANCE WITH THE REQUIREMENTS OF THE CONTRACT GENERAL CONDITIONS AND WITH THE PROVISIONS OF ALL APPLICABLE LOCAL, STATE, AND FEDERAL CODES AND LAWS.

WORK SHALL INCLUDE ALL INCIDENTALS, LABOR, MATERIAL, EQUIPMENT, APPLIANCES, SERVICES, HOISTING, SCAFFOLDING, SUPPORTS, TOOLS, CONSUMABLE ITEMS, FEES, LICENSES, AND ADMINISTRATIVE TASKS REQUIRED TO COMPLETE AND MAKE OPERABLE WORK SHOWN ON THE DRAWINGS, SPECIFIED HEREIN AND AS REQUIRED FOR A COMPLETE AND OPERATIONAL SYSTEM..

ALL EQUIPMENT, MATERIALS AND RELATED SYSTEMS COMPONENTS SHALL BE NEW UNLESS SPECIFICALLY NOTED OTHERWISE.

STORE MATERIALS INSIDE AND PROTECTED FROM DEBRIS, WEATHER AND MOISTURE.

THIS CONTRACTOR SHALL COORDINATE ALL POWER AND CONTROL WIRING REQUIRED FOR EQUIPMENT OPERATION REQUIRED FOR A COMPLETE AND OPERATIONAL SYSTEM WITH ELECTRICAL CONTRACTOR. THIS CONTRACTOR SHALL PROVIDE MOTOR STARTERS FOR INSTALLATION. COORDINATE REQUIREMENTS.

PROVIDE AND INSTALL ALL MAKE-UP WATER DISTRIBUTION TO HVAC EQUIPMENT INCLUDING BACKFLOW PREVENTER.

PROVIDE AND INSTALL INDIRECT CONDENSATE WASTE PIPING AND TRAP TO FLOOR DRAIN OR DRAIN RECEPTOR FROM ALL HVAC EQUIPMENT. PROVIDE ADDITIONAL FLOOR DRAINS WITH TRAP PRIMERS OR DRAIN RECEPTORS AS REQUIRED.

PLUMBING DEVICES, FAUCETS, VALVES AND FITTINGS REQUIRED FOR SPECIALTY SERVICE EQUIPMENT (IE. KITCHEN, LAB,ETC) SHALL BE PROVIDED BY THIS CONTRACTOR UNLESS OTHERWISE SPECIFIED. THIS CONTRACTOR SHALL PROVIDE AND INSTALL PIPING, CONNECTIONS, DEVICES, VALVES AND EQUIPMENT REQUIRED FOR PROPER OPERATION. COORDINATE REQUIREMENTS.

KITCHENS, LABS AND SIMILAR SPECIALTY AREAS: ALL EXPOSED PIPING, STOPS, COCKS, AND WASTES WHICH ARE VISIBLE SHALL BE CHROME PLATED.

REPAIR AND/OR REPLACE AT NO COST TO OWNER ALL EQUIPMENT AND MATERIALS DAMAGED DURING CONSTRUCTION.

ALTERATION WORK AND DEMOLITION

ALL EQUIPMENT, FIXTURES, PIPING, ETC. TO BE REMOVED, SHALL BE DISPOSED OF, TURNED OVER TO THE OWNER, OR SALVAGED AS DIRECTED BY THE OWNER. EQUIPMENT, FIXTURES, PIPING, DEVICES, ETC. SHALL NOT BE REMOVED FROM THE PREMISES WITHOUT THE OWNER'S APPROVAL.

UPON COMPLETION OF REMOVALS AND MODIFICATIONS, ALL PIPING TO REMAIN SHALL BE PROPERLY PLUGGED, VALVED, CAPPED AND/OR BY PASSED SUCH THAT UPON COMPLETION OF WORK ALL SYSTEMS TO REMAIN, REMAIN OPERATIONAL.

NO DEAD ENDS SHALL BE LEFT ON ANY PIPING SYSTEMS UPON COMPLETION OF WORK.

EXISTING EXPOSED PIPING SYSTEMS NOT TO BE REUSED, AND NOT SPECIFICALLY NOTED FOR REMOVAL SHALL BE COMPLETELY REMOVED.

ALL SYSTEMS SHALL BE LEFT IN WORKING ORDER TO THE SATISFACTION OF THE OWNER UPON COMPLETION OF ALL NEW WORK.

ALL EXISTING EXPOSED, UNNECESSARY PIPING RELATED TO NEW WORK SHALL BE COMPLETELY REMOVED.

RE-ROUTE OR REMOVE ALL EXISTING PIPING AND SYSTEMS WHERE NECESSARY TO AVOID NEW EQUIPMENT, STRUCTURAL, OR MASONRY WORK AS REQUIRED BY THE PROPOSED ALTERATIONS.

COORDINATION

THE CONTRACTOR SHALL OBTAIN AND REVIEW ALL CONTRACT DOCUMENTS, INCLUDING PROJECT MANUAL, PLANS AND SPECIFICATIONS OF ALL TRADES BEFORE SUBMITTING BID. REFER TO SPECIFICATIONS, PROJECT MANUAL AND PLANS, INCLUDING ALL EQUIPMENT SCHEDULES FOR INFORMATION. CONTRACTOR SHALL WALK THROUGH BUILDING PRIOR TO SUBMITTING BID WHEN AVAILABLE.

ALL OF THE CONTRACT DRAWINGS AND SPECIFICATIONS ARE COMPLIMENTARY TO FORM A TOTAL DESIGN PACKAGE. IT IS THE RESPONSIBILITY OF THE GENERAL CONTRACTOR/CONSTRUCTION MANAGER TO DETERMINE WHICH TRADE CONTRACTOR IS RESPONSIBLE FOR VARIOUS PORTIONS OF THE WORK.

ALL WORK AND ACTION DEPICTED AND DESCRIBED SHALL BE PERFORMED BY THE CONTRACTOR UNLESS SPECIFICALLY NOTED OTHERWISE.

THE PLUMBING CONTRACTOR SHALL VERIFY THESE DRAWINGS WITH EXISTING FIELD CONDITIONS AND SHALL COORDINATE WITH CIVIL ENGINEER LOCATIONS AND ELEVATIONS OF PLUMBING SERVICE LINES BEFORE PROCEEDING WITH CONSTRUCTION. THE UTILITY SERVICE LINES SHOWN ON THE DRAWINGS ARE FOR REFERENCE & BUILDING PERMIT ONLY. REFER TO CIVIL ENGINEERS DRAWINGS FOR UTILITY SERVICE LINES LAY-OUT & DETAILS.

CONTRACTORS SHALL COORDINATE THEIR WORK WITH ALL OWNER-FURNISHED EQUIPMENT, INCLUDING REQUIRED SERVICE CONNECTIONS, RECEPTACLES, ETC. BEFORE INSTALLATION.

THE DRAWINGS ARE DIAGRAMMATIC AND INDICATE THE GENERAL ARRANGEMENT OF SYSTEMS AND WORK INCLUDED IN THE CONTRACT. THE CONTRACTOR SHALL COORDINATE LOCATIONS OF EQUIPMENT WITH ALL TRADES BEFORE STARTING CONSTRUCTION. ANY MODIFICATIONS TO THE EQUIPMENT LAYOUT REQUIRED FOR INSTALLATION ARE TO BE PERFORMED AT NO ADDITIONAL COST TO THE OWNER.
COORDINATE ALL PIPING AND CONDUITS LEAVING THE BUILDING WITH THE SITE CONTRACTOR BEFORE INSTALLATION.
LOCATION AND SIZES OF ALL FLOOR, WALL AND ROOF PENETRATIONS SHALL BE COORDINATED WITH ALL OTHER TRADES INVOLVED.

DEVELOP AND SUBMIT COORDINATION DRAWINGS AS OUTLINED.

SHEET METAL, PLUMBING AND FIRE PROTECTION SHOP DRAWINGS THAT HAVE BEEN COORDINATED WITH ARCHITECTURAL AND STRUCTURAL DRAWINGS SHALL BE SUBMITTED TO ENGINEER FOR REVIEW.
DRAWINGS MUST BE RETURNED FROM ENGINEER EITHER "REVIEWED" OR "FURNISH AS CORRECTED" PRIOR TO BEING USED AS BASIS FOR COORDINATION DRAWINGS.

AFTER SHEET METAL AND PIPING DRAWINGS HAVE BEEN REVISED PER ENGINEERS COMMENTS, REPRODUCIBLE COPIES SHALL BE SENT TO THE TRADES IN THE FOLLOWING SEQUENCE FOR THE INCLUSION OF THEIR WORK:

-MECHANICAL SHEET METAL
-PLUMBING PIPING
-MECHANICAL PIPING
-SPRINKLER PIPING
-ELECTRICAL WORK

AFTER ALL TRADES HAVE INCLUDED THEIR WORK ON THE COORDINATION DRAWING AND NOTED CONFLICTS, ALL TRADES SHALL MEET TO RESOLVE CONFLICTS AND AGREE TO ACCEPTABLE SOLUTIONS. EACH TRADE SHALL SIGN COORDINATION DRAWINGS. ITEMS NOT SHOWN ON COORDINATION DRAWING IS RESPONSIBILITY OF OMITTING CONTRACTOR AND CONTRACTOR IS SUBJECT TO ADDITIONAL COSTS INCURRED BY OTHER TRADES.

THE ARCHITECT AND ENGINEER ARE NOT PART OF THE COORDINATION DRAWING PROCESS. THE ENGINEER WILL PROVIDE ASSISTANCE FOR NOTED CONFLICTS ONLY. COORDINATION DRAWINGS ARE NOT TO BE CONSIDERED PIPING OR DUCT SHOP DRAWINGS. THE CONTRACTOR IS REQUIRED TO SUBMIT INDIVIDUAL PIPING AND DUCTWORK SHOP DRAWINGS FOR REVIEW BY THE ENGINEER. PIPING AND DUCTWORK SHOP DRAWINGS SHALL FOLLOW THE DESIGN INTENT OF THE CONTRACT DOCUMENTS.

SUBMIT FINAL SIGNED COORDINATION DRAWING TO ENGINEER FOR REVIEW. ENGINEER WILL REVIEW COORDINATION DRAWINGS FOR GENERAL ARRANGEMENT AND FOR NOTED CONFLICTS ONLY. SPECIFIC INSTALLATION REQUIREMENTS WILL BE REVIEWED ONLY IN INDIVIDUAL TRADE SHOP DRAWINGS.

ANY WORK FABRICATED OR INSTALLED PRIOR TO SIGN OFF BY ALL TRADES WHICH IS DEEMED TO BE IN CONFLICT WITH COORDINATION DRAWINGS SHALL BE REMOVED AND RE-INSTALLED IN CONFORMANCE WITH COORDINATION DRAWINGS.

EACH CONTRACTOR (MENTIONED ABOVE) IS RESPONSIBLE FOR THE COORDINATION OF HIS SUB-CONTRACTORS.

THE OVERALL COORDINATION OF THE COORDINATION PROCESS IS THE RESPONSIBILITY OF THE CONTRACTOR. THE ENGINEER IS NOT RESPONSIBLE FOR THE COORDINATION PROCESS. THE ENGINEER WILL RESPOND TO QUESTIONS THAT ARISE FROM THE COORDINATION PROCESS. DRAWINGS SUBMITTED WILL BE REVIEWED FOR CLEARLY IDENTIFIED CONFLICTS ONLY. SOLUTIONS TO CONFLICTS WILL NOT BEAR ADDITIONAL COST.

SHOP DRAWINGS

CONTRACTOR SHALL SUBMIT SHOP DRAWINGS TO BE APPROVED, REVISED, OR RESUBMITTED AS PER THE ENGINEERS COMMENTS, PRIOR TO CONSTRUCTION. INCLUDING BUT NOT LIMITED TO THE FOLLOWING:

-PLUMBING FIXTURES	-CLEAN OUTS	-DRAINS
-PIPING		
-PIPE SEALS	-COMPRESSORS	-FITTINGS
-BRAZING	-HANGERS/SUPPORTS	
-INSULATION	-EXPANSION TANKS	-WATER HEATERS
-PUMPS	-VALVES	-THERMOSTATIC MIXING VALVES

AS BUILT DRAWINGS

PROVIDE A COMPLETE SET OF AS-BUILT DRAWINGS REFLECTING AS INSTALLED CONDITIONS. AS-BUILT DRAWINGS SHALL INDICATE ALL INSTALLED CONDITIONS OF SYSTEMS WITHIN THIS DISCIPLINE. DRAWINGS SHALL BE OF SIMILAR SCALE AS THE CONSTRUCTION DOCUMENTS AND INCLUDE DETAILS AS NECESSARY TO CLEARLY REFLECT THE INSTALLED CONDITION. DRAWINGS SHALL BE BOUND IN A COMPLETE AND CONSECUTIVE SET. SUPPLEMENTAL SKETCHES AND LOOSE PAPERWORK WILL NOT BE ACCEPTABLE AND WILL BE RETURNED FOR REVISION. THE CONTRACTOR SHALL COMPLY WITH THE ENGINEERS COMMENTS TO PRODUCE A CLEAR AND CONCISE SET OF DRAWINGS. DRAWINGS SHALL BE SUBMITTED IN BOTH HARD COPY AND ELECTRONIC (AUTO-CAD VERSION AS REQUIRED BY THE OWNER) VERSION. NUMBER OF COPIES OF EACH AS REQUESTED BY THE OWNER.

PROVIDE "AS-BUILT DRAWINGS" INDICATING IN A NEAT AND ACCURATE MANNER A COMPLETE RECORD OF ALL REVISIONS OF THE ORIGINAL DESIGN OF THE WORK. INDICATE THE FOLLOWING INSTALLED CONDITIONS:

INCLUDE ALL CHANGES AND AN ACCURATE RECORD, ON REPRODUCTIONS OF THE CONTRACT DRAWINGS OR APPROPRIATE SHOP DRAWINGS, OF ALL DEVIATIONS, BETWEEN THE WORK SHOWN AND WORK INSTALLED.

MAINS AND BRANCHES OF PIPING SYSTEMS, WITH VALVES AND CONTROL DEVICES LOCATED AND NUMBERED, CONCEALED UNIONS LOCATED, AND WITH ITEMS REQUIRING MAINTENANCE LOCATED (I.E., TRAPS, STRAINERS, EXPANSION COMPENSATORS, TANKS, ETC.). VALVE LOCATION DIAGRAMS, COMPLETE WITH VALVE TAG CHART.
EQUIPMENT LOCATIONS (EXPOSED AND CONCEALED), DIMENSIONED FROM PROMINENT BUILDING LINES.

APPROVED SUBSTITUTIONS, CONTRACT MODIFICATIONS, AND ACTUAL EQUIPMENT AND MATERIALS INSTALLED.

CONTRACT MODIFICATIONS, ACTUAL EQUIPMENT AND MATERIALS INSTALLED.

SUBMIT FOR REVIEW BOUND SETS OF THE REQUIRED DRAWINGS, MANUALS AND OPERATING INSTRUCTIONS.

SUBMIT A COMPLETE MAINTENANCE MANUAL OF ALL EQUIPMENT INSTALLED UNDER THIS CONTRACT.

HOUSEKEEPING PADS

PROVIDE CONCRETE HOUSEKEEPING PADS FOR FLOOR-MOUNTED EQUIPMENT. COORDINATE EXACT LOCATIONS, DIMENSIONS, PIPING LOCATIONS, AND ANCHOR BOLT REQUIREMENTS. PROVIDE CONCRETE HOUSEKEEPING PADS UNDER ALL FLOOR MOUNTED EQUIPMENT. PADS SHALL BE CONSTRUCTED OF 3,000 PSI CONCRETE. PADS SHALL BE 4 INCHES HIGH, AND 4 INCHES WIDER THAN THE EQUIPMENT IN BOTH DIRECTIONS.

COORDINATE FLOOR DRAIN LOCATIONS WITH RESPECT TO EQUIPMENT HOUSEKEEPING PADS. PLACE DRAINS SUCH THAT EDGE OF THE FLOOR GRATE EXTENDS NO FURTHER THAN 2 INCHES FROM THE SIDE OF THE PAD.

HANGERS AND SUPPORT

SEISMIC RESTRAINT: PROVIDE SEISMIC RESTRAINT AND EXPANSION OF ALL PLUMBING EQUIPMENT AND SYSTEMS IN ACCORDANCE WITH STATE AND FEDERAL BUILDING CODE REQUIREMENTS. SUBMIT SHOP DRAWINGS SIGNED AND SEALED BY A LICENSED PROFESSIONAL ENGINEER REGISTERED IN THE STATE OF THE PROJECT INDICATING ALL NECESSARY COMPONENT CUTS, PLAN LOCATIONS AND CALCULATIONS FOR A COMPLETE SYSTEM.

PROVIDE ALL NECESSARY STRUCTURAL MEMBERS INCLUDING ADDITIONAL STRUCTURAL SUPPORT TO SUPPORT PIPING AND EQUIPMENT. HANGERS AND SUPPORTS SHALL BE OF AN APPROVED DESIGN NECESSARY TO SUPPORT PIPING, EQUIPMENT AND TO KEEP PIPING IN PROPER ALIGNMENT AND PREVENT TRANSMISSION OF INJURIOUS THRUSTS AND VIBRATIONS. IN ALL CASES WHERE HANGERS, BRACKETS, ETC., ARE SUPPORTED FROM CONCRETE CONSTRUCTION, DO NOT WEAKEN CONCRETE OR PENETRATE WATERPROOFING. ALL HANGERS AND SUPPORTS SHALL BE CAPABLE OF SCREW ADJUSTMENT AFTER PIPING IS ERECTED. HANGERS SUPPORTING PIPING EXPANDING INTO LOOPS, BENDS AND OFFSETS SHALL BE SECURED TO THE BUILDING STRUCTURE IN SUCH A MANNER THAT HORIZONTAL ADJUSTMENT PERPENDICULAR TO THE RUN OF PIPING SUPPORTED MAY BE MADE TO ACCOMMODATE DISPLACEMENT DUE TO EXPANSION. ALL SUCH HANGERS SHALL BE FINALLY ADJUSTED BOTH IN THE VERTICAL AND HORIZONTAL DIRECTION, AS REQUIRED. HANGERS IN CONTACT WITH COPPER OR BRASS PIPE SHALL BE DIELECTRIC, COMPATIBLE WITH COPPER AND BRASS ALLOY OR PROVIDED WITH FELT SLEEVE.

PROVIDE ADDITIONAL SUPPORT FOR PIPING AND EQUIPMENT WHEN DECK IS NOT CAPABLE OF SUPPORT.

BEAM CLAMPS - HANGERS SUPPORTED FROM STEEL SHALL BE CENTER LOADING BEAM CLAMPS FOR HANGERS SUPPORTING PIPING 2 INCHES. FOR PIPING 2-1/2 INCHES AND LARGER, I BEAM CLAMPS SHALL BE FORGED STEEL, "C" CLAMPS ARE NOT TO BE USED.

PROVIDE AND INSTALL EXPANSION COMPENSATION FOR ALL PIPING. SUBMIT PLANS, CALCULATIONS AND EQUIPMENT DATA.

BAND IRON, TIE WIRE, METAL STRAPPING OR WIRE STRAPPING SHALL NOT BE PERMITTED TO SUPPORT PIPING OR EQUIPMENT.

PIPE SEALS

SEAL ALL PIPING PASSING THROUGH ALL FIRE AND/OR SMOKE RATED PARTITIONS AND WALLS WITH A UL LISTED, APPROVED AND TESTED FIRE AND/OR SMOKE SEALING MATERIAL INSTALLED IN ACCORDANCE WITH MANUFACTURERS RECOMMENDATIONS.

ALL PIPING PENETRATING A SLAB ON GRADE OR FOUNDATION WALL BELOW GRADE AND IN CONTACT WITH EARTH SHALL BE PROVIDED WITH A POURED IN PLACE SCHEDULE 80 GALVANIZED STEEL WATER TIGHT SLEEVE WITH INTEGRAL WATER STOP AND SEAL EQUAL TO "LINK SEAL".

FURNISH AND SET STEEL PIPE SLEEVES OF SCHEDULE 40 BLACK STEEL FOR ALL LOCATIONS OF INTERIOR PARTITIONS, WALLS AND FLOORS PROVIDING AT LEAST 1/2" CLEARANCE BETWEEN PIPE INSULATION AND SLEEVE OR PIPE AND SLEEVE. WALL SLEEVES SHALL BE SMOOTH CUT AND SET FLUSH WITH FINISHED WALLS. FLOOR SLEEVES SHALL EXTENDED 2" ABOVE THE FINISHED FLOOR.

ALL PIPING THROUGH WALLS, FLOORS OR CEILINGS SHALL HAVE SLEEVES AND ESCUTCHEONS. PROVIDE A TWO PIECE CHROME ESCUTCHEON WHERE PIPING PASSES THROUGH WALLS OR FLOORS OF FINISHED SPACES.

PLUMBING FIXTURES

PLUMBING FIXTURES SHALL BE NEW, COMPLETE WITH TRIMMINGS AND FITTINGS, INCLUDING FAUCETS, CARRIERS, SUPPLIES, STOPS, TRAPS, TAILPIECES, WASTE PLUGS, CASINGS, HANGERS, PLATES, BRACKETS, ANCHORS, SUPPORTS, HARDWARE AND FASTENING DEVICES. NOTE: ALL FIXTURES SHALL BE OF SAME MANUFACTURER. TRIMMINGS AND FITTINGS SHALL BE CONSTRUCT OF FORGED, CAST, ROLLED OR EXTRUDED BRASS OR BRONZE WITH MONEL AND OTHER SUITABLE NON-CORROSIVE PARTS. DESIGNED WITH EASILY RENEWABLE PARTS THAT ARE SUBJECT TO WEAR OR DETERIORATION. NO DIE CASTINGS AND STAMPINGS OTHER THAN BRASS OR STAINLESS STEEL. PROVIDE PLUMBING FIXTURES AND TRIM WITH ALL NECESSARY TRIM, DEVICES AND ACCESSORIES REQUIRED FOR PROPER OPERATIONS SPECIFICALLY NOTED OR NOT

ESCUTCHEONS SHALL BE ONE-PIECE CHROME PLATED CAST BRASS OR STAINLESS STEEL.

P-TRAPS SHALL BE ONE PIECE CHROME PLATED CAST BRASS WITH CLEANOUT PLUG.

EXAMINE ROUGHING-IN WORK OF POTABLE WATER AND WASTE PIPING SYSTEMS TO VERIFY ACTUAL LOCATIONS OF PIPING CONNECTIONS PRIOR TO INSTALLING FIXTURES. CORRECT ANY INCORRECT LOCATION OF PIPING, AND UNSATISFACTORY CONDITIONS FOR INSTALLATION OF PLUMBING FIXTURES. DO NOT PROCEED WITH WORK UNTIL UNSATISFACTORY CONDITIONS HAVE BEEN CORRECTED IN A MANNER ACCEPTABLE TO THE ENGINEER. ALL ROUGH-IN TO PLUMBING FIXTURES SHALL CONFORM TO FIXTURE MANUFACTURER PUBLISHED ROUGH-IN DIMENSIONS, AND REQUIREMENTS.

UPON COMPLETION OF INSTALLATION OF PLUMBING FIXTURES AND AFTER UNITS ARE WATER PRESSURIZED, TEST FIXTURES TO DEMONSTRATE CAPABILITY AND COMPLIANCE WITH REQUIREMENTS. CORRECT MALFUNCTIONING UNITS AT SITE, THEN RETEST TO DEMONSTRATE COMPLIANCE; OTHERWISE, REMOVE AND REPLACE WITH NEW UNITS AND PROCEED WITH RETESTING.

CLEAN PLUMBING FIXTURES, TRIM, AND STRAINERS OF DIRT AND DEBRIS UPON COMPLETION OF INSTALLATION.

ADJUST WATER PRESSURE AT DRINKING FOUNTAINS, FAUCETS, SHOWER VALVES, AND FLUSH VALVES TO PROVIDE PROPER FLOW STREAM AND SPECIFIED GPM.

SET FIXTURES LEVEL AND UNIFORMLY, WITH CONNECTIONS AT RIGHT ANGLES TO WALL AND PROPERLY CENTERED. LAY OUT ROUGHING ACCURATELY AND IN COORDINATION WITH SPACE AND FINISH REQUIREMENTS.

LOCATE WASTE OUTLETS AND WATER SUPPLIES AT CONSTANT HORIZONTAL LEVELS, WITH WASTE OUTLET CENTERED ON FIXTURE DRAIN CONNECTION AND WATER SUPPLIES SPACED EQUALLY TO RIGHT AND LEFT.

REFER TO THE ARCHITECTURAL DRAWINGS FOR THE EXACT LOCATION AND MOUNTING HEIGHTS OF EQUIPMENT. COLORS SHALL BE COORDINATED WITH THE ARCHITECT. CONTACT ARCHITECT FOR CLARIFICATION IF INFORMATION IS NOT CONTAINED IN THE DRAWINGS.

DRAINS AND CLEANOUTS

PROVIDE ALL POURED IN PLACE DRAINS AND CLEANOUTS WITH 24" X 24" FLASHING.

PROVIDE A MANUFACTURED BRONZE OUTLET FITTING FOR ALL SECONDARY ROOF DRAIN OUTLETS.

INSTALL EXTERIOR CLEANOUTS WITH A 18" SQUARE X 6" THICK CONCRETE APRON.

COORDINATE FLOOR DRAIN LOCATIONS WITH RESPECT TO EQUIPMENT HOUSEKEEPING PADS. PLACE DRAINS SUCH THAT EDGE OF THE FLOOR GRATE EXTENDS NO FURTHER THAN 2 INCHES FROM THE SIDE OF THE PAD. CLEANOUT PLUGS SHALL BE BRASS OR PLASTIC, OR OTHER APPROVED MATERIALS. BRASS CLEANOUT PLUGS SHALL BE UTILIZED WITH METALLIC DRAIN, WASTE AND VENT PIPING ONLY, AND SHALL CONFORM TO ASTM A 74, ASME A112.3.1 OR ASME A112.36.2M. CLEANOUTS WITH PLATE-STYLE ACCESS COVERS SHALL BE FITTED WITH CORROSION-RESISTING FASTENERS. PLUGS SHALL HAVE RAISED SQUARE OR COUNTERSUNK SQUARE HEADS. COUNTERSUNK HEADS SHALL BE INSTALLED WHERE RAISED HEADS ARE A TRIP HAZARD. CLEANOUT PLUGS WITH BOROSILICATE GLASS SYSTEMS SHALL BE OF BOROSILICATE GLASS.

PROVIDE TRAP PRIMERS FOR EACH FLOOR DRAIN. CONNECT TRAP PRIMER TO NEAREST COLD WATER MAIN. PROVIDE ISOLATION VALVE AND EXTEND TO FLOOR DRAIN AS REQUIRED.

CLEANOUTS SHALL BE LOCATED AT MINIMUM INTERVALS OF 50 FEET FOR PIPING NPS 4 AND SMALLER AND 100 FEET FOR LARGER PIPING.

BUILDING SEWERS SHALL BE PROVIDED WITH CLEANOUTS LOCATED NOT MORE THAN 100 FEET APART MEASURED FROM THE UPSTREAM ENTRANCE OF THE CLEANOUT. FOR BUILDING SEWERS 8 INCHES AND LARGER, MANHOLES SHALL BE PROVIDED AND LOCATED NOT MORE THAN 200 FEET FROM THE JUNCTION OF THE BUILDING DRAIN AND BUILDING SEWER, AT EACH CHANGE IN DIRECTION AND AT INTERVALS OF NOT MORE THAN 400 FEET APART. MANHOLES AND MANHOLE COVERS SHALL BE OF AN APPROVED TYPE.

CLEANOUTS SHALL BE INSTALLED AT EACH CHANGE OF DIRECTION OF THE BUILDING DRAIN OR HORIZONTAL WASTE OR SOIL LINES GREATER THAN 45 DEGREES (INCLUDING P-TRAPS). WHERE MORE THAN ONE CHANGE OF DIRECTION OCCURS IN A RUN OF PIPING, ONLY ONE CLEANOUT SHALL BE REQUIRED FOR EACH 40 FEET OF DEVELOPED LENGTH OF THE DRAINAGE PIPING.

A CLEANOUT SHALL BE PROVIDED AT THE BASE OF EACH WASTE OR SOIL STACK.

THERE SHALL BE A CLEANOUT NEAR THE JUNCTION OF THE BUILDING DRAIN AND THE BUILDING SEWER. THE CLEANOUT SHALL BE EITHER INSIDE OR OUTSIDE THE BUILDING WALL AND SHALL BE BROUGHT UP TO THE FINISHED GROUND LEVEL OR TO THE BASEMENT FLOOR LEVEL. AN APPROVED TWO-WAY CLEANOUT IS ALLOWED TO BE USED AT THIS LOCATION TO SERVE AS A REQUIRED CLEANOUT FOR BOTH THE BUILDING DRAIN AND BUILDING SEWER. THE CLEANOUT AT THE JUNCTION OF THE BUILDING DRAIN AND BUILDING SEWER SHALL NOT BE REQUIRED IF THE CLEANOUT ON A 3-INCH OR LARGER DIAMETER SOIL STACK IS LOCATED WITHIN A DEVELOPED LENGTH OF 10 FEET OF THE BUILDING DRAIN AND BUILDING SEWER CONNECTION.

CONCEALED PIPING. CLEANOUTS ON CONCEALED PIPING OR PIPING UNDER A FLOOR SLAB OR IN A CRAWL SPACE OF LESS THAN 24 INCHES IN HEIGHT OR A PLENUM SHALL BE EXTENDED THROUGH AND TERMINATE FLUSH WITH THE FINISHED WALL, FLOOR OR GROUND SURFACE OR SHALL BE EXTENDED TO THE OUTSIDE OF THE BUILDING. CLEANOUT PLUGS SHALL NOT BE COVERED WITH CEMENT, PLASTER OR ANY OTHER PERMANENT FINISH MATERIAL WHERE IT IS NECESSARY TO CONCEAL A CLEANOUT OR TO TERMINATE A CLEANOUT IN AN AREA SUBJECT TO VEHICULAR TRAFFIC, THE COVERING PLATE, ACCESS DOOR OR CLEANOUT SHALL BE OF AN APPROVED TYPE DESIGNED AND INSTALLED FOR THIS PURPOSE.

MINIMUM SIZE. CLEANOUTS SHALL BE THE SAME NOMINAL SIZE AS THE PIPE THEY SERVE UP TO 4 INCHES. FOR PIPES LARGER THAN 4 INCHES NOMINAL SIZE, THE MINIMUM SIZE OF THE CLEANOUT SHALL BE 4 INCHES.

CAST-IRON CLEANOUT SIZING SHALL BE IN ACCORDANCE WITH ASTM A 74 FOR HUB AND SPIGOT FITTINGS OR ASTM A 888 OR CISPI 301 FOR HUBLESS FITTINGS.

ACCESS SHALL BE PROVIDED TO ALL CLEANOUTS.

PROVIDE CONDENSATE DRAINAGE, COMPLETE WITH CONDENSATE REMOVAL PUMP, FOR EACH COOLING COIL. CONDENSATE PUMP DISCHARGE SHALL BE CONNECTED VIA INDIRECT WASTE CONNECTION TO BUILDING SANITARY/WASTE PIPING SYSTEM. COORDINATE PUMP WIRING WITH PROJECT ELECTRICIAN. IF GRAVITY DRAINAGE IS POSSIBLE WITHIN THE CONSTRAINTS OF PIPING PITCH, CONCEALMENT ABOVE CEILINGS, AND ONLY AFTER COMPLETE COORDINATION WITH STRUCTURE AND OTHER TRADES, THE CONTRACTOR MAY SUBMIT SKETCH PROPOSALS FOR GRAVITY ROUTING FOR REVIEW/APPROVAL.

MISCELLANEOUS SPECIALTIES

ALL EQUIPMENT, VALVES, STRAINERS, UNIONS, TRAPS, FLANGES AND OTHER APPURTENANCES REQUIRING ACCESS SHALL BE LOCATED IN ACCESSIBLE LOCATIONS. WHEN A PIECE OF EQUIPMENT MUST BE LOCATED ABOVE AN INACCESSIBLE CEILING OR WALL THEN THE APPROPRIATE ACCESS DOOR SHALL BE PROVIDED. SUCH EQUIPMENT INCLUDES, BUT IS NOT LIMITED TO CLEANOUTS, WATER HAMMER ARRESTORS AND VALVES. THESE SHALL BE COORDINATED WITH THE ARCHITECT. ACCESS DOORS SHALL BE RIGID CONSTRUCTION WITH TWO HINGES AND A LATCH. IN PLENUM CEILINGS, PROVIDE FELT BETWEEN THE DOOR AND FRAME TO MAKE AN AIR TIGHT SEAL. ACCESS DOORS SHALL BE RATED TO THE SAME OR GREATER RATING OF THE PARTITION IN WHICH THEY ARE INSTALLED. ACCESS DOORS SHALL BE FLUSH MOUNTED, PRIME COATED WITH RUST INHIBITIVE PAINT, CONCEALED FRAME, FLUSH SCREW DRIVER OPERATED LOCKS WITH METAL CAMS AND ANCHORS AS REQUIRED.

ACCESS DOOR SIZES SHALL BE:
12" X 12" AT EASILY ACCESSIBLE ITEMS
16" X 16" WHERE PARTIAL BODY ACCESS IS REQUIRED
24" X 24" WHERE FULL BODY ACCESS IS REQUIRED

PROVIDE AND INSTALL DRIP PANS WITH WATER DETECTOR AND DRAIN FOR PIPING REQUIRED BY ACTUAL FIELD CONDITIONS WHERE PIPING PASSES OVER INCLUDING AREA WITHIN 3'-0" OF ELECTRICAL EQUIPMENT.

DO NOT INSTALL AIR GAP BACKFLOW PREVENTERS IN CONCEALED SPACES OR IN AREAS WHERE SPLASHING WATER WILL DAMAGE FINISHES. PROVIDE AND INSTALL AN OVERSIZED COPPER FUNNEL WITH AIR GAP DIRECTLY BELOW RPD PRESSURE RELIEF PORT. PIPE FUNNEL TO SPILL AS AN INDIRECT WASTE TO AN APPROVED DRAIN LOCATION.

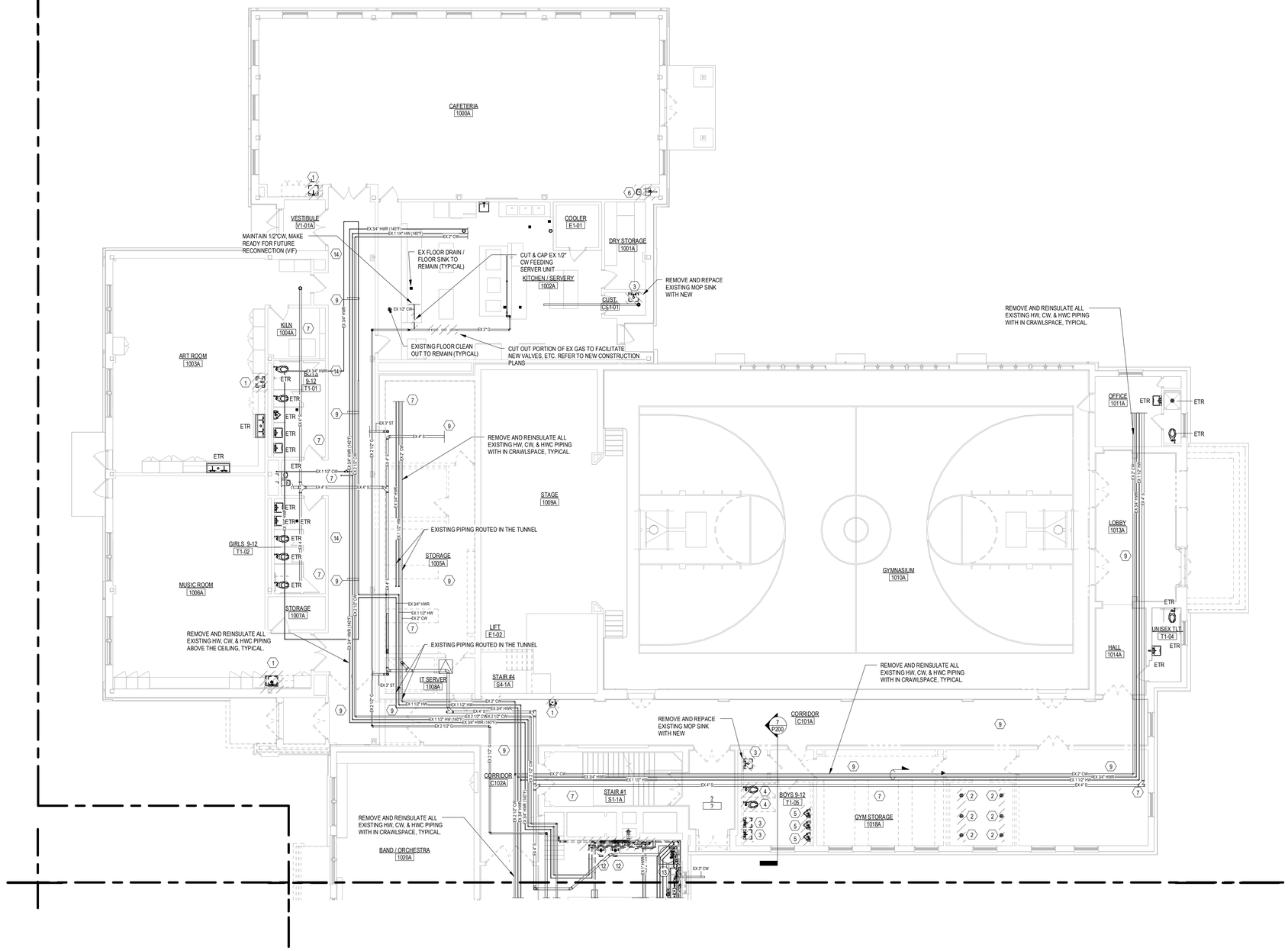
INSTALL ELECTRONIC TRAP PRIMERS SERVING ALL DRAINS. INSTALL ALL TRAP PRIMER VALVES IN AN ACCESSIBLE LOCATION. PROVIDE AND INSTALL ACCESS PANELS AND DOORS WHERE REQUIRED TO GAIN ACCESS IN CONCEALED CONSTRUCTION.

PROVIDE FLEXIBLE CONNECTIONS IN ALL PIPING SYSTEMS CONNECTED TO PUMPS AND OTHER EQUIPMENT WHICH REQUIRES VIBRATION ISOLATION, EXCEPT WATER COILS. FLEXIBLE CONNECTIONS SHALL BE PROVIDED AS CLOSE TO THE EQUIPMENT AS POSSIBLE.

PIPING GENERAL

NO PIPING SHALL BE COVERED UNTIL TESTED APPROVED BY THE AUTHORITIES HAVING JURISDICTION.

ALL PIPING SHALL BE RUN PERPENDICULAR AND/OR PARALLEL TO FLOORS, INTERIOR WALLS, ETC. PIPING AND VALVES SHALL BE GROUPED NEATLY AND SHALL BE RUN AS TO MAXIMIZE HEADROOM OR PASSAGE CLEARANCE. ALL VALVES, CONTROLS AND ACCESSORIES CONCEALED IN FURRED SPACES AND REQUIRING ACCESS FOR OPERATION AND MAINTENANCE SHALL BE ARRANGED TO ASSURE THE USE OF A MINIMUM NUMBER OF ACCESS DO



1 FIRST FLOOR DEMO PLAN PART A
1/8" = 1'-0"

PLUMBING DEMOLITION KEY NOTES

1. REMOVE AND DISPOSE OF EXISTING SINK. REMOVE ALL EXISTING EXPOSED WATER, WASTE AND VENT PIPING, CAP PIPING BELOW FLOOR, CEILING AND WALL, WITHIN 2 FT OF MAINS.
2. REMOVE AND DISPOSE OF EXISTING FLOOR DRAINS. REMOVE ALL EXISTING EXPOSED WASTE AND VENT PIPING, CAP PIPING BELOW FLOOR, CEILING AND WALL, WITHIN 2 FT OF MAINS.
3. REMOVE AND DISPOSE OF EXISTING LAVATORY. REMOVE ALL EXISTING EXPOSED WATER, WASTE AND VENT PIPING, CAP PIPING BELOW FLOOR, CEILING AND WALL, WITHIN 2 FT OF MAINS.
4. REMOVE AND DISPOSE OF EXISTING WATER CLOSET. REMOVE ALL EXISTING EXPOSED WATER, WASTE AND VENT PIPING, CAP PIPING BELOW FLOOR, CEILING AND WALL, WITHIN 2 FT OF MAINS.
5. REMOVE AND DISPOSE OF EXISTING URINAL. REMOVE ALL EXISTING EXPOSED WATER, WASTE AND VENT PIPING, CAP PIPING BELOW FLOOR, CEILING AND WALL, WITHIN 2 FT OF MAINS. EXISTING ROOF DRAIN TO REMAIN.
6. REMOVE AND DISPOSE OF EXISTING DRINKING FOUNTAIN. REMOVE ALL EXISTING EXPOSED WATER, WASTE AND VENT PIPING, CAP PIPING BELOW FLOOR, CEILING AND WALL, WITHIN 2 FT OF MAINS.
7. EXISTING SANITARY PIPING TO REMAIN. SNAKE, CLEAN AND JET ALL EXISTING PIPING. WHEN COMPLETE, CAMERA INSPECT WITH A VIDEO CAMERA. PROVIDE REPORT.
8. EXISTING STORM PIPING TO REMAIN.
9. EXISTING DOMESTIC WATER PIPE ABOVE CEILING TO REMAIN.
10. REMOVE AND DISPOSE OF EXISTING MOP SINK. REMOVE ALL EXISTING EXPOSED WATER, WASTE AND VENT PIPING, CAP PIPING BELOW FLOOR, CEILING AND WALL, WITHIN 2 FT OF MAINS.
11. REMOVE AND DISPOSE OF EXISTING VENT PIPING. REMOVE ALL EXISTING EXPOSED PIPING, CAP PIPING BELOW FLOOR, CEILING AND WALL, WITHIN 2 FT OF MAINS.
12. REMOVE AND DISPOSE OF EXISTING WATER HEATER AND RECIRCULATION PUMPS. REMOVE ALL EXISTING EXPOSED WATER PIPING, CAP PIPING BELOW FLOOR, CEILING AND WALL, WITHIN 2 FT OF MAINS.
13. EXISTING SEWAGE EJECTOR TO REMAIN ACTIVE.
14. EXISTING GAS PIPING ABOVE CEILING TO REMAIN.

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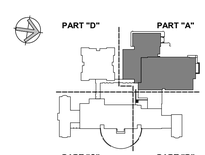
4. BEFORE SUBMITTING BID, THE CONTRACTOR SHALL VISIT THE JOB SITE AND BECOME FULLY FAMILIAR WITH THE EXISTING CONDITIONS AND THE DOCUMENTS OF OTHER TRADES UNDER WHICH HIS WORK WILL BE ACCOMPLISHED. THE CONTRACTOR SHALL BE HELD RESPONSIBLE FOR ANY ASSUMPTIONS, OMISSIONS OR ERRORS HE MADE AS A RESULT OF FAILURE TO BECOME FAMILIAR WITH THE EXISTING CONDITIONS.
5. LOCATION OF EXISTING EQUIPMENT AND PIPING SHOWN ON FLOOR PLANS IS BASED ON THE BEST AVAILABLE INFORMATION. THE CONTRACTOR SHALL VERIFY EXACT LOCATION(S) OF EXISTING EQUIPMENT, APPURTENANCES AND PIPING IN THE FIELD PRIOR TO COMMENCEMENT OF CONSTRUCTION.
6. DEMOLITION DRAWINGS ARE STRICTLY DIAGRAMMATIC AND SHOW GENERAL ARRANGEMENT OF EXISTING MECHANICAL AND ELECTRICAL EQUIPMENT LOCATION. IT IS NOT THE INTENT OF THE DRAWINGS TO SHOW THE ENTIRE EXISTING MECHANICAL OR ELECTRICAL SYSTEMS.
7. MAJOR COMPONENTS AND MAINS OF SYSTEMS ARE USUALLY INDICATED. FIELD VERIFY LAYOUT AND LOCATIONS OF MISCELLANEOUS SYSTEMS. REMOVE MISCELLANEOUS ITEMS IN THE RENOVATED AREA.
8. IT IS NOT THE INTENT OF THESE DRAWINGS TO SHOW ALL EQUIPMENT, PIPING OR CONDUIT TO BE REMOVED. EQUIPMENT NOT BEING REUSED SHALL BE REMOVED, INCLUDING ALL ASSOCIATED HANGERS, SUPPORTS, PIPES, DUCTS, CONDUITS, WIRES, AND CONTROLS BACK TO THE POINT OF ORIGIN.
9. ALL EXISTING EQUIPMENT, FIXTURES AND DEVICES TO BE REMOVED SHALL BE FIELD VERIFIED FOR EXACT QUANTITY. NO EQUIPMENT, PIPING, DUCTWORK OR CONDUIT SHALL BE ABANDONED IN PLACE, UNLESS SPECIFICALLY NOTED.
10. THE CONTRACTORS SHALL COORDINATE THE DEMOLITION SCOPE OF WORK PRIOR TO COMMENCEMENT OF WORK. CARE MUST BE TAKEN SO AS NOT TO DESTROY, REMOVE OR DEMOLISH ANY EQUIPMENT, APPURTENANCES OR DEVICES INTENDED TO REMAIN.
11. INCLUDE ALL WORK REQUIRED TO ALLOW PARTIAL DEMOLITION AS REQUIRED. COORDINATE WITH TOWN OF WINDSTED FOR CONSTRUCTION PHASING REQUIREMENTS. PROVIDE TEMPORARY SERVICES AND SYSTEM MODIFICATIONS AS NECESSARY.
12. SHOULD THE CONTRACTOR ENCOUNTER, DURING DEMOLITION OF EXISTING WALLS OR CHASES, ANY PIPING OR CONDUIT WHICH MUST REMAIN ACTIVE, HE SHALL IMMEDIATELY GIVE NOTICE TO THE ENGINEER, GENERAL CONTRACTOR, AND OWNER'S REPRESENTATIVE.
13. ALL SALVAGEABLE MATERIALS OR EQUIPMENT TO REMOVED SHALL BE TURNED OVER TO THE OWNER AT THE END OF EACH DAY. ITEMS REMOVED AND NOT REUSED OR DISCLAIMED BY THE OWNER SHALL BECOME PROPERTY OF THE TRADE CONTRACTOR AND SHALL BE TRANSPORTED FROM THE SITE; SITE STORAGE OR REMOVED ITEMS WILL NOT BE PERMITTED.
14. PROPERLY DISPOSE OF ALL DEMOLISHED EQUIPMENT IN COMPLIANCE WITH THE CODES AND REGULATIONS; THIS APPLIES TO HAZARDOUS MATERIALS AND CONTAMINATED ITEMS TO BE DEMOLISHED.
15. ALL SYSTEMS TO BE REMOVED SHALL BE REMOVED BACK TO THE POINT OF SOURCE. THE CONTRACTOR SHALL VERIFY WHICH SYSTEMS MUST REMAIN ACTIVE TO SERVE ADJACENT SPACES DURING CONSTRUCTION.
16. ALL PIPING ASSOCIATED WITH THE PLUMBING FIXTURE OR EQUIPMENT INDICATED TO BE REMOVED OR RELOCATED SHALL BE DISCONNECTED AND REMOVED (INCLUDING HANGERS, INSULATION, AND OTHER COMPONENTS) UP TO NEAREST EXISTING ACTIVE MAIN OR BRANCH LINE AND CAPPED AS CLOSE TO THE ACTIVE LINE AS POSSIBLE.
17. LICENSED PLUMBERS WILL BE REQUIRED TO PERFORM THE DISCONNECTS AND RESPONSIBLE FOR ANY APPLICABLE PERMITS/INSPECTIONS. SEE SPECIFICATIONS FOR MORE INFORMATION.



KEY PLAN

Project Title:
ADDITION & ALTERATIONS TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

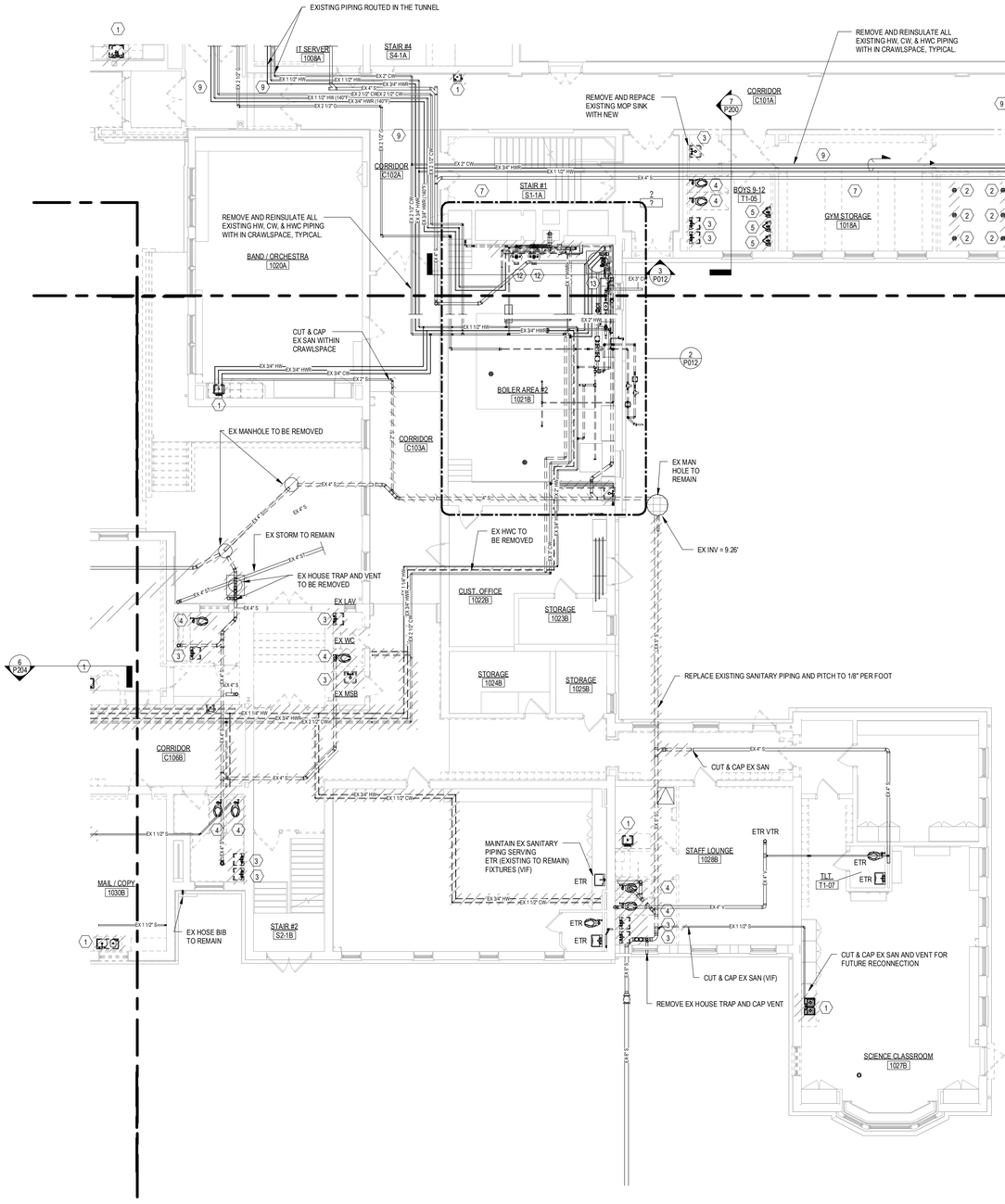
SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
311 STATE STREET NEW LONDON CT 06320
203 230 9007 silverpetrucelli.com

Revision:	Description:	Date:	Revised By:

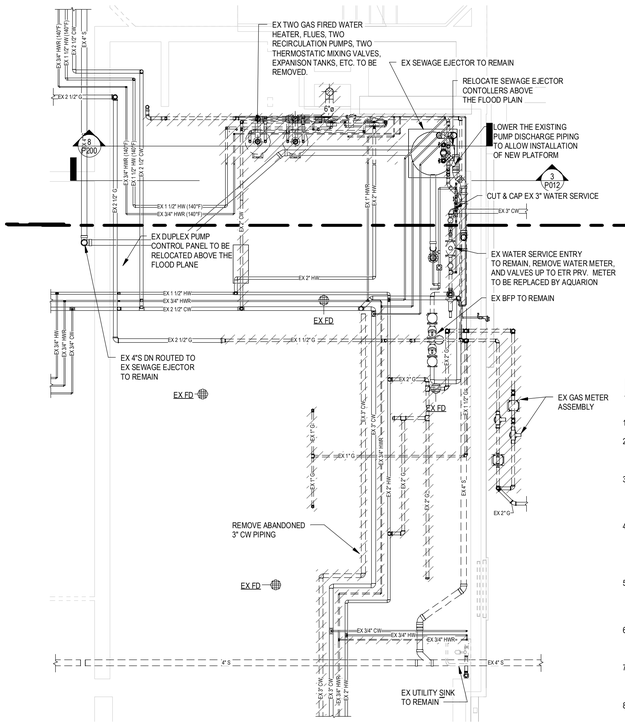
Drawing Title:
FIRST FLOOR DEMOLITION PLAN PART A - PLUMBING

Date: 08/29/2024
Scale: 1/8" = 1'-0"
Drawn By: MPB
Project Number: 22-382
Drawing Number: P011

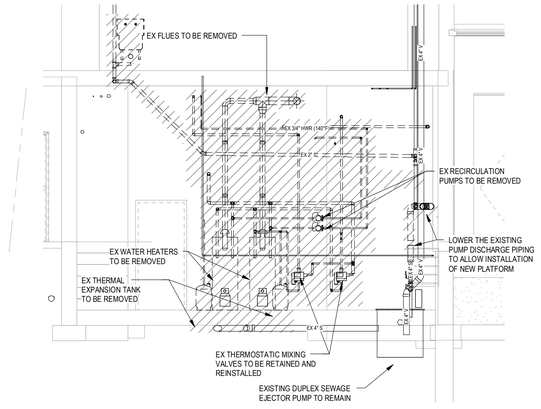
8/29/2024 11:13:02 AM



1 FIRST FLOOR DEMO PLAN PART B
1/8" = 1'-0"



2 BOILER ROOM DEMO PART PLAN
1/4" = 1'-0"



3 DEMO SECTION AT WATER HEATERS
1/4" = 1'-0"

PLUMBING DEMOLITION KEY NOTES

1. REMOVE AND DISPOSE OF EXISTING SINK. REMOVE ALL EXISTING EXPOSED WATER, WASTE AND VENT PIPING, CAP PIPING BELOW FLOOR, CEILING AND WALL, WITHIN 2 FT OF MAINS.
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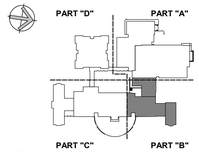


KEY PLAN

Project Title:
ADDITION & ALTERATIONS TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

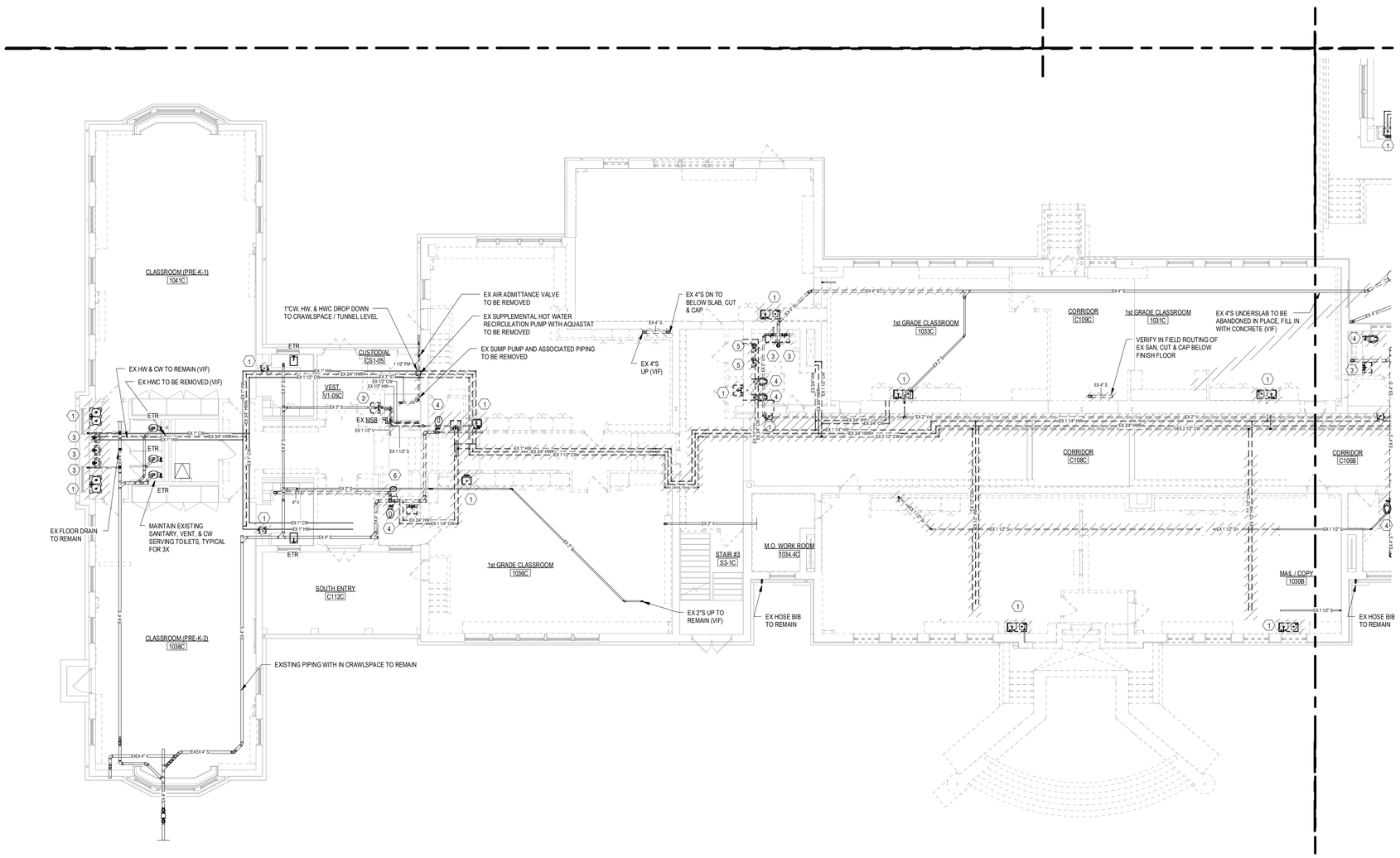
SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
311 STATE STREET NEW LONDON CT 06320
203 230 9007 silverpetrucelli.com

Revision: | Description: | Date: | Revised By:

Drawing Title:
FIRST FLOOR DEMOLITION PLAN PART B - PLUMBING

Date: 08/29/2024
Scale: As indicated
Drawn By: MPB
Project Number: 22-382
Drawing Number: P012

8/29/2024 11:16:21 AM



1 FIRST FLOOR DEMO PLAN PART C
1/8" = 1'-0"

PLUMBING DEMOLITION KEY NOTES

1. REMOVE AND DISPOSE OF EXISTING SINK. REMOVE ALL EXISTING EXPOSED WATER, WASTE AND VENT PIPING, CAP PIPING BELOW FLOOR, CEILING AND WALL, WITHIN 2 FT OF MAINS.
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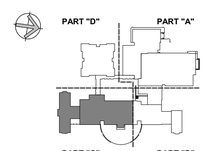

KEY PLAN

Project Title:
ADDITION & ALTERATIONS TO:
Old Greenwich School
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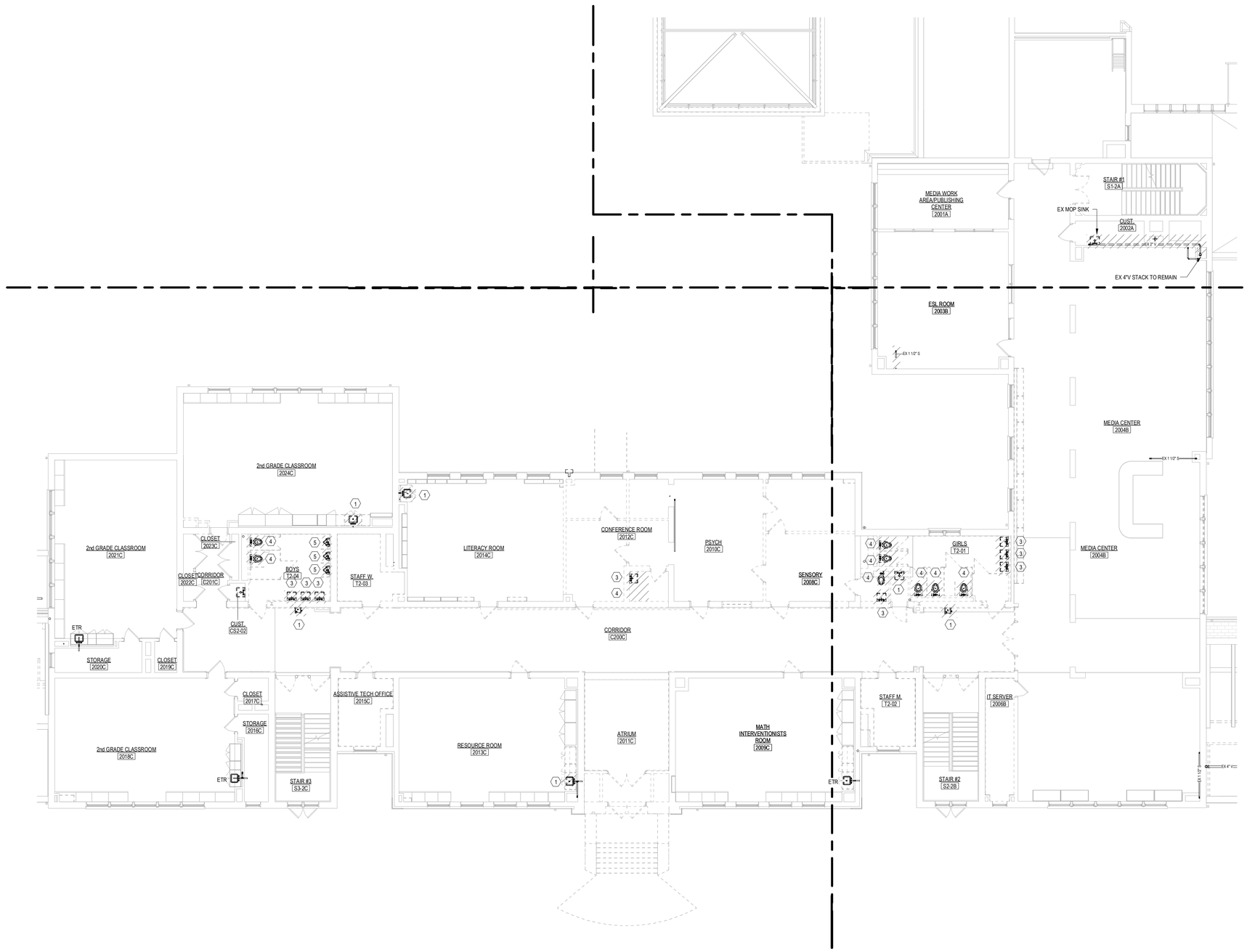
Revision: | Description: | Date: | Revised By:

Drawing Title:
FIRST FLOOR DEMOLITION PLAN PART C - PLUMBING

Date: 08/29/2024
Scale: 1/8" = 1'-0"
Drawn By: MPB
Project Number: 22-382
Drawing Number: P013

8/29/2024 11:15:11 AM



1 SECOND FLOOR DEMO PLAN PART B
1/8" = 1'-0"

PLUMBING DEMOLITION KEY NOTES

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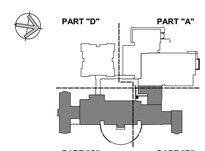
2. REMOVE AND DISPOSE OF EXISTING FLOOR DRAINS. REMOVE ALL EXISTING EXPOSED WASTE AND VENT PIPING, CAP PIPING BELOW FLOOR, CEILING AND WALL, WITHIN 2 FT OF MAINS.
3. REMOVE AND DISPOSE OF EXISTING LAVATORY. REMOVE ALL EXISTING EXPOSED WATER, WASTE AND VENT PIPING, CAP PIPING BELOW FLOOR, CEILING AND WALL, WITHIN 2 FT OF MAINS.
4. REMOVE AND DISPOSE OF EXISTING WATER CLOSET. REMOVE ALL EXISTING EXPOSED WATER, WASTE AND VENT PIPING, CAP PIPING BELOW FLOOR, CEILING AND WALL, WITHIN 2 FT OF MAINS.
5. REMOVE AND DISPOSE OF EXISTING URINAL. REMOVE ALL EXISTING EXPOSED WATER, WASTE AND VENT PIPING, CAP PIPING BELOW FLOOR, CEILING AND WALL, WITHIN 2 FT OF MAINS. EXISTING ROOF DRAIN TO REMAIN.
6. REMOVE AND DISPOSE OF EXISTING DRINKING FOUNTAIN. REMOVE ALL EXISTING EXPOSED WATER, WASTE AND VENT PIPING, CAP PIPING BELOW FLOOR, CEILING AND WALL, WITHIN 2 FT OF MAINS.
7. EXISTING SANITARY PIPING TO REMAIN. SNAKE, CLEAN AND JET ALL EXISTING PIPING. WHEN COMPLETE, CAMERA INSPECT WITH A VIDEO CAMERA. PROVIDE REPORT.
8. EXISTING STORM PIPING TO REMAIN.
9. EXISTING DOMESTIC WATER, PIPE ABOVE CEILING TO REMAIN.
10. REMOVE AND DISPOSE OF EXISTING MOP SINK. REMOVE ALL EXISTING EXPOSED WATER, WASTE AND VENT PIPING, CAP PIPING BELOW FLOOR, CEILING AND WALL, WITHIN 2 FT OF MAINS.
11. REMOVE AND DISPOSE OF EXISTING VENT PIPING. REMOVE ALL EXISTING EXPOSED PIPING, CAP PIPING BELOW FLOOR, CEILING AND WALL, WITHIN 2 FT OF MAINS.
12. REMOVE AND DISPOSE OF EXISTING WATER HEATER AND RECIRCULATION PUMPS. REMOVE ALL EXISTING EXPOSED WATER PIPING, CAP PIPING BELOW FLOOR, CEILING AND WALL, WITHIN 2 FT OF MAINS.
13. REMOVE AND DISPOSE OF EXISTING SUMP PUMP. REMOVE ALL EXISTING EXPOSED WASTE AND VENT PIPING, CAP PIPING BELOW FLOOR, CEILING AND WALL, WITHIN 2 FT OF MAINS.
14. EXISTING GAS PIPING ABOVE CEILING TO REMAIN.

NOTE: NOT ALL KEY NOTES ARE USED ON ALL SHEETS.

PLUMBING DEMOLITION GENERAL NOTES

1. THIS PROJECT IS A PARTIAL DEMOLITION TO AN EXISTING FACILITY.
2. ALL WORK SHALL BE PERFORMED PER CURRENT STATE APPLICABLE CODES, ORDINANCES AND PER REQUIREMENTS OF STATE AND LOCAL REGULATORY AGENCIES AND THE AUTHORITY HAVING JURISDICTION.
3. REFER TO THE ARCHITECTURAL DEMOLITION DRAWINGS AND SPECIFICATIONS FOR ADDITIONAL INFORMATION AND REQUIREMENTS. THE FULL EXTENT OF THE DEMOLITION AND RECONSTRUCTION SCOPE OF WORK SHALL BE DETERMINED BY THE ENTIRE SET OF BID DOCUMENTS.
4. BEFORE SUBMITTING BID, THE CONTRACTOR SHALL VISIT THE JOB SITE AND BECOME FULLY FAMILIAR WITH THE EXISTING CONDITIONS AND THE DOCUMENTS OF OTHER TRADES UNDER WHICH HIS WORK WILL BE ACCOMPLISHED. THE CONTRACTOR SHALL BE HELD RESPONSIBLE FOR ANY ASSUMPTIONS, OMISSIONS OR ERRORS HE MADE AS A RESULT OF FAILURE TO BECOME FAMILIAR WITH THE EXISTING CONDITIONS.
5. LOCATION OF EXISTING EQUIPMENT AND PIPING SHOWN ON FLOOR PLANS IS BASED ON THE BEST AVAILABLE INFORMATION. THE CONTRACTOR SHALL VERIFY EXACT LOCATION(S) OF EXISTING EQUIPMENT, APPURTENANCES AND PIPING IN THE FIELD PRIOR TO COMMENCEMENT OF CONSTRUCTION.
6. DEMOLITION DRAWINGS ARE STRICTLY DIAGRAMMATIC AND SHOW GENERAL ARRANGEMENT OF EXISTING MECHANICAL AND ELECTRICAL EQUIPMENT LOCATION. IT IS NOT THE INTENT OF THE DRAWINGS TO SHOW THE ENTIRE EXISTING MECHANICAL OR ELECTRICAL SYSTEMS.
7. MAJOR COMPONENTS AND MAINS OF SYSTEMS ARE USUALLY INDICATED. FIELD VERIFY LAYOUT AND LOCATIONS OF MISCELLANEOUS SYSTEMS. REMOVE MISCELLANEOUS ITEMS IN THE RENOVATED AREA.
8. IT IS NOT THE INTENT OF THESE DRAWINGS TO SHOW ALL EQUIPMENT, PIPING OR CONDUIT TO BE REMOVED. EQUIPMENT NOT BEING REUSED SHALL BE REMOVED, INCLUDING ALL ASSOCIATED HANGERS, SUPPORTS, PIPES, DUCTS, CONDUITS, WIRES, AND CONTROLS BACK TO THE POINT OF ORIGIN.
9. ALL EXISTING EQUIPMENT, FIXTURES AND DEVICES TO BE REMOVED SHALL BE FIELD VERIFIED FOR EXACT QUANTITY. NO EQUIPMENT, PIPING, DUCTWORK OR CONDUIT SHALL BE ABANDONED IN PLACE, UNLESS SPECIFICALLY NOTED.
10. THE CONTRACTORS SHALL COORDINATE THE DEMOLITION SCOPE OF WORK PRIOR TO COMMENCEMENT OF WORK. CARE MUST BE TAKEN SO AS NOT TO DESTROY, REMOVE OR DEMOLISH ANY EQUIPMENT, APPURTENANCES OR DEVICES INTENDED TO REMAIN.
11. INCLUDE ALL WORK REQUIRED TO ALLOW PARTIAL DEMOLITION AS REQUIRED. COORDINATE WITH TOWN OF WINDSTED FOR CONSTRUCTION PHASING REQUIREMENTS. PROVIDE TEMPORARY SERVICES AND SYSTEM MODIFICATIONS AS NECESSARY.
12. SHOULD THE CONTRACTOR ENCOUNTER, DURING DEMOLITION OF EXISTING WALLS OR CHASES, ANY PIPING OR CONDUIT WHICH MUST REMAIN ACTIVE, HE SHALL IMMEDIATELY GIVE NOTICE TO THE ENGINEER, GENERAL CONTRACTOR, AND OWNER'S REPRESENTATIVE.
13. ALL SALVAGEABLE MATERIALS OR EQUIPMENT TO REMOVED SHALL BE TURNED OVER TO THE OWNER AT THE END OF EACH DAY. ITEMS REMOVED AND NOT REUSED OR DISCLAIMED BY THE OWNER SHALL BECOME PROPERTY OF THE TRADE CONTRACTOR AND SHALL BE TRANSPORTED FROM THE SITE; SITE STORAGE OR REMOVED ITEMS WILL NOT BE PERMITTED.
14. PROPERLY DISPOSE OF ALL DEMOLISHED EQUIPMENT IN COMPLIANCE WITH THE CODES AND REGULATIONS; THIS APPLIES TO HAZARDOUS MATERIALS AND CONTAMINATED ITEMS TO BE DEMOLISHED.
15. ALL SYSTEMS TO BE REMOVED SHALL BE REMOVED BACK TO THE POINT OF SOURCE. THE CONTRACTOR SHALL VERIFY WHICH SYSTEMS MUST REMAIN ACTIVE TO SERVE ADJACENT SPACES DURING CONSTRUCTION.
16. ALL PIPING ASSOCIATED WITH THE PLUMBING FIXTURE OR EQUIPMENT INDICATED TO BE REMOVED OR RELOCATED SHALL BE DISCONNECTED AND REMOVED (INCLUDING HANGERS, INSULATION, AND OTHER COMPONENTS) UP TO NEAREST EXISTING ACTIVE MAIN OR BRANCH LINE AND CAPPED AS CLOSE TO THE ACTIVE LINE AS POSSIBLE.
17. LICENSED PLUMBERS WILL BE REQUIRED TO PERFORM THE DISCONNECTS AND RESPONSIBLE FOR ANY APPLICABLE PERMITS/INSPECTIONS. SEE SPECIFICATIONS FOR MORE INFORMATION.



KEY PLAN

Project Title:
ADDITION & ALTERATIONS TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

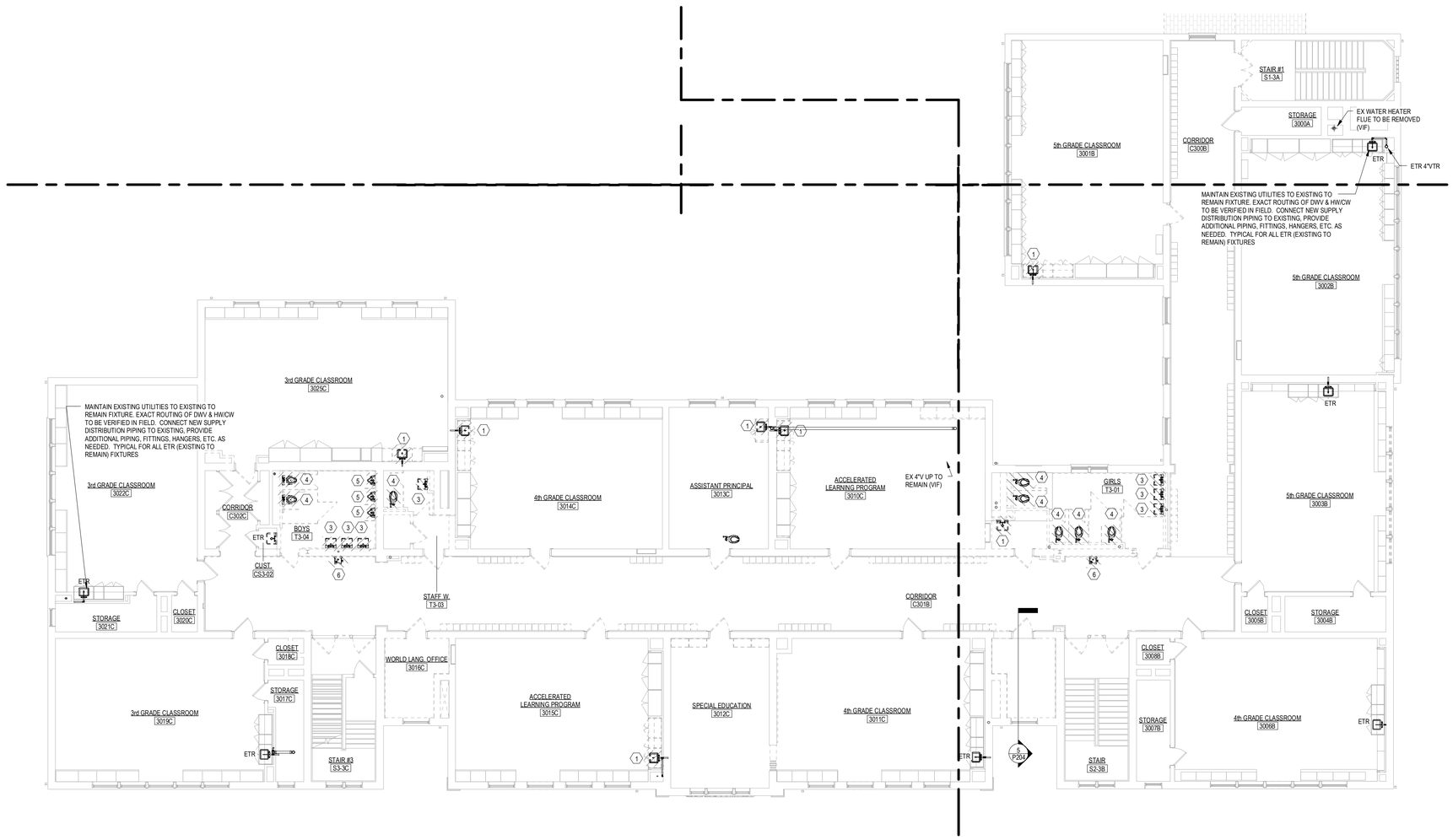
SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
311 STATE STREET NEW LONDON CT 06320
203 230 9007 silverpetrucelli.com

Revision:	Description:	Date:	Revised By:

Drawing Title:
SECOND FLOOR DEMOLITION PLAN
PART B & C - PLUMBING

Date: 08/29/2024
Scale: 1/8" = 1'-0"
Drawn By: MPB
Project Number: 22-382
Drawing Number: P022

8/29/2024 11:17:14 AM



PLUMBING DEMOLITION KEY NOTES

1. REMOVE AND DISPOSE OF EXISTING SINK. REMOVE ALL EXISTING EXPOSED WATER, WASTE AND VENT PIPING, CAP PIPING BELOW FLOOR, CEILING AND WALL, WITHIN 2 FT OF MAINS.
2. REMOVE AND DISPOSE OF EXISTING FLOOR DRAINS. REMOVE ALL EXISTING EXPOSED WASTE AND VENT PIPING, CAP PIPING BELOW FLOOR, CEILING AND WALL, WITHIN 2 FT OF MAINS.
3. REMOVE AND DISPOSE OF EXISTING LAVATORY. REMOVE ALL EXISTING EXPOSED WATER, WASTE AND VENT PIPING, CAP PIPING BELOW FLOOR, CEILING AND WALL, WITHIN 2 FT OF MAINS.
4. REMOVE AND DISPOSE OF EXISTING WATER CLOSET. REMOVE ALL EXISTING EXPOSED WATER, WASTE AND VENT PIPING, CAP PIPING BELOW FLOOR, CEILING AND WALL, WITHIN 2 FT OF MAINS.
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10. REMOVE AND DISPOSE OF EXISTING MOP SINK. REMOVE ALL EXISTING EXPOSED WATER, WASTE AND VENT PIPING, CAP PIPING BELOW FLOOR, CEILING AND WALL, WITHIN 2 FT OF MAINS.
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12. REMOVE AND DISPOSE OF EXISTING WATER HEATER AND RECIRCULATION PUMPS. REMOVE ALL EXISTING EXPOSED WATER PIPING, CAP PIPING BELOW FLOOR, CEILING AND WALL, WITHIN 2 FT OF MAINS.
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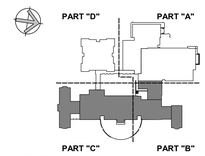


KEY PLAN

Project Title:

ADDITION & ALTERATIONS TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
311 STATE STREET NEW LONDON CT 06320
203 230 9007 silverpetrucelli.com

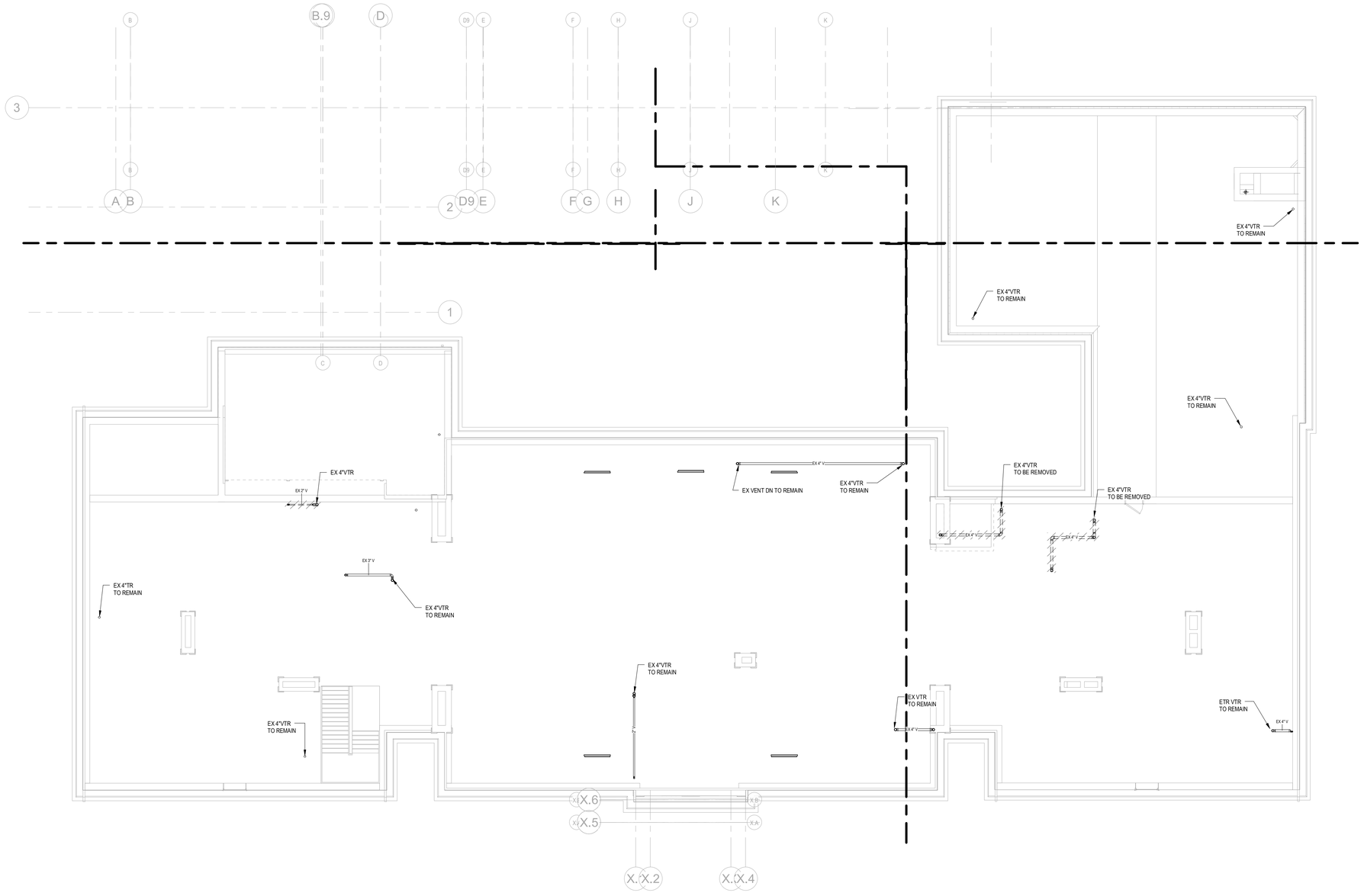
Revision:	Description:	Date:	Revised By:

Drawing Title:

THIRD FLOOR DEMOLITION PLAN
PARTS B & C - PLUMBING

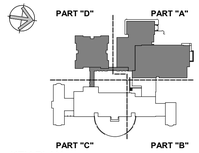
Date: 08/29/2024
Scale: 1/8" = 1'-0"
Drawn By: JES/MPB
Project Number: 22-382
Drawing Number: P032

8/29/2024 11:17:59 AM



1 ATTIC LEVEL DEMO PLAN

1/8" = 1'-0"



KEY PLAN

Project Title:

ADDITION & ALTERATIONS TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
311 STATE STREET NEW LONDON CT 06320
203 230 9007 silverpetrucelli.com

Revision:	Description:	Date:	Revised By:

Drawing Title:

ATTIC DEMOLITION PLAN - PLUMBING

Date: 08/29/2024
Scale: 1/8" = 1'-0"
Drawn By: MPB
Project Number: 22-382
Drawing Number: P033

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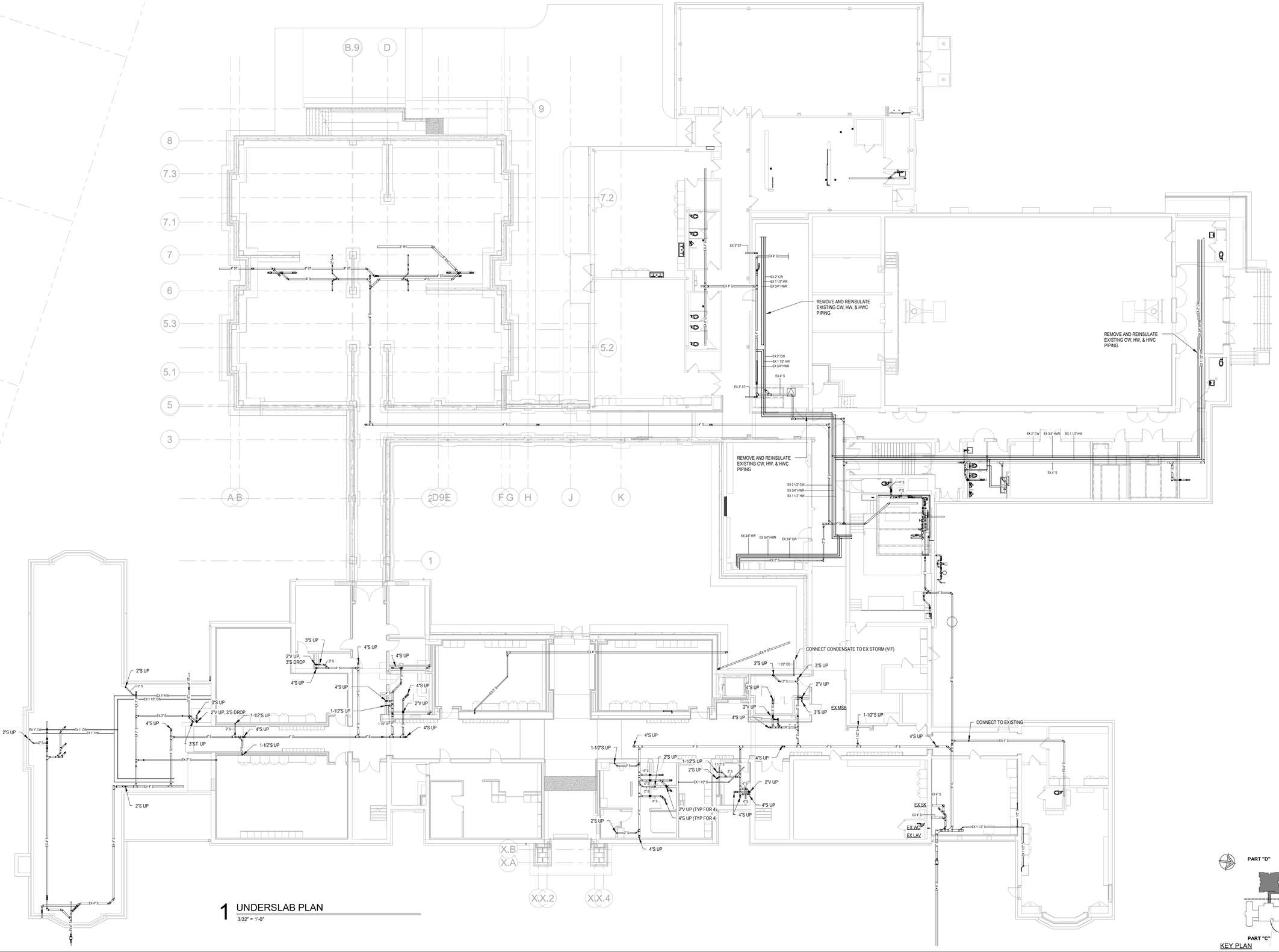


1 UNDERSLAB PLAN
3/32" = 1'-0"

KEY PLAN

Project Title:

ADDITION & ALTERATIONS TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
311 STATE STREET NEW LONDON CT 06320
203 230 9007 silverpetrucelli.com

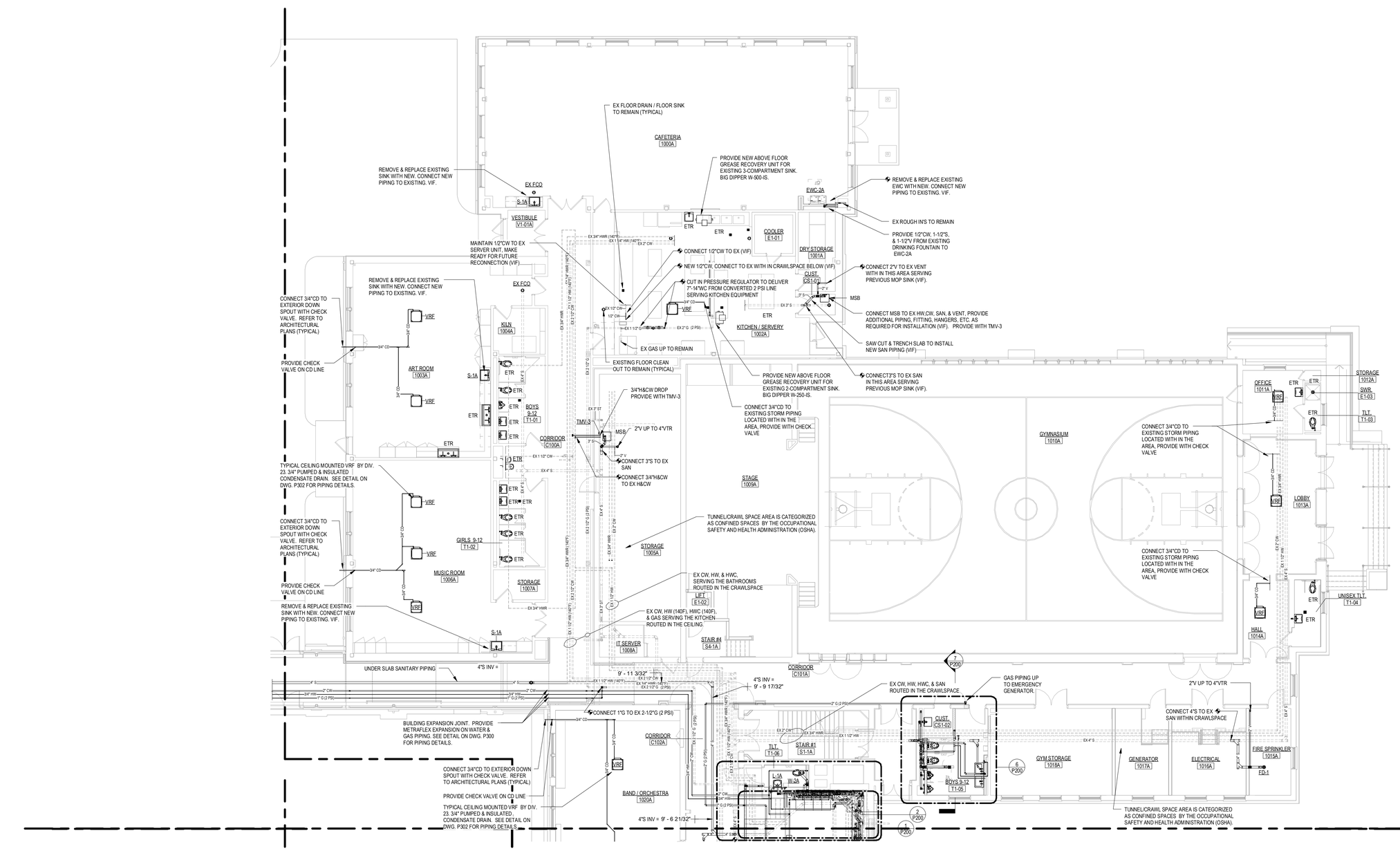
Revision:	Description:	Date:	Revised By:

Drawing Title:

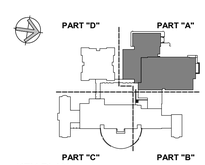
OVERALL UNDERSLAB PLAN - PLUMBING

Date: 08/29/2024
Scale: 3/32" = 1'-0"
Drawn By: MPB
Project Number: 22-382
Drawing Number: P100

8/29/2024 11:27:20 AM



1 FIRST FLOOR DRAINAGE PLAN PART 'A'
1/8" = 1'-0"



KEY PLAN

Project Title:

ADDITION & ALTERATIONS TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

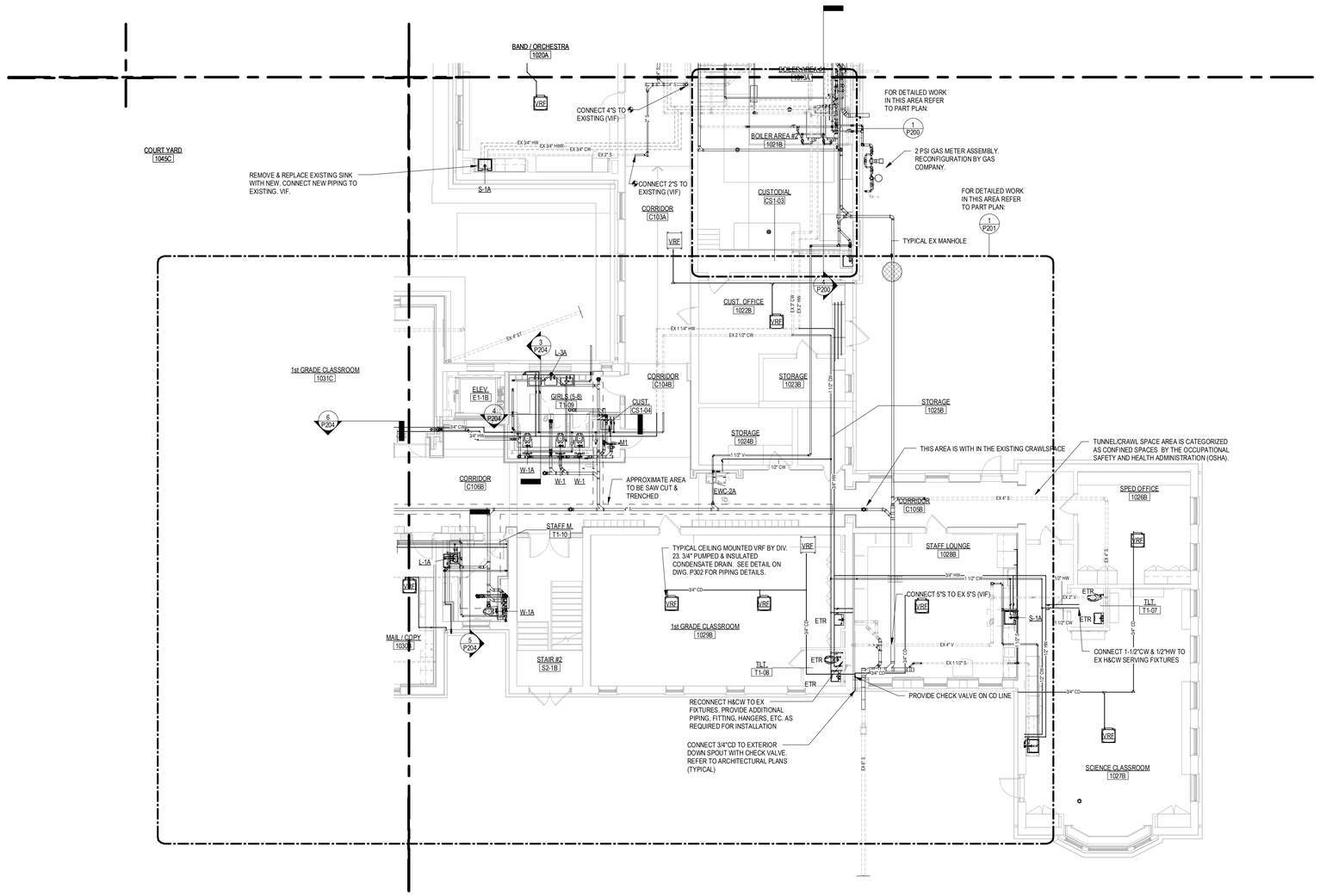
SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
311 STATE STREET NEW LONDON CT 06320
203 230 9007 silverpetrucelli.com

Revision:	Description:	Date:	Revised By:

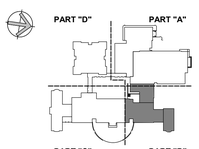
Drawing Title:
FIRST FLOOR PLAN PART A - PLUMBING

Date: 08/29/2024
Scale: 1/8" = 1'-0"
Drawn By: JES/MPB
Project Number: 22-382
Drawing Number: P101

8/29/2024 11:25:54 AM



1 FIRST FLOOR PLAN PART 'B'
1/8" = 1'-0"



KEY PLAN

Project Title:

ADDITION & ALTERATIONS TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
311 STATE STREET NEW LONDON CT 06320
203 230 9007 silverpetrucelli.com

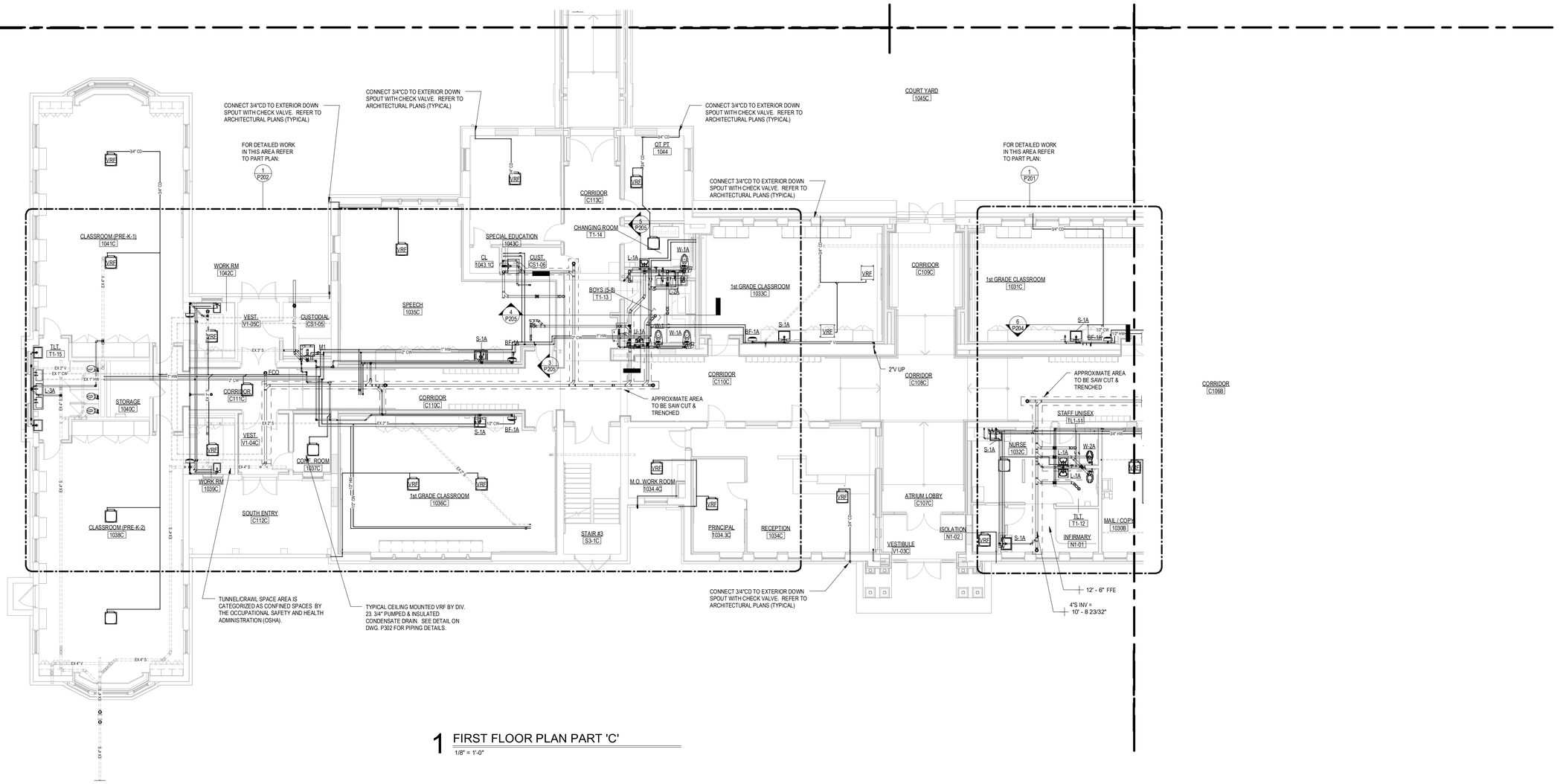
Revision:	Description:	Date:	Revised By:

Drawing Title:
FIRST FLOOR PLAN PART B - PLUMBING

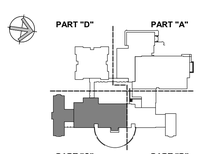
Date: 08/29/2024
Scale: 1/8" = 1'-0"
Drawn By: JES/MPB
Project Number: 22-382

Drawing Number: P102

8/29/2024 11:31:18 AM



1 FIRST FLOOR PLAN PART 'C'
1/8" = 1'-0"



KEY PLAN

Project Title:
ADDITION & ALTERATIONS TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
311 STATE STREET NEW LONDON CT 06320
203 230 9007 silverpetrucelli.com

Revision:	Description:	Date:	Revised By:

Drawing Title:
FIRST FLOOR PLAN PART C - PLUMBING

Date: 08/29/2024
Scale: 1/8" = 1'-0"
Drawn By: Author
Project Number: 22-382
Drawing Number: P103

8/29/2024 11:29:51 AM

SPECIAL NOTE:

SEISMIC HANGERS AND SUPPORTS ARE REQUIRED FOR THIS PROJECT. SEE DETAILS SHEET AND SPECIFICATION SECTION 220548.

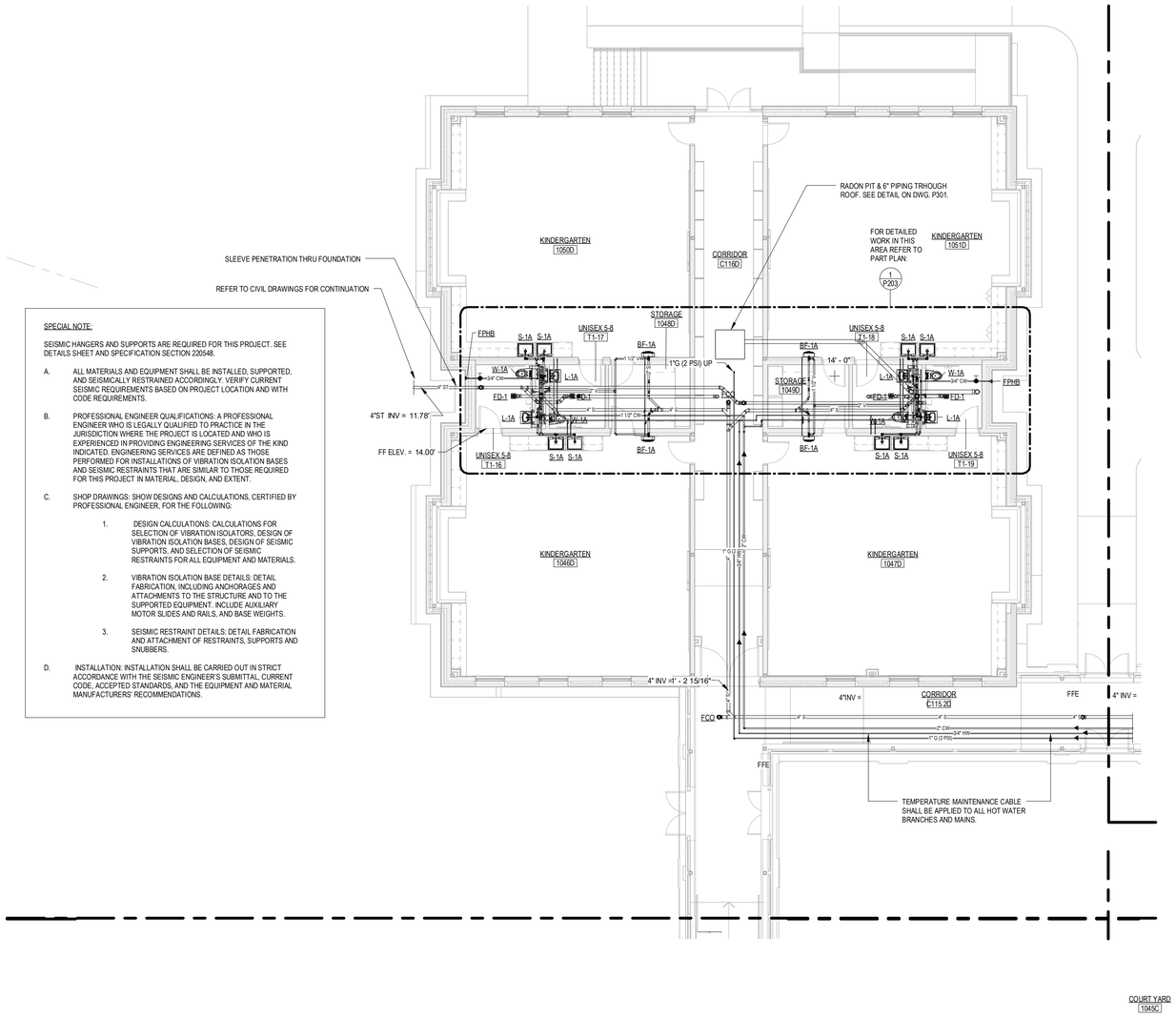
A. ALL MATERIALS AND EQUIPMENT SHALL BE INSTALLED, SUPPORTED, AND SEISMICALLY RESTRAINED ACCORDINGLY. VERIFY CURRENT SEISMIC REQUIREMENTS BASED ON PROJECT LOCATION AND WITH CODE REQUIREMENTS.

B. PROFESSIONAL ENGINEER QUALIFICATIONS: A PROFESSIONAL ENGINEER WHO IS LEGALLY QUALIFIED TO PRACTICE IN THE JURISDICTION WHERE THE PROJECT IS LOCATED AND WHO IS EXPERIENCED IN PROVIDING ENGINEERING SERVICES OF THE KIND INDICATED. ENGINEERING SERVICES ARE DEFINED AS THOSE PERFORMED FOR INSTALLATIONS OF VIBRATION ISOLATION BASES AND SEISMIC RESTRAINTS THAT ARE SIMILAR TO THOSE REQUIRED FOR THIS PROJECT IN MATERIAL, DESIGN, AND EXTENT.

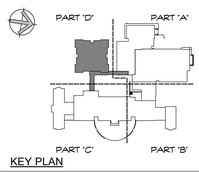
C. SHOP DRAWINGS: SHOW DESIGNS AND CALCULATIONS, CERTIFIED BY PROFESSIONAL ENGINEER, FOR THE FOLLOWING:

1. DESIGN CALCULATIONS: CALCULATIONS FOR SELECTION OF VIBRATION ISOLATORS, DESIGN OF VIBRATION ISOLATION BASES, DESIGN OF SEISMIC SUPPORTS, AND SELECTION OF SEISMIC RESTRAINTS FOR ALL EQUIPMENT AND MATERIALS.
2. VIBRATION ISOLATION BASE DETAILS: DETAIL FABRICATION, INCLUDING ANCHORAGES AND ATTACHMENTS TO THE STRUCTURE AND TO THE SUPPORTED EQUIPMENT. INCLUDE AUXILIARY MOTOR SLIDES AND RAILS, AND BASE WEIGHTS.
3. SEISMIC RESTRAINT DETAILS: DETAIL FABRICATION AND ATTACHMENT OF RESTRAINTS, SUPPORTS AND SNUBBERS.

D. INSTALLATION: INSTALLATION SHALL BE CARRIED OUT IN STRICT ACCORDANCE WITH THE SEISMIC ENGINEER'S SUBMITTAL, CURRENT CODE, ACCEPTED STANDARDS, AND THE EQUIPMENT AND MATERIAL MANUFACTURERS' RECOMMENDATIONS.



1 FIRST FLOOR PLAN PART 'D'
1/8" = 1'-0"



KEY PLAN

Project Title:

ADDITION & ALTERATIONS TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
311 STATE STREET NEW LONDON CT 06320
203 230 9007 silverpetrucelli.com

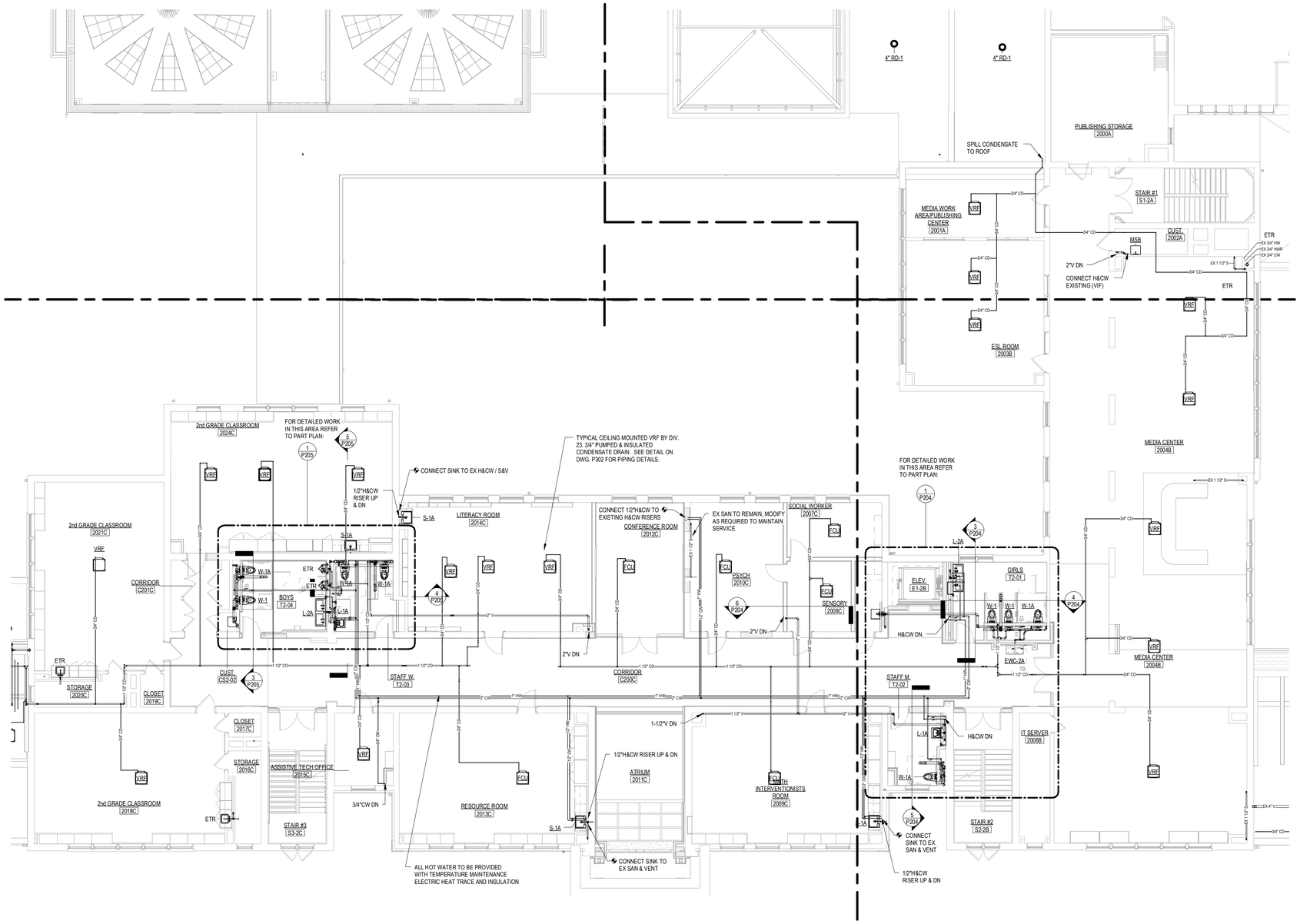
Revision:	Description:	Date:	Revised By:

Drawing Title: FIRST FLOOR PLAN PART D - PLUMBING

Date: 08/29/2024
Scale: 1/8" = 1'-0"
Drawn By: JES/MPB
Project Number: 22-382

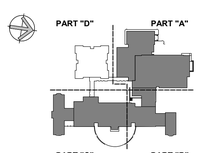
Drawing Number: P104

8/29/2024 11:32:39 AM



1 SECOND LEVEL PLAN PART 'B,C'

1/8" = 1'-0"



KEY PLAN

Project Title:

ADDITION & ALTERATIONS TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
311 STATE STREET NEW LONDON CT 06320
203 230 9007 silverpetrucelli.com

Revision:	Description:	Date:	Revised By:

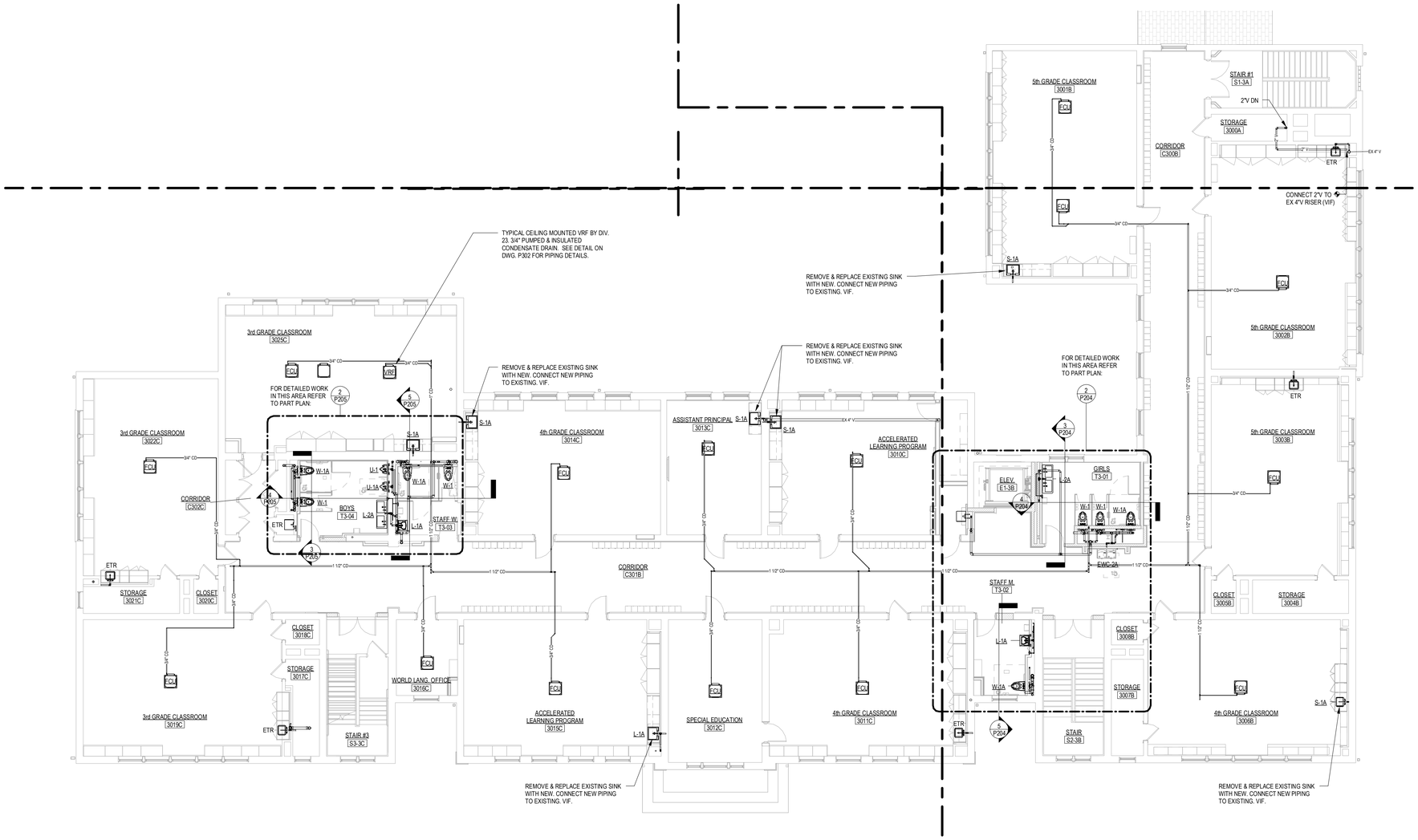
Drawing Title:

SECOND FLOOR PLAN PARTS B & C - PLUMBING

Date: 08/29/2024
Scale: 1/8" = 1'-0"
Drawn By: JES/MPB
Project Number: 22-382

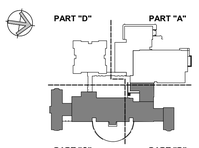
Drawing Number: P111

8/29/2024 11:33:57 AM



1 THIRD LEVEL PLAN PART 'B & C'

1/8" = 1'-0"



KEY PLAN

Project Title:

ADDITION & ALTERATIONS TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
311 STATE STREET NEW LONDON CT 06320
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Revision:	Description:	Date:	Revised By:

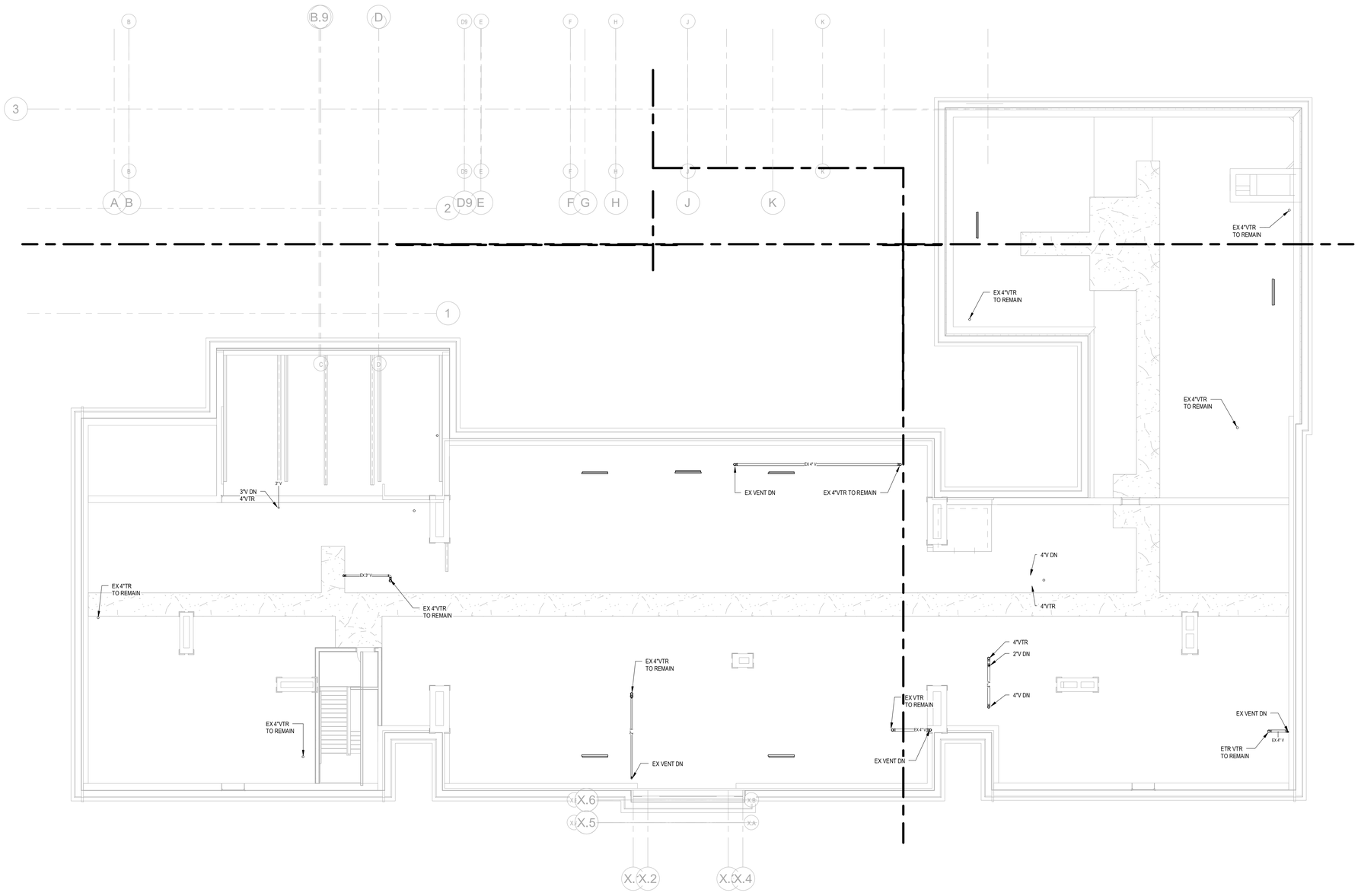
Drawing Title:

THIRD FLOOR PLAN PARTS B & C - PLUMBING

Date: 08/29/2024
Scale: 1/8" = 1'-0"
Drawn By: Author
Project Number: 22-382

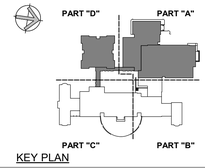
Drawing Number: P122

8/29/2024 11:35:19 AM



1 ATTIC LEVEL PLAN

1/8" = 1'-0"



KEY PLAN

Project Title:

ADDITION & ALTERATIONS TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
311 STATE STREET NEW LONDON CT 06320
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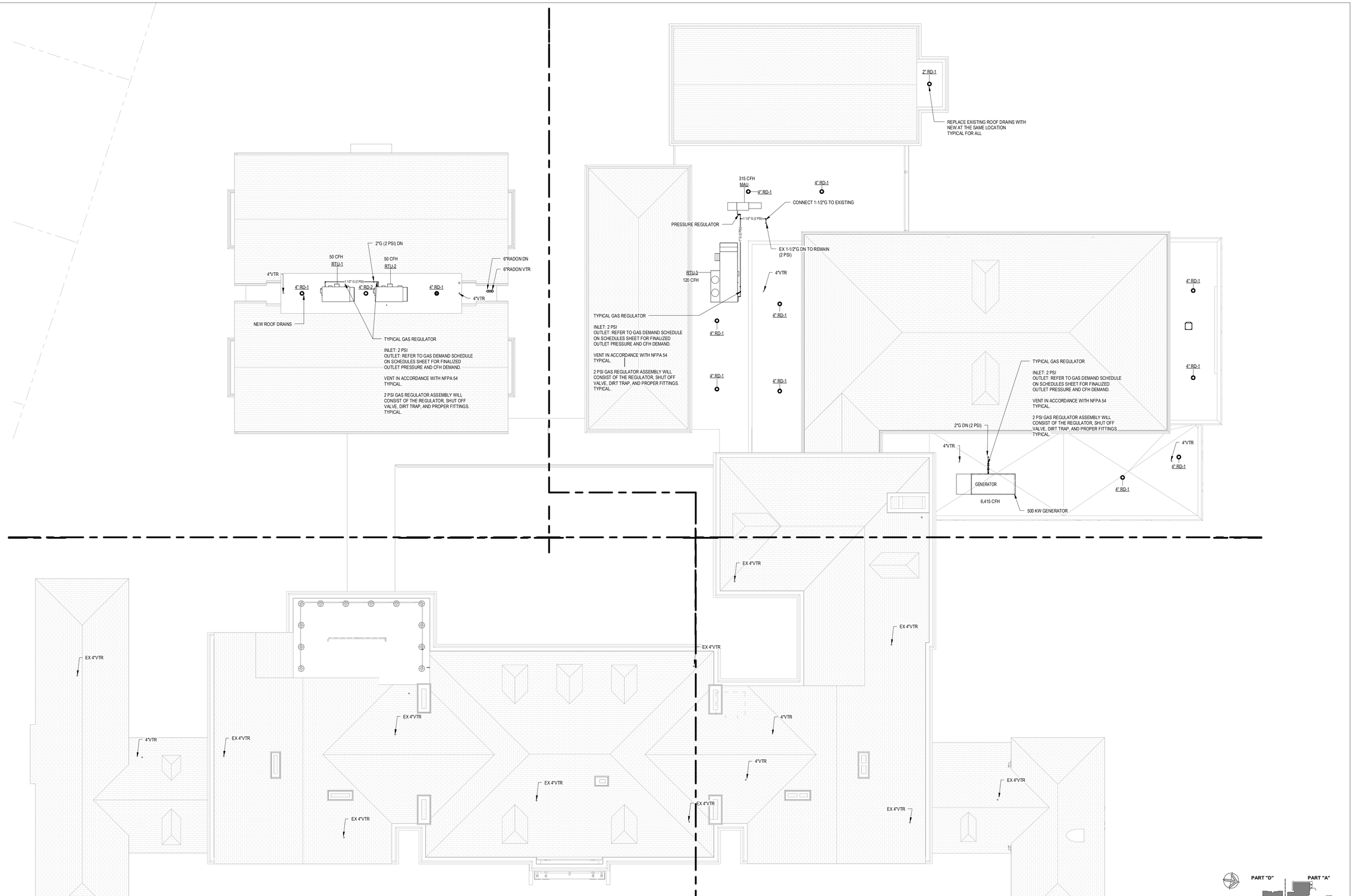
Revision:	Description:	Date:	Revised By:

Drawing Title: ATTIC PLAN - PLUMBING

Date: 08/29/2024
Scale: 1/8" = 1'-0"
Drawn By: Author
Project Number: 22-382

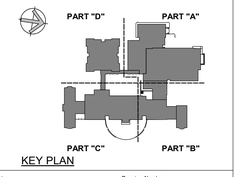
Drawing Number: P123

8/29/2024 11:36:35 AM



1 ROOF LEVEL PLAN

3/32" = 1'-0"



KEY PLAN

Project Title:

ADDITION & ALTERATIONS TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

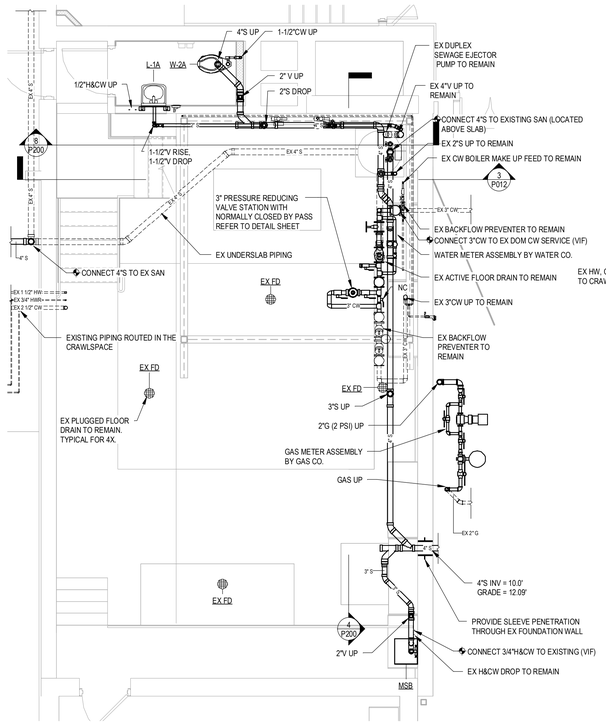
SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
311 STATE STREET NEW LONDON CT 06320
203 230 9007 silverpetrucelli.com

Revision:	Description:	Date:	Revised By:

Drawing Title: OVERALL ROOF PLAN - PLUMBING

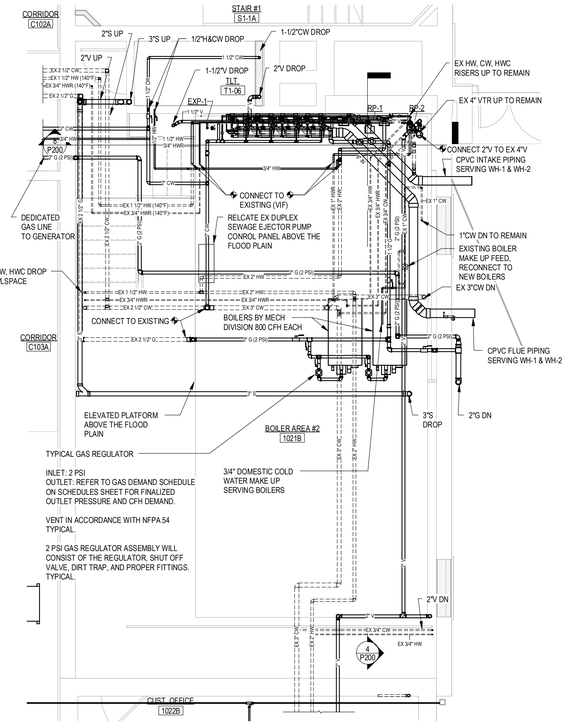
Date: 08/29/2024
Scale: 3/32" = 1'-0"
Drawn By: JES/MPB
Project Number: 22-382
Drawing Number: P130

8/29/2024 11:37:27 AM



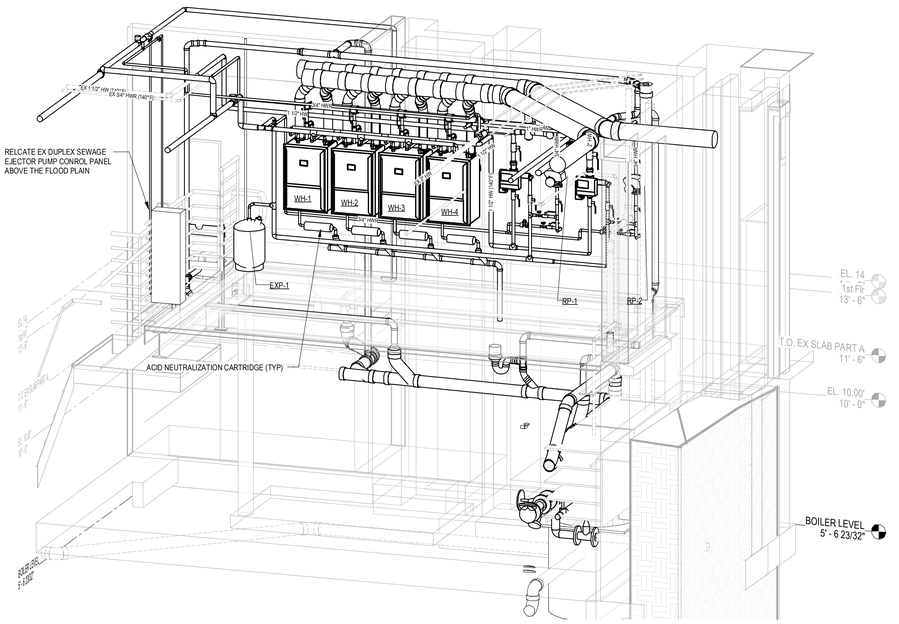
1 MECH. ROOM PART PLAN

1/4" = 1'-0"

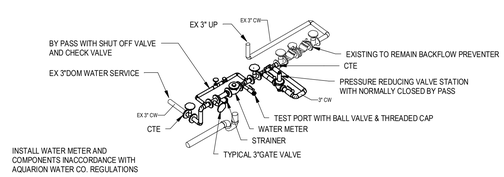


2 MECH. ROOM MEZZANINE PART PLAN

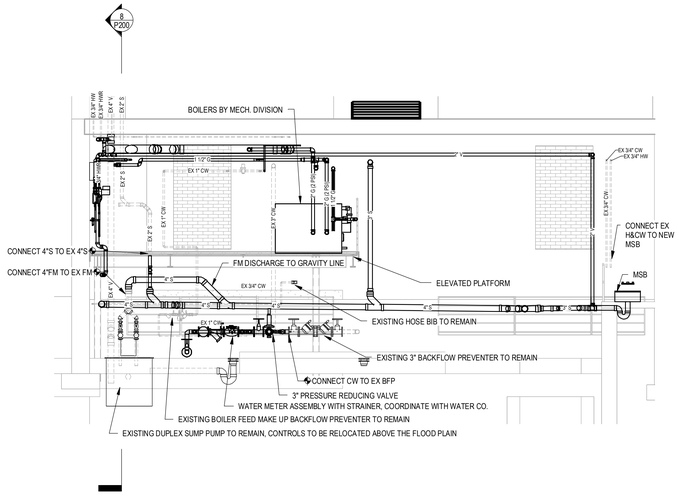
1/4" = 1'-0"



3 MECHANICAL ROOM ISO

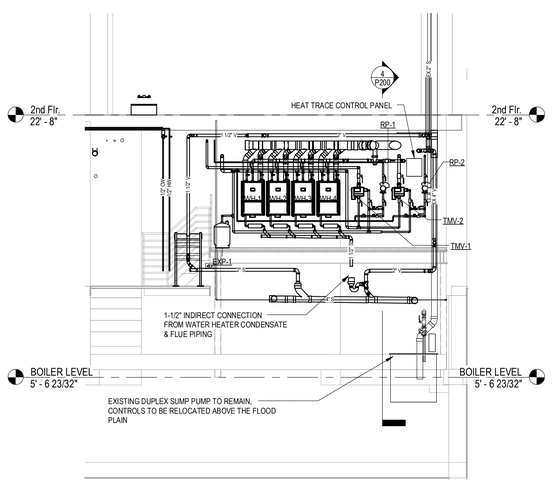


5 WATER SERVICE ENTRY PLAN



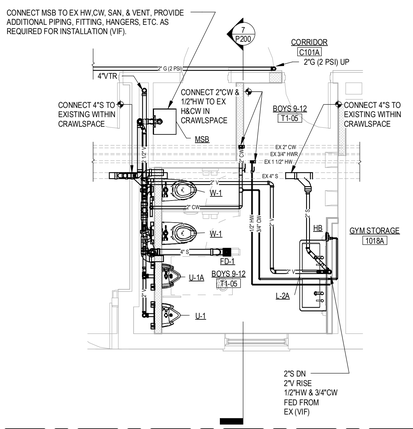
4 BOILER ROOM SECTION

1/4" = 1'-0"



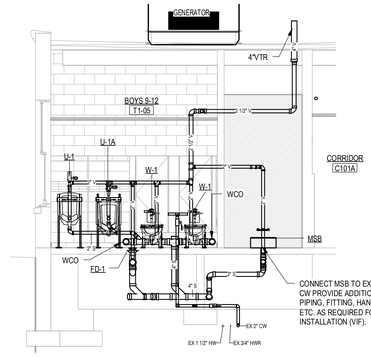
8 WATER HEATER SECTION

1/4" = 1'-0"



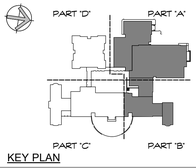
6 BOYS 9-12 1033A PART PLAN

1/4" = 1'-0"



7 BOYS 9-12 1033A SECTION

1/4" = 1'-0"



KEY PLAN

Project Title:

ADDITION & ALTERATIONS TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
311 STATE STREET NEW LONDON CT 06320
203 230 9007 silverpetrucelli.com

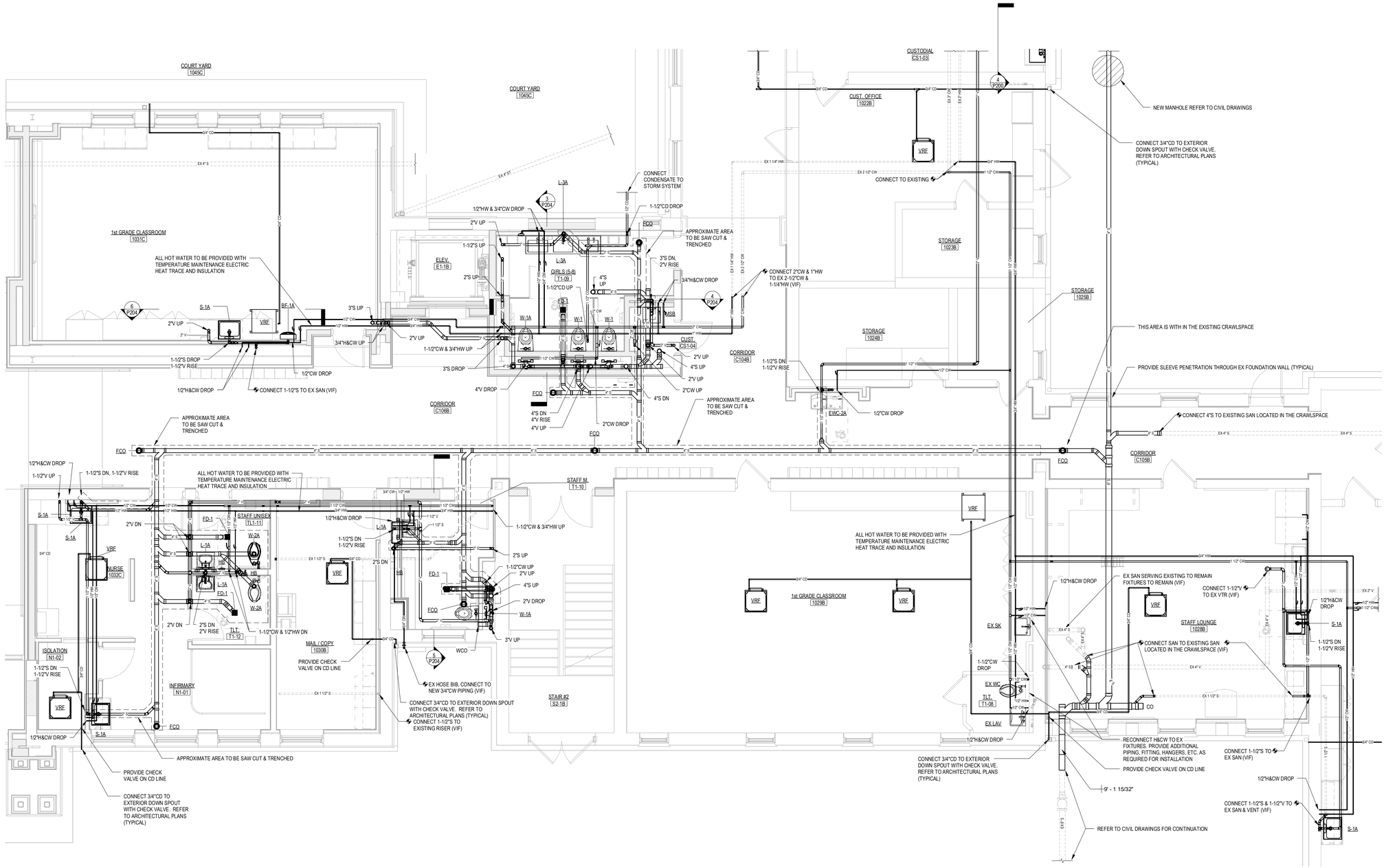
Revision:	Description:	Date:	Revised By:

Drawing Title:

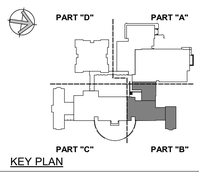
MECHANICAL ROOM PART PLANS - PLUMBING

Date: 08/29/2024
Scale: 1/4" = 1'-0"
Drawn By: MPB
Project Number: 22-382
Drawing Number: P200

8/29/2024 11:39:49 AM



1 FIRST FLOOR PART PLAN PART 'B'
1/4" = 1'-0"



KEY PLAN

Project Title:

ADDITION & ALTERATIONS TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
311 STATE STREET NEW LONDON CT 06320
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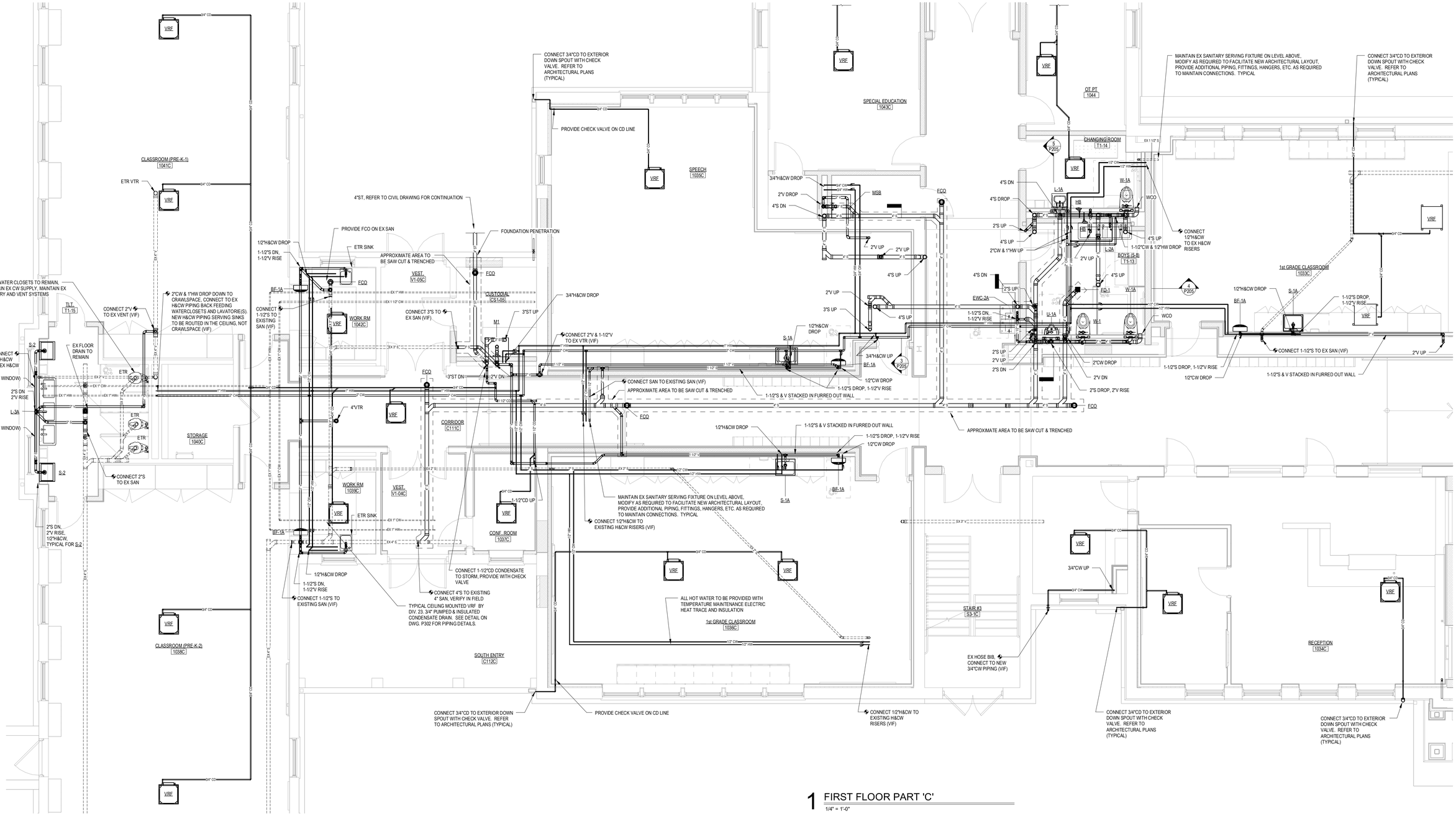
Revision:	Description:	Date:	Revised By:

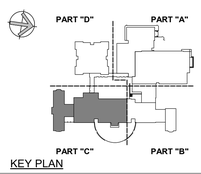
Drawing Title:
FIRST FLOOR B PART PLANS - PLUMBING

Date: 08/29/2024
Scale: 1/4" = 1'-0"
Drawn By: MPB
Project Number: 22-382
Drawing Number: P201

8/29/2024 11:52:29 AM



1 FIRST FLOOR PART 'C'
1/4" = 1'-0"



KEY PLAN

Project Title:

ADDITION & ALTERATIONS TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
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203 230 9007 silverpetrucelli.com

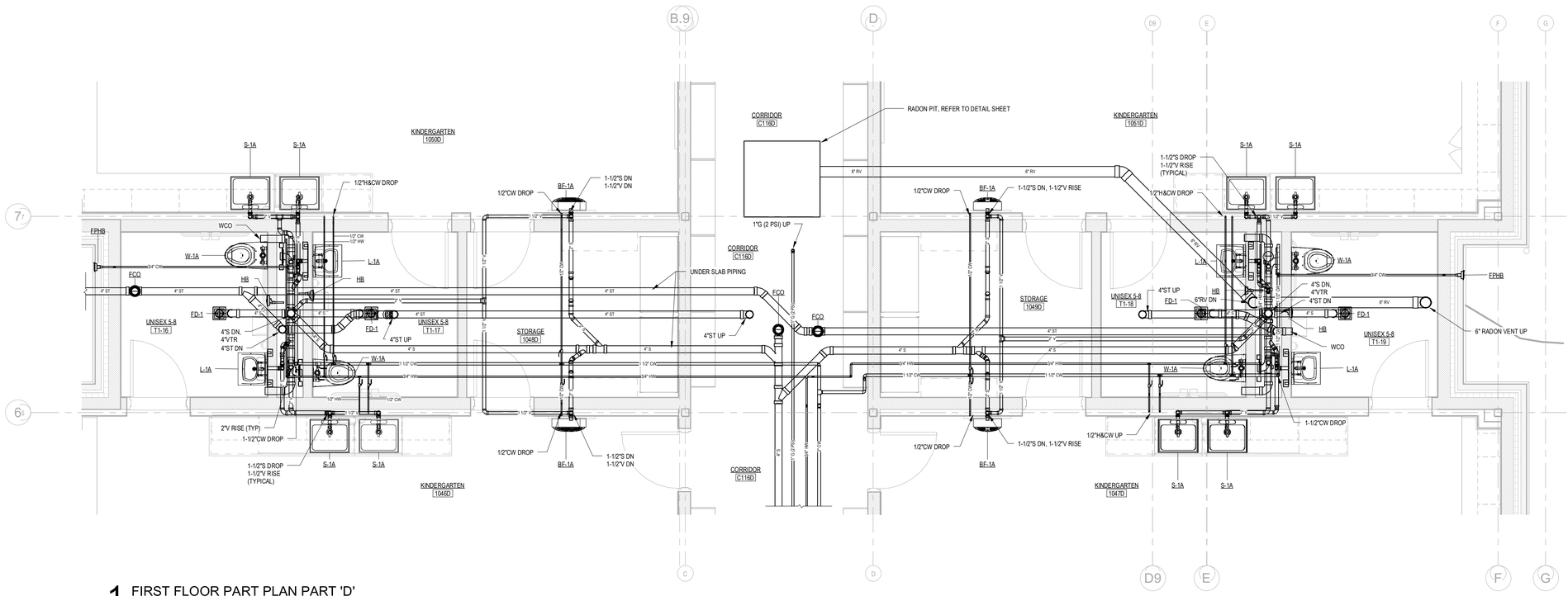
Revision:	Description:	Date:	Revised By:

Drawing Title:
FIRST FLOOR C PART PLANS - PLUMBING

Date: 08/29/2024
Scale: 1/4" = 1'-0"
Drawn By: MPB
Project Number: 22-382

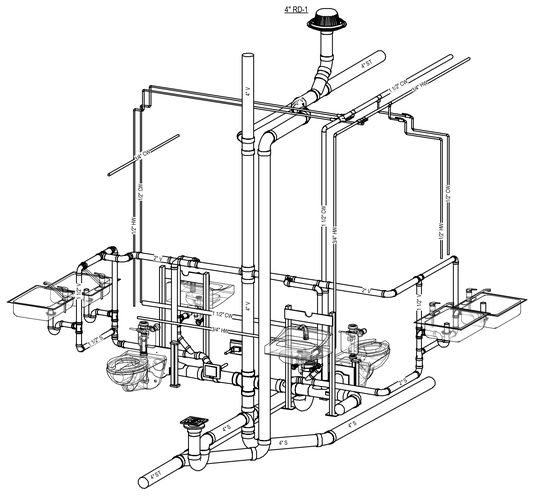
Drawing Number: P202

8/29/2024 11:54:02 AM

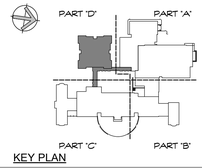


1 FIRST FLOOR PART PLAN PART 'D'

3/8" = 1'-0"



2 ISO PART D



KEY PLAN

Project Title:

ADDITION & ALTERATIONS TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
311 STATE STREET NEW LONDON CT 06320
203 230 9007 silverpetrucelli.com

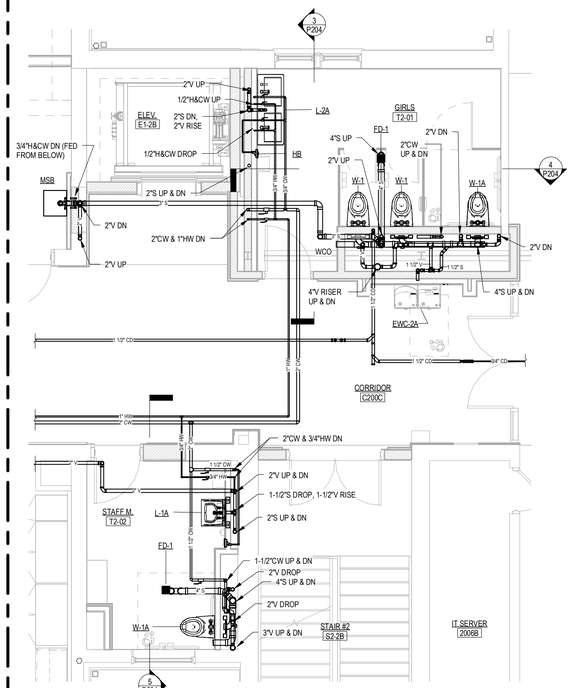
Revision:	Description:	Date:	Revised By:

Drawing Title: FIRST FLOOR D PART PLAN - PLUMBING

Date: 08/29/2024
Scale: 3/8" = 1'-0"
Drawn By: MPB
Project Number: 22-382

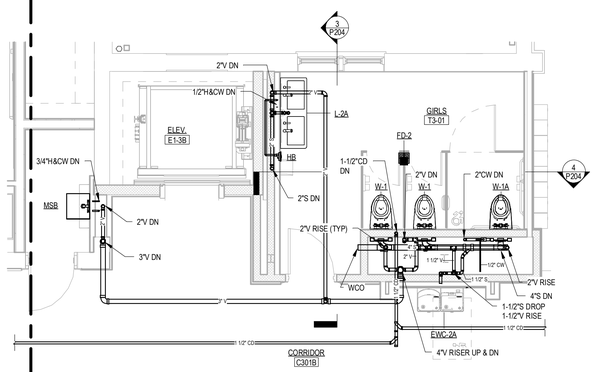
Drawing Number: P203

8/29/2024 11:54:39 AM



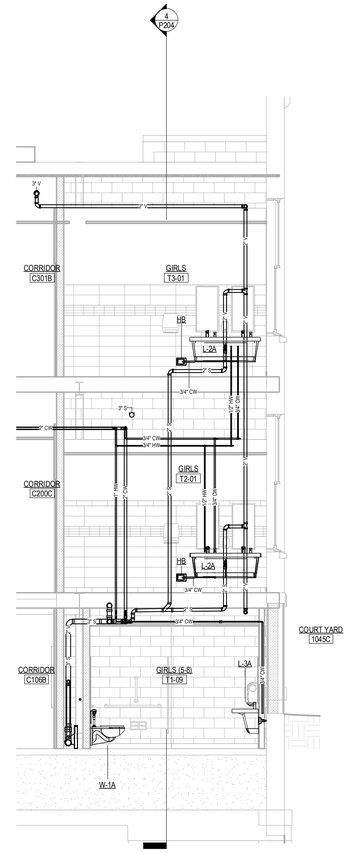
1 SECOND LEVEL PLAN PART 'A' - Callout 2

1/4" = 1'-0"



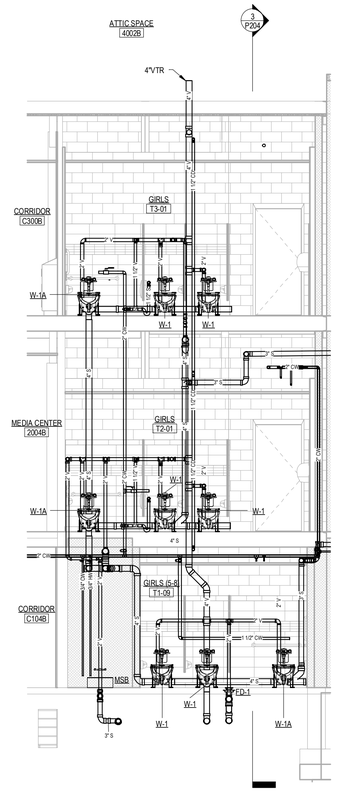
2 THIRD LEVEL PLAN PART 'B & C' - Callout 2

1/4" = 1'-0"



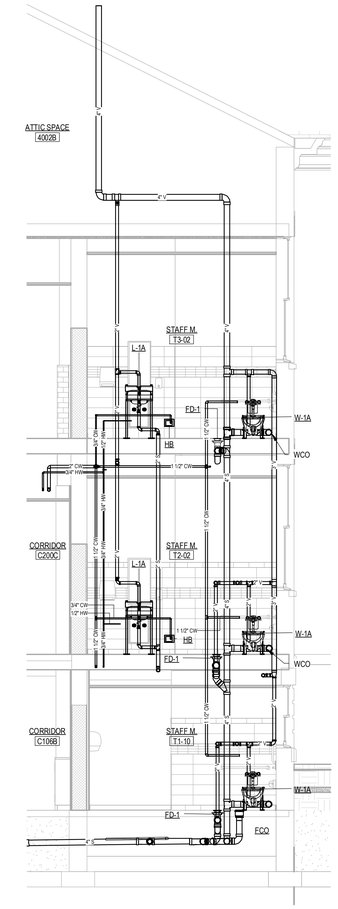
3 PART B GIRLS SECTION 1

1/4" = 1'-0"



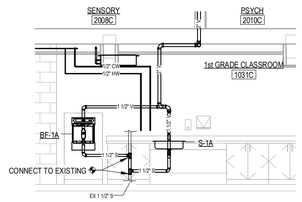
4 PART B GIRLS SECTION 2

1/4" = 1'-0"



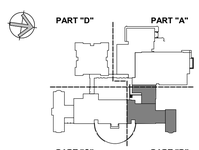
5 PART B STAFF M SECTION 1

1/4" = 1'-0"



6 1ST GRADE CLASSROOM 1061C

1/4" = 1'-0"



KEY PLAN

Project Title:

ADDITION & ALTERATIONS TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

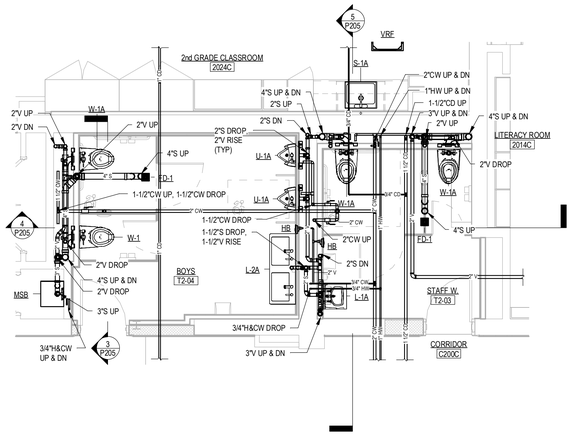
SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
311 STATE STREET NEW LONDON CT 06320
203 230 9007 silverpetrucelli.com

Revision:	Description:	Date:	Revised By:

Drawing Title: 2ND & 3RD PART PLANS B - PLUMBING

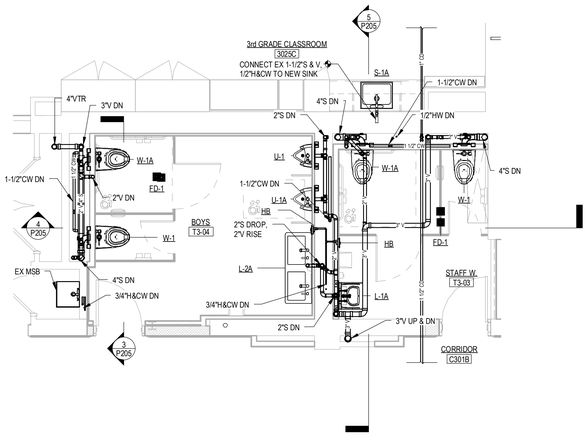
Date: 08/29/2024
Scale: 1/4" = 1'-0"
Drawn By: MPB
Project Number: 22-382
Drawing Number: P204

8/29/2024 1:02:22 PM



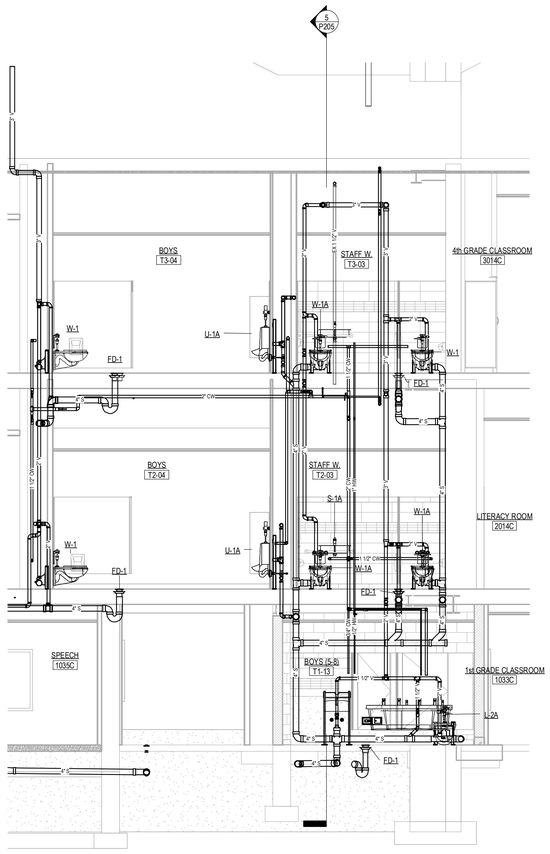
1 SECOND LEVEL PLAN PART 'C' - Callout 1

1/4" = 1'-0"



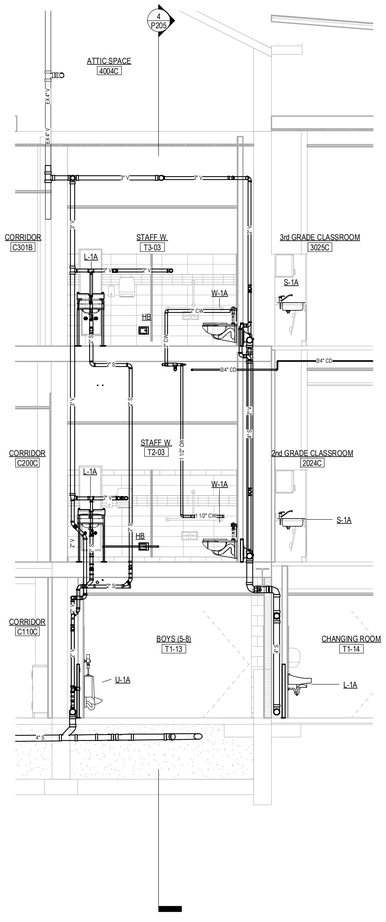
2 THIRD LEVEL PLAN PART 'C' - Callout 1

1/4" = 1'-0"



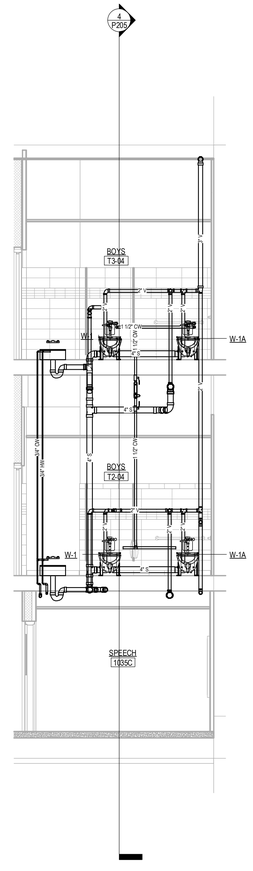
4 PART C BOYS SECTION 2

1/4" = 1'-0"



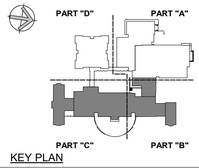
5 PART C BOYS SECTION 1

1/4" = 1'-0"



3 PART C BOYS SECTION 3

1/4" = 1'-0"



KEY PLAN

Project Title:

ADDITION & ALTERATIONS TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
311 STATE STREET NEW LONDON CT 06320
203 230 9007 silverpetrucelli.com

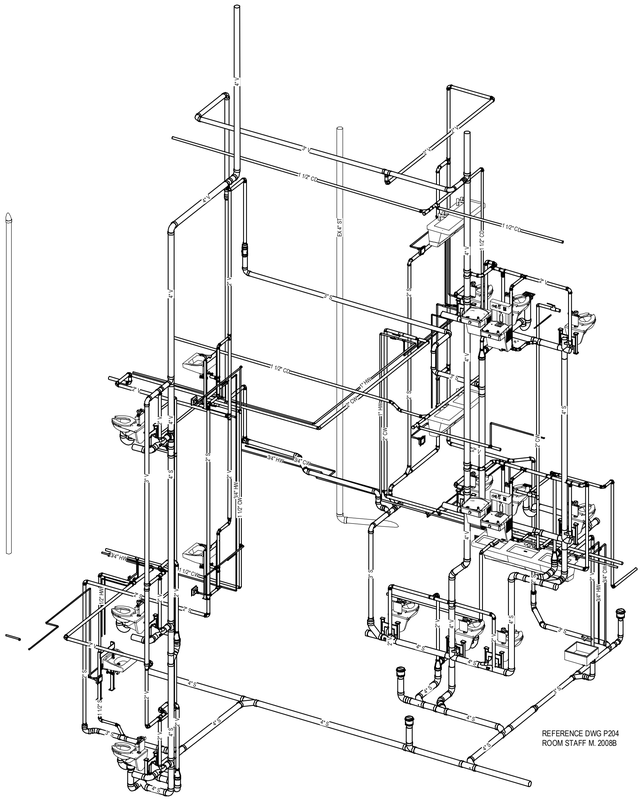
Revision:	Description:	Date:	Revised By:

Drawing Title: 2ND & 3RD PART PLANS C - PLUMBING

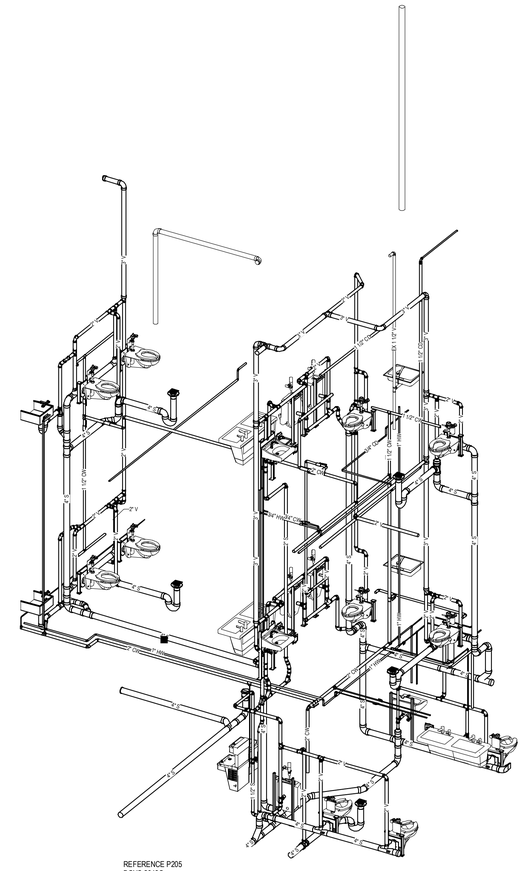
Date: 08/29/2024
Scale: 1/4" = 1'-0"
Drawn By: MPB
Project Number: 22-382

Drawing Number: P205

8/29/2024 1:04:00 PM



1 ISO PART B STAFF M. 2008B



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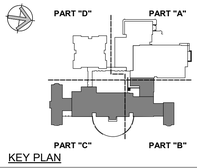


KEY PLAN

Project Title:

ADDITION & ALTERATIONS TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

SILVER PETRUCELLI + ASSOCIATES

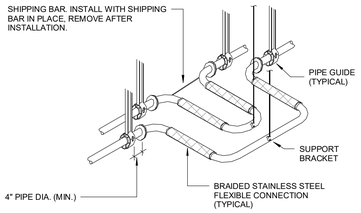
3190 WHITNEY AVENUE HAMDEN CT 06518
311 STATE STREET NEW LONDON CT 06320
203 230 9007 silverpetrucelli.com

Revision:	Description:	Date:	Revised By:

Drawing Title:
PART B & C RISER ISO VIEWS - PLUMBING

Date: 08/29/2024
Scale:
Drawn By: Author
Project Number: 22-382
Drawing Number: P206

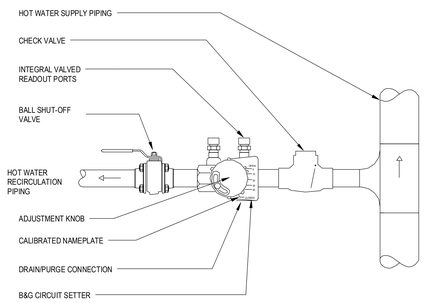
8/29/2024 1:07 PM



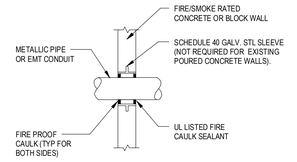
GENERAL NOTES:

1. EXPANSION LOOP: METRAFLEX CO. MLS SERIES.
2. INSTALL IN STRICT ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS.
3. INSTALL ARMAFLEX INSULATION ON BRAIDED FLEXIBLE CONNECTIONS. INSULATE REMAINING PIPING AS INDICATED IN THE SPECIFICATIONS.

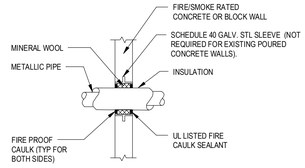
12 WATER EXPANSION LOOP DETAIL
NTS



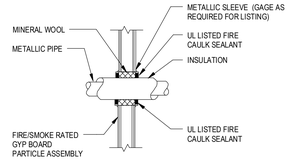
11 HOT WATER RECIRCULATING FLOW BALANCE ASSEMBLY1
NTS



NON INSULATED PIPE/ CONDUIT



INSULATED PIPE



INSULATED/NON INSULATED PIPE

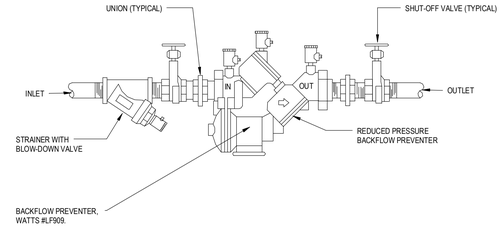
GENERAL NOTES:

PROVIDE UL LISTED, FM APPROVED FIRE/SMOKE PENETRATION ASSEMBLY IN ACCORDANCE W/ UL1479, ASTM E814 REQUIREMENTS FOR WALL TYPE, RATING, PIPE SIZE AND INSULATION THICKNESS INSTALLED.

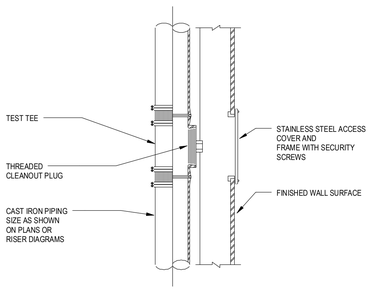
FIRE STOPPING SHALL HAVE A RATING EQUAL TO OR GREATER THAN THE WALL BEING PENETRATED - SEE SPECIFICATIONS. REFER TO ARCHITECTURAL DRAWINGS FOR WALL RATING AND LOCATIONS

PLASTIC PIPING: PROVIDE UL LISTED, FM APPROVED FIRE/SMOKE ASSEMBLY LISTED FOR PLASTIC PIPE IN ACCORDANCE W/ MANUFACTURER'S REQUIREMENTS.

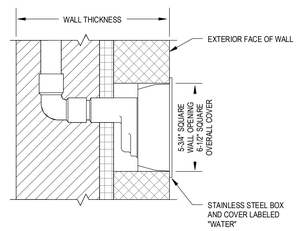
10 PIPE PENETRATION WITH FIRE/SMOKE SEAL
NTS



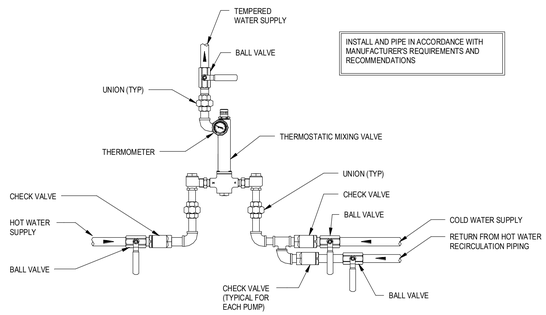
9 BACKFLOW PREVENTER DETAIL (2" AND SMALLER)
NTS



8 WALL CLEANOUT DETAIL
NTS

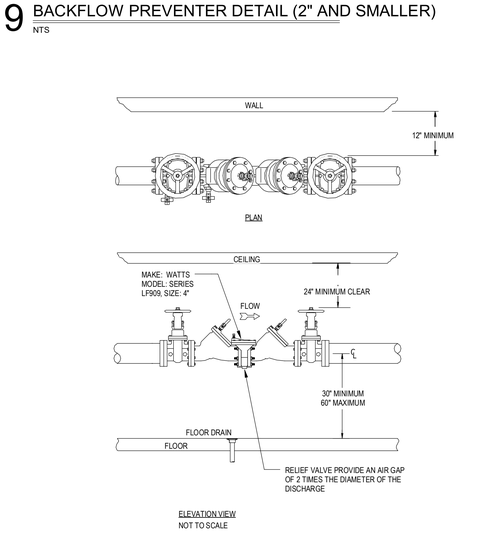


7 WALL HYDRANT DETAIL
NTS



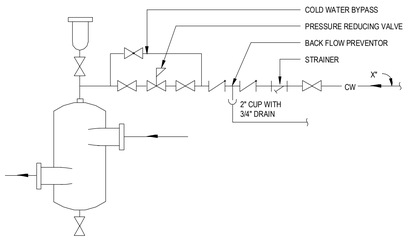
INSTALL AND PIPE IN ACCORDANCE WITH MANUFACTURER'S REQUIREMENTS AND RECOMMENDATIONS

6 MASTER THERMOSTATIC MIXING VALVE
NTS

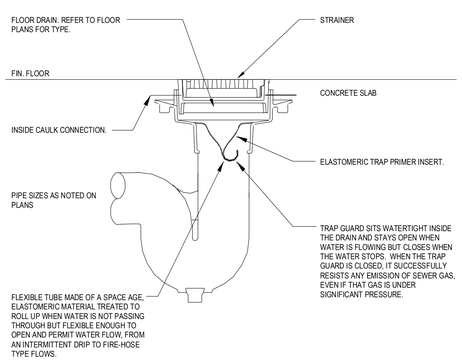


ELEVATION VIEW
NOT TO SCALE

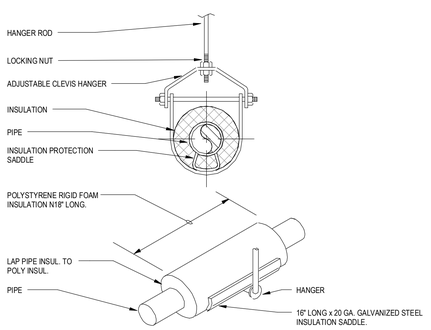
5 BACKFLOW PREVENTER DETAIL (2-1/2" AND LARGER)
NTS



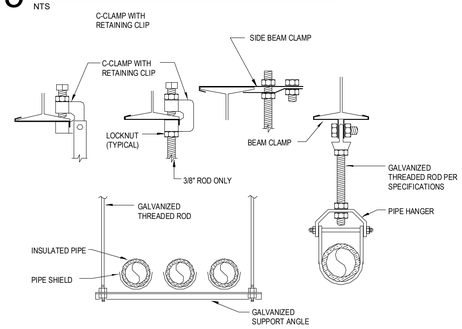
4 MAKEUP WATER TO BOILER
NTS



3 TRAP SEAL DETAIL
NTS



2 CLEVIS HANGER WITH SADDLE DETAIL
NTS



18" OR WIDER

PIPE SIZE	ROD DIA.	SUPPORT ANGLE OR EQUIV. CHANNEL	MAX SPACING STEEL PIPE	MAX SPACING COPPER PIPE	MAXIMUM AREA *
1/2" TO 1"	3/8"	1 1/2" X 1 1/2" X 1/8"	8'-0" O.C.	6'-0" O.C.	4 SQ. FT.
1 1/4" TO 2"	3/8"	1 1/2" X 1 1/2" X 1/8"	10'-0" O.C.	8'-0" O.C.	10 SQ. FT.
2 1/2" TO 4"	1/2"	2" X 2" X 1/4"	12'-0" O.C.	10'-0" O.C.	10 SQ. FT.

* REDUCE SPACING TO NEXT SMALLER INTERVAL IF PIPE AREA EXCEEDS MAXIMUM

1 PIPE SUPPORT DETAIL
NTS

Project Title:

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203 230 9007 silverpetrucelli.com

Revision:	Description:	Date:	Revised By:

Drawing Title: DETAILS - PLUMBING

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Project Number: 22-382
Drawing Number: P300

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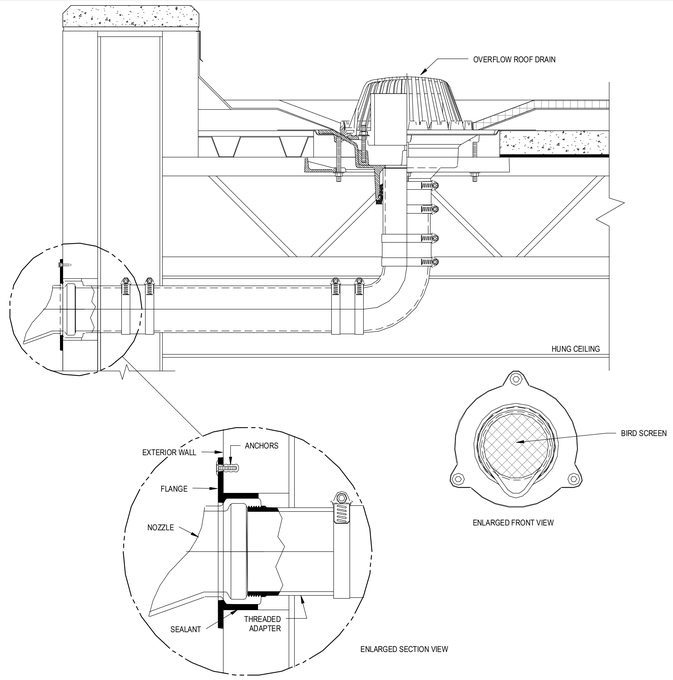
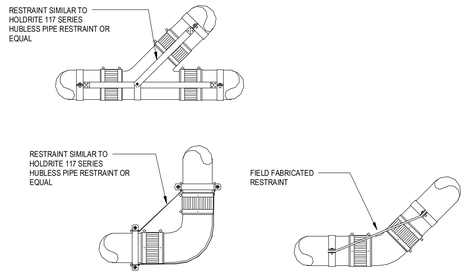
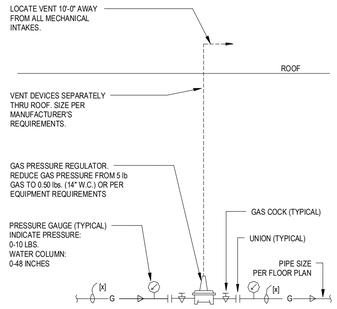


8 OVERFLOW DOWNSPOUT NOZZLE DETAIL
NTS

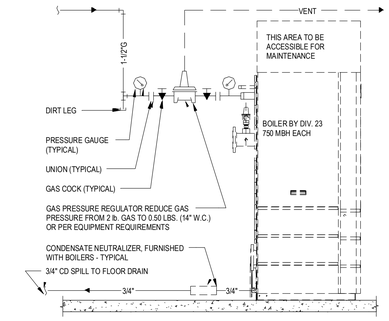


HORIZONTAL PIPE AND FITTINGS 5" AND LARGER SHALL BE SUITABLY BRACED TO PREVENT HORIZONTAL MOVEMENT. THIS MUST BE DONE AT EVERY BRANCH OPENING OR CHANGE IN DIRECTION BY THE USE OF BRACES, BLOCKS, RODDING OR OTHER SUITABLE METHOD, TO PREVENT MOVEMENT OR JOINT SEPARATION. THIS BRACING MAY BE FIELD FABRICATED OR A MANUFACTURED SYSTEM. THE DETAILS SHOWN ON THIS PAGE ILLUSTRATES SEVERAL METHODS OF BRACING.

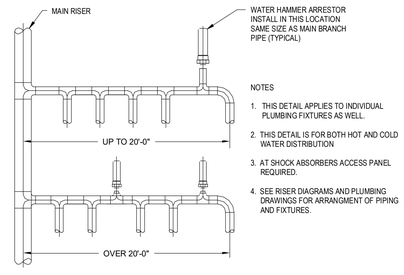
7 THRUST RESTRAINT PIPING DETAIL
NTS



6 NATURAL GAS PRESSURE REGULATOR DETAIL1
NTS



5 BOILER PIPING DETAIL
NTS



NOTES
1. THIS DETAIL APPLIES TO INDIVIDUAL PLUMBING FIXTURES AS WELL.
2. THIS DETAIL IS FOR BOTH HOT AND COLD WATER DISTRIBUTION
3. AT SHOCK ABSORBERS ACCESS PANEL REQUIRED.
4. SEE RISER DIAGRAMS AND PLUMBING DRAWINGS FOR ARRANGMENT OF PIPING AND FIXTURES.

4 SHOCK ABSORBER DETAIL
NTS

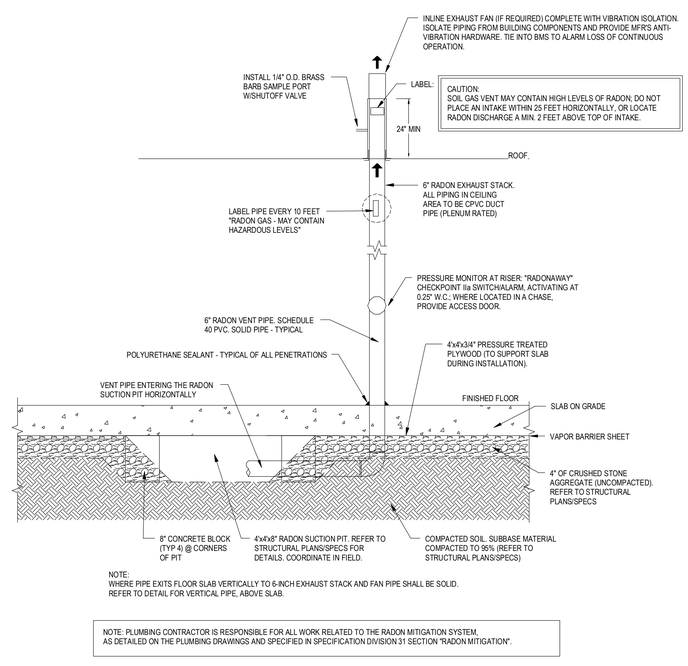
RADON SYSTEM GENERAL NOTES:

1. RADON SUCTION PIPE SHALL BE CENTRALLY LOCATED AS SHOWN.
2. DO NOT LOCATE SUCTION PIT NEAR SUBSLAB BARRIERS OR NEAR UNSEALED OPENINGS THROUGH THE SLAB.
3. VENT PIPE SHALL ENTER THE RADON SUCTION PIT HORIZONTALLY.
4. RUN VENT PIPE UNDER THE SLAB AND EXIT THE SUBSLAB IN THE GENERAL LOCATION INDICATED ON THE PLANS.
5. PROVIDE PRESSURE MONITOR/WARNING SIGNAL AT RISER. WHERE LOCATED IN A CHASE, PROVIDE AN ACCESS DOOR.
6. HORIZONTAL PIPE RUNS IN THE CEILING MUST PITCH A MINIMUM OF 1/8" PER FOOT BACK TO THE RADON SUCTION PIT.
7. ALL PVC PIPING SECTIONS TO BE CONNECTED USING PVC CEMENT (LOW VOC'S)
8. REFER TO OTHER DISCIPLINES DRAWINGS FOR ANY ADDITIONAL INFORMATION ON THE RADON SYSTEM INSTALLATION REQUIREMENTS.
9. CONTRACTOR SHALL PROVIDE THE SERVICES OF A RADON TESTING PROFESSIONAL WHO IS QUALIFIED FOR RADON TESTING IN CONNECTICUT SCHOOLS (LIST OF QUALIFIED PROFESSIONALS IS AVAILABLE ON STATE OF CT DPH WEBSITE), TO TEST RADON LEVELS AND PRESSURE FIELD EXTENSION (PFE) AFTER COMPLETION OF RADON SYSTEM INSTALLATION AND IN ACCORDANCE WITH EPA, STATE AND LOCAL REGULATIONS AND GUIDELINES. TESTING SHALL BE PERFORMED AFTER COMPLETION OF PASSIVE RADON EXHAUST SYSTEM INSTALLATION. THE TESTING PROFESSIONAL SHALL SUBMIT A WRITTEN REPORT CONTAINING THE RESULTS.
10. IF LEVELS ARE FOUND TO BE HIGH AFTER TESTING IS COMPLETED, SYSTEM SHALL BE CONVERTED FROM A PASSIVE SYSTEM TO AN ACTIVE SYSTEM.

10.a. INLINE RADON EXHAUST FAN MOUNTED IN RADON VENT STACK, ABOVE RADON VENT ROOF PENETRATION: 'RADONAWAY' MODEL RP380 RATED 420 CFM AT 0" ESP. (TESTED WITH 6" INLET AND DISCHARGE PIPING); COORDINATE PROVISION OF POWER WIRING AND DISCONNECT SWITCH WITH ELECTRICIAN. FAN IS TO RUN CONTINUOUSLY.

10.b. COORDINATE WIRING OF PRESSURE MONITOR INTO BMS. REFER TO DIVISION 23 SPECS FOR MORE INFORMATION.

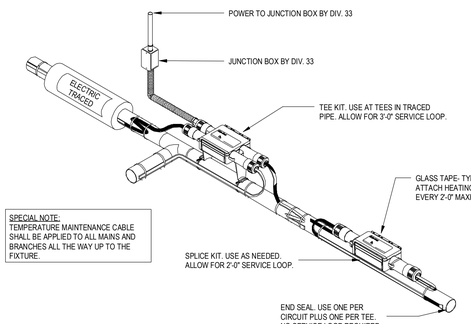
10.c. FAN SHALL BE COMMISSIONED PER COMMISIONING AGENT REQUIREMENTS.



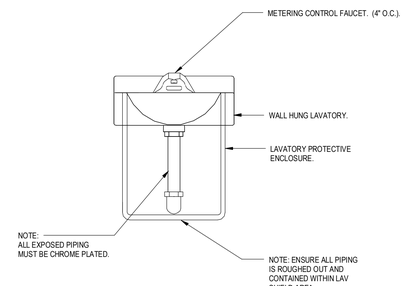
NOTE:
WHERE PIPE EXITS FLOOR SLAB VERTICALLY TO 6-INCH EXHAUST STACK AND FAN PIPE SHALL BE SOLID.
REFER TO DETAIL FOR VERTICAL PIPE, ABOVE SLAB.

NOTE: PLUMBING CONTRACTOR IS RESPONSIBLE FOR ALL WORK RELATED TO THE RADON MITIGATION SYSTEM, AS DETAILED ON THE PLUMBING DRAWINGS AND SPECIFIED IN SPECIFICATION DIVISION 31 SECTION "RADON MITIGATION".

3 RADON SUBSLAB DEPRESSURIZATION PIPING DETAIL
NTS



2 HEAT TRACE CABLE DETAIL
NTS



1 LAVATORY ENCLOSURE DETAIL
NTS

Project Title:

ADDITION & ALTERATIONS TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

SILVER PETRUCELLI + ASSOCIATES
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Drawn By: JES
Project Number: 22-382

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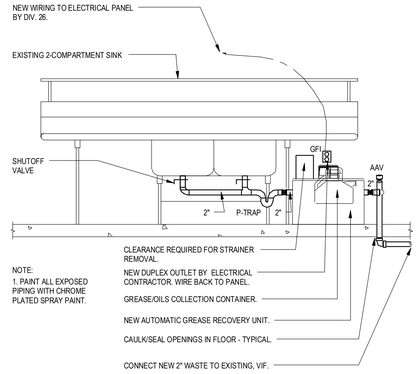
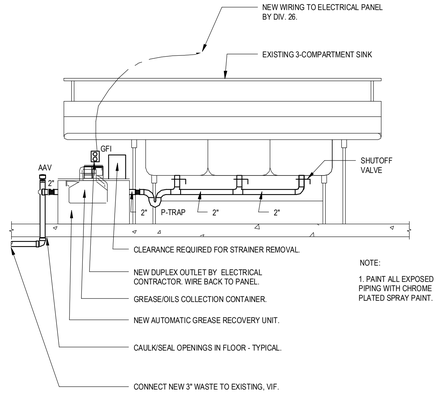
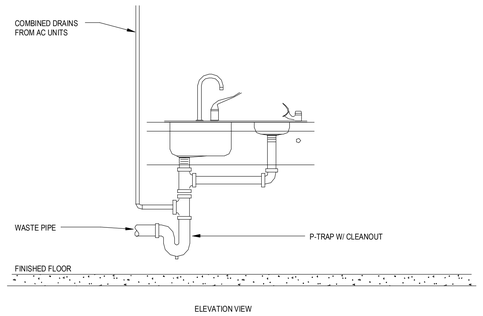


8 GREASE RECOVERY UNIT DETAIL 2
NTS

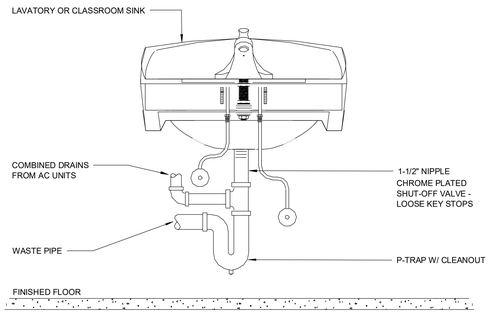


7 GREASE RECOVERY UNIT DETAIL 1
NTS

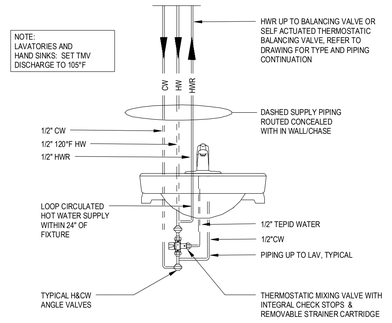


ELEVATION VIEW

6 CLASSROOM SINK INDIRECT DRAIN
NTS

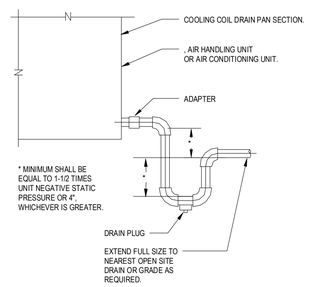


5 LAVATORY W/ INDIRECT DRAIN DETAIL
12" = 1'-0"

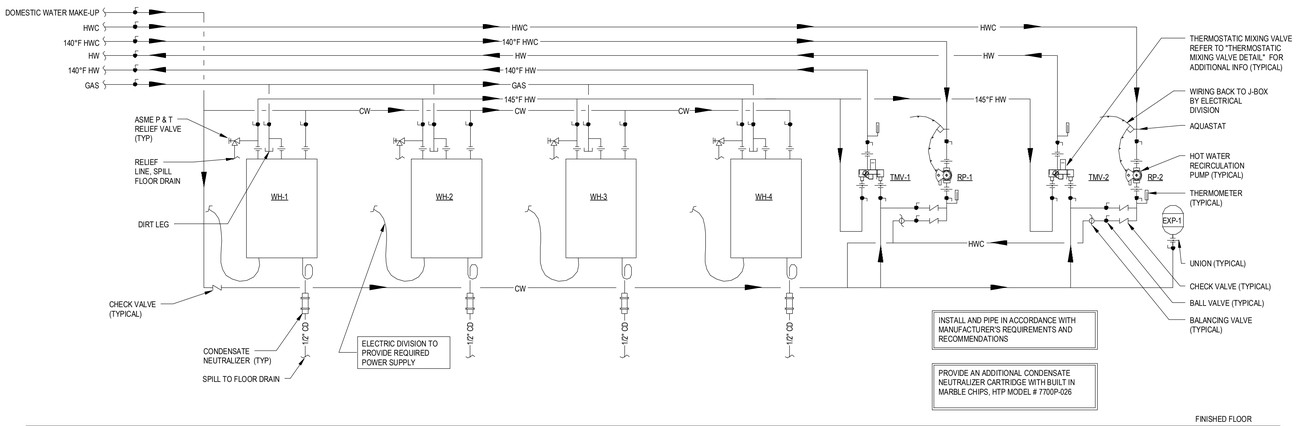


THERMOSTATIC MIXING VALVE TO BE READILY ACCESSIBLE, WITHIN UNDER-FIXTURE ENCLOSURE WHERE PROVIDED. COORDINATE EXACT LOCATION IN FIELD WITH ARCHITECTURAL, ADA, ETC. REQUIREMENTS.

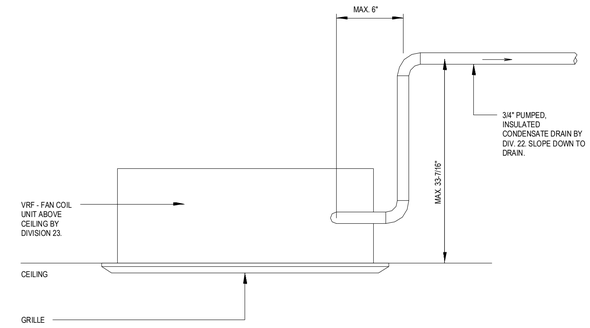
4 MIXING VALVE (LAVATORIES/HAND SINKS)
NTS



3 CONDENSATE DRAIN DETAIL
NTS



2 MULTIPLE GAS FIRED INSTANTANEOUS WATER HEATER DETAIL
12" = 1'-0"



1 FAN COIL CONDENSATE DRAIN DETAIL
NTS

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285 SOUND BEACH AVENUE
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Drawn By: JES
Project Number: 22-382

Drawing Number: P302

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PIPE AND FITTING SCHEDULE

DESCRIPTION	SIZE	PIPE		FITTING		REMARKS
		TYPE	SCHEDULE	TYPE	RATING	
SOIL, WASTE AND VENT ABOVE GROUND	ALL	CI-NH	SV	CI	SV	4 BAND FOR 4" AND SMALLER 6 BAND FOR LARGER THEN 4"
SOIL, WASTE AND VENT BELOW GROUND	ALL	CI-H&S	SV	CI	SV	--
STORM ABOVE GROUND	ALL	CI-NH	SV	CI	SV	4 BAND FOR 4" AND SMALLER 6 BAND FOR LARGER THEN 4"
STORM BELOW GROUND	ALL	CI-H&S	SV	CI	SV	--
DOMESTIC COLD WATER WITHIN BUILDING	ALL	COPPER	TYPE L	CUS	STD	HARD TEMPERED
DOMESTIC HOT WATER WITHIN BUILDING	ALL	COPPER	TYPE L	CUS	STD	HARD TEMPERED
DOMESTIC HOT WATER RECIRCULATION WITHIN BUILDING	ALL	COPPER	TYPE L	CUS	STD	HARD TEMPERED
INDIRECT WASTE AND CONDENSATE PIPING	ALL	COPPER	TYPE L	CUS	STD	HARD TEMPERED
DOMESTIC HOT & COLD WATER PIPING WITHIN BUILDING, BELOW SLAB	ALL	COPPER	TYPE K	CUS	STD	SOFT TEMPERED, NO JOINTS BELOW SLAB
TRAP PRIMER PIPING	ALL	PEX	--	--	--	NO JOINTS ALLOWED BELOW SLAB
GAS PIPING	2" AND SMALLER	STL-BLK	SCH. 40	MIT	CLASS 150	--
GAS PIPING	2" AND LARGER	STL-BLK	SCH. 40	WE	SCH. 40	--
FORCE MAIN (ABOVE GROUND)	2" AND SMALLER	COPPER	TYPE L	CUS	STD	--
FORCE MAIN (ABOVE GROUND)	2-1/2" AND LARGER	GS,GES	--	PF,TJ,GJ	--	--
FORCE MAIN (BELOW GROUND)	4" AND SMALLER	DI	SV	DI	MJ	--

NOTES:
1. TRANSITION COUPLINGS AND NO-HUB PIPE SHALL NOT BE INSTALLED BELOW SLAB OR IN ANY BURIED CONDITIONS IN CONTACT WITH EARTH

2. ALL PIPING IN RETURN AIR CEILING PLENUM INSTALLATIONS SHALL BE UL LISTED FOR THIS APPLICATION

3. MECHANICAL JOINTS ARE ALLOWED FOR SERVICE. PURPOSED ONLY IN WALLS AND CEILINGS BUT MUST BE READILY ACCESSIBLE. 25/50 PVDF IS UL LISTED FOR RETURN AIR CEILING PLENUM ISTALLATIONS

ABBREVIATIONS	DESCRIPTION	ABBREVIATIONS	DESCRIPTION
AWWA	AMERICAN WATER WORKS ASSOCATION	MIT	MALLEABLE IRON THREADED
CI	CAST IRON	NH	NO HUB W/SUPER DUTY HUSKY SD 4000 CLAMP
CPVC	CHLORINATED POLYVINYL CHLORIDE	PEX	PEX PIPING
CUS	WROUGHT COPPER SOLDER (95/5)	PF	PRESSURE FITTING
DI	DUCTILE IRON	POLY-PRO	POLYPROPYLENE PIPING
DIMJ	DUCTILE IRON MECHANICAL JOINT	STD	STANDARD
GES	GROOVED END STEEL	STL-BLK	BLACK STEEL
GJ	GROOVED JOINT SYSTEM FITTINGS/COUPLINGS	SV	SERVICE WEIGHT
GS	GALVANIZED STEEL	TJ	THREADED JOINTS
H&S	HUB AND SPIGOT	WE	BUT WELD
MJ	MECHANICAL JOINT		

VALVE SCHEDULE

DESCRIPTION	SIZE	TYPE						CLASS	REMARKS
		GATE	GLOBE	CHECK	BALL	PLUG	BALANCE		
DOMESTIC COLD WATER	3" AND SMALLER	GVT	GLVT	CVT	BVT	--	--	125PSI	--
DOMESTIC HOT WATER	3 AND SMALLER	GVT	GLVT	CVT	BVT	--	CBV	125PSI	--
DOMESTIC COLD WATER	4" AND LARGER	GVF	--	CVF	--	--	--	125PSI	--
DOMESTIC HOT WATER	4" AND LARGER	GVF	--	CVF	--	--	CBV	125PSI	--
BACKFLOW PREVENTER	2" AND SMALLER	--	--	--	BVT	--	--	125PSI	--
BACKFLOW PREVENTER	2-1/2" AND LARGER	GVF	--	--	--	--	--	125PSI	--
GAS	2" AND SMALLER	--	--	--	--	PGVT	--	125PSI	--
GAS	2-1/2" AND LARGER	--	--	--	--	PGVF	--	125PSI	--

NOTES:
1. SOLENOID VALVE: UL LISTED, FM APPROVED FOR GAS SERVICE, EXPLOSION PROOF, TWO -WAY NORMALLY CLOSED. ASCO 8044 SERIES W/MANUAL RESET. (EMERGENCY GAS SHUT-OFF VALVE ASSEMBLY)

2. CALIBRATED PRESSURE RELIEF VALVE: INSTALL A MINIMUM OF 12" ABOVE WATER HEATER AND PIPE DISCHARGE TO ADEQUATE LOCATION. WATTS MODEL 540C

ABBREVIATION	DESCRIPTION	ABBREVIATION	DESCRIPTION
BVF	BALL VALVE FLANGED - FULL PORT, BRONZE	CVF	CHECK VALVE FLANGED - IMMB
BVT	BALL VALVE THREADED - 2-PIECE, FULL PORT, 400PSI, BRONZE	CVT	CHECK VALVE THREADED - BRONZE
CBV	CALIBRATED BALANCING VALVE - BRONZE	GVF	GATE VALVE FLANGED - IMMB
CPRV	CALIBRATED PRESSURE RELIEF VALVE	GVT	GATE VALVE THREADED - BRONZE
PGVT	PLUG VALVE THREADED - AGA APPROVED	PGVF	PLUG VALVE FLANGED - AGA APPROVED

INSULATION SCHEDULE

SYSTEM	PIPE SIZE	INSULATION TYPE	INSULATION THICKNESS	FITTINGS, VALVES, FLANGES INSULATION TYPE	REMARKS
DOMESTIC COLD WATER	ALL	MINERAL FIBER, ASJ, SSL		MOLDED, PRE-FORMED MINERAL FIBER WITH PVC JACKET	TYPE 1
DOMESTIC HOT WATER	< 1-1/2	MINERAL FIBER, ASJ, SSL	1"	MOLDED, PRE-FORMED MINERAL FIBER WITH PVC JACKET	TYPE 1
DOMESTIC HOT WATER	> 1-1/2	MINERAL FIBER, ASJ, SSL	1 1/2"	MOLDED, PRE-FORMED MINERAL FIBER WITH PVC JACKET	TYPE 1
DOMESTIC WATER UNDERGROUND & INSLAB	ALL	CLOSED CELL	1"	ARMAFLEX	--
CONDENSATE	ALL	MINERAL FIBER, ASJ, SSL	1/2"	MOLDED, PRE-FORMED MINERAL FIBER WITH PVC JACKET	TYPE 1
INTERIOR ROOF DRAIN PIPING	ALL	MINERAL FIBER, ASJ, SSL	1"	MOLDED, PRE-FORMED MINERAL FIBER WITH PVC JACKET	TYPE 1 INCLUDE ROOF DRAIN BODY
FLOOR DRAIN TRAP IN MECHANICAL ROOM	ALL	MINERAL FIBER, ASJ, SSL	1"	MOLDED, PRE-FORMED MINERAL FIBER WITH PVC JACKET	TYPE 1 INCLUDE 8' HORIZONTAL RUN
EXTERIOR PIPE	ALL	CELLULAR GLASS (FOAM GLASS)	2"	CELLULAR GLASS (FOAM GLASS)	ALUMINUM JACKET WITH HEAT TRACE

NOTES:
1. FIBERGLASS INSULATION: THERMAL CONDUCTIVITY .22 TO .28BTU x IN./H x FT x °F W/ 100°F MEAN TEMP. THICKNESS BASED ON ASHRAE 90.1, 1999 6.2.4.5

2. REFER TO SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS

3. ALL KITCHEN WASTE SHALL BE HEAT TRACED FROM FIXTURE TO THE GREASE INTERCEPTOR

ELECTRIC HEAT TRACE FOR TEMPERED WATER LINES

GENERAL - ELECTRIC HEAT TRACE, RAYCHEM, HWAT-R2 SERIES, SELF-REGULATING CABLE. UL LISTED SYSTEM WITH (2) 16 AWG NICKEL-COPPER BUS WIRES EMBEDDED IN PARALLEL IN A SELF-REGULATING POLYMER CORE THAT VARIES ITS POWER OUTPUT TO RESPOND TO TEMPERATURE ALL ALONG ITS LENGTH. THE HEATING CABLE CAN BE CUT TO LENGTH IN THE FIELD AND SHALL INCLUDE ALL POWER CONNECTIONS, SEALS, SPLICES, TEE KITS AND FASTENGING HARDWARE. CONTROLS SHALL BE LINE SENSING, AND ALL CABLE SHALL MAINTAIN 95F-140F. COORDINATE WITH ELECTRICAL CONTRACTOR AND MANUFACTURES REQUIREMENTS AND RECOMMENDATIONS. INSTALLER FOLLOW INSTALATION AND TESTING PROCEDURES IN RAYCHEM HWAT SYSTEM O&M #H57548.

CONTROLLER: nVENT RAYCHEM HWAT-ECO-GF SINGLE POINT ELECTRONIC CONTROLLER, PROVIDE WITH DRY CONTACT / RELAY TO INTERFACE WITH BMS FOR REMOTE MONITORING AND ALARM. EACH CONTROLLER REQUIRES 30 AMP CIRCUIT 208V 1Ø.

CLEANOUT SCHEDULE

MARK	FIXTURE, MODEL NUMBER AND DESCRIPTION	TRAP SIZE	REMARKS
FCO	FLOOR CLEANOUT (ALL INTERIOR AREAS EXCEPT CARPETED AREAS). WATTS CO-200-RX-C-6, ADJUSTABLE ROUND SCORIATED HEAVY DUTY NICKEL BRONZE SECURED TOP WITH FRAME, CAST IRON BODY, FLASHING FLANGE AND CLAMP, BRONZE PLUG. PROVIDE WITH VANDAL PROOF SCREWS. PROVIDE NICKEL BRONZE FRAME IN WET AREAS.	AS NOTED ON DWG.	--
FCO	FLOOR CLEANOUT (CARPETED AREAS). WATTS CO-200-RC-6, ADJUSTABLE ROUND SCORIATED HEAVY DUTY NICKEL BRONZE SECURED TOP WITH FRAME, CARPET MARKER, CAST IRON BODY, FLASHING FLANGE AND CLAMP, BRONZE PLUG. PROVIDE WITH VANDAL PROOF SCREWS.	AS NOTED ON DWG.	--
WCO	WALL PLATE CLEANOUT COVER. WATTS CO-590-RD, PROVIDE AT CAST IRON CLEANOUTS WITH COUNTERSUNK BRASS PLUG AND STAINLESS STEEL COVER SECURED WITH VANDAL PROOF SCREWS.	--	--

NOTES:
1. TRANSITION COUPLINGS AND NO-HUB PIPE SHALL NOT BE INSTALLED BELOW SLAB OR IN ANY BURIED CONDITIONS IN CONTACT WITH EARTH

2. PROVIDE ALL POURED IN PLACE CLEANOUTS WITH 24"X24" FLASHING

INTERCEPTOR SCHEDULE

MARK	TYPE/STYLE	CONSTRUCTION FINISH	FLOW RATE (GAL./MIN)	REMOVAL RATE (LBS/HR)	INLET SIZE	OUTLET SIZE	INLET HEIGHT	OUTLET HEIGHT	ELECTRICAL			REMARKS
									VOLTAGE	WATTS	AMP	
AGRU-1	AUTOMATIC	304 STAINLESS STEEL	25	56.4	2"	2"	10.5"	10.5"	115	1173	10.2	SEE NOTES
AGRU-2	AUTOMATIC	304 STAINLESS STEEL	25	56.4	2"	2"	10.5"	10.5"	115	1173	10.2	SEE NOTES

NOTES:

PROVIDE THE FOLLOWING FACTORY OPTIONS:

1. CF-VENT-1 CARBON VENT FILTER
2. DSA-25-1 DRY STRAINER
3. HAG-2 HORIZONTAL AIR GAP ASSEMBLY WITH 2" CONNECTION (COMES WITH 3 FLOW RESTRICTORS FOR SINK DRAINS)

DRAIN SCHEDULE

MARK	FIXTURE, MODEL NUMBER AND DESCRIPTION	ROUGH-IN		
		TRAP	WASTE	VENT
FD-1	FLOOR DRAIN (MECHANICAL ROOM). WATTS FD-320-Y, HEAVY DUTY CAST IRON BODY, BOTTOM OUTLET. 9" DIAMETER CAST IRON TOP, TRAP PRIMER CONNECTION, SEEPAGE PAN AND COMBINATION MEMBRANE FLASHING CLAMP	AS NOTED ON DRWGS.	AS NOTED ON DRWGS.	AS NOTED ON DRWGS.
FD-2	FLOOR DRAIN (TOILET ROOM). WATTS FD-1100-A5, HEAVY DUTY CAST IRON BODY, BOTTOM OUTLET. 6"X6" SQUARE NCKEL BRONZE TOP, TRAP PRIMER CONNECTION, SEEPAGE PAN AND COMBINATION MEMBRANE FLASHING CLAMP	AS NOTED ON DRWGS.	AS NOTED ON DRWGS.	AS NOTED ON DRWGS.
RD-1	STANDARD PRIMARY ROOF DRAIN. WATTS DRAINAGE RD-300 EPOXY COATED CAST IRON ROOF DRAIN WITH FLASHING CLAMP WITH INTEGRAL GRAVEL STOP, SELF-LOCKING POLYETHYLENE DOME (STANDARD), AND NO HUB (STANDARD) OUTLET ROOF SUMP RECEIVER, UNDER DECK CLAMP, AND COMBINATION MEMBRANE FLASHING CLAMP/GRAVEL GUARD. 137 SQ IN FREE AREA.	AS NOTED ON DRWGS.	AS NOTED ON DRWGS.	AS NOTED ON DRWGS.
RD-2	OVER FLOW ROOF DRAIN. WATTS DRAINAGE RD-100-R WITH 2" EXTERNAL WATER DAM. EPOXY COATED CAST IRON ROOF DRAIN WITH FLASHING CLAMP WITH INTEGRAL GRAVEL STOP, SELF-LOCKING POLYETHYLENE DOME (STANDARD), AND NO HUB (STANDARD) OUTLET. COMBINATION MEMBRANE FLASHING CLAMP/GRAVEL GUARD. REFER TO DRAWINGS. 137 SQ IN FREE AREA.	AS NOTED ON DRWGS.	AS NOTED ON DRWGS.	AS NOTED ON DRWGS.
OST	OVERFLOW FITTING: COW TONGUE, WATTS DRAINAGE RD-940 ROUND CAST NICKEL BRONZE DOWNSPOUT COVER WITH ANCHOR FLANGE. COORDINATE SIZING WITH OVERFLOW DRAINAGE. REFER TO DRAWINGS.	NA	AS NOTED ON DRWGS.	NA

NOTES:
1. PROVIDE TRAP PRIMERS FOR ALL DRAINS. DRAINS INCORPORATING A CONSTANT AND REGULAR WASTE ARE NOT REQUIRED TO INTERGRATE TRAP PRIMERS (I.E. SHOWER DRAINS, KITCHEN DRAINS, ETC).

2.TRANSITION COUPLINGS AND NO-HUB PIPE SHALL NOT BE INSTALLED BELOW SLAB OR IN ANY BURIED CONDITIONS IN CONTACT WITH EARTH

GAS WATER HEATER SCHEDULE

MARK	MAKE & MODEL	TYPE	STORAGE	RECOVERY @ TEMP. RISE	MIXING VALVE	GAS		REMARKS
						PRESSURE	INPUT (MBH)	
WH-1	INTELLIHOT iQ251 GEN II	CONDENSING TANK LESS ON-DEMAND	N/A	4.8 GPM @ 100°F	TMV-1 / 2	3.5" - 14" WC	251	SEE NOTES
WH-2	INTELLIHOT iQ251 GEN II	CONDENSING TANK LESS ON-DEMAND	N/A	4.8 GPM @ 100°F	TMV-1 / 2	3.5" - 14" WC	251	SEE NOTES
WH-3	INTELLIHOT iQ251 GEN II	CONDENSING TANK LESS ON-DEMAND	N/A	4.8 GPM @ 100°F	TMV-1 / 2	3.5" - 14" WC	251	SEE NOTES
WH-4	INTELLIHOT iQ251 GEN II	CONDENSING TANK LESS ON-DEMAND	N/A	4.8 GPM @ 100°F	TMV-1 / 2	3.5" - 14" WC	251	SEE NOTES

NOTES:

1. PROVIDE WITH CONDENSATE NEUTRALIZATION KIT, MANUFACTURED BY AXIOM INDUSTRIES LTD. MODEL NC-2, 2 LITER TRANSPARENT CAPSULE WITH MEDIA. MOUNT TO WALL AND PROVIDE REQUIRED CLEARANCE FOR MEDIA REPLACEMENT.
3. PROVIDE EACH WATER HEATER WITH A SEPARATE CONDENSATE NEUTRALIZATION KIT.
4. PROVIDE THERMAL EXPANSION TANK (EXP-1) MANUFACTURED BY AMTROL, MODEL ST-5C-DD, 2 GALLON, 150 PSIG WORKING PRESSURE. FACTORY PRECHARGED TO 55 PSIG.
5. PROVIDE CPVC, POLYPROPYLENE, OR AL29-4C STAINLESS STEEL VENTING. PVC IS NOT PERMITTED REGARDLESS OF MANUFACTURER'S APPROVAL
6. INSTALL WATER HEATER IN ACCORDANCE WITH BUILDING CODE - PLUMBING & MECHANICAL (WITH LATEST AMENDMENTS) CODES,ENERGY CODE, AND APPLICABLE STANDARDS AND MANUFACTURERS RECOMMENDATIONS.
7. PROVIDE BRASS DRAIN VALVE, & ALL REQUIRED OPTIONS TO COMPLETE THE INSTALLATION.

THERMOSTATIC MIXING VALVE SCHEDULE

MARK	EQUIPMENT BEING SERVED (I.E. WATER HEATER, ETC...)	AREA SERVED	FLOW RATE @ 10PSI DIFFERENTIAL	MINIMUM FLOW RATE GPM	INLET TEMP.	OUTLET TEMP.	INLET SIZE	OUTLET SIZE	MANUFACTURER	REMARKS
									MODEL	
TMV-1	WH-1 WH-2	140°F LOOP KITCHEN	20 GPM	0.5 GPM (NOTE 3)	145°F	140°F	1"	1"	EXISTING TO REMAIN	ASSE 1017
TMV-2	WH-1 WH-2	120°F LOOP KITCHEN	20 GPM	0.5 GPM (NOTE 3)	145°F	120°F	1"	1"	EXISTING TO REMAIN	ASSE 1017
TMV-3	LAVS	BUILDING	1 GPM	0.25 GPM	120°F	100°F	1/2"	1/2"	POWERS LFG480	ASSE 1070

NOTES:
1. MAXIMUM PRESSURE DIFFERENTIAL SHALL BE 10PSI FOR MIXING VALVE
2. PROVIDE WITH DIAL THERMOMETER, ADJUSTABLE SET POINT, INTEGRAL STRAINER CHECKSTOPS ON INLETS, PROVIDE SHUTOFFS/UNIONS AT ALL CONNECTIONS
3. MINIMUM LOW RATE WHEN VALVE IS INSTALLED AT OR NEAR HOT WATER SOURCE WITH RECIRCULATED TEMPERED WATER AND CONTINUOUSLY OPERATING CIRCULATION PUMP.

PUMP SCHEDULE

MARK	LOCATION	SERVICE	PUMP TYPE	FLUID	GPM	HEAD	ELECTRICAL				MANUFACTURER	REMARKS
							WATTS / AMPS	VOLTAGE	PHASE	RPM	MODEL	
RP-1	BOILER ROOM	140°F HWC LOOP (KITCHEN)	VARIABLE SPEED WET ROTOR CIRCULATOR	140°F HOT WATER RECIRC	10	15	44 / .54	120 V	1	1590 - 4830	TACO 0018e	ECM MOTOR
RP-2	BOILER ROOM	120°F HWC LOOP (BLDG)	VARIABLE SPEED WET ROTOR CIRCULATOR	140°F HOT WATER RECIRC	10	15	44 / .54	120 V	1	1590 - 4830	TACO 0018e	ECM MOTOR

PLUMBING FIXTURE / EQUIPMENT SCHEDULE

MARK	FIXTURE, MODEL NUMBER AND DESCRIPTION	ROUGH-IN			
		WASTE/ SANITARY	VENT	CW	HW
	PLUMBING CONTRACTOR TO COORDINATE FIXTURE HEIGHT, TYPE, ETC. WITH ARCHITECTURAL TOILET PLANS.				
W-1 W-1A	WATER CLOSET, WALL HUNG, STANDARD HEIGHT (W-1) AND ADA HEIGHT W-1A (WHEN PROPERLY MOUNTED, REFER TO ARCHITECTURAL DRAWINGS). AMERICAN STANDARD AFWALL MILLENIUM, MODEL NO 2257.101, VITREOUS CHINA, TOP SPUD, ELONGATED BOWL WITH EVERCLEAN SURFACE. 1-1/2" TOP SPUD, SIPHON JET TOILET WITH WALL SUPPLY. MANUAL FLUSHOMETER: SLOAN 111-1.6-H-L, 1.6 GPF. AMERICAN STANDARD HEAVY DUTY SEAT WITH EVERCLEAN MODEL 5905.110, OPEN FRONT SEAT. PROVIDE ALL ITEMS REQUIRED FOR COMPLETE INSTALLATION.	4"	2"	1"	--
W-2A	WATER CLOSET, FLOOR MOUNTED, ADA HEIGHT, (REFER TO ARCHITECTURAL DRAWINGS). AMERICAN STANDARD ,MADERA FLOWISE 16-1/2" HEIGHT, MODEL NO 3461.001, VITREOUS CHINA, ELONGATED BOWL WITH EVERCLEAN SURFACE. 1-1/2" TOP SPUD, SIPHON JET TOILET WITH WALL SUPPLY. MANUAL FLUSHOMETER: SLOAN 111-1.6-H-L, 1.6 GPF. AMERICAN STANDARD HEAVY DUTY SEAT WITH EVERCLEAN MODEL 5905.110, OPEN FRONT SEAT. PROVIDE ALL ITEMS REQUIRED FOR COMPLETE INSTALLATION.	4"	2"	1"	--
U-1 U-1A	URINAL, WALL HUNG, U-1 STANDARD HEIGHT, U-1A ADA HEIGHT, (REFER TO ARCHITECTURAL DRAWINGS). AMERICAN STANDARD, WASHBROOK FLOWISE MODEL NO 6590.001, WITH MANUAL 0.125 (1/8TH) GPF FLUSHOMETER. VITREOUS CHINA 3/4"INLET SPUD WALL SUPPLY WASHOUT URINAL WITH FULLY ENCLOSED P-TRAP. MANUAL FLUSHOMETER: SLOAN ROYAL 186-0.125-CO. PROVIDE ALL ITEMS REQUIRED FOR COMPLETE INSTALLATION.	2"	2"	3/4"	--
L-1A	LAVATORY: WALL-HUNG LAVATORY, MANUFACTURED BY AMERICAN STANDARD, LUCERNE, MODEL 0355.012, 4" CENTERS (21-1/4" X 18-1/4"), VITREOUS CHINA. FAUCET: DELTA 88T1153, MANUAL METERING WITH VANDAL RESISTANT HOT AND COLD ADA LEVER HANDLES, 0.5 GPM. PROVIDE ASSE 1070 MIXING VALVE "TMV-3", SEE THERMOSTATIC MIXING VALVE SCHEDULE. PROVIDE 1-1/2" CHROME PLATED CAST BRASS P-TRAP , SUPPLIES, BRASS ANGLE STOPS WITH LOOSE KEY OPERATION, GRID DRAIN, ETC. FOR COMPLETE INSTALLATION. PROVIDE TRUEBRO IPS CORP. LAV SHIELD, ADA COMPLIANT RIGID ENCLOSURE. COORDINATE MOUNTING HEIGHTS WITH ARCHITECT PRIOR TO INSTALLATION. NOTE: PROVIDE ONE HOSE BIB (HB) MOUNTED NEAR LAVATORY PER RESTROOM.	1-1/2"	1-1/2"	1/2"	1/2"
L-2A	LAVATORY SYSTEM, MANUFACTURED BY BRADLEY CORP., 1-2 USERS, GLX-2, CONSTRUCTED OF TERREON, A DENSIFIED SOLID SURFACE MATERIAL COMPOSED OF A BIO-BASED RESIN. SINGLE CENTER FAUCET HOLE LINEA STYLE FAUCET: 0.5 GPM, TOUCH FREE ACTIVATION, POLISHED CHROME, CAST BRASS SPOUT, 4" SET, VANDAL-RESISTANT MULTI-LAMINAR SPRAY. SOAP DISPENSER: LINEA STYLE, CHROME PLATED, MULTI-FEED TANK. PROVIDE WITH HARD-WIRED AC POWER SUPPLY BATTERY BACK-UP PK00.BBU ALLOWS AC POWERED FAUCETS TO CONTINUOUSLY OPERATE DURING A POWER FAILURE. PROVIDE ASSE 1070 MIXING VALVE "TMV-3", SEE THERMOSTATIC MIXING VALVE SCHEDULE. PROVIDE 1-1/2" CHROME PLATED CAST BRASS P-TRAP , SUPPLIES, BRASS ANGLE STOPS WITH LOOSE KEY OPERATION, GRID DRAIN, ETC. FOR COMPLETE INSTALLATION. COORDINATE MOUNTING HEIGHTS WITH ARCHITECT PRIOR TO INSTALLATION. COLOR AS SELECTED BY ARCHITECT. NOTE: PROVIDE ONE HOSE BIB (HB) MOUNTED NEAR LAVATORY PER RESTROOM.	1-1/2"	1-1/2"	1/2"	1/2"
L-3A	LAVATORY SYSTEM, MANUFACTURED BY BRADLEY CORP., 1-3 USERS, GLX-3, CONSTRUCTED OF TERREON, A DENSIFIED SOLID SURFACE MATERIAL COMPOSED OF A BIO-BASED RESIN. SINGLE CENTER FAUCET HOLE LINEA STYLE FAUCET: 0.5 GPM, TOUCH FREE ACTIVATION, POLISHED CHROME, CAST BRASS SPOUT, 4" SET, VANDAL-RESISTANT MULTI-LAMINAR SPRAY. SOAP DISPENSER: LINEA STYLE, CHROME PLATED, MULTI-FEED TANK. PROVIDE WITH HARD-WIRED AC POWER SUPPLY BATTERY BACK-UP PK00.BBU ALLOWS AC POWERED FAUCETS TO CONTINUOUSLY OPERATE DURING A POWER FAILURE. PROVIDE ASSE 1070 MIXING VALVE "TMV-3", SEE THERMOSTATIC MIXING VALVE SCHEDULE. PROVIDE 1-1/2" CHROME PLATED CAST BRASS P-TRAP , SUPPLIES, BRASS ANGLE STOPS WITH LOOSE KEY OPERATION, GRID DRAIN, ETC. FOR COMPLETE INSTALLATION. COORDINATE MOUNTING HEIGHTS WITH ARCHITECT PRIOR TO INSTALLATION. COLOR AS SELECTED BY ARCHITECT. NOTE: PROVIDE ONE HOSE BIB (HB) MOUNTED NEAR LAVATORY PER RESTROOM.	1-1/2"	1-1/2"	1/2"	1/2"
S-1A	SINGLE BOWL SINK: ADA COMPLIANT, ELKAY LRAD-252155, 25 X 21-1/4 X 5-1/2, 18 GAUGE TYPE 302 STAINLESS STEEL, SELF-RIMMING. MR2 HOLE DRILL CONFIGURATION. FAUCET: DELTA 711LF-HDF (LEAD FREE) 1.5 GPM, ADA SINGLE LEVER SWING SPOUT FAUCET LESS SPRAY. PROVIDE 1/2" CHROME PLATED CAST BRASS P-TRAP , SUPPLIES, BRASS ANGLE STOPS WITH LOOSE KEY OPERATION, GRID DRAIN, ETC. FOR COMPLETE INSTALLATION.	1-1/2"	1-1/2"	1/2"	1/2"
S-2	ONE STATION WALL MOUNTED SERVICE SINK WITH SQUARE CORNER, MANUFACTURED BY ADVANCE TABCO, MODEL 19-18-23EF. 23"x16"x19.5" OD. ALL 16 GAUGE TYPE 304 STAINLESS STEEL, 1-5/8" TUBULAR 304 STAINLESS STEEL WALL BRACKETS. STAINLESS STEEL GUSSETS. 8 1/2" HIGH BACKSPLASH, 8" SINK BOWL DEPTH, ONE STAINLESS STEEL 2" BRACKET, ONE K-6 3 1/2" REAR BASKET DRAIN. TWO TUBULAR STAINLESS STEEL SUPPORT BRACKETS THAT ALLOW FULL CLEARANCE UNDERNEATH. ELECTRONIC FAUCET, WALL MOUNT, MODEL K-175.	2"	1-1/2"	1/2"	1/2"
EWC-1	ELECTRIC WATER COOLER WITH BOTTLE FILLER, SINGLE STATION. MANUFACTURED BY ELKAY, MODEL LVRCWSK WALL MOUNT ADA COMPLIANT, FILTERED 8 GPH STAINLESS. CHILLING CAPACITY OF 8.0 GPH OF 50° F DRINKING WATER, BASED ON 80°F INLET WATER AND 90° F AMBIENT, PER ASHRAE 18 TESTING. FEATURES SHALL INCLUDE FILTERED AND BE HEAVY DUTY VANDAL RESISTANT. FURNISHED WITH VANDAL RESISTANT STREAMSAVER BUBBLER. MECHANICAL FRONT BUBBLER BUTTON ACTIVATION. PRODUCT SHALL BE WALL MOUNT, SINGLE STATION. UNIT SHALL BE CERTIFIED TO UL 399 AND CAN/CSA C22.2 NO. 120. UNIT SHALL BE LEAD-FREE DESIGN WHICH IS CERTIFIED TO NSF/ANSI 61 & 372 (LEAD FREE) AND MEETS FEDERAL AND STATE LOW-LEAD REQUIREMENTS. PROVIDE 98324C - ACCESSORY - CANE APRON (STAINLESS). PROVIDE WITH P-TRAP (NOT SUPPLIED WITH COOLER) AND PROVIDE WITH LOOSE KEY ANGLE STOP.	1-1/2"	1-1/2"	1/2"	--
EWC-2	ELECTRIC WATER COOLER, BI-LEVEL, WITH BOTTLE FILLER, MANUFACTURED BY ELKAY, MODEL LVRCTLBWSK, EZH2O VANDAL-RESISTANT BOTTLE FILLING STATION &, BI-LEVEL COOLER, FILTERED, REFRIGERATED, STAINLESS. CHILLING CAPACITY OF 8.0 GPH (GALLONS PER HOUR) OF 50° F DRINKING WATER, BASED ON 80° F INLET WATER AND 90° F AMBIENT, PER ASHRAE 18 TESTING. FEATURES SHALL INCLUDE VISUAL FILTER MONITOR, FILTERED, GREEN TICKER, LAMINAR FLOW, REAL DRAIN, VANDAL RESISTANT. FURNISHED WITH VANDAL RESISTANT BUBBLER. ELECTRONIC BOTTLE FILLER BUTTON WITH MECHANICAL FRONT BUBBLER BUTTON ACTIVATION. PRODUCT SHALL BE WALL MOUNT, SERVING 2 STATION. UNIT SHALL BE CERTIFIED TO UL 399 AND CAN/CSA C22.2 NO. 120. UNIT SHALL BE LEAD-FREE DESIGN WHICH IS CERTIFIED TO NSF/ANSI 61 & 372 (LEAD FREE) AND MEETS FEDERAL AND STATE LOW-LEAD REQUIREMENTS. PROVIDE 98324C - ACCESSORY - CANE APRON (STAINLESS). PROVIDE WITH P-TRAP (NOT SUPPLIED WITH COOLER) AND PROVIDE WITH LOOSE KEY ANGLE STOP.	1-1/2"	1-1/2"	1/2"	--
BF-1A	BOTTLE FILLER: ELKAY MODEL LZWSSM EZH2O BOTTLE FILLING STATION SURFACE MOUNT FILTERED NON-REFRIGERATED, STAINLESS. FEATURES SHALL INCLUDE ANTIMICROBIAL, FILTERED, GREEN TICKER, HANDS FREE, LAMINAR FLOW, REAL DRAIN, VISUAL FILTER MONITOR. ELECTRONIC BOTTLE FILLER SENSOR ACTIVATION. PRODUCT SHALL BE WALL MOUNT (ON WALL), FOR INDOOR APPLICATIONS, SERVING 1 STATION(S). UNIT SHALL BE CERTIFIED TO UL 399 AND CAN/CSA C22.2 NO. 120. 115V/60 HZ, NO BUBBLER.	1-1/2"	1-1/2"	1-1/2"	--
MSB	MOP SINK, FIAT MSB2424, MOLDED STONE, 24x24x12, SERVICE FAUCET PLATE #830-AA, HOSE AND HOSE BRACKET PLATE #832- AA, BUMPER GUARD PLATE #E-77-AA, SS MOP HANGER #889-CC, MOP SINK DRAIN GASKET #DDC3XH, WALL GUARDS #MSG24, WITH INTEGRAL DRAIN. PROVIDE TRAP, SUPPLIES, STOPS, ETC FOR COMPLETE INSTALLATION.	3"	2"	3/4"	3/4"
HB	HOSE BIBB, WOODFORD MODEL 24 (EXPOSED) / B24 (WITH RECESSED BOX), BRONZE BODY. REMOVABLE VALVE SEAT & STEM ASSEMBLY, THREADED END. INTEGRAL VACUUM BREAKER, LOOSE TEE KEY. PROVIDE WITH ANODIZED ALUMINUM BOX, RECESSED IN WALL. NOTE: PROVIDE ONE HOSE BIB MOUNTED NEAR LAVATORY PER RESTROOM.	--	--	1/2"	--
FPHB	FREEZE PROOF HOSE BIBB, WOODFORD MODEL MB67, CAST BRONZE NON-FREEZE WALL HYDRANT WITH STAINLESS STEEL HINGED LOCKING COVER, 3/4"HPT OUTLET, INTEGRAL DOUBLE CHECK BACKFLOW PREVENTER PRESSURE RELIEF VALVE, AND 3/4" FEMALE & 1" MALE NPT INNER CONNECTION	--	--	3/4"	--
SA	WATER HAMMER ARRESTOR, PRECISION PLUMBING PRODUCTS (PPP.) SC SERIES, 1/2"-1", SIZE PER MANUFACTURE RECOMMENDATIONS AND REQUIREMENTS	--	--	1/2"-1"	--
TP-1	TRAP PRIMER INSERT, PROSET, TG-23AN. ELASTOMERIC, NORMALLY CLOSED TRAP GUARD DEVICE UTILIZES A NORMALLY CLOSED SEAL TO PREVENT EVAPORATION OF THE TRAP SEAL AND ALSO PROTECT AGAINST SEWER GASES FROM BACKING UP INTO HABITABLE AREAS. IT OPENS WITH FLUID AND ALLOWS LIQUID DRAINAGE TO FLOW THROUGH INTO THE BUILDING DRAIN.	--	--	--	--

NOTES:
1. LAVATORY & WATER COOLERS SUPPLY SHALL BE BRASS W/ BRASS ANGLE STOPS FOR 1/2" WATER SUPPLY LINES, W/ LOOSE KEY (W/CAP), AND WALL FLANGE. ALL COMPONENTS SHALL BE POLISHED CHROME FINISH. MANUFACTURER: BRASS CRAFT OR APPROVED EQUAL.

2. CAST BODY "P" TRAP 1-1/2" x 1-1/2" WITH HEAVY CAST J-BEND & FLAT CLEANOUT PLUG, SLIP NUTS

ABBREVIATIONS

(NOT ALL SYMBOLS ARE USED)

(###)	CFM
ABV	ABOVE
AC	AIR COMPRESSOR
ACU-#	AIR CONDITIONING UNIT
AD	ACCESS DOOR
AF	AIRFOIL
AFC	ADJUSTABLE FREQUENCY CONTROLLER
AFF	ABOVE FINISHED FLOOR
AFMS	AIR FLOW MEASURING STATION
AHU-#	AIR HANDLING UNIT
AL	ACOUSTIC LINING
ALD	AUTOMATIC LOUVER DAMPER
APD	AIR PRESSURE DROP
AUTO	AUTOMATIC
B-#	BOILER
BC	BACKWARD CURVED
BD	BELT DRIVE
BMCS	BUILDING MANAGEMENT & CONTROL SYSTEM
IBT	INVERTED BUCKET TRAP
BTU	BRITISH THERMAL UNIT
C-#	CHILLER
CAP	CAPACITY
CB-#	CHILLED BEAM
CC-#	COOLING COIL
CD	CEILING DIFFUSER
CFM	CUBIC FEET PER MINUTE
CG	CEILING GRILLE
CLG	CEILING
CONV-#	HOT WATER CONVECTOR
CP	CONDENSATE RECEIVER/PUMPING SYSTEM
CR	CEILING REGISTER
CT-#	COOLING TOWER
CTD	CEILING TRANSFER DUCT
CUH-#	CABINET UNIT HEATER HOT WATER
CV	CONTROL VALVE
CW	COLD WATER
D&T	DRIP AND TRAP
dB	DECIBELS
DB	DRY BULB
DD	DIRECT DRIVE
DDC	DIRECT DIGITAL CONTROL
DIFF	DIFFUSER
DL	DOOR LOUVER
DN	DOWN
DOAS	DEDICATED OUTDOOR AIR SYSTEM
DP	DEWPOINT TEMPERATURE
DR	DROP
DTS	DUAL TEMPERATURE SUPPLY
DTR	DUAL TEMPERATURE RETURN
DX	DIRECT EXPANSION
EF-#	EXHAUST FAN
EAT	ENTERING AIR TEMPERATURE
EER	ENERGY EFFICIENCY RATIO
EG	EXHAUST GRILLE
EHC-#	ELECTRIC HEATING COIL
ENT	ENTERING
HEPA	HIGH EFFICIENCY PARTICULATE FILTER
ER	EXHAUST REGISTER
ES	END SUCTION
ESP	EXTERNAL STATIC PRESSURE
ET-#	EXPANSION TANK
EUH-#	ELECTRIC UNIT HEATER
EWT	ENTERING WATER TEMPERATURE
EXT	EXTERNAL
EX	EXISTING
EXH	EXHAUST
F°	DEGREES FAHRENHEIT
F&B	FACE & BYPASS DAMPER
FA	FACE AREA
FBO	FURNISHED BY OTHERS
	INSTALLED BY HVAC SUBCONTRACTOR
FC	FORWARD CURVE
FCU	FAN COIL UNIT
FD	FIRE DAMPER WITH ACCESS DOOR
FF	FINAL FILTER
FIBO	FURNISHED AND INSTALLED BY OTHERS
FIN FL	FINISH FLOOR
FL	FLOOR
FLA	FULL LOAD AMPERES
FLEX	FLEXIBLE
FPF	FINS PER FOOT
FPV	FAN POWERED VAV BOX
FT	FEET
F.T.	FLOAT & THERMOSTATIC TRAP
FTR	FIN TUBE RADIATION
FV	FACE VELOCITY
GC	GENERAL CONTRACTOR
GIH	GRAVITY INTAKE HOOD
GPH	GALLONS PER HOUR
GPM	GALLONS PER MINUTE
GWLS	GEOTHERMAL WATER LOOP SUPPLY
GWLR	GEOTHERMAL WATER LOOP RETURN
H/C	HEATING/COOLING
H-#	HUMIDIFIER
H-O-A	HAND-OFF-AUTOMATIC
HC-#	HEATING COIL
hd	FEET OF HEAD
HP	HORSEPOWER
HTG	HEATING
HTR	HEATER
HV-#	HEATING AND VENTILATING UNIT
HVAC	HEATING, VENTILATING & AIR CONDITIONING
HX-#	HEAT EXCHANGER CONVERTOR
ID	INSIDE DIMENSION
IN	INCHES
IV	INLET GUIDE VANES
IL	INLINE
KW	KILOWATT
KWH	KILOWATT HOUR
LAT	LEAVING AIR TEMPERATURE
LD	LINEAR DIFFUSER
LIN	LINEAR
LRA	LOCKED ROTOR AMPERES
LPR	LOW PRESSURE RETURN
LPS	LOW PRESSURE SUPPLY
LVG	LEAVING
LWT	LEAVING WATER TEMPERATURE
MAN	MANUAL
MAT	MIXED AIR TEMPERATURE
MAX	MAXIMUM
MBH	1000 BTU'S
MCA	MINIMUM CIRCUIT AMPACITY
MD	MOTORIZED DAMPER
MER	MECHANICAL EQUIPMENT ROOM
MEZZ	MEZZANINE
MFS	MAXIMUM FUSE SIZE
MIN	MINIMUM
MOT	MOTOR
MUA	MAKE-UP AIR
MV	MOTORIZED VALVE
NC	NORMALLY CLOSED
NC	NOISE CRITERIA
NFA	NET FREE AREA
NIC	NOT IN THIS CONTRACT
NO	NORMALLY OPEN
NTS	NOT TO SCALE
OA	OUTSIDE AIR
OAT	OUTDOOR AIR TEMPERATURE
OAI	OUTDOOR AIR INTAKE
OBD	OPPOSED BLADE DAMPER
OD	OUTSIDE DIMENSION
O.E. T.D.	OPEN END TRANSFER DUCT
P-#	PUMP
PB	PUSH BUTTON
PBD	PARALLEL BLADE DAMPER
PD	PRESSURE DROP
PF	PREFILTER
PH	PHASE
PHC	PREHEAT COIL
PPH	POUND PER HOUR
PRV	PRESSURE REDUCING VALVE
PSI	POUND PER SQUARE INCH
RA	RETURN AIR
RAF-#	RETURN AIR FAN
RAT	RETURN AIR TEMPERATURE
REG	REGISTER
RH	RELATIVE HUMIDITY
RHC	REHEAT COIL
RM	ROOM
RP	RADIANT PANEL
RPM	REVOLUTIONS PER MINUTE
RS	RISE
RTU-#	ROOFTOP AIR CONDITIONING UNIT
SA	SUPPLY AIR
SAF-#	SUPPLY AIR FAN
SAT	SUPPLY AIR TEMPERATURE
SB	SECURITY BARS
VSC	VERTICAL SPLIT CASE
HSC	HORIZONTAL SPLIT CASE
SD	SMOKE DAMPER
SG	SUPPLY GRILLE
SP	STATIC PRESSURE
SQ FT	SQUARE FOOT (AREA)
ST	SINGLE POLE SWITCH WITHERMAL OVERLOAD
SWR	SIDE WALL REGISTER
T'STAT	THERMOSTAT
TD	TEMPERATURE DIFFERENCE
TEMP	TEMPERATURE
TG	AIR TRANSFER GRILLE
TOT	TOTAL
TN-HR	TON HOUR REFRIGERATION
TRD	TRANSFER DUCT
TT	THERMOSTATIC TRAP
TYP	TYPICAL
UC	UNDERCUT DOOR
UH-#	UNIT HEATER HOT WATER
UV-#	UNIT VENTILATOR
VAV-#	VARIABLE AIR VOLUME
VD	VOLUME DAMPER
VE	VOLUME EXTRACTOR
VFD	VARIABLE FREQUENCY DRIVE
VI	VIBRATION ISOLATOR
VSF	VARIABLE SPEED FAN SWITCH
W/	WITH
WB	WET BULB
WFM	WATER FLOW MEASURING STATION
WMS	WIRE MESH SCREEN
WPD	WATER PRESSURE DROP
WT	WEIGHT (LBS)
ZD	ZONE DAMPER

SYMBOL LEGEND

(NOT ALL SYMBOLS ARE USED)

	PRESSURE/TEMPERATURE PORT	OR	PIPE UNION		MECHANICAL NOTE REFERENCE, NUMBER INDICATES NOTE
T	TEMPERATURE GAUGE/ TEMPERATURE INDICATOR	AV	AIR VENT, AUTOMATIC	C F	CUBIC FEET PER MINUTE
	PRESSURE GAUGE		AIR VENT, MANUAL		DUCT STATIC PRESSURE
	BUTTERFLY VALVE	OR	PUMP OR FAN	VD	VOLUME DAMPER
	SHUT-OFF VALVE		STRAINER	BD	BACKDRAFT DAMPER
	ANGLE GATE VALVE		STRAINER, BLOW OFF		DEMOLITION
	GLOBE VALVE		1" DOOR UNDERCUT	MD	MOTORIZED DAMPER
	BALL OR BUTTERFLY VALVE		RETURN GRILLE		SUPPLY OR OUTSIDE AIR DUCT UP OR CSD
	ANGLE GLOBE VALVE	T	THERMOSTAT OR SPACE TEMPERATURE SENSOR		SUPPLY OR OUTSIDE AIR DUCT DOWN
M	TWO WAY MOTORIZED CONTROL VALVE	P	PRESSURE SENSOR		RETURN OR EXHAUST DUCT UP OR CRG/CRR
M	THREE WAY MOTORIZED CONTROL VALVE		DIRECTION OF FLOW		RETURN OR EXHAUST DUCT DOWN
	CHECK VALVE		METER	FC	FLEXIBLE CONNECTION
	OS & Y	DIA. OR Ø	DIAMETER		DUCT TRANSITION
	SAFETY RELIEF VALVE (PRESS. & TEMP.)	OR	THERMOMETER		RECTANGULAR TO ROUND TRANSITION
	DRAIN VALVE W/ HOSE COUPLING W/CAP		PIPE TEE, OUTLET UP		DUCT WORK, DIRECTION OF FLOW
	CAP		PIPE ELBOW, TURNED UP		POSITIVE PRESSURE DUCT
	PIPE CONNECTION BOTTOM		PIPE TEE, OUTLET DOWN		NEGATIVE PRESSURE DUCT
	PIPE CONNECTION TOP	HWS	HOT WATER SUPPLY	R	CHANGE OF ELEVATION, RISE (R) DROP (D)
	PIPE COUPLING (JOINT)	HWR	HOT WATER RETURN		LINED DUCT WORK
	ELBOW, 90°	CWS	CONDENSER WATER SUPPLY		SINGLE LINE LINED DUCT WORK
	PIPE ELBOW, TURNED DOWN	CWR	CONDENSER WATER RETURN		DIRECTION OF SUPPLY OR OUTSIDE AIR
	PIPE TEE		POINT OF CONNECTION		DIRECTION OF RETURN OR EXHAUST AIR
X / XXX	AIR OUTLET TYPE / CFM		RETURN OR EXHAUST DUCT UP		AIR TERMINAL UNIT
H	HUMIDISTAT/HUMIDITY SENSOR		SUPPLY OR OUTSIDE AIR DUCT UP	S	DUCT SMOKE DETECTOR
H	DUCT MOUNTED HUMIDITY SENSOR	SD	SMOKE DAMPER	FD	FIRE DAMPER WITH ACCESS DOOR AS REQUIRED
CO2	DUCT MOUNTED CARBON DIOXIDE SENSOR	FSD	COMBINATION FIRE AND SMOKE DAMPER		DUCT ACCESS DOOR
HWS	HOT WATER SUPPLY	45 CHWS	45°F CHILLED WATER SYSTEM SUPPLY	57 CHWS	57°F CHILLED WATER SYSTEM SUPPLY
HWR	HOT WATER RETURN	45 CHWR	45°F CHILLED WATER SYSTEM RETURN	57 CHWR	57°F CHILLED WATER SYSTEM RETURN
	PIPE ANCHOR		PIPE GUIDE		FLEXIBLE DUCT WORK

GENERAL

1. THE INTENT OF THESE CONTRACT DOCUMENTS IS FOR THE CONTRACTOR TO FURNISH AND INSTALL COMPLETE MECHANICAL SYSTEMS. THESE MECHANICAL SYSTEMS INCLUDE HVAC AND ALL ASSOCIATED SPECIAL SYSTEMS. ALL SYSTEMS SHALL BE COMPLETE IN ALL RESPECTS, OPERATING, TESTED, ADJUSTED, APPROVED BY THE AUTHORITIES HAVING JURISDICTION AND READY FOR BENEFICIAL USE BY THE OWNER.
2. THE CONTRACTOR SHALL OBTAIN AND REVIEW ALL CONTRACT DOCUMENTS, INCLUDING PROJECT MANUAL, PLANS AND SPECIFICATIONS OF ALL TRADES BEFORE SUBMITTING BID. REFER TO SPECIFICATIONS, PROJECT MANUAL AND PLANS, INCLUDING ALL EQUIPMENT SCHEDULES FOR MECHANICAL AND ELECTRICAL INFORMATION. CONTRACTOR SHALL WALK THROUGH BUILDING PRIOR TO SUBMITTING BID.
3. ALL OF THE CONTRACT DRAWINGS AND SPECIFICATIONS ARE COMPLEMENTARY TO FORM A TOTAL DESIGN PACKAGE. IT IS THE RESPONSIBILITY OF THE GENERAL CONTRACTOR/CONSTRUCTION MANAGER TO DETERMINE WHICH TRADE CONTRACTOR IS RESPONSIBLE FOR VARIOUS PORTIONS OF THE WORK.
4. ALL WORK AND ACTION DEPICTED AND DESCRIBED SHALL BE PERFORMED BY THE CONTRACTOR UNLESS SPECIFICALLY NOTED OTHERWISE.
5. PROVIDE SUPPORT/BRACING OF EQUIPMENT AND BUILDING SERVICES FOR SEISMIC RESTRAINT AS REQUIRED BY CODE..
6. OBTAIN AND PAY FOR ALL REQUIRED PERMITS AND INSPECTIONS.
7. ALL EQUIPMENT, MATERIALS AND RELATED SYSTEMS COMPONENTS SHALL BE NEW UNLESS SPECIFICALLY NOTED OTHERWISE.
8. REPAIR AND/OR REPLACE AT NO COST TO OWNER ALL EQUIPMENT, BUILDING ELEMENTS, TREES SHRUBS, ETC AND MATERIALS DAMAGED DURING CONSTRUCTION.
9. THE DRAWINGS ARE DIAGRAMMATIC AND INDICATE THE GENERAL ARRANGEMENT OF SYSTEMS AND WORK INCLUDED IN THE CONTRACT. THE CONTRACTOR SHALL COORDINATE LOCATIONS OF EQUIPMENT WITH ALL TRADES BEFORE STARTING CONSTRUCTION. ANY MODIFICATIONS TO THE EQUIPMENT LAYOUT REQUIRED FOR INSTALLATION ARE TO BE PERFORMED AT NO ADDITIONAL COST TO THE OWNER.
10. REFER TO THE ARCHITECTURAL DRAWINGS FOR THE EXACT LOCATION OF LIGHT FIXTURES AND MOUNTING HEIGHTS OF EQUIPMENT, INCLUSIVE OF RECEPTACLES, SWITCHES, THERMOSTATS, ETC. ALL SUCH EQUIPMENT AND COLORS SHALL BE COORDINATED WITH THE ARCHITECT. CONTACT ARCHITECT FOR CLARIFICATION OF MOUNTING REQUIREMENTS. IF INFORMATION IS NOT CONTAINED IN THE DRAWINGS.
11. ALL WORK SHALL BE PERFORMED IN COMPLIANCE WITH THE APPLICABLE CODES IN THE ORDINANCES AND THE REGULATORY AGENCIES HAVING JURISDICTION.
12. ALL EQUIPMENT SHALL BE LOCATED IN ACCESSIBLE LOCATIONS. WHEN A PIECE OF EQUIPMENT MUST BE LOCATED ABOVE AN INACCESSIBLE CEILING OR WALL THEN THE APPROPRIATE ACCESS DOOR SHALL BE PROVIDED. THESE SHALL BE COORDINATED WITH THE ARCHITECT.
13. WHEN CONFLICTS OCCUR BETWEEN THE DRAWINGS AND/OR SPECIFICATIONS IT SHALL BE BROUGHT TO THE ATTENTION OF THE ENGINEER. THE CONTRACTOR SHALL CARRY AS PART OF THE BID THE LARGER QUANTITY AND/OR MORE EXPENSIVE ITEM(S).
14. CONTRACTORS SHALL COORDINATE THEIR WORK WITH ALL OWNER-FURNISHED EQUIPMENT, INCLUDING REQUIRED SERVICE CONNECTIONS, RECEPTACLES, ETC. BEFORE INSTALLATION.
15. CONTRACTORS SHALL PROVIDE ALL REQUIRED SLEEVES AND SEALS FOR PIPES OR CONDUIT PENETRATING WALLS OR FLOOR SLABS WITH FIRESTOPPING SEALANT WHERE REQUIRED.
16. PROVIDE VIBRATION ISOLATORS FOR ALL PIPING SUPPORTS CONNECTED TO AND WITHIN 50 FEET OF ISOLATED EQUIPMENT THROUGHOUT MECHANICAL EQUIPMENT ROOMS.
17. LOCATE ALL TEMPERATURE, PRESSURE AND FLOW MEASURING DEVICES IN ACCESSIBLE LOCATIONS WITH STRAIGHT SECTION OF PIPE OR DUCT UP/DOWN STREAM AS RECOMMENDED BY THE MANUFACTURER FOR GOOD ACCURACY.
18. PROVIDE ACCESS PANELS FOR INSTALLATION IN WALLS AND CEILINGS, WHERE REQUIRED, TO SERVICE DAMPERS, VALVES, SMOKE DETECTORS AND OTHER CONCEALED MECHANICAL EQUIPMENT.
19. ALL EQUIPMENT, PIPING, AND DUCTWORK SHALL BE SUPPORTED AS DETAILED, SPECIFIED AND REQUIRED TO PROVIDE A VIBRATION FREE INSTALLATION.
20. INSTALL COMPLETE OPERATING SYSTEMS. PROVIDE ALL COMPONENTS, DEVICES, CONTROLS, RELAYS, TRANSFORMERS, ETC., WHETHER INDICATED OR NOT, FOR COMPLETE SYSTEMS AS INTENDED BY THE CONSTRUCTION DOCUMENTS.
21. ALL NEW EQUIPMENT SPECIFIED IN THE SCHEDULES SHALL BE CONNECTED TO THE EXISTING BUILDING AUTOMATION SYSTEM.
22. CONTRACTOR SHALL PROVIDE ALL CUTTING OF OPENINGS AND FIRESTOPPING AS REQUIRED THROUGH ALL WALLS AND FLOORS AS REQUIRED.
23. BOTH SUPPLY AND RETURN DUCTWORK SHALL BE INSULATED.

RENOVATION

1. THIS PROJECT IS A RENOVATION OF AN EXISTING FACILITY. IT IS THE INTENT OF THE DEMOLITION DRAWING TO LEAVE ALL MATERIALS OUTSIDE THE LIMITS OF THIS CONTRACT IN EXISTING OPERATING CONDITION.
2. BEFORE SUBMITTING HIS BID THE CONTRACTOR SHALL VISIT THE SITE AND BECOME THOROUGHLY FAMILIAR WITH THE EXISTING CONDITIONS UNDER WHICH THE PROJECT IS TO BE COMPLETED.
3. THE CONTRACTOR SHALL BE HELD RESPONSIBLE FOR ANY ASSUMPTIONS, OMISSIONS OR ERRORS HE MAKES AS A RESULT ON HIS FAILURE TO BECOME FULLY FAMILIAR WITH THE EXISTING CONDITIONS.
4. IT IS NOT THE INTENT OF THESE DRAWINGS TO SHOW EVERY PIECE OF EQUIPMENT, PIPING OR CONDUIT TO BE REMOVED. EQUIPMENT NOT BEING USED SHALL BE REMOVED INCLUDING ALL ASSOCIATED HANGARS, SUPPORTS, PIPES, DUCTS, CONDUITS, WIRES AND CONTROLS BACK TO THE POINT OF ORIGIN.
5. NO EQUIPMENT, PIPING OR CONDUIT SHALL BE ABANDONED IN PLACE UNLESS SPECIFICALLY NOTED.
6. PROPERLY DISPOSE OF ALL DEMOLISHED EQUIPMENT AND MATERIALS IN COMPLIANCE WITH CODES AND REGULATIONS.
7. RELOCATE EXISTING EQUIPMENT, PIPING, WIRING AND RELATED SYSTEMS TO REMAIN AS REQUIRED FOR CONSTRUCTION. EXTEND FEEDER/CONDUIT AND PROVIDE RECONNECTIONS FOR SYSTEM TO BE FULLY OPERATIONAL. ALL RELOCATED EQUIPMENT SHALL BE PROTECTED DURING CONSTRUCTION.
8. PROVIDE TEMPORARY CONNECTIONS AND SYSTEM MODIFICATIONS AS REQUIRED FOR CONSTRUCTION.
9. ALL EXISTING EQUIPMENT, DIFFUSERS, FIXTURES AND DEVICES ASSOCIATED WITH MECHANICAL AND/OR ELECTRICAL ON WALLS AND CEILINGS TO BE DEMOLISHED SHALL BE REMOVED UNLESS OTHERWISE SPECIFIED. FIELD VERIFIED FOR EXACT LOCATIONS AND QUANTITY OF ITEMS BEING REMOVED. COORDINATE WITH ARCHITECTURAL PLANS FOR SCOPE AREA OF DEMOLITION AND CONSTRUCTION.
10. GENERAL CONTRACTOR IS RESPONSIBLE OF PATCHING, REPAIRING, CAPPING, ETC. PER DEMOLITION AND CONSTRUCTION.
11. REBALANCE EXISTING AIR AND WATER SYSTEMS ASSOCIATED WITH RENOVATIONS, INCLUDING ALL RENOVATED AREAS AND ALL AREAS AFFECTED BY SYSTEM MODIFICATIONS.
12. REPLACE ALL INSULATION REMOVED AS PART OF MECHANICAL INSTALLATION OR MODIFICATION OF DUCTWORK, REGISTERS, GRILLES, DIFFUSERS, VALVES, COILS, FITTINGS AND PIPING.
13. CONTRACTOR SHALL TEMPORARY REMOVE ALL CEILING RADIANT PANELS TO ALLOW NEW CEILING INSTALLATION AND THEN RE-INSTALL CEILING RADIATION PANELS AS REQUIRED. CONTRACTOR SHALL REMOVE AND RECONNECT EXISTING PIPING, SUPPORTS, ETC AS REQUIRED.

PIPING NOTES

1. PIPING LAYOUTS AS INDICATED ON THE DRAWINGS ARE DIAGRAMMATIC; PROVIDE ADDITIONAL TRANSITIONS AND OFFSETS AS REQUIRED FOR COORDINATION WITH BUILDING CONSTRUCTION AND THE WORK OF OTHER TRADES.
2. UNLESS OTHERWISE NOTED, ALL PIPING IS OVERHEAD, TIGHT TO UNDERSIDE OF STRUCTURE OR SLAB, WITH SPACE FOR INSULATION IF REQUIRED.
3. INSTALL PIPING SO THAT ALL VALVES, STRAINERS, UNIONS, TRAPS, FLANGES AND OTHER APPURTENANCES REQUIRING ACCESS ARE ACCESSIBLE.
4. UNIONS AND/OR FLANGES SHALL BE INSTALLED AT EACH PIECE OF EQUIPMENT, IN BYPASSES AND IN LONG PIPING RUNS (100 FEET OR MORE) TO PERMIT DISASSEMBLY FOR ALTERATION AND REPAIRS.
5. ALL PIPING WORK SHALL BE COORDINATED WITH ALL TRADES INVOLVED. OFFSETS IN PIPING AROUND OBSTRUCTIONS SHALL BE PROVIDED AT NO ADDITIONAL COST TO THE OWNER.
6. PROVIDE FLEXIBLE CONNECTIONS IN ALL PIPING SYSTEMS CONNECTED TO PUMPS AND OTHER EQUIPMENT WHICH REQUIRE VIBRATION ISOLATION. FLEXIBLE CONNECTIONS SHALL BE PROVIDED AS CLOSE TO THE EQUIPMENT AS POSSIBLE.
7. SEISMICALLY RESTRAIN ALL PIPING AS REQUIRED PER CODE. CONTRACTOR SHALL OBTAIN SERVICES OF REGISTERED PROFESSIONAL ENGINEER TO PROVIDE ANALYSIS AND CALCULATIONS IN DETERMINING PIPING TO BE RESTRAINED.
8. CONTRACTOR SHALL ENGAGE SERVICES OF PROFESSIONAL ENGINEER WITH EXPERTISE IN SEISMIC, VIBRATION AND ISOLATION CONTROLS. ENGINEER SHALL DETERMINE ALL LOCATIONS, TYPES AND REQUIREMENTS OF SEISMIC CONTROLS, PIPING EXPANSION AND VIBRATION CONTROLS.
9. INSULATE ALL PIPING INCLUDED BUT NOT LIMITED TO HOT WATER SUPPLY AND RETURN, PER ENERGY CODE.
10. CONTRACTOR SHALL PROVIDE ALL CORE DRILLING AND FIRESTOPPING AS REQUIRED THROUGH ALL WALLS AND FLOORS AS REQUIRED.

PHASING NOTES

1. WORK SHALL BE PHASED TO ALLOW OWNER TO CONTINUE BUSINESS OPERATIONS DURING THE CONSTRUCTION PERIOD. COORDINATE WORK WITH OWNER AND GENERAL CONTRACTOR TO ALLOW SUFFICIENT TIME TO RELOCATE OPERATIONS WITHIN THE BUILDING PRIOR TO COMMENCING WORK IN AREAS AFFECTED BY DEMOLITION OR NEW CONSTRUCTION.
2. WORK REQUIRING INTERRUPTION OF ESSENTIAL BUILDING SERVICES SHALL BE PERFORMED DURING UNOCCUPIED PERIODS (AFTER BUSINESS HOURS). ESSENTIAL SERVICES SHALL INCLUDE BUT NOT BE LIMITED TO VENTILATION, WATER AND SEWER SERVICE, POWER, TELECOMMUNICATIONS. HEATING AND AIR CONDITIONING SHALL BE CONSIDERED TO BE ESSENTIAL WHEN CONDITIONS WILL CAUSE TEMPERATURES IN THE BUILDING TO FALL BELOW 68°F OR EXCEED 78°F.

Project Title:

ADDITION & ALTERATIONS TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
311 STATE STREET NEW LONDON CT 06320
203 230 9007 silverpetrucelli.com

Revision:	Description:	Date:	Revised By:

Drawing Title:

GENERAL MECHANICAL NOTES, LEGENDS AND ABBREVIATIONS

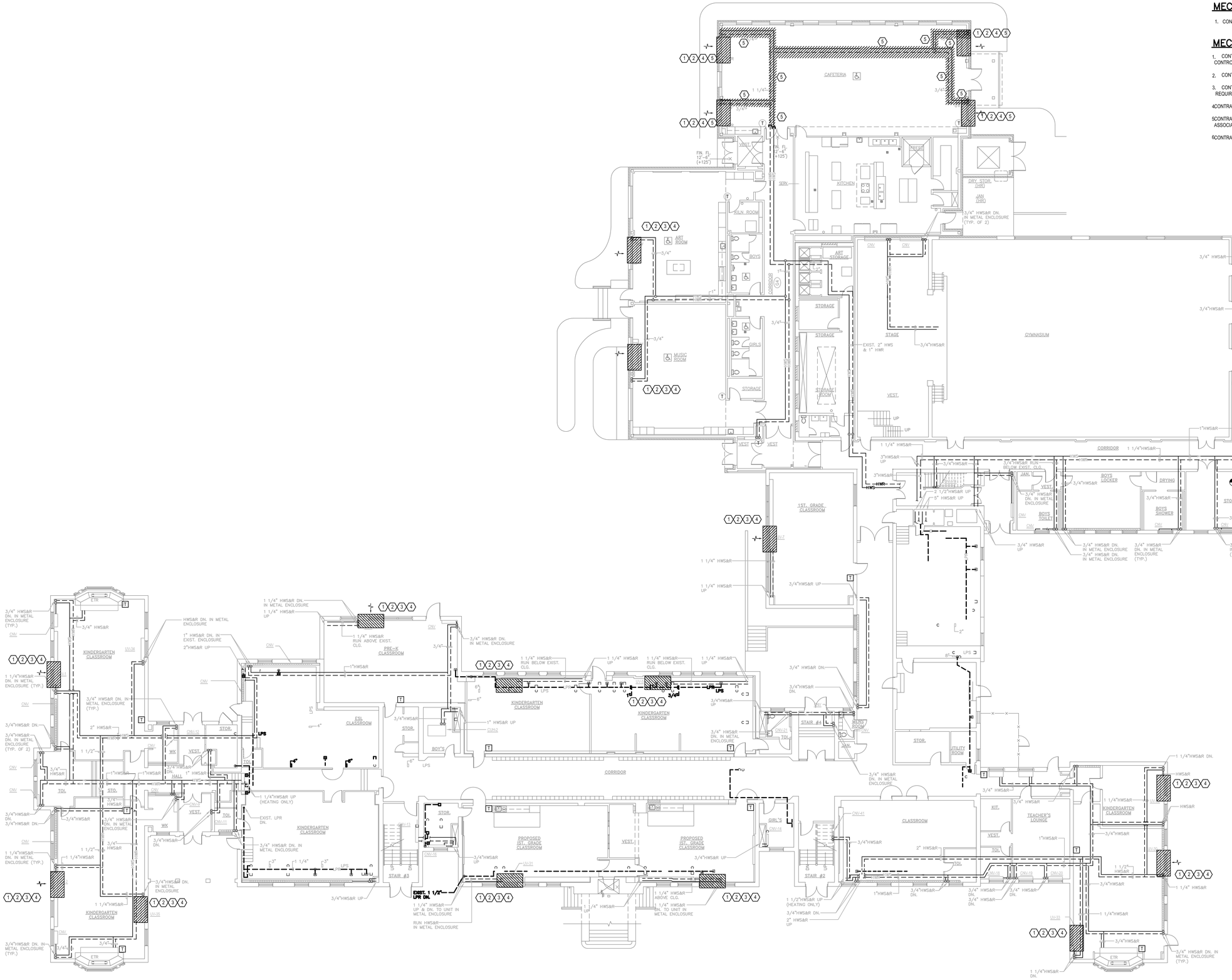
Date: 08/29/2024
Scale: AS NOTED
Drawn By: MZ
Project Number: 22.382
Drawing Number: M001

MECHANICAL GENERAL NOTES:

1. CONTRACTOR SHALL REMOVE ALL WALL MOUNTED CONTROLS AS REQUIRED

MECHANICAL DEMOLITION NOTES: (D)

1. CONTRACTOR SHALL REMOVE UNIT VENTILATORS AND ASSOCIATED VALVES AND CONTROLS.
2. CONTRACTOR SHALL REMOVE EXISTING PIPE INSULATION.
3. CONTRACTOR SHALL MAKE READY FOR NEW PIPING AND VALVES AS REQUIRED, CLEAN OUTSIDE AIR PATH.
4. CONTRACTOR SHALL REMOVE ANY FRAMING AND SUPPORTS.
5. CONTRACTOR SHALL REMOVE PIPING, HANGERS, FITTINGS AND ASSOCIATED INSULATION.
6. CONTRACTOR SHALL REMOVE EXISTING CONVECTOR.



Project Title:

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Revision:	Description:	Date:	Revised By:

Drawing Title:

MECHANICAL DEMOLITION PLAN - 1st FLOOR

Date: 08/29/2024
Scale: AS NOTED
Drawn By: MZ
Project Number: 22.382

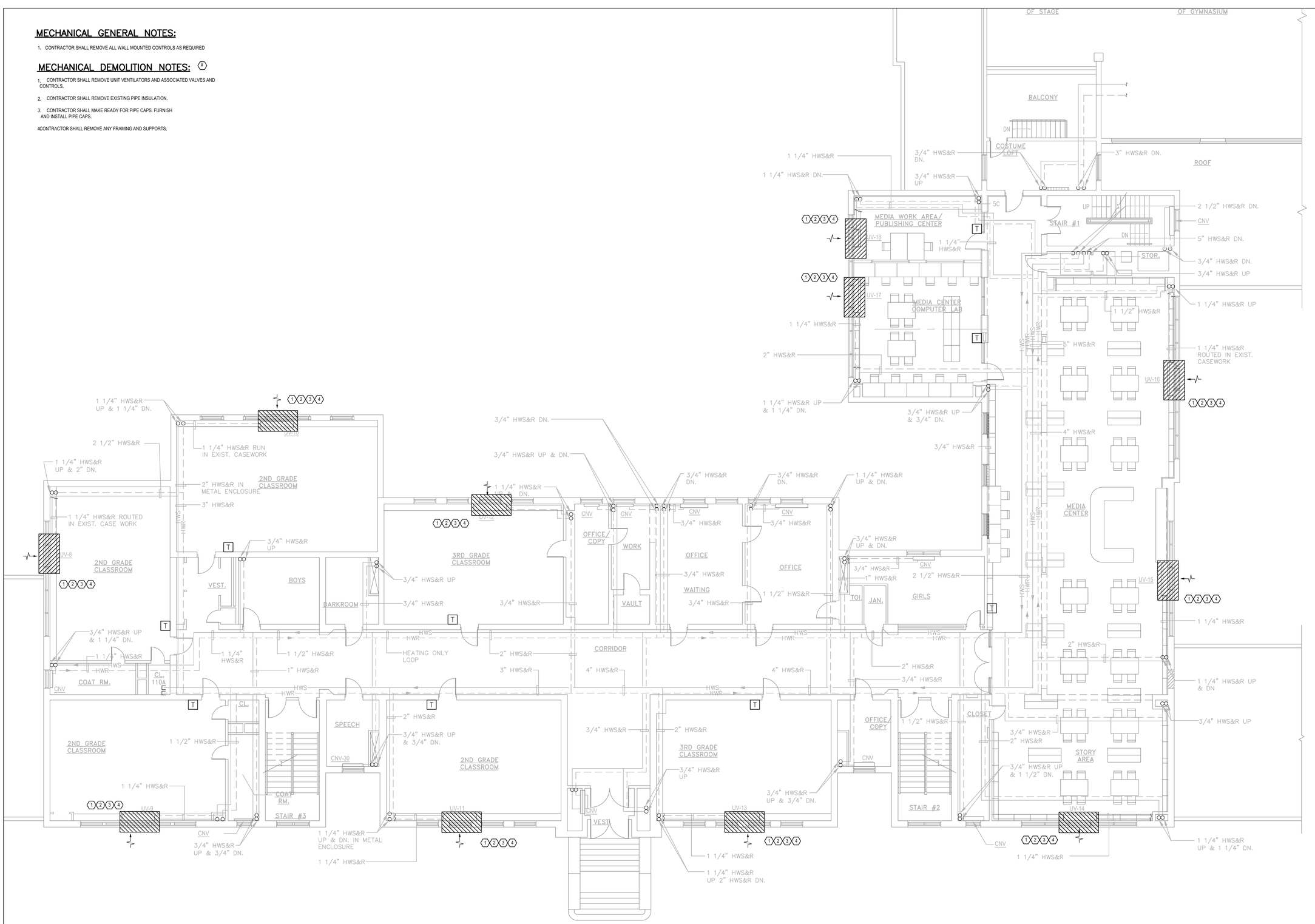
Drawing Number: M010

MECHANICAL GENERAL NOTES:

1. CONTRACTOR SHALL REMOVE ALL WALL MOUNTED CONTROLS AS REQUIRED

MECHANICAL DEMOLITION NOTES: (#)

1. CONTRACTOR SHALL REMOVE UNIT VENTILATORS AND ASSOCIATED VALVES AND CONTROLS.
2. CONTRACTOR SHALL REMOVE EXISTING PIPE INSULATION.
3. CONTRACTOR SHALL MAKE READY FOR PIPE CAPS. FURNISH AND INSTALL PIPE CAPS.
4. CONTRACTOR SHALL REMOVE ANY FRAMING AND SUPPORTS.



Project Title:

ADDITION & ALTERATIONS TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
311 STATE STREET NEW LONDON CT 06320
203 230 9007 silverpetrucelli.com

Revision:	Description:	Date:	Revised By:

Drawing Title:

MECHANICAL DEMOLITION PLAN - 2nd FLOOR

Date: 08/29/2024
Scale: AS NOTED
Drawn By: MZ
Project Number: 22.382

Drawing Number: M020

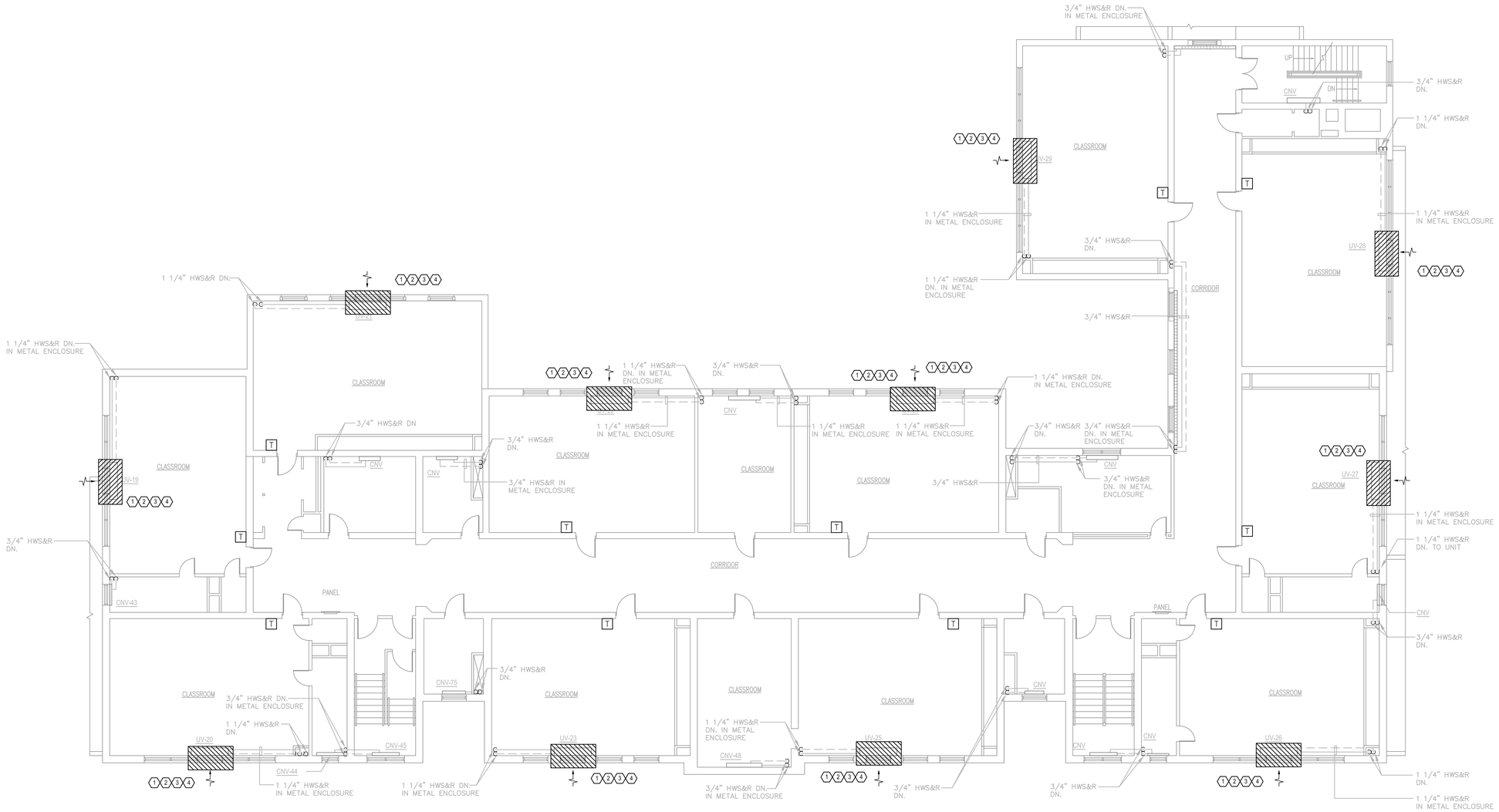
MECHANICAL GENERAL NOTES:

1. CONTRACTOR SHALL REMOVE ALL WALL MOUNTED CONTROLS AS REQUIRED

MECHANICAL DEMOLITION NOTES: (T)

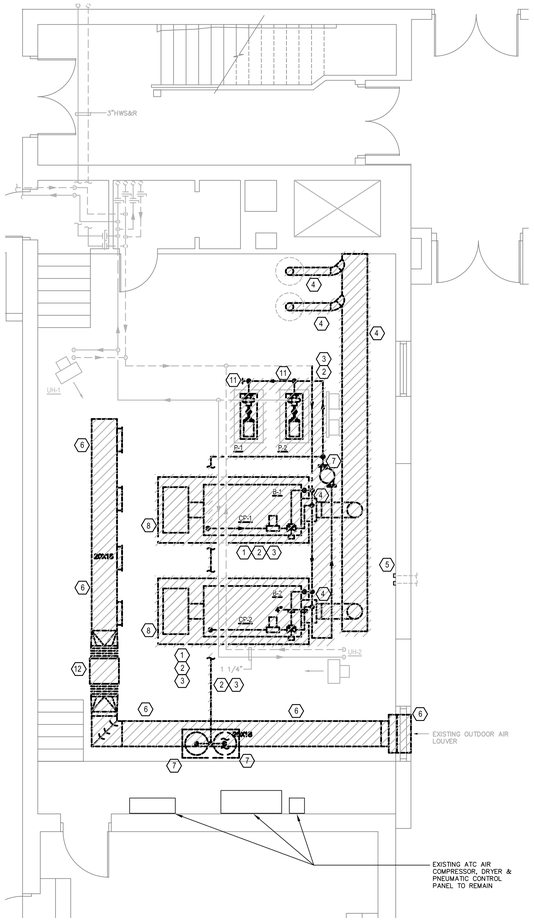
1. CONTRACTOR SHALL REMOVE UNIT VENTILATORS AND ASSOCIATED VALVES AND CONTROLS.
2. CONTRACTOR SHALL REMOVE EXISTING PIPE INSULATION.
3. CONTRACTOR SHALL MAKE READY FOR PIPE CAPS. FURNISH AND INSTALL PIPE CAPS.

4CONTRACTOR SHALL REMOVE ANY FRAMING AND SUPPORTS.

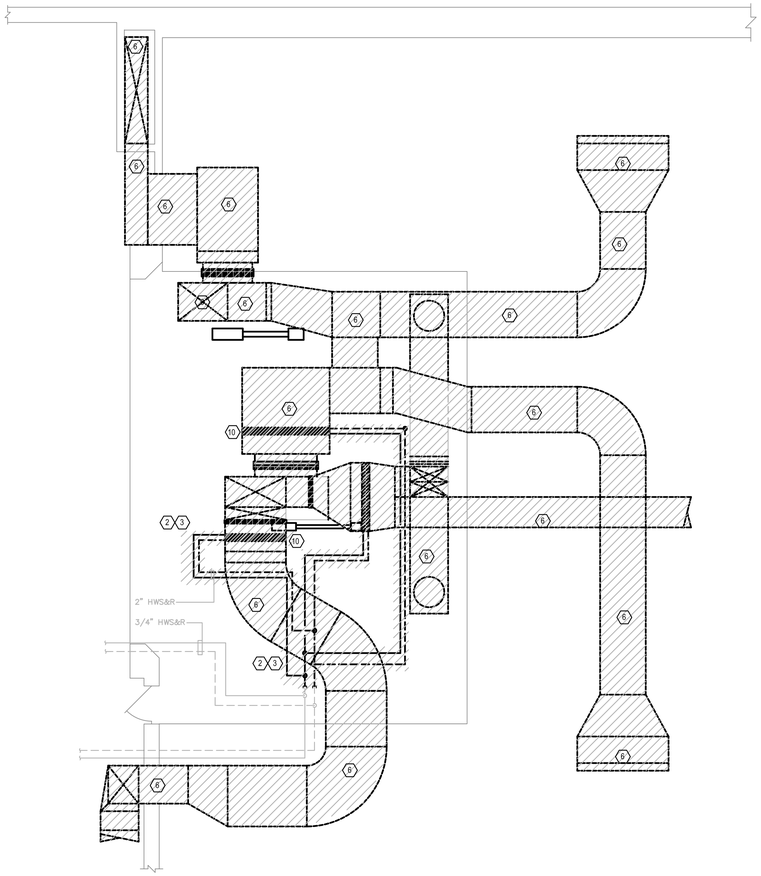

1 1/4" HWS&R DN.
IN METAL ENCLOSURE
1 1/4" HWS&R DN.
3/4" HWS&R DN.
3/4" HWS&R DN
1 1/4" HWS&R DN. IN METAL ENCLOSURE
3/4" HWS&R DN. IN METAL ENCLOSURE
3/4" HWS&R IN METAL ENCLOSURE
1 1/4" HWS&R IN METAL ENCLOSURE
3/4" HWS&R
UP
DN
CNV
CLASSROOM
CORRIDOR
PANEL
UV-19
UV-20
UV-23
UV-25
UV-26
UV-27
UV-28
UV-29
CNV-43
CNV-44
CNV-45
CNV-48
CNV-75
1 1/4" HWS&R DN. TO UNIT
1 1/4" HWS&R DN.
1 1/4" HWS&R IN METAL ENCLOSURE
3/4" HWS&R DN.
3/4" HWS&R DN. IN METAL ENCLOSURE
1 1/4" HWS&R DN. IN METAL ENCLOSURE
1 1/4" HWS&R DN. IN METAL ENCLOSURE
1 1

MECHANICAL DEMOLITION NOTES: (#)

1. CONTRACTOR SHALL REMOVE THE TWO (2) EXISTING BOILERS AND ASSOCIATED PUMPS AND EXISTING HOUSE KEEPING PADS.
2. CONTRACTOR SHALL REMOVE EXISTING PIPING, SUPPORTS, FRAMING AS INDICATED ON DRAWING.
3. CONTRACTOR SHALL REMOVE EXISTING PIPE INSULATION.
4. CONTRACTOR SHALL REMOVE ALL BREECHING, SUPPORTS, HANGERS AS REQUIRED INCLUDING THE BREECHING INSIDE THE CHIMNEY.
5. EXISTING PIPING TO REMAIN SHALL BE VALVED AND CAPPED AT WALL PENETRATION.
6. CONTRACTOR SHALL REMOVE OUTSIDE AIR LOUVER, DUCTWORK, INSULATION, HANGERS SUPPORTS, ETC.
7. REMOVE EXISTING AIR SEPARATOR AND EXPANSION TANKS. REMOVE EXPANSION TANK BASE.
8. REMOVE BOILER MOUNTED BURNER.
9. CONTRACTOR SHALL REMOVE EXHAUST FAN, ASSOCIATED HANGERS, SUPPORTS, CONNECTIONS.
10. CONTRACTOR SHALL REMOVE WATER COIL, SUPPORTS, VALVES AND FITTINGS.
11. CONTRACTOR SHALL REMOVE PUMPS AND ASSOCIATED BASES.
12. CONTRACTOR SHALL REMOVE FAN, ASSOCIATED HANGERS AND SUPPORTS.



2 M040 BOILER ROOM PART PLAN
SCALE: NTS



1 M040 GYMNASIUM FAN ROOM PART PLAN
SCALE: NTS

Project Title:

ADDITION & ALTERATIONS TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

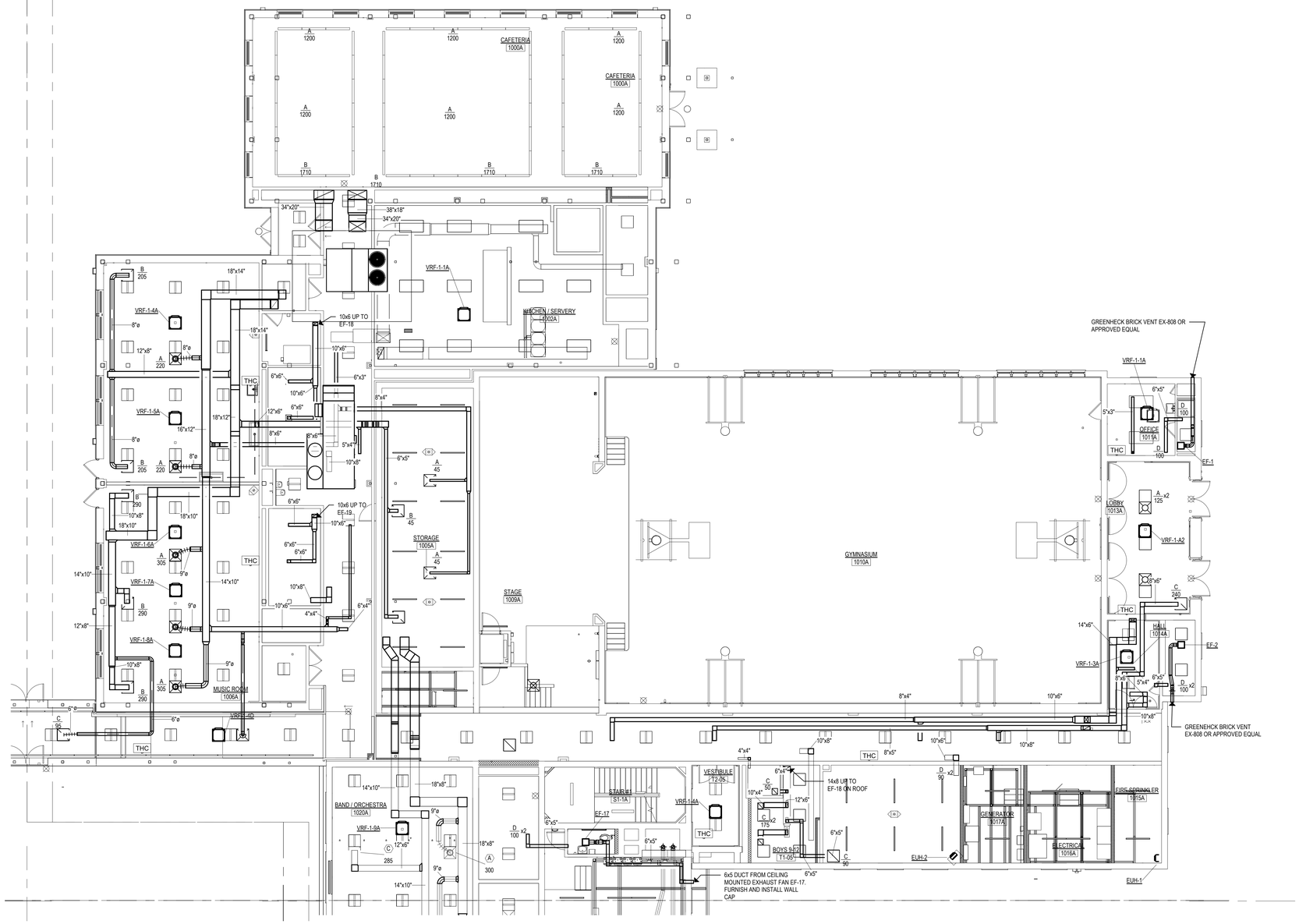
SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
311 STATE STREET NEW LONDON CT 06320
203 230 9007 silverpetrucelli.com

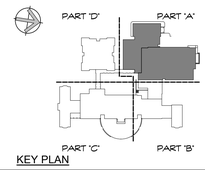
Revision:	Description:	Date:	Revised By:

Drawing Title:
MECHANICAL DEMOLITION PART PLANS

Date: 08/29/2024
Scale: AS NOTED
Drawn By: MZ
Project Number: 22.382

Drawing Number: M040





KEY PLAN

Project Title:

ADDITION & ALTERATIONS TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
311 STATE STREET NEW LONDON CT 06320
203 230 9007 silverpetrucelli.com

Revision:	Description:	Date:	Revised By:

Drawing Title:

FIRST FLOOR HVAC PLAN PART 'A'

Date: 08/29/2024
Scale: 1/8" = 1'-0"
Drawn By: MZ
Project Number: 22.382
Drawing Number: M101

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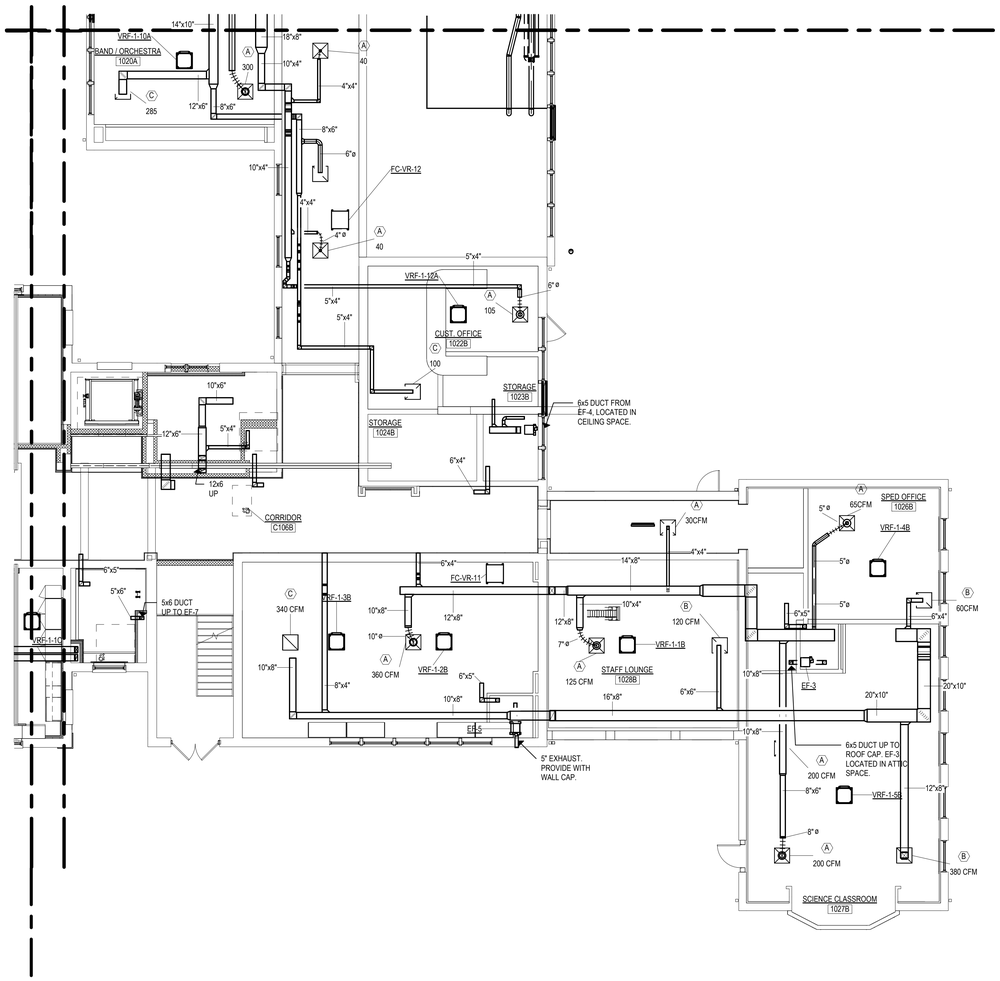

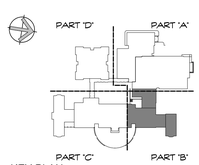

KEY PLAN

Project Title:

ADDITION & ALTERATIONS TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

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Revision:	Description:	Date:	Revised By:

Drawing Title:

FIRST FLOOR HVAC PLAN PART 'B'

Date: 08/29/2024
Scale: 1/8" = 1'-0"
Drawn By: MZ
Project Number: 22.382
Drawing Number: M102

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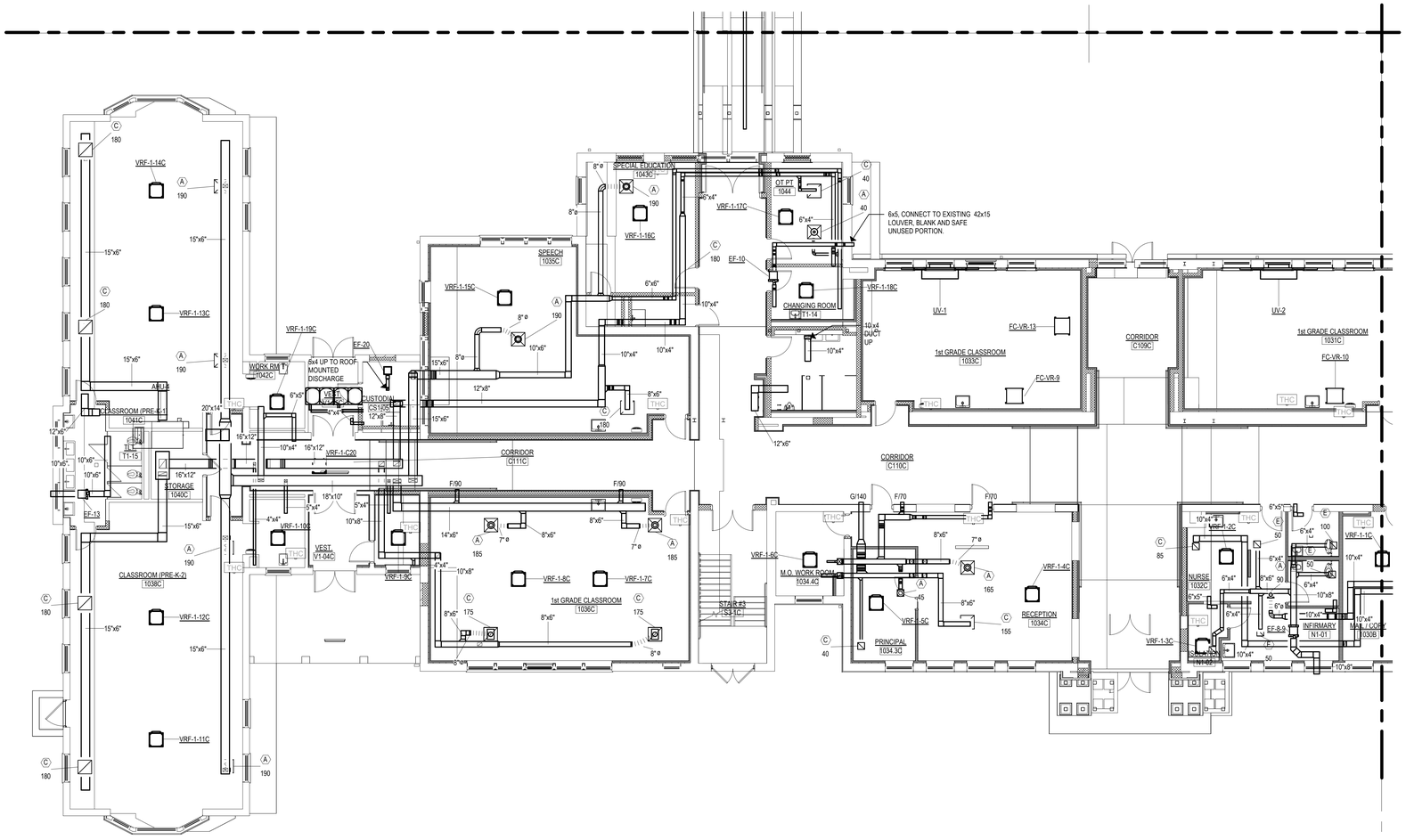

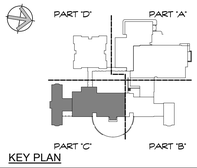

KEY PLAN

Project Title:

ADDITION & ALTERATIONS TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

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Revision:	Description:	Date:	Revised By:

Drawing Title:

FIRST FLOOR HVAC PLAN PART 'C'

Date: 08/29/2024
Scale: 1/8" = 1'-0"
Drawn By: MZ
Project Number: 22.382
Drawing Number: M103

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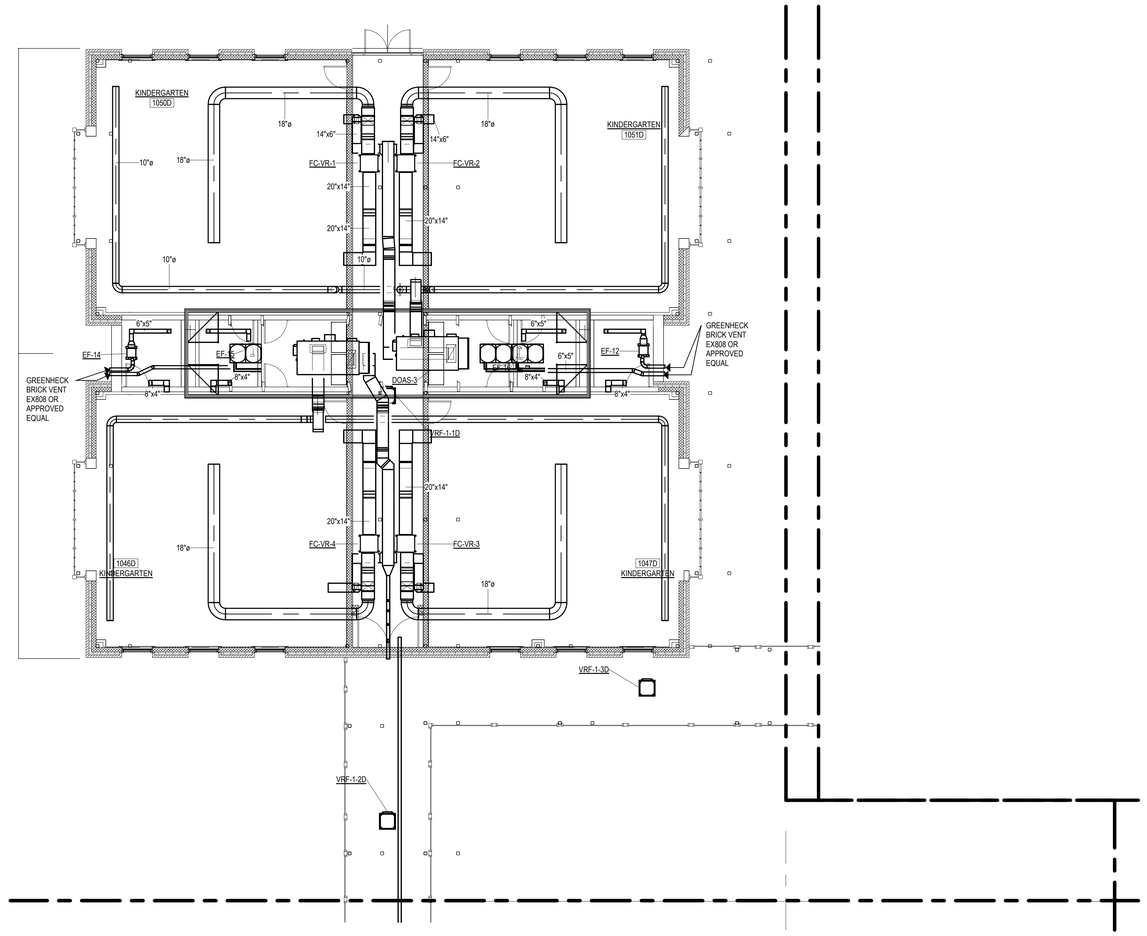

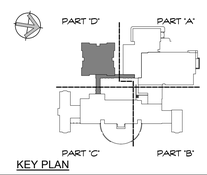

KEY PLAN

Project Title:

ADDITION & ALTERATIONS TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

SILVER PETRUCELLI + ASSOCIATES
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311 STATE STREET NEW LONDON CT 06320
203 230 9007 silverpetrucelli.com

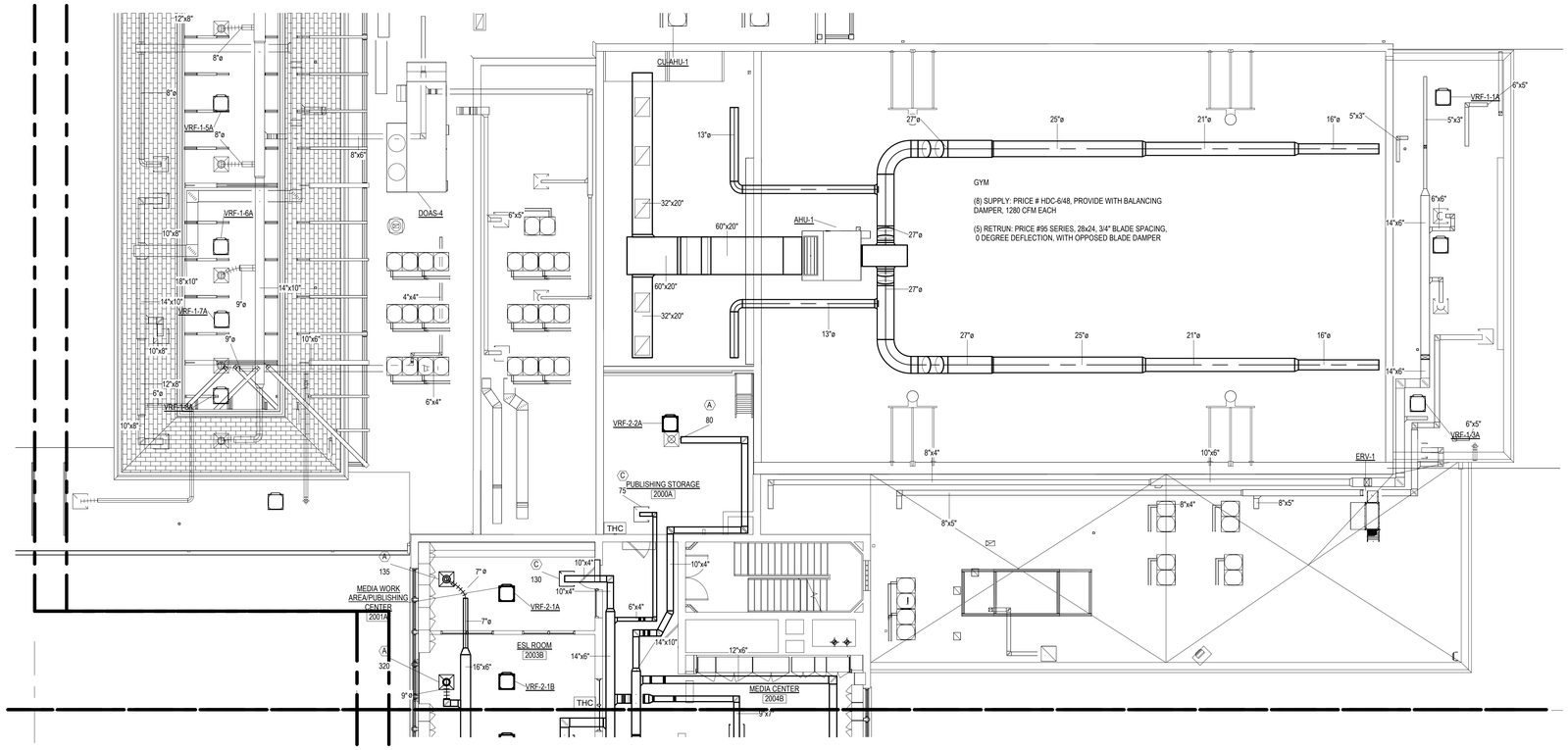
Revision:	Description:	Date:	Revised By:

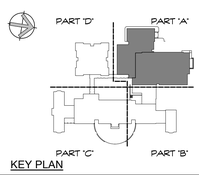
Drawing Title:
FIRST FLOOR HVAC PLAN PART 'D'

Date: 08/29/2024
Scale: 1/8" = 1'-0"
Drawn By: MZ
Project Number: 22.382

Drawing Number:
M104

8/29/2024 3:48:16 PM





KEY PLAN

Project Title:

ADDITION & ALTERATIONS TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

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Revision:	Description:	Date:	Revised By:

Drawing Title:
SECOND FLOOR HVAC PLAN PART 'A'

Date: 08/29/2024
Scale: 1/8" = 1'-0"
Drawn By: MZ
Project Number: 22.382

Drawing Number: M110

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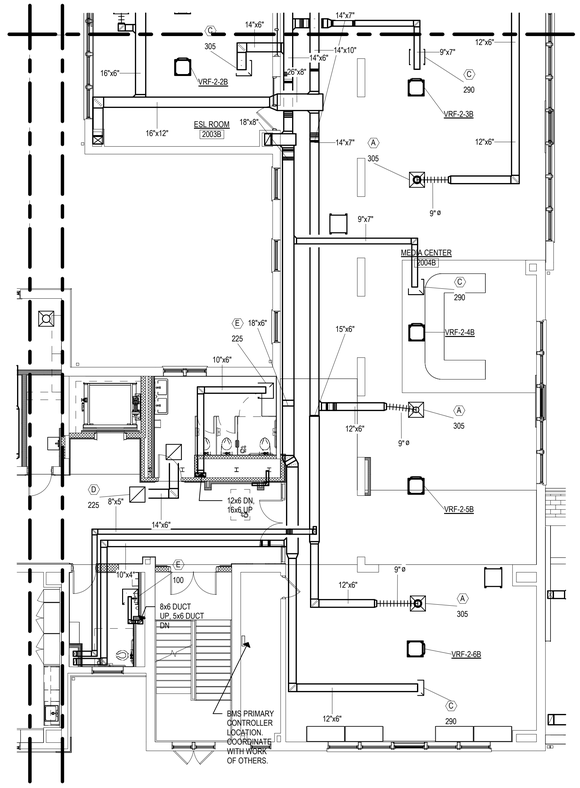

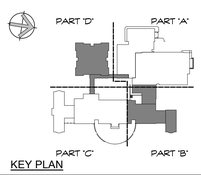

KEY PLAN

Project Title:

ADDITION & ALTERATIONS TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

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Revision:	Description:	Date:	Revised By:

Drawing Title:

SECOND FLOOR HVAC PLAN PART 'B'

Date: 08/29/2024
Scale: 1/8" = 1'-0"
Drawn By: MZ
Project Number: 22.382

Drawing Number: M120

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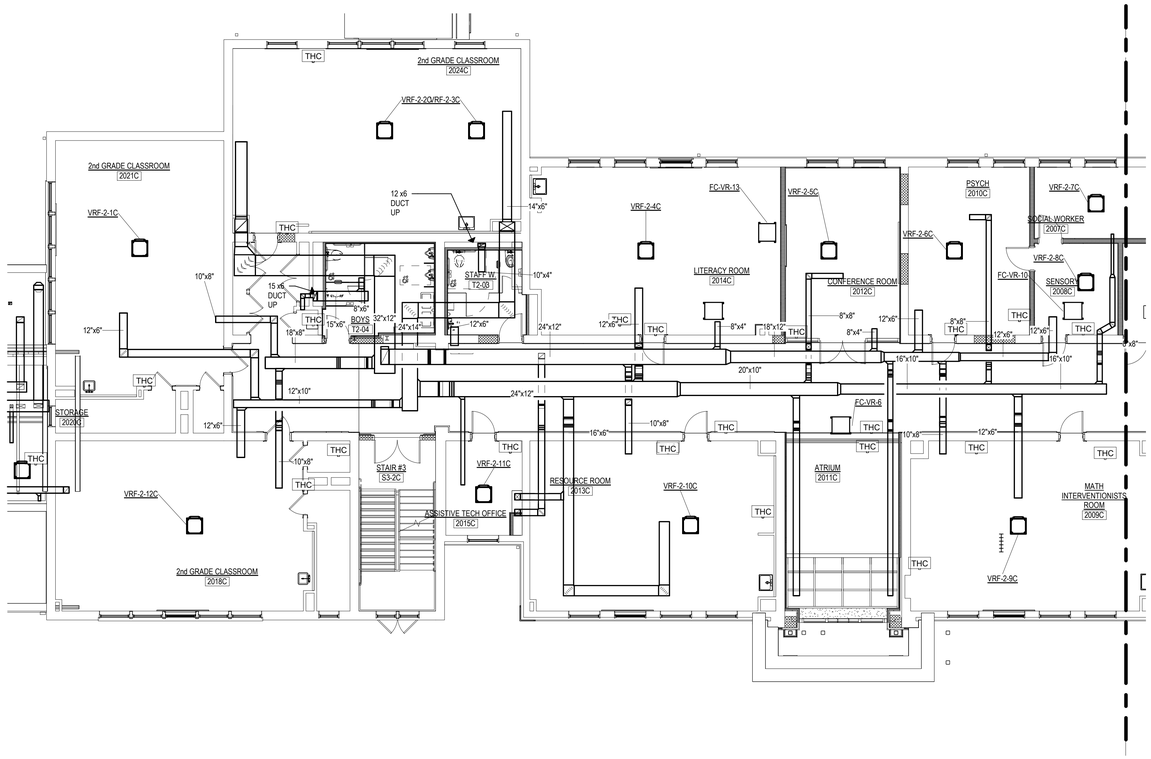

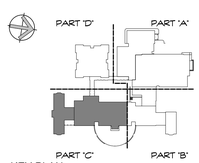

KEY PLAN

Project Title:

ADDITION & ALTERATIONS TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

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Revision:	Description:	Date:	Revised By:

Drawing Title:

SECOND FLOOR HVAC PLAN PART 'C'

Date: 08/29/2024
Scale: 1/8" = 1'-0"
Drawn By: Author
Project Number: 22.382

Drawing Number: M130

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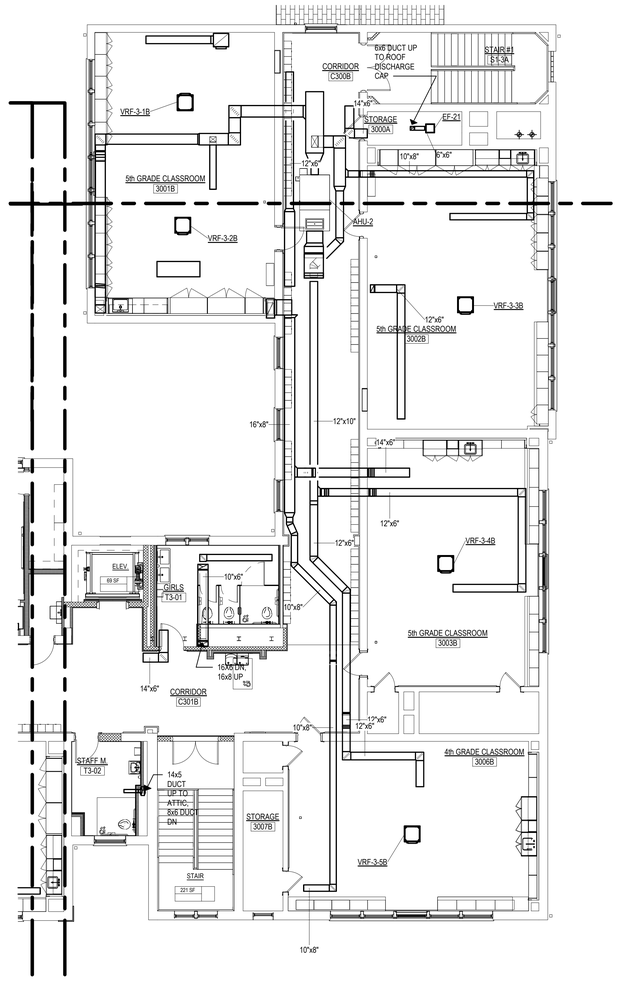

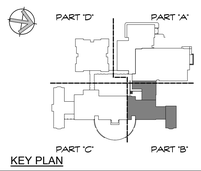

KEY PLAN

Project Title:

ADDITION & ALTERATIONS TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
311 STATE STREET NEW LONDON CT 06320
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Revision:	Description:	Date:	Revised By:

Drawing Title: THIRD FLOOR HVAC PLANT PART ' B'

Date: 08/29/2024
Scale: 1/8" = 1'-0"
Drawn By: Author
Project Number: 22.382
Drawing Number: M140

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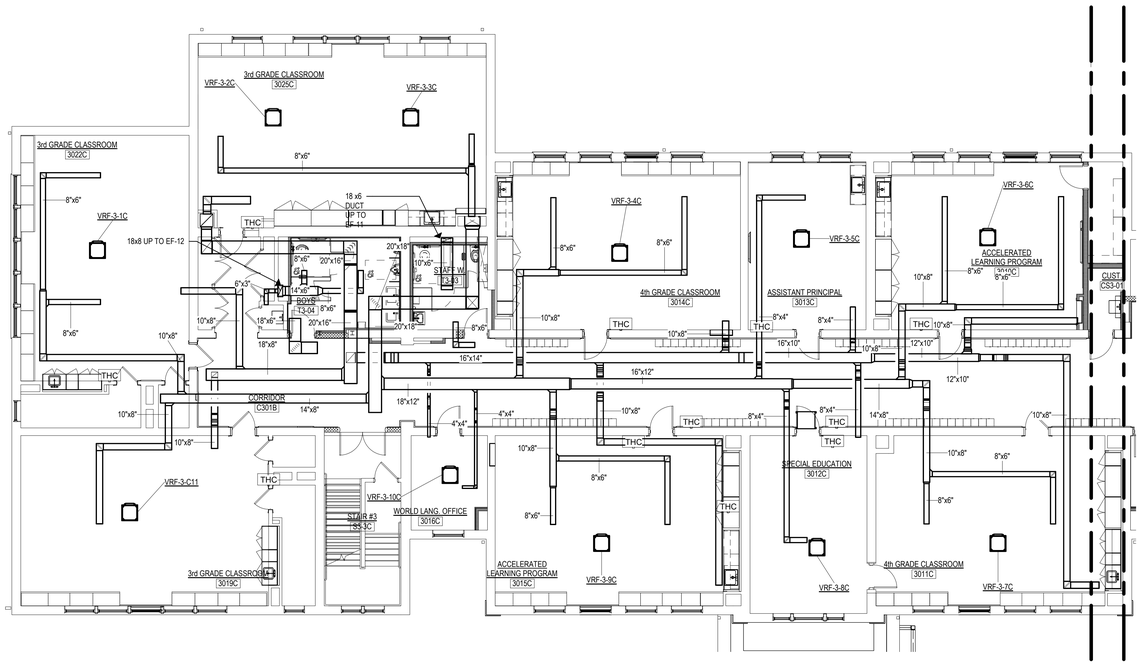

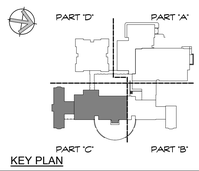

KEY PLAN

Project Title:

ADDITION & ALTERATIONS TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
311 STATE STREET NEW LONDON CT 06320
203 230 9007 silverpetrucelli.com

Revision: | Description: | Date: | Revised By:

Drawing Title: THIRD FLOOR HVAC PLAN PART 'C'

Date: 08/29/2024
Scale: 1/8" = 1'-0"
Drawn By: MZ
Project Number: 22.382

Drawing Number: M150

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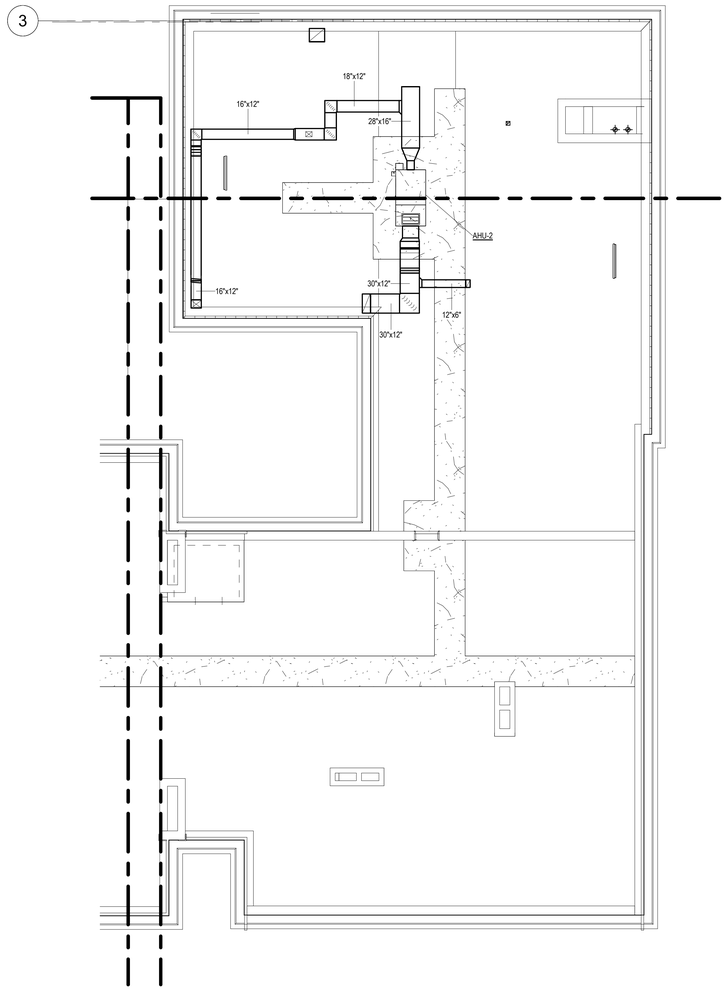
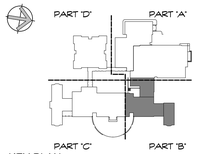




KEY PLAN

Project Title:

ADDITION & ALTERATIONS TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

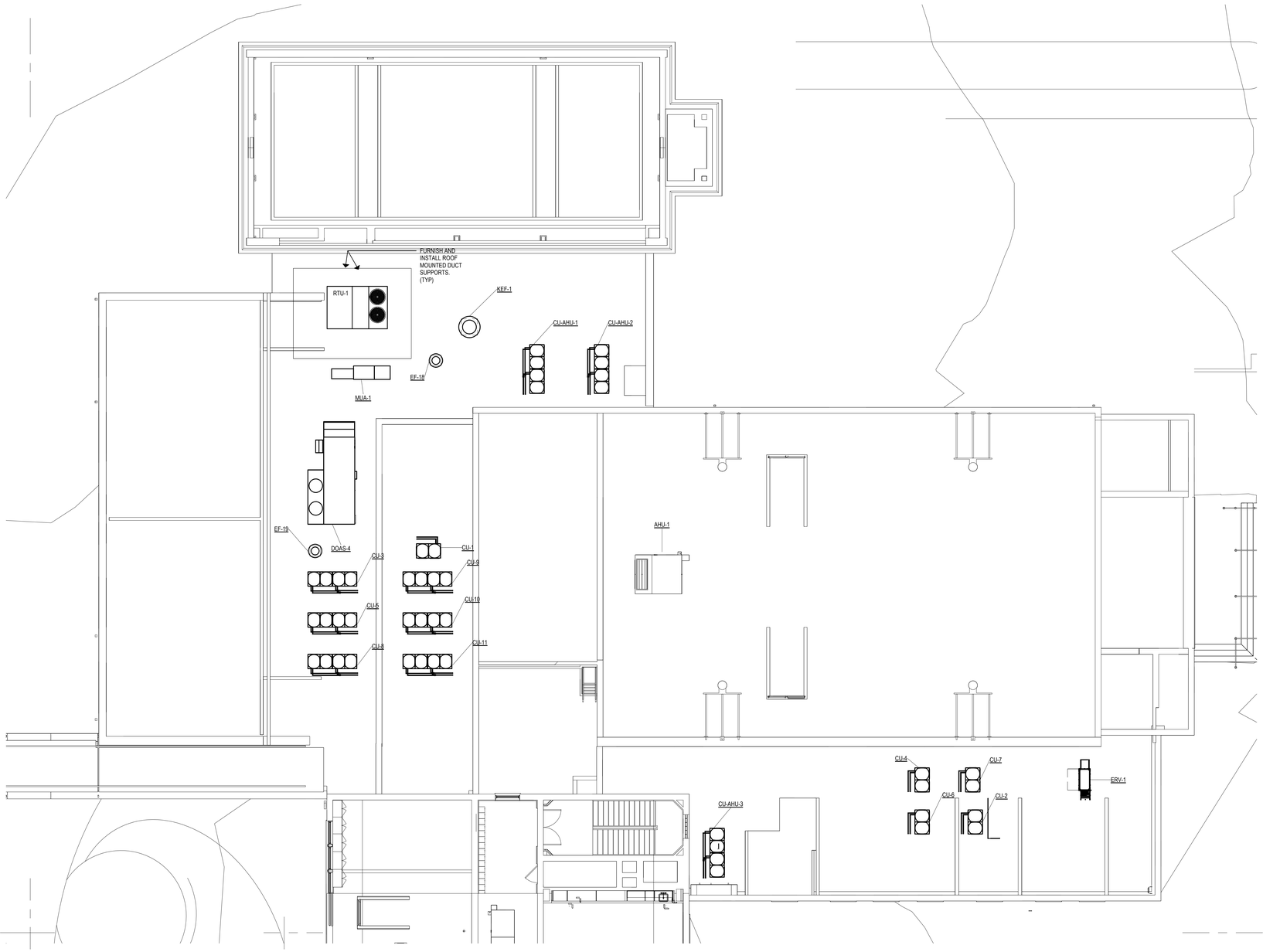
SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
311 STATE STREET NEW LONDON CT 06320
203 230 9007 silverpetrucelli.com

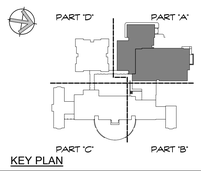
Revision:	Description:	Date:	Revised By:

Drawing Title:
ATTIC PLAN HVAC PART 'B

Date: 08/29/2024
Scale: 1/8" = 1'-0"
Drawn By: MZ
Project Number: 22.382
Drawing Number: M160

8/29/2024 4:06:57 PM





KEY PLAN

Project Title:

ADDITION & ALTERATIONS TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
311 STATE STREET NEW LONDON CT 06320
203 230 9007 silverpetrucelli.com

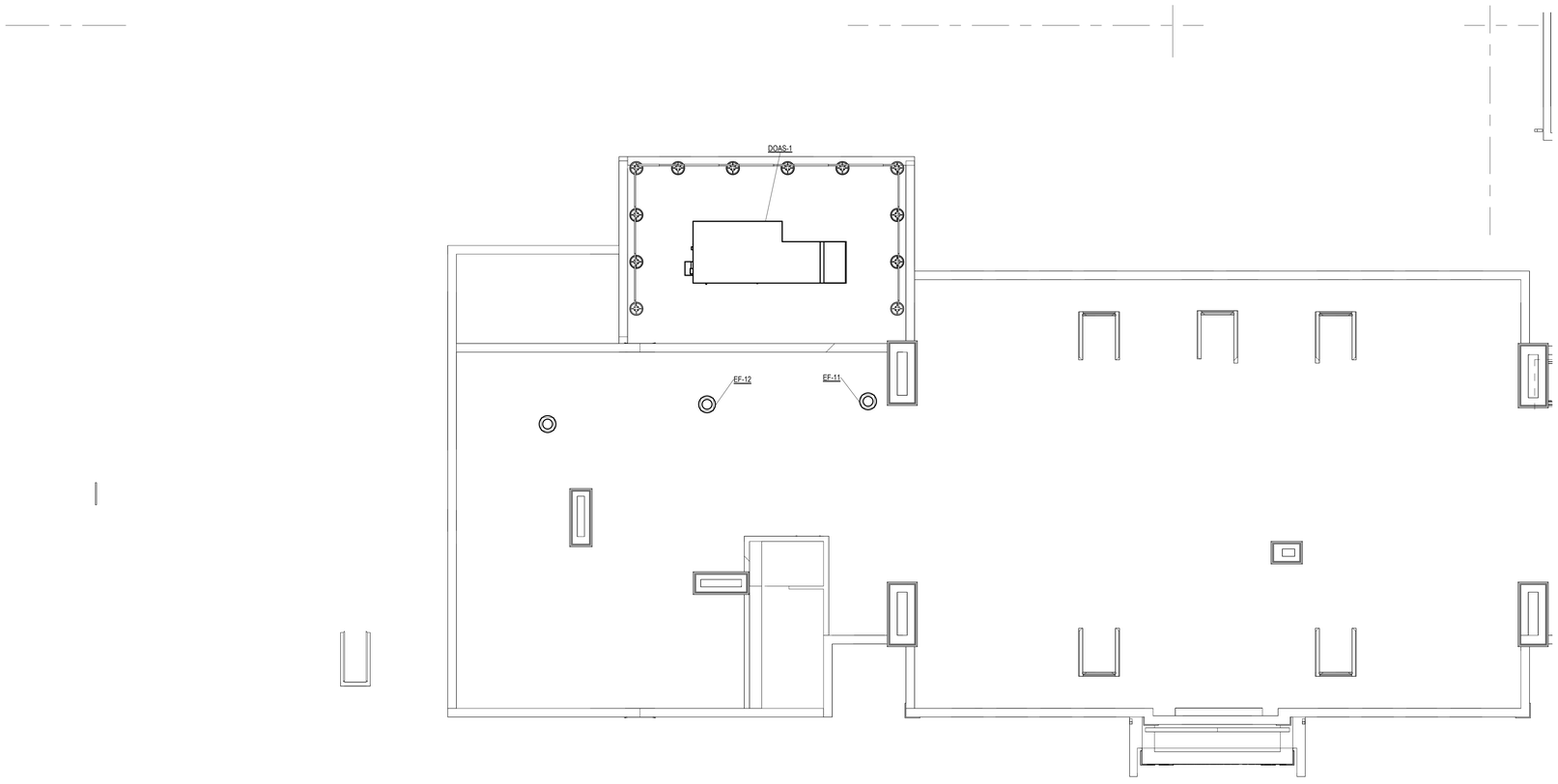
Revision:	Description:	Date:	Revised By:

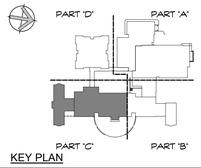
Drawing Title:
ROOF PLAN PART 'A'

Date: 08/29/2024
Scale: 1/8" = 1'-0"
Drawn By: MZ
Project Number: 22.382

Drawing Number: M180

8/29/2024 4:26:48 PM





KEY PLAN

Project Title:

ADDITION & ALTERATIONS TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

SILVER PETRUCELLI + ASSOCIATES

3190 WHITNEY AVENUE HAMDEN CT 06518
311 STATE STREET NEW LONDON CT 06320
203 230 9007 silverpetrucelli.com

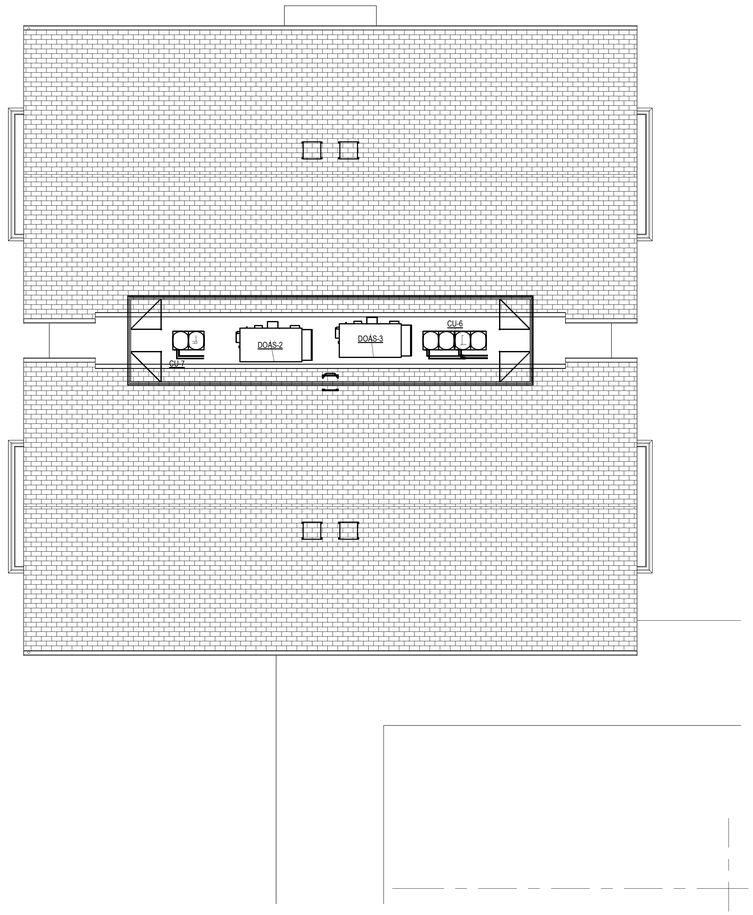
Revision:	Description:	Date:	Revised By:

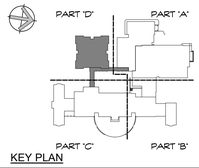
Drawing Title:
ROOF PLAN PART 'C'

Date: 08/29/2024
Scale: 1/8" = 1'-0"
Drawn By: MZ
Project Number: 22.382

Drawing Number: M190

8/29/2024 4:25:14 PM





KEY PLAN

Project Title:

ADDITION & ALTERATIONS TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

SILVER PETRUCELLI + ASSOCIATES

3190 WHITNEY AVENUE HAMDEN CT 06518
311 STATE STREET NEW LONDON CT 06320
203 230 9007 silverpetrucelli.com

Revision:	Description:	Date:	Revised By:

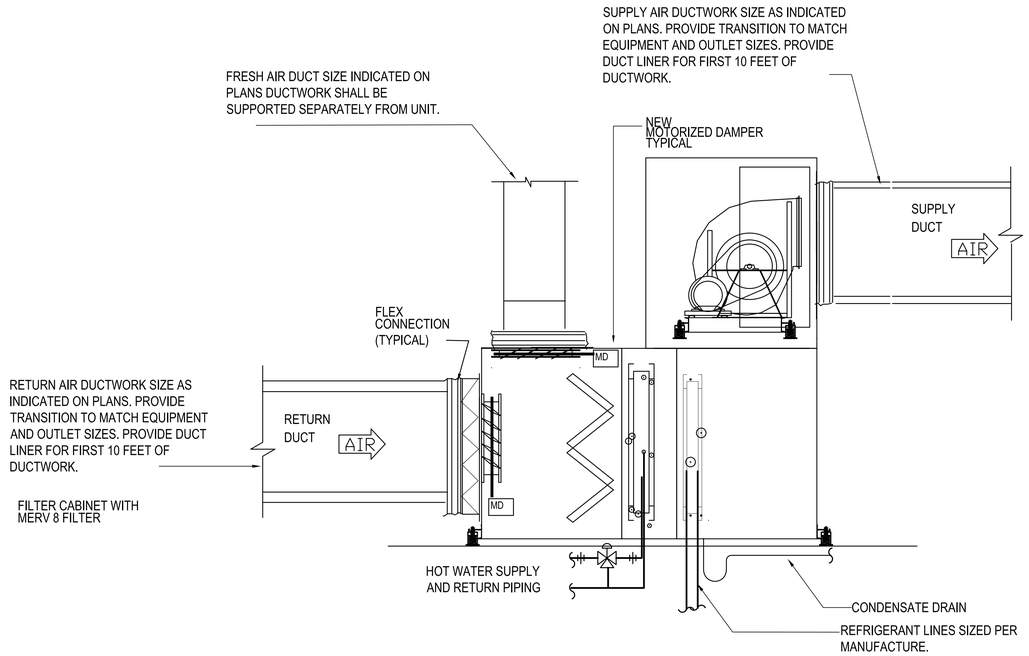
Drawing Title:

ROOF PLAN PART 'D'

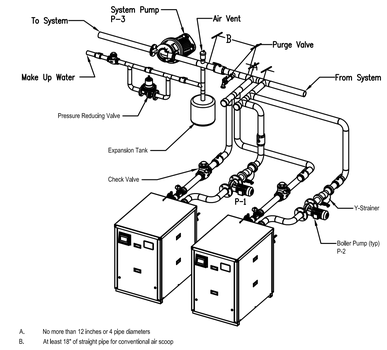
Date: 08/29/2024
Scale: 1/8" = 1'-0"
Drawn By: MZ
Project Number: 22.382

Drawing Number: M191

8/29/2024 4:42:15 PM

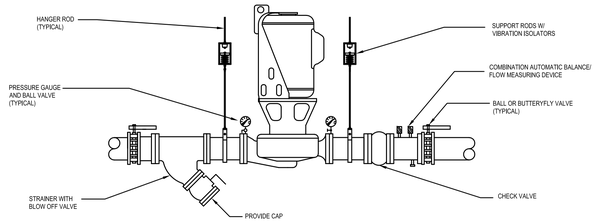


9 M301 HORIZONTAL AHU DETAIL
SCALE: NTS

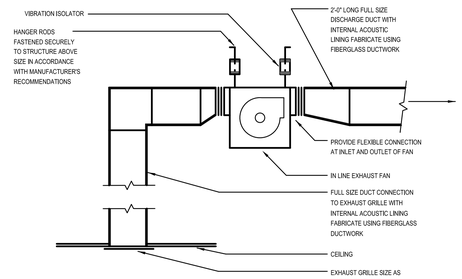


A. No more than 12 inches or 4 pipe diameters
B. At least 18" of straight pipe for conventional air scoop

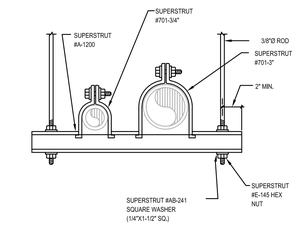
8 M301 BOILER PIPING DIAGRAM
SCALE: NTS



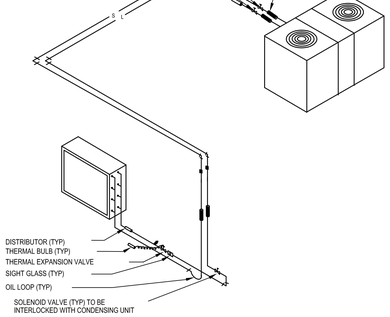
4 M301 INLINE PUMP DETAIL
SCALE: NTS



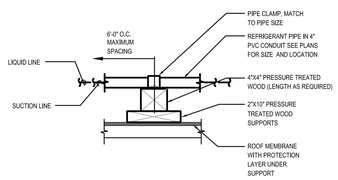
7 M301 INLINE EXHAUST FAN
SCALE: NTS



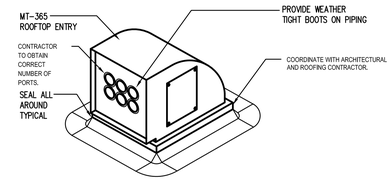
3 M301 TRAPEZZE PIPE HANGING DETAIL
SCALE: NTS



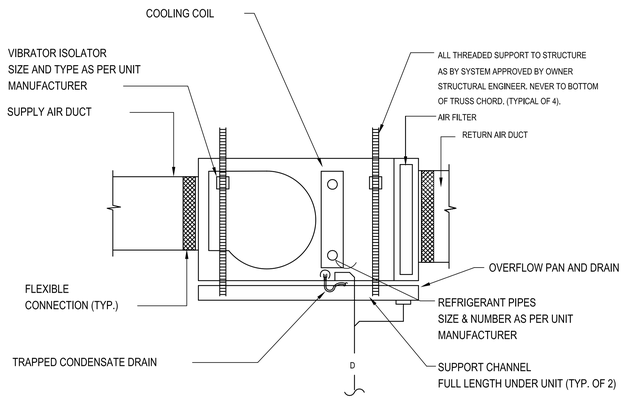
10 M301 REFRIGERANT PIPING SCHEMATIC
SCALE: NTS



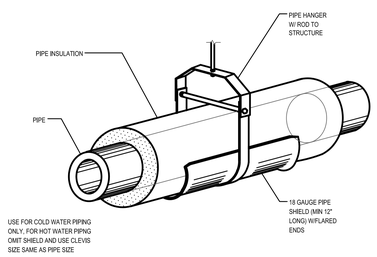
6 M301 REFRIGERANT PIPING ROOF SUPPORT
SCALE: NTS



2 M301 REFRIGERANT PIPING ROOF ENCLOSURE
SCALE: NTS



11 M301 VRF FAN COIL UNIT DETAIL
SCALE: NTS



5 M301 TYPICAL PIPE HANGER DETAIL
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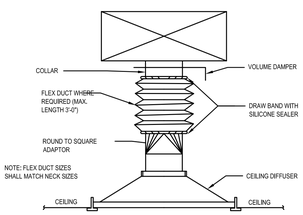

1 M301 TYPICAL DIFFUSER CONNECTION
SCALE: NTS

Project Title:

ADDITION & ALTERATIONS TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
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203 230 9007 silverpetrucelli.com

Revision:	Description:	Date:	Revised By:

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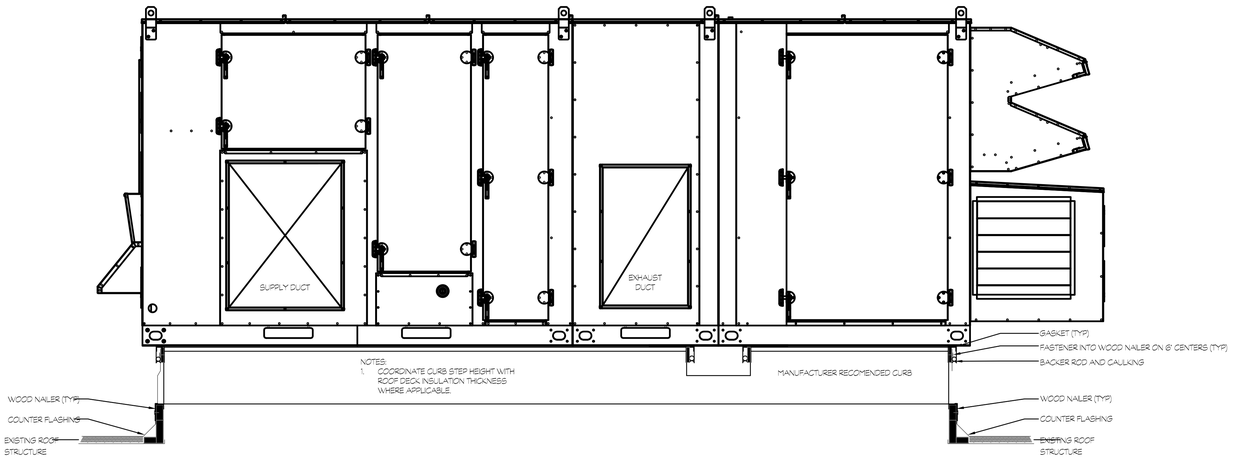
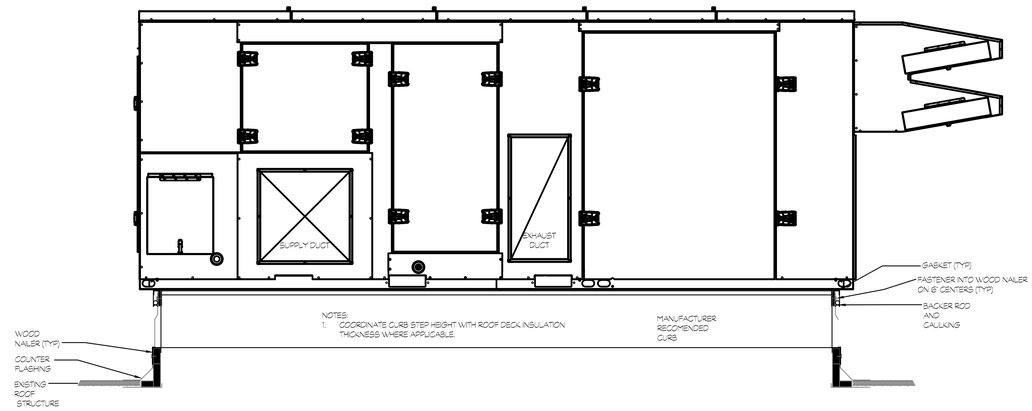
Drawn By: MZ
Project Number: 22.382

Drawing Number: M301



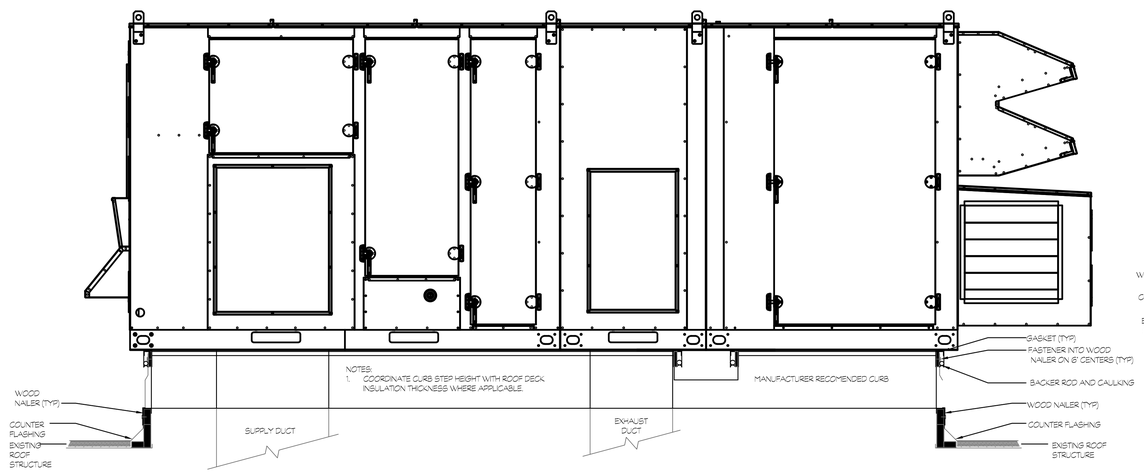
4 M302 DOAS ROOF CURB (OAK) INSTALLATION DUCTED THROUGH WALL

SCALE: NTS



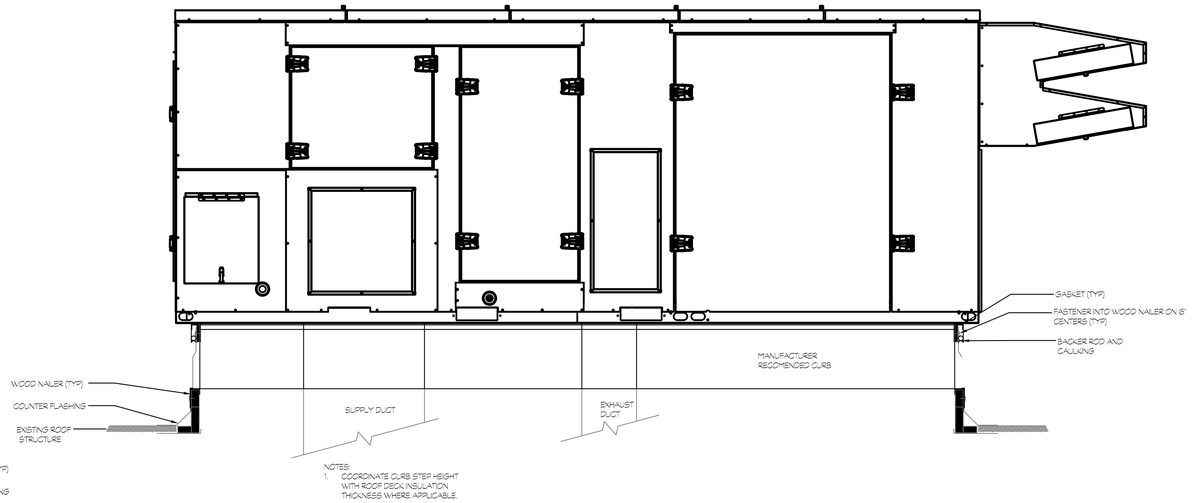
2 M302 DOAS ROOF CURB (OAD) INSTALLATION DUCTED THROUGH WALL

SCALE: NTS



3 M302 DOAS ROOF CURB (OAK) INSTALLATION DUCTED THROUGH CURB

SCALE: NTS



1 M302 DOAS ROOF CURB (OAD) INSTALLATION DUCTED THROUGH CURB

SCALE: NTS

Project Title:

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Old Greenwich School
285 SOUND BEACH AVENUE
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Drawn By: MZ
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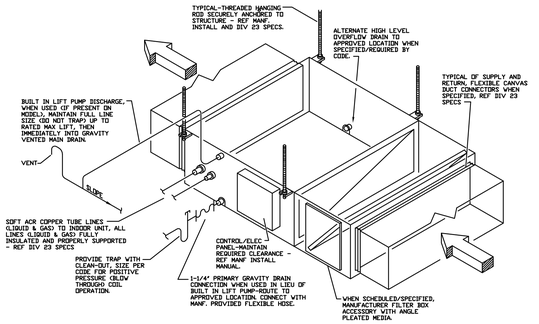
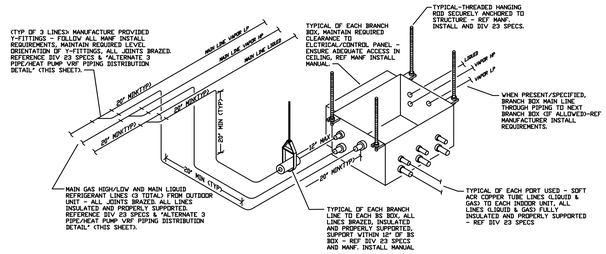
Drawing Number: M302



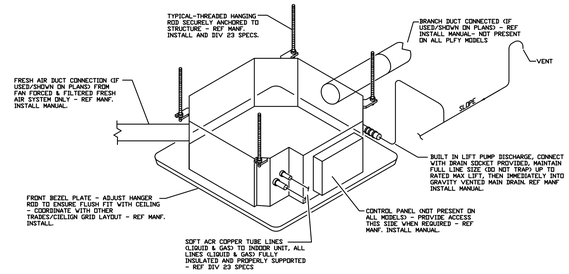
10 M303 VRF DUCTED INDOOR UNIT (PERY FAMILY) DETAIL

SCALE: NTS



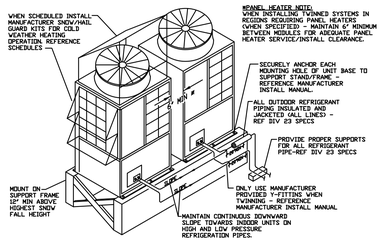
7 M303 ALTERNATE 3-PIPE VRF BRANCH BOX DETAIL

SCALE: NTS



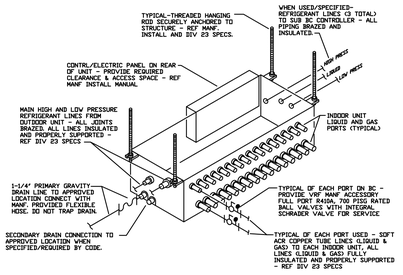
3 M303 VRF CASSETTE INDOOR UNIT (PLFY) DETAIL

SCALE: NTS



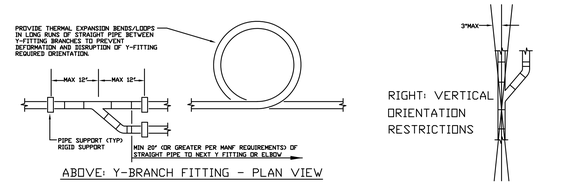
9 M303 VRF OUTDOOR N GEN TWINNED MODULE DETAIL

SCALE: NTS



6 M303 VRF R2 HEAT RECOVERY BRANCH CIRCUIT (BC) CONTROLLER DETAIL

SCALE: NTS



ABOVE: Y-BRANCH FITTING - PLAN VIEW

ABOVE: Y-BRANCH HORIZONTAL ORIENTATION RESTRICTIONS

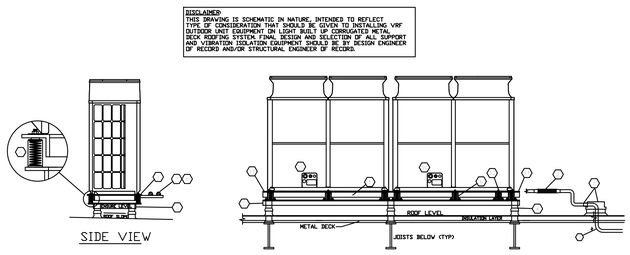
ADDITIONAL PIPING DISTRIBUTION NOTES:

- 90 DEG ELBOWS TO BE KEPT 20' FROM FAN COILS AND BS BOXES (OR GREATER PER MANF REQUIREMENTS)
- 90 DEG ELBOWS SHOULD BE KEPT 20' FROM Y-FITTINGS AND HEADERS (OR GREATER PER MANF REQUIREMENTS).
- ALL PIPING TO BE SUPPORTED WITHIN 12" OF FAN COILS, BS BOXES, AND CONDENSERS.

2 M303 ALTERNATE 3-PIPE/HEAT PUMP VRF PIPING DISTRIBUTION REQUIREMENTS

SCALE: NTS

DISCLAIMER:
THIS DRAWING IS SCHEMATIC IN NATURE, INTENDED TO REFLECT TYPE OF CONSIDERATION THAT SHOULD BE GIVEN TO INSTALLING VRF OUTDOOR UNIT EQUIPMENT ON LIGHT BUILT UP CORRUGATED METAL ROOF ROOFING SYSTEM. FINAL DESIGN AND SELECTION OF ALL SUPPORT AND VIBRATION ISOLATION EQUIPMENT SHOULD BE BY DESIGN ENGINEER OF RECORD AND/OR STRUCTURAL ENGINEER OF RECORD.

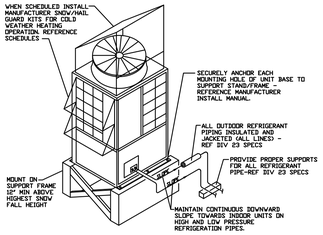


CODED NOTES:

1. PROVIDE STRUCTURAL INTERSTITIAL ANGLE IRON MOUNTING MEMBER OR SIMILAR ATTACHED DIRECTLY TO BOTTOM OF UNIT MOUNTING FLANGE AND PROVIDE CROSS BRACING FOR RIGIDITY. ENSURE IT CARRIES FULL MOUNTING FOOT WIDTH ON UNIT. FINAL SPECIFICATION OF MEMBER BY STRUCTURAL ENGINEER OF RECORD.
2. PROVIDE BRAIDED COPPER FLEXIBLE CONNECTOR, R410A RATED, 650PSI MAX WORKING PRESSURE, PACKLESS INDUSTRIES OR EQUAL ON ALL MAIN PIPING DOWNSTREAM OF TWINNING KITS/CONVERGING FITTINGS PRIOR TO PENETRATION THROUGH ROOF.
3. PIPE ROOF CURB, FLASHED AND SEALED WATER TIGHT, PROVIDE FLEXIBLE WATER TIGHT COLLAR TO ALLOW FOR MOVEMENT WHERE PIPE ENTERS CURB. DO NOT ENTER PIPE CURB FROM VERTICAL DIRECTION.
4. TYPICAL BASE SUPPORT POSTS, SECURELY ANCHORED TO BUILDING STRUCTURE BELOW, QUANTITY, SIZE, AND CARRYING CAPACITY DETERMINED BY STRUCTURAL ENGINEER OF RECORD.
5. STRUCTURAL ANGLE IRON BASE MOUNTING FRAME WITH CROSS MEMBERS FOR RIGIDITY - FINAL SIZING BY STRUCTURAL ENGINEER OF RECORD.
6. VIBRATION SPRING SLR TYPE ISOLATORS (MASON INDUSTRIES OR EQUIV.) WITH RUBBER BASE PADS, SECURELY FASTENED TO STRUCTURAL BASE AND TO VRF UNIT INTERSTITIAL SUPPORT STEEL. SPRING ISOLATOR TO PROVIDE MINIMUM 1" DEFLECTION OR 10 TIMES THE STATIC DEFLECTION OF THE ROOF DECK FROM EQUIPMENT WEIGHT - DETERMINED BY STRUCTURAL ENGINEER OF RECORD. AT A MINIMUM, PROVIDE SPRING ISOLATORS AT EACH EQUIPMENT BASE MOUNTING HOLE LOCATION.
7. IF REQUIRED, ONLY SUPPORT LATERAL PIPE EMANATING FROM VRF UNIT CONNECTIONS BY CROSS MEMBER SUPPORT THAT IS ATTACHED DIRECTLY TO VRF UNIT MOUNTING ANGLE IRON FRAME ABOVE SPRING ISOLATORS. DO NOT ATTACH ANY PIPING TO LOWER FIXED SUPPORT BASE.
8. USE NEOPRENE ISOLATION COLLARS ON PIPE CLAMS WHEN FASTENING PIPING TO SUPPORTS.
9. USE LONG RADIUS SWEEPING COPPER ACR TUBE PIPE BENDS WHERE PIPE ENTERS BUILDING AT FIRST ELBOW INTO CEILING SPACE TO MINIMIZE REFRIGERANT FLOW NOISE AND VIBRATION.
10. ALL ELECTRICAL CONNECTIONS TO UNITS TO BE VIA FLEXIBLE CONDUIT, PROVIDE SUFFICIENT SLACK TO ALLOW FOR UNIT MOVEMENT ON SPRING ISOLATORS.
11. ENSURE CROSS MEMBERS OF INTERSTITIAL FRAME AND BOTTOM SUPPORT FRAME ARE NOT DIRECTLY BELOW ENDS OF MODULES IN ALL LOCATIONS AND DO NOT BLOCK DRAINAGE WEEP HOLES IN BOTTOM OF UNIT CASING. FAILURE TO DO THIS MAY RESULT IN ICE DAMMING/BUILDUP BENEATH UNIT AND SUBSEQUENT BUILDUP OF ICE IN BOTTOM OF UNIT CASING BELOW COIL AND POTENTIAL DAMAGE TO BOTTOM OF COIL.
12. WHEN SELECTING SPRING ISOLATORS ALWAYS CONSIDER WEIGHT DISTRIBUTION BY REFERENCING EQUIPMENT WEIGHT AND CENTER OF GRAVITY. NEAR RIGHT ENDS OF UNITS (VIEWED FROM FRONT PANEL) SPRING WEIGHT CAPACITY MAY BE LARGER. IF HIGHER SPRING WEIGHT CAPACITY IS REQUIRED VS OTHER SPRING LOCATIONS, CONSIDER AN ADDITIONAL SPRING OF EQUAL "K" VALUE (lbs/in) NEAR RIGHT END OF LAST MODULE. IN GENERAL IT IS RECOMMENDED TO SELECT ALL MOUNTING SPRINGS OF EQUIVALENT "K" VALUE (lbs/in).

8 M303 ROOF LEVEL VRF VIBRATION ISOLATION SAMPLE DETAIL

SCALE: NTS



5 M303 VRF OUTOOR N GEN SINGLE MODULE DETAIL

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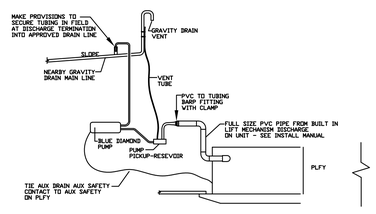

4 M303 BLUE DIAMOND PUMP ON PLFY

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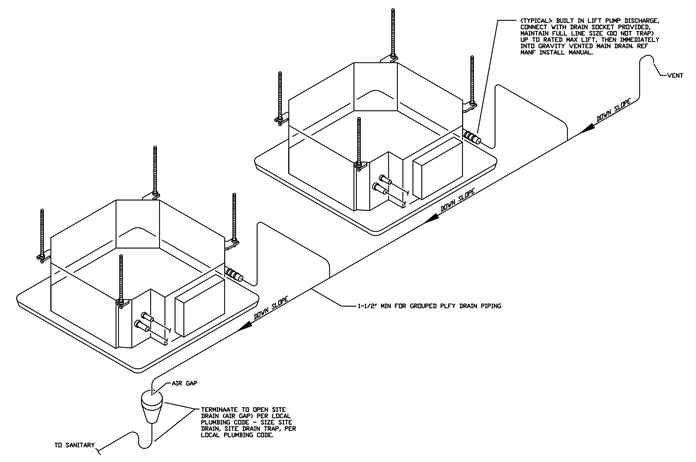

1 M303 PLFY BUILT IN CONDENSATE LIFT GROUPED PIPING DETAIL

SCALE: NTS

Project Title:

ADDITION & ALTERATIONS TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

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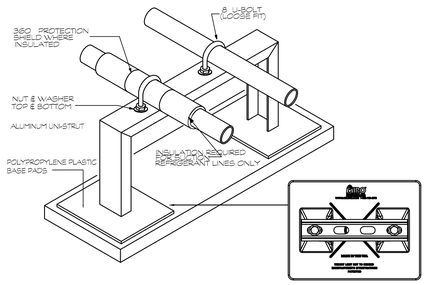

1 M304 **REGRIGERANT PIPING SUPPORT DETAIL**
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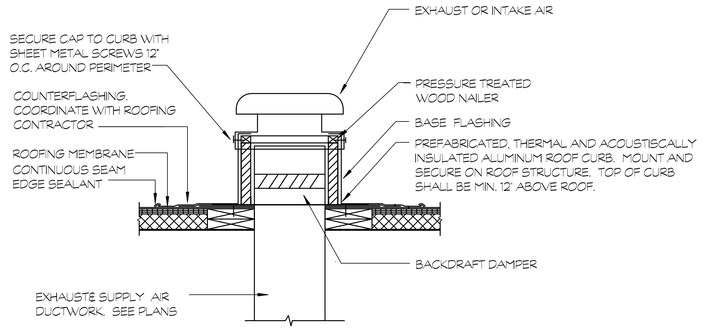
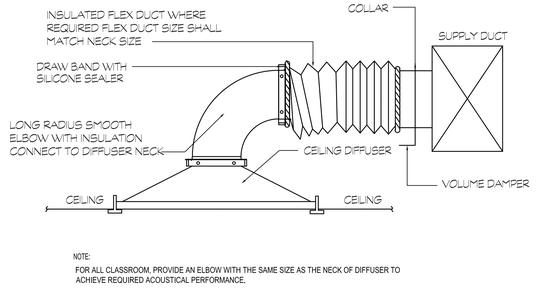
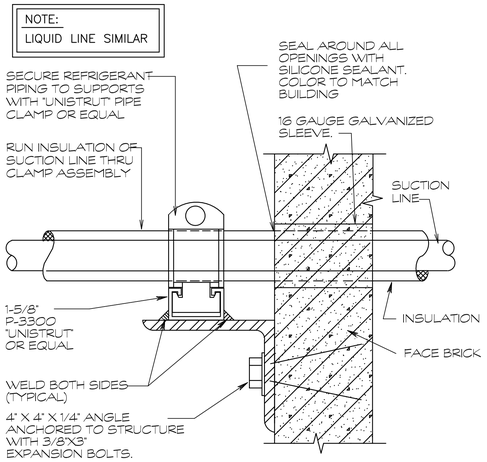


2 M304 **ROOF VENTILATOR DETAIL**
SCALE: NTS

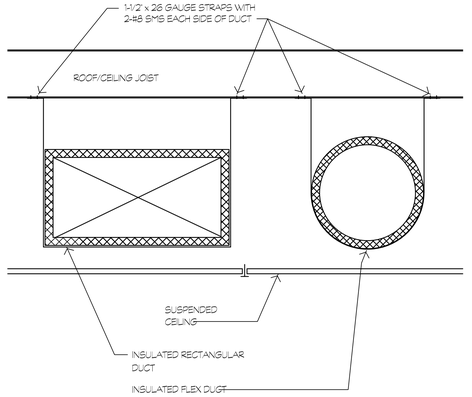


NOTE:
FOR ALL CLASSROOM, PROVIDE AN ELBOW WITH THE SAME SIZE AS THE NECK OF DIFFUSER TO ACHIEVE REQUIRED ACOUSTICAL PERFORMANCE.

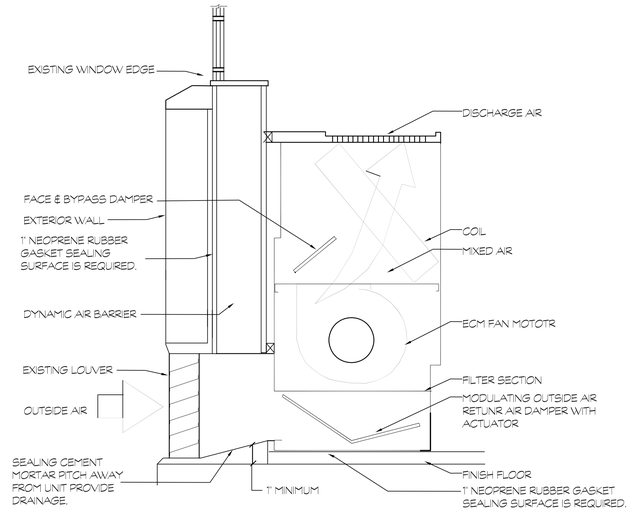
3 M304 **TYPICAL SUPPLY DIFFUSER CONNECTION DETAIL**
SCALE: NTS



4 M304 **REFRIGERANT PIPE SUPPORT AT EXTERIOR WALL**
SCALE: NTS



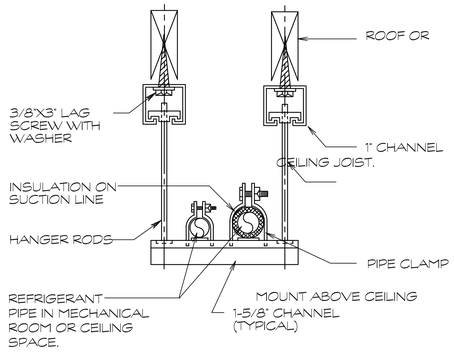
5 M304 **HORIZONTAL PIPE SUPPORT DETAIL**
SCALE: NTS



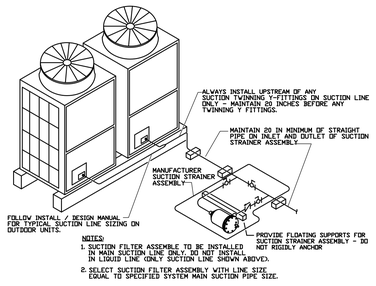
6 M304 **UNIT VENTILATOR DETAIL**
SCALE: NTS

NOTES:
1. CONTRACTOR SHALL FIELD VERIFY AND PROVIDE NEW INSULATED SLEEVE / DUCT COLLAR FROM U.V. TO EXISTING LOUVER AS REQUIRED.

2. IF ANY SURFACE MATERIAL BEHIND UNIT VENTILATOR THAT NEEDS TO BE REPLACE, THE CONTRACTOR SHALL REPLACE AND INSTALL WITH 5/8" TYPE X FIRE RESISTANT GYPSUM BOARD SCREWED TO THE CMU WALL.



7 M304 **SUSPENDED REFRIGERANT PIPE SUPPORT AT CEILING**
SCALE: NTS



8 M304 **OUTDOOR VRF UNIT OPTIONAL SUCTION LINE STRAINER INSTALL DETAIL**
SCALE: NTS

Project Title:
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Old Greenwich School
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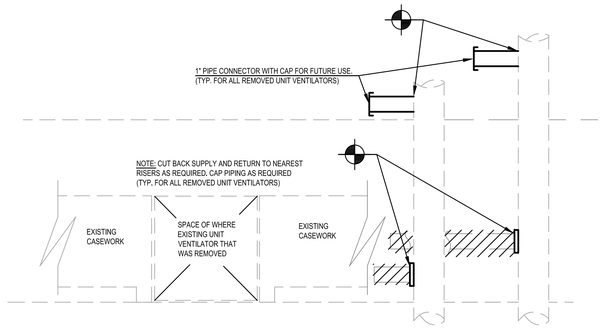
Drawing Number: M304



1 M305 **SECONDARY HEAT PREPARATION**
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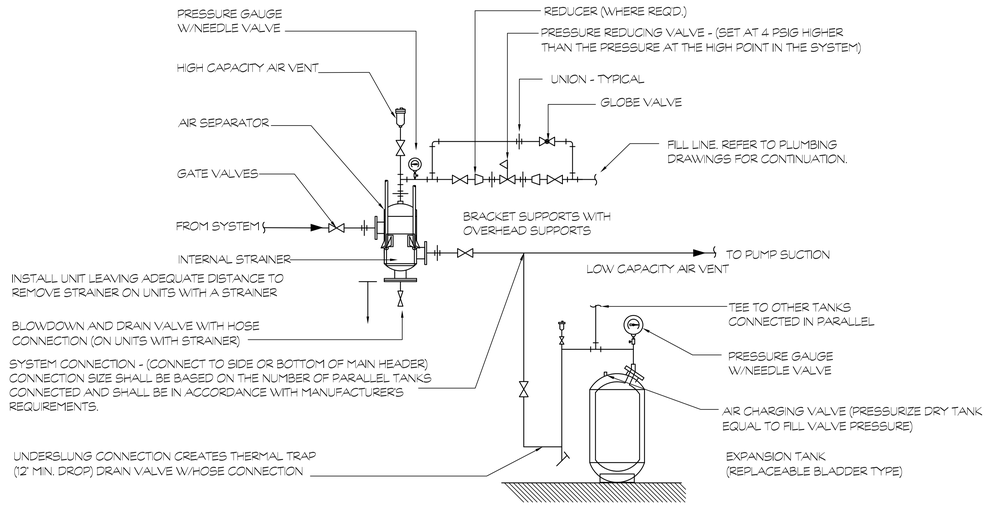
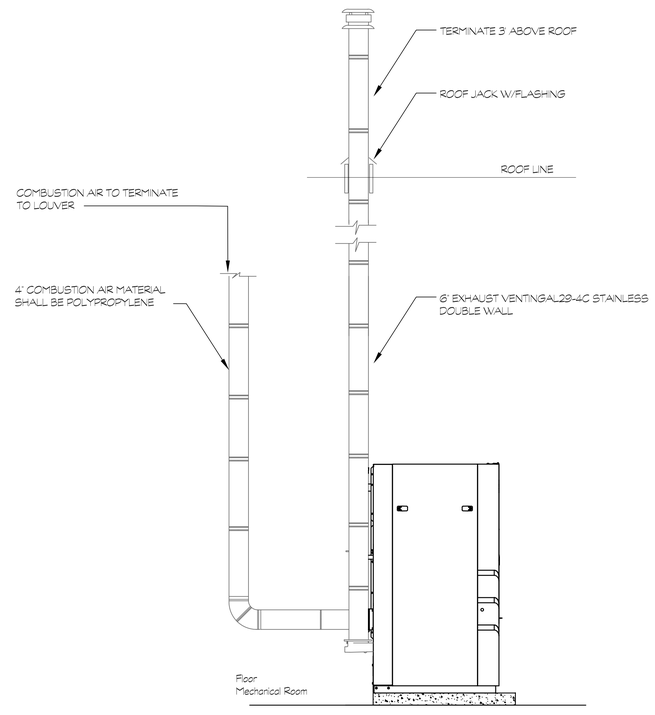
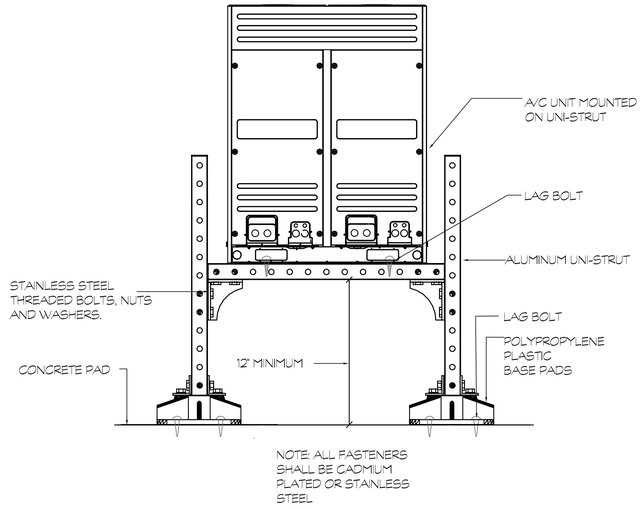


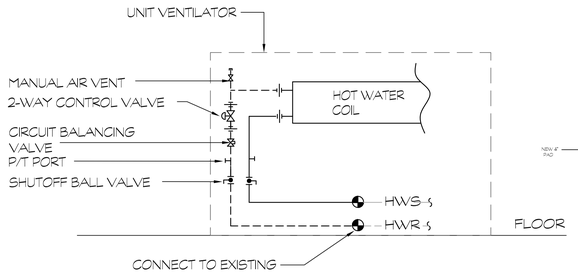
2 M305 **AIR SEPERATOR AND EXPANTION TANK DETAIL AND DIAGRAM**
SCALE: NTS



5 M305 **BOILER FLUE VENTING DETAIL**
SCALE: NTS

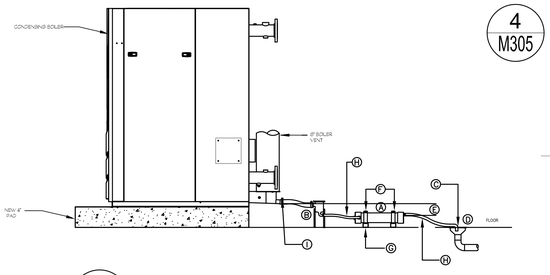


3 M305 **HEAT PUMP UNIT MOUNTING DETAIL**
SCALE: NTS



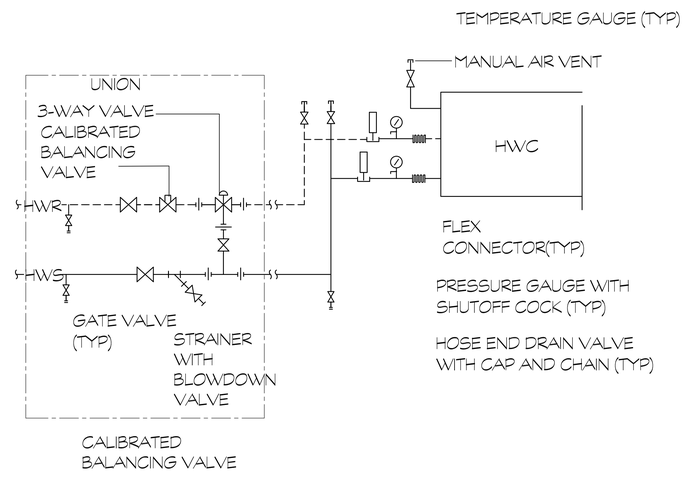
6 M305 **UNIT VENTILATOR PIPING DETAIL**
SCALE: NTS

NOTES:
1. ALL PIPING SHALL BE WITHIN CABINET ENCLOSURE.
2. CONTRACTOR SHALL RE-INSULATE ALL NEW PIPING.

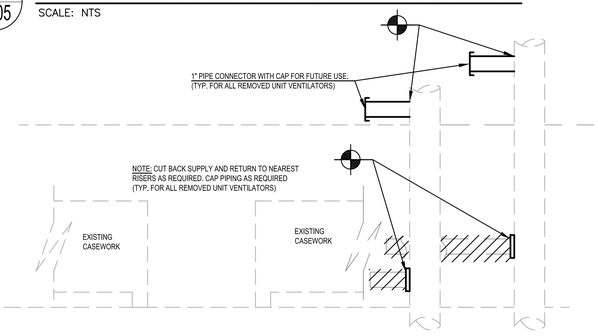


7 M305 **BOILER CONDENSATE SYSTEM**
SCALE: NTS

A. ANSEN NEUTRATEC MODEL #N75 NEUTRALIZER TANK.
B. FACTORY SUPPLIED CONDENSATE TRAP. PROVIDE FIELD FABRICATED SUPPORTS AS REQUIRED.
C. CONDENSATE DRAIN TERMINATION. AT FLOOR DRAIN, OR CONDENSATE PUMP RESERVOIR INLET. SECURE IN PLACE AS REQUIRED.
D. FLOOR DRAIN, OR SUMP.
E. BOTTOM OF BOILER CONDENSATE OUTLET MUST BE ABOVE THE BOTTOM OF THE CONDENSATE TANK OUTLET.
F. UNISTRUT CLAMPS. SECURE TUBE IN POSITION AND SECURELY. CONDENSATE OUTLET MUST BE ORIENTED UP WITH CONDENSATE INLET TO THE SIDE.
G. UNISTRUT BASE. BOLT TO FLOOR OR MOUNTING PAD.
H. PLASTIC TUBING OR PVC PIPE.
I. USE HOSE CLAMPS AT ALL CONNECTIONS WHEN USING FACTORY SUPPLIED RUBBER HOSE.



4 M305 **HOT WATER COIL PIPING DIAGRAM FOR AHUs**
SCALE: NTS



8 M305 **SECONDARY HEAT PREPARATION**
SCALE: NTS

Project Title:

ADDITION & ALTERATIONS TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

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Revision:	Description:	Date:	Revised By:

Drawing Title:

MECHANICAL DETAILS

Date: 08/29/2024
Scale: AS NOTED
Drawn By: MZ
Project Number: 22.382
Drawing Number: M305

EXHAUST FAN SCHEDULE

SYMBOL	MFGR	MODEL	TYPE	CFM	STATIC PRESS (IN. WG.)	FAN RPM	ELECTRICAL				WEIGHT (LBS)	SONES	INTERLOCKED WITH	REMARKS
							VOLTS	PHASE	HP (WATTS)	AMPS				
EF-1	GREENHECK	SP-A90	CEILING	75	.25	877	115	1	(14)	,17	20	.4	SPEED CONTROL BMS	1,2,3,4,5
EF-2	GREENHECK	SP-A90	CEILING	75	.25	877	115	1	(14)	,17	20	.4		
EF-3	GREENHECK	SQ-97-VG	CABINET	150	.375	1398	115	1	1/4	2.85	50	1.3	SPEED CONTROL BMS	1,2,3,4,5
EF-4	GREENHECK	SP-B150	CEILING	100	.5	1050	115	1	(128)	1.8	10	3	SPEED CONTROL BMS	1,2,3,4,5
EF-5	GREENHECK	SP-LP0511	CEILING	100	.5	939	115	1	(22)	.29	40	3	SPEED CONTROL BMS	1,2,3,4,5
EF-6	GREENHECK	G-099-VG	ROOF	675	1	1636	115	1	1/4	3.5	70	2.5	SPEED CONTROL BMS	1,2,3,4,5
EF-7	GREENHECK	CSP-A390	CABINET	225	.934	1350	115	1	(112)	1.42	50	4.5	SPEED CONTROL BMS	1,2,3,4,5
EF-8	GREENHECK	CSP-A250	CABINET	100	.82	1000	115	1	(54)	.56	50	2	SPEED CONTROL BMS	1,2,3,4,5
EF-9	GREENHECK	CSP-A250	CABINET	100	.82	1000	115	1	(54)	.56	50	2	SPEED CONTROL BMS	1,2,3,4,5
EF-10	GREENHECK	CSP-A250	CABINET	100	.82	1000	115	1	(54)	.56	50	2	SPEED CONTROL BMS	1,2,3,4,5
EF-11	GREENHECK	G-099-VG	CABINET	525	1	1567	115	1	(368)	3.5	70	2.5	SPEED CONTROL BMS	1,2,3,4,5
EF-12	GREENHECK	G-098-VG	CABINET	100	1	1720	115	1	1/4	3.5	60	1.4	SPEED CONTROL BMS	1,2,3,4,5
EF-13	GREENHECK	CSP-A410	CABINET	225	.5	1000	115	1	(112)	1.7	64	2	SPEED CONTROL BMS	1,2,3,4,5
EF-14	GREENHECK	CSP-A200	CABINET	100	.6	825	115	1	(118)	.46	51	1.4	SPEED CONTROL BMS	1,2,3,4,5
EF-15	GREENHECK	CSP-A200	CABINET	100	.6	825	115	1	(118)	.46	51	1.4	SPEED CONTROL BMS	1,2,3,4,5
EF-16	GREENHECK	CSP-A200	CABINET	100	.6	825	115	1	(118)	.46	51	1.4	SPEED CONTROL BMS	1,2,3,4,5
EF-17	GREENHECK	CSP-A250	CABINET	139	.72	1000	115	1	(56)	.56	27	2.5	INTERLOCK WITH OCCUPANCY SENSOR	1,2,4
EF-18	GREENHECK	CUE-090-VG	ROOF	540	.5	1725	115	1	1/10	1.5	83	--	SPEED CONTROL BMS	1,2,3,4,5
EF-19	GREENHECK	SQ-97-VG	--	150	.5	1398	115	1	1/4	2.85	55	--	SPEED CONTROL BMS	1,2,3,4,5
EF-21	GREENHECK	SP-LP0810W	ROOF	714	.372	714	115	1	(9)	.29	10	--		1,2,3,4,5

REMARKS:
1. PROVIDE WITH FACTORY WIRED DISCONNECT, GRAVITY BACKDRAFT DAMPER AND BRICK VENT.
2. FAN INTERLOCKS INDICATED ABOVE SHALL BE WIRED UNDER DIVISION 26.
3. UNLESS NOTED OTHERWISE, MOUNT SPEED CONTROL SWITCH NEXT TO UNIT FOR BALANCING PURPOSES.
4. TRANSITION DUCTWORK ON INLET AND OUTLET OF EACH FAN TO MATCH SIZES SHOWN ON PLANS.
5. CAPACITIES LISTED ARE WITH UTILIZING FAN SPEED CONTROLLER, NOT THE MAXIMUM CAPACITY.
6. PROVIDE WITH GREASE BOX AND VAV PACKAGE WITH MANUAL CONTROL (VFD INCLUDED), VENTED CURB ASSEMBLY, UL705, UL 762 AND UL S645 LISTED.
7. PROVIDE WITH WEATHERPROOF DISCONNECT AND LISTED VENTED CURB ASSEMBLY.
8. FAN IS ALL ALUMINUM CONSTRUCTION, NEMA-3 DISCONNECT, PROVIDE WITH 16" ROOF CURB, ALUMINUM BIRDSCREEN.

HYDRONIC PUMP SCHEDULE

SYMBOL	TYPE	MFGR	GPM	FT HEAD	HP	RPM	ELECTRICAL			SERVICE	FLUID	MODEL	NOTES
							VOLTAGE	PHASE	HERTZ				
P-1	INLINE	TACO	85	20	2.0	2,800	200-240	1	60	BOILER PUMP	HOT WATER	VR30M	1,2,3,4,5,6
P-2	INLINE	TACO	85	20	2.0	2,800	200-240	1	60	BOILER PUMP	HOT WATER	VR30M	1,2,3,4,5
P-3	INLINE	TACO	180	65	7.5	1,760	730	3	60	SYSTEM PUMP	HOT WATER	SKV3009D	1,2,3,4,5

1. PROVIDE DRAIN BASE, SUCTION DIFFUSER AND FULL SIZE CONNECTION ON INLET AND OUTLET OF PUMP.
2. PROVIDE GAUGE TAPS ON INLET AND DISCHARGE FLANGES, PROVIDE WITH FACTORY INSTALLED DISCONNECTS.
3. PROVIDE FRAMING FOR PUMPS, PROVIDE WITH VFD'S WITH BY-PASS.
4. BASED ON TACO.
5. PROVIDE WITH TACO SELF SENSING MODULATING PUMP CONTROLLER FOR EACH SYSTEM.
6. FURNISH AND INSTALL X-POT-COMPACT *58760 MAGNETIC FILTER, SIZE FOR THE ENTIRE BUILDING SYSTEM.

CONDENSING NATURAL GAS BOILER SCHEDULE

TAG	MAXIMUM INPUT MBTU/hr	MAXIMUM OUTPUT MBTU/hr	SUPPLY WATER TEMP DEG. F	RETURN WATER TEMP DEG. F	BURNER			ELECTRICAL			MODEL #	NOTES
					GAS PRESS	TURNDOWN RATIO	IGNITION	VOLTS/PHASE	THERMAL EFFICIENCY			
B-1	800	776	180	160	4"-14"	10;1	DIRECT SPARK	120/1	97%		AMP(U) - 800	1,2,3,4,5
B-2	800	776	180	160	4"-14"	10;1	DIRECT SPARK	120/1	97%		AMP(U) - 800	1,2,3,4,5

NOTES:
1. CONTRACTOR SHALL PROVIDE STAINLESS STEEL FLUE MATERIAL
2. PROVIDE WITH FACTORY BOILER MANAGEMENT SYSTEM ACS, WITH BACNET COMPATIBILITY.
3. PROVIDE WITH BOILER SUPPLIED ISOLATION KIT.
4. BASED ON AERCO BOILERS
5. PROVIDE WITH CONDENSATE NEUTRALIZATION TANK SYSTEM.

AIR OUTLET SIZE AND PERFORMANCE SCHEDULE

TYPE 'A' - CEILING OUTLETS-SUPPLY			TYPE 'C' AND 'E' EXHAUST / RETURN OUTLETS (DUCTED)			TYPE 'B' - SLOT DIFFUSER OUTLETS-SUPPLY				TYPE 'D' - TRANSFER CEILING OUTLETS AND DUCTED RETURN OUTLETS		
CFM	NECK SIZE	MAX NC	CFM	NECK SIZE	MAX NC	CFM/LNI. FT	# OF SLOTS	NECK SIZE	MAX NC	CFM	NECK SIZE	MAX NC
0 - 120	6"Ø	20	0 - 95	6 x 6	20	20 - 43	2	4	20	0 - 110	8 x 8	20
125 - 275	8"Ø	20	100 - 190	10 x 6	22	44 - 61	3	6	20	120 - 280	12 x 12	20
280 - 370	10"Ø	20	205 - 210	14 x 6	20	62 - 80 (1)	4	7	22	290 - 400	14 x 14	20
375 - 410	12"Ø	20	215 - 340	14 x 10	20	81 - 90	5	9	20	410 - 750	18 x 18	20
415 - 530	14"Ø	20	345 - 430	18 x 10	20					760 - 1200	22 x 22	20
525 - 830	16"Ø	21	435 - 530	24 x 10	20							
835 - 1180	21 x 21	20	535 - 650	30 x 10	20							
			655 - 950	22 X 22	20							

AIR OUTLET TYPE SCHEDULE

X = TYPE, # = CFM

TAG	MANUFACTURER	MODEL NO.	OUTLET TYPE DIFFUSERS	SIZE	MATERIAL	CFM RANGE	SP (IN. WG)	REMARKS
A	TITUS	TDCA	SQUARE-CLG	PER SCHEDULE	STEEL	PER SCHEDULE	.1 MAX	1, 3
B		ML-38	SLOT DIFFUSER-CLG	PER SCHEDULE	STEEL	PER SCHEDULE	.1 MAX	1,2,4
C		50 FF	CLG GRILLE	PER SCHEDULE	ALUMINUM	PER SCHEDULE	.1 MAX	1, 5
D		50 FF	CLG GRILLE	PER SCHEDULE	ALUMINUM	PER SCHEDULE	.1 MAX	1, 5
E		355-RL	CLG EXHAUST REGISTER	PER SCHEDULE	ALUMINUM	PER SCHEDULE	.1 MAX	1, 6

REMARKS:
1. PROVIDE DUCT MOUNTED BALANCING DAMPER.
2. PROVIDE INSULATED PLENUM.
3. SQUARE FACE LOUVERED WITH REMOVABLE CORE AND 24x24 LAY-IN BORDER, FINISH FACE ROUND INLET W/ ADJUSTABLE DISCHARGE.
4. 3/4" WIDE SLOTS - ADJUSTABLE THROW.
5. PLENUM RETURN AIR NONDUCTED, OR DUCTED TRANSFER GRILLE.
6. DUCTED RETURN OR EXHAUST
7. DUCTED SUPPLY

NOTES: MAXIMUM FLEXIBLE CONNECTOR LENGTH SHALL BE 5 FEET. EXTEND RIGID DUCT AS REQUIRED. USE ABOVE SIZES UNLESS OTHERWISE NOTED.

AIR COOLED CONDENSING UNIT

SYMBOL	MFGR.	MODEL NO.	AMBIENT AIR TEMP (°F)	COOLING	HEATING	ELECTRICAL DATA		
				GROSS CAPACITY (MBH)	BTU	VOLTS/PH	MCA	MAXIMUM FUSE SIZE
CU-AHU-1	TRANE	TUHYH1923B	95	192	215,000	208/230/3	43/40	70/60
CU-AHU-2	TRANE	TTA2404	95	240		460/3	40	
CU-AHU-3	TRANE	TTA0904	95	120	135	208/230/3	66/60	110/100
CU-AHU-4	TRANE	TTA1504	95	12.5		460/3	25	

NOTES:
1. PROVIDE WITH AUTO-RESET, HIGH AND LOW PRESSURE CONTROLS. REFRIGERANT SHALL BE R-410A.
2. PROVIDE WITH PAINTED STEEL CABINET AND HEAVY DUTY STEEL RAIED BEDS WITH 1-1/2" LEGS.
3. MFGR, TO PROVIDE WITH LIQUID LINE DRYER AND SIGHT GLASS.

AIR SEPARATORS SCHEDULE

SYMBOL	MANUFACTURER/ MODEL NUMBER	DIA (INCH)	HEIGHT (INCH)	OPTIMUM FLOW GPM	SYSTEM SERVED	NOTES
AS-1	TACO/4904ADM-125	12	25	180	HEATING	1,2,3

NOTES:
1. PROVIDE ASME TANK.
2. PROVIDE WITH AIR VENT.
3. PROVIDE WITH BLOW DOWN VALVE AND FLUSH VALVE.

UNIT VENTILTATOR (HOT WATER HEATING AND DX COOLING 1ST FLOOR)

UNIT								Fan				DX Coil							Hot Water Coil							
												EAT		LAT						EAT	LAT					
TAG	Qty	Model	Cooling Coil Type	Heating Coil Type	Voltage	Min Circuit Amps	Max Fuse amps	Airflow (CFM)	ESP (inH2O)	Fan Speed	Motor Power (HP)	EDB(°F)	EWB(°F)	LDB(°F)	LWB(°F)	Evaporator Refrigerant Temp (°F)	Total Capacity (Btu/hr)	Sensible Capacity (Btu/hr)	Coil Rows	EDB(°F)	LDB(°F)	Fluid Type	EWT (°F)	LWT (°F)	Flow Rate (gpm)	WPD (ft H2O)	Total Capacity (Btu/hr)
UV-1	1	UAVS9V13	DX	Hot Water	208/60/1	3,80	15	984	0.00	High	0.333	80,0	67.0	49,5	49,5	45.0	43416	32562	1	70,0	106,1	No Glycol	180,0	141.4	2,00	0,64	38557
UV-2	1	UAVS9V13	DX	Hot Water	208/60/1	3,80	15	984	0.00	High	0.333	80,0	67.0	49,5	49,5	45.0	43416	32562	1	70,0	106,1	No Glycol	180,0	141.4	2,00	0,64	38557

EXPANSION TANK SCHEDULE

SYMBOL	MANUFACTURER/ MODEL NUMBER	SYSTEM	TYPE	LOCATION	CONNECTION (in)	TANK VOLUME (GAL)	SIZE (DIAXH)	SHIPPING WEIGHT	NOTES
ET-1	TACO	HEATING	VERTICAL	BOILER ROOM	1-1/2"	79	24X67	145	1

1. PROVIDE ASME TANK.
2. MOUNT ON 4" HOUSE KEEPING PAD.

KITCHEN MAKE UP AIR UNIT

UNIT NO.	MANUFACTURER	FAN UNIT MODEL #	BLOWER	HOUSING	MIN. CFM	DESIGN CFM	ESP.	RPM	H.P.	B.H.P.	Ø	VOLT	FLA	SONES	BURNER EFFICIENCY(%)	INPUT BTUs	OUTPUT BTUs	TEMP. RISE	REQUIRED INPUT GAS PRESSURE	GAS TYPE	NOTE
MUA-1	ECON-AIR	EA2-D250-200	20MF-2-MOD	A2-D250	2000	2350	1.00	1258	1.5	1.055	1	208	6.5	10.3	92	158100	145452	58 ØF	7 in. w.c. - 14 in. w.c.	Natural	1,2,3,4,5,6,7,8

1. AC INTERLOCK RELAY - 24VAC COIL
2. MOTORIZED BACKDRAFT DAMPER FOR A2-D HOUSING
3. LOW FIRE START AND MOTORIZED DAMPER ON SUPPLY DISCHARGE
4. INLET PRESSURE GAUGE, 0-35"
5. MANIFOLD PRESSURE GAUGE, -5 TO 15" WC
6. VAV PACKAGE W/ MANUAL CONTROL (VFD INCLUDED)
7. VFD FACTORY MOUNTED AND WIRED IN COMMERCIAL CONTROL VESTIBULE FOR TEMPERED SUPPLY FAN.
8. PROVIDE WITH 20" CURBS.

BRANCH CIRCUIT CONTROLLER BOX SCHEDULE

System Tag	MFGR	Model	Type	# of Ports	Voltage / Phase	Connected Capacity	M-net Address	Notes
BCC-A1	MITSUBISHI	TCMBM0108JA11N4	MAIN	8	208V - 230V / 1	248,000.0	52	1, 2
BCC-A2	MITSUBISHI	TCMBS0104KB11N4	SUB	4	208V - 230V / 1	90,000.0	59	1, 2
BCC-B1	MITSUBISHI	TCMBM0108JA11N4	MAIN	8	208V - 230V / 1	166,000.0	65	1, 2
BCC-C1	MITSUBISHI	TCMBM0108JA11N4	MAIN	8	208V - 230V / 1	141,000.0	73	1, 2
BCC-D1	MITSUBISHI	TCMBM1012JA11N4	MAIN	12	208V - 230V / 1	276,000.0	52	1, 2
BCC-E1	MITSUBISHI	TCMBM1012JA11N4	MAIN	12	208V - 230V / 1	264,000.0	67	1, 2

NOTES:

1. INCLUDE DIAMONDBACK BALL VALVES BV-SERIES, 700 PSIG WORKING PRESSURE, FULL PORT, 410A RATED.
2. FOR SUB BC CONTROLLER CMB-P-NU-GB1 OR -GB, THE TOTAL CONNECTABLE INDOOR UNIT CAPACITY CAN BE 126,000 BTUS OR LESS. IF TWO SUB BC CONTROLLERS ARE USED, THE TOTAL INDOOR UNIT CAPACITY CONNECTED TO BOTH SUB BC CONTROLLERS ALSO CANNOT EXCEED 126,000 BTUS. FOR SUB BC CONTROLLER CMB-P1016NU-HB1, THE TOTAL CONNECTABLE INDOOR UNIT CAPACITY CONNECTED TO BOTH SUB CONTROLLERS MUST NOT EXCEED 168,000 BTUS.

KITCHEN EXHAUST FAN

SYMBOL	MFGR.	MODEL	TYPE	CFM	STATIC PRESS (IN. WG.)	FAN RPM	ELECTRICAL					SONES	REMARKS
							VOLTS	PHASE	HP (WATTS)	BHP (WATTS)	FLA AMPS		
KEF-1	ECON-AIR	EAD018OH	ROOF	2585	.75	1010	208	3	1.00	.741	3.9	11.6	1,2,3,4,5

1. PROVIDE WITH GREASE CUPS, GREASE BOX EXHAUST FAN HEAT BAFFLES.
2. PROVIDE WITH HINGED, VENTED, CURRENT UL LISTED CURB.
3. PROVIDE WITH FACTORY MOUNTED DISCONNECT. PROVIDE WITH VFD'S WITH BY-PASS, UL/762 UPBLAST KITCHEN EXHAUST FAN MANUFACTURER BY CAPTIVEAIRE.
4. ROVIDE WITH 20" CURBS.
5. PROVIDE WITH VARIABLE SPEED EXHAUST SYSTEM.

ELECTRIC DUCT HEATER SCHEDULE

TAG	MANUFACTURER	MODEL	NOMINAL CFM	ELECTRICAL V/Ø/Hz	ELECTRIC HEAT		FLA	MCA	MOPD	REMARKS
					CAPACITY (KW)	TEMPERATURE RISE (°F)				
EDH-1	RENEW AIRE	EK-1212006SCCHR-23-1SV-N	565	208/3/60	6,0	31,5	16,65	20,81	25	1,2,3,4,5

NOTES:
1. OPEN COIL ELEMENT
2. CONTROL TERMINAL BOARD
3. GROUNDING LUGS
4. AUTOMATIC LIMIT SWITCH
5. DISCONNECT SWITCH

ENERGY RECOVERY VENTILATOR SCHEDULE

		SUMMER								WINTER								ELECTRIC		
		OUTDOOR AIR			RETURN AIR			SUPPLY AIR		OUTDOOR AIR			RETURN AIR			SUPPLY AIR					
SYMBOL	MANUFACTURER & MODEL	ACTUAL FLOW RATE	DRY BULB/ WET BULB	ENTHALPY	ACTUAL FLOW RATE	DRY BULB/ WET BULB	ENTHALPY	ACTUAL FLOW RATE	DRY BULB/ WET BULB	ENTHALPY	ACTUAL FLOW RATE	DRY BULB/ WET BULB	ENTHALPY	ACTUAL FLOW RATE	DRY BULB/ WET BULB	ENTHALPY	ACTUAL FLOW RATE	DRY BULB/ WET BULB	ENTHALPY	V/PH	MCA	MOP
		ACFM	Deg. F	BTU/lb	ACFM	Deg. F	BTU/lb	ACFM	Deg. F	BTU/lb	ACFM	Deg. F	BTU/lb	ACFM	Deg. F	BTU/lb	ACFM	Deg. F	BTU/lb			
ERV-1	RENEWAIRE HE10-JRTV-S15EE--DGNT---L	605	87/73	36,6	575	75/62	28,1	580	78/67	31,7	516	11,4	3,3	565	70/51	21,0	565	54/41	16,0	208-230/1	3,9	15
EDH-1	RENEWAIRE EK-1212006SCCHR--23-1SV-N																					

NOTES:
1. STAND ALONE CONTROLS
2. MANUFACTURER SHALL PROVIDE ALL UNITS WITH DISCONNECT SWITCH
3. ERV-1 PROVIDE (TCTD) DIGITAL TIME CLOCK CONTROL WITH TRANSFORMER RELAY PACKAGE MODEL (TR40)
4. ERV SHALL BE PROVIDED WITH MERV 13 FILTERS
4. ERV SHALL BE PROVIDED WITH EC MOTOR
4. ERV SHALL BE PROVIDED WITH SPEED CONTROL
4. ERV-1 SHALL BE PROVIDED WITH ELECTRIC DUCT HEATER - EK SERIES

Project Title:

ADDITION & ALTERATIONS TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

SILVER PETRUCELLI + ASSOCIATES
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203 230 9007 silverpetrucelli.com

Revision: Description: Date: Revised By:

Drawing Title:
MECHANICAL SCHEDULES

Date: 08/29/2024
Scale: AS NOTED
Drawn By: MZ
Project Number: 22.382

Drawing Number: M400

DEDICATED OUTSIDE AIR DEHUMIDIFICATION UNIT SCHEDULE

TAG	MFGR	MODEL	SUPPLY AIR FANS					EXHAUST AIR FAN					ELECTRICAL				DX COIL							HEATING PERFORMANCE (HEAT PUMP)					HEATING PERFORMANCE (GAS FURNACE)					ENERGY RECOVERY WHEEL (SUMMER)																WEIGHTS	NOTES
			NOMINAL CFM	SP (IN WG)		QTY	BHP EACH	HP EACH	NOMINAL CFM	SP (IN WG)		QTY	BHP EACH	HP EACH	V/P/Hz	MCA	FLA	MFS	CAPACITY		ENT AIR	LVG AIR	LAT-REHEAT	LAT-UNIT	EVAP-FACE AREA	MAX APD (IN.WG.)	CAPACITY MBH	EAT-DB °F	LAT-DB	AMBIANT AIR-DB	MAX APD (IN.WG.)	INPUT CAPACITY (MBH)	OUTPUT CAPACITY (MBH)	EAT-DB	LAT-DB	MAX APD (IN.WG.)	VENTILATION SUPPLY				OUTSIDE AIR SUPPLY			RETURN AIR			EXHAUST AIR									
				TSP	ESP					TSP	ESP							TOTAL MBH	SENS MBH	EAT DB/WB	LAT DB/WB	DB/WB	DB/WB	SQUARE FEET															AIR FLOW (CFM)	DB °F	WB °F	PD (IN WG)	AIR FLOW (CFM)	DB °F	WB °F	AIR FLOW (CFM)	DB °F	WB °F	ESP (IN WG)	AIR FLOW (CFM)	DB °F	WB °F	ERV PD (IN WG)	(LBS)	
DOAS-1	TRANE	HORIZON HEAT PUMP-OAK	5,500	2.0	3.46	1	4.14	5	5,500	2.18	1	1	3.12	5	460/3/60	148.8	143.2	150	303	193.1	79/66	47/47	70/56	72/57	22.1	0.22	208	8	86	8	68	-	54.3	93.2	.02	5,500	79.8	66.7	.94	5,847	95	74	5,500	75	64	1.0	5,847	89.9	71.6	.94	8,500	1,2,3,4, 5,6,7
DOAS-2	TRANE	HORIZON HEAT PUMP-OABG	900	2.45	1.5	1	0.55	2	900	1.78	1	1	0.42	2	460/3/60	18.6	16.7	25	41.8	27.6	78/66	50/49	70/56	71/58	3.51	0.15	25.9	58.6	83	8	50	40	58.6	99.6	.08	900	78.4	66	.58	1,040	95	74	900	75	64	1.0	1,040	91.4	72.4	.58	2,200	1,2,3,4, 5,6,7
DOAS-3	TRANE	HORIZON HEAT PUMP-OABG	900	2.45	1.5	1	0.55	2	900	1.78	1	1	0.42	2	460/3/60	18.6	16.7	25	41.8	27.6	78/66	50/49	70/56	71/58	3.51	0.15	25.9	58.6	83	8	50	40	58.6	99.6	.08	900	78.4	66	.58	1,040	95	74	900	75	64	1.0	1,040	91.4	72.4	.58	2,200	1,2,3,4, 5,6,7
DOAS-4	TRANE	HORIZON HEAT PUMP-OADN	7,430	3.8	2.0	1	6.76	7.5	7,430	2.18	1	1	3.12	7.5	460/3/60	148.8	143.2	150	363.1	239.7	79/66	49/49	70/58	72/59	22.1	0.33	258	71.1	82.9	8	68 KW	-	54.3	83.2	.03	7,435	79.8	66	.92	7,800	95	74	7,435	75	64	1.0	7,800	89.9	71.7	.92	8,500	1,2,3,4, 5,6,7

NOTES:

1. BASED ON TRANE.
2. UNITS SHALL HAVE ENERGY WHEELS.
3. UNIT CONTROLS SHALL BE FURNISHED BY UNIT MANUFACTURER. REFER TO SPEC SECTION 230900.
4. FURNISH UNITS WITH SINGLE POINT POWER CONNECTION.
5. FURNISH WITH VFD AND DISCONNECT SWITCH.
6. VFD SHALL BE PROVIDE AND INSTALLED FROM THE MANUFACTURER..
7. PROVIDE WITH INDIRECT CONDENSATE DRAINS WITH AN AIRGAP.

DEDICATED OUTSIDE AIR DEHUMIDIFICATION UNIT SCHEDULE

TAG	ENERGY RECOVERY WHEEL (WINTER)												SUMMER WHEEL RATING (MBH)			WINTER WHEEL RATING (MBH)		
	VENTILATION SUPPLY				OUTSIDE AIR SUPPLY			RETURN AIR				EXHAUST AIR						
	AIR FLOW	DB °F	WB °F	PD (IN WG)	AIR FLOW	DB °F	WB °F	AIR FLOW	DB °F	WB °F	ESP (IN WG)	AIR FLOW	DB °F	WB °F	ERV PD (IN WG)	TOTAL CAPACITY	SENSIBLE CAPACITY	LATENT CAPACITY	TOTAL CAPACITY	SENSIBLE CAPACITY	LATENT CAPACITY
DOAS-1	5,500	54.3	47.9	.94	5,847	8	8	5,500	70	58	1.0	5,847	25.5	25.3	.94	145.2	86.9	58.3	390.1	269.6	120.5
DOAS-2	900	58.6	50.7	.58	1,040	8	8	900	70	58	1.0	1,040	21.3	21.2	.58	26.19	15.67	10.52	70.15	48.42	21.73
DOAS-3	900	58.6	50.7	.58	1,040	8	8	900	70	58	1.0	1,040	21.3	21.2	.58	26.19	15.67	10.52	70.15	48.42	21.73
DOAS-4	7,435	54.3	47.9	.92	7,800	8	8	7,435	70	58	1.0	7,800	25.4	25.2	.92	196.87	117.77	79.10	528.7	365.35	163.36

AIR HANDLING UNIT SCHEDULE

SYMBOL	SUPPLY FAN					MIN OUTSIDE AIR (CFM)	COOLING					ELECTRICAL		HEATING								MFGR	MODEL	FILTERS	NOTES
	TOTAL CFM	ESP	TSP	HP	BHP		CAPACITY TOTAL (MBH)	CAPACITY SENS. (MBH)	EAT db/wb (°F)	LAT db°F	LAT wb°F	AMBIENT (°F)	VOLTS/Ø	FLA	HEATING CAPACITY (MBH)	EAT db°F	LAT db°F	EWT °F	LWT °F	WPD (FT)	GPM				
AHU-1	11095	--	3.3	7.5	--	2220	358	245	78/65	57.8	44	95	460/60/3	21.22	430	--	--	--	--	--	--	TRANE	UCCAG21	2" PLEATED MERV 8	1,2,3,4,5
AHU-2	2900	--	3.2	3.0	--	580	221	127	74/50	50.7	50.3	95	460/60/3	5.02	257	--	--	--	--	--	--	TRANE	UCCAG10	2" PLEATED MERV 8	1,2,3,4,5
AHU-3	1200	--	2.4	1.5	--	1015	102	57.5	91/74	47	46.8	95	460/60/3	3.6	106	8	90	180	152	.87	7.78	TRANE	UCCAG06	2" PLEATED MERV 8	1,2,3,4,5
AHU-4	2000	--	2.57	2.0	--	1830	120	84	74/52	52.51	52.03	95	460/60/3	3.62	177	--	--	--	--	--	--	TRANE	UCCAG08	2" PLEATED MERV 8	1,2,3,4,5

NOTES:
1. BASED ON TRANE. CONTRACTOR SHALL VERIFY PERFORMANCE, SIZE, SPACE AND ELECTRICAL REQUIREMENTS.
2. CONTRACTOR TO CONFIRM THAT UNITS ARE TO BE FURNISHED IN EITHER DOWNFLOW OR SIDE DISCHARGE CONFIGURATION. UNIT SHALL BE PROVIDED WITH VIBRATION ISOLATED CURBS, ECONOMIZER AND BAROMETRIC RELIEF, DEMAND CONTROL VENTILATION, UNIT MOUNTED CIRCUIT BREAKER, POWERED CONVENIENCE OUTLET, BAC-TALK COMMUNICATIONS INTERFACE, FREEZE-STAT, CLOGGED FILTER SWITCH, FAN FAILURE SWITCH, DUCT MOUNTED SMOKE DETECTORS SHALL BE INSTALLED IN ACCORDANCE WITH NFPA-72 REQUIREMENTS. PROVIDE WITH VFD PER ELECTRICAL REQUIREMENTS. CONTRACTOR SHALL PROVIDE DUCT MOUNTED STATIC PRESSURE SENSORS FOR VFD OPERATION.
3. PROVIDE WITH MIXING SECTION AND MOTORIZED DAMPERS FOR RETURN AIR AND OUTSIDE AIR.
4. MECHANICAL CONTRACTOR TO PROVIDE VFD DRIVES AND AIR VENTS ON THE HEATING AND COOLING COILS. COORDINATE WITH ELECTRICAL CONTRACTOR.
5. MECHANICAL CONTRACTOR TO INSTALL DUCT SMOKE DETECTORS. COORDINATE WITH ELECTRICAL CONTRACTOR.

ELECTRIC UNIT HEATER SCHEDULE

TAG	MANUFACTURER	MODEL	NOMINAL CFM	ELECTRICAL V/Ø/Hz	ELECTRIC HEAT			
					CAPACITY (KW)	TEMPERATURE RISE (°F)	AMPS	REMARKS
EUH -1	KING-ELECTRIC	KB4803-3MP-B2	400	208/3/60	3.0	37	6.3	1,2,3,4
EUH -2	KING-ELECTRIC	KB4803-3MP-B2	400	208/3/60	3.0	37	6.3	1,2,3,4

NOTES:

1. ALL UNITS SHALL BE INTALLED IN ACCORDANCE WITH MANUFACTURER RECOMMENDATION.
2. PROVIDE WITH FACTORY OPTIONS FOR THERMOSTAT AND DISCONNECT.
3. FURNISH WITH SINGLE POINT POWER CONNECTION.
4. PROVIDE WITH WALL HANGING BRACKET.

VRF HEAT RECOVERY BRANCH CIRCUIT CONTROLLER

System Tag	Model Number	Type	Number of Ports	Voltage / Phase	Connected Capacity to BC	Power Cooling 208/230V (kW)	Power Heating 208/230V (kW)	MCA 208/230	Notes / Options
System 2 ALT	TCMBG0106SJ11N4	Single	6	208/230V/1 - phase	91,000.0	0.091/0.118	0.046/0.059	0.55/0.65	1
System 3 ALT	TCMBM0108JA11N4	Main	8	208/230V/1 - phase	197,000.0	0.137/0.176	0.076/0.098	0.83/0.97	1
System 4	TCMBG1012SJ11N4	Single	12	208/230V/1 - phase	153,000.0	0.182/0.235	0.091/0.118	1.1/1.29	1
System 5	TCMBM1016JA11N4	Main	16	208/230V/1 - phase	336,000.0	0.258/0.333	0.137/0.176	1.57/1.82	1
System 6 ALT	TCMBM0108JA11N4	Main	8	208/230V/1 - phase	213,000.0	0.137/0.176	0.076/0.098	0.83/0.97	1
System 8 ALT	TCMBM0108JA11N4	Main	8	208/230V/1 - phase	174,000.0	0.137/0.176	0.076/0.098	0.83/0.97	1
System 9 ALT	TCMBM1012JA11N4	Main	12	208/230V/1 - phase	245,000.0	0.198/0.255	0.106/0.137	1.19/1.39	1
System 10 ALT	TCMBM0108JA11N4	Main	8	208/230V/1 - phase	228,000.0	0.137/0.176	0.076/0.098	0.83/0.97	1
System 11 ALT	TCMBM1012JA11N4	Main	12	208/230V/1 - phase	245,000.0	0.198/0.255	0.106/0.137	1.19/1.39	1
System 1	TCMBG0104SJ11N4	Single	4	208/230V/1 - phase	80,000.0	0.061/0.078	0.3/0.039	0.38/0.44	1

NOTES:
1. INCLUDE DIAMONDBACK BALL VALVES BV-SERIES, 700 PSIG WORKING PRESSURE, FULL PORT, 410A RATED.
2. FOR SUB BC CONTROLLER CMB-P-NU-GB1 OR -GB, THE TOTAL CONNECTABLE INDOOR UNIT CAPACITY CAN BE 126,000 BTUS OR LESS. IF TWO SUB BC CONTROLLERS ARE USED, THE TOTAL INDOOR UNIT CAPACITY CONNECTED TO BOTH SUB BC CONTROLLERS ALSO CANNOT EXCEED 126,000 BTUS. FOR SUB BC CONTROLLER CMB-P1016NU-HB1, THE TOTAL CONNECTABLE INDOOR UNIT CAPACITY CONNECTED TO BOTH SUB CONTROLLERS MUST NOT EXCEED 168,000 BTUS.

PACKAGED ROOFTOP AIR CONDITIONING UNIT SCHEDULE

SYMBOL	SUPPLY FAN			MIN OUTSIDE AIR (CFM)	COOLING				ELECTRICAL			ELECTRIC HEATING	HEAT PUMP					MFGR/ MODEL	NOTES
	TOTAL CFM	TSP	HP		CAPACITY TOTAL (MBH)	CAPACITY SENS. (MBH)	EAT db/wb (°F)	AMBIENT (°F)	VOLTS/Ø	MCA	MOCP	INPUT CAPACITY (KW)	EAT db°F	LAT db°F	CAPACITY (MBH)	EAT db°F	LAT db°F		
RTU-1	7,905	2.0	5.0		250	195	76.8	93	460/3	146	150	72	58.3	86.4	117.1	58.2	74.8	TRANE/ WH200A	1,2,3

NOTES:
1. BASED ON TRANE. CONTRACTOR SHALL VERIFY PERFORMANCE, SIZE, SPACE AND ELECTRICAL REQUIREMENTS OF REPLACEMENT EQUIPMENT AGAINST EXISTING DRAWINGS PRIOR TO ORDERING EQUIPMENT.
2. CONTRACTOR TO CONFIRM THAT UNITS ARE TO BE FURNISHED IN EITHER DOWNFLOW OR SIDE DISCHARGE CONFIGURATION. UNIT SHALL BE PROVIDED WITH VIBRATION ISOLATED CURBS, ECONOMIZER AND BAROMETRIC RELIEF, DEMAND CONTROL VENTILATION, UNIT MOUNTED CIRCUIT BREAKER, POWERED CONVENIENCE OUTLET, BAC-TALK COMMUNICATIONS INTERFACE, FREEZE-STAT, CLOGGED FILTER SWITCH, FAN FAILURE SWITCH, DUCT MOUNTED SMOKE DETECTORS SHALL BE INSTALLED IN ACCORDANCE WITH PA-72 REQUIREMENTS. PROVIDE WITH VFD PER ELECTRICAL REQUIREMENTS, CONTRACTOR SHALL PROVIDE DUCT MOUNTED STATIC PRESSURE SENSORS FOR VFD OPERATION.
3. PROVIDE WITH MIXING SECTION AND MOTORIZED DAMPERS FOR RETURN AIR AND OUTSIDE AIR.

Project Title:

ADDITION & ALTERATIONS TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

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VARIABLE REFRIGERANT VOLUME – AIR–COOLED CONDENSING UNIT SCHEDULE (1ST FLOOR)

TAG:ROOM	BASIS OF DESIGN (DAIKIN)	NOMINAL TONNAGE	DESCRIPTION	COOLING CAPACITY		HEATING CAPACITY		REFRIGERANT CHARGE		CONNECTION RATIO (%)	ELECTRICAL												DIMENSIONS		EFFICIENCY (NonDucted/Ducted or Spedific Combo)						
											VOLTAGE-PHASE	MIN CIRCUIT AMPS (MCA)				MAX OVERCURRENT PROTECTION (MOP)				RUNNING CURRENT (RLA)				(WxHxD) (inch)	(WEIGHT) (lbs)							
				BTU/h	AMBIENT DESIGN(°F DB)	BTU/h	AMBIENT DESIGN (°F DB/WB)	Factory Charge (lbs)	Add'l Refrigerant (lbs)			mod #1	mod #2	mod #3	total	mod #1	mod #2	mod #3	total	mod #1	mod #2	mod #3	total			EER	IEER	COP47	COP17	SCHE		
ACCU-1	REYQ96AATJA	8	Air cooled heat recovery(1)	90,892	95.0	92,301	30.0/29.0	25.8	24.6	108.6	208-230V 3ph	34.1			34.1	35.0			35.0	15.2			15.2	48.8x65.4x30.1	709.9	14.6/12.8	30/25.3	4.3/3.56	2.48/2.25	26.1/21.1		

NOTES:

1. PROVIDE INTEGRAL DRAIN PAN DEFROST
2. PROVIDE BACNET GATEWAY FOR ATC CONTROL INTEGRATION

VARIABLE REFRIGERANT VOLUME – ZONE HEAT RECOVERY DEVICE SCHEDULE (1ST FLOOR)

TAG	BASIS OF DESIGN (DAIKIN)	CONDENSING UNIT SERVED	VOLTAGE-PHASE	MIN CIRCUIT AMPS (MCA)	MAX OVERCURRENT PROTECTION (MOP)	MAX CAPACITY (per Port)	DIMENSIONS (WxHxD inch)	WEIGHT (lbs)	ZONE SERVED	Options & Accessories	
BS-1	BSF8QS4TVJ	ACCU-1	208-230V 1ph	0.8	15.0	54,000	23.3 x 9.5 x 23.7	81.6		KHFP26A100CA (1)	

NOTES:

1. NO CONDENSATE OR CONDENSATE DRAIN PANS REQUIRED

MITSUBISHI ELECTRIC TRANE HVAC US: CITY MULTI VRF OUTDOOR UNIT SCHEDULE

System Tag	Model Number	COOLING				HEATING				EER2 [EER2]	Nom.System Connected Capacity (% of NOM)	Preliminary Added Refrid.Charge (See Note 5)	Max Pipe Length from BC or 1st Joint (feet)	ELECTRICAL-Per Module				Notes / Options
														208/230 or [460V]				
		Nominal Cooling Capacity (BTUH)	Corrected Cooling Total Capacity (BTUH)	Design Cooling Outdoor Temp DB (°F)	Cooling Efficiency ((EER [SEER]	Nominal Heating Capacity (BTUH)	Corrected Heating Total Capacity (BTUH)	Design Heating Outdoor Temp WB (°F)	Heating COP @ 47°F [HSPF]					MCA 208/230 or [460V]	MOCP	Voltage / Phase	RFS	
CU-1	TRUZA024H4A70NA	24,000	24,887.1	86.0	0 [13.6]	26,000	15,170.6	5.1	0 [8.5]	0[]	100.0 %	0.0	0.0	19	26	208/230V / 1-phase	25	1,2,3,4,5
CU-2	TURYH096SAN4OAN	96,000	99,272.0	86.0	23.2 / 13.65	108,000	108,004.9	5.1	4.010	0	94.8 %	13.2	0.0	44/40	70/60	208/230V / 3-phase 3-wire	70/60	1,2,3,4,5
CU-3	TURYH192SBN4OAN	192,000	197,886.5	86.0	22.25 / 12.7	215,000	215,042.1	5.1	3.740	0	102.6 %	26.6	0.0	44/40, 44/40	70/60, 70/60	208/230V / 3-phase 3-wire	70/60, 70/60	1,2,3,4,5
CU-4	TURYH120SAN4OAN	120,000	133,164.8	86.0	22.05 / 12.85	135,000	129,677.3	5.1	3.810	0	127.5 %	19.9	0.0	47/44	70/60	208/230V / 3-phase 3-wire	70/60	1,2,3,4,5
CU-5	TURYH240SBN4OAN	240,000	268,589.7	86.0	18.85 / 11.45	270,000	259,341.7	5.1	3.460	0	140.0 %	37.6	0.0	47/44, 47/44	70/60, 70/60	208/230V / 3-phase 3-wire	70/60, 70/60	1,2,3,4,5
CU-6	TURYH240SBN4OAN	240,000	243,824.8	86.0	18.85 / 11.45	270,000	256,672.4	5.1	3.460	0	88.8 %	28.7	0.0	47/44, 47/44	70/60, 70/60	208/230V / 3-phase 3-wire	70/60, 70/60	1,2,3,4,5
CU-7	TURYH120SAN4OAN	120,000	124,988.4	86.0	22.1 / 13.3	135,000	128,336.2	5.1	4.010	0	90.0 %	6.6	0.0	47/43	70/60	208/230V / 3-phase 3-wire	70/60	1,2,3,4,5
CU-8	TURYH192SBN4OAN	192,000	196,659.8	86.0	22.25 / 12.7	215,000	215,009.7	5.1	3.740	0	90.6 %	25.4	0.0	44/40, 44/40	70/60, 70/60	208/230V / 3-phase 3-wire	70/60, 70/60	1,2,3,4,5
CU-9	TURYH240SBN4OAN	240,000	247,273.9	86.0	18.85 / 11.45	270,000	256,892.5	5.1	3.460	0	102.1 %	30.9	0.0	47/44, 47/44	70/60, 70/60	208/230V / 3-phase 3-wire	70/60, 70/60	1,2,3,4,5
CU-10	TURYH240SBN4OAN	240,000	243,824.8	86.0	18.85 / 11.45	270,000	256,672.4	5.1	3.460	0	95.0 %	28.7	0.0	47/44, 47/44	70/60, 70/60	208/230V / 3-phase 3-wire	70/60, 70/60	1,2,3,4,5
CU-11	TURYH240SBN4OAN	240,000	247,273.9	86.0	18.85 / 11.45	270,000	256,892.5	5.1	3.460	0	102.1 %	30.9	0.0	47/44, 47/44	70/60, 70/60	208/230V / 3-phase 3-wire	70/60, 70/60	1,2,3,4,5
CU-AHU-2A	TUHYH192SBN4OAN	192,000	196,659.2	86.0	22.2 / 13.45	215,000	215,009.7	5.1	3.890	0	100.0 %	11.1	0.0	43/40, 43/40	70/60, 70/60	208/230V / 3-phase 3-wire	70/60, 70/60	1,2,3,4,5
CU-AHU-2B	TUHYH192SBN4OAN	192,000	196,659.2	86.0	22.2 / 13.45	215,000	215,009.7	5.1	3.890	0	100.0 %	11.1	0.0	43/40, 43/40	70/60, 70/60	208/230V / 3-phase 3-wire	70/60, 70/60	1,2,3,4,5
System 1	TURYH072SAN4OAN	72,000	76,194.7	86.0	23.25 / 12.5	80,000	52,137.7	5.1	3.925	0	111.1 %	13.2	0.0	38/35	60/50	208/230V / 3-phase 3-wire	60/50	1,2,3,4,5

NOTES:

1. NOMINAL COOLING CAPACITIES ARE BASED ON INDOOR COIL EAT OF 80/67 °F (DB/WB), OUTDOOR OF 95°F (DB).
2. NOMINAL HEATING CAPACITIES ARE BASED ON INDOOR COIL EAT OF 70F (DB), OUTDOOR OF 43°F (WB).
3. EFFICIENCY VALUES FOR EER, IEER, MOCP ARE BASED ON AHRI 1230 TEST METHOD FOR MIXTURE OF DUCTED & NONDUCTED INDOOR UNITS.
4. FOR SYSTEMS WITH MULTIPLE MODULES. REFRIGERANT PIPE DIMENSIONS INDICATE TOTAL SYSTEM COMBINED PIPING DOWNSTREAM OF MODULE TWINNING.
5. ADDED FIELD CHARGE LISTED IS IN ADDITION TO FACTORY CHARGE. THIS MUST BE UPDATED BASED UPON FINAL AS-BUILT PIPING LAYOUT.

Project Title:

ADDITION & ALTERATIONS TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

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Revision: Description: Date: Revised By:

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MECHANICAL SCHEDULES

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Drawn By: MZ
Project Number: 22.382

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CITY MULTI VRF INDOOR UNIT SCHEDULE

System Tag	Room Name	Tag Reference	Model	Type	Nominal Cooling Capacity (BTU/h)	Nominal Heating Capacity (BTU/h)	Cooling Design Entering Temp DB/WB (°F)	Heating Design Entering Temp DB (°F)	Corrected Capacity				Estimated Cooling Coil LAT (°F) / [LWT]	Estimated Heating Coil LAT (°F) / [LWT]	Refrig Pipe Dim Liquid/Suction (inch)	Fan Speed Setting	Peak Fan Airflow (cfm) / [Design gpm G(US)/min]	Max Fan ESP Setting 208V/230V (IN WG)	Voltage / Phase	Power Cooling 208V/230V (kw)	Power Heating 208V/230V (kw)	Electrical MCA/MFS	Condensate Removal Rate (gal/hr)	Notes / Options
									Cooling Diversity Full/Partial (See Note 5, 6)	Cooling Total Capacity (BTU/h)	Cooling Sensible Capacity (BTU/h)	Heating Diversity Full/Partial (See Note 5, 6) / Heating Capacity (BTU/h)												
System 1 ALT	Kitchen Rm 18	VRF-1-A8	TPLA0A0241EA80A	Ceiling-Cassette (Four-Way)	24,000	26,000	80.0/67.0	70	FULL DEMAND	24,887.1	21,043.3	FULL DEMAND	15,170.6	55.5	87.4	3/8 / 5/8	HIGH	810		208/230V/1-phase			Powered by Outdoor	0.42	1,2,3,4,5,6,7
System 2 ALT	Gym Office Rm 2	VRF-1-A1	TPLFYP015EM140B	Ceiling-Cassette (Four-Way)	15,000	17,000	80.0/67.0	70	FULL DEMAND	15,009.2	11,360.8	FULL DEMAND	16,966.5	62.1	96.2	1/4 /1/2	HIGH	600		208/230V/1-phase	0.03	0.02	0.39/0.39/15	0.42	1,2,3,4,5,6,7
System 2 ALT	Lobby Rm 3	VRF-1-A2	TPLFYP012EM140B	Ceiling-Cassette (Four-Way)	12,000	13,500	80.0/67.0	70	FULL DEMAND	12,007.4	9,720.4	FULL DEMAND	13,473.5	64.7	90.8	1/4 /1/2	HIGH	600		208/230V/1-phase	0.03	0.02	0.39/0.39/15	0.26	1,2,3,4,5,6,7
System 2 ALT	Lobby South Rm 4	VRF-1-A3	TPLFYP005FM140A	Ceiling-Cassette (Four-Way)	5,000	5,600	80.0/67.0	70	FULL DEMAND	5,003.1	4,384.5	FULL DEMAND	5,589.0	65.2	88.5	1/4 /1/2	HIGH	280		208/230V/1-phase	0.02	0.02	0.24/0.24/15	0.02	1,2,3,4,5,6,7
System 2 ALT	Music Bandroom Rm 10	VRF-1-A9	TPLFYP030EM140B	Ceiling-Cassette (Four-Way)	30,000	34,000	80.0/67.0	70	FULL DEMAND	30,018.5	21,153.8	FULL DEMAND	33,933.2	55.4	108.7	3/8 / 5/8	HIGH	812		208/230V/1-phase	0.04	0.04	0.57/0.57/15	1.09	1,2,3,4,5,6,7
System 2 ALT	Music Bandroom Rm 10	VRF-1-A10	TPLFYP024EM140B	Ceiling-Cassette (Four-Way)	24,000	27,000	80.0/67.0	70	FULL DEMAND	24,014.8	16,868.2	FULL DEMAND	26,947.0	60.4	100.8	3/8 / 5/8	HIGH	812		208/230V/1-phase	0.04	0.03	0.54/0.54/15	0.85	1,2,3,4,5,6,7
System 2 ALT	Vestibule Rm 8	VRF-1-A4	TPLFYP005FM140A	Ceiling-Cassette (Four-Way)	5,000	5,600	80.0/67.0	70	FULL DEMAND	5,003.1	4,384.5	FULL DEMAND	5,589.0	65.2	88.5	1/4 /1/2	HIGH	280		208/230V/1-phase	0.02	0.02	0.24/0.24/15	0.09	1,2,3,4,5,6,7
System 3 ALT	Science Lab Rm 22	VRF-1-B4	TPLFYP005FM140A	Ceiling-Cassette (Four-Way)	5,000	5,600	80.0/67.0	70	FULL DEMAND	5,004.0	4,384.8	FULL DEMAND	5,491.3	65.2	88.2	1/4 /1/2	HIGH	280		208/230V/1-phase	0.02	0.02	0.24/0.24/15	0.09	1,2,3,4,5,6,7
System 3 ALT	Custodian Office 27	VRF-1-A12	TPLFYP006EM140B	Ceiling-Cassette (Four-Way)	6,000	6,700	80.0/67.0	70	FULL DEMAND	6,004.8	Dependent on 5,088.3	FULL DEMAND	6,569.9	70.3	82.3	1/4 /1/2	HIGH	494		208/230V/1-phase	0.02	0.02	0.24/0.19/15	0.06	1,2,3,4,5,6,7
System 4	Mail/Copy 30	VRF-1-C1	TPLFYP012EM140B	Ceiling-Cassette (Four-Way)	12,000	13,500	80.0/67.0	70	FULL DEMAND	10,444.3	9,129.3	FULL DEMAND	10,219.8	65.6	85.8	1/4 /1/2	HIGH	600		208/230V/1-phase	0.03	0.02	0.39/0.39/15	0.26	1,2,3,4,5,6,7
System 4	Nurse - Rm 31	VRF-1-C2 VRF-1-C3	TPLFYP015FM140A	Ceiling-Cassette (Four-Way)	15,000	17,000	80.0/67.0	70	FULL DEMAND	13,055.4	9,065.9	FULL DEMAND	12,869.3	58.0	100.6	1/4 /1/2	HIGH	390		208/230V/1-phase	0.03	0.03	0.35/0.35/15	0.58	1,2,3,4,5,6,7
System 4	Main Office - Rm 32a	VRF-1-C4	TPLFYP012FM140A	Ceiling-Cassette (Four-Way)	12,000	13,500	80.0/67.0	70	FULL DEMAND	10,444.3	7,428.7	FULL DEMAND	10,219.8	59.1	98.3	1/4 /1/2	HIGH	335		208/230V/1-phase	0.02	0.02	0.29/0.29/15	0.45	1,2,3,4,5,6,7
System 4	Main Office - Rm 32b	VRF-1-C4A	TPLFYP012FM140A	Ceiling-Cassette (Four-Way)	12,000	13,500	80.0/67.0	70	FULL DEMAND	10,444.3	7,428.7	FULL DEMAND	10,219.8	59.1	98.3	1/4 /1/2	HIGH	335		208/230V/1-phase	0.02	0.02	0.29/0.29/15	0.45	1,2,3,4,5,6,7
System 4	Principal 33	VRF-1-C5	TPLFYP005FM140A	Ceiling-Cassette (Four-Way)	5,000	5,600	80.0/67.0	70	FULL DEMAND	4,351.8	4,144.3	FULL DEMAND	4,239.3	66.0	84.0	1/4 /1/2	HIGH	280		208/230V/1-phase	0.02	0.02	0.24/0.24/15	0.09	1,2,3,4,5,6,7
System 4	Corridor 46	AIR HANDLER	TPLFYP015EM140B	Ceiling-Cassette (Four-Way)	15,000	17,000	80.0/67.0	70	FULL DEMAND	13,055.4	10,601.0	FULL DEMAND	12,869.3	63.3	89.9	1/4 /1/2	HIGH	600		208/230V/1-phase	0.03	0.02	0.39/0.39/15	0.42	1,2,3,4,5,6,7
System 4	Ot / Pt 36	VRF-1-C17	TPLFYP005FM140A	Ceiling-Cassette (Four-Way)	5,000	5,600	80.0/67.0	70	FULL DEMAND	4,351.8	4,144.3	FULL DEMAND	4,239.3	66.0	84.0	1/4 /1/2	HIGH	280		208/230V/1-phase	0.02	0.02	0.24/0.24/15	0.09	1,2,3,4,5,6,7
System 4	Changing Room 37	VRF-1-C18	TPLFYP005FM140A	Ceiling-Cassette (Four-Way)	5,000	5,600	80.0/67.0	70	FULL DEMAND	4,351.8	4,144.3	FULL DEMAND	4,239.3	66.0	84.0	1/4 /1/2	HIGH	280		208/230V/1-phase	0.02	0.02	0.24/0.24/15	0.09	1,2,3,4,5,6,7
System 5	Spec Ed 38	VRF-1-C16	TPLFYP008FM140A	Ceiling-Cassette (Four-Way)	8,000	9,000	80.0/67.0	70	FULL DEMAND	6,395.0	5,604.7	FULL DEMAND	6,142.3	63.2	88.1	1/4 /1/2	HIGH	315		208/230V/1-phase	0.02	0.02	0.28/0.28/15	0.25	1,2,3,4,5,6,7
System 5	Corridor 45	IDU-E3	TPLFYP015EM140B	Ceiling-Cassette (Four-Way)	15,000	17,000	80.0/67.0	70	FULL DEMAND	11,990.6	10,196.5	FULL DEMAND	11,602.1	63.9	87.9	1/4 /1/2	HIGH	600		208/230V/1-phase	0.03	0.02	0.39/0.39/15	0.42	1,2,3,4,5,6,7
System 5	Small Conference 47	VRF-1-C9	TPLFYP005FM140A	Ceiling-Cassette (Four-Way)	5,000	5,600	80.0/67.0	70	FULL DEMAND	3,996.9	3,996.9	FULL DEMAND	3,821.9	66.5	82.7	1/4 /1/2	HIGH	280		208/230V/1-phase	0.02	0.02	0.24/0.24/15	0.09	1,2,3,4,5,6,7
System 5	Small Conference 48	VRF-1-C10	TPLFYP005FM140A	Ceiling-Cassette (Four-Way)	5,000	5,600	80.0/67.0	70	FULL DEMAND	3,996.9	3,996.9	FULL DEMAND	3,821.9	66.5	82.7	1/4 /1/2	HIGH	280		208/230V/1-phase	0.02	0.02	0.24/0.24/15	0.09	1,2,3,4,5,6,7
System 5	Small Conference 49	VRF-1-C19	TPLFYP005FM140A	Ceiling-Cassette (Four-Way)	5,000	5,600	80.0/67.0	70	FULL DEMAND	3,996.9	3,996.9	FULL DEMAND	3,821.9	66.5	82.7	1/4 /1/2	HIGH	280		208/230V/1-phase	0.02	0.02	0.24/0.24/15	0.09	1,2,3,4,5,6,7
System 7	Corridor 60	VRF-1-D1	TPLFYP012EM140B	Ceiling-Cassette (Four-Way)	12,000	13,500	80.0/67.0	70	FULL DEMAND	11,996.8	9,716.4	FULL DEMAND	13,473.9	64.7	90.8	1/4 /1/2	HIGH	600		208/230V/1-phase	0.03	0.02	0.39/0.39/15	0.26	1,2,3,4,5,6,7
System 7	Corridor 61	VRF-1-D2	TPLFYP024EM140B	Ceiling-Cassette (Four-Way)	24,000	27,000	80.0/67.0	70	FULL DEMAND	23,993.6	16,859.5	FULL DEMAND	26,947.8	60.4	100.8	3/8 / 5/8	HIGH	812		208/230V/1-phase	0.04	0.03	0.54/0.54/15	0.85	1,2,3,4,5,6,7
System 7	Corridor 62	VRF-1-D4	TPLFYP036EM140B	Ceiling-Cassette (Four-Way)	36,000	40,000	80.0/67.0	70	FULL DEMAND	35,990.4	25,044.3	FULL DEMAND	39,922.6	58.4	103.8	3/8 / 5/8	HIGH	1095		208/230V/1-phase	0.07	0.07	0.92/0.92/15	1.34	1,2,3,4,5,6,7
System 7	Corridor 62	VRF-1-D3	TPLFYP036EM140B	Ceiling-Cassette (Four-Way)	36,000	40,000	80.0/67.0	70	FULL DEMAND	35,990.4	25,044.3	FULL DEMAND	39,922.6	58.4	103.8	3/8 / 5/8	HIGH	1095		208/230V/1-phase	0.07	0.07	0.92/0.92/15	1.34	1,2,3,4,5,6,7
System 8 ALT	Media Room 63	VRF-2-3B	TPLFYP030EM140B	Ceiling-Cassette (Four-Way)	30,000	34,000	80.0/67.0	70	FULL DEMAND	30,024.1	21,156.1	FULL DEMAND	33,933.2	55.4	108.7	3/8 / 5/8	HIGH	812		208/230V/1-phase	0.04	0.04	0.57/0.57/15	1.09	1,2,3,4,5,6,7
System 8 ALT	Media Room 63	VRF-2-4B	TPLFYP024EM140B	Ceiling-Cassette (Four-Way)	24,000	27,000	80.0/67.0	70	FULL DEMAND	24,019.3	16,870.1	FULL DEMAND	26,947.0	60.4	100.8	3/8 / 5/8	HIGH	812		208/230V/1-phase	0.04	0.03	0.54/0.54/15	0.85	1,2,3,4,5,6,7
System 8 ALT	Media Room 63	VRF-2-5B	TPLFYP030EM140B	Ceiling-Cassette (Four-Way)	30,000	34,000	80.0/67.0	70	FULL DEMAND	30,024.1	21,156.1	FULL DEMAND	33,933.2	55.4	108.7	3/8 / 5/8	HIGH	812		208/230V/1-phase	0.04	0.04	0.57/0.57/15	1.09	1,2,3,4,5,6,7
System 8 ALT	Media Room 63	VRF-2-6B	TPLFYP024EM140B	Ceiling-Cassette (Four-Way)	24,000	27,000	80.0/67.0	70	FULL DEMAND	24,019.3	16,870.1	FULL DEMAND	26,947.0	60.4	100.8	3/8 / 5/8	HIGH	812		208/230V/1-phase	0.04	0.03	0.54/0.54/15	0.85	1,2,3,4,5,6,7
System 8 ALT	Media Work 64	VRF-2-1A	TPLFYP012EM140B	Ceiling-Cassette (Four-Way)	12,000	13,500	80.0/67.0	70	FULL DEMAND	12,009.6	9,721.3	FULL DEMAND	13,473.5	64.7	90.8	1/4 /1/2	HIGH	600		208/230V/1-phase	0.03	0.02	0.39/0.39/15	0.26	1,2,3,4,5,6,7
System 8 ALT	Media Computer Lab 65	VRF-2-2B	TPLFYP030EM140B	Ceiling-Cassette (Four-Way)	30,000	34,000	80.0/67.0	70	FULL DEMAND	30,024.1	21,156.1	FULL DEMAND	33,933.2	55.4	108.7	3/8 / 5/8	HIGH	812		208/230V/1-phase	0.04	0.04	0.57/0.57/15	1.09	1,2,3,4,5,6,7
System 8 ALT	3rd Grade Classroom 70	VRF-2-9C	TPLFYP024EM140B	Ceiling-Cassette (Four-Way)	24,000	27,000	80.0/67.0	70	FULL DEMAND	24,019.3	16,870.1	FULL DEMAND	26,947.0	60.4	100.8	3/8 / 5/8	HIGH	812		208/230V/1-phase	0.04	0.03	0.54/0.54/15	0.85	1,2,3,4,5,6,7
System 9 ALT	Social Rm 67	VRF-2-7C	TPLFYP018EM141B	Ceiling-Cassette (Four-Way)	18,000	20,000	80.0/67.0	70	FULL DEMAND	18,014.4	14,479.5	FULL DEMAND	18,642.4	63.2	91.3	1/4 /1/2	HIGH	812		208/230V/1-phase	0.04	0.04	0.54/0.54/15	0.32	1,2,3,4,5,6,7
System 9 ALT	Psych 68	VRF-2-6C	TPLFYP018EM141B	Ceiling-Cassette (Four-Way)	18,000	20,000	80.0/67.0	70	FULL DEMAND	18,014.4	14,479.5	FULL DEMAND	18,642.4	63.2	91.3	1/4 /1/2	HIGH	812		208/230V/1-phase	0.04	0.04	0.54/0.54/15	0.32	1,2,3,4,5,6,7
System 9 ALT	Conference 69	VRF-2-5C	TPLFYP018EM141B	Ceiling-Cassette (Four-Way)	18,000	20,000	80.0/67.0	70	FULL DEMAND	18,014.4	14,479.5	FULL DEMAND	18,642.4	63.2	91.3	1/4 /1/2	HIGH	812		208/230V/1-phase	0.04	0.04	0.54/0.54/15	0.32	1,2,3,4,5,6,7
System 9 ALT	Resource 72	VRF-2-10C	TPLFYP024EM140B	Ceiling-Cassette (Four-Way)	24,000	27,000	80.0/67.0	70	FULL DEMAND	24,019.3	16,870.1	FULL DEMAND	24,949.3	60.4	98.5	3/8 /5/8	HIGH	812		208/230V/1-phase	0.04	0.03	0.54/0.54/15	0.85	1,2,3,4,5,6,7
System 9 ALT	Literacy 76	VRF-2-4C	TPLFYP048EM140B	Ceiling-Cassette (Four-Way)	48,000	54,000	80.0/67.0	70	FULL DEMAND	48,038.5	33,323.5	FULL DEMAND	49,898.6	54.5	107.4	3/8 /5/8	HIGH	1236		208/230V/1-phase	0.11	0.11	1.27/1.27/15	1.81	1,2,3,4,5,6,7
System 9 ALT	Assistant Tech Office	VRF-2-11C	TPLFYP005EM140A	Ceiling-Cassette (Four-Way)	5,000	5,600	80.0/67.0	70	FULL DEMAND	5,004.0	4,384.8	FULL DEMAND	5,174.7	65.2	87.1	1/4 /1/2	HIGH	280		208/230V/1-phase	0.02	0.02	0.24/0.24/15	0.09	1,2,3,4,5,6,7
System 9 ALT	2nd Grade Class 73	VRF-2-12C	TPLFYP030EM140B	Ceiling-Cassette (Four-Way)	30,000	34,000	80.0/67.0	70	FULL DEMAND	30,024.1	21,156.1	FULL DEMAND	31,417.7	55.4	105.9	3/8 /5/8	HIGH	812		208/230V/1-phase	0.04	0.04	0.57/0.57/15	1.09	1,2,3,4,5,6,7
System 9 ALT	2nd Grade Class 74	VRF-2-1C	TPLFYP030EM140B	Ceiling-Cassette (Four-Way)	30,000	34,000	80.0/67.0	70	FULL DEMAND	30,024.1	21,156.1	FULL DEMAND	31,417.7	55.4	105.9	3/8 /5/8	HIGH	812		208/230V/1-phase	0.04	0.04	0.57/0.57/15	1.09	1,2,3,4,5,6,7
System 9 ALT	2nd Grade Class 75	VRF-2-2C	TPLFYP030EM140B	Ceiling-Cassette (Four-Way)	30,000	34,000	80.0/67.0	70	FULL DEMAND	30,024.1	21,156.1	FULL DEMAND	31,417.7	55.4	105.9	3/8 /5/8	HIGH	812		208/230V/1-phase	0.04	0.04	0.57/0.57/15	1.09	1,2,3,4,5,6,7
System 9 ALT	2nd Grade Class 75	VRF-2-3C	TPLFYP024EM140B	Ceiling-Cassette (Four-Way)	24,000	27,000	80.0/67.0	70	FULL DEMAND	24,019.3	16,870.1	FULL DEMAND	24,949.3	60.4	98.5	3/8 /5/8	HIGH	812		208/230V/1-phase	0.04	0.03	0.54/0.54/15	0.85	1,2,3,4,5,6,7
System 10 ALT	5th Grade Class 80	VRF-3-1B	TPLFYP024EM140B	Ceiling-Cassette (Four-Way)	24,000	27,000	80.0/67.0	70	FULL DEMAND	24,019.3	16,870.1	FULL DEMAND	24,947.8	60.4	100.8	3/8 /5/8	HIGH	812		208/230V/1-phase	0.04	0.03	0.54/0.54/15	0.85	1,2,3,4,5,6,7
System 10 ALT	5th Grade Class 80	VRF-3-2B	TPLFYP030EM140B	Ceiling-Cassette (Four-Way)	30,000	34,000	80.0/67.0	70	FULL DEMAND	30,024.1	21,156.1	FULL DEMAND	33,934.2	55.4	108.7	3/8 /5/8	HIGH	812		208/230V/1-phase	0.04	0.04	0.57/0.57/15	1.09	1,2,3,4,5,6,7
System 10 ALT	5th Grade Class 81	VRF-3-3B	TPLFYP036EM140A	Ceiling-Cassette (Four-Way)	36,000	40,000	80.0/67.0	70	FULL DEMAND	36,028.9	25,060.3	FULL DEMAND	39,922.6	58.4	103.8	3/8 /5/8	HIGH	1095		208/230V/1-phase	0.07	0.07	0.92/0.92/15	1.34	1,2,3,4,5,6,7
System 10 ALT	5th Grade Class 82	VRF-3-4B	TPLFYP030EM140B	Ceiling-Cassette (Four-Way)	30,000	34,000	80.0/67.0	70	FULL DEMAND	30,024.1	21,156.1	FULL DEMAND	33,934.2	55.4	108.7	3/8 /5/8	HIGH	812		208/230V/1-phase	0.04	0.04	0.57/0.57/15	1.09	1,2,3,4,5,6,7
System 10 ALT	5th Grade Class 83	VRF-3-5B	TPLFYP030EM140B	Ceiling-Cassette (Four-Way)	30,000	34,000	80.0/67.0	70	FULL DEMAND	30,024.1	21,156.1	FULL DEMAND	33,934.2	55.4	108.7	3/8 /5/8	HIGH	812		208/230V/1-phase	0.04	0.04	0.57/0.57/15	1.09	1,2,3,4,5,6,7
System 10 ALT	Acc. Learning 86	VRF-3-C6	TPLFYP048EM140B	Ceiling-Cassette (Four-Way)	48,000	54,000	80.0/67.0	70	FULL DEMAND	48,038.5	33,323.5	FULL DEMAND	53,895.5	54.5	110.4	3/8 /5/8	HIGH	1236		208/230V/1-phase	0.11	0.11	1.27/1.27/15	1.81	1,2,3,4,5,6,7
System 10 ALT	4th Grade Class 94	VRF-3-7C	TPLFYP030EM140B	Ceiling-Cassette (Four-Way)	30,000	34,000	80.0/67.0	70	FULL DEMAND	30,024.1	21,156.1	FULL DEMAND	33,934.2	55.4	108.7	3/8 /5/8	HIGH	812		208/230V/1-phase	0.04	0.04	0.57/0.57/15	1.09	1,2,3,4,5,6,7
System 11 ALT	Assis. Principal 87	VRF-3-C5	TPLFYP018EM141B	Ceiling-Cassette (Four-Way)	18,000	20,000	80.0/67.0	70	FULL DEMAND	18,014.4	14,479.5	FULL DEMAND	18,608.7	63.2	91.2	1/4 /1/2	HIGH	812		208/230V/1-phase	0.04	0.04	0.54/0.43/15	0.32	1,2,3,4,5,6,7
System 11 ALT	4th Grade Class 88	VRF-3-C4	TPLFYP048EM140B	Ceiling-Cassette (Four-Way)	48,000	54,000	80.0/67.0	70	FULL DEMAND	48,038.5	33,323.5	FULL DEMAND	50,243.4	54.5	107.7	3/8 /5/8	HIGH	1236		208/230V/1-phase	0.11	0.11	1.27/1.27/15	1.81	1,2,3,4,5,6,7
System 11 ALT	Spec Ed 93	VRF-3-C8	TPLFYP012EM140B	Ceiling-Cassette (Four-Way)	12,000	13,500	80.0/67.0	70	FULL DEMAND	12,009.6	9,721.3	FULL DEMAND	12,560.8	64.7	89.4	1/4 /1/2	HIGH	600		208/230V/1-phase	0.03	0.02	0.39/0.39/15	0.26	1,2,3,4,5,6,7
System 11 ALT	Acc. Learning 92	VRF-3-C9	TPLFYP030EM140B	Ceiling-Cassette (Four-Way)	30,000	34,000	80.0/67.0	70	FULL DEMAND	30,024.1	21,156.1	FULL DEMAND	31,634.7	55.4	106.1	3/8 /5/8	HIGH	812		208/230V/1-phase	0.04	0.04	0.57/0.57/15	1.09	1,2,3,4,5,6,7
System 11 ALT	World Language 95	VRF-3-C10	TPLFYP005EM140A	Ceiling-Cassette (Four-Way)	5,000	5,600	80.0/67.0	70	FULL DEMAND	5,004.0	4,384.8	FULL DEMAND	5,210.4	65.2	87.3	1/4 /1/2	HIGH	280		208/230V/1-phase	0.02	0.02	0.24/0.24/15	0.09	1,2,3,4,5,6,7
System 11 ALT	3rd Grade Class 89	VRF-3-C2	TPLFYP024EM140B	Ceiling-Cassette (Four-Way)	24,000	27,000	80.0/67.0	70	FULL DEMAND	24,019.3	16,870.1	FULL DEMAND	25,121.7	60.4	98.7	3/8 /5/8	HIGH	812		208/230V/1-phase	0.04	0.03	0.54/0.54/15	0.85	1,2,3,4,5,6,7
System 11 ALT	3rd Grade Class 89	VRF-3-C3	TPLFYP030EM140B	Ceiling-Cassette (Four-Way)	30,000	34,000	80.0/67.0	70	FULL DEMAND	30,024.1	21,156.1	FULL DEMAND	31,634.7	55.4	106.1	3/8 /5/8	HIGH	812		208/230V/1-phase	0.04	0.04	0.57/0.57/15	1.09	1,2,3,4,5,6,7
System 11 ALT	3rd Grade Class 90	VRF-3-C1	TPLFYP048EM140B	Ceiling-Cassette (Four-Way)	48,000	54,000	80.0/67.0	70	FULL DEMAND	48,038.5	33,323.5	FULL DEMAND	50,243.4	54.5	107.7	3/8 /5/8	HIGH	1236		208/230V/1-phase	0.11	0.11	1.27/1.27/15	1.81	1,2,3,4,5,6,7
System 11 ALT	2nd Grade Class 91	VRF-3-C11	TPLFYP030EM140B	Ceiling-Cassette (Four-Way)	30,000	34,000	80.0/67.0	70	FULL DEMAND	30,024.1	21,156.1	FULL DEMAND	31,634.7	55.4	106.1	3/8 /5/8	HIGH	812		208/230V/1-phase	0.04	0.04	0.57/0.57/15	1.09	1,2,3,4,5,6,7

Vrf Indoor Unit Notes & Options:

1. Nominal cooling capacities are based on indoor coil EAT of 80/67°F (DB/WB), outdoor of 95°F (DB)
2. Nominal heating capacities are based on indoor coil EAT of 70°F (DB), outdoor of 43°F (WB)
3. See outdoor unit schedule for outdoor ambient conditions, connected capacity, and other factors associated with corrected capacities
4. See schematic piping/control diagram for indication of required indoor unit remote controllers, system controllers, and integration devices.
5. Full demand corrected capacity includes de-rate associated with indoor vs. outdoor connected capacity indicated on outdoor unit schedule for associated system.
6. Partial corrected capacity assumes sufficient diversity exists such that the connected capacity de-rate does not apply.
7. Contractor shall provide an integrated condensate pump and wall mounted controller with each ceiling cassette unit.

Project Title:

ADDITION & ALTERATIONS TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

SILVER PETRUCELLI + ASSOCIATES
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311 STATE STREET NEW LONDON CT 06320
203 230 9007 silverpetrucelli.com

Revision: Description: Date: Revised By:

Drawing Title:
MECHANICAL SCHEDULES

Date: 08/29/2024
Scale: AS NOTED
Drawn By: MZ
Project Number: 22.382

Drawing Number:
M403

CONCEALED AIR HANDLER SCHEDULE

SYSTEM	ROOM NAME	MANUFACTURER	MODEL NUMBER	ELECTRICAL DATA				FAN DATA		COOLING DATA					HEATING DATA				CONDENSATE REMOVAL RATE (GAL/h)	REFRIGERANT PIPE Ø LIQUID / SUCTION (in)
				VOLTAGE/Ph	MCA	POWER COOLING (kW)	POWER HEATING (kW)	PEAK AIRFLOW (CFM)	MAX ESP 208V/230V (in WG)	DESIGN ENTERING TEMP DB/WB (°F)	NOMIAL CAPACITY (BTUih)	TOTAL COOLING CAPACITY (BTUih)	SENSIBLE CAPACITY (BTUih)	ESTIMATED LAT (°F)	DESIGN ENTERING TEMP DB/WB (°F)	NOMIAL CAPACITY (BTUih)	HEATING CAPACITY (BTUih)	ESTIMATED LAT (°F)		
3	---	TRANE	TPEFYP018MA145A	208-230/1	2,88	0,082	0,14	833	0,6/0,6	80,0/67,0	18,000	18,014.4	16,961.9	61,9	70,0	20,000	19,960,7	91,0	0,11	1⁄4 / 1⁄2
3	---	TRANE	TPEFYP024MA144A	208-230/1	2,88	0,142	0,14	833	0,6/0,6	80,0/67,0	24,000	24,019.3	19,221.2	59,4	70,0	27,000	26,947,0	98,3	0,82	3/8 / 5/8
4	CORRIDOR 46	TRANE	TPVFYP018AM141A	208-230/1	3,00	0,130	0,13	585	0,3/0,5	80,0/67,0	18,000	17,995.2	13,702.1	57,9	70,0	20,000	19,961,3	101,6	0,50	1⁄4 / 1⁄2
5	CORRIDOR 45	TRANE	TPVFYP018AM141A	208-230/1	3,00	0,130	0,13	585	0,3/0,5	80,0/67,0	18,000	18,014.4	13,709.6	57,9	70,0	20,000	19,961,3	101,6	0,50	1⁄4 / 1⁄2
5	PRE-K-RM 42	TRANE	TPVFYP018AM141A	208-230/1	3,00	0,130	0,13	585	0,3/0,5	80,0/67,0	18,000	18,014.4	13,709.6	57,9	70,0	20,000	19,961,3	101,6	0,50	1⁄4 / 1⁄2
5	PRE-K-RM 42	TRANE	TPVFYP018AM141A	208-230/1	3,00	0,130	0,13	585	0,3/0,5	80,0/67,0	18,000	18,014.4	13,709.6	57,9	70,0	20,000	19,961,3	101,6	0,50	1⁄4 / 1⁄2
5	PRE-K-RM 42	TRANE	TPVFYP018AM141A	208-230/1	3,00	0,130	0,13	585	0,3/0,5	80,0/67,0	18,000	18,014.4	13,709.6	57,9	70,0	20,000	19,961,3	101,6	0,50	1⁄4 / 1⁄2
5	PRE-K-RM 41	TRANE	TPVFYP018AM141A	208-230/1	3,00	0,130	0,13	585	0,3/0,5	80,0/67,0	18,000	18,014.4	13,709.6	57,9	70,0	20,000	19,961,3	101,6	0,50	1⁄4 / 1⁄2
5	PRE-K-RM 41	TRANE	TPVFYP018AM141A	208-230/1	3,00	0,130	0,13	585	0,3/0,5	80,0/67,0	18,000	18,014.4	13,709.6	57,9	70,0	20,000	19,961,3	101,6	0,50	1⁄4 / 1⁄2
5	PRE-K-RM 41	TRANE	TPVFYP018AM141A	208-230/1	3,00	0,130	0,13	585	0,3/0,5	80,0/67,0	18,000	18,014.4	13,709.6	57,9	70,0	20,000	19,961,3	101,6	0,50	1⁄4 / 1⁄2
6	CLASS K-1 50	TRANE	TPEFYP054MA144A	208-230/1	4,38	0,252	0,250	1413	0,6/0,6	80,0/67,0	54,000	54,035.2	38,082.1	54,5	70,0	60,000	58,649,5	108,5	1.75	3/8 / 5/8
6	CLASS K-1 51	TRANE	TPEFYP036MA144A	208-230/1	4,25	0,222	0,220	1271	0,6/0,6	80,0/67,0	36,000	36,023,5	28,398.5	58,9	70,0	40,000	39,099,7	98,5	0,92	3/8 / 5/8
6	CLASS K-1 52	TRANE	TPEFYP054MA144A	208-230/1	4,38	0,252	0,250	1413	0,6/0,6	80,0/67,0	54,000	54,035.2	38,082.1	54,5	70,0	60,000	58,649,5	108,5	1.75	3/8 / 5/8
6	CLASS K-1 53	TRANE	TPEFYP054MA144A	208-230/1	4,38	0,252	0,250	1413	0,6/0,6	80,0/67,0	54,000	54,035.2	38,082.1	54,5	70,0	60,000	58,649,5	108,5	1.75	3/8 / 5/8
1	HALLWAY 98	TRANE	TPEFYP008MA144A	208-230/1	1,75	0,042	0,040	300	0,6/0,6	80,0/67,0	8,000	7,619.5	6,282.4	60,2	70,0	9,000	8,091,3	95,0	0,28	1⁄4 / 1⁄2

Vrf Indoor Unit Notes & Options:

1 Nominal cooling capacities are based on indoor coil EAT of 80/67°F (DB/WB), outdoor of 95°F (DB)
2 Nominal heating capacities are based on indoor coil EAT of 70°F (DB), outdoor of 43°F (WB)
3 See outdoor unit schedule for outdoor ambient conditions, connected capacity, and other factors associated with corrected capacities
4 See schematic piping/control diagram for indication of required indoor unit remote controllers, system controllers, and integration devices.
5 Full demand corrected capacity includes de-rate associated with indoor vs. outdoor connected capacity indicated on outdoor unit schedule for associated system,
6 Partial corrected capacity assumes sufficient diversity exists such that the connected capacity de-rate does not apply,
7 It is the designer's responsibility to ensure "Diamond System Builder" is set in the appropriate output capacity setting (full demand/partial demand) prior to generating this schedule,
8 It is recommended to always base heating corrected capacity on full demand,

Project Title:

ADDITION & ALTERATIONS TO:
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311 STATE STREET NEW LONDON CT 06320
203 230 9007 silverpetrucelli.com

Revision: Description: Date: Revised By:

Drawing Title:
MECHANICAL SCHEDULES

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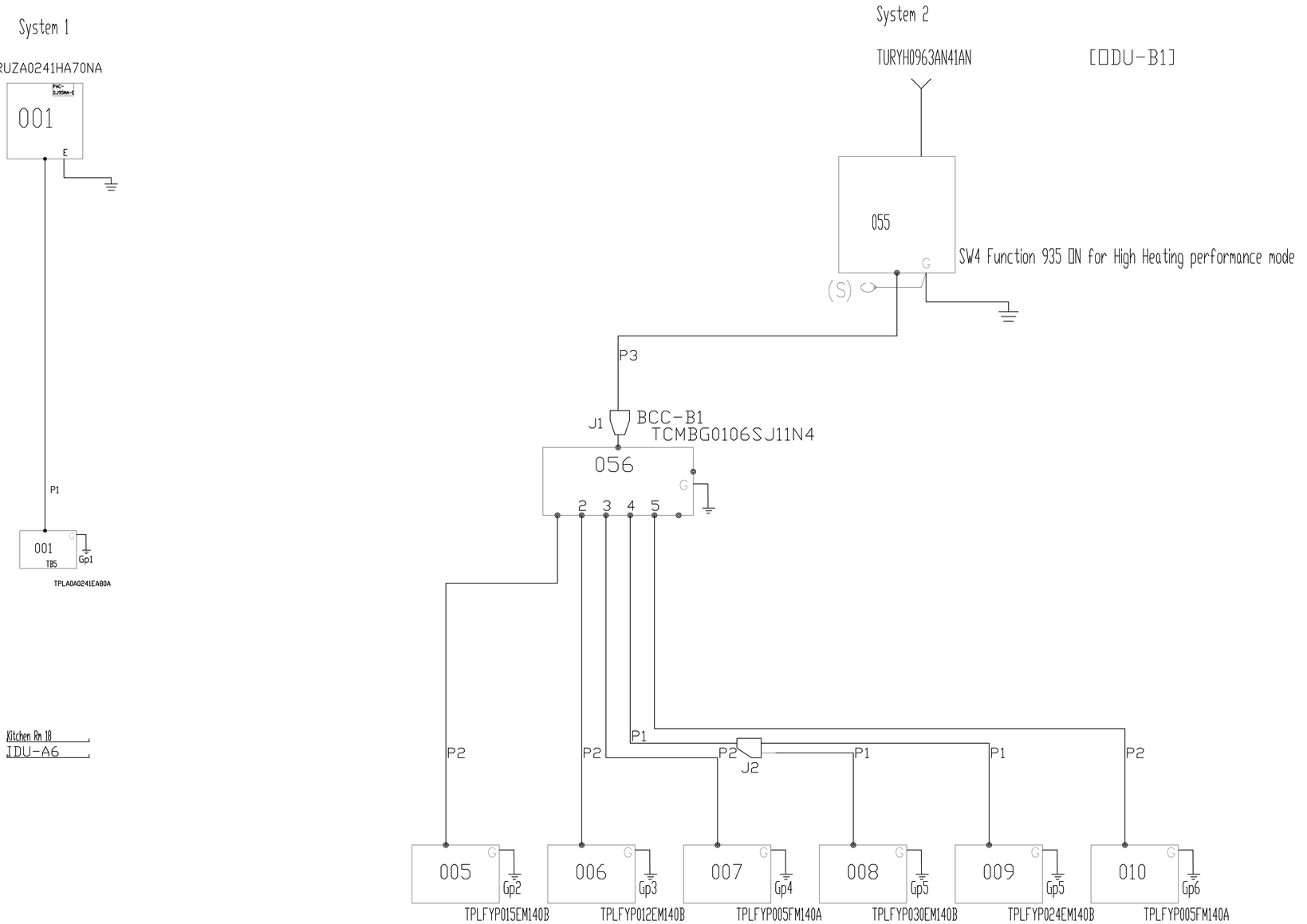
Drawn By: MZ
Project Number: 22.382

Drawing Number:
M404



PIPING AND CONTROLS		
SYMBOL	BRANCH PIPE MODEL NAME	
J1	CMY-R301S-G	
J2	CMY-Y102SS-G2	
J3	CMY-R200NCBK	
J4	CMY-R302S-G1	
J5	CMY-R160-J1	
SYMBOL	LIQUID PIPE/GAS PIPE SIZE	
P1	3/8	/ 5/8
P2	1/4	/ 1/2
P3	3/4	/ 7/8
P4	3/4	/
P5		/ 7/8
P6	3/8	/ 3/4
P7	7/8	/ 1-1/8
P8	3/4	/ 1-1/8
SYMBOL	MODEL NUMBER	
MA	TAR-40MAAU	
MA	TAR-41MAAU	

Project Title:

ADDITION & ALTERATIONS TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

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Revision:	Description:	Date:	Revised By:

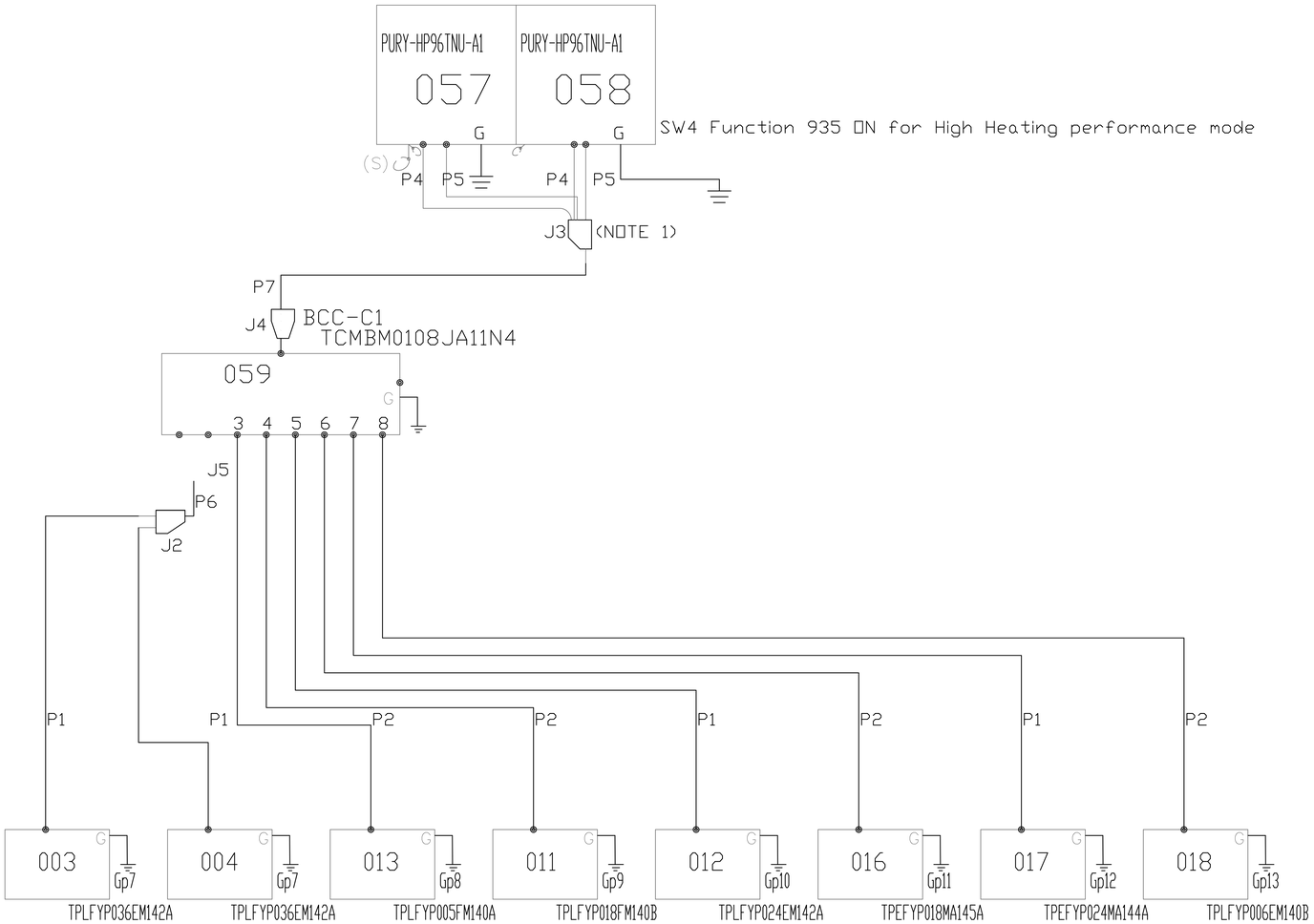
Drawing Title:
MECHANICAL REFRIGERANT SYSTEMS

Date: 08/29/2024
Scale: AS NOTED
Drawn By: MZ
Project Number: 22.382

Drawing Number: M500

System 3

TURYH1923BN41AN



PIPING AND CONTROLS		
SYMBOL	BRANCH PIPE MODEL NAME	
J1	CMY-R301S-G	
J2	CMY-Y102SS-G2	
J3	CMY-R200NCBK	
J4	CMY-R302S-G1	
J5	CMY-R160-J1	
SYMBOL	LIQUID PIPE/GAS PIPE SIZE	
P1	3/8	/ 5/8
P2	1/4	/ 1/2
P3	3/4	/ 7/8
P4	3/4	/
P5		/ 7/8
P6	3/8	/ 3/4
P7	7/8	/ 1-1/8
P8	3/4	/ 1-1/8
SYMBOL	MODEL NUMBER	
MA	TAR-40MAAU	
MA	TAR-41MAAU	

Project Title:

ADDITION & ALTERATIONS TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

SILVER PETRUCELLI + ASSOCIATES
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Revision:	Description:	Date:	Revised By:

Drawing Title:

MECHANICAL REFRIGERANT SYSTEMS

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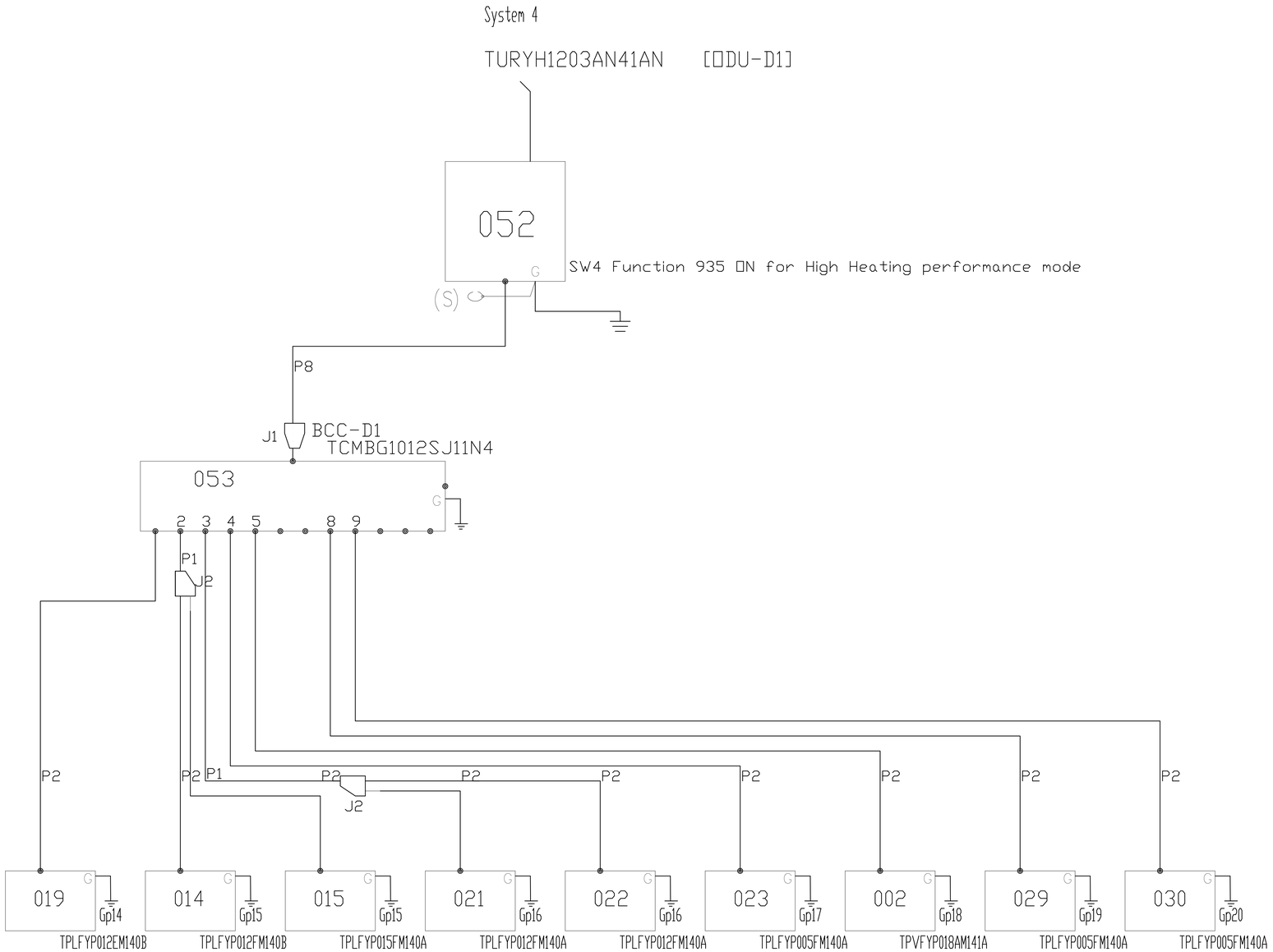
Project Number: 22.382

Drawing Number: M501



PIPING AND CONTROLS	
SYMBOL	BRANCH PIPE MODEL NAME
J1	CMY-R301S-G
J2	CMY-Y102SS-G2
J3	CMY-R200NCBK
J4	CMY-R302S-G1
J5	CMY-R160-J1
SYMBOL	LIQUID PIPE/GAS PIPE SIZE
P1	3/8 / 5/8
P2	1/4 / 1/2
P3	3/4 / 7/8
P4	3/4 /
P5	/ 7/8
P6	3/8 / 3/4
P7	7/8 / 1-1/8
P8	3/4 / 1-1/8
SYMBOL	MODEL NUMBER
MA	TAR-40MAAU
MA	TAR-41MAAU

Project Title:

ADDITION & ALTERATIONS TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

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Revision:	Description:	Date:	Revised By:

Drawing Title:
MECHANICAL REFRIGERANT SYSTEMS

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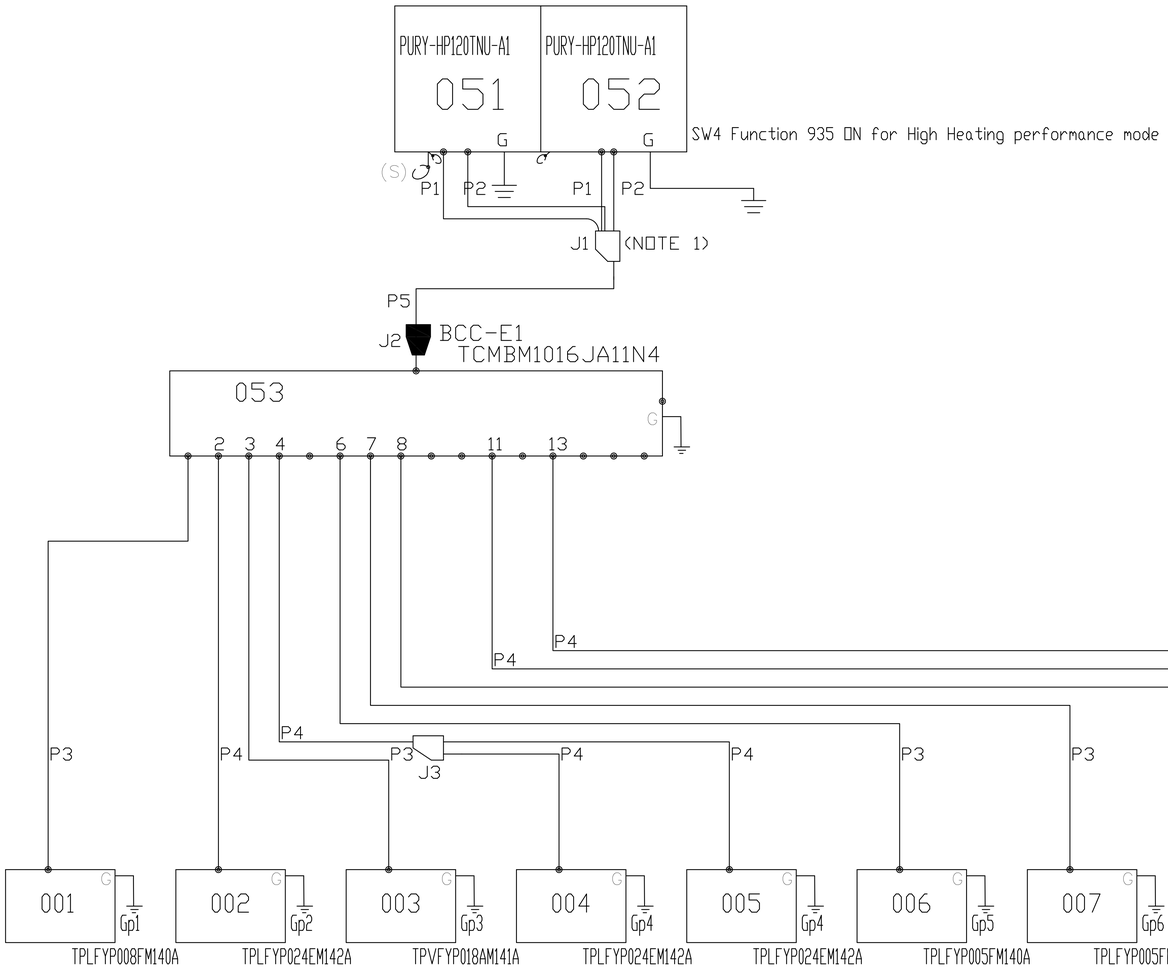
Drawn By: MZ
Project Number: 22.382

Drawing Number: M502

SYSTEM 5



PIPING AND CONTROLS		
SYMBOL	BRANCH PIPE MODEL NAME	
J1	CMY-R200NCBK	
J2	CMY-R302S-G1	
J3	CMY-Y102SS-G2	
J4	CMY-Y102LS-G2	
SYMBOL	LIQUID PIPE/GAS PIPE SIZE	
P1	3/4	/
P2		/ 1-1/8
P3	1/4	/ 1/2
P4	3/8	/ 5/8
P5	7/8	/ 1-3/8
P6		/ 7/8
P7	7/8	/ 1-1/8
P8	3/8	/ 1-1/8
P9	3/8	/ 7/8
P10	3/8	/ 3/4
SYMBOL	MODEL NUMBER	
MA	TAR-40MAAU	
MA	TAR-41MAAU	

Project Title:

ADDITION & ALTERATIONS TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

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Revision:	Description:	Date:	Revised By:

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MECHANICAL REFRIGERANT SYSTEMS

Date: 08/29/2024
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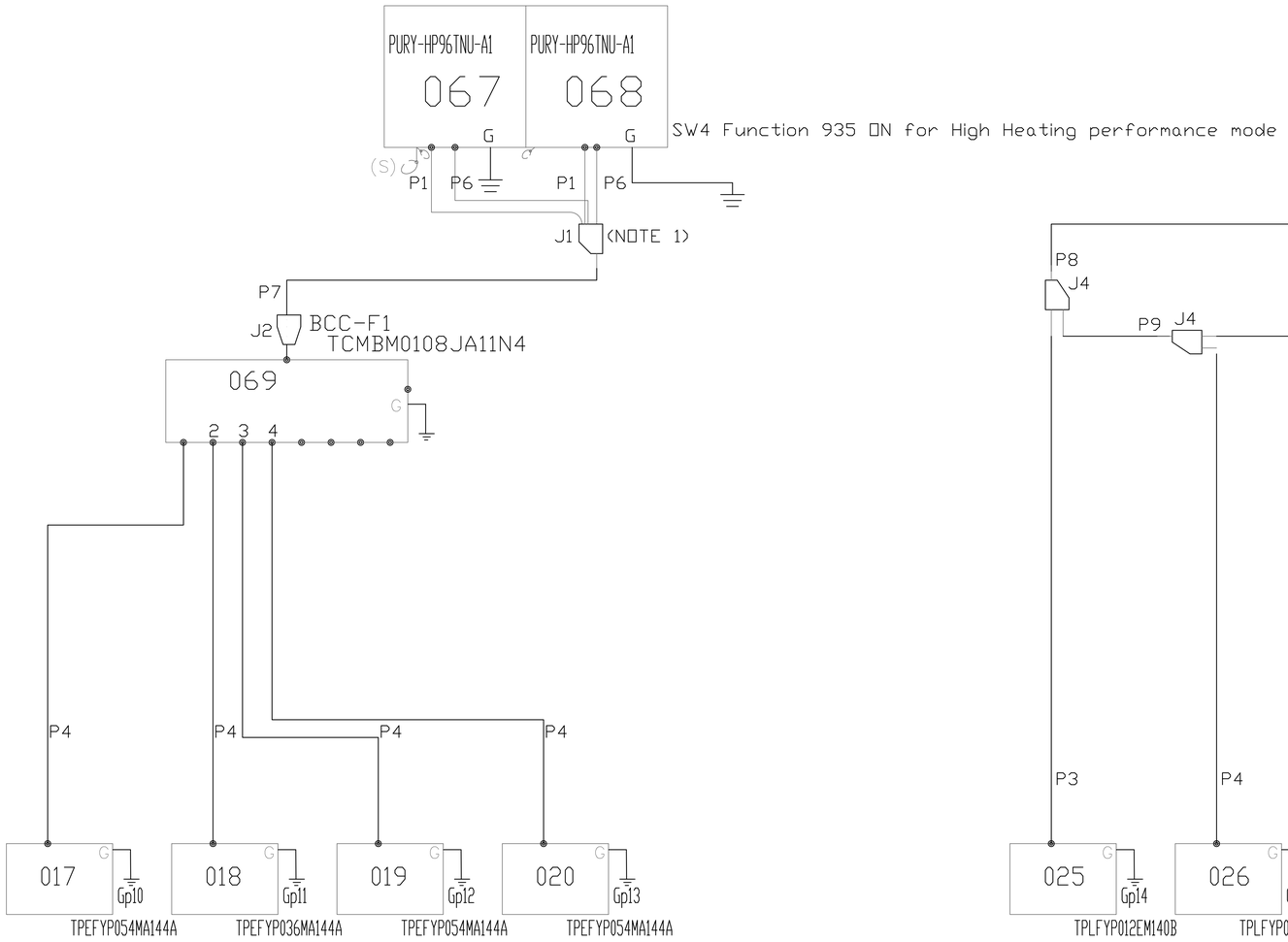
Drawn By: MZ
Project Number: 22.382

Drawing Number:
M503

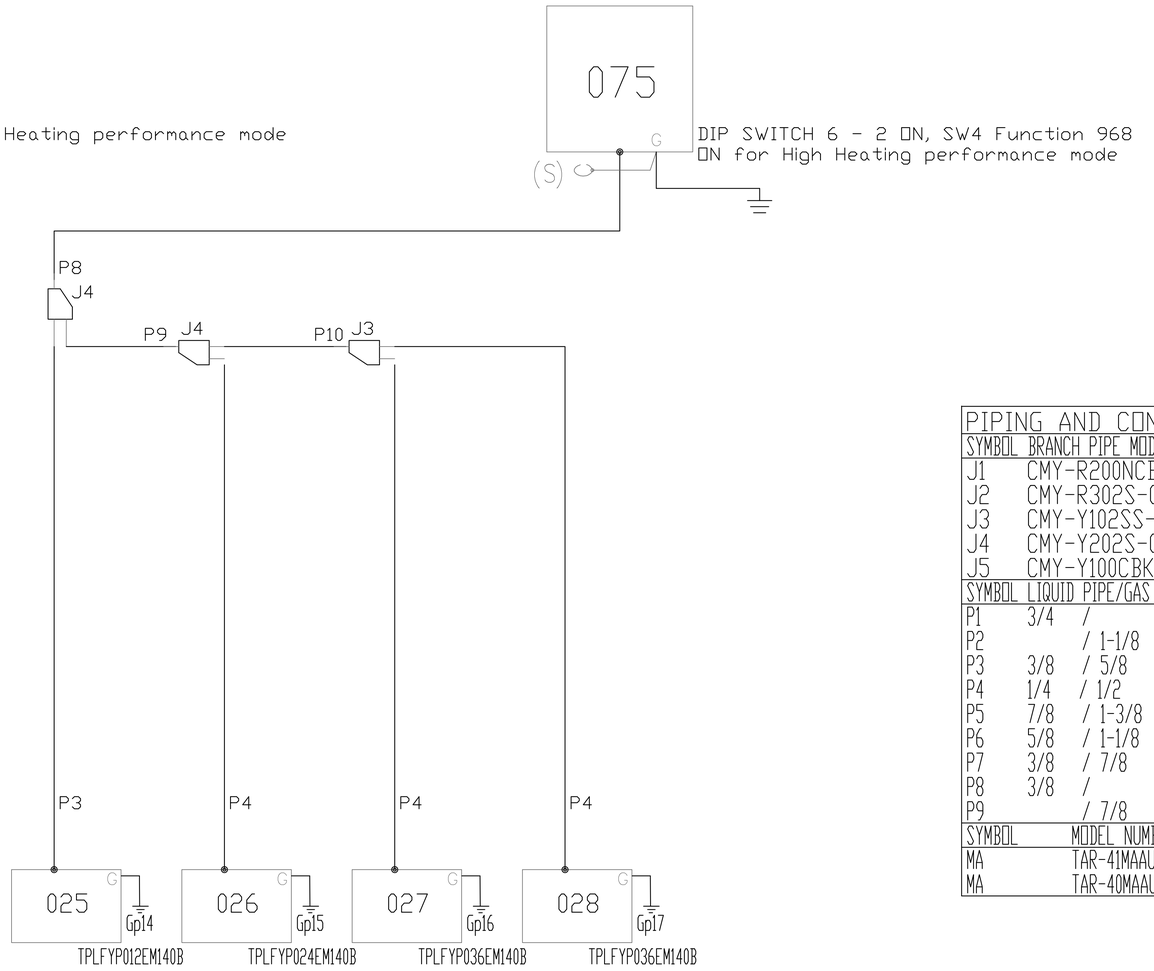
System 6

TURYH1923BN41AN [□DU-F1]



System 7

TUHYH1203AN41AN [□DU-G1]



PIPING AND CONTROLS		
SYMBOL	BRANCH PIPE MODEL NAME	
J1	CMY-R200NCBK	
J2	CMY-R302S-G1	
J3	CMY-Y102SS-G2	
J4	CMY-Y202S-G2	
J5	CMY-Y100CBK3	
SYMBOL	LIQUID PIPE/GAS PIPE SIZE	
P1	3/4	/
P2		/ 1-1/8
P3	3/8	/ 5/8
P4	1/4	/ 1/2
P5	7/8	/ 1-3/8
P6	5/8	/ 1-1/8
P7	3/8	/ 7/8
P8	3/8	/
P9		/ 7/8
SYMBOL	MODEL NUMBER	
MA	TAR-41MAAU	
MA	TAR-40MAAU	

Project Title:

ADDITION & ALTERATIONS TO:
Old Greenwich School
285 SOUND BEACH AVENUE
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MECHANICAL REFRIGERANT SYSTEMS

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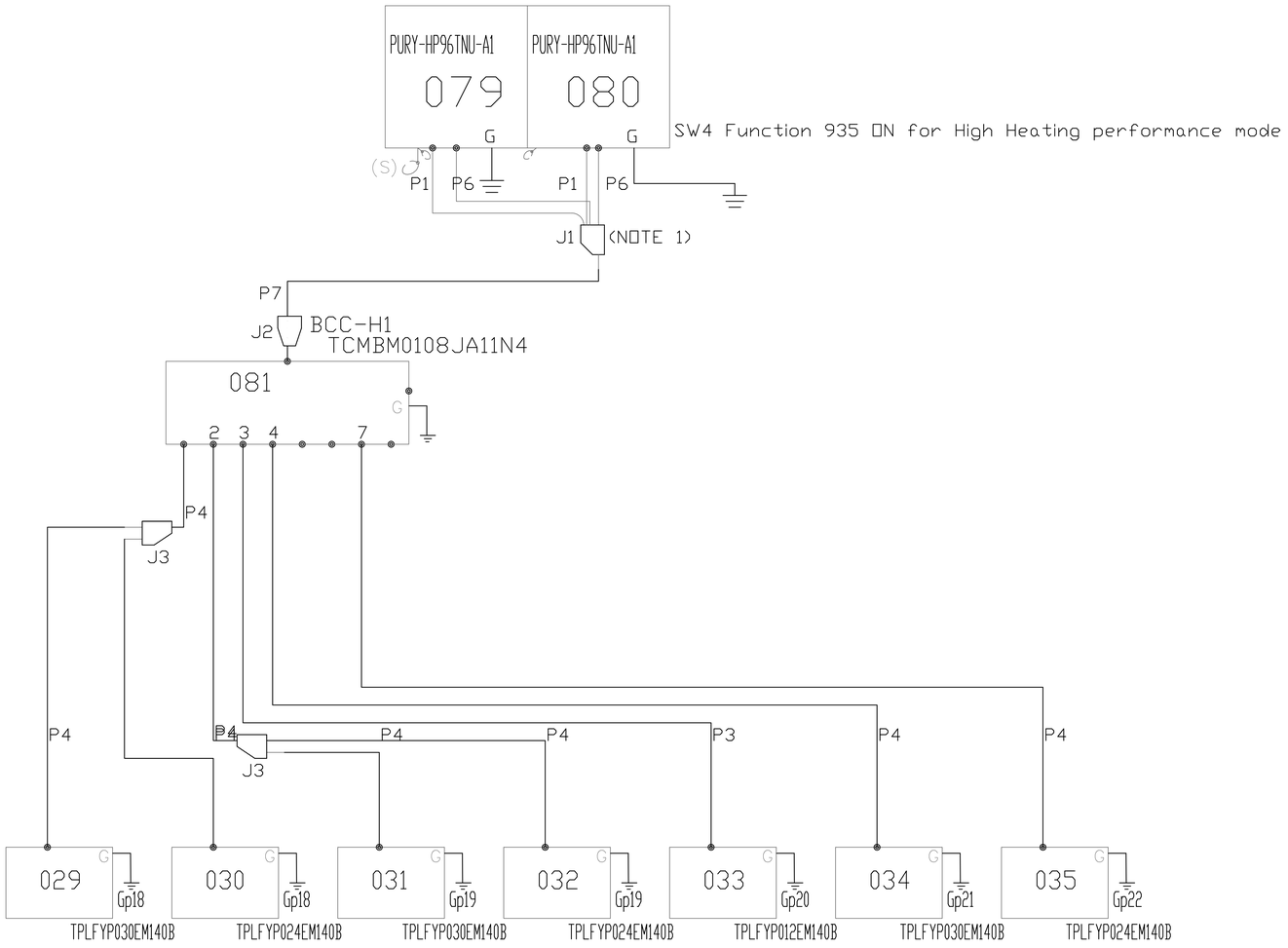
Project Number: 22.382

Drawing Number: M504

System 8

TURYH1923BN41AN [ODU-H1]



PIPING AND CONTROLS		
SYMBOL	BRANCH PIPE MODEL NAME	
J1	CMY-R200NCBK	
J2	CMY-R302S-G1	
J3	CMY-Y102SS-G2	
J4	CMY-Y102LS-G2	
SYMBOL	LIQUID PIPE/GAS PIPE SIZE	
P1	3/4	/
P2		/ 1-1/8
P3	1/4	/ 1/2
P4	3/8	/ 5/8
P5	7/8	/ 1-3/8
P6		/ 7/8
P7	7/8	/ 1-1/8
P8	3/8	/ 1-1/8
P9	3/8	/ 7/8
P10	3/8	/ 3/4
SYMBOL	MODEL NUMBER	
MA	TAR-40MAAU	
MA	TAR-41MAAU	

Project Title:

ADDITION & ALTERATIONS TO:
Old Greenwich School
285 SOUND BEACH AVENUE
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SILVER PETRUCELLI + ASSOCIATES
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Revision:	Description:	Date:	Revised By:

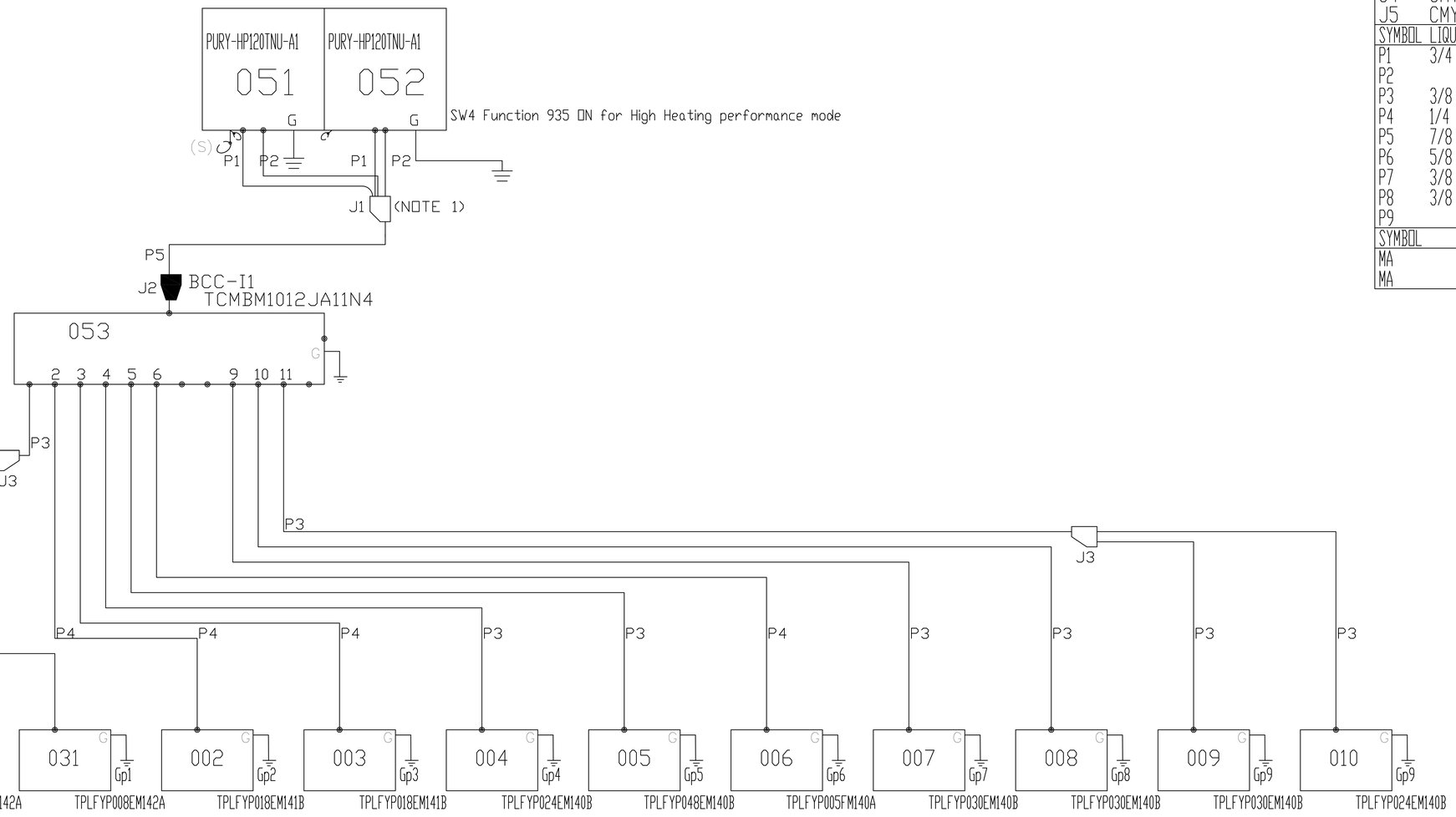
Drawing Title:
MECHANICAL REFRIGERANT SYSTEMS

Date: 08/29/2024
Scale: AS NOTED
Drawn By: MZ
Project Number: 22.382

Drawing Number: M505

System 9

TURYH2403BN41AN [ODU-I1]



PIPING AND CONTROLS		
SYMBOL	BRANCH PIPE MODEL NAME	
J1	CMY-R200NCBK	
J2	CMY-R302S-G1	
J3	CMY-Y102SS-G2	
J4	CMY-Y202S-G2	
J5	CMY-Y100CBK3	
SYMBOL	LIQUID PIPE/GAS PIPE SIZE	
P1	3/4	/
P2		/ 1-1/8
P3	3/8	/ 5/8
P4	1/4	/ 1/2
P5	7/8	/ 1-3/8
P6	5/8	/ 1-1/8
P7	3/8	/ 7/8
P8	3/8	/
P9		/ 7/8
SYMBOL	MODEL NUMBER	
MA	TAR-41MAAU	
MA	TAR-40MAAU	

Project Title:

ADDITION & ALTERATIONS TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

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Revision:	Description:	Date:	Revised By:

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MECHANICAL REFRIGERANT SYSTEMS

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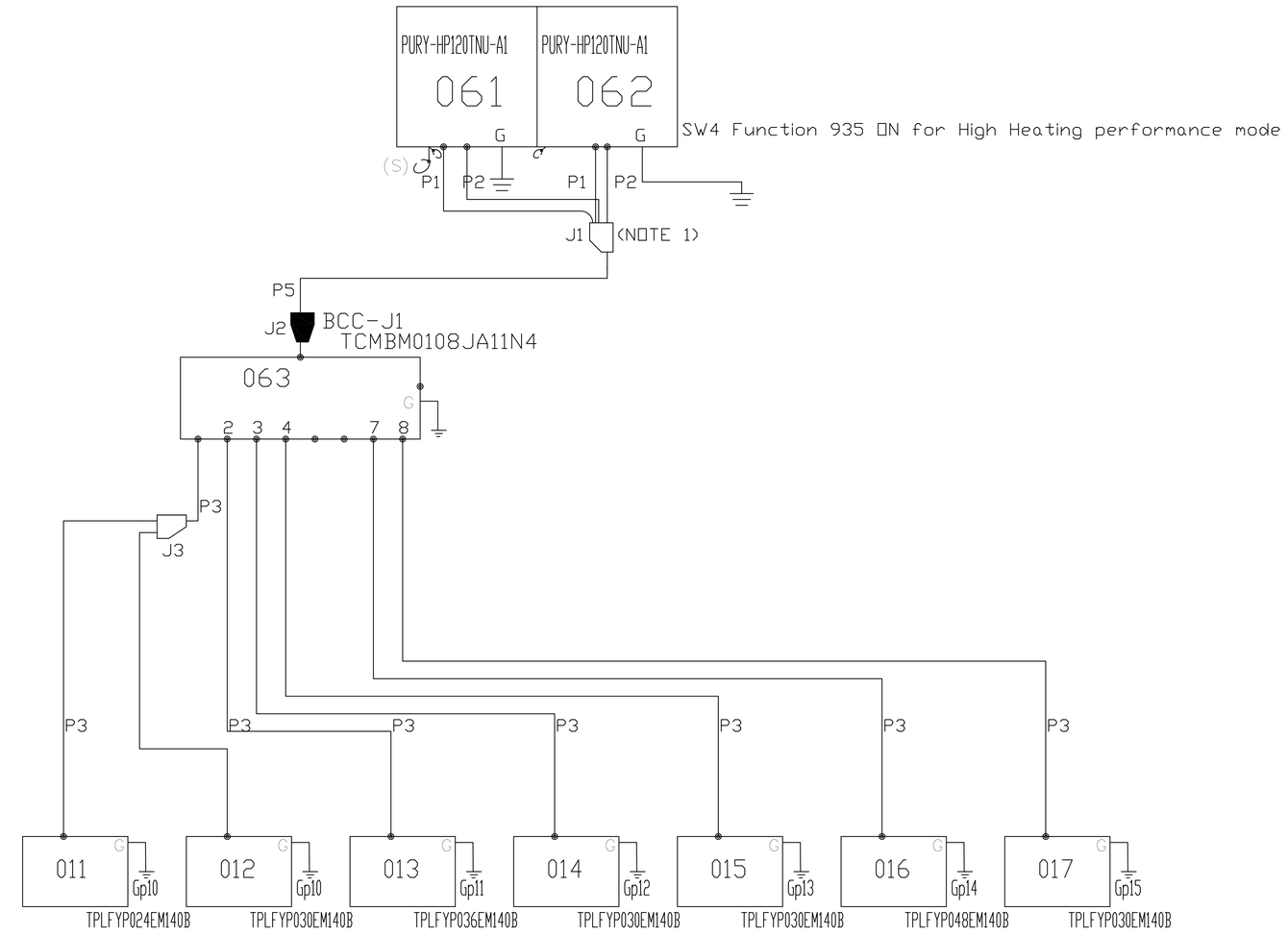
Project Number: 22.382

Drawing Number: M506

SYSTEM 10

TURYH2403BN41AN [ODU-J1]



PIPING AND CONTROLS	
SYMBOL	BRANCH PIPE MODEL NAME
J1	CMY-R200NCBK
J2	CMY-R302S-G1
J3	CMY-Y102SS-G2
J4	CMY-Y202S-G2
J5	CMY-Y100CBK3
SYMBOL	LIQUID PIPE/GAS PIPE SIZE
P1	3/4 /
P2	/ 1-1/8
P3	3/8 / 5/8
P4	1/4 / 1/2
P5	7/8 / 1-3/8
P6	5/8 / 1-1/8
P7	3/8 / 7/8
P8	3/8 /
P9	/ 7/8
SYMBOL	MODEL NUMBER
MA	TAR-41MAAU
MA	TAR-40MAAU

Project Title:

ADDITION & ALTERATIONS TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
311 STATE STREET NEW LONDON CT 06320
203 230 9007 silverpetrucelli.com

Revision:	Description:	Date:	Revised By:

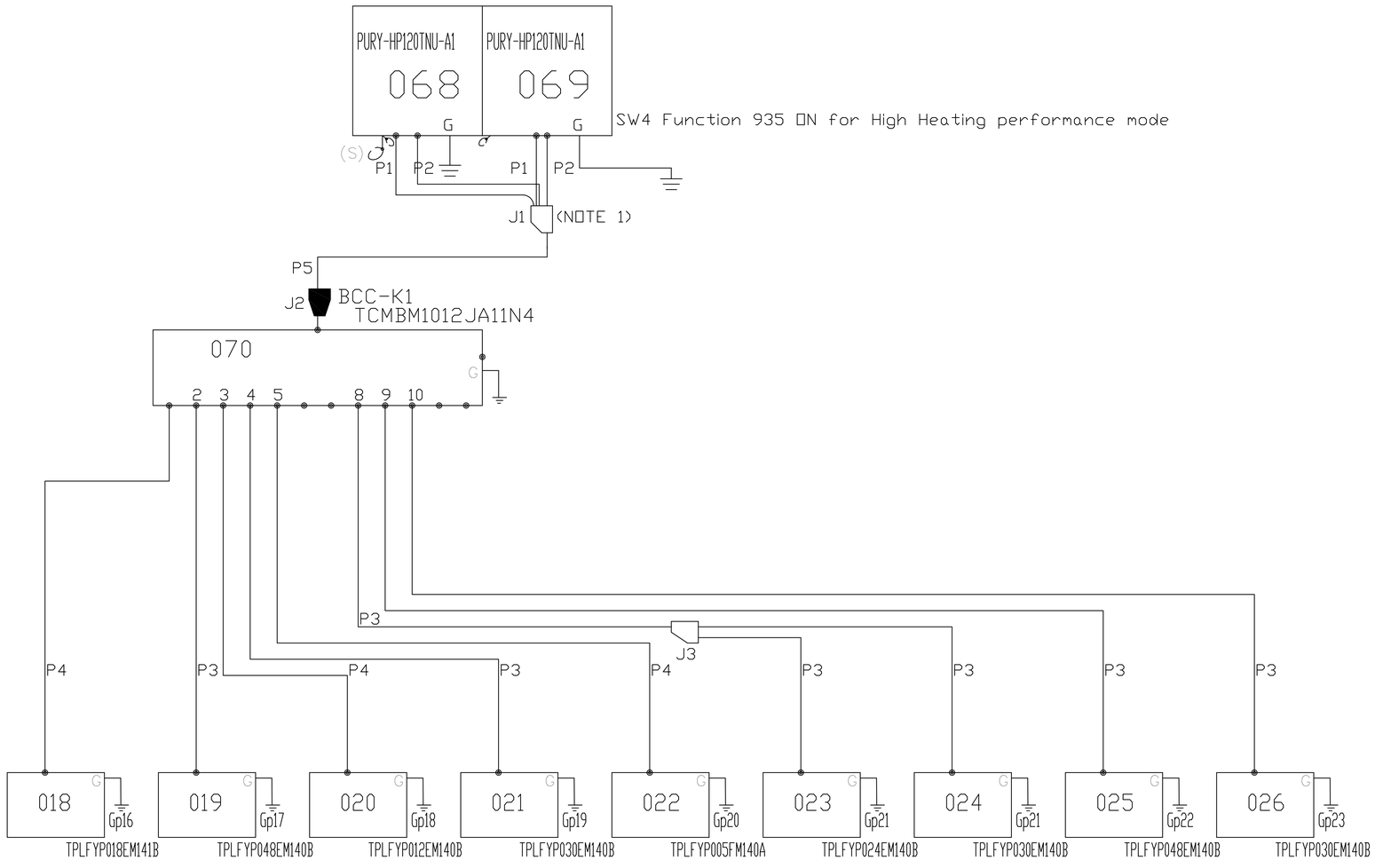
Drawing Title:
MECHANICAL REFRIGERANT SYSTEMS

Date: 08/29/2024
Scale: AS NOTED
Drawn By: MZ
Project Number: 22.382

Drawing Number:
M507

System 11

TURYH2403BN41AN [□DU-K1]



PIPING AND CONTROLS	
SYMBOL	BRANCH PIPE MODEL NAME
J1	CMY-R200NCBK
J2	CMY-R302S-G1
J3	CMY-Y102SS-G2
J4	CMY-Y202S-G2
J5	CMY-Y100CBK3
SYMBOL	LIQUID PIPE/GAS PIPE SIZE
P1	3/4 /
P2	/ 1-1/8
P3	3/8 / 5/8
P4	1/4 / 1/2
P5	7/8 / 1-3/8
P6	5/8 / 1-1/8
P7	3/8 / 7/8
P8	3/8 /
P9	/ 7/8
SYMBOL	MODEL NUMBER
MA	TAR-41MAAU
MA	TAR-40MAAU

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MECHANICAL REFRIGERANT SYSTEMS

Date: 08/29/2024
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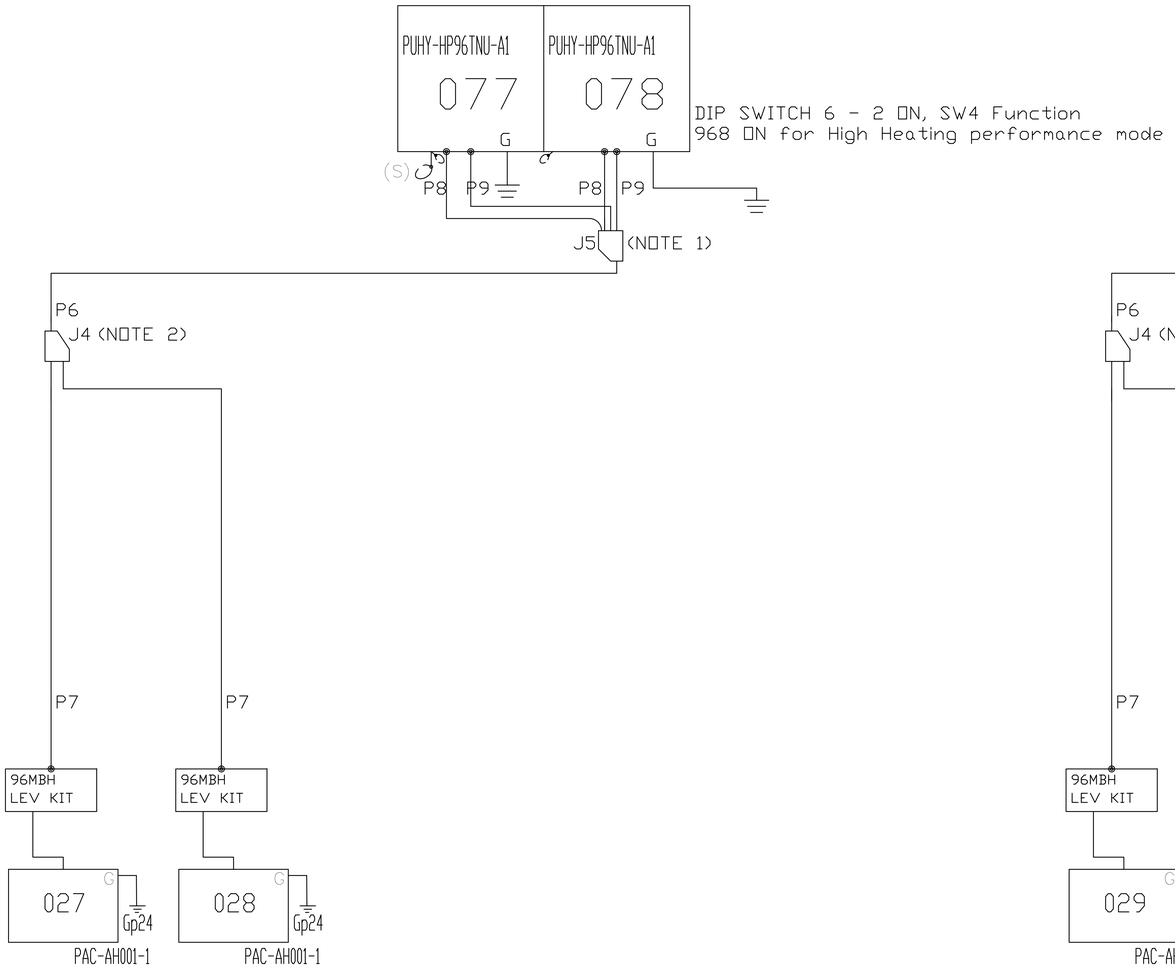
Drawn By: MZ
Project Number: 22.362

Drawing Number: M508

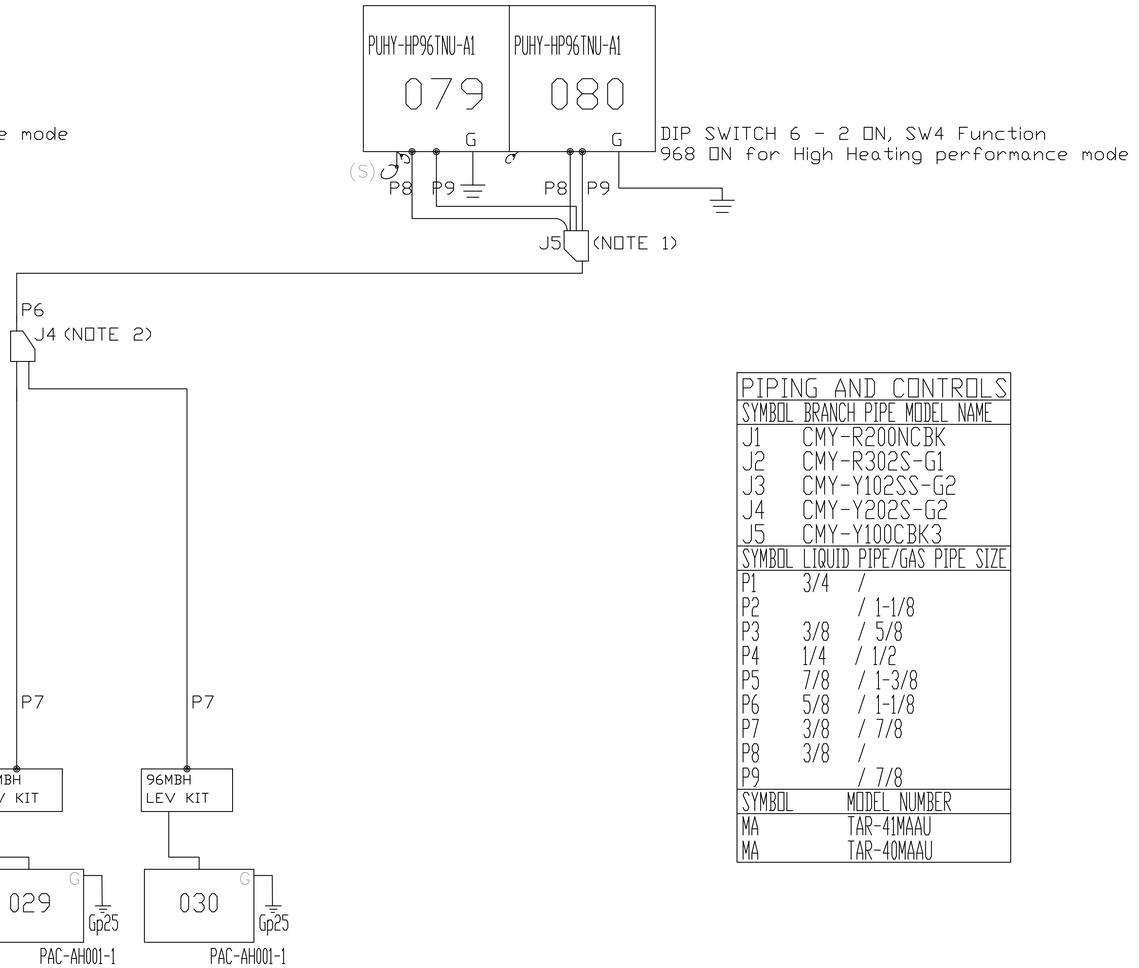
CU-AHU-1A

TUHYH1923BN41AN [CU-AHU-1A]



CU-AHU-1B

TUHYH1923BN41AN [CU-AHU-1B]



PIPING AND CONTROLS	
SYMBOL	BRANCH PIPE MODEL NAME
J1	CMY-R200NCBK
J2	CMY-R302S-G1
J3	CMY-Y102SS-G2
J4	CMY-Y202S-G2
J5	CMY-Y100CBK3
SYMBOL	LIQUID PIPE/GAS PIPE SIZE
P1	3/4 /
P2	/ 1-1/8
P3	3/8 / 5/8
P4	1/4 / 1/2
P5	7/8 / 1-3/8
P6	5/8 / 1-1/8
P7	3/8 / 7/8
P8	3/8 /
P9	/ 7/8
SYMBOL	MODEL NUMBER
MA	TAR-41MAAU
MA	TAR-40MAAU

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MECHANICAL REFRIGERANT SYSTEMS

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Drawn By: MZ
Project Number: 22.382

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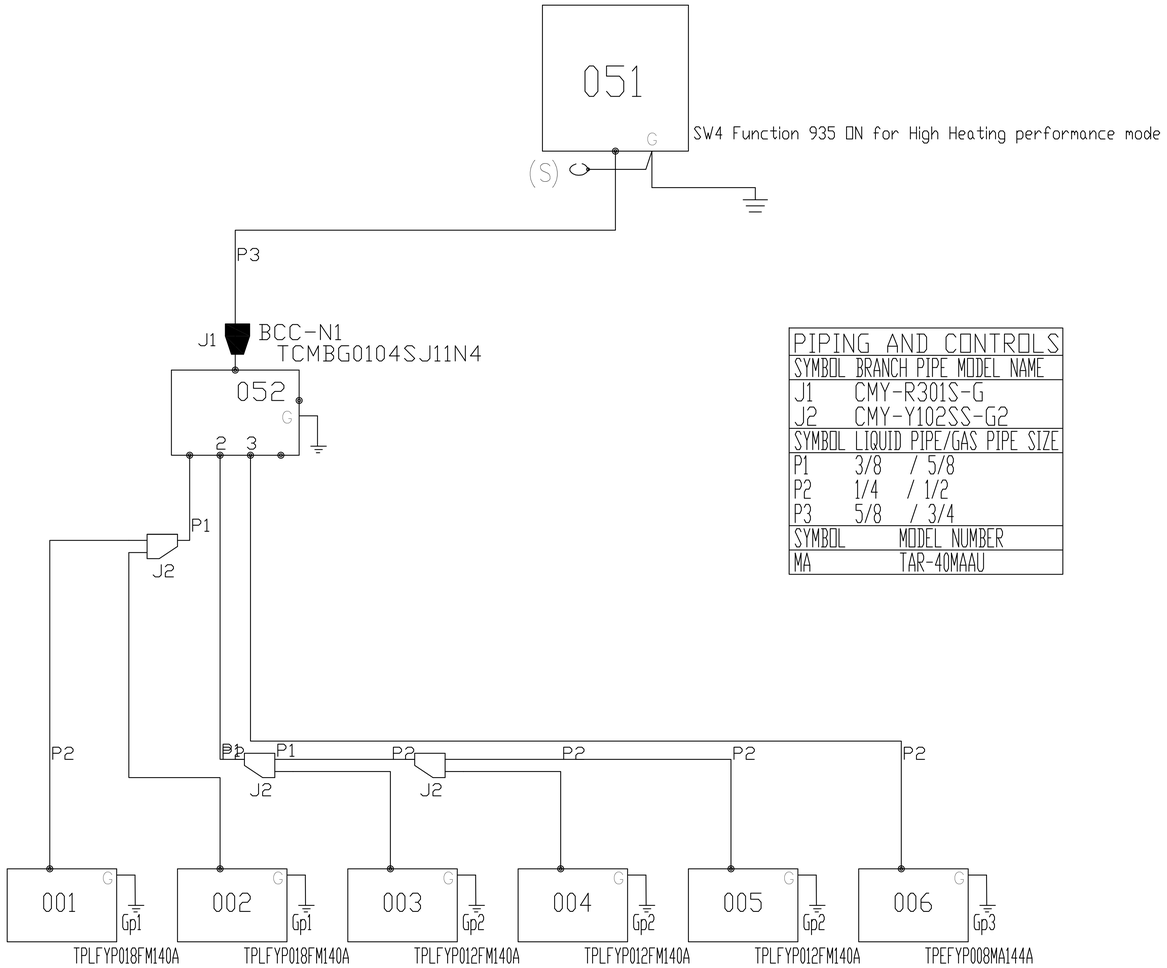

PIPING AND CONTROLS	
SYMBOL	BRANCH PIPE MODEL NAME
J1	CMY-R301S-G
J2	CMY-Y102SS-G2
SYMBOL	LIQUID PIPE/GAS PIPE SIZE
P1	3/8 / 5/8
P2	1/4 / 1/2
P3	5/8 / 3/4
SYMBOL	MODEL NUMBER
MA	TAR-40MAAU

Project Title:

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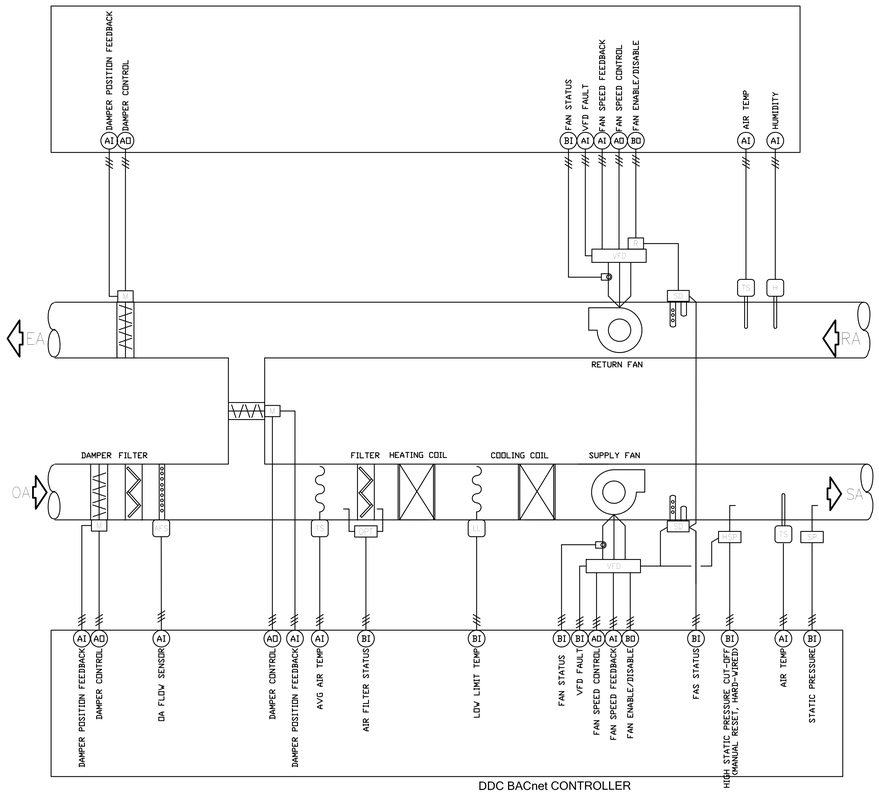
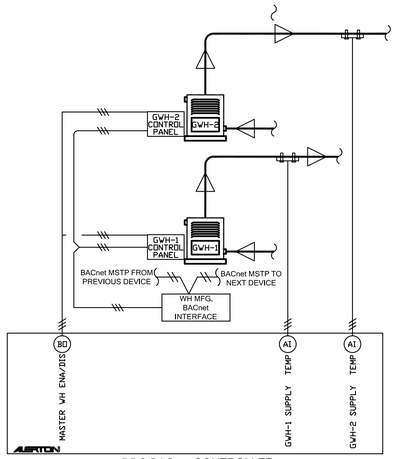


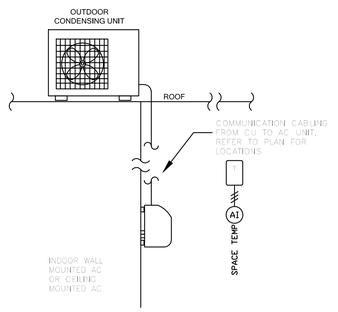
6 M600 AHU WITHOUT ENERGY RECOVERY CONTROL DIAGRAM

SCALE: NTS



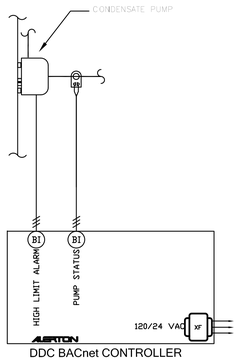
5 M600 DOMESTIC WATER HEATER CONTROL DIAGRAM

SCALE: NTS



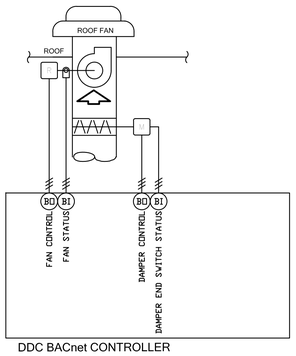
4 M600 DUCTLESS SPLIT SYSTEM CONTROL DIAGRAM

SCALE: NTS



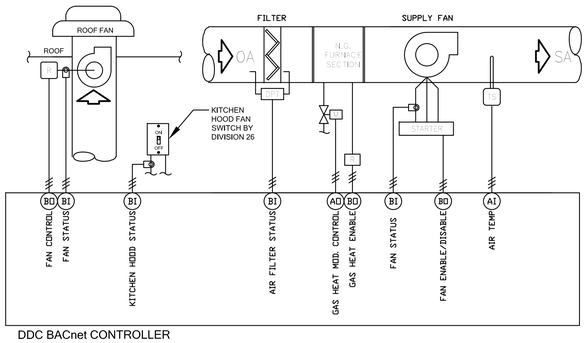
3 M600 CONDENSATE PUMP FOR VRF UNITS CONTROL DIAGRAM

SCALE: NTS



2 M600 TYPICAL EXHAUST CONTROL DIAGRAM

SCALE: NTS



1 M600 KITCHEN HOOD & MUA CONTROL DIAGRAM

SCALE: NTS

Project Title:

ADDITION & ALTERATIONS TO:
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285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

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MECHANICAL CONTROLS SYSTEMS

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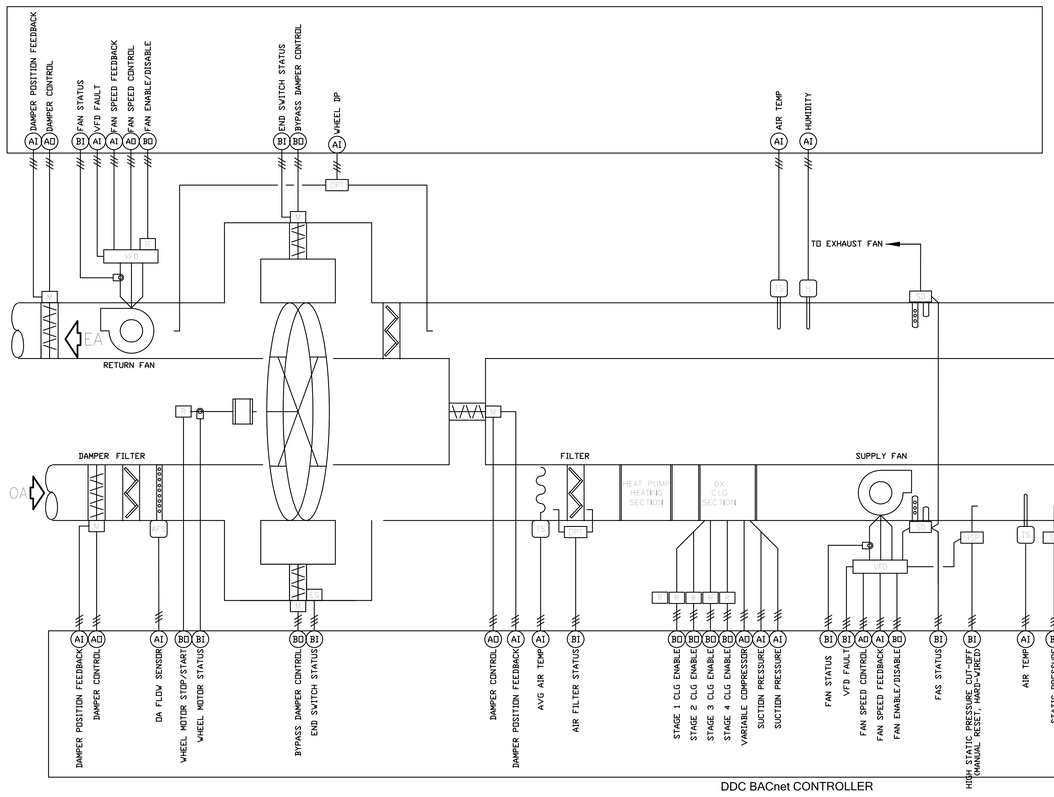
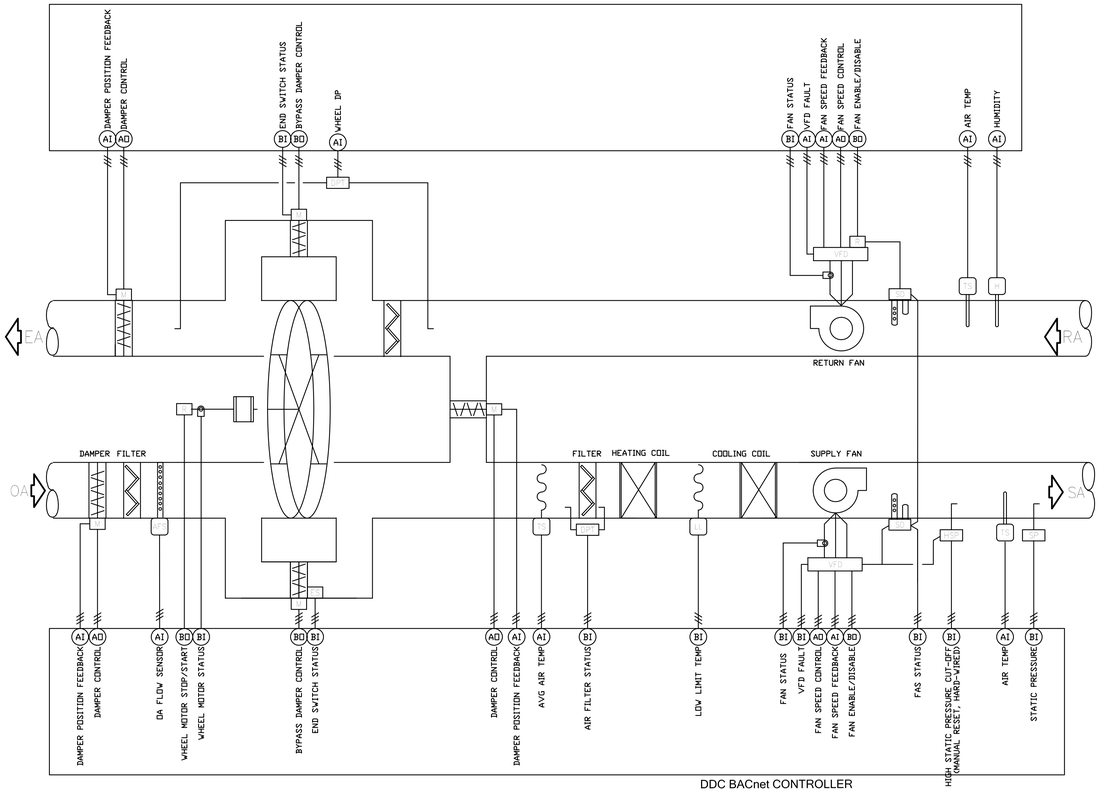
Drawing Number: M600



2 M601 GYMNASIUM RTU WITH HEAT PUMP HEATING AND COOLING CONTROL DIAGRAM

SCALE: NTS



1 M601 AHU WITH ENERGY RECOVERY CONTROL DIAGRAM

SCALE: NTS

Project Title:

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MECHANICAL CONTROLS SYSTEMS

Date: 08/29/2024
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Project Number: 22.382
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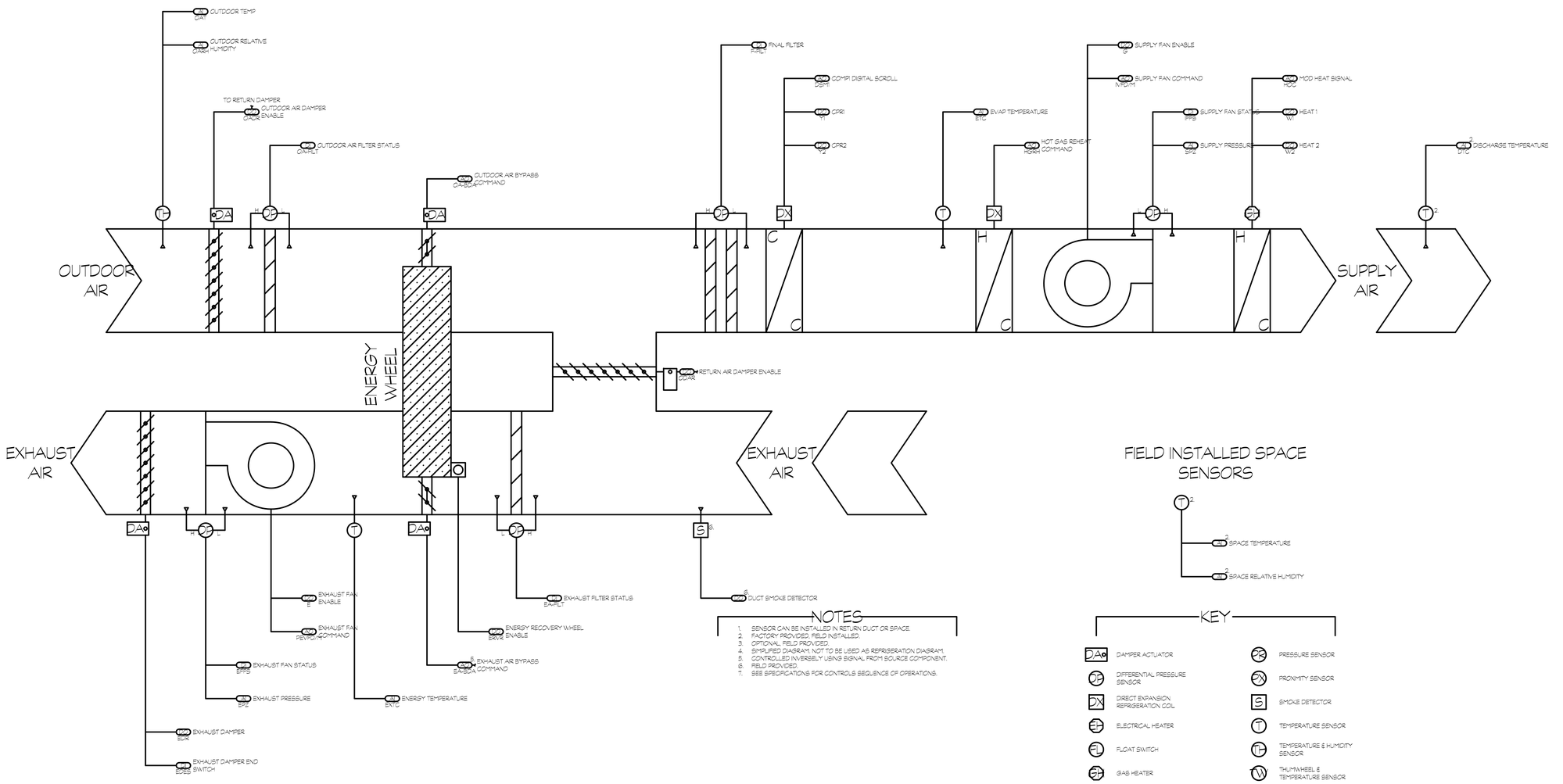

NOTES

1. SENSOR CAN BE INSTALLED IN RETURN DUCT OR SPACE.
2. FACTORY PROVIDED, FIELD INSTALLED.
3. OPTIONAL FIELD PROVIDED.
4. SIMPLIFIED DIAGRAM, NOT TO BE USED AS REFRIGERATION DIAGRAM.
5. CONTROLLED INVERSELY USING SIGNAL FROM SOURCE COMPONENT.
6. FIELD PROVIDED.
7. SEE SPECIFICATIONS FOR CONTROLS SEQUENCE OF OPERATIONS.

FIELD INSTALLED SPACE SENSORS

KEY

- DAMPER ACTUATOR
- DIFFERENTIAL PRESSURE SENSOR
- DIRECT EXPANSION REFRIGERATION COIL
- ELECTRICAL HEATER
- FLOAT SWITCH
- GAS HEATER
- HUMIDITY SENSOR
- PRESSURE SENSOR
- PROXIMITY SENSOR
- SMOKE DETECTOR
- TEMPERATURE SENSOR
- TEMPERATURE & HUMIDITY SENSOR
- THUMWHEEL & TEMPERATURE SENSOR
- VALVE ACTUATOR
- VELOCITY PROBE

1 / M602 **DOAS FLOW DIAGRAM**

SCALE: NTS

Project Title:

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285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

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Revision:	Description:	Date:	Revised By:

Drawing Title:

MECHANICAL CONTROLS SYSTEMS

Date: 08/29/2024
Scale: AS NOTED
Drawn By: MZ
Project Number: 22.362
Drawing Number: M-602

GENERAL NOTES

GENERAL

1. WHEN A CONFLICT BETWEEN THE DRAWINGS, NOTES AND/OR SPECIFICATIONS OCCUR, THE MORE STRINGENT, AND/OR LARGER QUANTITY AND/OR MORE EXPENSIVE SHALL APPLY. THE REQUIREMENTS LISTED WITHIN NOTES OR SPECIFICATIONS SHALL BE REQUIRED, PROVIDED AND INSTALLED WHETHER SPECIFICALLY INDICATED ON THE DRAWINGS OR NOT.\
2. ALL WORK AND ACTION DEPICTED AND DESCRIBED SHALL BE PERFORMED BY THE CONTRACTOR UNLESS SPECIFICALLY NOTED OTHERWISE.
3. REPAIR AND/OR REPLACE AT NO COST TO OWNER ALL EQUIPMENT AND MATERIALS DAMAGED DURING CONSTRUCTION.
4. ALL EQUIPMENT SHALL BE LOCATED IN ACCESSIBLE LOCATIONS. WHEN A PIECE OF EQUIPMENT MUST BE LOCATED ABOVE AN INACCESSIBLE CEILING OR WALL THEN THE APPROPRIATE ACCESS DOOR SHALL BE PROVIDED. THESE SHALL BE COORDINATED WITH THE ARCHITECT.
5. ANY COP REQUEST FOR ELECTRICAL WORK AFTER AWARD MUST BE BASED ON NORMAL NECA COMMERCIAL LABOR UNITS & NATIONAL AVERAGE MATERIAL AMP MATERIAL COST PRICES; NATIONAL AVERAGE AMP DATA BASE FOR MATERIAL AND NECA LABOR RATES MUST BE SUBMITTED TO THE ENGINEER OF RECORD AT THE TIME OF AWARD.

WIRING & RACEWAY:

1. THE DRAWINGS SHOW THE GENERAL LAYOUT AND TYPICAL DETAILS. PROVIDE COMPLETE SYSTEMS. DRAWINGS ARE BASED ON THE SPECIFIED EQUIPMENT, RACEWAY LAYOUTS, BOXES, AND WIRING OF THE SYSTEMS ARE SUBJECT TO APPROVED SHOP DRAWINGS.
2. ENSURE THAT ITEMS TO BE FURNISHED FIT THE SPACE AVAILABLE. MAKE NECESSARY FIELD MEASUREMENTS TO ASCERTAIN SPACE REQUIREMENTS, INCLUDING THOSE FOR CONNECTIONS, AND PROVIDE SUCH SIZES AND SHAPES OF EQUIPMENT THAT FINAL INSTALLATION SHALL SATISFY THE INTENT OF THE DRAWINGS AND SPECIFICATIONS.
3. LOCATIONS OF OUTLETS, SWITCHES, APPLIANCES, ETC. AS SHOWN ON ELECTRICAL PLANS ARE APPROXIMATE; COORDINATE WITH ARCHITECTURAL AND MECHANICAL PLANS AND DETAILS, AND WITH JOB CONDITIONS. INSTALL SWITCHES WITH "OFF" POSITION DOWN. INSTALL RECEPTACLES WITH GROUNDING POLE IN THE UP POSITION FOR VERTICAL MOUNTING AND AT RIGHT FOR HORIZONTAL MOUNTING.
4. LOCATE AND INSTALL ELECTRICAL EQUIPMENT, JUNCTION AND PULL BOXES, PANELBOARDS, SWITCHES, CONTROLS, AND OTHER APPARATUS REQUIRING MAINTENANCE, INSPECTION, AND OPERATION SO AS TO BE READILY ACCESSIBLE.

RACEWAY INSTALLATION:

1. IN ALL ARCHITECTURALLY FINISHED SPACES, CONDUITS AND CABLES SHALL BE RUN CONCEALED IN HUNG OR FURRED CEILINGS, SLABS, MASONRY, AND PARTITIONS UNLESS OTHERWISE INDICATED. SAW CUTTING AND FINISHED PATCHING SHALL BE REQUIRED IN EXISTING SLABS AND MASONRY WALLS. IN UNFINISHED SPACES, RACEWAYS MAY BE RUN EXPOSED.
2. UNLESS OTHERWISE INDICATED, EXACT ROUTING OF RACEWAYS SHALL BE DETERMINED BY THE CONTRACTOR TO SUIT PROJECT REQUIREMENTS AND FIELD CONDITIONS.
3. PROVIDE SEPARATE RACEWAYS, JUNCTION BOXES, PULL BOXES AND WIREWAYS FOR ALL EMERGENCY SYSTEM WIRING.
4. CONTRACTORS SHALL PROVIDE ALL REQUIRED SLEEVES AND SEALS FOR PIPES OR CONDUIT PENETRATING WALLS OR FLOOR SLABS WITH UL LISTED FIRE STOPPING SEALANT WHERE REQUIRED.
5. ELECTRICAL CONDUITS AND BOXES TO BE CONCEALED IN WALLS OR ABOVE CEILING WHEREVER POSSIBLE. WHERE SURFACE CONDUIT IS REQUIRED IT MUST MATCH THE WALL COLOR THAT IT IS BEING ATTACHED TO; REFER TO RACEWAY & BOX SPECIFICATION FOR FURTHER DETAILS.

WIRING INSTALLATION:

1. DO NOT USE WIRE SMALLER THAN NO. 12 AWG FOR ANY POWER OR LIGHTING CIRCUIT. USE LARGER SIZES WHERE INDICATED, AS REQUIRED BY CODES, AND AS FOLLOWS:

   30 AMPERE CIRCUIT: NO. 10
   40 AMPERE CIRCUIT: NO. 8
   50 AMPERE CIRCUIT: NO. 6
   60 AMPERE CIRCUIT: NO. 6

A. MINIMUM HOMERUN AND BRANCH CIRCUIT WIRING SIZES AND MAXIMUM HOMERUN CONDUIT FILL FOR 120 VOLT, 20 AMPERE CIRCUITS SHALL BE AS FOLLOWS:

LENGTH	CIRCUIT WIRE SIZE	HOME RUN WIRE SIZE	CONDUIT SIZE (8 WIRES/CONDUIT)
0' TO 50'	#12	#12	3/4"
51' TO 100'	#12	#10	3/4"
101' TO 200'	#10	#8	1"

GREATER THAN 200' - REQUEST DIRECTION FROM ARCHITECT.

NOTE: PROVIDE DERATING PER CODE WHEN INSTALLING MORE THAN 3 CURRENT CARRYING CONDUCTORS IN CONDUIT.

B. HOME RUNS AND BRANCH CIRCUIT WIRING FOR 277 VOLT, 20 AMPERE CIRCUITS SHALL BE AS FOLLOWS:

LENGTH	CIRCUIT WIRE SIZE	HOME RUN WIRE SIZE	CONDUIT SIZE (8 WIRES/CONDUIT)
0' TO 100'	#12	#12	3/4"
100' TO 200'	#12	#10	3/4"

GREATER THAN 200' - REQUEST DIRECTION FROM ARCHITECT.

NOTE: PROVIDE DERATING PER CODE WHEN INSTALLING MORE THAN 3 CURRENT CARRYING CONDUCTORS IN CONDUIT.

2. DO NOT USE WIRE SMALLER THAN NO. 14 AWG FOR CONTROL CIRCUITS UNLESS OTHERWISE RECOMMENDED BY THE EQUIPMENT OR SYSTEM MANUFACTURER ON WIRING SHOP DRAWINGS, AND SO APPROVED BY THE ARCHITECT.
3. WHERE GREATER THAN THREE (3) CURRENT-CARRYING CONDUCTORS ARE INSTALLED IN ANY ONE CONDUIT OR CABLE, CONDUCTORS MUST BE DERATED AND SIZES INCREASED, IF NEEDED, TO ACCOMMODATE CONDUCTOR DERATING AS REQUIRED BY NEC ARTICLE 310.
4. CONDUCTORS SHALL BE COMPLETELY INSTALLED AND CONNECTED. PROVIDE ALL TERMINALS, LUGS, AND CONNECTORS TO SUIT THE APPLICATION, AND IN COMPLIANCE WITH EQUIPMENT MANUFACTURERS' RECOMMENDATIONS.
5. UNDER NO CIRCUMSTANCES SHALL ANY SWITCH OR CIRCUIT BREAKER BREAK A NEUTRAL CONDUCTOR.
6. THE CIRCUIT NUMBERS INDICATED ON THE DRAWINGS ARE INTENDED AS A GUIDE FOR PROPER CONNECTION OF CIRCUITS AT PANELS. HOWEVER, IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO ENSURE THAT THE FINAL CIRCUITING WORK FULFILLS THE FOLLOWING CONDITIONS:

A. LOADS ON PANEL BUSSES SHALL BE PHASE-BALANCED AS EVENLY AS POSSIBLE.

GROUNDING INSTALLATION:

1. EQUIPMENT GROUNDING

A. INSTALL AN INSULATED GROUND CONDUCTOR, RUN IN THE RACEWAY WITH THE PHASE CONDUCTORS. FOR EACH FEEDER SERVING: PANELBOARDS, LIGHTING DIMMER BOARDS, MOTOR CONTROL CENTERS, MOTORS, EQUIPMENT AND APPLIANCES UNLESS OTHERWISE NOTED.

B. INCLUDE AN INSULATED GROUND CONDUCTOR IN ALL CONDUIT RUNS CONTAINING SECTIONS OF FLEXIBLE CONDUIT UNLESS OTHERWISE NOTED.

C. INCLUDE AN INSULATED GROUND CONDUCTOR IN ALL BRANCH CIRCUIT RACEWAYS OR CABLES UNLESS OTHERWISE NOTED.

2. TELECOMMUNICATIONS CLOSET GROUNDING

A. PROVIDE A #4 AWG GROUND CONDUCTOR RISER IN 1" EMT CONDUIT TO EACH TELECOMMUNICATIONS CLOSET GROUNDING BUSBAR (TGB) FROM THE TELECOMMUNICATIONS MAIN GROUNDING BUSBAR (TMGB), AND TO MAIN SERVICE GROUNDING ELECTRODE SYSTEM.

B. CONNECT THE GROUND RISER TO TMGB AND TGB'S PER TIA/EIA STANDARD 607 - 1994.

C. PROVIDE ADDITIONAL #4 AWG GROUND CABLE CONNECTIONS FROM EACH TMGB AND TGB TO THE CLOSEST BUILDING STEEL AND TO THE GROUND BUS IN THE ELECTRIC PANEL FEEDING THE OUTLETS AND EQUIPMENT IN THE ASSOCIATED TELECOMMUNICATIONS ROOM/CLOSET.

3. GROUND EACH TELECOMMUNICATIONS, FIRE ALARM, SECURITY, AND BMS SYSTEM EQUIPMENT AND CONTROL PANEL WITHIN EACH TELECOMMUNICATIONS ROOM/CLOSET TO THE ASSOCIATED CLOSET TMGB OR TGB WITH A #4 AWG CONDUCTOR PER TIA/EIA STANDARD 607 - 1994.

RACEWAYS FOR TELECOMMUNICATION SYSTEMS:

1. PROVIDE EMPTY CONDUIT SYSTEMS FOR TELECOMMUNICATION WORK, REFER TO "T" SERIES DRAWINGS FOR SIZE OF CONDUIT AND BACK BOXES REQUIRED.
2. WHEN COMPLETED THE CONDUIT SYSTEMS SHALL BE READY FOR THE INSTALLATION OF WIRING AND EQUIPMENT.
3. FROM EACH OUTLET PROVIDE AN EMPTY EMT CONDUIT ROUTED INTO THE CEILING CAVITY OR TO THE CLOSEST TELECOMMUNICATIONS CLOSET. PROVIDE A DRAG LINE IN EACH RUN AND TERMINATE IN A BUSHED ELBOW.

ELEVATOR EQUIPMENT WIRING:

1. WORK INCLUDED

A. ELEVATOR EQUIPMENT WIRING INCLUDES POWER SERVICE CONNECTIONS, TELEPHONE SERVICE CONNECTIONS, PUBLIC ADDRESS SYSTEM CONNECTIONS AND FIRE ALARM SYSTEM CONNECTIONS.

B. ELEVATOR CONTROL WIRING AND INTERLOCK CONTROLS ARE NOT INCLUDED.

2. COMPONENTS

A. PROVIDE DISTRIBUTION PANELBOARD CIRCUIT BREAKER AND SHUNT TRIP ELEVATOR MACHINE ROOM FUSED DISCONNECT WITH DRY CONTACTS FOR ELEVATOR DRIVE UNIT POWER, AND POWER WIRING COMPLETE TO THE DRIVE UNIT.

B. PROVIDE BRANCH CIRCUITS FOR ELEVATOR CAB, MACHINE ROOM GFI CONVENIENCE OUTLET AND MACHINE ROOM LIGHTS; USE EMERGENCY POWER WHERE AVAILABLE.

C. PROVIDE CONDUIT FOR ELEVATOR COMMUNICATION SYSTEMS.

D. PROVIDE CONDUIT AND WIRE FOR ELEVATOR RECALL SYSTEM; COORDINATE REQUIREMENTS WITH FIRE ALARM SYSTEM.

E. PROVIDE ELEVATOR PIT AND MACHINE ROOM LIGHTS, RECEPTACLES AND SWITCHES.

F. PROVIDE CONNECTIONS FOR ELEVATOR PIT SUMP PUMP.

G. PROVIDE HEAT DETECTORS AT THE TOP OF THE SHAFT, PIT AND MACHINE ROOM, AND INTERLOCK WITH THE DRIVE UNIT POWER SOURCE TO DISCONNECT POWER UPON SENSING OF FIRE AND BEFORE ACTIVATION OF ANY SPRINKLER HEADS.

H. PROVIDE LOCKING MECHANISMS FOR OVERCURRENT DEVICES ON BRANCH CIRCUITS SERVING ELEVATOR EQUIPMENT INCLUDING CAB, PIT AND MACHINE ROOM LIGHTING, VENTILATION, RECEPTACLES AND CONTROLLER POWER.

3. COORDINATION

A. COORDINATE ENTIRE INSTALLATION WITH ELEVATOR SYSTEM SUPPLIER PRIOR TO COMMENCEMENT OF WORK.

B. IF THE HORSEPOWER RATING OF THE EQUIPMENT FURNISHED BY THE ELEVATOR SUPPLIER DIFFERS FROM THE HORSEPOWER LISTED ON THE CONTRACT DOCUMENTS, THE CONTRACTOR SHALL NOTIFY THE ARCHITECT PRIOR TO INSTALLING ANY WORK AND OBTAIN DIRECTION.

MECHANICAL EQUIPMENT WIRING:

1. UNLESS OTHERWISE INDICATED OR SPECIFIED HEREIN, ALL MOTORS, MOTOR STARTERS, MOTOR CONTROLLERS, VARIABLE SPEED/FREQUENCY DRIVES, AND ASSOCIATED CONTROL DEVICES ARE FURNISHED AND INSTALLED UNDER THIS DIVISION. COORDINATE INSTALLATION AND LOCATIONS WITH OTHER DIVISION CONTRACTORS.
2. POWER WIRING FROM THE INDICATED SOURCE TO THE STARTER/CONTROLLER/DRIVE UNIT, AND FROM THE STARTER/CONTROLLER/DRIVE UNIT TO THE MOTOR, INCLUDING ANY LOCAL DISCONNECT SWITCHES PROVIDED AND INSTALLED BY THIS DIVISION, AND ALL ASSOCIATED LUGS, TERMINALS, AND CONNECTIONS, IS THE WORK OF THIS DIVISION.
3. CONTROL CIRCUIT WIRING IS GENERALLY FURNISHED AND INSTALLED UNDER OTHER DIVISIONS, EXCEPT THAT ANY SUCH WIRING SHOWN ON ELECTRICAL DRAWINGS IS WORK OF THIS DIVISION.
4. PROVIDE 120 VOLT POWER TO ALL TEMPERATURE CONTROL PANELS (TCP'S) SUPPLIED AND INSTALLED BY DIVISION 23. USE EMERGENCY POWER SOURCES WHEN AVAILABLE. COORDINATE ALL POWER REQUIREMENTS AND PANEL LOCATIONS WITH DIVISION 23 TEMPERATURE CONTROLS CONTRACTOR.
5. COOPERATE AND COORDINATE WITH THE OTHER TRADES IN THE INSTALLATION, CONNECTION, AND TESTING OF MECHANICAL EQUIPMENT. PERFORM WORK OF THIS SECTION IN ACCORDANCE WITH EQUIPMENT MANUFACTURERS' INSTRUCTIONS.

COORDINATION DRAWINGS:

1. DEVELOP AND SUBMIT COORDINATION DRAWINGS AS OUTLINED.

A. SHEET METAL, PLUMBING AND FIRE PROTECTION SHOP DRAWINGS THAT HAVE BEEN COORDINATED WITH ARCHITECTURAL AND STRUCTURAL DRAWINGS SHALL BE SUBMITTED TO ENGINEER FOR REVIEW. DRAWINGS MUST BE RETURNED FROM ENGINEER EITHER "REVIEWED" OR "FURNISH AS CORRECTED" PRIOR TO BEING USED AS BASIS FOR COORDINATION DRAWINGS.

B. AFTER SHEET METAL AND PIPING DRAWINGS HAVE BEEN REVISED PER ENGINEERS COMMENTS, REPRODUCIBLE COPIES SHALL BE SENT TO THE TRADES IN THE FOLLOWING SEQUENCE FOR THE INCLUSION OF THEIR WORK:

   -MECHANICAL SHEET METAL
   -PLUMBING PIPING
   -MECHANICAL PIPING
   -SPRINKLER PIPING
   -ELECTRICAL WORK

2. AFTER ALL TRADES HAVE INCLUDED THEIR WORK ON THE COORDINATION DRAWING AND NOTED CONFLICTS, ALL TRADES SHALL MEET TO RESOLVE CONFLICTS AND AGREE TO ACCEPTABLE SOLUTIONS. EACH TRADE SHALL SIGN COORDINATION DRAWINGS. ITEMS NOT SHOWN ON COORDINATION DRAWING IS RESPONSIBILITY OF OMITTING CONTRACTOR AND CONTRACTOR IS SUBJECT TO ADDITIONAL COSTS INCURRED BY OTHER TRADES.
3. THE ARCHITECT AND ENGINEER ARE NOT PART OF THE COORDINATION DRAWING PROCESS. THE ENGINEER WILL PROVIDE ASSISTANCE FOR NOTED CONFLICTS ONLY. COORDINATION DRAWINGS ARE NOT TO BE CONSIDERED PIPING OR DUCT SHOP DRAWINGS. THE CONTRACTOR IS REQUIRED TO SUBMIT INDIVIDUAL PIPING AND DUCTWORK SHOP DRAWINGS FOR REVIEW BY THE ENGINEER. PIPING AND DUCTWORK SHOP DRAWINGS SHALL FOLLOW THE DESIGN INTENT OF THE CONTRACT DOCUMENTS.
4. SUBMIT FINAL SIGNED COORDINATION DRAWING TO ENGINEER FOR REVIEW. ENGINEER WILL REVIEW COORDINATION DRAWINGS FOR GENERAL ARRANGEMENT AND FOR NOTED CONFLICTS ONLY. SPECIFIC INSTALLATION REQUIREMENTS WILL BE REVIEWED ONLY IN INDIVIDUAL TRADE SHOP DRAWINGS.
5. ANY WORK FABRICATED OR INSTALLED PRIOR TO SIGN OFF BY ALL TRADES WHICH IS DEEMED TO BE IN CONFLICT WITH COORDINATION DRAWINGS SHALL BE REMOVED AND RE-INSTALLED IN CONFORMANCE WITH COORDINATION DRAWINGS.
6. EACH CONTRACTOR (MENTIONED ABOVE) IS RESPONSIBLE FOR THE COORDINATION OF HIS SUB-CONTRACTORS.
7. THE OVERALL COORDINATION OF THE COORDINATION PROCESS IS THE RESPONSIBILITY OF THE CONTRACTOR. THE ENGINEER IS NOT RESPONSIBLE FOR THE COORDINATION PROCESS. THE ENGINEER WILL RESPOND TO QUESTIONS THAT ARISE FROM THE COORDINATION PROCESS. DRAWINGS SUBMITTED WILL BE REVIEWED FOR CLEARLY IDENTIFIED CONFLICTS ONLY. SOLUTIONS TO CONFLICTS WILL NOT BEAR ADDITIONAL COST.

AS BUILT DRAWINGS

1. PROVIDE A COMPLETE SET OF AS-BUILT DRAWINGS REFLECTING AS INSTALLED CONDITIONS. AS-BUILT DRAWINGS SHALL INDICATE ALL INSTALLED CONDITIONS OF SYSTEMS WITHIN THIS DISCIPLINE. DRAWINGS SHALL BE OF SIMILAR SCALE AS THE CONSTRUCTION DOCUMENTS AND INCLUDE DETAILS AS NECESSARY TO CLEARLY REFLECT THE INSTALLED CONDITION. DRAWINGS SHALL BE BOUND IN A COMPLETE AND CONSECUTIVE SET. SUPPLEMENTAL SKETCHES AND LOOSE PAPERWORK WILL NOT BE ACCEPTABLE AND WILL BE RETURNED FOR REVISION. THE CONTRACTOR SHALL COMPLY WITH THE ENGINEERS COMMENTS TO PRODUCE A CLEAR AND CONCISE SET OF DRAWINGS. DRAWINGS SHALL BE SUBMITTED IN BOTH HARD COPY AND ELECTRONIC (AUTO-CAD VERSION AS REQUIRED BY THE OWNER) VERSION. NUMBER OF COPIES OF EACH AS REQUESTED BY THE OWNER.
2. PROVIDE "AS-BUILT DRAWINGS" INDICATING IN A NEAT AND ACCURATE MANNER A COMPLETE RECORD OF ALL REVISIONS OF THE ORIGINAL DESIGN OF THE WORK. INDICATE THE FOLLOWING INSTALLED CONDITIONS:

A. INCLUDE ALL CHANGES AND AN ACCURATE RECORD, ON REPRODUCTIONS OF THE CONTRACT DRAWINGS OR APPROPRIATE SHOP

B. DRAWINGS, OF ALL DEVIATIONS, BETWEEN THE WORK SHOWN AND WORK INSTALLED.

C. EQUIPMENT LOCATIONS (EXPOSED AND CONCEALED), DIMENSIONED FROM PROMINENT BUILDING LINES.

D. APPROVED SUBSTITUTIONS, CONTRACT MODIFICATIONS, AND ACTUAL EQUIPMENT AND MATERIALS INSTALLED.

E. CONTRACT MODIFICATIONS, ACTUAL EQUIPMENT AND MATERIALS INSTALLED.

F. SUBMIT FOR REVIEW BOUND SETS OF THE REQUIRED DRAWINGS, MANUALS AND OPERATING INSTRUCTIONS.

G. SUBMIT A COMPLETE MAINTENANCE MANUAL OF ALL EQUIPMENT INSTALLED UNDER THIS CONTRACT.

ELECTRICAL LEGEND

(NOT ALL SYMBOLS ARE USED)

- DISTRIBUTION PANEL, 480/277 OR 120/208 VOLT
- ELECTRICAL PANEL, 480/277 VOLT
- ELECTRICAL PANEL, 120/208 VOLT
- PANELBOARD FLUSH MOUNTED
- PANELBOARD SURFACE MOUNTED
- NON-FUSED DISCONNECT SWITCH
- FUSED DISCONNECT SWITCH
- J — WALL MOUNTED JUNCTION BOX, ACCORDING TO NEC REQUIREMENTS
- J — CEILING MOUNTED JUNCTION BOX, ACCORDING TO NEC REQUIREMENTS
- J — FLOOR MOUNTED JUNCTION BOX, ACCORDING TO NEC REQUIREMENTS
- MOTOR STARTER, COORDINATE EXACT REQUIREMENTS WITH MOTOR FURNISHED
- RECESSED LIGHT FIXTURE; LETTER INDICATES FIXTURE TYPE
- RECESSED LIGHT FIXTURE WIRED TO EMERGENCY DISTRIBUTION SYSTEM
- TYPICAL RECESSED MOUNTED HIGH PERFORMANCE LED LIGHT FIXTURE; LETTER INDICATES FIXTURE TYPE
- RECESSED MOUNTED HIGH PERFORMANCE LED LIGHT FIXTURE WIRED TO EMERGENCY DISTRIBUTION SYSTEM
- TYPICAL RECESSED/SURFACE MOUNTED FLAT LENS LED LIGHT FIXTURE; LETTER INDICATES FIXTURE TYPE
- RECESSED/SURFACE MOUNTED FLAT LENS LED LIGHT FIXTURE WIRED TO THE EMERGENCY DISTRIBUTION SYSTEM
- TYPICAL SURFACE/PENDANT MOUNTED LED LIGHT FIXTURE; LETTER INDICATES FIXTURE TYPE
- WALL MOUNTED FIXTURE; LETTER INDICATES FIXTURE TYPE
- CEILING/WALL/END MOUNTED EXIT SIGN. SHADING INDICATES DIRECTION OF FIXTURE FACE, ARROW INDICATES DIRECTION OF CHEVRON, PROVIDE UNSWITCHED POWER FROM AREA LIGHTING CIRCUIT
- DOUBLE FACE EXIT SIGN
- TWIN HEAD EMERGENCY LIGHT WITH INTEGRAL BATTERY FOR 90 MINUTE EMERGENCY LIGHTING
- SINGLE POLE SWITCH; MOUNT AT 48" AFF
- S_3 — 3-WAY SWITCH; MOUNT AT 48" AFF
- S_4 — 4-WAY SWITCH; MOUNT AT 48" AFF
- S_M — DUAL TECHNOLOGY, MOTION SENSOR SWITCH; MOUNT AT 48" AFF
- S_{PT} — DUAL TECHNOLOGY, MOTION SENSOR SWITCH WITH RAISE & LOWER BUTTONS; MOUNT AT 48" AFF
- S_D — 4-BUTTON DIMMER SWITCH (ON-OFF-RAISE-LOWER); MOUNT AT 48" AFF, COMPATIBLE WITH LOAD CONTROLLED
- S_D — MULTI-LOCATION 4-BUTTON DIMMER SWITCH (ON-OFF-RAISE-LOWER); MOUNT AT 48" AFF, COMPATIBLE WITH LOAD CONTROLLED
- S_L — 4-BUTTON PRESET LOW VOLTAGE SWITCH (HIGH-MEDIUM-LOW-OFF); MOUNT AT 48" AFF
- S_K — KEYED SINGLE POLE OR 3-WAY SWITCH; MOUNT AT 48" AFF
- S_P — SINGLE POLE SWITCH WITH PILOT LIGHT
- S_{OR} — LOW VOLTAGE CONTROL SYSTEM OVERRIDE SWITCH (2, 3 $ 4 BUTTON, REFER TO DETAIL ON DWG E603)
- DUPLEX RECEPTACLE; MOUNT AT 18" AFF UNLESS OTHERWISE SPECIFIED
- SINGLE RECEPTACLE; MOUNT AT 18" AFF UNLESS OTHERWISE SPECIFIED
- QUAD RECEPTACLE; MOUNT AT 18" AFF UNLESS OTHERWISE SPECIFIED
- DUPLEX RECEPTACLE MOUNTED 6" ABOVE COUNTER/COMPUTER SHELF TO BOTTOM OF DEVICE, OR 48" TO CENTER OF OUTLET NOT LOCATED ABOVE A COUNTER UNLESS OTHERWISE SPECIFIED. "HM" DENOTES DEVICE TO BE HORIZONTALLY MOUNTED
- QUAD RECEPTACLE MOUNTED 6" ABOVE COUNTER TO BOTTOM OF DEVICE, OR 48" TO CENTER OF OUTLET NOT LOCATED ABOVE A COUNTER UNLESS OTHERWISE SPECIFIED
- R_{SR} — SPLIT WIRED / SWITCHED DUPLEX RECEPTACLE; MOUNT AT 18" AFF UNLESS OTHERWISE SPECIFIED. HALF OF THE RECEPTACLE SHALL BE SWITCHED / CONTROLLED BY ROOM OCCUPANCY SENSOR(S) PER THE ENERGY CODE WHILE THE OTHER HALF SHALL BE WIRED DIRECTLY TO PANEL SERVING DEVICE.
- R_{GF} — RECEPTACLE WITH OUTDOOR RATED "IN-USE" COVER PLATE. PROVIDE FLUSH MOUNTED BOX
- R_{GFI} — GROUND FAULT CIRCUIT INTERRUPTING RECEPTACLE
- R_{USB} — DUPLEX RECEPTACLE WITH TWO INTEGRAL POWERED USB OUTLETS
- R_{PT} — DUPLEX RECEPTACLE FOR POWER ASSISTED TABLE
- R_{TR} — TAMPER RESISTANT DUPLEX RECEPTACLE
- SPECIAL OUTLET CONFIGURATION, SEE NEMA #
- CEILING MOUNTED DUPLEX RECEPTACLE; PROVIDE FLUSH MOUNTED BOX
- FLOOR MOUNTED DUPLEX RECEPTACLE, "PT" INDICATES POKE THROUGH TYPE RECEPTACLE; SEE SPECIFICATION FOR DETAILS
- FLOOR MOUNTED SINGLE RECEPTACLE; SEE SPECIFICATION FOR DETAILS
- FLOOR MOUNTED DOUBLE DUPLEX RECEPTACLE, "BT" INDICATES BENCH TOP MOUNTED; SEE SPECIFICATION FOR DETAILS
- FLOOR MOUNTED SPECIAL RECEPTACLE; SEE NEMA # AND SPECIFICATION FOR DETAILS
- FB1 — FLUSH MOUNTED MULTI-OUTLET (6-GANG) FLOOR BOX UNIT. PROVIDE UNIT WITH (3) DUPLEX RECEPTACLES AND PLATES FOR (3) TELECOMMUNICATION/AV OUTLETS (COORDINATE WITH "T" SERIES DWG'S). WIREMOLD EVOLUTION SERIES #EF60S OR EQUAL
- CALL-FOR-AID CORRIDOR LIGHT/BUZZER, MOUNT AT 7'-6" AFF
- CALL-FOR-AID SWITCH, MOUNT AT 36" AFF WITH PULL CORD HANGING DOWN TO 6" AFF
- OXT — BRANCH CIRCUIT HOMERUN (VOLTAGE, BRANCH CIRCUIT POLES)
- CEILING MOUNTED OCCUPANCY SENSOR (DUAL TECHNOLOGY TYPE) WITH 360° COVERAGE, "HC" DENOTES HIGH CEILING SENSOR (15-45 FT.), "DPP" DENOTES DUAL POWER PACKS REQUIRED (ONE AT 277 V FOR LIGHTING & ONE AT 120V FOR EXHAUST FAN).
- CEILING MOUNTED OCCUPANCY SENSOR (ULTRASONIC TYPE) WITH 360° COVERAGE
- CEILING / WALL MOUNTED DUAL TECHNOLOGY OCCUPANCY SENSOR (ULTRASONIC/PASSIVE INFRARED TYPE) W/180° COVERAGE. "2P" INDICATES UNIT TO HAVE TWO POLE OUTPUT TO CONTROL TWO SEPARATE DEVICES (LIGHTS & RECEPTACLES).
- CEILING MOUNTED DAYLIGHT SENSOR WITH 360° COVERAGE
- FIRE ALARM MANUAL PULL STATION - 48" AFF U.O.N.
- FIRE ALARM SPEAKER/STROBE - 80" AFF U.O.N.; "SG" INDICATES SECURITY GRADE WIRE GUARD
- FIRE ALARM STROBE LIGHT - 80" AFF U.O.N.; "SG" INDICATES SECURITY GRADE WIRE GUARD
- SMOKE DETECTOR, "R" DENOTES ELEVATOR RECALL DEVICE
- HEAT DETECTOR
- DUCT MOUNTED IONIZATION SMOKE DETECTOR; "WP" INDICATES DETECTOR FURNISHED WITH AN EXTERIOR RATED/WEATHERPROOF (NEMA 4X) ENCLOSURE TO MOUNT TO EXTERIOR MOUNTED DUCTWORK
- SD — SMOKE DAMPER, ELECTRICAL CONTRACTOR SHALL FURNISH AND INSTALL AN ADDRESSABLE DUCT SMOKE DETECTOR TO TIE INTO FIRE ALARM SYSTEM IN ADDITION TO 120V CONNECTION FROM LOCAL NORMAL CIRCUIT, COORDINATE LOCATION OF DAMPERS WITH MECHANICAL DRAWINGS
- FSD — FIRE-SMOKE DAMPER, ELECTRICAL CONTRACTOR SHALL FURNISH AND INSTALL AN ADDRESSABLE DUCT SMOKE DETECTOR TO TIE INTO FIRE ALARM SYSTEM IN ADDITION TO 120V CONNECTION FROM LOCAL NORMAL CIRCUIT, COORDINATE LOCATION OF DAMPERS WITH MECHANICAL DRAWINGS
- M — FIRE ALARM MAGNETIC DOOR HOLD OPEN
- CO — CARBON MONOXIDE DETECTOR
- Z_1 — TEST SWITCH AND REMOTE INDICATOR LIGHT FOR DUCT SMOKE DETECTOR, NUMBER INDICATES QUANTITY AT THAT LOCATION

ELECTRICAL LEGEND CONTINUED

- J SF — 120VAC CONNECTION TO ELECTRONIC SENSOR FAUCET (FURNISHED BY PLUMBING CONTRACTOR)
- J FV — 120VAC CONNECTION TO ELECTRONIC FLUSH VALVE (FURNISHED BY PLUMBING CONTRACTOR)
- J SB — 120VAC CONNECTION TO SMART BOARD (FURNISHED BY OWNER)
- J PROJ — 120VAC CONNECTION TO ARM MOUNTED PROJECTOR (FURNISHED BY OWNER INTEGRAL W/WHITE BOARD). JUNCTION BOX SHALL BE MOUNTED APPROXIMATELY 7'-6"AFF CENTERED ON WHITE BOARD, REFER TO ARCH. DETAIL AND MANUFACTURERS MOUNTING REQUIREMENTS
- J GH — 120VAC CONNECTION TO GENERATOR BLOCK HEATER (FURNISHED BY GENERATOR MANUFACTURER)
- J GC — 120VAC CONNECTION TO GENERATOR BATTERY CHARGER (FURNISHED BY GENERATOR MANUFACTURER)
- J FF — 120VAC CONNECTION TO OWNER FURNISHED ELECTRIFIED FURNITURE SYSTEM (FURNITURE FEED)
- R — EMERGENCY BY-PASS RELAY, REFER TO DETAIL ON DWG. E602
- D — 120VAC CONNECTION TO ELECTRIC HAND DRYER (FURNISHED BY OWNER)
- J SV — 120VAC CONNECTION TO MOTORIZED SMOKE VENT (MOTOR OPERATOR SUPPLIED BY VENDOR)
- J DCL — 120VAC CONNECTION TO ELECTRIC DOOR LOCK/POWER OPERATOR FURNISHED BY DOOR HARDWARE VENDOR, WIRED BY ELECTRICAL CONTRACTOR. REFER TO DETAILS ON "T" SERIES DRAWING, ALONG WITH DOOR HARDWARE SCHEDULE
- PC — PHOTOCELL
- MPS J — 120VAC CONNECTION TO MOTORIZED PROJECTION SCREEN, COMPRM MOUNTING HEIGHT AND POWER REQUIREMENT WITH APPROVED VENDER SHOP DRAWING. ALSO PROVIDE A JUNCTION BOX AND CONDUIT PER MANUFACTURERS REQUIREMENTS FOR RAISE/LOWER SWITCH FURNISHED BY VENDER, INSTALLED BY ELECTRICAL CONTRACTOR
- J FSS — 120VAC CONNECTION TO KITCHEN HOOD FIRE SUPPRESSION SYSTEM FURNISHED AND INSTALLED BY KITCHEN VENDOR. WIRED BY ELECTRICAL CONTRACTOR. ALSO ELECTRICAL CONTRACTOR SHALL CONNECT SUPPRESSION SYSTEM TO BUILDING FIRE ALARM SYSTEM
- J HD — 120VAC CONNECTION TO KITCHEN HOOD (LIGHTS & FAN), FURNISHED AND INSTALLED BY KITCHEN VENDOR, WIRED BY ELECTRICAL CONTRACTOR
- PT1 — FLUSH FLOOR MOUNTED POKE THROUGH DEVICE WITH FURNITURE FEED (TWO OPENINGS) ONE FOR POWER AND ONE FOR COMMUNICATIONS [(1) 3/4" PWR & (1) 1"]. COMM'L SEE SPECIFICATION AND "T" SERIES DRAWINGS FOR MORE INFORMATION. (WIREMOLD #4FFACT01SAC OR EQUAL). COLOR OF BOTH TRIM RING AND COVER BLACK ARE TO BE ALUMINUM.
- PT2 — FLUSH FLOOR MOUNTED POKE THROUGH DEVICE WITH TWO 20 AMP DUPLEX RECEPTACLES (EACH RECEPTACLE CAN BE WIRED TO A SEPARATE CIRCUIT) AND FOUR COMMUNICATIONS PORTS; SEE SPECIFICATION AND "T" SERIES DRAWINGS FOR MORE INFORMATION. (WIREMOLD #RC4ATCAA OR EQUAL)
- PT3 — FLUSH FLOOR MOUNTED POKE THROUGH DEVICE WITH 20 AMP DUPLEX RECEPTACLE AND TWO COMMUNICATIONS PORTS; SEE SPECIFICATION AND "T" SERIES DRAWINGS FOR MORE INFORMATION. (WIREMOLD #RC7ATCAA OR EQUAL)
- J TP — 120VAC CONNECTION TO TRAP PRIMER, INSTALLED BY PLUMBING CONTRACTOR WIRED BY E.C.
- J HT — 208V-1Ø CONNECTION TO KITCHEN HEAT TRACE CONTROL PANEL, FURNISHED AND INSTALLED BY PLUMBING CONTRACTOR, WIRED BY ELECTRICAL CONTRACTOR
- EPO — EMERGENCY POWER OFF SWITCH (EPO)
- J PRF — JUNCTION BOX WITH COVER AND 20 FEET OF 3 CONDUCTOR MC CABLE (COILED UP) TO BE INSTALLED BELOW ROOF WHERE THE RADON EXHAUST VENT IS INSTALLED TO SERVE FUTURE FAN
- EC J J EC

INTERIOR LIGHTING FIXTURE SCHEDULE

DESIGNATION	DESCRIPTION	MANUFACTURER/ MODEL NUMBER	LAMP			ELECTRICAL			NOTES
			TYPE	COLOR TEMP	NO	DRIVER	VOLTAGE	WATTS	
A1	RECESSED MOUNTED HIGH PERFORMANCE ARCHITECTURAL 2FT x 2FT LED LIGHT FIXTURE WITH SMOOTH DIFFUSED CENTER LENS (3000 LUMEN PACKAGE)	DAY-BRITE #2FFXG30L835-2-DS-UNV-DIM	LED	3500K		DIMMING	120	26	
A1.1	SAME AS TYPE 'A1' EXCEPT FLANGED FOR SHEET ROCK CEILING	DAY-BRITE #2FFXG38L835-2-DS-UNV-DIM-FMA22	LED	3500K		DIMMING	120	26	
A2	SAME AS TYPE 'A1' EXCEPT LUMEN PACKAGE (3800 LUMENS)	DAY-BRITE #2FFXG38L835-2-DS-UNV-DIM	LED	3500K		DIMMING	120	34	
A3	SAME AS TYPE 'A1' EXCEPT LUMEN PACKAGE (3300 LUMENS)	DAY-BRITE #2FFXG33L835-2-DS-UNV-DIM	LED	3500K		DIMMING	120	29	
A4	SAME AS TYPE 'A1' EXCEPT LUMEN PACKAGE (4500 LUMENS)	DAY-BRITE #2FFXG45L835-2-DS-UNV-DIM	LED	3500K		DIMMING	120	40	
B1	RECESSED MOUNTED 2FT x 2FT FLAT PANEL LED LIGHT FIXTURE WITH SMOOTH DIFFUSED LENS AND WHITE HOUSING (2000 LUMEN PACKAGE)	DAY-BRITE #2FPZ20L835-2-DS-UNV-DIM	LED	3500K		DIMMING	120	16	
B2	SAME AS TYPE 'B1' EXCEPT LUMEN PACKAGE (3000 LUMENS)	DAY-BRITE #2FPZ30L835-2-DS-UNV-DIM	LED	3500K		DIMMING	120	23	
B3	SAME AS TYPE 'B1' EXCEPT LUMEN PACKAGE (3500 LUMENS)	DAY-BRITE #2FPZ35L835-2-DS-UNV-DIM	LED	3500K		DIMMING	120	31.3	
B4	SAME AS TYPE 'B1' EXCEPT LUMEN PACKAGE (4500 LUMENS)	DAY-BRITE #2FPZ45L835-2-DS-UNV-DIM	LED	3500K		DIMMING	120	36	
C	RECESSED MOUNTED 2FT x 4FT FLAT PANEL LED LIGHT FIXTURE (XXXX LUMEN PACKAGE)	DAY-BRITE #2FPZ???835-4-DS-UNV-DIM	LED	3500K		DIMMING	120	X	
D1	PENDANT MOUNTED 24" DIA. DIRECT/INDIRECT LED LIGHT FIXTURE WITH A DIFFUSE LENS (DN), CLEAR LENS (UP), WHITE FINISH AND A X COLORED ACOUSTIC PANEL ON THE BOTTOM OF THE FIXTURE (5690 LUMEN PACKAGE)	DAY-O-LITE #COML-24-DI-DP-35-2-PD-W-X-DIM10	LED	3500K		DIMMING	120	52	
D2	SAME AS TYPE 'D1' EXCEPT 36" DIA. AND (8400 LUMEN PACKAGE)	DAY-O-LITE #COML-24-DI-DP-35-3-PD-W-X-DIM10	LED	3500K		DIMMING	120	86	
E1	SINGLE FACE WALL/CEILING MOUNTED LED EXIT SIGN WITH RED LETTERS AND WHITE THERMO-PLASTIC HOUSING	CHLORIDE #CLXNRW	LED	NA		ELECTRONIC	120/277	3.8	1 6
E2	SAME AS TYPE 'E1' EXCEPT DOUBLE FACE AND END/ CEILING MOUNTED	CHLORIDE #CLXNRW	LED	NA		ELECTRONIC	120/277	3.8	1 6
E3	SINGLE FACE WALL/CEILING MOUNTED LED EXIT SIGN WITH INTERNATIONAL SYMBOL OF ACCESSIBILITY, RED LETTERS AND WHITE HOUSING	SIGNTEX INC. #CAEBB-1RMW-REC	LED	NA		ELECTRONIC	120/277	3.8	1 6 7
E4	EXTERIOR WET LOCATION RATED SINGLE FACE WALL MOUNTED LED EXIT SIGN WITH RED LETTERS AND WHITE HOUSING AND HEATER	CHLORIDE #TPEWN1RWHTR	LED	NA		ELECTRONIC	120/277	3.8	1 6
F1	PENDANT MOUNTED 4' SQ. 6FT. LONG DIRECT/INDIRECT LED LIGHT FIXTURE WITH A DIFFUSE LENS (DN), CLEAR LENS (UP) AND SILVER FINISH (500 LUMENS PER FOOT DOWN & 250 LUMENS PER FOOT UP)	3G LIGHTING #3G-4PLI-DI-D500-L250-S80-35K-UNV-DIM-FL-FL-SV-60-1C-CUS	LED	3500K		DIMMING	120	30.6	11
F1.1	PENDANT MTD 4" SQ. 6FT. LONG DIRECT/INDIRECT LED LIGHT FIXTURE WITH A DIFFUSED LENS (DN), WIDE SPREAD OPTIC LENS (UP), WHITE FINISH & 2 CIRCUIT (250 LUMENS PER FOOT DOWN & 250 LUMENS PER FOOT UP)	3G LIGHTING #3G-4PLI-DI-D250-L250-S80-35K-UNV-DIM-FL-WSO-WH-60-2C-CUS	LED	3500K		DIMMING	120	30.6	11
F2	SAME AS TYPE 'F1' EXCEPT 4FT. LONG	3G LIGHTING #3G-4PLI-DI-D500-L250-S80-35K-UNV-DIM-FL-FL-SV-60-1C-CUS	LED	3500K		DIMMING	120	20.4	11
F3	SAME AS TYPE 'F1' EXCEPT DIRECT ONLY & WHITE FINISH (500 LUMENS PER FOOT)	3G LIGHTING #3G-4PLI-D-D500-S80-35K-UNV-DIM-FL-WH-60-1C-S-6'	LED	3500K		DIMMING	120	30.6	
F4	SAME AS TYPE 'F3' EXCEPT 4FT. LONG AND (750 LUMENS PER FOOT)	3G LIGHTING #3G-4PLI-D-D750-S80-35K-UNV-DIM-FL-WH-60-1C-S-4'	LED	3500K		DIMMING	120	20.8	
F4.1	SAME AS TYPE 'F4' EXCEPT (500 LUMENS PER FOOT)	3G LIGHTING #3G-4PLI-D-D500-S80-35K-UNV-DIM-FL-WH-60-1C-S-4'	LED	3500K		DIMMING	120	13.6	
F5	SAME AS TYPE 'F3' EXCEPT 3FT. LONG (500 LUMENS PER FOOT)	3G LIGHTING #3G-4PLI-D-D500-S80-35K-UNV-DIM-FL-WH-60-1C-S-3'	LED	3500K		DIMMING	120	13.6	
G	SURFACE MOUNTED 4FT. LONG WRAPAROUND LED LIGHT FIXTURE WITH INTEGRAL MOTION SENSOR AND WHITE FINISH. SENSOR TO REDUCE LIGHT TO 10% WHEN INACTIVE (SELECTABLE LUMEN PACKAGES)	TRACE-LITE #SSF-4-CP-SC	LED	3500K		DIMMING	120	25	
G1	SAME AS TYPE 'G' EXCEPT WITH HIGHEST OUTPUT LEVEL SELECTED	TRACE-LITE #SSF-4-CP-SC	LED	3500K		DIMMING	120	40	
H	RECESSED MOUNTED HIGH PERFORMANCE ARCHITECTURAL 2FT x 4FT LED LIGHT FIXTURE WITH SMOOTH DIFFUSED CENTER LENS (4800 LUMEN PACKAGE)	DAY-BRITE #2EVG48L835-4-D-UNV-DIM	LED	3500K		DIMMING	120	48	
H1	SAME AS TYPE 'H' EXCEPT 2FT x 2FT, FLUSH MOUNTED AND LUMEN PACKAGE (3300 LUMEN PACKAGE)	DAY-BRITE #2EVG33L835-2-D-UNV-DIM-FMA22	LED	3500K		DIMMING	120	28.6	
J1	12.5" SUARE SURFACE MOUNTED LED LIGHT FIXTURE WITH AN OPAL POLYCARBONATE LENS AND WHITE HOUSING (2347 LUMEN PACKAGE)	CGF DESIGN #TA2-SQ-LED17-CT4-UNV-WHT	LED	4000K		DIMMING	120	18.1	
J2	SAME AS TYPE 'J1' EXCEPT WITH PHOTOCELL & BI-LEVEL DIMMING WITH MOTION SENSOR	CGF DESIGN #TA2-SQ-LED17-CT4-UNV-WHT-PHTD-BLD	LED	4000K		DIMMING	120	18.1	
K	3" DIAMETER RECESSED MOUNTED LED LENSED WALL WASH LIGHT FIXTURE WITH A COMFORT CLEAR REFLECTOR AND WHITE TRIM RING (500 LUMEN PACKAGE)	LIGHTOLIER #3RN-C3L0593NZ10U-C3RLWCC	LED	3500K		DIMMING	120	76	
L1	12.5" DIA ROUND SURFACE MOUNTED LED LIGHT FIXTURE WITH AN OPAL POLYCARBONATE LENS, PHOTOCELL & BI-LEVEL DIMMING WITH MOTION SENSOR AND WHITE HOUSING (2408 LUMEN PACKAGE)	CGF DESIGN #TA2-RD-LED17-CT4-UNV-WHT-PHTD-BLD	LED	4000K		DIMMING	120	17	
L2	SAME AS TYPE 'L1' EXCEPT LUMEN PACKAGE (3613 LUMEN PACKAGE)	CGF DESIGN #TA2-RD-LED25-CT4-UNV-WHT-PHTD-BLD	LED	4000K		DIMMING	120	25	
M	8FT. LONG PENDANT MOUNTED 4IN. SQUARE LINEAR LED LIGHT FIXTURE WITH A FLUSH LENS AND CUSTOM COLORED FINISH (750 LUMENS PER FOOT - 6000 LUMENS TOTAL)	3G LIGHTING #3G-4PLI-D-D750-S80-35K-UNV-DIM-FL-XX-120"-BCN-BC-S-8'	LED	3500K		DIMMING	120	41.6	

INTERIOR LIGHTING FIXTURE SCHEDULE CONTINUED

DESIGNATION	DESCRIPTION	MANUFACTURER/ MODEL NUMBER	LAMP			ELECTRICAL			NOTES
			TYPE	COLOR TEMP	NO	DRIVER	VOLTAGE	WATTS	
N	3.5FT. SURFACE MOUNTED UNDERCOUNTER LIGHT FIXTURE WITH WHITE HOUSING AND FROSTED LENS (1500 LUMEN PACKAGE)	NORA LIGHTING #NUD-8842/30-WH	LED	3000K		DIMMING	120	20	
P	8IN. DIAMETER PENDANT MOUNTED LED CYLINDER LIGHT FIXTURE WITH SEMI-DIFFUSE CLEAR REFLECTOR AND CUSTOM COLORED FINISH (2000 LUMEN PACKAGE)	SPECTRUM LIGHTING INC. #C0812XT-20L-35K-WD-EX-TSG-HMLCXX-CC	LED	3500K		DIMMING	120	21.7	
Q1	4FT. SURFACE/PENDANT MOUNTED LENSED LED STRIP LIGHT FIXTURE WITH ROUND DIFFUSED ACRYLIC LENS AND WHITE HOUSING (3500 LUMEN PACKAGE)	H.E. WILLIAMS LIGHTING #75R-4-L50/835-(L35)-DIM-UNV	LED	3500K		DIMMING	120	26	
Q2	SAME AS TYPE 'Q1' EXCEPT LUMEN PACKAGE (5000 LUMENS)	H.E. WILLIAMS LIGHTING #75R-4-L50/835-DIM-UNV	LED	3500K		DIMMING	120	33	
Q3	SAME AS TYPE 'Q1' EXCEPT LUMEN PACKAGE (6500 LUMENS)	H.E. WILLIAMS LIGHTING #75R-4-L65/835-DIM-UNV	LED	3500K		DIMMING	120	42.3	
Q4	SAME AS TYPE 'Q1' EXCEPT LUMEN PACKAGE (8500 LUMENS)	H.E. WILLIAMS LIGHTING #75R-4-L85/835-DIM-UNV	LED	3500K		DIMMING	120	56.2	
R	6FT. CORNER MOUNTED LED LIGHT FIXTURE WITH CURVED ILLUMINATED SURFACE, ALUMINUM FINISH (1000 LUMENS PER FOOT)	AXIS LIGHTING #ELSC-AR-1000-80-35-CLS-6-AP-UNV-DP-1-MT-FL-EXTBX	LED	3500K		DIMMING	120	60.8	
S	6" DIA. RECESSED MOUNTED OPEN LED DOWNLIGHT FIXTURE WITH MEDIUM BEAM, CLEAR DIFFUSE FINISH AND WHITE TRIM (1000 LUMEN PACKAGE)	LIGHTOLIER #5RN-BAC / C6L10935MZ10U / C5RDLCD-BAC	LED	3500K		DIMMING	120	8.6	
T	1 FT. & 4FT. LONG LED COVE LIGHT FIXTURE WITH AIMABLE HOUSING (60 DEGREES) AND WHITE FINISH (3411/273 LUMENS PER FIXTURE). RUN FIXTURES CONTINUOUSLY THE ENTIRE LENGTH OF EACH COVE.	MODA LIGHT #MNCI-S-Sx-W-E-35H-1/MNCI-S-Sx-W-E-35H-4	LED	3500K		DIMMING	120	3.85/10.5	

LIGHT FIXTURE NOTES:

1. PROVIDE WITH FEATURES & ACCESSORIES NECESSARY FOR UNIVERSAL MOUNTING AND DIRECTIONAL ARROW KNOCKOUTS. ARROWS ON PLANS INDICATE DIRECTION OF CHEVRONS, SHADING INDICATES QUANTITY AND LOCATIONOF FIXTURE FACE.
2. ALL EXTERIOR FIXTURES AND INTERIOR FIXTURES IN UNHEATED SPACES SHALL BE CAPABLE OF OPERATING IN COLD TEMPERATURES (ZERO DEGREE FARENHEIGHT).
3. ALL ELECTRONIC DRIVERS SHALL HAVE A MAXIMUM TOTAL HARMONIC DISTORTION BETWEEN TEN & FIFTEEN PERCENT (10-15%).
4. ALL INTERIOR FIXTURES SHALL BE FURNISHED WITH 4000K COLOR LED's, AND ALL EXTERIOR LED's SHALL BE 4000k.
5. FURNISH ALL ADDITIONAL MATERIALS AND ACCESSORIES REQUIRED FOR A COMPLETE INSTALLATION AND BE FULLY OPERATIONAL.
6. FURNISH WITH NICKEL CADMIUM BATTERY FOR A MINIMUM OF 90 MINUTES OF EMERGENCY LIGHTING OPERATION.
7. FIXTURE SHALL BE ONE LONG SIGN WITH THE WORDING "EXIT" AND THE CT APPROVED HANDICAP SYMBOL ADJACENT TO IT.
8. MOUNT CENTER OF LIGHT FIXTURE AT 16'-9" ABOVE FINISHED FLOOR.
9. ALL EQUALS MUST BE APPROVED BY THE ARCHITECT/ENGINEER OF RECORD BY A POINT BY POINT CALCULATION. IES FILES HAVE TO BE PROVIDED FOR EACH ALTERNATE FIXTURE. THERE WILL BE NO EXCEPTIONS GRANTED. ANY ALTERNATES SUBMITTED MUST NOT CONSUME MORE THEN THE WATTAGE SHOWN ON THE FIXTURE SCHEDULE, THERE WILL BE NO EXCEPTIONS GRANTED. ALTERNATE FIXTURES MAY VARY SLIGHTLY IN APPEARANCE & AESTHETICS PROVIDED THEY MEET THE PERFORMANCE REQUIREMENTS SHOWN ON FIXTURE SCHEDULE (FINAL APPROVAL BY LIGHTING DESIGNER AND ARCHITECT). POINT BY POINT CALCULATIONS NEED TO BE PERFORMED AND APPROVED PRIOR TO PRODUCT SUBMITTAL PACKAGE SUBMISSION.

   ALL SUBSTITUTED DRIVERS OFFERED MUST BE LESS THAN OR EQUAL TO WATTAGES SHOWN ON EACH TYPE FIXTURE, NO SUBSTITUTED DRIVER WILL BE ACCEPTED THAT DOESN'T MEET THIS REQUIREMENT.
10. CONTRACTOR TO INCLUDE IN THEIR BASE BID THE FOLLOWING EXTRA MATERIAL:
    - 5 PIECE - DAY LIGHT/OCCUPANCY SENSOR
    - 3 PIECE - EXTERIOR MOTION SENSOR
    - 5 PIECES - POWER PACKS - DUAL CIRCUIT
    - 5 PIECES - WALL SWITCH WITH J-BOX (TOGGLE & DIMMER)
    - 5 PIECES - JUNCTION BOXES INSTALLED (EACH SIZE)
    - 3 PIECES - ROOM CONTROLLER
    - 5 PIECE - EXIT SIGN

11. FIXTURES 'F1' & 'F2' ARE TO BE INTERCONNECTED INTO ONE FIXTURE (RECTANGULAR WITH A CENTER CROSS BAR AS SHOWN), PROVIDE FIXTURE WITH ALL HARDWARE/CONNECTORS TO PROVIDE THE SHAPE INDICATED. THIS IS THE SAME FOR FIXTURE 'F1.1' IN THE MEDIA CENTER.

EXTERIOR LIGHTING FIXTURE SCHEDULE

DESIGNATION	DESCRIPTION	MANUFACTURER/ MODEL NUMBER	LAMP			ELECTRICAL			NOTES
			TYPE	COLOR TEMP	NO	DRIVER	VOLTAGE	WATTS	
SL1	PENDANT/STEM AND CROSS CHAIN MOUNTED TRADITIONAL LANTERN TYPE LED LIGHT FIXTURE WITH TYPE 5 DISTRIBUTION, BLACK FINISH AND CLEAR LENS (7342 LUMEN PACKAGE)	SUN VALLEY LIGHTING #SIG23-P/PLED-V-SQ-N/36LED-700mA/40K/120/PM/RAL-9005-T/ CM+L/HLSW	LED	4000K		DIMMING	120	79.2	
SL2	LARGE WALL MOUNTED FULL CUT-OFF SCONCE TYPE LED LIGHT FIXTURE WITH TYPE 3 DISTRIBUTION, BLACK FINISH AND CLEAR LENS (5940 LUMEN PACKAGE)	GARDCO #PWS-196L-1150-NW-G3-3-UNV-MMRI-BK	LED	4000K		DIMMING	120	51	
SL3	SAME AS TYPE 'SL2' EXCEPT LUMEN PACKAGE (8403 LUMENS)	GARDCO #PWS-196L-1675-NW-G3-3-UNV-MMRI-BK	LED	4000K		DIMMING	120	75	
SL4	SMALL WALL MOUNTED FULL CUT-OFF SCONCE TYPE LED LIGHT FIXTURE WITH TYPE 4 DISTRIBUTION, BLACK FINISH AND CLEAR LENS (2500 LUMEN PACKAGE)	GARDCO #GWM-A06-840-T4M-UNV-DUCC-MW30-PCB-BK	LED	4000K		DIMMING	120	16	
SL5	SAME AS TYPE 'SL4' EXCEPT DISTRIBUTION (TYPE 2)	GARDCO #GWM-A06-840-T2M-UNV-DUCC-MW30-PCB-BK	LED	4000K		DIMMING	120	16	

Project Title:

ADDITION & ALTERATIONS TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

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Revision: | Description: | Date: | Revised By:

Drawing Title: LIGHT FIXTURE SCHEDULES

Date: 8/29/2024
Scale: 12" = 1'-0"
Drawn By: S. CROTEAU
Project Number: 22.382

Drawing Number: E002

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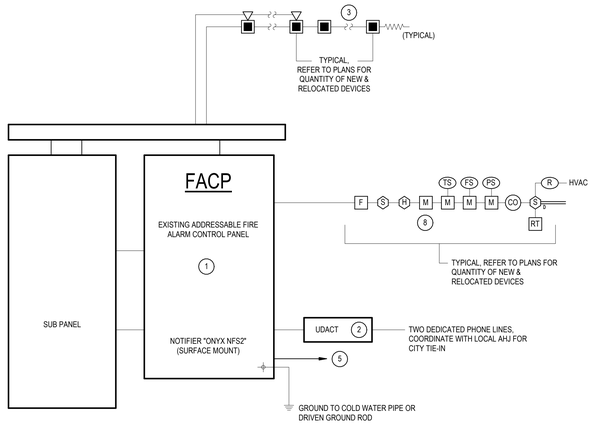
DEMOLITION AND REMOVAL NOTES

1. THE EXISTING FACILITY WILL BE PARTIALLY OCCUPIED AND IN OPERATION DURING THE PERFORMANCE OF THE WORK.
2. WHEN NECESSARY TO TEMPORARILY DISCONNECT ANY EXISTING FEEDER OR BRANCH CIRCUIT SUPPLYING THE OCCUPIED PORTION OF THE FACILITY, CONFIRM WITH THE OWNER , AND SCHEDULE A MUTUALLY AGREEABLE PERIOD OF INTERRUPTION.
3. WHERE REPLACEMENT, RELOCATION OR MODIFICATION OF EXISTING EQUIPMENT IS INDICATED, PROVIDE AND MAINTAIN ALL TEMPORARY FEEDERS, CONNECTIONS, CIRCUIT PROTECTION, AND ANY OTHER MATERIALS AND APPURTENANCES REQUIRED TO MAINTAIN SERVICES TO THE OCCUPIED AREAS.
4. NO WORK SHALL BE LEFT INCOMPLETE, NOR ANY HAZARDOUS SITUATIONS CREATED, WHICH WILL AFFECT THE LIFE OR SAFETY OF THE PUBLIC AND/OR BUILDING OCCUPANTS. AT NO TIME SHALL THE WORK INTERFERE WITH OR CUT OFF ANY OF THE EXISTING SERVICES WITHOUT THE OWNER'S PRIOR WRITTEN PERMISSION.
5. THE OWNER RESERVES THE RIGHT TO OPERATE ALL EXISTING ELECTRICAL AND MECHANICAL EQUIPMENT NOT INCLUDED IN THIS WORK, AND TO PERFORM ALL REQUIRED SERVICING AND REPAIRS TO SAME, AT ALL TIMES.
6. IT IS REQUIRED THAT THE WORK INDICATED AND/OR SPECIFIED SHALL BE CARRIED OUT WITH A MINIMUM OF INTERFERENCE TO THE ESTABLISHED OPERATIONS OF THE BUILDING.
7. REMOVE, ABANDON, REROUTE, RELOCATE ANY CONDUIT, WIRING, LIGHTING FIXTURES, OUTLETS, AND OTHER ELECTRICAL ITEMS, WHICH ARE LAID BARE IN THE COURSE OF, OR INTERFERENCE WITH, THE ALTERATIONS. REMOVE ALL EXPOSED OUTLETS, CONDUIT, AND BRANCH CIRCUIT WORK, WHICH INTERFERE WITH THE ALTERATIONS.
8. IT IS THE INTENT OF THESE SPECIFICATIONS TO PROVIDE FOR THE CONTINUANCE OF ELECTRICAL SERVICES PRESENTLY INSTALLED IN THE UNALTERED AREAS. PROVIDE ALL CONDUIT, WIRING, AND DEVICES NECESSARY TO MAINTAIN SERVICES TO THESE AREAS.
9. COMPARE THE PLANS WITH THE EXISTING CONDITIONS TO DETERMINE THE AMOUNT OF WORK AFFECTED. REMOVE ALL UNUSED EXPOSED CIRCUIT WORK, OUTLETS, FIXTURES AND THE LIKE NOT REQUIRED BY THE ALTERATIONS.
10. ALL MATERIALS REQUIRED TO BE REMOVED AND NOT REINSTALLED UNDER THIS DIVISION OF WORK, UNLESS OTHERWISE INDICATED, SHALL BECOME THE PROPERTY OF THE CONTRACTOR, AND SHALL BE REMOVED FROM THE SITE.
11. WHERE FEEDERS AND BRANCH CIRCUITS OR DEVICES AND EQUIPMENT ARE INDICATED TO BE REMOVED, CONDUCTORS AND CABLES SHALL BE COMPLETELY REMOVED BACK TO THEIR SOURCE. EXPOSED OR ACCESSIBLE CONDUITS SHALL BE REMOVED COMPLETELY; CONDUITS EMBEDDED IN CONCRETE OR MASONRY SHALL BE CUT OFF FLUSH AND THE SURFACE PATCHED SMOOTH AND LEVEL.
12. REMOVED MATERIALS SHALL BE DISPOSED OF USING A LICENSED CARTING SERVICE.
13. CONTRACTOR SHALL REMOVE ALL ELECTRICAL EQUIPMENT IN OR ON WALLS THAT ARE TO BE REMOVED - MAINTAIN CONTINUITY OF ALL EXISTING BRANCH CIRCUITRY TO EXISTING ROOMS NOT BEING RENOVATED, REWIRE ALL EXISTING BRANCH CIRCUITS (THAT ARE TO REMAIN) AS REQUIRED. REFER TO ARCHITECTURAL DEMOLITION DRAWINGS FOR WALLS BEING REMOVED - REFER TO CONSTRUCTION SCHEDULE FOR TIME DELAY.
14. OUTAGES OF EXISTING ELECTRICAL (LIGHTING, POWER, AND SIGNAL) SYSTEMS NECESSITATED BY WORK OF ALL TRADES SHALL BE IN ACCORDANCE WITH FIELD SCHEDULES BY THE GENERAL CONTRACTOR AND OWNER - INCLUDE ALL ELECTRICAL WORK OVERTIME AND SUPERVISION TO COMPLY - CONTRACTOR SHALL OBTAIN OWNERS AND GENERAL CONTRACTOR'S APPROVAL PRIOR TO DISRUPTING OF EXISTING ELECTRICAL SYSTEMS.
15. CONTRACTOR TO MAINTAIN CONTINUITY AND ACCESSIBILITY OF ALL EXISTING SYSTEMS AND SYSTEM EQUIPMENT FEEDERS WHICH MAY BE DISRUPTED FROM WORK OF OTHER TRADES.
16. ANY EXISTING ELECTRICAL WORK WHICH IS PULLED OUT OR CUT AWAY SHALL BE REMOVED FROM THE SITE AS DIRECTED BY THE GENERAL CONTRACTOR AND THE OWNER.
17. EXISTING ELECTRICAL EQUIPMENT WHICH IS NOT TO BE REUSED SHALL BE REMOVED FROM DRYWALL PARTITIONS. ANY OPENING IN THE EXISTING PARTITIONS BY REMOVAL OF EXISTING ELECTRICAL EQUIPMENT SHALL BE PATCHED BY THIS CONTRACTOR WITH MATERIALS TO MATCH EXISTING.
18. FOR PURPOSES OF THE CONTRACT, WHAT IS NOTED OR SHOWN ON THE DRAWINGS INDICATES THE SCOPE OF WORK REQUIRED AND THE QUALITY OF MATERIALS.
19. CONTRACTOR TO EXAMINE ALL CONTRACT DOCUMENTS AND PERFORM ALL DEMOLITION BOTH FOR AREAS BEING RENOVATED AND FOR AREAS WHICH MUST BE REWORKED TO PERMIT THE INSTALLATION OF WORK BY VARIOUS TRADES.
20. CONTRACTOR SHALL VISIT THE SITE AND VERIFY THE EXTENT OF DEMOLITION AND REMOVALS PRIOR TO THE SUBMISSION OF BIDS. NO CONSIDERATION SHALL BE GIVEN FOR FAILURE TO VISIT THE SITE.



1 FIRE ALARM RISER DIAGRAM

N.T.S.

NOTES:

1. REFER TO SPECIFICATIONS (283111) FOR SYSTEM REQUIREMENTS FOR MODIFICATIONS & PROGRAMMING REQUIRED FOR PROJECT.
2. CONFIRM EXISTING AUTO-DIALER FOR FIRE SERVICE NOTIFICATION IS WORKING PROPERLY.
3. PROVIDE WIRING AS REQUIRED TO ALLOW FOR SILENCING OF AUDIBLE DEVICES WITH STROBES STILL ACTIVE. ALL NEW AND EXISTING STROBES SHALL BE SYNCHRONIZED TO EACH OTHER.
4. MAINTAIN ALL EXISTING FIRE ALARM DEVICE ADDRESSES AND ADD FOR THE DEVICES IN THE NEW ADDITION AND ALL OTHER NEW DEVICES.
5. PROVIDE A NEW 120V-20A DEDICATED BRANCH CIRCUIT WITH BREAKER LOCK, FED GENERATOR PANEL TO REPLACE EXISTING BRANCH CIRCUIT.
6. ALL WIRING SHALL BE PER SPECIFICATIONS AND MANUFACTURER'S REQUIREMENTS.
7. FURNISH DEVICES WITH ALL NECESSARY MATERIALS AND ACCESSORIES FOR A COMPLETE INSTALLATION TO BE FULLY OPERATIONAL.
8. FURNISH AND INSTALL MONITORING MODULE FOR MONITORING ALARM CONTACTS IN THE FOLLOWING: (1) GENERATOR, (1) KITCHEN HOOD SUPPRESSION SYSTEM.
9. CONTRACTOR SHALL COORDINATE LOCATION OF ALL DUCT SMOKE DETECTORS, SMOKE DAMPERS AND FIRE/SMOKE DAMPERS WITH MECHANICAL CONTRACTOR, ALL DEVICES SHALL BE WIRED TO THE FIRE ALARM SYSTEM.
10. MOUNT BOTTOM OF NOTIFICATION DEVICES 80" AFF OR 6" BELOW CEILING, WHICH EVER IS LOWER UNLESS OTHERWISE NOTED. MOUNT TOP OF PULL STATION DEVICES AT 48" AFF.
11. REFER TO ELECTRICAL & MECHANICAL PLANS TO CONFIRM DEVICE QUANTITES, ALL FIRE ALARM WORK SHALL BE INCLUDED IN THE BASE BID.

SEQUENCE OF OPERATION

A. THE SYSTEMALARM OPERATION SUBSEQUENT TO THE ALARM ACTIVATION OF ANY MANUAL STATION, AUTOMATIC DETECTION DEVICE, OR SPRINKLER FLOW SWITCH IS TO BE AS FOLLOWS:

1. ALL AUDIBLE ALARM INDICATING APPLIANCES SHALL SOUND AN ALARM SIGNAL UNTIL SILENCED BY THE ALARM SILENCE SWITCH AT THE CONTROL PANEL.
2. ALL VISUAL ALARM INDICATING APPLIANCES (XENON STROBES) SHALL DISPLAY A CONTINUOUS PATTERN UNTIL EXTINGUISHED BY THE ALARM SILENCE SWITCH.
3. ALL DOORS NORMALLY HELD OPEN BY DOOR CONTROL DEVICES SHALL RELEASE.
4. A SUPERVISED SIGNAL TO NOTIFY AN APPROVED CENTRAL STATION SHALL BE ACTIVATED. ALL AIR HANDLING SYSTEMS AND EXHAUST FANS LARGER THAN 2000 CFM, SHALL BE AUTOMATICALLY SHUTDOWN.
5. ALARMS SHALL BE DISPLAYED ON THE PANEL DISPLAY. THE ALARM LED SHALL FLASH ON THE CONTROL PANEL UNTIL THE ALARM HAS BEEN ACKNOWLEDGED AT THE CONTROL PANEL. ONCE ACKNOWLEDGED, THIS SAME LED SHALL LATCHON. A SUBSEQUENT ALARM RECEIVED FROM ANOTHER ZONE AFTER ACKNOWLEDGED SHALL FLASH THE ALARM LED ON THE CONTROL PANEL AND THE PANEL DISPLAL SHALL SHOW THE NEW ALARM INFORMATION. A PULSING ALARM TONE SHALL OCCUR WITHIN THE CONTROL PANEL AND THE REMOTE ANNUNCIATOR UNTIL ACKNOWLEDGED.

B. THE ALARM ACTIVATION OF ANY ELEVATOR LOBBY, HOISTWAY, OR MACHINE ROOM SMOKE OR HEAT DETECTOR SHALL, IN ADDITION TO THE OPERATIONS LISTED ABOVE, CAUSE THE ELEVATOR CAB TO BE RECALLED ACCORDING TO THE FOLLOWING SEQUENCE:

1. IF THE ALARMED DETECTOR IS ON ANY FLOOR OTHER THAN THE MAIN LEVEL OF EGRESS, THE ELEVATOR CAB SHALL BE RECALLED TO THE MAIN LEVEL OF EGRESS.
2. IF THE ALARMED DETECTOR IS ON THE MAIN EGRESS LEVEL, THE ELEVATOR CAB SHALL BE RECALLED TO THE PREDETERMINED ALTERNATE RECALL LEVEL AS DETERMINED BY THE LOCAL AUTHORITY HAVING JURIDICTION.
3. THE ACTIVATION OF ANY HEAT DETECTOR IN THE ELEVATOR HOISTWAY OR MACHINE ROOM SHALL AUTOMATICALLY DISCONNECT POWER TO THE ELEVATOR MOTOR VIA BASE-MOUNTED CONTACTS ACTIVATING THE ELEVATOR FEEDER SHUNT-TRIP CIRCUIT BREAKER (REFER TO DRAWINGS). POWER TO SHUNT-TRIP UNIT SHALL BE FROM LOCAL EMERGENCY PANEL.

C. THE CONTROL PANEL SHALL HAVE A DEDICATED SUPERVISORY SERVICE LED AND A DEDICATED SUPERVISORY SERVICE ACKNOWLEDGE SWITCH.

D. ALARM AND TROUBLE CONDITIONS SHALL BE IMMEDIATELY DISPLAYED ON THE CONTROL PANEL FRONT ALPHANUMERIC DISPLAY. IF MORE ALARMS OR TROUBLES ARE IN THE SYSTEM THE OPERATOR MAY SCROLL TO DISPLAY NEW ALARMS.

E. THE SYSTEM SHALL HAVE AN ALARM LIST KEY THAT WILL ALLOW THE OPERATOR TO DISPLAY ALL ALARMS, TROUBLES, AND SUPERVISORY SERVICE CONDITIONS WITH THE TIME OF OCCURANCE.

F. THE ACTIVATION OF ANY STANDPIPE OR SPRINKLER VALVE TAMPER SWITCH SHALL ACTIVATE THE SYSTEM SUPERVISORY SERVICE AUDIBLE SIGNAL AND ILLUMINATE THE LED AT THE CONTROL PANEL.

1. ACTIVATING THE SUPERVISORY SERVICE ACKNOWLEDGE SWITCH WILL SILENCE THE SUPERVISORY AUDIBLE SIGNAL WHILE MAINTAINING THE SUPERVISORY SERVICE LED ON INDICATING THE TAMPER CONTACT IS STILL IN THE OFF-NORMAL STATE.
2. RESTORING THE VALVE TO THE NORMAL POSITION SHALL CAUSE THE SUPERVISORY SERVICE LED TO EXTINGUISH THUS INDICATING RESTORATION TO NORMAL POSITION.

ELECTRICAL DRAWING LIST

DRAWING NUMBER	DRAWING DESCRIPTION
E001	ELECTRICAL SYMBOLS, NOTES & ABBREVIATIONS
E002	LIGHT FIXTURE SCHEDULES
E003	ELECTRICAL DRAWING LIST, DEMOLITION NOTES & FIRE ALARM RISER DIAGRAM
E011	FIRST FLOOR LIGHTING DEMOLITION PLAN - PART 'A'
E012	FIRST FLOOR LIGHTING DEMOLITION PLAN - PART 'B'
E013	FIRST FLOOR LIGHTING DEMOLITION PLAN - PART 'C'
E021	SECOND FLOOR LIGHTING DEMOLITION PLAN - PART 'A', 'B' & 'C'
E031	THIRD FLOOR LIGHTING DEMOLITION PLAN - PART 'A', 'B' & 'C'
E041	ATTIC LIGHTING DEMOLITION PLAN - 'B' & 'C'
E051	FIRST FLOOR POWER DEMOLITION PLAN - PART 'A'
E052	FIRST FLOOR POWER DEMOLITION PLAN - PART 'B'
E053	FIRST FLOOR POWER DEMOLITION PLAN - PART 'C'
E061	SECOND FLOOR POWER DEMOLITION PLAN - PART 'A', 'B' & 'C'
E071	THIRD FLOOR POWER DEMOLITION PLAN - PART 'A', 'B' & 'C'
E081	ATTIC POWER DEMOLITION PLAN - PART 'B' & 'C'
E091	ROOF DEMOLITION POWER PLAN - PART 'A'
E101	FIRST FLOOR LIGHTING PLAN - PART 'A'
E102	FIRST FLOOR LIGHTING PLAN - PART 'B'
E103	FIRST FLOOR LIGHTING PLAN - PART 'C'
E104	FIRST FLOOR LIGHTING PLAN - PART 'D'
E110	SECOND FLOOR LIGHTING PLAN - PART 'A', 'B' & 'C'
E120	THIRD FLOOR LIGHTING PLAN - PART 'A', 'B' & 'C'
E130	ATTIC LIGHTING PLAN - PART 'B' & 'C'
E140	ELECTRICAL SITE PLAN
E201	FIRST FLOOR POWER PLAN - PART 'A'
E202	FIRST FLOOR POWER PLAN - PART 'B'
E203	FIRST FLOOR POWER PLAN - PART 'C'
E204	FIRST FLOOR POWER PLAN - PART 'D'
E210	SECOND FLOOR POWER PLAN - PART 'A', 'B' & 'C'
E220	THIRD FLOOR POWER PLAN - PART 'A', 'B' & 'C'
E230	ATTIC POWER PLAN - PART 'B' & 'C'
E241	ROOF POWER PLAN - PART 'A'
E242	ROOF POWER PLAN - PART 'D'
E401	EXISTING ONE LINE DIAGRAM - NORTH SIDE - ELECTRICAL DEMOLITION
E402	EXISTING ONE LINE DIAGRAM - SOUTH SIDE - ELECTRICAL DEMOLITION
E403	ELECTRICAL ONE LINE DIAGRAM - NORTH SIDE
E404	ELECTRICAL ONE LINE DIAGRAM - SOUTH SIDE
E501	ELECTRICAL PANEL SCHEDULES - FIRST FLOOR PART 'A'
E502	ELECTRICAL PANEL SCHEDULES - FIRST FLOOR PART 'A' & 'B'
E503	ELECTRICAL PANEL SCHEDULES - FIRST FLOOR PART 'B' & 'C'
E504	ELECTRICAL PANEL SCHEDULES - SECOND FLOOR
E505	ELECTRICAL PANEL SCHEDULES - THIRD FLOOR
E506	ELECTRICAL PANEL SCHEDULES - PART 'A' THRU 'D'
E601	ELECTRICAL DETAILS
E602	ELECTRICAL DETAILS

Project Title:

ADDITION & ALTERATIONS TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

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Revision: | Description: | Date: | Revised By:

Drawing Title:
ELECTRICAL DRAWING LIST, DEMOLITION NOTES & FIRE ALARM RISER DIAGRAM

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Drawn By: S. CROTEAU
Project Number: 22.382

Drawing Number: E003

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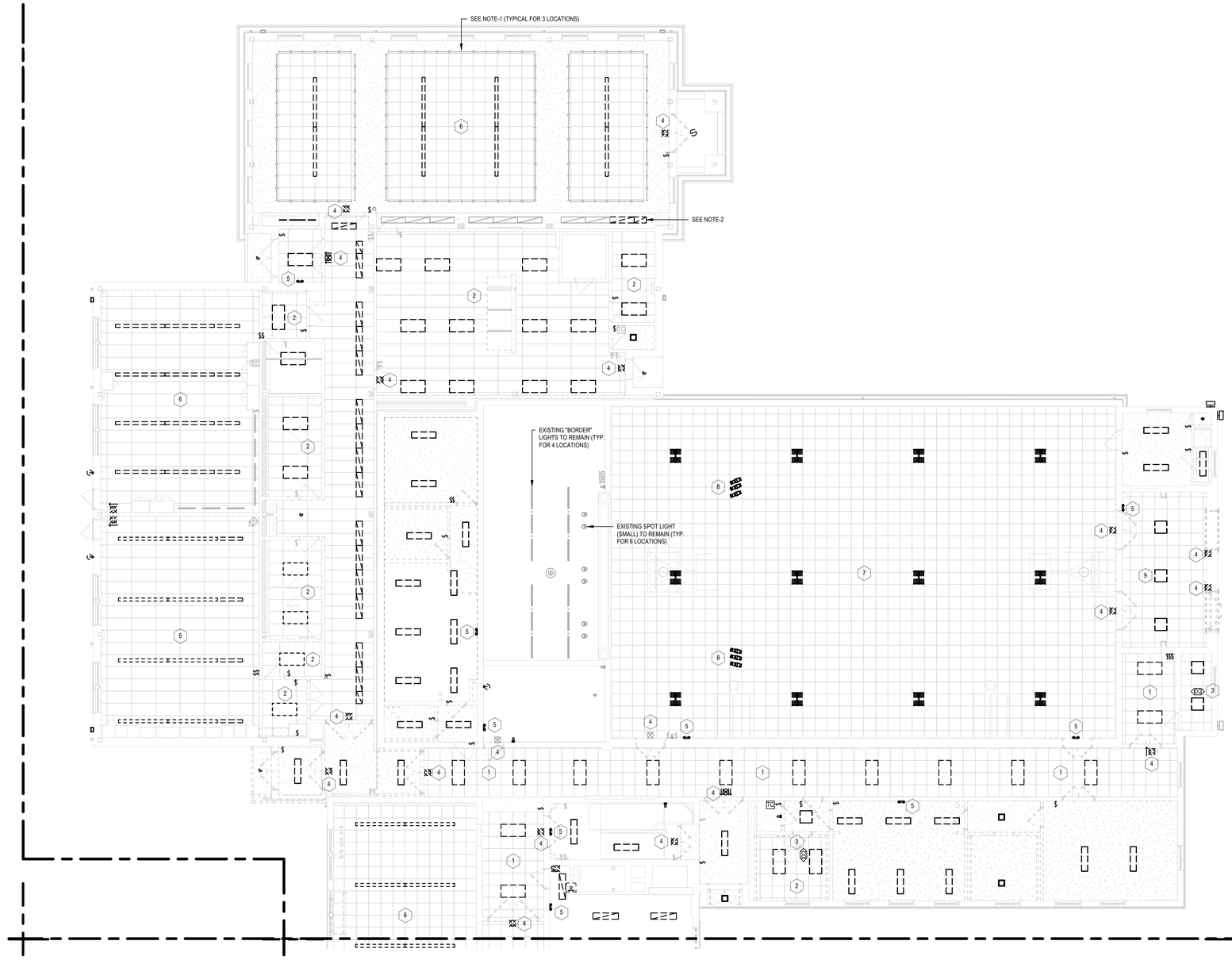


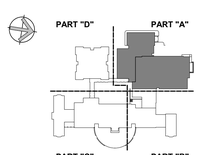
1 FIRST FLOOR DEMO. LTG PLAN PART 'A'
1/8" = 1'-0"

LIGHTING DEMOLITION KEY NOTES

1. CONTRACTOR SHALL DISCONNECT AND REMOVE EXISTING RECESSED 18 CELL PARABOLIC FLUORESCENT LIGHT FIXTURE IN THIS ROOM/CORRIDOR AND ALL ASSOCIATED BRANCH CIRCUIT WIRING COMPLETELY BACK TO POINT OF ORIGIN.
2. CONTRACTOR SHALL DISCONNECT AND REMOVE EXISTING RECESSED FLAT LENS 2 x 4 FLUORESCENT LIGHT FIXTURE IN THIS ROOM AND ALL ASSOCIATED BRANCH CIRCUIT WIRING COMPLETELY BACK TO POINT OF ORIGIN.
3. CONTRACTOR SHALL DISCONNECT, REMOVE AND STORE EXISTING CEILING MOUNTED OCCUPANCY/VACANCY SENSOR IN THIS ROOM TO BE REINSTALLED IN THE SAME LOCATION AFTER THE SPRINKLER PIPING WORK IS DONE.
4. CONTRACTOR SHALL DISCONNECT AND REMOVE EXISTING CEILING/WALL MOUNTED EXIT SIGN INDICATED AND ALL ASSOCIATED BRANCH CIRCUIT WIRING COMPLETELY BACK TO POINT OF ORIGIN.
5. CONTRACTOR SHALL DISCONNECT AND REMOVE EXISTING CEILING/WALL MOUNTED TWIN HEAD EMERGENCY LIGHTING UNIT INDICATED AND ALL ASSOCIATED BRANCH CIRCUIT WIRING BACK TO POINT OF ORIGIN.
6. CONTRACTOR SHALL DISCONNECT AND REMOVE EXISTING PENDANT MOUNTED FLUORESCENT LIGHT FIXTURES IN THIS ROOM AND ALL ASSOCIATED BRANCH CIRCUIT WIRING COMPLETELY BACK TO POINT OF ORIGIN.
7. CONTRACTOR SHALL DISCONNECT, REMOVE AND STORE EXISTING SURFACE MOUNTED SQUARE LED HIGH BAY LIGHT FIXTURES IN THE GYMNASIUM TO BE REINSTALLED IN THE SAME LOCATION AFTER SPRINKLER PIPING WORK IS DONE.
8. CONTRACTOR SHALL DISCONNECT, REMOVE AND STORE EXISTING SURFACE/CEILING MOUNTED STAGE SPOT LIGHT FIXTURES IN THE GYMNASIUM TO BE REINSTALLED IN THE SAME LOCATION AFTER SPRINKLER PIPING WORK IS DONE.
9. CONTRACTOR SHALL DISCONNECT, REMOVE AND STORE EXISTING RECESSED MOUNTED FLAT LENS 2 x 4 LED LIGHT FIXTURES IN THE GYMNASIUM LOBBY TO BE REINSTALLED IN THE SAME LOCATION AFTER SPRINKLER PIPING WORK IS DONE.

GENERAL LIGHTING DEMOLITION NOTES

1. ALL EXISTING FLUORESCENT COVE LIGHT FIXTURES ARE TO REMAIN, CONTRACTOR SHALL DISCONNECT AND REMOVE LAMPS AND BALLAST AND INSTALL NEW RETROFIT LED LAMPS AND DRIVERS OF EQUAL LIGHT OUTPUT.
2. ALL EXISTING FLUORESCENT WALL WASH LIGHT FIXTURES ARE TO REMAIN EXCEPT FOR THE TWO INDICATED, CONTRACTOR SHALL DISCONNECT AND REMOVE LAMPS AND BALLAST AND INSTALL NEW RETROFIT LED LAMPS AND DRIVERS OF EQUAL LIGHT OUTPUT.



KEY PLAN

Project Title:
ADDITION & ALTERATIONS TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

SILVER PETRUCELLI + ASSOCIATES
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Revision:	Description:	Date:	Revised By:

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FIRST FLOOR LIGHTING DEMOLITION PLAN - PART 'A'

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Drawn By: S. CROTEAU
Project Number: 22.382
Drawing Number: E011

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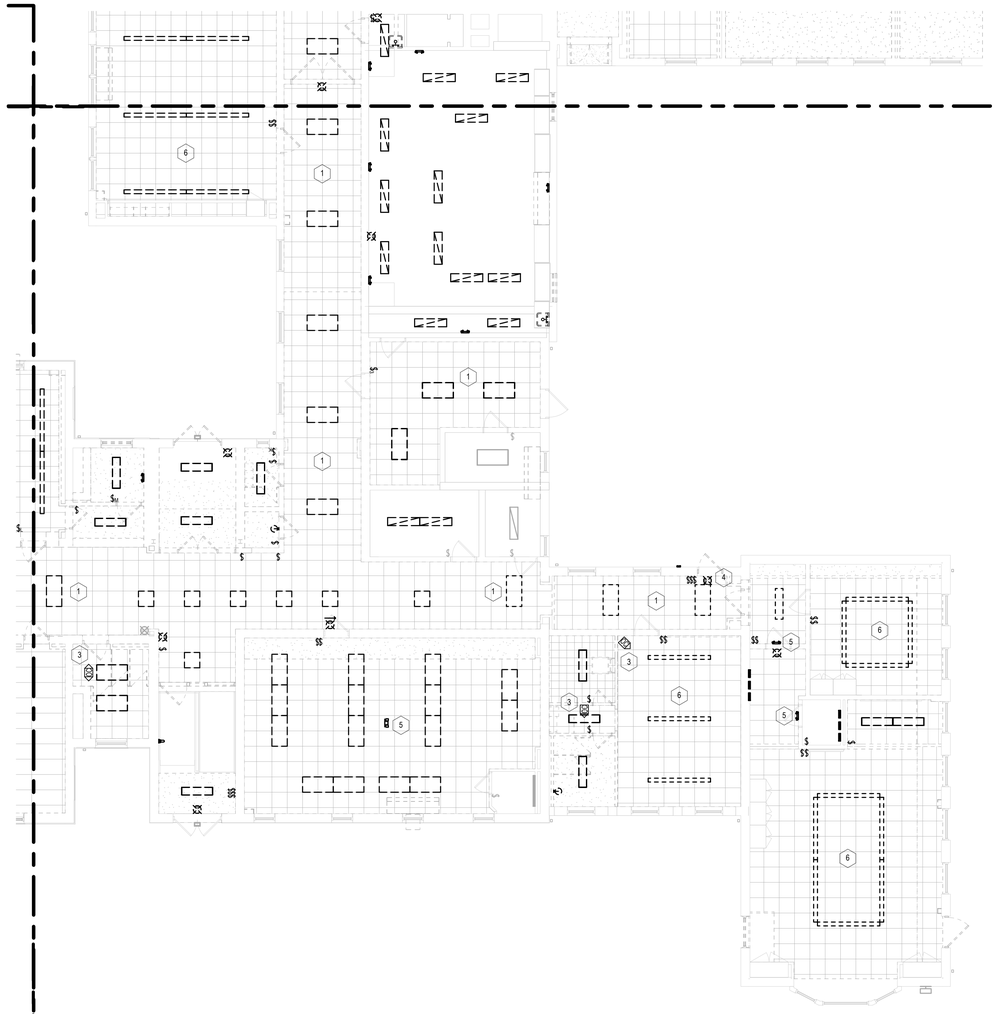
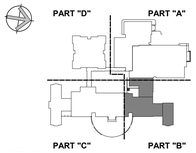
LIGHTING DEMOLITION KEY NOTES

1. CONTRACTOR SHALL DISCONNECT AND REMOVE EXISTING RECESSED 18 CELL PARABOLIC FLUORESCENT LIGHT FIXTURE IN THIS ROOM/CORRIDOR AND ALL ASSOCIATED BRANCH CIRCUIT WIRING COMPLETELY BACK TO POINT OF ORIGIN.
2. CONTRACTOR SHALL DISCONNECT AND REMOVE EXISTING RECESSED FLAT LENS 2 x 4 FLUORESCENT LIGHT FIXTURE IN THIS ROOM AND ALL ASSOCIATED BRANCH CIRCUIT WIRING COMPLETELY BACK TO POINT OF ORIGIN.
3. CONTRACTOR SHALL DISCONNECT, REMOVE AND STORE EXISTING CEILING MOUNTED OCCUPANCY/VACANCY SENSOR IN THIS ROOM TO BE REINSTALLED IN THE SAME LOCATION AFTER THE SPRINKLER PIPING WORK IS DONE.
4. CONTRACTOR SHALL DISCONNECT AND REMOVE EXISTING CEILING/WALL MOUNTED EXIT SIGN INDICATED AND ALL ASSOCIATED BRANCH CIRCUIT WIRING COMPLETELY BACK TO POINT OF ORIGIN.
5. CONTRACTOR SHALL DISCONNECT AND REMOVE EXISTING CEILING/WALL MOUNTED TWIN HEAD EMERGENCY LIGHTING UNIT INDICATED AND ALL ASSOCIATED BRANCH CIRCUIT WIRING BACK TO POINT OF ORIGIN.
6. CONTRACTOR SHALL DISCONNECT AND REMOVE EXISTING PENDANT MOUNTED LIGHT FIXTURES IN THIS ROOM AND ALL ASSOCIATED BRANCH CIRCUIT WIRING COMPLETELY BACK TO POINT OF ORIGIN.



1 FIRST FLOOR DEMO. LTG PLAN PART 'B'
1/8" = 1'-0"



KEY PLAN

Project Title:

ADDITION & ALTERATIONS TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

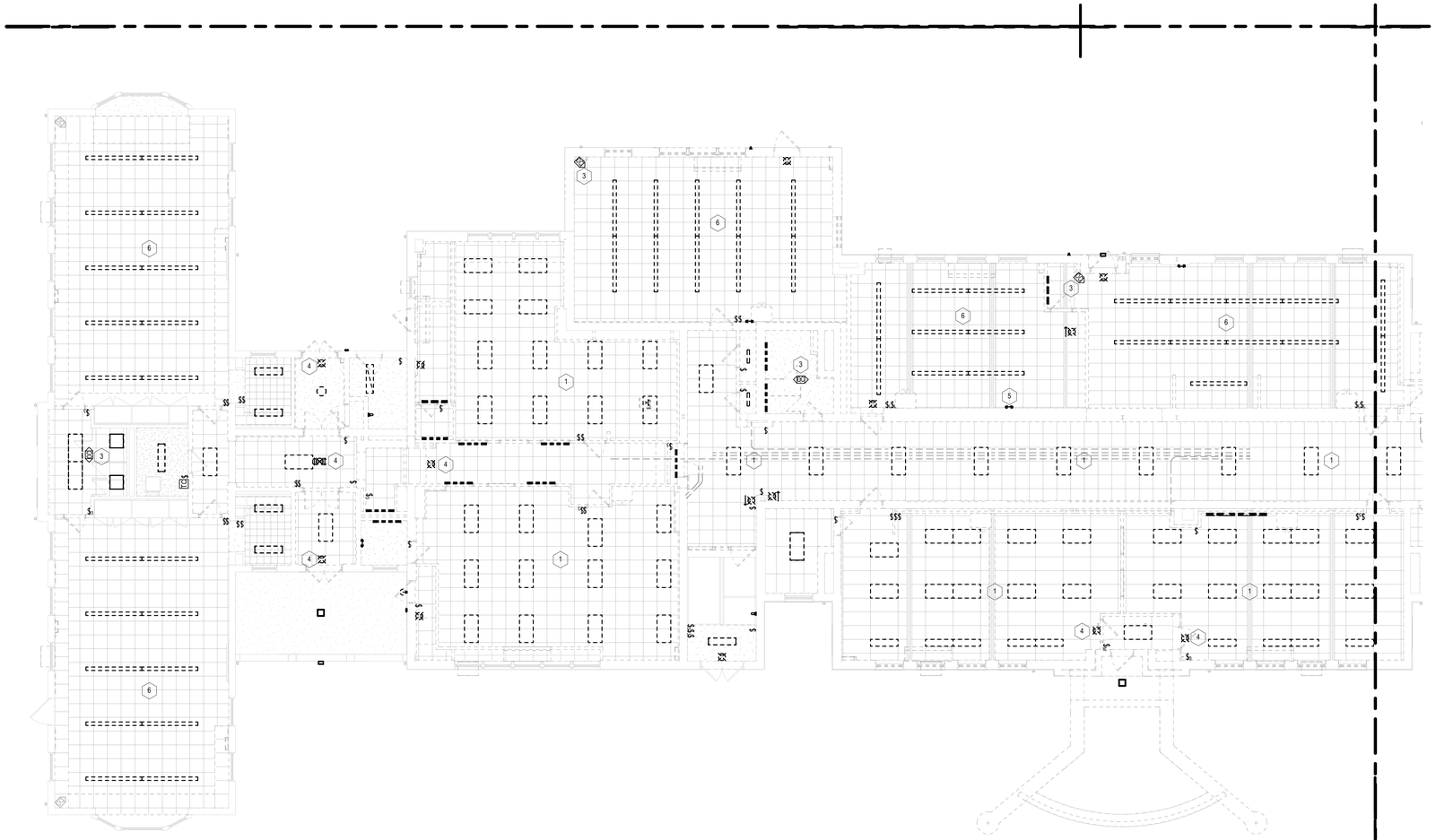
SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
311 STATE STREET NEW LONDON CT 06320
203 230 9007 silverpetrucelli.com

Revision:	Description:	Date:	Revised By:

Drawing Title:
FIRST FLOOR LIGHTING DEMOLITION PLAN - PART 'B'

Date: 8/29/2024
Scale: As indicated
Drawn By: S. CROTEAU
Project Number: 22.382
Drawing Number: E012

8/29/2024 1:18:35 PM



1 FIRST FLOOR DEMO. LTG PLAN PART 'C'
1/8" = 1'-0"

LIGHTING DEMOLITION KEY NOTES

1. CONTRACTOR SHALL DISCONNECT AND REMOVE EXISTING RECESSED 18 CELL PARABOLIC FLUORESCENT LIGHT FIXTURE IN THIS ROOM/CORRIDOR AND ALL ASSOCIATED BRANCH CIRCUIT WIRING COMPLETELY BACK TO POINT OF ORIGIN.
2. CONTRACTOR SHALL DISCONNECT AND REMOVE EXISTING RECESSED FLAT LENS 2 x 4 FLUORESCENT LIGHT FIXTURE IN THIS ROOM AND ALL ASSOCIATED BRANCH CIRCUIT WIRING COMPLETELY BACK TO POINT OF ORIGIN.
3. CONTRACTOR SHALL DISCONNECT, REMOVE AND STORE EXISTING CEILING MOUNTED OCCUPANCY/VACANCY SENSOR IN THIS ROOM TO BE REINSTALLED IN THE SAME LOCATION AFTER THE SPRINKLER PIPING WORK IS DONE.
4. CONTRACTOR SHALL DISCONNECT AND REMOVE EXISTING CEILING/WALL MOUNTED EXIT SIGN INDICATED AND ALL ASSOCIATED BRANCH CIRCUIT WIRING COMPLETELY BACK TO POINT OF ORIGIN.
5. CONTRACTOR SHALL DISCONNECT AND REMOVE EXISTING CEILING/WALL MOUNTED TWIN HEAD EMERGENCY LIGHTING UNIT INDICATED AND ALL ASSOCIATED BRANCH CIRCUIT WIRING BACK TO POINT OF ORIGIN.
6. CONTRACTOR SHALL DISCONNECT AND REMOVE EXISTING PENDANT MOUNTED FLUORESCENT LIGHT FIXTURES IN THIS ROOM AND ALL ASSOCIATED BRANCH CIRCUIT WIRING COMPLETELY BACK TO POINT OF ORIGIN.

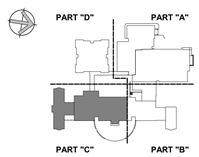
   CONTRACTOR SHALL DISCONNECT AND REMOVE EXISTING RECESSED LINEAR LIGHT FIXTURE INSTALLED IN CASE WORK TO BE REMOVED. EXISTING BRANCH CIRCUIT SHALL BE MADE SAFE TO BE USED TO SERVE NEW LIGHT FIXTURE IN THIS LOCATION (REFER TO DWG. E120).

   CONTRACTOR SHALL DISCONNECT, REMOVE AND STORE EXISTING RECESSED MOUNTED 2 x 4 CENTER BASKET TYPE LED LIGHT FIXTURES IN THE CORRIDOR TO BE REINSTALLED IN THE SAME LOCATION AFTER SPRINKLER PIPING WORK IS DONE.

   CONTRACTOR SHALL DISCONNECT, REMOVE AND STORE EXISTING RECESSED MOUNTED 2 x 4 CENTER BASKET TYPE LED LIGHT FIXTURES IN THIS ROOM TO BE REINSTALLED IN THE SAME LOCATION AFTER SPRINKLER PIPING WORK IS DONE.

GENERAL LIGHTING NOTES

1. REFER TO DRAWING E001 FOR SYMBOLS AND ABBREVIATIONS.
2. ALL EXISTING LIGHT FIXTURES, EXIT SIGNS AND LIGHT SWITCHES SHOWN HALF-TONE (LIGHT), ARE EXISTING TO REMAIN AND ALL WIRING TO THESE DEVICES SHALL REMAIN WIRED TO THEIR EXISTING BRANCH CIRCUIT(S). CONTRACTOR IS RESPONSIBLE FOR MAINTAINING THE CONTINUITY OF ALL EXISTING BRANCH CIRCUITS EFFECTED BY THE RENOVATION AND PROVIDE ADDITIONAL WIRING AS NEEDED.
3. ALL NEW LIGHT FIXTURES, EXIT SIGNS AND LIGHT SWITCHES MOUNTED ON EXISTING CONCRETE WALLS (POURED OR BLOCK) SHALL BE FED WITH SURFACE MOUNTED WIREMOLD RACEWAY, TYPE 500 OR 700 SERIES. PROVIDE ALL NECESSARY ACCESSORIES, CONNECTIONS AND FITTINGS FOR A COMPLETE SYSTEM.
4. ALL ROOMS/AREAS THAT HAVE BOTH NORMAL AND EMERGENCY LIGHT FIXTURES EXCEPT BATHROOMS, SHALL BE CONTROLLED TOGETHER VIA A DIMMABLE 924 RELAY UNLESS OTHERWISE NOTED. BATHROOMS SHALL BE CONTROLLED BY A STANDARD NON-DIMMABLE 924 RELY INSTEAD.



KEY PLAN

Project Title:
ADDITION & ALTERATIONS TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
311 STATE STREET NEW LONDON CT 06320
203 230 9007 silverpetrucelli.com

Revision:	Description:	Date:	Revised By:

Drawing Title:
FIRST FLOOR LIGHTING DEMOLITION PLAN - PART 'C'

Date: 8/29/2024
Scale: As indicated
Drawn By: S. CROTEAU
Project Number: 22.382
Drawing Number: E013

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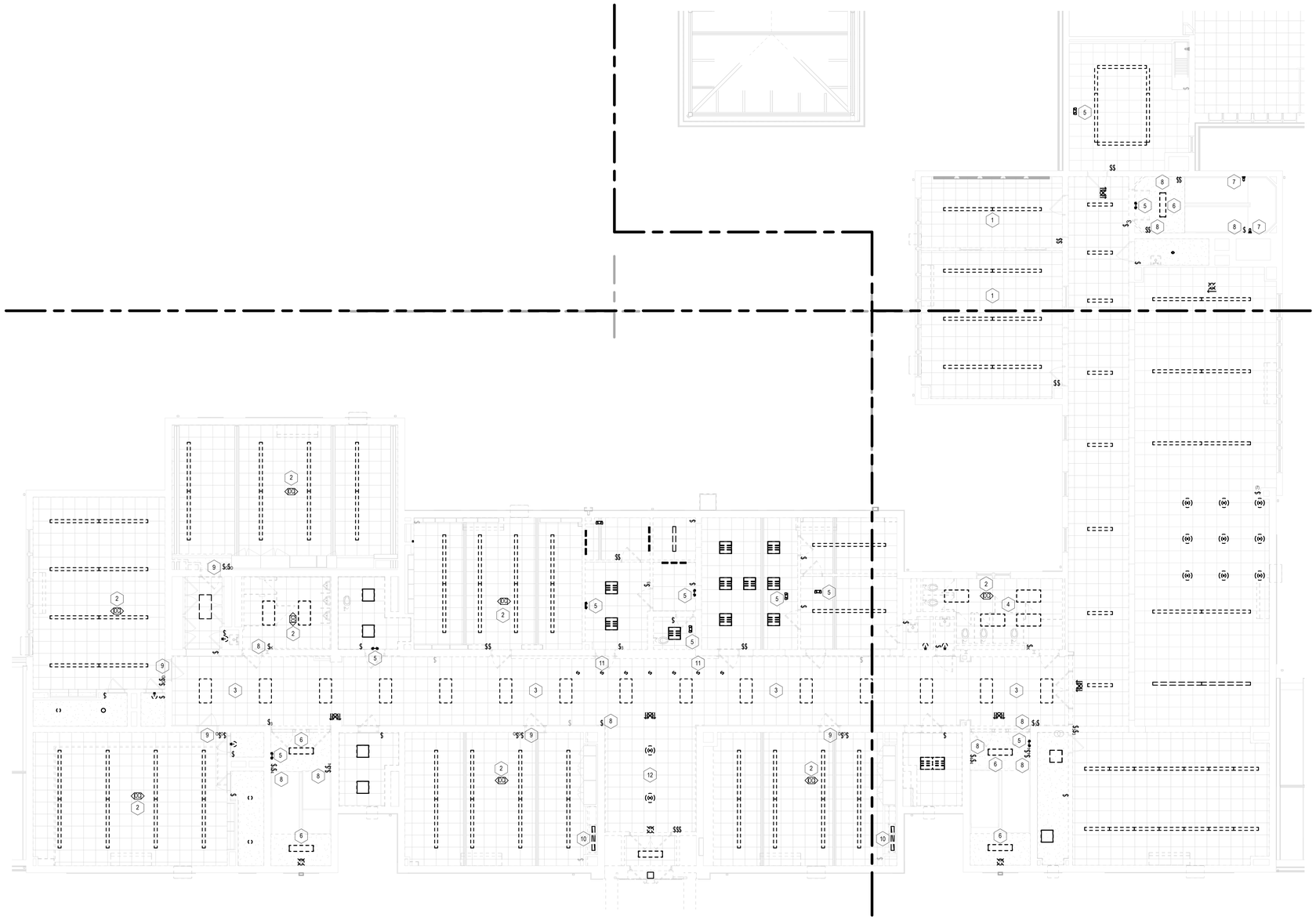


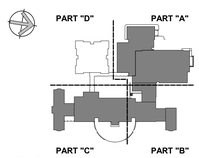
1 SECOND FLOOR DEMO. LIGHTING PLAN
1/8" = 1'-0"

LIGHTING DEMOLITION KEY NOTES

1. CONTRACTOR SHALL DISCONNECT, REMOVE AND STORE EXISTING PENDANT MOUNTED FLUORESCENT LIGHT FIXTURES IN THIS ROOM TO BE RELAMPED WITH LED RETROFIT BULBS (SAME LIGHT OUTPUT) AND REINSTALLED IN THE SAME LOCATION AFTER SPRINKLER PIPING WORK IS DONE.
2. CONTRACTOR SHALL DISCONNECT, REMOVE AND STORE EXISTING CEILING MOUNTED OCCUPANCY/VACANCY SENSOR IN THIS ROOM TO BE REINSTALLED IN THE SAME LOCATION AFTER THE SPRINKLER PIPING WORK IS DONE.
3. CONTRACTOR SHALL DISCONNECT AND REMOVE EXISTING RECESSED MOUNTED 2 x 4 FLUORESCENT 18 CELL PARABOLIC LIGHT FIXTURES IN THE CORRIDOR AND ALL ASSOCIATED BRANCH CIRCUIT WIRING BACK TO POINT OF ORIGIN.
4. CONTRACTOR SHALL DISCONNECT AND REMOVE EXISTING RECESSED MOUNTED 2 x 4 FLAT LENSED FLUORESCENT LIGHT FIXTURES IN THIS ROOM AND ALL ASSOCIATED BRANCH CIRCUIT WIRING BACK TO POINT OF ORIGIN.
5. CONTRACTOR SHALL DISCONNECT AND REMOVE EXISTING CEILING/WALL MOUNTED TWIN HEAD EMERGENCY LIGHTING UNIT INDICATED AND ALL ASSOCIATED BRANCH CIRCUIT WIRING BACK TO POINT OF ORIGIN.
6. CONTRACTOR SHALL DISCONNECT AND REMOVE EXISTING SURFACE MOUNTED 4 FOOT FLUORESCENT WRAPAROUND LIGHT FIXTURE(S) INDICATED AND ALL ASSOCIATED BRANCH CIRCUIT WIRING BACK TO POINT OF ORIGIN.
7. CONTRACTOR SHALL DISCONNECT AND REMOVE EXISTING SURFACE MOUNTED INCANDESCENT "JELLY JAR" LIGHT FIXTURE INDICATED AND ALL ASSOCIATED BRANCH CIRCUIT WIRING BACK TO POINT OF ORIGIN.
8. CONTRACTOR SHALL DISCONNECT AND REMOVE EXISTING TOGGLE TYPE LIGHT SWITCH(ES) OR KEY SWITCH(ES) IN THIS LOCATION ALONG WITH ALL ASSOCIATED WIRING. EXISTING RECESSED BACK BOX AND CONDUIT SHALL REMAIN AND INSTALL A NEW METAL BLANK PLATE OVER BOX.
9. CONTRACTOR SHALL DISCONNECT, REMOVE AND RELOCATE EXISTING DIMMER SWITCH(ES) IN THIS LOCATION ALONG WITH ALL ASSOCIATED WIRING TO ACCOMMODATE NEW ADA DOOR. INSTALL A NEW BLANK PLATE OVER EXISTING BACK BOX TO REMAIN. REFER TO DRAWING E220 FOR NEW SWITCH LOCATION.
10. CONTRACTOR SHALL DISCONNECT AND REMOVE EXISTING RECESSED LINEAR LIGHT FIXTURE INSTALLED IN CASE WORK TO BE REMOVED. EXISTING BRANCH CIRCUIT SHALL BE MADE SAFE TO BE USED TO SERVE NEW LIGHT FIXTURE IN THIS LOCATION (REFER TO DWG. E110).
11. CONTRACTOR SHALL DISCONNECT AND REMOVE EXISTING RECESSED MOUNTED DOWN LIGHT FIXTURE(S) IN THIS AREA AND ALL ASSOCIATED BRANCH CIRCUIT WIRING BACK TO POINT OF ORIGIN.
12. CONTRACTOR SHALL DISCONNECT AND REMOVE EXISTING PENDANT MOUNTED ROUND DIRECT/ INDIRECT LIGHT FIXTURE IN THIS LOCATION AND ALL ASSOCIATED BRANCH CIRCUIT WIRING BACK TO POINT OF ORIGIN.

GENERAL LIGHTING NOTES

1. REFER TO DRAWING E001 FOR SYMBOLS AND ABBREVIATIONS.
2. ALL EXISTING LIGHT FIXTURES, EXIT SIGNS AND LIGHT SWITCHES SHOWN HALF-TONE (LIGHT), ARE EXISTING TO REMAIN AND ALL WIRING TO THESE DEVICES SHALL REMAIN WIRED TO THEIR EXISTING BRANCH CIRCUIT(S). CONTRACTOR IS RESPONSIBLE FOR MAINTAINING THE CONTINUITY OF ALL EXISTING BRANCH CIRCUITS EFFECTED BY THE RENOVATION AND PROVIDE ADDITIONAL WIRING AS NEEDED.
3. ALL NEW LIGHT FIXTURES, EXIT SIGNS AND LIGHT SWITCHES MOUNTED ON EXISTING CONCRETE WALLS (POURED OR BLOCK) SHALL BE FED WITH SURFACE MOUNTED WIREMOLD RACEWAY, TYPE 500 OR 700 SERIES. PROVIDE ALL NECESSARY ACCESSORIES, CONNECTIONS AND FITTINGS FOR A COMPLETE SYSTEM.
4. ALL ROOMS/AREAS THAT HAVE BOTH NORMAL AND EMERGENCY LIGHT FIXTURES EXCEPT BATHROOMS, SHALL BE CONTROLLED TOGETHER VIA A DIMMABLE 924 RELAY UNLESS OTHERWISE NOTED. BATHROOMS SHALL BE CONTROLLED BY A STANDARD NON-DIMMABLE 924 RELY INSTEAD.



KEY PLAN

Project Title:
ADDITION & ALTERATIONS TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
311 STATE STREET NEW LONDON CT 06320
203 230 9007 silverpetrucelli.com

Revision:	Description:	Date:	Revised By:

Drawing Title:
SECOND FLOOR LIGHTING
DEMOLITION PLAN - PART 'A', 'B' & 'C'

Date: 8/29/2024
Scale: As indicated
Drawn By: S. CROTEAU
Project Number: 22.382
Drawing Number: E021

8/29/2024 1:19:27 PM

1 DEMO THIRD FLOOR OVERALL
3/32" = 1'-0"

Project Title:

ADDITIONS & ALTERATION TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
311 STATE STREET NEW LONDON CT 06320
203 230 9007 silverpetrucelli.com

Revision:	Description:	Date:	Revised By:

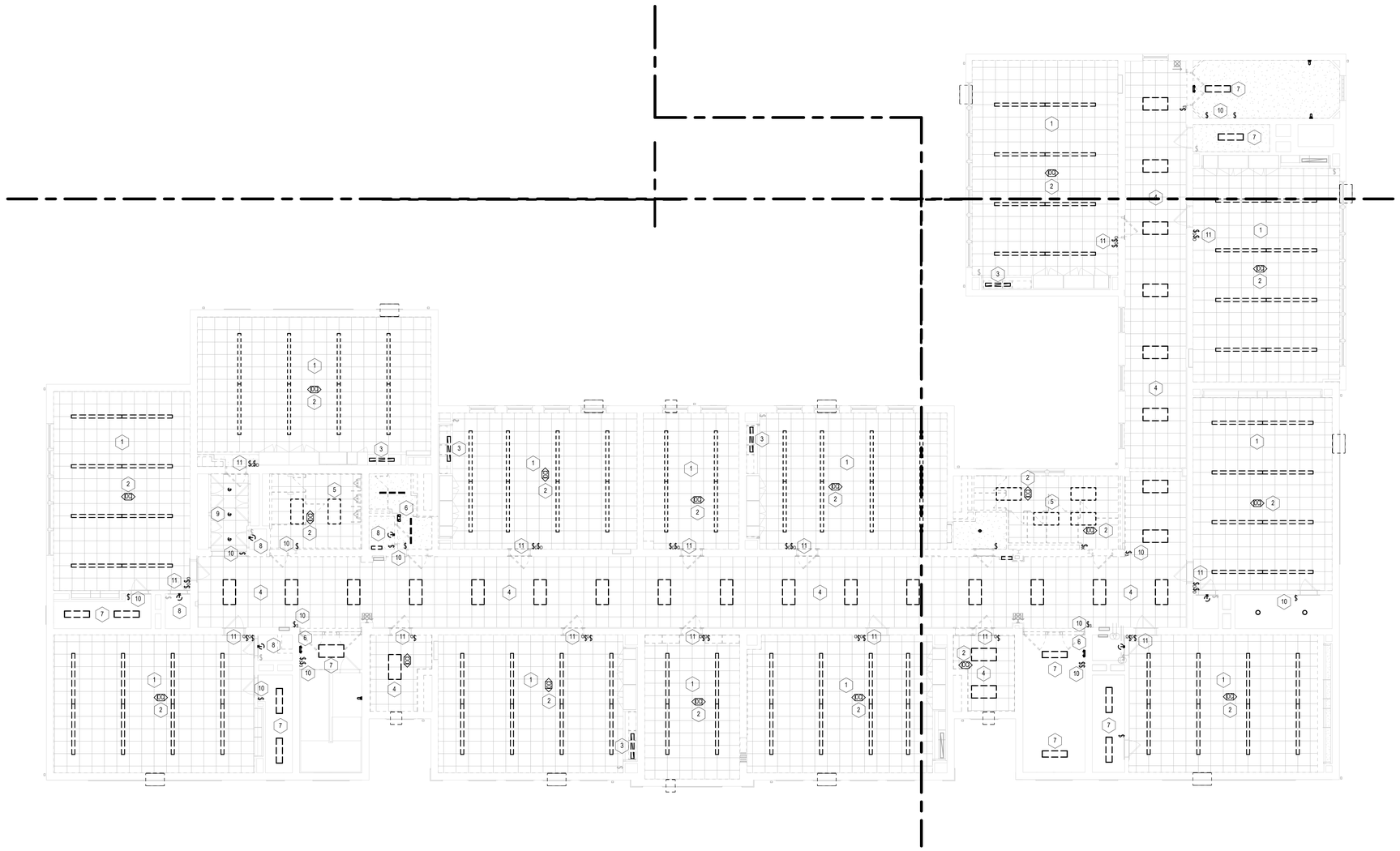
Drawing Title:
TECH-SEC-AV OVERALL THIRD FLOOR PLAN DEMO

95% SUBMISSION - AUGUST 29, 2024

Date: 08/29/2024
Scale: 3/32" = 1'-0"
Drawn By: MD
Project Number: 22-382

Drawing Number: T030

8/28/2024 5:16:44 PM



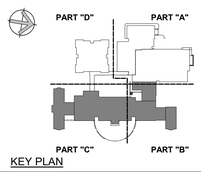
1 THIRD FLOOR DEMO. LIGHTING PLAN
1/8" = 1'-0"

LIGHTING DEMOLITION KEY NOTES

1. CONTRACTOR SHALL DISCONNECT, REMOVE AND STORE EXISTING PENDANT MOUNTED LED LIGHT FIXTURES IN THIS ROOM TO BE REINSTALLED IN THE SAME LOCATION AFTER SPRINKLER PIPING WORK IS DONE.
2. CONTRACTOR SHALL DISCONNECT, REMOVE AND STORE EXISTING CEILING MOUNTED OCCUPANCY/VACANCY SENSOR IN THIS ROOM TO BE REINSTALLED IN THE SAME LOCATION AFTER THE SPRINKLER PIPING WORK IS DONE.
3. CONTRACTOR SHALL DISCONNECT AND REMOVE EXISTING RECESSED LINEAR LIGHT FIXTURE INSTALLED IN CASE WORK TO BE REMOVED. EXISTING BRANCH CIRCUIT SHALL BE MADE SAFE TO BE USED TO SERVE NEW LIGHT FIXTURE IN THIS LOCATION (REFER TO DWG. E120).
4. CONTRACTOR SHALL DISCONNECT, REMOVE AND STORE EXISTING RECESSED MOUNTED 2 x 4 CENTER BASKET TYPE LED LIGHT FIXTURES IN THE CORRIDOR TO BE REINSTALLED IN THE SAME LOCATION AFTER SPRINKLER PIPING WORK IS DONE.
5. CONTRACTOR SHALL DISCONNECT AND REMOVE EXISTING RECESSED MOUNTED 2 x 4 FLAT LENSED FLUORESCENT LIGHT FIXTURES IN THIS ROOM AND ALL ASSOCIATED BRANCH CIRCUIT WIRING BACK TO POINT OF ORIGIN.
6. CONTRACTOR SHALL DISCONNECT AND REMOVE EXISTING CEILING/WALL MOUNTED TWIN HEAD EMERGENCY LIGHTING UNIT INDICATED AND ALL ASSOCIATED BRANCH CIRCUIT WIRING BACK TO POINT OF ORIGIN.
7. CONTRACTOR SHALL DISCONNECT AND REMOVE EXISTING SURFACE MOUNTED 4 FOOT FLUORESCENT WRAPAROUND LIGHT FIXTURE(S) INDICATED AND ALL ASSOCIATED BRANCH CIRCUIT WIRING BACK TO POINT OF ORIGIN.
8. CONTRACTOR SHALL DISCONNECT AND REMOVE EXISTING SURFACE MOUNTED INCANDESCENT "JELLY JAR" LIGHT FIXTURE INDICATED AND ALL ASSOCIATED BRANCH CIRCUIT WIRING BACK TO POINT OF ORIGIN.
9. CONTRACTOR SHALL DISCONNECT, REMOVE AND STORE EXISTING RECESSED MOUNTED DOWN LIGHT LIGHT FIXTURE IN THIS AREA TO BE REINSTALLED IN THE SAME LOCATION AFTER SPRINKLER PIPING WORK IS DONE.
10. CONTRACTOR SHALL DISCONNECT AND REMOVE EXISTING TOGGLE TYPE LIGHT SWITCH(ES) IN THIS LOCATION ALONG WITH ALL ASSOCIATED WIRING. EXISTING RECESSED BACK BOX AND CONDUIT SHALL REMAIN AND INSTALL A NEW METAL BLANK PLATE OVER BOX.
11. CONTRACTOR SHALL DISCONNECT, REMOVE AND RELOCATE EXISTING DIMMER SWITCH(ES) IN THIS LOCATION ALONG WITH ALL ASSOCIATED WIRING TO ACCOMMODATE NEW ADA DOOR. INSTALL A NEW BLANK PLATE OVER EXISTING BACK BOX TO REMAIN. REFER TO DRAWING E220 FOR NEW SWITCH LOCATION.

GENERAL LIGHTING NOTES

1. REFER TO DRAWING E001 FOR SYMBOLS AND ABBREVIATIONS.
2. ALL EXISTING LIGHT FIXTURES, EXIT SIGNS AND LIGHT SWITCHES SHOWN HALF-TONE (LIGHT), ARE EXISTING TO REMAIN AND ALL WIRING TO THESE DEVICES SHALL REMAIN WIRED TO THEIR EXISTING BRANCH CIRCUIT(S). CONTRACTOR IS RESPONSIBLE FOR MAINTAINING THE CONTINUITY OF ALL EXISTING BRANCH CIRCUITS EFFECTED BY THE RENOVATION AND PROVIDE ADDITIONAL WIRING AS NEEDED.
3. ALL NEW LIGHT FIXTURES, EXIT SIGNS AND LIGHT SWITCHES MOUNTED ON EXISTING CONCRETE WALLS (POURED OR BLOCK) SHALL BE FED WITH SURFACE MOUNTED WIREMOLD RACEWAY, TYPE 500 OR 700 SERIES. PROVIDE ALL NECESSARY ACCESSORIES, CONNECTIONS AND FITTINGS FOR A COMPLETE SYSTEM.
4. ALL ROOMS\AREAS THAT HAVE BOTH NORMAL AND EMERGENCY LIGHT FIXTURES EXCEPT BATHROOMS, SHALL BE CONTROLLED TOGETHER VIA A DIMMABLE 924 RELAY UNLESS OTHERWISE NOTED. BATHROOMS SHALL BE CONTROLLED BY A STANDARD NON-DIMMABLE 924 RELY INSTEAD.



KEY PLAN

Project Title:
ADDITION & ALTERATIONS TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
311 STATE STREET NEW LONDON CT 06320
203 230 9007 silverpetrucelli.com

Revision:	Description:	Date:	Revised By:

Drawing Title:
THIRD FLOOR LIGHTING DEMOLITION PLAN - PART 'A', 'B' & 'C'

Date: 8/29/2024
Scale: As indicated
Drawn By: S. CROTEAU
Project Number: 22.382
Drawing Number: E031

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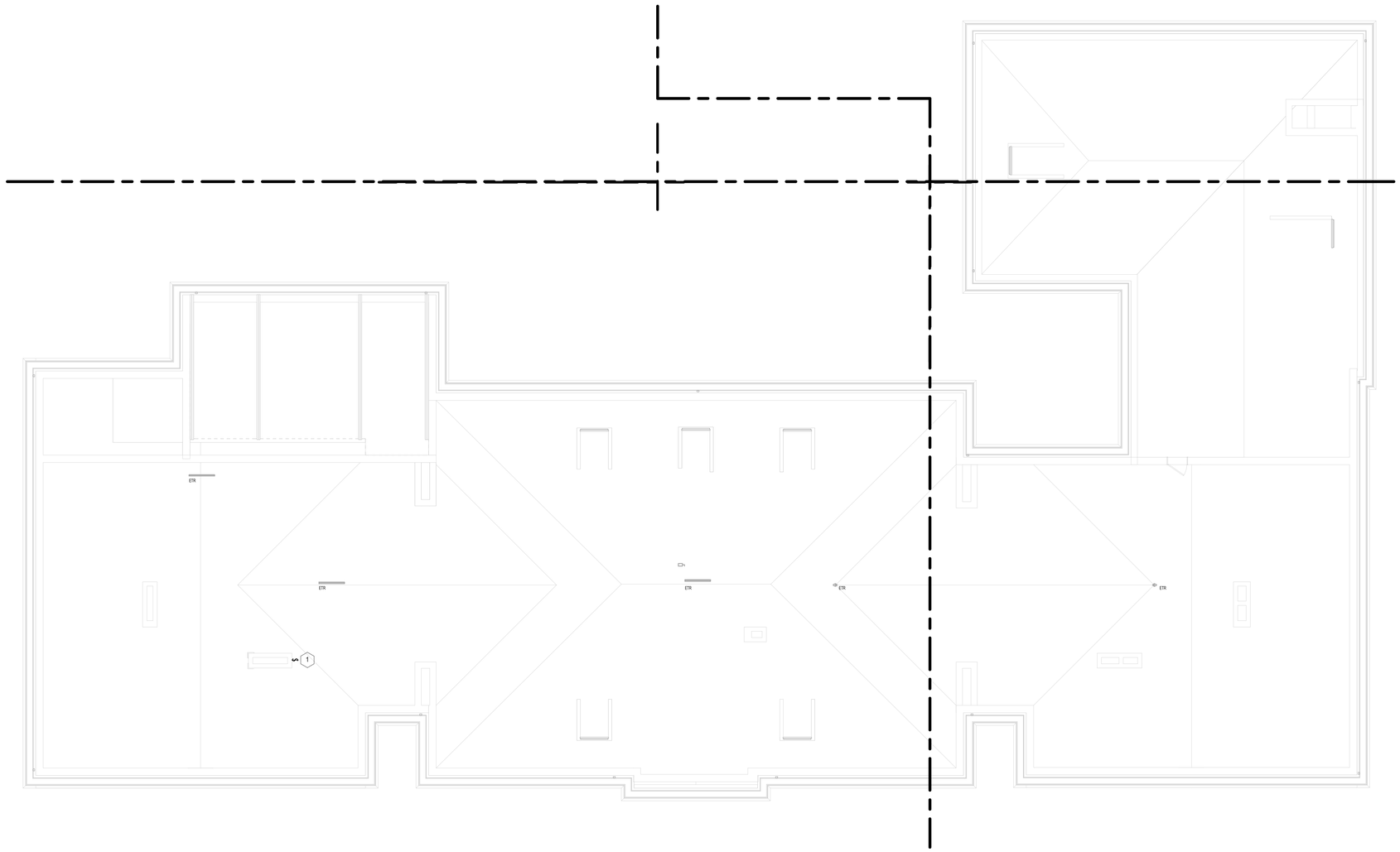


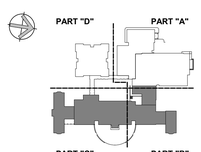
1 ATTIC LEVEL DEMO. LIGHTING PLAN
1/8" = 1'-0"

LIGHTING DEMOLITION KEY NOTES

1 CONTRACTOR SHALL DISCONNECT AND REMOVE EXISTING TOGGLE TYPE LIGHT SWITCH(ES) IN THIS LOCATION ALONG WITH ALL ASSOCIATED WIRING TO FIRST FIXTURE. EXISTING BRANCH SHALL REMAIN TO SERVE SOME OF THE EXISTING FIXTURES THAT REMAIN AND SOME OF THE NEW FIXTURES. THE REMAINING FIXTURES WILL BE WIRED TO THE NEW EMERGENCY GENERATOR DISTRIBUTION.

GENERAL LIGHTING NOTES

1. REFER TO DRAWING E001 FOR SYMBOLS AND ABBREVIATIONS.
2. ALL EXISTING LIGHT FIXTURES, EXIT SIGNS AND LIGHT SWITCHES SHOWN HALF-TONE (LIGHT), ARE EXISTING TO REMAIN AND ALL WIRING TO THESE DEVICES SHALL REMAIN WIRED TO THEIR EXISTING BRANCH CIRCUIT(S). CONTRACTOR IS RESPONSIBLE FOR MAINTAINING THE CONTINUITY OF ALL EXISTING BRANCH CIRCUITS EFFECTED BY THE RENOVATION AND PROVIDE ADDITIONAL WIRING AS NEEDED.
3. ALL NEW LIGHT FIXTURES, EXIT SIGNS AND LIGHT SWITCHES MOUNTED ON EXISTING CONCRETE WALLS (POURED OR BLOCK) SHALL BE FED WITH SURFACE MOUNTED WIREMOLD RACEWAY, TYPE 500 OR 700 SERIES. PROVIDE ALL NECESSARY ACCESSORIES, CONNECTIONS AND FITTINGS FOR A COMPLETE SYSTEM.
4. ALL ROOMS/AREAS THAT HAVE BOTH NORMAL AND EMERGENCY LIGHT FIXTURES EXCEPT BATHROOMS, SHALL BE CONTROLLED TOGETHER VIA A DIMMABLE 924 RELAY UNLESS OTHERWISE NOTED. BATHROOMS SHALL BE CONTROLLED BY A STANDARD NON-DIMMABLE 924 RELY INSTEAD.



KEY PLAN

Project Title:
ADDITION & ALTERATIONS TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
311 STATE STREET NEW LONDON CT 06320
203 230 9007 silverpetrucelli.com

Revision:	Description:	Date:	Revised By:

Drawing Title:
ATTIC LIGHTING DEMOLITION PLAN - 'B' & 'C'

Date: 8/29/2024
Scale: As indicated
Drawn By: S. CROTEAU
Project Number: 22.382
Drawing Number: E041

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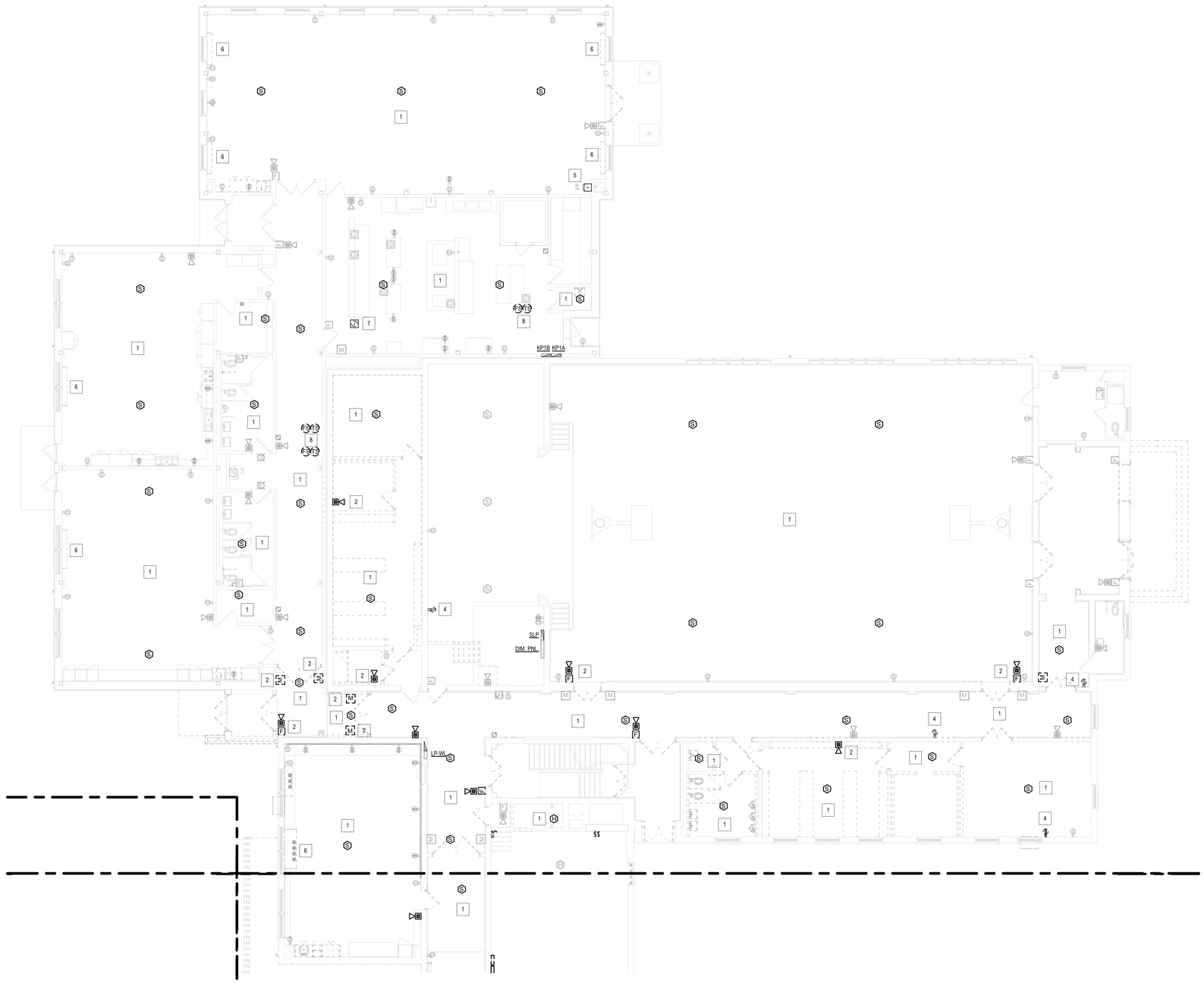


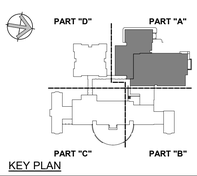
1 FIRST FLOOR DEMO. PWR. PLAN PART 'A'
1/8" = 1'-0"

POWER DEMOLITION KEY NOTES

1. CONTRACTOR SHALL DISCONNECT, REMOVE AND STORE EXISTING CEILING MOUNTED FIRE ALARM DEVICES (SMOKE DETECTOR, HORN/STROBE, ETC.) IN THIS ROOM/CORRIDOR TO BE REINSTALLED IN THE SAME LOCATION AFTER SPRINKLER PIPING WORK IS DONE.
2. CONTRACTOR SHALL DISCONNECT, REMOVE AND STORE EXISTING WALL MOUNTED FIRE ALARM DEVICE INDICATED ON WALL TO BE REMOVED TO BE REINSTALLED IN THE SAME GENERAL LOCATION. REFER TO DWG. E210 FOR NEW LOCATION.
3. CONTRACTOR SHALL DISCONNECT AND REMOVE EXISTING SURFACE MOUNTED FIRE ALARM DUCT SMOKE DETECTOR REMOTE INDICATOR LIGHT, INCLUDING BUT NOT LIMITED TO BACK BOX AND ALL ASSOCIATED CONDUIT AND WIRING BACK TO POINT OF ORIGIN.
4. CONTRACTOR SHALL DISCONNECT AND REMOVE EXISTING DUPLEX RECEPTACLE INDICATED INCLUDING BRANCH CIRCUIT WIRING BACK TO POINT OF ORIGIN. WHERE WALL IS TO BE REMOVED, EXISTING BACK BOX AND RECESSED CONDUIT SHALL BE REMOVED COMPLETELY. WHERE WALL IS TO REMAIN, BACK BOX AND CONDUIT IN WALL SHALL REMAIN.
5. CONTRACTOR SHALL DISCONNECT AND REMOVE EXISTING ELECTRICAL CONNECTION TO ELECTRIC WATER COOLER TO BE REMOVED, BRANCH CIRCUIT SHALL BE MADE "SAFE" TO BE EXTENDED/REROUTED TO SERVE NEW WATER COOLER IN THIS AREA.
6. CONTRACTOR SHALL DISCONNECT AND REMOVE EXISTING ELECTRICAL CONNECTION TO UNIT VENTILATOR TO BE REMOVED IN THIS LOCATION INCLUDING BUT NOT LIMITED TO DISCONNECT SWITCH AND ALL ASSOCIATED CONDUIT AND WIRING BACK TO POINT OF ORIGIN.
7. CONTRACTOR SHALL DISCONNECT AND REMOVE EXISTING JUNCTION BOX AND CONDUIT STUBBING OUT OF THE FLOOR SERVING EXISTING SERVING LINE EQUIPMENT. REMOVE WIRING BACK TO POINT OF ORIGIN OR NEAREST ACCESSIBLE JUNCTION BOX TO REFEED EQUIPMENT VIA NEW CHASE WALL, CUT CONDUIT FLUSH WITH FLOOR AND FLOOR OPENING. REFER TO DRAWING E201 FOR ADDITIONAL INFORMATION.
8. CONTRACTOR SHALL DISCONNECT, REMOVE AND RELOCATE EXISTING TAMPER & FLOW SWITCH ASSOCIATED WITH EXISTING SPRINKLER SYSTEM TO BE REMOVED AND RELOCATE AS INDICATED. REFER TO DRAWINGS E201 & E202 FOR NEW LOCATIONS OF DEVICES.

GENERAL POWER NOTES

1. REFER TO DRAWING E001 FOR SYMBOLS AND ABBREVIATIONS.
2. ALL EXISTING DEVICES SHOWN HALF-TONE (LIGHT), ARE EXISTING TO REMAIN AND ALL WIRING TO THESE DEVICES SHALL REMAIN WIRED TO THEIR EXISTING BRANCH CIRCUIT(S) UNLESS OTHERWISE NOTED. CONTRACTOR IS RESPONSIBLE FOR MAINTAINING THE CONTINUITY OF ALL EXISTING BRANCH CIRCUITS EFFECTED BY THE RENOVATION AND PROVIDE ADDITIONAL WIRING AS NEEDED.
3. ALL NEW DEVICES MOUNTED ON EXISTING CONCRETE WALLS (POURED OR BLOCK) SHALL BE SURFACE MOUNTED WIREMOLD RACEWAY, TYPE 500 OR 700 SERIES FOR SINGLE SYSTEMS AND TYPE 4000 SERIES FOR MULTIPLE SYSTEMS. PROVIDE ALL NECESSARY ACCESSORIES, CONNECTIONS AND FITTINGS FOR A COMPLETE SYSTEM.
4. ALL NEW RECEPTACLES (15 AND 20 AMP 125V & 250V NON-LOCKING) SHALL BE TAMPER-RESISTANT TYPE PER NEC 406.12 UNLESS LOCATED MORE THAN 5'-6" ABOVE THE FLOOR OR SERVE A DEDICATED PIECE OF EQUIPMENT THAT CAN NOT BE EASLY MOVED TO EXPOSE THE PLUG.
5. ALL EXISTING FIRE ALARM PULL STATIONS TO REMAIN NEED TO BE LOWERED SO THAT THE TOP OF THE DEVICE IS AT 48 INCHES ABOVE THE FINISHED FLOOR TO MEET THE ADA CODE FOR TOP OF THE PULL HANDLE.



KEY PLAN

Project Title:
ADDITION & ALTERATIONS TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
311 STATE STREET NEW LONDON CT 06320
203 230 9007 silverpetrucelli.com

Revision:	Description:	Date:	Revised By:

Drawing Title:
FIRST FLOOR POWER DEMOLITION PLAN - PART 'A'

Date: 8/29/2024
Scale: As indicated
Drawn By: S. CROTEAU
Project Number: 22.382
Drawing Number: E051

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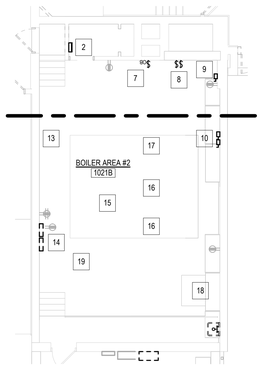
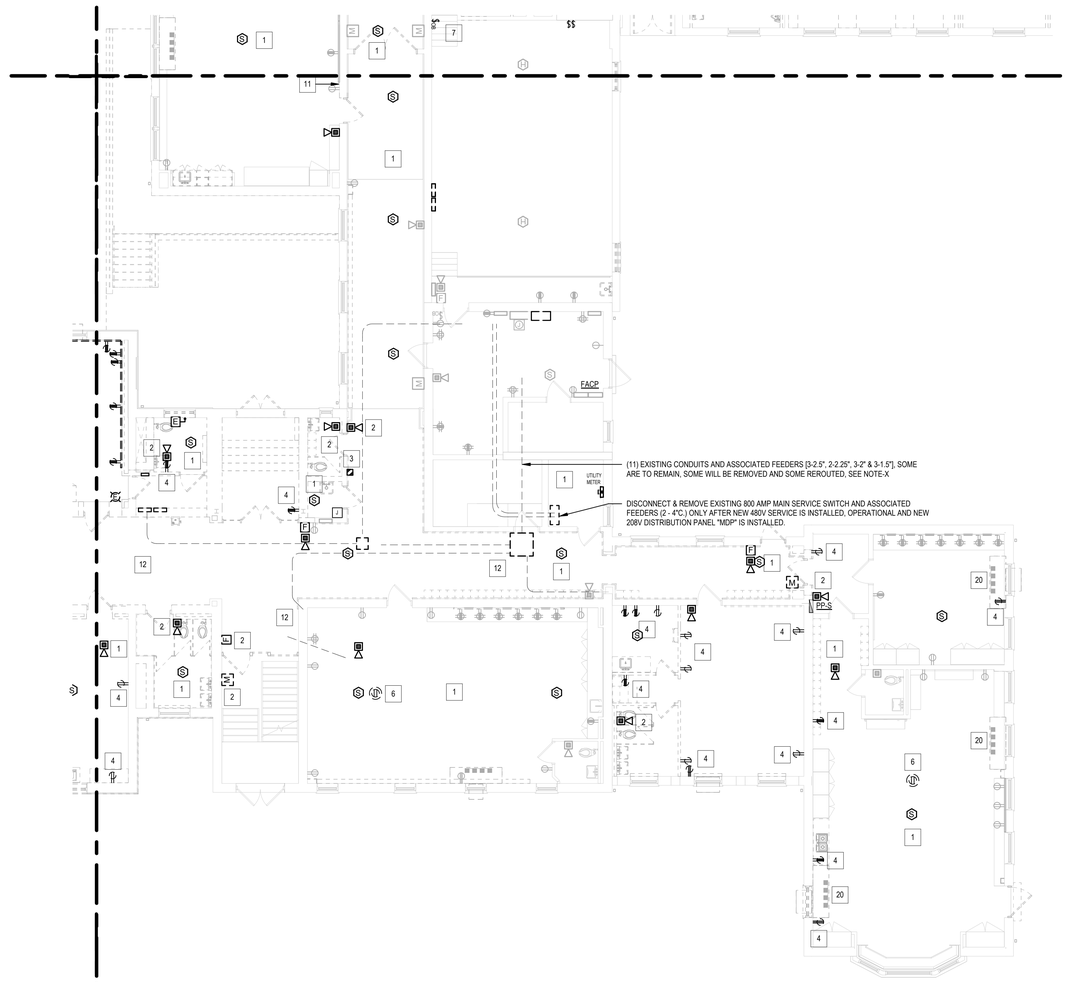


2 LOWER BOILER RM. DEMO POWER PLAN
1/8" = 1'-0"



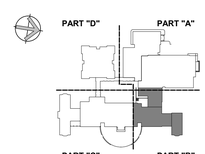
1 FIRST FLOOR DEMO. PWR. PLAN PART 'B'
1/8" = 1'-0"

POWER DEMOLITION KEY NOTES

1. CONTRACTOR SHALL DISCONNECT, REMOVE AND STORE EXISTING CEILING MOUNTED FIRE ALARM DEVICES (SMOKE DETECTOR, HORN/STROBE, ETC.) IN THIS ROOM/CORRIDOR TO BE REINSTALLED IN THE SAME LOCATION AFTER SPRINKLER PIPING WORK IS DONE.
2. CONTRACTOR SHALL DISCONNECT, REMOVE AND STORE EXISTING WALL MOUNTED FIRE ALARM DEVICE INDICATED ON WALL TO BE REMOVED TO BE REINSTALLED IN THE SAME GENERAL LOCATION. REFER TO DWG. E210 FOR NEW LOCATION.
3. CONTRACTOR SHALL DISCONNECT AND REMOVE EXISTING SURFACE MOUNTED FIRE ALARM DUCT SMOKE DETECTOR REMOTE INDICATOR LIGHT, INCLUDING BUT NOT LIMITED TO BACK BOX AND ALL ASSOCIATED CONDUIT AND WIRING BACK TO POINT OF ORIGIN.
4. CONTRACTOR SHALL DISCONNECT AND REMOVE EXISTING DUPLEX RECEPTACLE INDICATED INCLUDING BRANCH CIRCUIT WIRING BACK TO POINT OF ORIGIN. WHERE WALL IS TO BE REMOVED, EXISTING BACK BOX AND RECESSED CONDUIT SHALL BE REMOVED COMPLETELY. WHERE WALL IS TO REMAIN, BACK BOX AND CONDUIT IN WALL SHALL REMAIN.
5. CONTRACTOR SHALL DISCONNECT AND REMOVE EXISTING ELECTRICAL CONNECTION TO ELECTRIC WATER COOLER TO BE REMOVED, INCLUDING BUT NOT LIMITED TO BACK BOX AND CONDUIT AND WIRING BACK TO POINT OF ORIGIN.
6. CONTRACTOR SHALL DISCONNECT AND REMOVE EXISTING CEILING MOUNTED DUPLEX RECEPTACLE INDICATED, BACK BOX AND ASSOCIATED BRANCH CIRCUIT WIRING BACK TO POINT OF ORIGIN.
7. CONTRACTOR SHALL DISCONNECT AND REMOVE (2) EXISTING GAS BURNER EMERGENCY OFF SWITCHES AT THIS LOCATION, TWO GANG BACK BOX AND ALL ASSOCIATED BRANCH CIRCUIT WIRING BACK TO POINT OF ORIGIN.
8. CONTRACTOR SHALL DISCONNECT AND REMOVE (2) EXISTING TOGGLE SWITCH DISCONNECTS INDICATED SERVING MECHANICAL EQUIPMENT TO BE REMOVED INCLUDING BACK BOX AND ALL ASSOCIATED BRANCH CIRCUIT WIRING BACK TO POINT OF ORIGIN.
9. CONTRACTOR SHALL DISCONNECT AND REMOVE EXISTING WALL MOUNTED DISCONNECT SWITCH INDICATED SERVING MECHANICAL EQUIPMENT TO BE REMOVED INCLUDING ALL ASSOCIATED BRANCH CIRCUIT WIRING BACK TO POINT OF ORIGIN.
10. CONTRACTOR SHALL DISCONNECT AND REMOVE (2) EXISTING DISCONNECT SWITCHES INDICATED AND ASSOCIATED VFD'S SERVING MECHANICAL PUMPS #1 & 2 TO BE REMOVED INCLUDING ALL ASSOCIATED BRANCH CIRCUIT WIRING BACK TO POINT OF ORIGIN.
11. CONTRACTOR SHALL CUT BACK EXISTING WIREMOLD RACEWAY TO ACCOMMODATE ADA DOOR CHANGE. RELOCATE ANY DEVICES THAT ARE CURRENTLY IN THE AREA THAT NEEDS TO BE CUT BACK.
12. CONTRACTOR SHALL DISCONNECT AND REMOVE ALL EXISTING PANEL FEEDERS, ASSOCIATED PULL BOX(ES) AND BRANCH CIRCUIT WIRING RUN THROUGHOUT THE NORTH-SOUTH CORRIDOR CEILING (CONDUIT AND MC CABLE). BRANCH CIRCUIT WIRING SHALL BE REROUTED INTO THE ADJACENT CLASSROOM CEILINGS AND ONLY RUN CONDUIT ACROSS THE CORRIDOR (UP HIGH BETWEEN BEAMS) WHEN NEEDED. PANEL FEEDERS SERVING PANELS TO REMAIN WILL BE REROUTED AS INDICATED ON POWER PLANS AND ONE LINE DIAGRAMS.
13. CONTRACTOR SHALL DISCONNECT AND REMOVE EXISTING ELECTRICAL CONNECTION TO EXISTING SEWAGE EJECTOR PUMP CONTROL PANEL TO BE RELOCATED IN THE BOILER ROOM OUT OF THE FLOOD ZONE. EXISTING BRANCH CIRCUIT SHALL BE REDIRECT TO A NEW 50A-3P CIRCUIT BREAKER TO BE INSTALLED IN PANEL 'SDP1'.
14. CONTRACTOR SHALL DISCONNECT AND REMOVE EXISTING ELECTRICAL PANEL AND ADJACENT PANEL/PULL BOX. ALL ACTIVE BRANCH CIRCUIT WILL NEED TO BE RELOCATED TO A NEW ELECTRICAL PANEL.
15. ALL EXISTING RECEPTACLES TO REMAIN IN THE BOILER ROOM THAT ARE IN THE FLOOD PLAIN SHALL BE GFCI PROTECTED. CONTRACTOR SHALL EITHER REPLACE THE RECEPTACLE WITH A GFCI RECEPTACLE OR REPLACE THE BREAKER SERVING THE RECEPTACLE(S) WITH A GFCI BREAKER.
16. CONTRACTOR SHALL DISCONNECT AND REMOVE EXISTING ELECTRICAL CONNECTION TO BOILER TO BE REMOVED INCLUDING ASSOCIATED PUMPS (CIRCULATION) IN THIS LOCATION INCLUDING BUT NOT LIMITED TO DISCONNECT SWITCH(ES) AND ALL ASSOCIATED CONDUIT AND WIRING BACK TO POINT OF ORIGIN.
17. CONTRACTOR SHALL DISCONNECT AND REMOVE EXISTING ELECTRICAL CONNECTION TO PUMPS (P1 & P2) TO BE REMOVED IN THIS LOCATION INCLUDING BUT NOT LIMITED TO DISCONNECT SWITCHES AND ALL ASSOCIATED CONDUIT AND WIRING BACK TO POINT OF ORIGIN.
18. CONTRACTOR SHALL DISCONNECT AND REMOVE EXISTING ELECTRICAL CONNECTION TO FUEL OIL SUPPLY & RETURN PUMPS TO BE REMOVED IN THIS LOCATION INCLUDING BUT NOT LIMITED TO DISCONNECT SWITCHES AND ALL ASSOCIATED CONDUIT AND WIRING BACK TO POINT OF ORIGIN.
19. CONTRACTOR SHALL DISCONNECT AND REMOVE EXISTING ELECTRICAL CONNECTION TO SUPPLY FAN (SF-1) TO BE REMOVED IN THIS LOCATION INCLUDING BUT NOT LIMITED TO DISCONNECT SWITCH AND ALL ASSOCIATED CONDUIT AND WIRING BACK TO POINT OF ORIGIN.
20. CONTRACTOR SHALL DISCONNECT AND REMOVE EXISTING ELECTRICAL CONNECTION TO UNIT VENTILATOR TO BE REMOVED IN THIS LOCATION INCLUDING BUT NOT LIMITED TO DISCONNECT SWITCH AND ALL ASSOCIATED CONDUIT AND WIRING BACK TO POINT OF ORIGIN.

GENERAL POWER NOTES

1. REFER TO DRAWING E001 FOR SYMBOLS AND ABBREVIATIONS.
2. ALL EXISTING DEVICES SHOWN HALF-TONE (LIGHT), ARE EXISTING TO REMAIN AND ALL WIRING TO THESE DEVICES SHALL REMAIN WIRED TO THEIR EXISTING BRANCH CIRCUIT(S) UNLESS OTHERWISE NOTED. CONTRACTOR IS RESPONSIBLE FOR MAINTAINING THE CONTINUITY OF ALL EXISTING BRANCH CIRCUITS EFFECTED BY THE RENOVATION AND PROVIDE ADDITIONAL WIRING AS NEEDED.
3. ALL NEW DEVICES MOUNTED ON EXISTING CONCRETE WALLS (POURED OR BLOCK) SHALL BE SURFACE MOUNTED WIREMOLD RACEWAY, TYPE 500 OR 700 SERIES FOR SINGLE SYSTEMS AND TYPE 4000 SERIES FOR MULTIPLE SYSTEMS. PROVIDE ALL NECESSARY ACCESSORIES, CONNECTIONS AND FITTINGS FOR A COMPLETE SYSTEM.
4. ALL NEW RECEPTACLES (15 AND 20 AMP 125V & 250V NON-LOCKING) SHALL BE TAMPER-RESISTANT TYPE PER NEC 406.12 UNLESS LOCATED MORE THAN 5'-6" ABOVE THE FLOOR OR SERVE A DEDICATED PIECE OF EQUIPMENT THAT CAN NOT BE EASLY MOVED TO EXPOSE THE PLUG.
5. ALL EXISTING FIRE ALARM PULL STATIONS TO REMAIN NEED TO BE LOWERED SO THAT THE TOP OF THE DEVICE IS AT 48 INCHES ABOVE THE FINISHED FLOOR TO MEET THE ADA CODE FOR TOP OF THE PULL HANDLE.



KEY PLAN

Project Title:

ADDITION & ALTERATIONS TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
311 STATE STREET NEW LONDON CT 06320
203 230 9007 silverpetrucelli.com

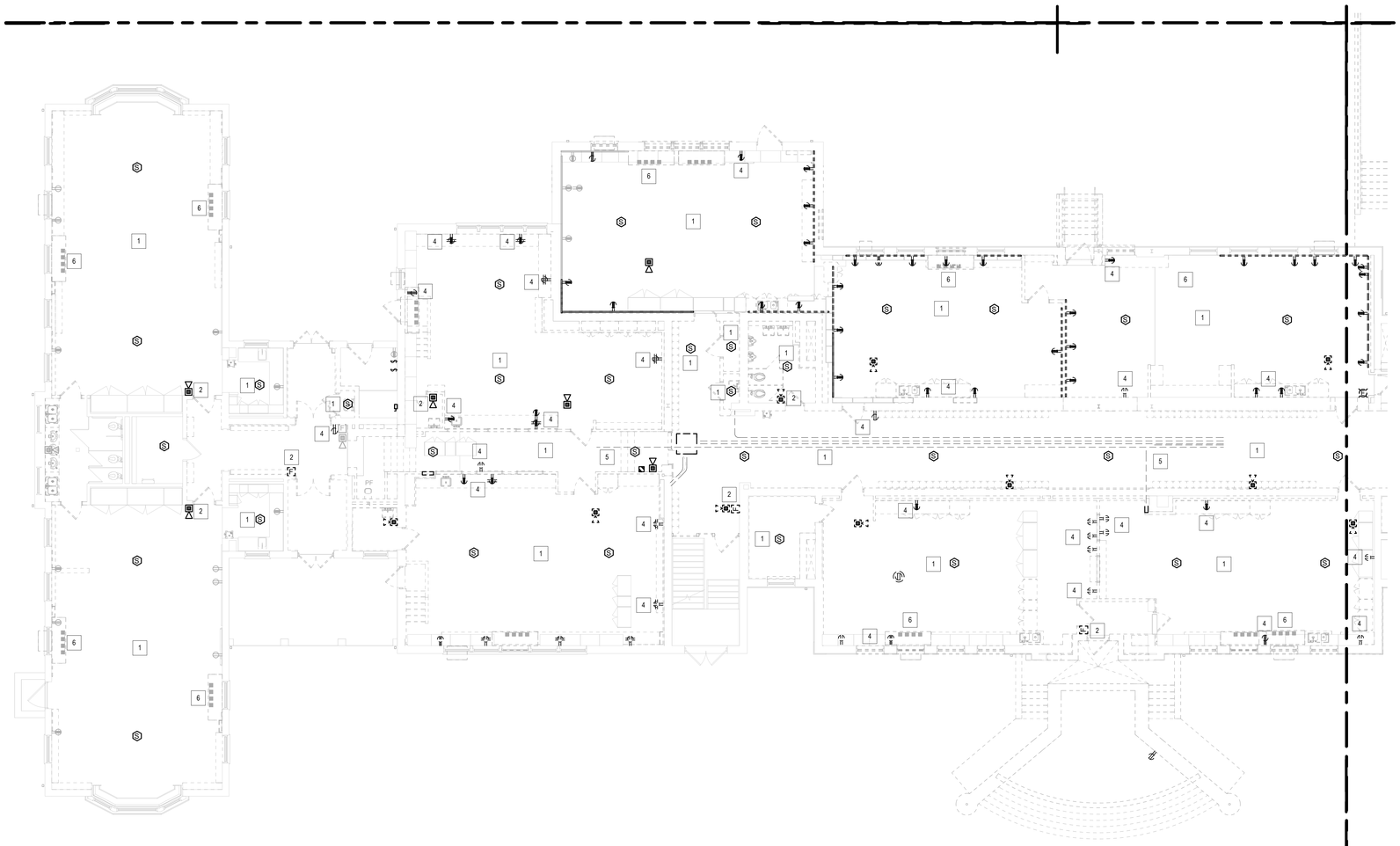
Revision:	Description:	Date:	Revised By:

Drawing Title:
FIRST FLOOR POWER DEMOLITION PLAN - PART 'B'

Date: 8/29/2024
Scale: As indicated
Drawn By: S. CROTEAU
Project Number: 22.382

Drawing Number: E052

8/29/2024 1:21:06 PM



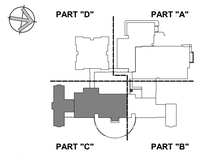
1 FIRST FLOOR DEMO. PWR. PLAN PART 'C'
1/8" = 1'-0"

POWER DEMOLITION KEY NOTES

1. CONTRACTOR SHALL DISCONNECT, REMOVE AND STORE EXISTING CEILING MOUNTED FIRE ALARM DEVICES (SMOKE DETECTOR, HORN/STROBE, ETC.) IN THIS ROOM/CORRIDOR TO BE REINSTALLED IN THE SAME LOCATION AFTER SPRINKLER PIPING WORK IS DONE.
2. CONTRACTOR SHALL DISCONNECT, REMOVE AND STORE EXISTING WALL MOUNTED FIRE ALARM DEVICE INDICATED ON WALL TO BE REMOVED TO BE REINSTALLED IN THE SAME GENERAL LOCATION. REFER TO DWG. E210 FOR NEW LOCATION.
3. CONTRACTOR SHALL DISCONNECT AND REMOVE EXISTING SURFACE MOUNTED FIRE ALARM DUCT SMOKE DETECTOR REMOTE INDICATOR LIGHT, INCLUDING BUT NOT LIMITED TO BACK BOX AND ALL ASSOCIATED CONDUIT AND WIRING BACK TO POINT OF ORIGIN.
4. CONTRACTOR SHALL DISCONNECT AND REMOVE EXISTING DUPLEX/QUAD RECEPTACLE INDICATED INCLUDING BRANCH CIRCUIT WIRING BACK TO POINT OF ORIGIN. WHERE WALL IS TO BE REMOVED, EXISTING BACK BOX AND RECESSED CONDUIT SHALL BE REMOVED COMPLETELY. WHERE WALL IS TO REMAIN, BACK BOX AND CONDUIT IN WALL SHALL REMAIN.
5. CONTRACTOR SHALL DISCONNECT AND REMOVE ALL EXISTING PANEL FEEDERS, ASSOCIATED PULL BOX(ES) AND BRANCH CIRCUIT WIRING RUN THROUGHOUT THE NORTH-SOUTH CORRIDOR CEILING (CONDUIT AND MC CABLE). BRANCH CIRCUIT WIRING SHALL BE REROUTED INTO THE ADJACENT CLASSROOM CEILINGS AND ONLY RUN CONDUIT ACROSS THE CORRIDOR (UP HIGH BETWEEN BEAMS) WHEN NEEDED. PANEL FEEDERS SERVING PANELS TO REMAIN WILL BE REROUTED AS INDICATED ON POWER PLANS AND ONE LINE DIAGRAMS.
6. CONTRACTOR SHALL DISCONNECT AND REMOVE EXISTING ELECTRICAL CONNECTION TO UNIT VENTILATOR TO BE REMOVED IN THIS LOCATION INCLUDING BUT NOT LIMITED TO DISCONNECT SWITCH AND ALL ASSOCIATED CONDUIT AND WIRING BACK TO POINT OF ORIGIN.

GENERAL POWER NOTES

1. REFER TO DRAWING E001 FOR SYMBOLS AND ABBREVIATIONS.
2. ALL EXISTING DEVICES SHOWN HALF-TONE (LIGHT), ARE EXISTING TO REMAIN AND ALL WIRING TO THESE DEVICES SHALL REMAIN WIRED TO THEIR EXISTING BRANCH CIRCUIT(S) UNLESS OTHERWISE NOTED. CONTRACTOR IS RESPONSIBLE FOR MAINTAINING THE CONTINUITY OF ALL EXISTING BRANCH CIRCUITS EFFECTED BY THE RENOVATION AND PROVIDE ADDITIONAL WIRING AS NEEDED.
3. ALL NEW DEVICES MOUNTED ON EXISTING CONCRETE WALLS (POURED OR BLOCK) SHALL BE SURFACE MOUNTED WIREMOLD RACEWAY, TYPE 500 OR 700 SERIES FOR SINGLE SYSTEMS AND TYPE 4000 SERIES FOR MULTIPLE SYSTEMS. PROVIDE ALL NECESSARY ACCESSORIES, CONNECTIONS AND FITTINGS FOR A COMPLETE SYSTEM.
4. ALL NEW RECEPTACLES (15 AND 20 AMP 125V & 250V NON-LOCKING) SHALL BE TAMPER-RESISTANT TYPE PER NEC 406.12 UNLESS LOCATED MORE THAN 5'-6" ABOVE THE FLOOR OR SERVE A DEDICATED PIECE OF EQUIPMENT THAT CAN NOT BE EASLY MOVED TO EXPOSE THE PLUG.
5. ALL EXISTING FIRE ALARM PULL STATIONS TO REMAIN NEED TO BE LOWERED SO THAT THE TOP OF THE DEVICE IS AT 48 INCHES ABOVE THE FINISHED FLOOR TO MEET THE ADA CODE FOR TOP OF THE PULL HANDLE.



KEY PLAN

Project Title:
ADDITION & ALTERATIONS TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
311 STATE STREET NEW LONDON CT 06320
203 230 9007 silverpetrucelli.com

Revision:	Description:	Date:	Revised By:

Drawing Title:
FIRST FLOOR POWER DEMOLITION PLAN - PART 'C'

Date: 8/29/2024
Scale: As indicated
Drawn By: S. CROTEAU
Project Number: 22.382
Drawing Number: E053

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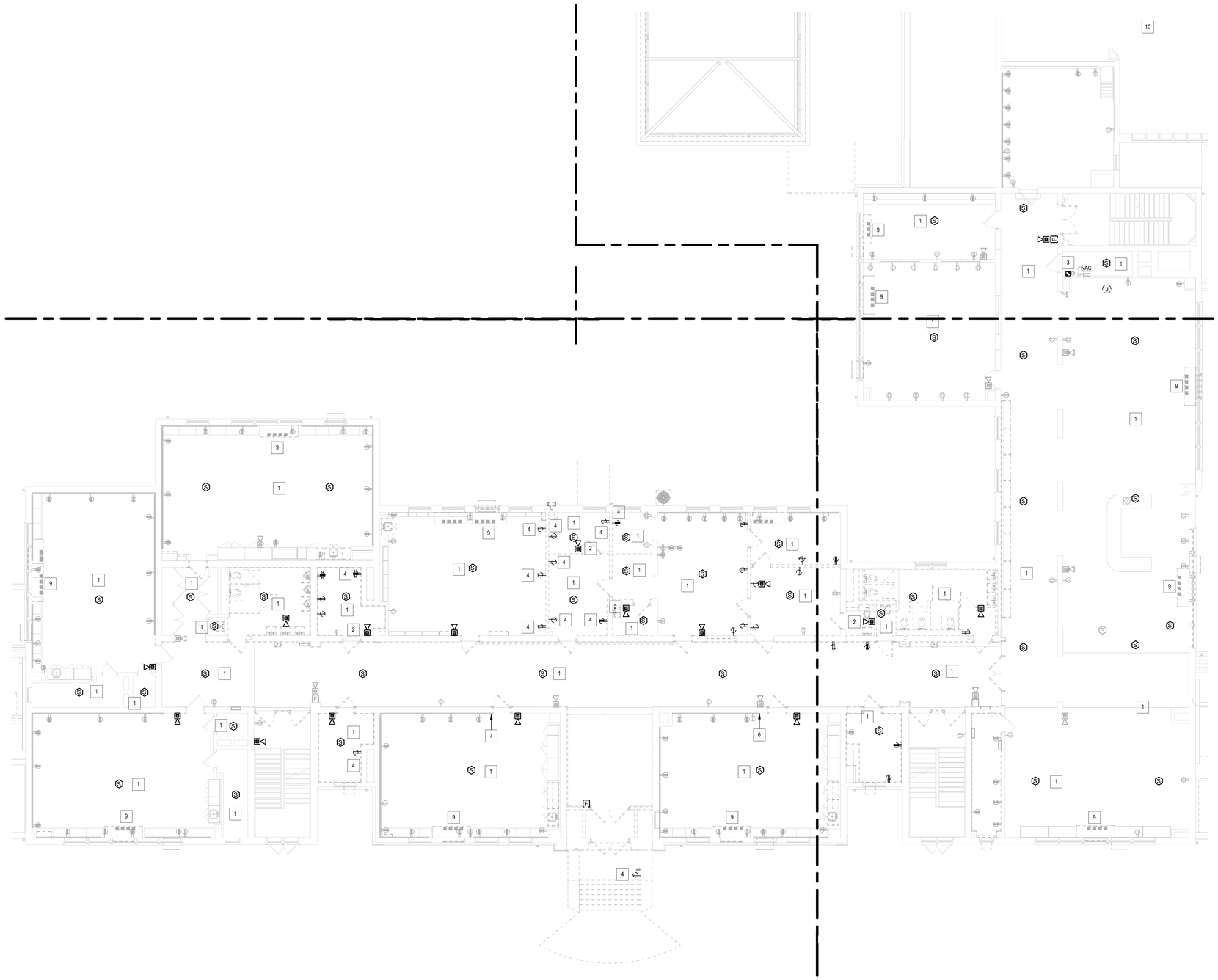


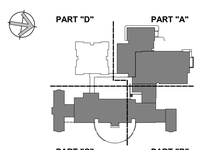
1 SECOND FLOOR DEMO. POWER PLAN
1/8" = 1'-0"

POWER DEMOLITION KEY NOTES

1. CONTRACTOR SHALL DISCONNECT, REMOVE AND STORE EXISTING CEILING MOUNTED FIRE ALARM DEVICES (SMOKE DETECTOR, HORN/STROBE, ETC.) IN THIS ROOM/CORRIDOR TO BE REINSTALLED IN THE SAME LOCATION AFTER SPRINKLER PIPING WORK IS DONE.
2. CONTRACTOR SHALL DISCONNECT, REMOVE AND STORE EXISTING WALL MOUNTED FIRE ALARM DEVICE INDICATED ON WALL TO BE REMOVED TO BE REINSTALLED IN THE SAME GENERAL LOCATION. REFER TO DWG. E210 FOR NEW LOCATION.
3. CONTRACTOR SHALL DISCONNECT AND REMOVE EXISTING SURFACE MOUNTED FIRE ALARM DUCT SMOKE DETECTOR REMOTE INDICATOR LIGHT, INCLUDING BUT NOT LIMITED TO BACK BOX AND ALL ASSOCIATED CONDUIT AND WIRING BACK TO POINT OF ORIGIN.
4. CONTRACTOR SHALL DISCONNECT AND REMOVE EXISTING DUPLEX RECEPTACLE INDICATED INCLUDING BRANCH CIRCUIT WIRING BACK TO POINT OF ORIGIN. WHERE WALL IS TO BE REMOVED, EXISTING BACK BOX AND RECESSED CONDUIT SHALL BE REMOVED COMPLETELY. WHERE WALL IS TO REMAIN, BACK BOX AND CONDUIT IN WALL SHALL REMAIN.
5. CONTRACTOR SHALL DISCONNECT AND REMOVE EXISTING ELECTRICAL CONNECTION TO ELECTRIC WATER COOLER TO BE REMOVED, INCLUDING BUT NOT LIMITED TO BACK BOX AND CONDUIT AND WIRING BACK TO POINT OF ORIGIN.
6. CONTRACTOR SHALL DISCONNECT, REMOVE AND RELOCATE/REINSTALL EXISTING VERTICAL RUN OF WIREMOLD AT THIS LOCATION AND ALL ASSOCIATED WIRING TO ACCOMMODATE THE ADA DOOR CHANGE.
7. CONTRACTOR SHALL CUT BACK EXISTING WIREMOLD RACEWAY TO ACCOMMODATE ADA DOOR CHANGE. RELOCATE ANY DEVICES THAT ARE CURRENTLY IN THE AREA THAT NEEDS TO BE CUT BACK.
8. CONTRACTOR SHALL DISCONNECT, REMOVE AND STORE EXISTING SURFACE MOUNTED 'TVSS' PANEL THAT SERVES EXISTING ADJACENT CORRIDOR PANEL 'LP2S1'. THIS PANEL SHALL BE RELOCATED OUT INTO THE CORRIDOR (RECESSED MOUNTED ADJACENT TO THE PANEL 'LP2S1' AND RECONNECTED.
9. CONTRACTOR SHALL DISCONNECT AND REMOVE EXISTING ELECTRICAL CONNECTION TO UNIT VENTILATOR TO BE REMOVED IN THIS LOCATION INCLUDING BUT NOT LIMITED TO DISCONNECT SWITCH AND ALL ASSOCIATED CONDUIT AND WIRING BACK TO POINT OF ORIGIN.
10. CONTRACTOR SHALL DISCONNECT AND REMOVE EXISTING ELECTRICAL CONNECTION TO MECHANICAL UNIT TO BE REMOVED IN THIS LOCATION INCLUDING BUT NOT LIMITED TO DISCONNECT SWITCH AND ALL ASSOCIATED CONDUIT AND WIRING BACK TO POINT OF ORIGIN.

GENERAL POWER NOTES

1. REFER TO DRAWING E001 FOR SYMBOLS AND ABBREVIATIONS.
2. ALL EXISTING DEVICES SHOWN HALF-TONE (LIGHT), ARE EXISTING TO REMAIN AND ALL WIRING TO THESE DEVICES SHALL REMAIN WIRED TO THEIR EXISTING BRANCH CIRCUIT(S) UNLESS OTHERWISE NOTED. CONTRACTOR IS RESPONSIBLE FOR MAINTAINING THE CONTINUITY OF ALL EXISTING BRANCH CIRCUITS EFFECTED BY THE RENOVATION AND PROVIDE ADDITIONAL WIRING AS NEEDED.
3. ALL NEW DEVICES MOUNTED ON EXISTING CONCRETE WALLS (POURED OR BLOCK) SHALL BE SURFACE MOUNTED WIREMOLD RACEWAY, TYPE 500 OR 700 SERIES FOR SINGLE SYSTEMS AND TYPE 4000 SERIES FOR MULTIPLE SYSTEMS. PROVIDE ALL NECESSARY ACCESSORIES, CONNECTIONS AND FITTINGS FOR A COMPLETE SYSTEM.
4. ALL NEW RECEPTACLES (15 AND 20 AMP 125V & 250V NON-LOCKING) SHALL BE TAMPER-RESISTANT TYPE PER NEC 406.12 UNLESS LOCATED MORE THAN 5'-6" ABOVE THE FLOOR OR SERVE A DEDICATED PIECE OF EQUIPMENT THAT CAN NOT BE EASLY MOVED TO EXPOSE THE PLUG.
5. ALL EXISTING FIRE ALARM PULL STATIONS TO REMAIN NEED TO BE LOWERED SO THAT THE TOP OF THE DEVICE IS AT 48 INCHES ABOVE THE FINISHED FLOOR TO MEET THE ADA CODE FOR TOP OF THE PULL HANDLE.



KEY PLAN

Project Title:
ADDITION & ALTERATIONS TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
311 STATE STREET NEW LONDON CT 06320
203 230 9007 silverpetrucelli.com

Revision:	Description:	Date:	Revised By:

Drawing Title:
SECOND FLOOR POWER DEMOLITION PLAN - PART 'A', 'B' & 'C'

Date: 8/29/2024
Scale: As indicated
Drawn By: S. CROTEAU
Project Number: 22.382
Drawing Number: E061

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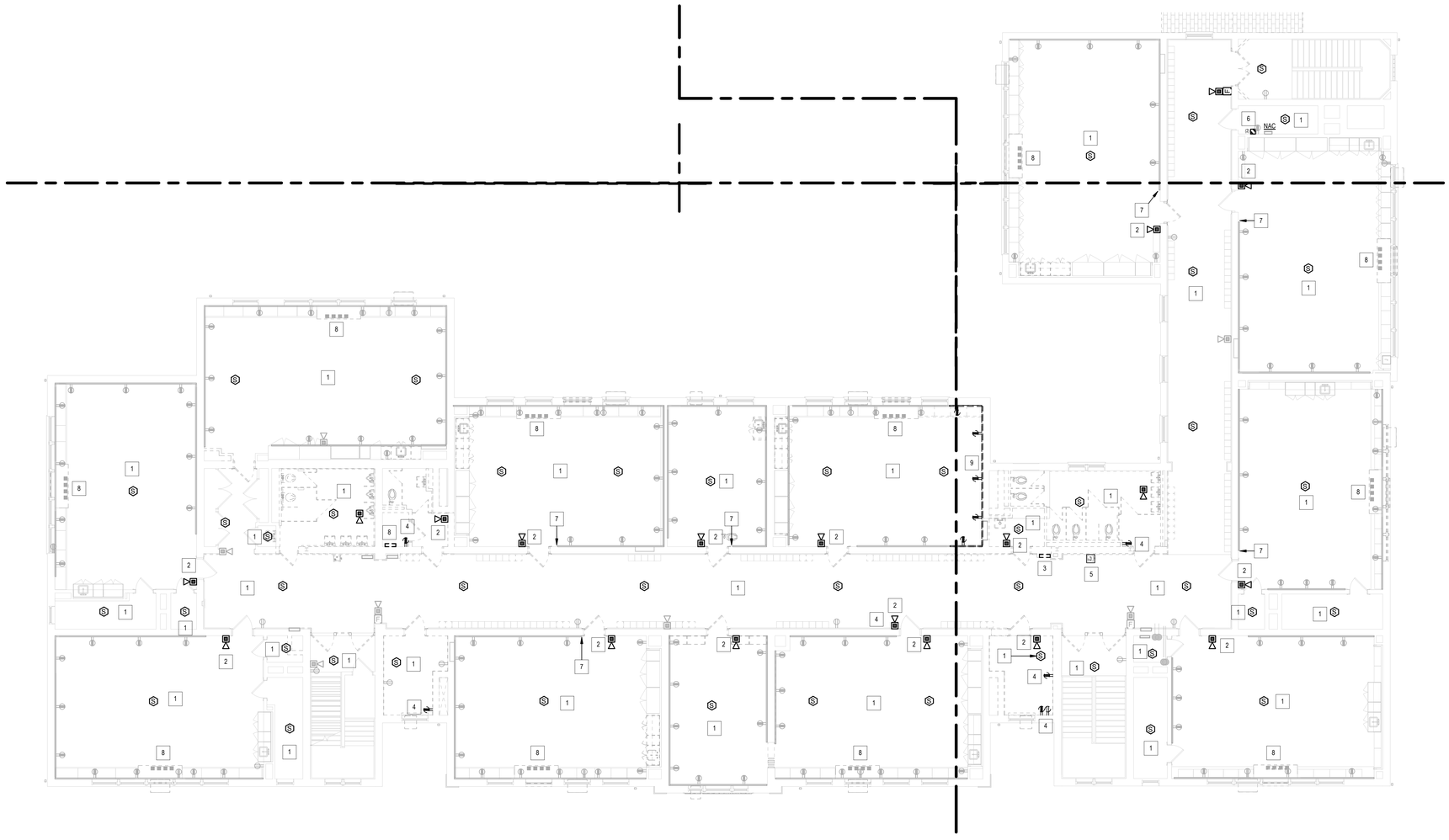


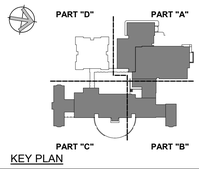
1 THIRD FLOOR DEMO. POWER PLAN
1/8" = 1'-0"

POWER DEMOLITION KEY NOTES

1. CONTRACTOR SHALL DISCONNECT, REMOVE AND STORE EXISTING CEILING MOUNTED FIRE ALARM DEVICES (SMOKE DETECTOR, HORN/STROBE, ETC.) IN THIS ROOM/CORRIDOR TO BE REINSTALLED IN THE SAME LOCATION AFTER SPRINKLER PIPING WORK IS DONE.
2. CONTRACTOR SHALL DISCONNECT, REMOVE AND STORE EXISTING WALL MOUNTED FIRE ALARM DEVICE INDICATED ON WALL TO BE REMOVED TO BE REINSTALLED IN THE SAME GENERAL LOCATION. REFER TO DWG. E220 FOR NEW LOCATION.
3. CONTRACTOR SHALL DISCONNECT AND REMOVE EXISTING RECESSED ELECTRICAL PANEL "LP-2N" INDICATED ON WALL TO BE REMOVED. ALL EXISTING "ACTIVE" BRANCH CIRCUITS SHALL BE COILED UP ABOVE THE CEILING TO BE REDIRECTED/EXTENDED TO NEW ELECTRICAL PANEL IN THE SAME GENERAL LOCATION. REFER TO DWG. E220 FOR NEW LOCATION.
4. CONTRACTOR SHALL DISCONNECT AND REMOVE EXISTING DUPLEX RECEPTACLE INDICATED INCLUDING BRANCH CIRCUIT WIRING BACK TO POINT OF ORIGIN. WHERE WALL IS TO BE REMOVED, EXISTING BACK BOX AND RECESSED CONDUIT SHALL BE REMOVED COMPLETELY. WHERE WALL IS TO REMAIN, BACK BOX AND CONDUIT IN WALL SHALL REMAIN.
5. CONTRACTOR SHALL DISCONNECT AND REMOVE EXISTING ELECTRICAL CONNECTION TO ELECTRIC WATER COOLER TO BE REMOVED, INCLUDING BUT NOT LIMITED TO BACK BOX AND CONDUIT AND WIRING BACK TO POINT OF ORIGIN.
6. CONTRACTOR SHALL DISCONNECT AND REMOVE EXISTING SURFACE MOUNTED FIRE ALARM DUCT SMOKE DETECTOR REMOTE INDICATOR LIGHT, INCLUDING BUT NOT LIMITED TO BACK BOX AND ALL ASSOCIATED CONDUIT AND WIRING BACK TO POINT OF ORIGIN.
7. CONTRACTOR SHALL DISCONNECT, REMOVE AND RELOCATE/REINSTALL EXISTING VERTICAL RUN OF WIREMOLD AT THIS LOCATION AND ALL ASSOCIATED WIRING TO ACCOMMODATE THE ADA DOOR CHANGE.
8. CONTRACTOR SHALL DISCONNECT AND REMOVE EXISTING ELECTRICAL CONNECTION TO UNIT VENTILATOR TO BE REMOVED IN THIS LOCATION INCLUDING BUT NOT LIMITED TO DISCONNECT SWITCH AND ALL ASSOCIATED CONDUIT AND WIRING BACK TO POINT OF ORIGIN.
9. CONTRACTOR SHALL DISCONNECT AND REMOVE EXISTING WIREMOLD AND ASSOCIATED RECEPTACLES INDICATED AND RECONNECT EXISTING SECTIONS INDICATED TO REMAIN. ADD NEW VERTICAL SECTION(S) AS NEEDED AND CONNECT THESE SECTIONS ABOVE NEW CEILING NOT ON WALL.

GENERAL POWER NOTES

1. REFER TO DRAWING E001 FOR SYMBOLS AND ABBREVIATIONS.
2. ALL EXISTING DEVICES SHOWN HALF-TONE (LIGHT), ARE EXISTING TO REMAIN AND ALL WIRING TO THESE DEVICES SHALL REMAIN WIRED TO THEIR EXISTING BRANCH CIRCUIT(S) UNLESS OTHERWISE NOTED. CONTRACTOR IS RESPONSIBLE FOR MAINTAINING THE CONTINUITY OF ALL EXISTING BRANCH CIRCUITS EFFECTED BY THE RENOVATION AND PROVIDE ADDITIONAL WIRING AS NEEDED.
3. ALL NEW DEVICES MOUNTED ON EXISTING CONCRETE WALLS (POURED OR BLOCK) SHALL BE SURFACE MOUNTED WIREMOLD RACEWAY, TYPE 500 OR 700 SERIES FOR SINGLE SYSTEMS AND TYPE 4000 SERIES FOR MULTIPLE SYSTEMS. PROVIDE ALL NECESSARY ACCESSORIES, CONNECTIONS AND FITTINGS FOR A COMPLETE SYSTEM.
4. ALL NEW RECEPTACLES (15 AND 20 AMP 125V & 250V NON-LOCKING) SHALL BE TAMPER-RESISTANT TYPE PER NEC 406.12 UNLESS LOCATED MORE THAN 5'-6" ABOVE THE FLOOR OR SERVE A DEDICATED PIECE OF EQUIPMENT THAT CAN NOT BE EASLY MOVED TO EXPOSE THE PLUG.
5. ALL EXISTING FIRE ALARM PULL STATIONS TO REMAIN NEED TO BE LOWERED SO THAT THE TOP OF THE DEVICE IS AT 48 INCHES ABOVE THE FINISHED FLOOR TO MEET THE ADA CODE FOR TOP OF THE PULL HANDLE.



KEY PLAN

Project Title:
ADDITION & ALTERATIONS TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
311 STATE STREET NEW LONDON CT 06320
203 230 9007 silverpetrucelli.com

Revision:	Description:	Date:	Revised By:

Drawing Title:
THIRD FLOOR POWER DEMOLITION PLAN - PART 'A', 'B' & 'C'

Date: 8/29/2024
Scale: As indicated
Drawn By: S. CROTEAU
Project Number: 22.382
Drawing Number: E071

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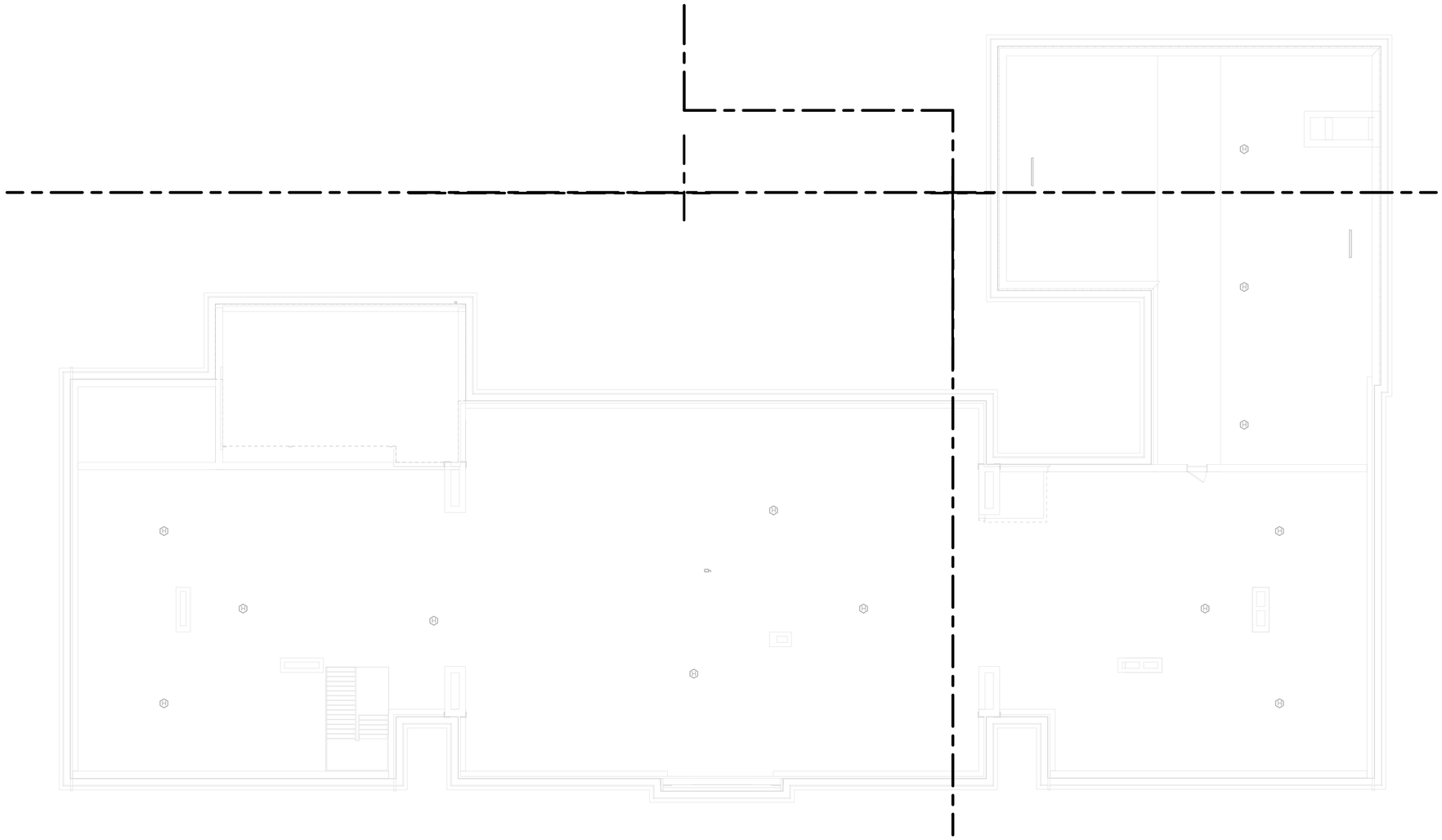

GENERAL POWER NOTES

1. REFER TO DRAWING E001 FOR SYMBOLS AND ABBREVIATIONS.
2. ALL EXISTING DEVICES SHOWN HALF-TONE (LIGHT), ARE EXISTING TO REMAIN AND ALL WIRING TO THESE DEVICES SHALL REMAIN WIRED TO THEIR EXISTING BRANCH CIRCUIT(S) UNLESS OTHERWISE NOTED. CONTRACTOR IS RESPONSIBLE FOR MAINTAINING THE CONTINUITY OF ALL EXISTING BRANCH CIRCUITS EFFECTED BY THE RENOVATION AND PROVIDE ADDITIONAL WIRING AS NEEDED.
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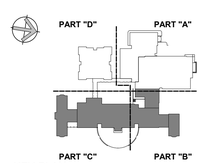
4. ALL NEW RECEPTACLES (15 AND 20 AMP 125V & 250V NON-LOCKING) SHALL BE TAMPER-RESISTANT TYPE PER NEC 406.12 UNLESS LOCATED MORE THAN 5'-6" ABOVE THE FLOOR OR SERVE A DEDICATED PIECE OF EQUIPMENT THAT CAN NOT BE EASLY MOVED TO EXPOSE THE PLUG.
5. ALL EXISTING FIRE ALARM PULL STATIONS TO REMAIN NEED TO BE LOWERED SO THAT THE TOP OF THE DEVICE IS AT 48 INCHES ABOVE THE FINISHED FLOOR TO MEET THE ADA CODE FOR TOP OF THE PULL HANDLE.

1 ATTIC FLOOR DEMOLITION POWER PLAN
1/8" = 1'-0"



KEY PLAN

Project Title:

ADDITION & ALTERATIONS TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

SILVER PETRUCELLI + ASSOCIATES

3190 WHITNEY AVENUE HAMDEN CT 06518
311 STATE STREET NEW LONDON CT 06320
203 230 9007 silverpetrucelli.com

Revision:	Description:	Date:	Revised By:

Drawing Title:
ATTIC POWER DEMOLITION PLAN - PART 'B' & 'C'

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Drawn By: S. CROTEAU
Project Number: 22.382
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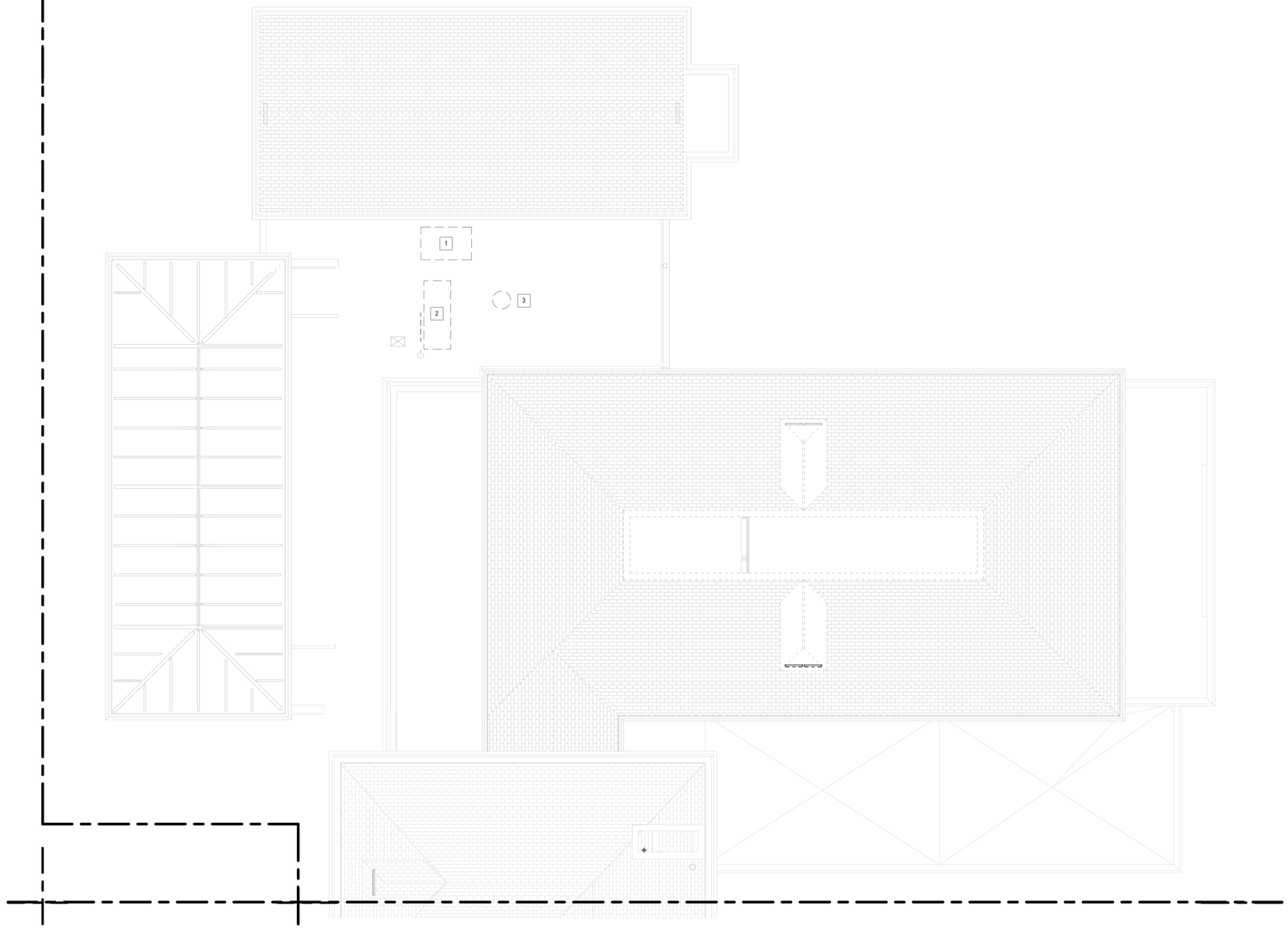
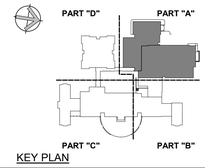


POWER DEMOLITION KEY NOTES

1. CONTRACTOR SHALL DISCONNECT AND REMOVE EXISTING ELECTRICAL CONNECTION TO EXISTING ROOF TOP UNIT (RTU) INDICATED TO BE REMOVED THAT SERVES THE CAFETERIA, INCLUDING BUT NOT LIMITED TO DISCONNECT SWITCH AND ALL ASSOCIATED BRANCH CIRCUIT WIRING BACK TO POINT OF ORIGIN.
2. CONTRACTOR SHALL DISCONNECT AND REMOVE EXISTING ELECTRICAL CONNECTION TO EXISTING MAKEUP AIR UNIT (MAU) INDICATED TO BE REMOVED THAT SERVES THE KITCHEN, INCLUDING BUT NOT LIMITED TO DISCONNECT SWITCH AND ALL ASSOCIATED BRANCH CIRCUIT WIRING BACK TO POINT OF ORIGIN.
3. CONTRACTOR SHALL DISCONNECT AND REMOVE EXISTING ELECTRICAL CONNECTION TO EXISTING KITCHEN EXHAUST FAN (KEF) INDICATED TO BE REMOVED THAT SERVES THE KITCHEN, INCLUDING BUT NOT LIMITED TO DISCONNECT SWITCH AND ALL ASSOCIATED BRANCH CIRCUIT WIRING BACK TO POINT OF ORIGIN.



KEY PLAN

Project Title:

ADDITION & ALTERATIONS TO:
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285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

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Drawing Title:
ROOF DEMOLITION POWER PLAN - PART 'A'

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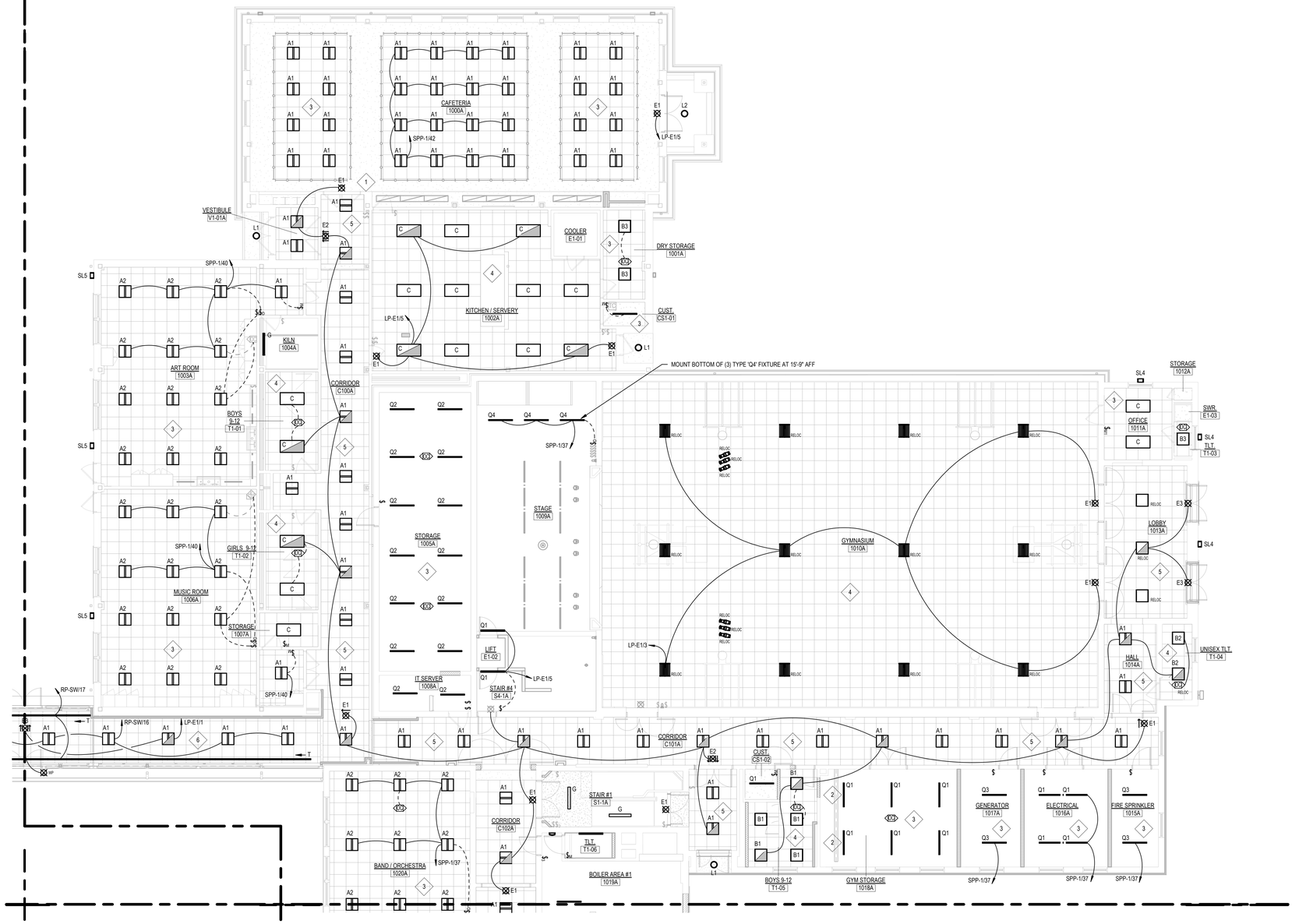


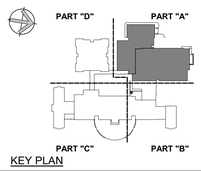
1 FIRST FLOOR LIGHTING PLAN PART 'A'
1/8" = 1'-0"

LIGHTING KEY NOTES

1. CONTRACTOR SHALL REPLACE EXISTING TOGGLE TYPE LIGHT SWITCH(ES) THAT PREVIOUSLY SERVED THE PENDANT MOUNTED LIGHT FIXTURES IN THE HIGH CEILING WITH NEW DIMMER SWITCHES TO BE GROUPED ONE SWITCH FOR EACH OF THE END HIGH CEILING AREAS AND TWO DIMMER SWITCHES FOR THE MIDDLE HIGH CEILING AREA. EXISTING SWITCH(ES) THAT SERVE THE WALL WASH LIGHTS ALONG THE KITCHEN WALL ARE TO REMAIN.
2. MOUNT FIXTURE APPROXIMATELY 12" BELOW CEILING SO THAT THE ENTIRE LENS OF FIXTURE IS BELOW ADJACENT BEAM.
3. CONTRACTOR SHALL WIRE NEW RECESS MOUNTED 2 X 2 LIGHT FIXTURES NOT INDICATED TO GENERATOR PANEL TO EXISTING BRANCH CIRCUIT PREVIOUSLY SERVING PENDANT MOUNTED LIGHT FIXTURES IN THIS ROOM. EXISTING OR NEW CEILING MOUNTED SENSOR(S) SHALL BE INSTALLED AS INDICATED IN THIS ROOM TO SERVE BOTH NORMAL AND GENERATOR CIRCUITS. WIRE FIXTURES TO EXISTING AND/OR NEW SWITCHES AND SENSOR(S) AS INDICATED, FIXTURES SHALL BE WIRED TO NEW GENERATOR PANEL AS INDICATED (STANDBY SYSTEM).
4. CONTRACTOR SHALL WIRE ALL NEW FIXTURE(S) IN THIS ROOM TO THE EXISTING "NORMAL" BRANCH CIRCUIT PREVIOUSLY SERVING THIS ROOM UNLESS INDICATED TO BE WIRED TO THE GENERATOR EMERGENCY DISTRIBUTION. FIXTURE(S) SHALL BE CONTROLLED BY NEW OR EXISTING/RELOCATED SWITCH(ES) AND/OR SENSOR(S) LOCATED IN THE ROOM.
5. CONTRACTOR SHALL INSTALL NEW RECESSED MOUNTED 2 X 2 LED LIGHT FIXTURES WHERE INDICATED IN THE CORRIDOR OR VESTIBULE. FIXTURES SHALL BE WIRED TO EITHER THE NEW GENERATOR PANEL (EMERGENCY SYSTEM) OR THE EXISTING BRANCH CIRCUIT (NORMAL POWER) THAT PREVIOUSLY SERVED THE CORRIDOR. THESE LIGHTS SHALL BE CONTROLLED BY THE BUILDING LIGHTING CONTROL SYSTEM. BOTH NORMAL AND EMERGENCY FIXTURES SHALL TURN ON 15-20 BEFORE SCHOOL STAFF ARIVES AND STAY ON DURING NORMAL SCHOOL HOURS. THE EMERGENCY FIXTURES WILL TURN OFF TWO HOURS AFTER SCHOOL ENDS AND THE NORMAL LIGHTS WILL REMAIN ON UNTIL 15 MINUTES AFTER SCHOOL CLOSES.
6. CONTRACTOR SHALL INSTALL NEW RECESSED MOUNTED 2 X 2 LED LIGHT FIXTURES AND LED COVE LIGHT FIXTURES INDICATED IN THE CORRIDOR OR VESTIBULE. FIXTURES SHALL BE WIRED TO EITHER THE NEW GENERATOR PANEL (EMERGENCY SYSTEM) OR THE NORMAL BRANCH CIRCUIT (RP-SW). THESE LIGHTS SHALL BE CONTROLLED BY THE BUILDING LIGHTING CONTROL SYSTEM. BOTH NORMAL AND EMERGENCY FIXTURES SHALL TURN ON 15-20 BEFORE SCHOOL STAFF ARIVES AND STAY ON DURING NORMAL SCHOOL HOURS. THE EMERGENCY FIXTURES WILL TURN OFF TWO HOURS AFTER SCHOOL ENDS AND THE NORMAL LIGHTS WILL REMAIN ON UNTIL 15 MINUTES AFTER SCHOOL CLOSES.

GENERAL LIGHTING NOTES

1. REFER TO DRAWING E001 FOR SYMBOLS AND ABBREVIATIONS.
2. ALL EXISTING LIGHT FIXTURES, EXIT SIGNS AND LIGHT SWITCHES SHOWN HALF-TONE (LIGHT), ARE EXISTING TO REMAIN AND ALL WIRING TO THESE DEVICES SHALL REMAIN WIRED TO THEIR EXISTING BRANCH CIRCUIT(S). CONTRACTOR IS RESPONSIBLE FOR MAINTAINING THE CONTINUITY OF ALL EXISTING BRANCH CIRCUITS EFFECTED BY THE RENOVATION AND PROVIDE ADDITIONAL WIRING AS NEEDED.
3. ALL NEW LIGHT FIXTURES, EXIT SIGNS AND LIGHT SWITCHES MOUNTED ON EXISTING CONCRETE WALLS (POURED OR BLOCK) SHALL BE FED WITH SURFACE MOUNTED WIREMOLD RACEWAY, TYPE 500 OR 700 SERIES. PROVIDE ALL NECESSARY ACCESSORIES, CONNECTIONS AND FITTINGS FOR A COMPLETE SYSTEM.
4. ALL ROOMS/AREAS THAT HAVE BOTH NORMAL AND EMERGENCY LIGHT FIXTURES EXCEPT BATHROOMS, SHALL BE CONTROLLED TOGETHER V/A A DIMMABLE 924 RELAY UNLESS OTHERWISE NOTED. BATHROOMS SHALL BE CONTROLLED BY A STANDARD NON-DIMMABLE 924 RELY INSTEAD.



KEY PLAN

Project Title:
ADDITION & ALTERATIONS TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
311 STATE STREET NEW LONDON CT 06320
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Revision:	Description:	Date:	Revised By:

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Drawn By: S. CROTEAU
Project Number: 22.382
Drawing Number: E101

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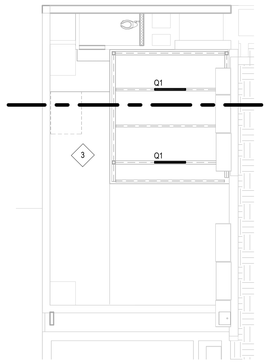
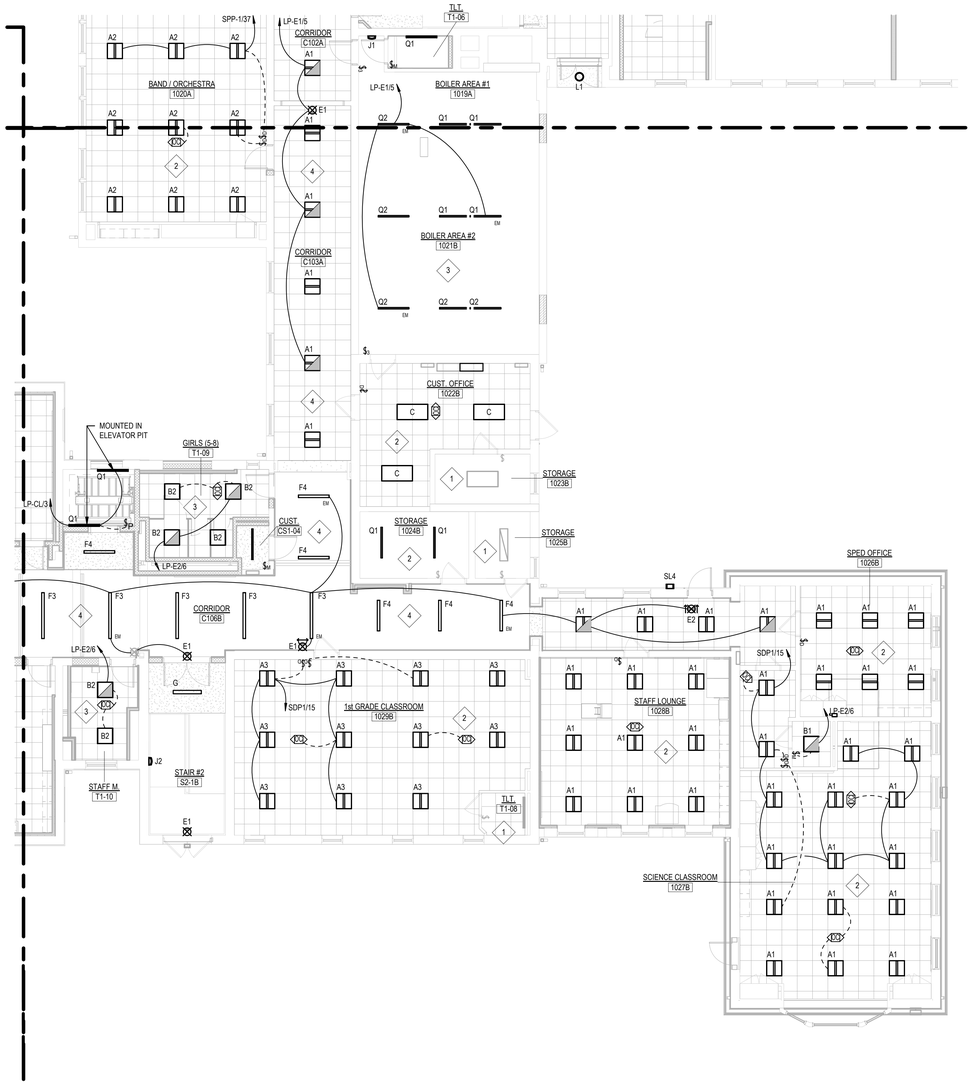


2 LOWER BOILER ROOM LIGHTING PLAN
1/8" = 1'-0"



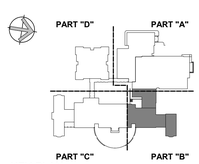
1 FIRST FLOOR LIGHTING PLAN PART 'B'
1/8" = 1'-0"

LIGHTING KEY NOTES

1. EXISTING FLUORESCENT LIGHT FIXTURE(S) AND TOGGLE TYPE LIGHT SWITCH(ES) IN THIS ROOM ARE EXISTING TO REMAIN. CONTRACTOR SHALL REPLACE EXISTING FLUORESCENT LAMP(S) AND BALLAST IN THESE FIXTURES WITH NEW LED RETROFIT LAMP(S) AND DRIVER OF EQUAL OR BETTER LIGHT OUTPUT.
2. CONTRACTOR SHALL WIRE NEW RECESS MOUNTED 2 X 2 LIGHT FIXTURES NOT INDICATED TO GENERATOR PANEL TO EXISTING BRANCH CIRCUIT PREVIOUSLY SERVING FLUORESCENT LIGHT FIXTURES IN THIS ROOM. EXISTING/NEW CEILING MOUNTED OCCUPANCY SENSOR SHALL BE INSTALLED AS INDICATED IN THIS ROOM TO SERVE BOTH NORMAL AND GENERATOR CIRCUITS. WIRE FIXTURES TO EXISTING RELOCATED AND/OR NEW SWITCHES AND SENSOR(S) AS INDICATED.
3. CONTRACTOR SHALL WIRE ALL NEW FIXTURE(S) IN THIS ROOM TO THE EXISTING "NORMAL" BRANCH CIRCUIT PREVIOUSLY SERVING THIS ROOM UNLESS INDICATED TO BE WIRED TO THE GENERATOR EMERGENCY DISTRIBUTION. FIXTURE(S) SHALL BE CONTROLLED BY NEW OR EXISTING/RELOCATED SWITCH(ES) AND/OR SENSOR(S) LOCATED IN THE ROOM.
4. CONTRACTOR SHALL INSTALL NEW RECESSED MOUNTED 2 X 2 LED LIGHT FIXTURES AND PENDANT MOUNTED LINEAR LED FIXTURES WHERE INDICATED IN THE CORRIDOR OR VESTIBULE. FIXTURES SHALL BE WIRED TO EITHER THE NEW GENERATOR PANEL (EMERGENCY SYSTEM) OR THE EXISTING BRANCH CIRCUIT (NORMAL POWER) THAT PREVIOUSLY SERVED THE CORRIDOR. THESE LIGHTS SHALL BE CONTROLLED BY THE BUILDING LIGHTING CONTROL SYSTEM. BOTH NORMAL AND EMERGENCY FIXTURES SHALL TURN ON 15-20 BEFORE SCHOOL STAFF ARRIVES AND STAY ON DURING NORMAL SCHOOL HOURS. THE EMERGENCY FIXTURES WILL TURN OFF TWO HOURS AFTER SCHOOL ENDS AND THE NORMAL LIGHTS WILL REMAIN ON UNTIL 15 MINUTES AFTER SCHOOL CLOSES.

GENERAL LIGHTING NOTES

1. REFER TO DRAWING E001 FOR SYMBOLS AND ABBREVIATIONS.
2. ALL EXISTING LIGHT FIXTURES, EXIT SIGNS AND LIGHT SWITCHES SHOWN HALF-TONE (LIGHT), ARE EXISTING TO REMAIN AND ALL WIRING TO THESE DEVICES SHALL REMAIN WIRED TO THEIR EXISTING BRANCH CIRCUIT(S). CONTRACTOR IS RESPONSIBLE FOR MAINTAINING THE CONTINUITY OF ALL EXISTING BRANCH CIRCUITS EFFECTED BY THE RENOVATION AND PROVIDE ADDITIONAL WIRING AS NEEDED.
3. ALL NEW LIGHT FIXTURES, EXIT SIGNS AND LIGHT SWITCHES MOUNTED ON EXISTING CONCRETE WALLS (POURED OR BLOCK) SHALL BE FED WITH SURFACE MOUNTED WIREMOLD RACEWAY, TYPE 500 OR 700 SERIES. PROVIDE ALL NECESSARY ACCESSORIES, CONNECTIONS AND FITTINGS FOR A COMPLETE SYSTEM.
4. ALL ROOMS/AREAS THAT HAVE BOTH NORMAL AND EMERGENCY LIGHT FIXTURES EXCEPT BATHROOMS, SHALL BE CONTROLLED TOGETHER VIA A DIMMABLE 924 RELAY UNLESS OTHERWISE NOTED. BATHROOMS SHALL BE CONTROLLED BY A STANDARD NON-DIMMABLE 924 RELY INSTEAD.



KEY PLAN

Project Title:
ADDITION & ALTERATIONS TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
311 STATE STREET NEW LONDON CT 06320
203 230 9007 silverpetrucelli.com

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Drawn By: S. CROTEAU
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Drawing Number: E102

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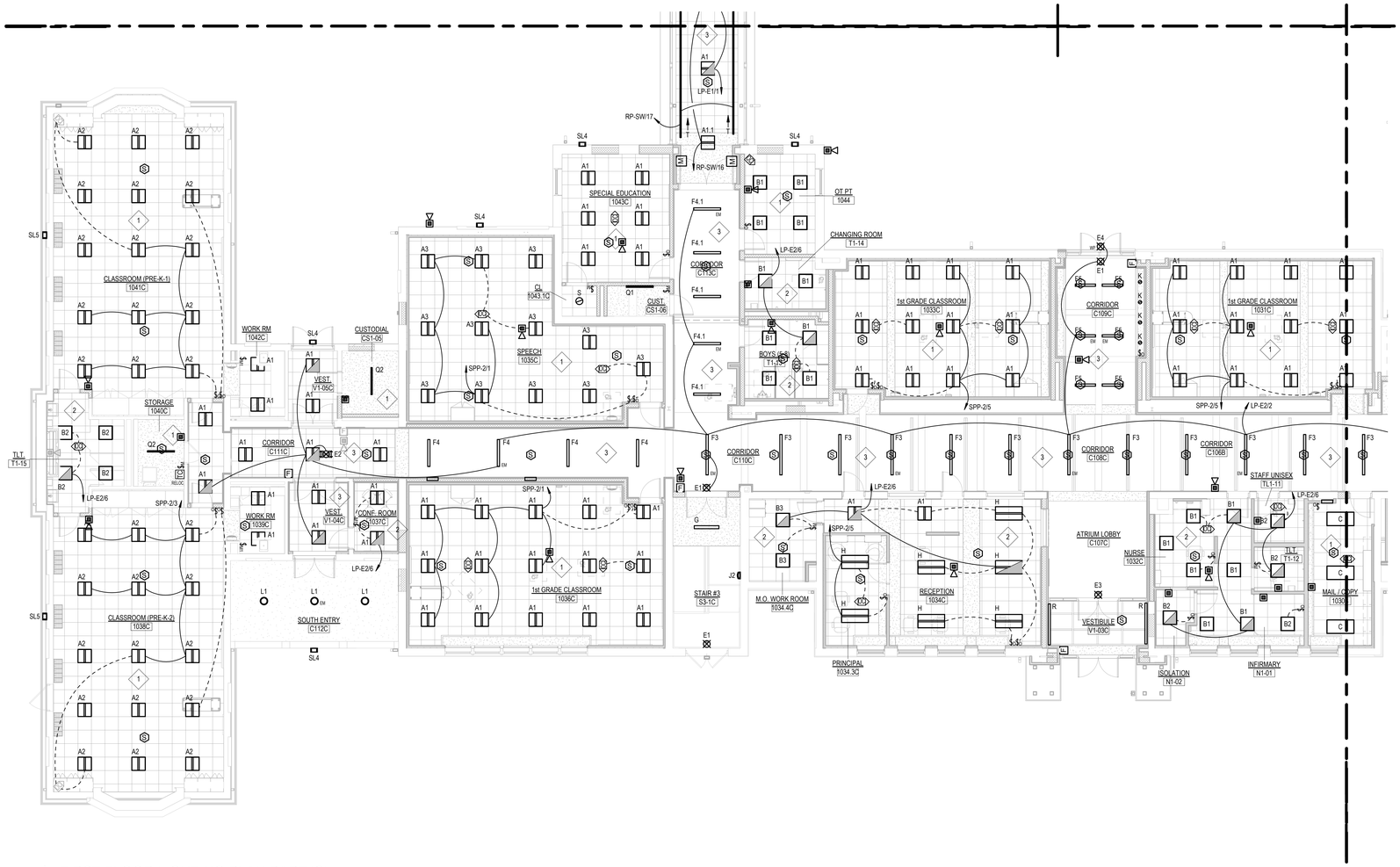


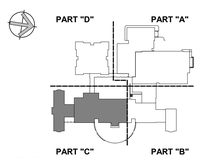
1 FIRST FLOOR LIGHTING PLAN PART 'C'
1/8" = 1'-0"

LIGHTING KEY NOTES

1. CONTRACTOR SHALL WIRE NEW RECESS MOUNTED 2 X 2 LIGHT FIXTURES NOT INDICATED TO GENERATOR PANEL TO EXISTING BRANCH CIRCUIT PREVIOUSLY SERVING FLUORESCENT LIGHT FIXTURES IN THIS ROOM. EXISTING/NEW CEILING MOUNTED OCCUPANCY SENSOR SHALL BE INSTALLED AS INDICATED IN THIS ROOM TO SERVE BOTH NORMAL AND GENERATOR CIRCUITS. WIRE FIXTURES TO EXISTING RELOCATED AND/OR NEW SWITCHES AND SENSOR(S) AS INDICATED.
2. CONTRACTOR SHALL WIRE ALL NEW FIXTURE(S) IN THIS ROOM TO THE EXISTING "NORMAL" BRANCH CIRCUIT PREVIOUSLY SERVING THIS ROOM UNLESS INDICATED TO BE WIRED TO THE GENERATOR EMERGENCY DISTRIBUTION. FIXTURE(S) SHALL BE CONTROLLED BY NEW OR EXISTING/RELOCATED SWITCH(ES) AND/OR SENSOR(S) LOCATED IN THE ROOM.
3. CONTRACTOR SHALL INSTALL NEW RECESSED MOUNTED 2 X 2 LED LIGHT FIXTURES AND PENDANT MOUNTED LINEAR LED FIXTURES WHERE INDICATED IN THE CORRIDOR OR VESTIBULE. FIXTURES SHALL BE WIRED TO EITHER THE NEW GENERATOR PANEL (EMERGENCY SYSTEM) OR THE EXISTING BRANCH CIRCUIT (NORMAL POWER) THAT PREVIOUSLY SERVED THE CORRIDOR. THESE LIGHTS SHALL BE CONTROLLED BY THE BUILDING LIGHTING CONTROL SYSTEM. BOTH NORMAL AND EMERGENCY FIXTURES SHALL TURN ON 15-20 BEFORE SCHOOL STAFF ARIVES AND STAY ON DURING NORMAL SCHOOL HOURS. THE EMERGENCY FIXTURES WILL TURN OFF TWO HOURS AFTER SCHOOL ENDS AND THE NORMAL LIGHTS WILL REMAIN ON UNTIL 15 MINUTES AFTER SCHOOL CLOSES.
4.

GENERAL LIGHTING NOTES

1. REFER TO DRAWING E001 FOR SYMBOLS AND ABBREVIATIONS.
2. ALL EXISTING LIGHT FIXTURES, EXIT SIGNS AND LIGHT SWITCHES SHOWN HALF-TONE (LIGHT), ARE EXISTING TO REMAIN AND ALL WIRING TO THESE DEVICES SHALL REMAIN WIRED TO THEIR EXISTING BRANCH CIRCUIT(S). CONTRACTOR IS RESPONSIBLE FOR MAINTAINING THE CONTINUITY OF ALL EXISTING BRANCH CIRCUITS EFFECTED BY THE RENOVATION AND PROVIDE ADDITIONAL WIRING AS NEEDED.
3. ALL NEW LIGHT FIXTURES, EXIT SIGNS AND LIGHT SWITCHES MOUNTED ON EXISTING CONCRETE WALLS (POURED OR BLOCK) SHALL BE FED WITH SURFACE MOUNTED WIREMOLD RACEWAY, TYPE 500 OR 700 SERIES. PROVIDE ALL NECESSARY ACCESSORIES, CONNECTIONS AND FITTINGS FOR A COMPLETE SYSTEM.
4. ALL ROOMS/AREAS THAT HAVE BOTH NORMAL AND EMERGENCY LIGHT FIXTURES EXCEPT BATHROOMS, SHALL BE CONTROLLED TOGETHER VIA A DIMMABLE 924 RELAY UNLESS OTHERWISE NOTED. BATHROOMS SHALL BE CONTROLLED BY A STANDARD NON-DIMMABLE 924 RELY INSTEAD.



KEY PLAN

Project Title:

ADDITION & ALTERATIONS TO:
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OLD GREENWICH, CONNECTICUT 06870

SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
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Revision:	Description:	Date:	Revised By:

Drawing Title: FIRST FLOOR LIGHTING PLAN - PART 'C'

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Drawn By: S. CROTEAU
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Drawing Number: E103

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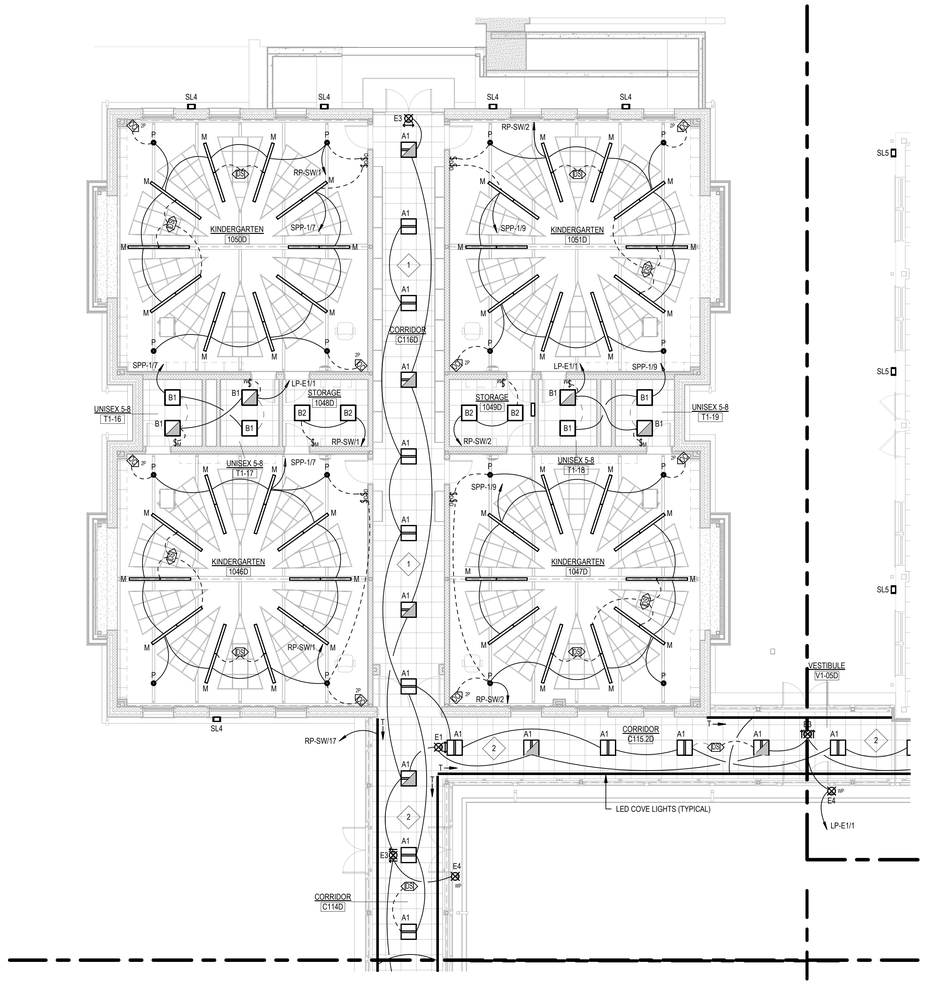


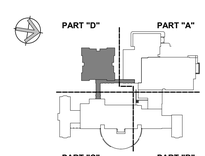
1 FIRST FLOOR LIGHTING PLAN PART 'D'
1/8" = 1'-0"

LIGHTING KEY NOTES

1. CONTRACTOR SHALL INSTALL NEW RECESSED MOUNTED 2 X 2 LED LIGHT FIXTURES AND LED COVE LIGHT FIXTURES INDICATED IN THE CORRIDOR OR VESTIBULE. FIXTURES SHALL BE WIRED TO EITHER THE NEW GENERATOR PANEL (EMERGENCY SYSTEM) OR THE NORMAL BRANCH CIRCUIT (RP-SW). THESE LIGHTS SHALL BE CONTROLLED BY THE BUILDING LIGHTING CONTROL SYSTEM. BOTH NORMAL AND EMERGENCY FIXTURES SHALL TURN ON 15-20 BEFORE SCHOOL STAFF ARIVES AND STAY ON DURING NORMAL SCHOOL HOURS. THE EMERGENCY FIXTURES WILL TURN OFF TWO HOURS AFTER SCHOOL ENDS AND THE NORMAL LIGHTS WILL REMAIN ON UNTIL 15 MINUTES AFTER SCHOOL CLOSES.
2. IN ADDITION TO THE CONTROLS INDICATED ABOVE, ALL OF THE 2 X 2 FIXTURES IN THE GLASS CORRIDOR AND VESTIBULE (NORTH/SOUTH & EAST/WEST) SHALL BE ADDITIONALLY CONTROLLED BY A DAY LIGHT SENSOR IN THEIR RESPECTIVE CORRIDORS.

GENERAL LIGHTING NOTES

1. REFER TO DRAWING E001 FOR SYMBOLS AND ABBREVIATIONS.
2. ALL EXISTING LIGHT FIXTURES, EXIT SIGNS AND LIGHT SWITCHES SHOWN HALF-TONE (LIGHT), ARE EXISTING TO REMAIN AND ALL WIRING TO THESE DEVICES SHALL REMAIN WIRED TO THEIR EXISTING BRANCH CIRCUIT(S). CONTRACTOR IS RESPONSIBLE FOR MAINTAINING THE CONTINUITY OF ALL EXISTING BRANCH CIRCUITS EFFECTED BY THE RENOVATION AND PROVIDE ADDITIONAL WIRING AS NEEDED.
3. ALL NEW LIGHT FIXTURES, EXIT SIGNS AND LIGHT SWITCHES MOUNTED ON EXISTING CONCRETE WALLS (POURED OR BLOCK) SHALL BE FED WITH SURFACE MOUNTED WIREMOLD RACEWAY, TYPE 500 OR 700 SERIES. PROVIDE ALL NECESSARY ACCESSORIES, CONNECTIONS AND FITTINGS FOR A COMPLETE SYSTEM.
4. ALL ROOMS/AREAS THAT HAVE BOTH NORMAL AND EMERGENCY LIGHT FIXTURES EXCEPT BATHROOMS, SHALL BE CONTROLLED TOGETHER VIA A DIMMABLE 924 RELAY UNLESS OTHERWISE NOTED. BATHROOMS SHALL BE CONTROLLED BY A STANDARD NON-DIMMABLE 924 RELY INSTEAD.



KEY PLAN

Project Title:
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Drawing Title: FIRST FLOOR LIGHTING PLAN - PART 'D'

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Drawn By: S. CROTEAU
Project Number: 22.382
Drawing Number: E104

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1 SECOND FLOOR LIGHTING PLAN

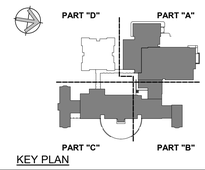
1/8" = 1'-0"

LIGHTING KEY NOTES

1. CONTRACTOR SHALL WIRE NEW RECESS MOUNTED 2 X 2 LIGHT FIXTURES NOT INDICATED TO GENERATOR PANEL TO EXISTING BRANCH CIRCUIT PREVIOUSLY SERVING PENDANT MOUNTED LIGHT FIXTURES IN THIS ROOM. EXISTING OR NEW CEILING MOUNTED SENSOR(S) SHALL BE INSTALLED AS INDICATED IN THIS ROOM TO SERVE BOTH NORMAL AND GENERATOR CIRCUITS. WIRE FIXTURES TO EXISTING AND/OR NEW SWITCHES AND SENSOR(S) AS INDICATED, FIXTURES SHALL BE WIRED TO NEW GENERATOR PANEL AS INDICATED (STANDBY SYSTEM).
2. EXISTING RECESSED DISPLAY CASE IN THIS LOCATION IS TO REMAIN, CONTRACTOR SHALL REPLACE EXISTING FLUORESCENT LIGHT FIXTURE LAMP(S) AND BALLAST WITH NEW LED RETROFIT LAMP(S) AND DRIVER OF EQUAL OR BETTER LIGHT OUTPUT. EXISTING RECESSED TOGGLE SWITCH SHALL REMAIN TO CONTROL THE LIGHT(S).
3. NEW UNDERCOUNTER LIGHT FIXTURE SHALL BE WIRED TO EXISTING BRANCH CIRCUIT THAT PREVIOUSLY SERVED LIGHT FIXTURE IN THIS LOCATION. FIXTURE SHALL BE CONTROLLED BY EXISTING TOGGLE TYPE SWITCH THAT SERVED PREVIOUS LIGHT IN THIS LOCATION. REPLACE ANY BROKEN OR NON-WORKING SWITCH WITH NEW.
4. CONTRACTOR SHALL WIRE NEW RECESS MOUNTED 2 X 2 LIGHT FIXTURES AND DOWNLIGHT FIXTURES INDICATED TO EXISTING BRANCH CIRCUIT PREVIOUSLY SERVING PENDANT MOUNTED LIGHT FIXTURES IN THIS ROOM. EXISTING OR NEW CEILING MOUNTED SENSOR SHALL BE INSTALLED AS INDICATED IN THIS ROOM TO SERVE ALL FIXTURES.
5. ALL NEW AND/OR RELOCATED FIXTURE(S) IN THIS ROOM SHALL BE WIRED TO THE EXISTING "NORMAL" BRANCH CIRCUIT PREVIOUSLY SERVING THIS ROOM UNLESS INDICATED TO BE WIRED TO THE GENERATOR EMERGENCY DISTRIBUTION. FIXTURE(S) SHALL BE CONTROLLED BY NEW OR EXISTING/RELOCATED SWITCH AND/OR SENSOR LOCATED IN THE ROOM.
6. CONTRACTOR SHALL INSTALL NEW RECESSED MOUNTED 2 X 4 LED LIGHT FIXTURES WHERE INDICATED IN THE CORRIDOR. FIXTURES SHALL BE WIRED TO EITHER THE NEW GENERATOR PANEL (EMERGENCY SYSTEM) OR THE EXISTING BRANCH CIRCUIT (NORMAL POWER) THAT PREVIOUSLY SERVED THE CORRIDOR. THESE LIGHTS SHALL BE CONTROLLED BY THE BUILDING LIGHTING CONTROL SYSTEM. BOTH NORMAL AND EMERGENCY FIXTURES SHALL TURN ON 15-20 BEFORE SCHOOL STAFF ARIVES AND STAY ON DURING NORMAL SCHOOL HOURS. THE EMERGENCY FIXTURES WILL TURN OFF TWO HOURS AFTER SCHOOL ENDS AND THE NORMAL LIGHTS WILL REMAIN ON UNTIL 15 MINUTES AFTER SCHOOL CLOSES.
7. CONTRACTOR SHALL INSTALL (6) NEW DIMMER SWITCHES IN THE EXISTING LOCATION OF THE SEVEN SWITCHES IN THIS LOCATION THAT PREVIOUSLY SERVED THE LIGHT FIXTURES IN THE MEDIA CENTER. ONE SWITCH TO CONTROL THE (6) TYPE D2 FIXTURES ABOVE THE SERVICE DESK. TWO SWITCHES TO CONTROL THE TYPE F1.1 LIGHT FIXTURE (ONE CONTROLS UP LIGHT AND ONE CONTROLS DOWN LIGHT). ONE SWITCH CONTROLS THE (4) TYPE D2 LIGHT FIXTURES BELOW SERVICE DESK. ONE SWITCH CONTROLS THE (6) TYPE D2 LIGHT FIXTURES AT THE EAST END OF THE MEDIA CENTER AND THE LAST SWITCH CONTROLS ALL OF THE TYPE D1 FIXTURES. ALL OF THE FIXTURES IN THE MEDIA CENTER ARE TO BE WIRED TO THE EXISTING NORMAL BRANCH CIRCUIT THAT PREVIOUSLY SERVED THE MEDIA CENTER EXCEPT FOR THOSE INDICATED TO BE WIRED TO THE GENERATOR EMERGENCY CIRCUIT.
8. THE ATRIUM LIGHT FIXTURES (F1 & F2) ARE TO BE OPERATED WITH THE SECOND FLOOR CORRIDOR LIGHTS (SEE NOTE 6 ABOVE). THEY ARE ALSO AUTOMATICALLY ADJUSTED BY THE DAY LIGHT SENSOR SERVING THIS AREA AND MANUALLY ADJUSTED BY A DIMMER SWITCH LOCATED IN THE MAIN OFFICE (SEE DWG. E103). THE (4) TYPE 'F1' LIGHT FIXTURES ARE TO BE WIRED TO THE EXISTING NORMAL BRANCH CIRCUIT THAT PREVIOUSLY SERVED THIS AREA.

GENERAL LIGHTING NOTES

1. REFER TO DRAWING E001 FOR SYMBOLS AND ABBREVIATIONS.
2. ALL EXISTING LIGHT FIXTURES, EXIT SIGNS AND LIGHT SWITCHES SHOWN HALF-TONE (LIGHT), ARE EXISTING TO REMAIN AND ALL WIRING TO THESE DEVICES SHALL REMAIN WIRED TO THEIR EXISTING BRANCH CIRCUIT(S). CONTRACTOR IS RESPONSIBLE FOR MAINTAINING THE CONTINUITY OF ALL EXISTING BRANCH CIRCUITS EFFECTED BY THE RENOVATION AND PROVIDE ADDITIONAL WIRING AS NEEDED.
3. ALL NEW LIGHT FIXTURES, EXIT SIGNS AND LIGHT SWITCHES MOUNTED ON EXISTING CONCRETE WALLS (POURED OR BLOCK) SHALL BE FED WITH SURFACE MOUNTED WIREMOLD RACEWAY, TYPE 500 OR 700 SERIES. PROVIDE ALL NECESSARY ACCESSORIES, CONNECTIONS AND FITTINGS FOR A COMPLETE SYSTEM.
4. ALL ROOMS/AREAS THAT HAVE BOTH NORMAL AND EMERGENCY LIGHT FIXTURES EXCEPT BATHROOMS, SHALL BE CONTROLLED TOGETHER VIA A DIMMABLE 924 RELAY UNLESS OTHERWISE NOTED. BATHROOMS SHALL BE CONTROLLED BY A STANDARD NON-DIMMABLE 924 RELY INSTEAD.



KEY PLAN

Project Title:

ADDITION & ALTERATIONS TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
311 STATE STREET NEW LONDON CT 06320
203 230 9007 silverpetrucelli.com

Revision:	Description:	Date:	Revised By:

Drawing Title: SECOND FLOOR LIGHTING PLAN - PART 'A', 'B' & 'C'

Date: 8/29/2024
Scale: As indicated
Drawn By: S. CROTEAU
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Drawing Number: E110

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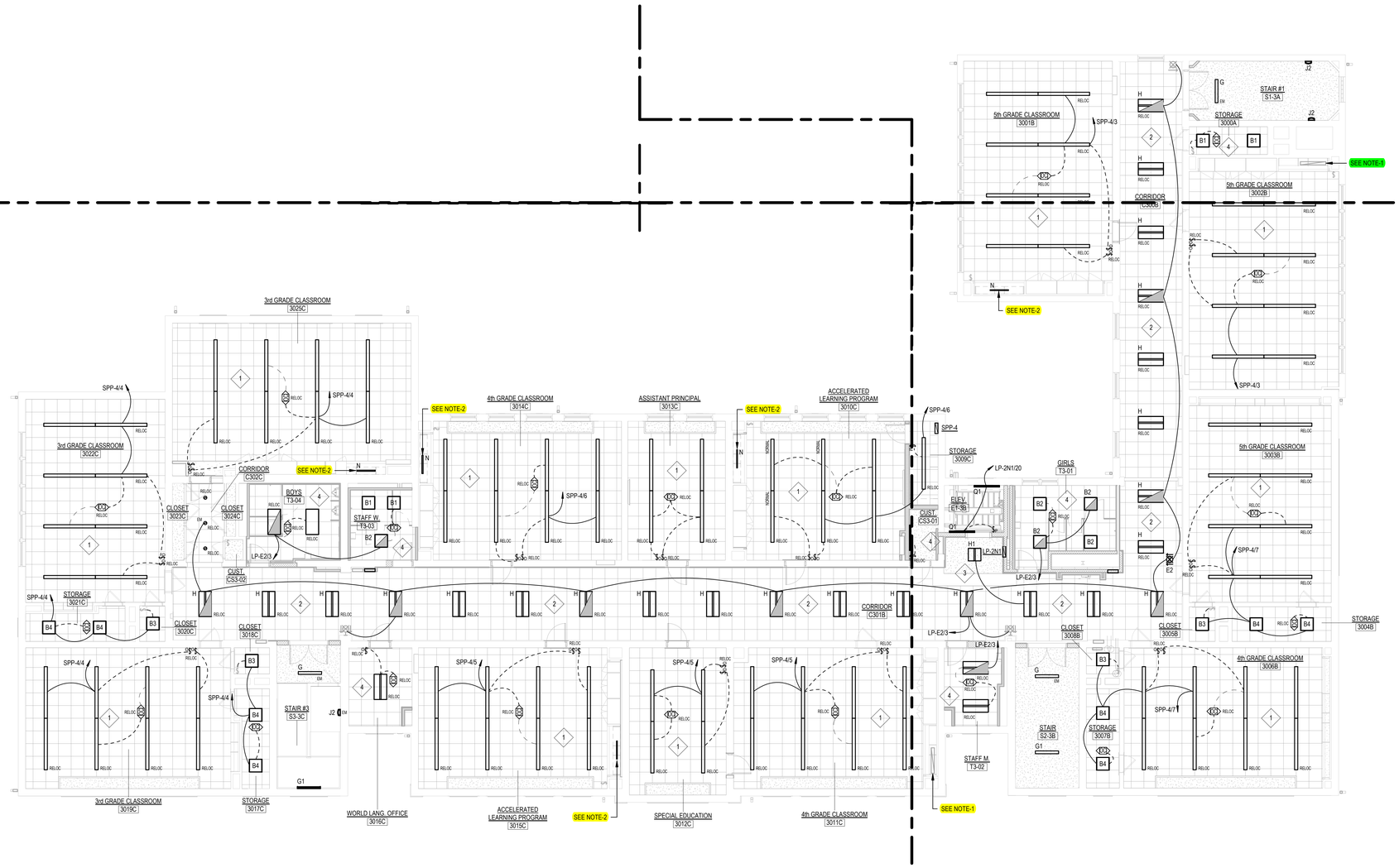


1 THIRD FLOOR LIGHTING PLAN

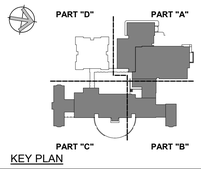
1/8" = 1'-0"

LIGHTING KEY NOTES

1. CONTRACTOR SHALL REINSTALL EXISTING PENDANT MOUNTED LED LIGHT FIXTURES AND CEILING MOUNTED OCCUPANCY SENSOR IN THE SAME LOCATION AFTER SPRINKLER PIPING WORK IS DONE IN THIS ROOM. WIRE FIXTURES TO EXISTING SWITCHES AND OCCUPANCY SENSOR AS INDICATED. TWO ROWS OF FIXTURES CLOSEST TO THE TEACHING WALL SHALL BE WIRED TO THE NEW GENERATOR PANEL INDICATED (STANDBY SYSTEM). THE TWO ROWS OF FIXTURES AT THE BACK OF THE ROOM SHALL BE WIRED TO THE EXISTING BRANCH CIRCUIT (NORMAL POWER) PREVIOUSLY SERVING THIS ROOM.
2. CONTRACTOR SHALL REINSTALL EXISTING RECESSED MOUNTED 2FT. X 4FT. LED LIGHT FIXTURE(S) IN THE SAME LOCATION OF THE CORRIDOR AFTER THE SPRINKLER PIPING WORK IS DONE. FIXTURES SHALL BE WIRED TO EITHER THE NEW GENERATOR PANEL (EMERGENCY SYSTEM) OR THE EXISTING BRANCH CIRCUIT (NORMAL POWER) THAT PREVIOUSLY SERVED THE CORRIDOR. THESE LIGHTS SHALL BE CONTROLLED BY THE BUILDING LIGHTING CONTROL SYSTEM. BOTH NORMAL AND EMERGENCY FIXTURES SHALL TURN ON 15-20 BEFORE SCHOOL STAFF ARIVES AND STAY ON DURING NORMAL SCHOOL HOURS. THE EMERGENCY FIXTURES WILL TURN OFF TWO HOURS AFTER SCHOOL ENDS AND THE NORMAL LIGHTS WILL REMAIN ON UNTIL 15 MINUTES AFTER SCHOOL CLOSES.
3. CONTRACTOR SHALL WIRE NEW ELEVATOR LOBBY FIXTURE TO EXISTING "NORMAL" BRANCH CIRCUIT SERVING THE ADJACENT CORRIDOR FIXTURES. NEW LOBBY FIXTURE AND EXISTING CORRIDOR LIGHTS SHALL BE CONTROLLED AS INDICATED ABOVE.
4. ALL NEW AND/OR RELOCATED FIXTURE(S) IN THIS ROOM SHALL BE WIRED TO THE EXISTING "NORMAL" BRANCH CIRCUIT PREVIOUSLY SERVING THIS ROOM UNLESS INDICATED TO BE WIRED TO THE GENERATOR EMERGENCY DISTRIBUTION. FIXTURE(S) SHALL BE CONTROLLED BY NEW OR EXISTING/RELOCATED SWITCH AND/OR SENSOR LOCATED IN THE ROOM.

GENERAL LIGHTING NOTES

1. CONTRACTOR SHALL REPLACE EXISTING FLUORESCENT LAMP AND BALLAST IN THIS FIXTURE WITH NEW LED RETROFIT LAMP AND DRIVER OF EQUAL LIGHT OUTPUT.
2. CONTRACTOR SHALL WIRE NEW UNDERCABINET LIGHT FIXTURE TO EXISTING BRANCH CIRCUIT THAT PREVIOUSLY FED LIGHT FIXTURE IN THIS LOCATION. ALSO WIRE NEW FIXTURE TO EXISTING ADJACENT TOGGLE TYPE LIGHT SWITCH.
3. ALL EXISTING LIGHT FIXTURES, EXIT SIGNS AND SWITCHES SHOWN LIGHT (HALF-TONE) ARE EXISTING TO REMAIN.
4. ALL ROOMS/AREAS THAT HAVE BOTH NORMAL AND EMERGENCY LIGHT FIXTURES EXCEPT BATHROOMS, SHALL BE CONTROLLED TOGETHER VIA A DIMMABLE 924 RELAY UNLESS OTHERWISE NOTED. BATHROOMS SHALL BE CONTROLLED BY A STANDARD NON-DIMMABLE 924 RELY INSTEAD.



KEY PLAN

Project Title:

ADDITION & ALTERATIONS TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
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203 230 9007 silverpetrucelli.com

Revision:	Description:	Date:	Revised By:

Drawing Title:
THIRD FLOOR LIGHTING PLAN - PART 'A', 'B' & 'C'

Date: 8/29/2024
Scale: As indicated
Drawn By: S. CROTEAU
Project Number: 22.382
Drawing Number: E120

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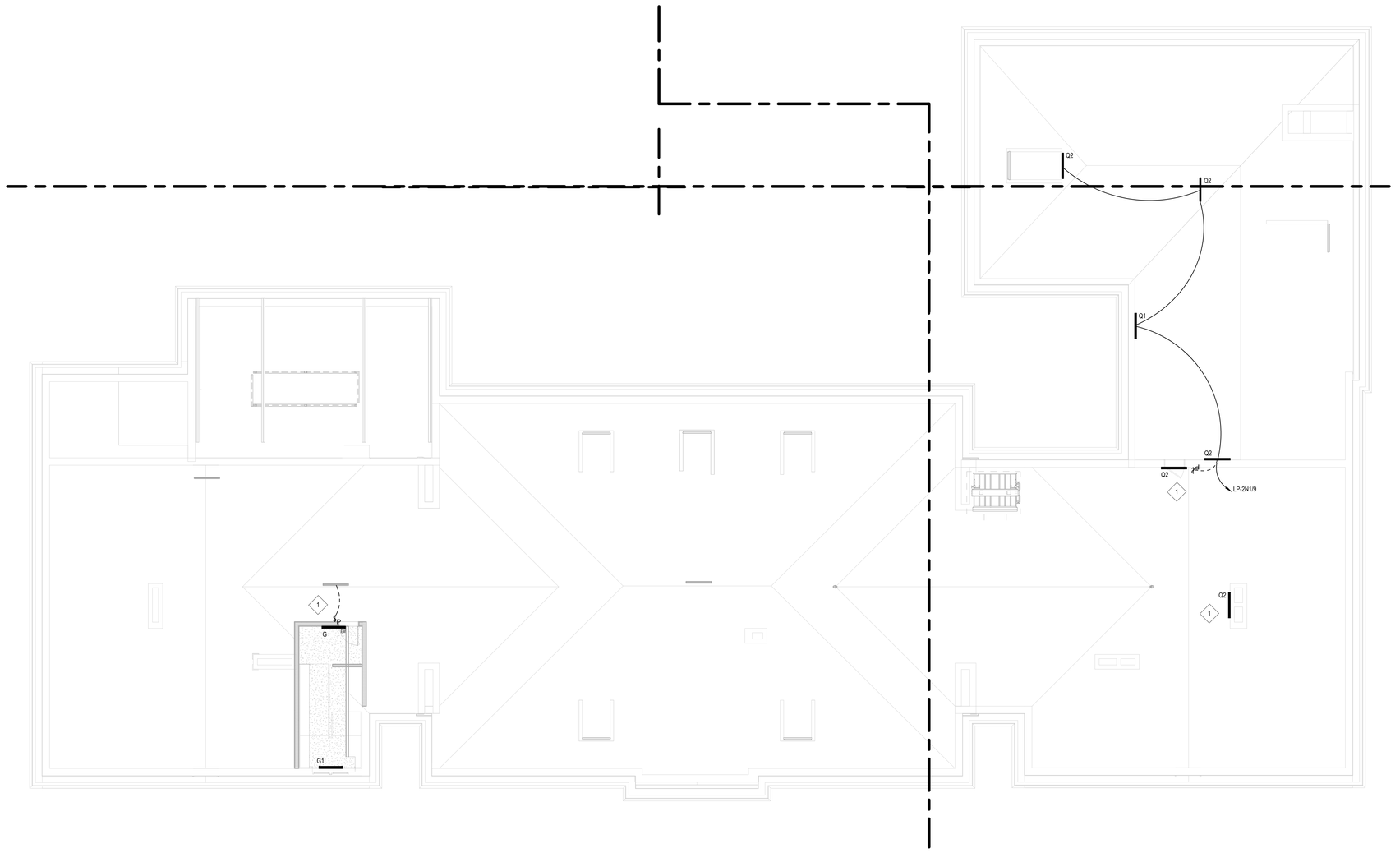


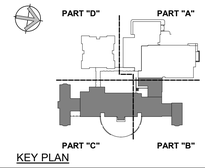
GENERAL LIGHTING NOTES

1. REFER TO DRAWING E001 FOR SYMBOLS AND ABBREVIATIONS.
2. ALL EXISTING LIGHT FIXTURES, EXIT SIGNS AND LIGHT SWITCHES SHOWN HALF-TONE (LIGHT), ARE EXISTING TO REMAIN AND ALL WIRING TO THESE DEVICES SHALL REMAIN WIRED TO THEIR EXISTING BRANCH CIRCUIT(S). CONTRACTOR IS RESPONSIBLE FOR MAINTAINING THE CONTINUITY OF ALL EXISTING BRANCH CIRCUITS EFFECTED BY THE RENOVATION AND PROVIDE ADDITIONAL WIRING AS NEEDED.
3. ALL NEW LIGHT FIXTURES, EXIT SIGNS AND LIGHT SWITCHES MOUNTED ON EXISTING CONCRETE WALLS (POURED OR BLOCK) SHALL BE FED WITH SURFACE MOUNTED WIREMOLD RACEWAY, TYPE 500 OR 700 SERIES. PROVIDE ALL NECESSARY ACCESSORIES, CONNECTIONS AND FITTINGS FOR A COMPLETE SYSTEM.
4. ALL ROOMS/AREAS THAT HAVE BOTH NORMAL AND EMERGENCY LIGHT FIXTURES EXCEPT BATHROOMS, SHALL BE CONTROLLED TOGETHER VIA A DIMMABLE 924 RELAY UNLESS OTHERWISE NOTED. BATHROOMS SHALL BE CONTROLLED BY A STANDARD NON-DIMMABLE 924 RELY INSTEAD.

LIGHTING KEY NOTES

1. CONTRACTOR SHALL WIRE NEW LIGHT FIXTURES INDICATED IN THIS AREA OF THE ATTIC TO THE EXISTING BRANCH CIRCUIT SERVING THE OTHER LIGHTS TO REMAIN. BOTH NEW AND EXISTING LIGHT FIXTURES IN THIS AREA SHALL BE CONTROLLED BY NEW SWITCH WITH PILOT LIGHT AT THE DOOR NEXT TO THE STAIR.

1 ATTIC FLOOR LIGHTING PLAN
1/8" = 1'-0"



KEY PLAN

Project Title:
ADDITION & ALTERATIONS TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
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Revision:	Description:	Date:	Revised By:

Drawing Title: ATTIC LIGHTING PLAN - PART 'B' & 'C'

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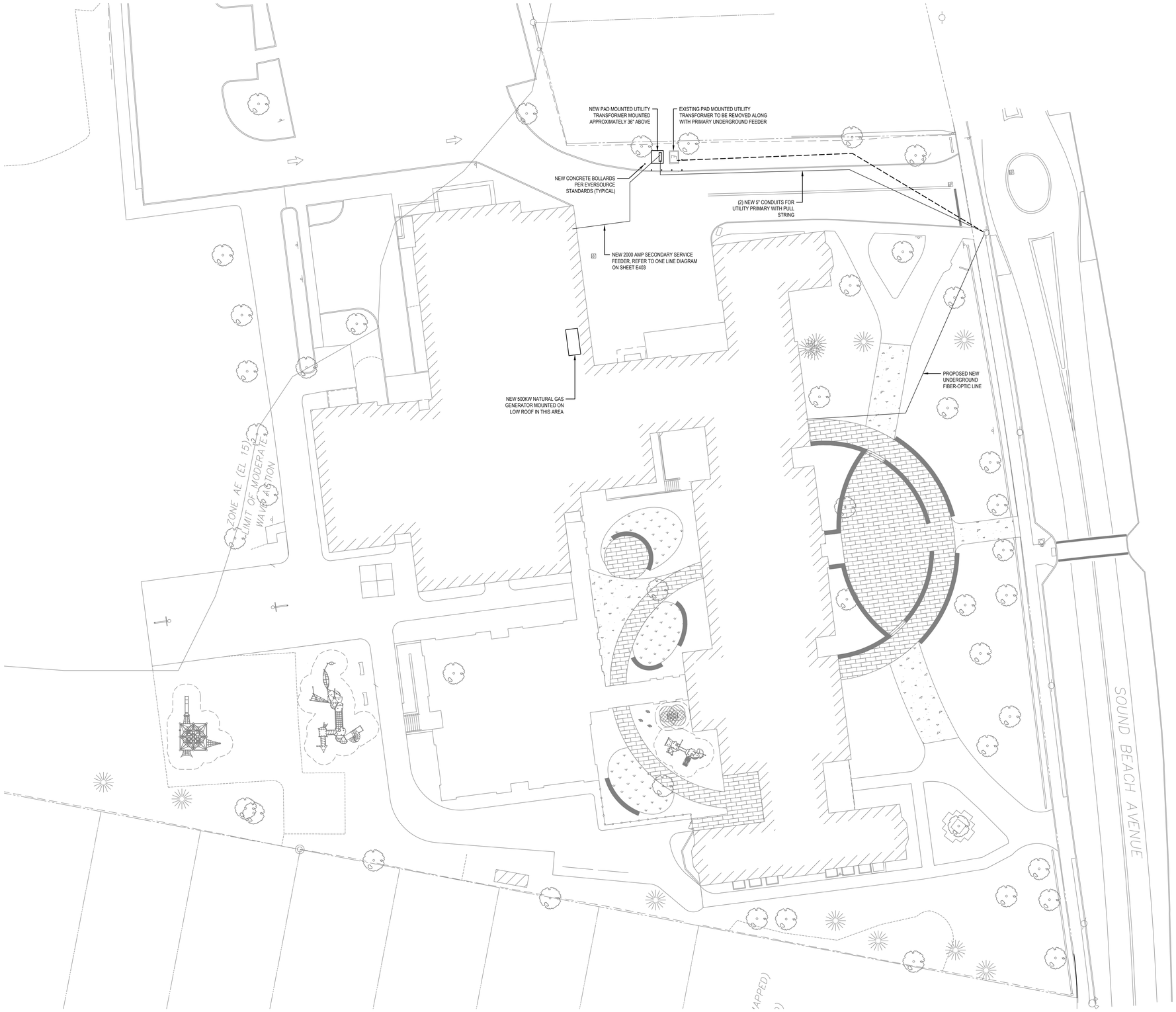

1 SITE PLAN
SCALE: 1" = 20'-0"

Project Title:

ADDITION & ALTERATIONS TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

SILVER PETRUCELLI + ASSOCIATES
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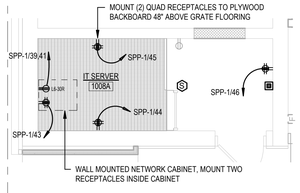
Revision:	Description:	Date:	Revised By:

Drawing Title:
ELECTRICAL SITE PLAN

Date: 08/29/2024
Scale: AS NOTED
Drawn By: S. CROTEAU
Project Number: 22.382

Drawing Number: E140



2 IT SERVER ROOM PART PLAN

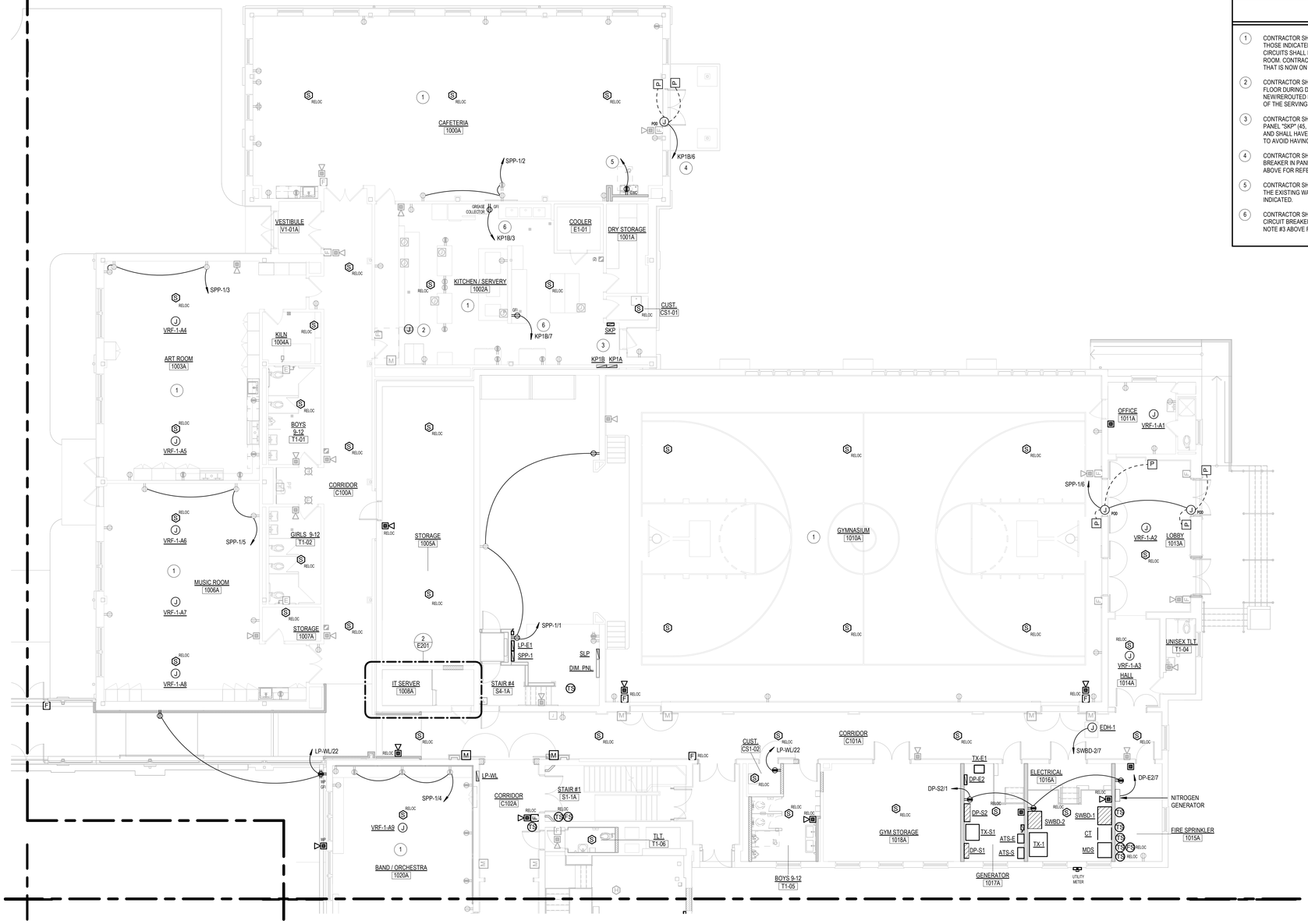
1/4" = 1'-0"

GENERAL POWER NOTES

1. REFER TO DRAWING E001 FOR SYMBOLS AND ABBREVIATIONS.
2. ALL EXISTING DEVICES SHOWN HALF-TONE (LIGHT), ARE EXISTING TO REMAIN AND ALL WIRING TO THESE DEVICES SHALL REMAIN WIRED TO THEIR EXISTING BRANCH CIRCUIT(S) UNLESS OTHERWISE NOTED. CONTRACTOR IS RESPONSIBLE FOR MAINTAINING THE CONTINUITY OF ALL EXISTING BRANCH CIRCUITS EFFECTED BY THE RENOVATION AND PROVIDE ADDITIONAL WIRING AS NEEDED.
3. ALL NEW DEVICES MOUNTED ON EXISTING CONCRETE WALLS (POURED OR BLOCK) SHALL BE SURFACE MOUNTED WIREMOLD RACEWAY, TYPE 500 OR 700 SERIES FOR SINGLE SYSTEMS AND TYPE 4000 SERIES FOR MULTIPLE SYSTEMS. PROVIDE ALL NECESSARY ACCESSORIES, CONNECTIONS AND FITTINGS FOR A COMPLETE SYSTEM.
4. ALL NEW RECEPTACLES (15 AND 20 AMP, 125V & 250V NON-LOCKING) SHALL BE TAMPER-RESISTANT TYPE PER NEC 406.12 UNLESS LOCATED MORE THAN 5'-6" ABOVE THE FLOOR OR SERVE A DEDICATED PIECE OF EQUIPMENT THAT CAN NOT BE EASLY MOVED TO EXPOSE THE PLUG.
5. ALL EXISTING FIRE ALARM PULL STATIONS TO REMAIN NEED TO BE LOWERED SO THAT THE TOP OF THE DEVICE IS AT 48 INCHES ABOVE THE FINISHED FLOOR TO MEET THE ADA CODE FOR TOP OF THE PULL HANDLE.

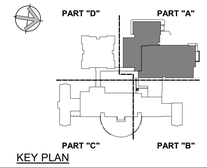
POWER KEY NOTES

1. CONTRACTOR SHALL MAINTAIN THE EXISTING BRANCH CIRCUITS IN THIS ROOM EXCEPT FOR THOSE INDICATED TO BE WIRED TO THE NEW GENERATOR DISTRIBUTION. THE EXISTING CIRCUITS SHALL BE REWIRED TO MAINTAIN CONTINUITY OF EXISTING CIRCUITING WITHIN THE ROOM. CONTRACTOR SHALL ALSO INSTALL A COLORED STICKER (DOT) ON EACH RECEPTACLE THAT IS NOW ON THE GENERATOR, CONFIRM WITH OWNER THE COLOR OF THE STICKER.
2. CONTRACTOR SHALL INSTALL/EXTEND/REROUTE EXISTING BRANCH CIRCUIT REMOVED FROM FLOOR DURING DEMOLITION THAT SERVES THE SERVING LINE EQUIPMENT. RUN NEW/REROUTED BRANCH CIRCUIT DOWN IN NEW CHASE WALL AND THE ALONG THE BOTTOM OF THE SERVING LINE TO THE EQUIPMENT.
3. CONTRACTOR SHALL RELOCATE THE FOLLOWING BRANCH CIRCUITS IN PANEL "KP1B" TO NEW PANEL "SKP" (45, 48, 49, 51, 54, 56, 58, 59, 60, 61, 62 & 63). PANEL "SKP" IS SURFACE MOUNTED AND SHALL HAVE A WIRE TROUGH RUN FROM THE TOP OF THE PANEL TO ABOVE THE CEILING TO AVOID HAVING EXPOSED CONDUITS.
4. CONTRACTOR SHALL WIRE NEW POWER DOOR OPERATOR "POD" FROM SPARE 15A-1P CIRCUIT BREAKER IN PANEL 'KP-1B' WITH 2 #12 + #12G IN 3/4"C. SPARE CIRCUITS ARE LISTED IN NOTE #3 ABOVE FOR REFERNCE.
5. CONTRACTOR SHALL EXTEND/REROUTE THE EXISTING BRANCH CIRCUIT THAT PREVIOUSLY FED THE EXISTING WATER COOLER REMOVED IN THIS AREA TO SERVE NEW WATER COOLER INDICATED.
6. CONTRACTOR SHALL WIRE EACH NEW GREASE COLLECTOR (BIG DIPPER) FROM A SPARE 15A-1P CIRCUIT BREAKER IN PANEL 'KP-1B' WITH 2 #12 + #12G IN 3/4"C. SPARE CIRCUITS ARE LISTED IN NOTE #3 ABOVE FOR REFERENCE.



1 FIRST FLOOR POWER PLAN PART 'A'

1/8" = 1'-0"



KEY PLAN

Project Title:

ADDITION & ALTERATIONS TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
311 STATE STREET NEW LONDON CT 06320
203 230 9007 silverpetrucelli.com

Revision:	Description:	Date:	Revised By:

Drawing Title: FIRST FLOOR POWER PLAN - PART 'A'

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Scale: As indicated
Drawn By: S. CROTEAU
Project Number: 22.382
Drawing Number: E201

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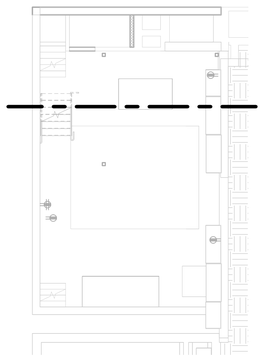
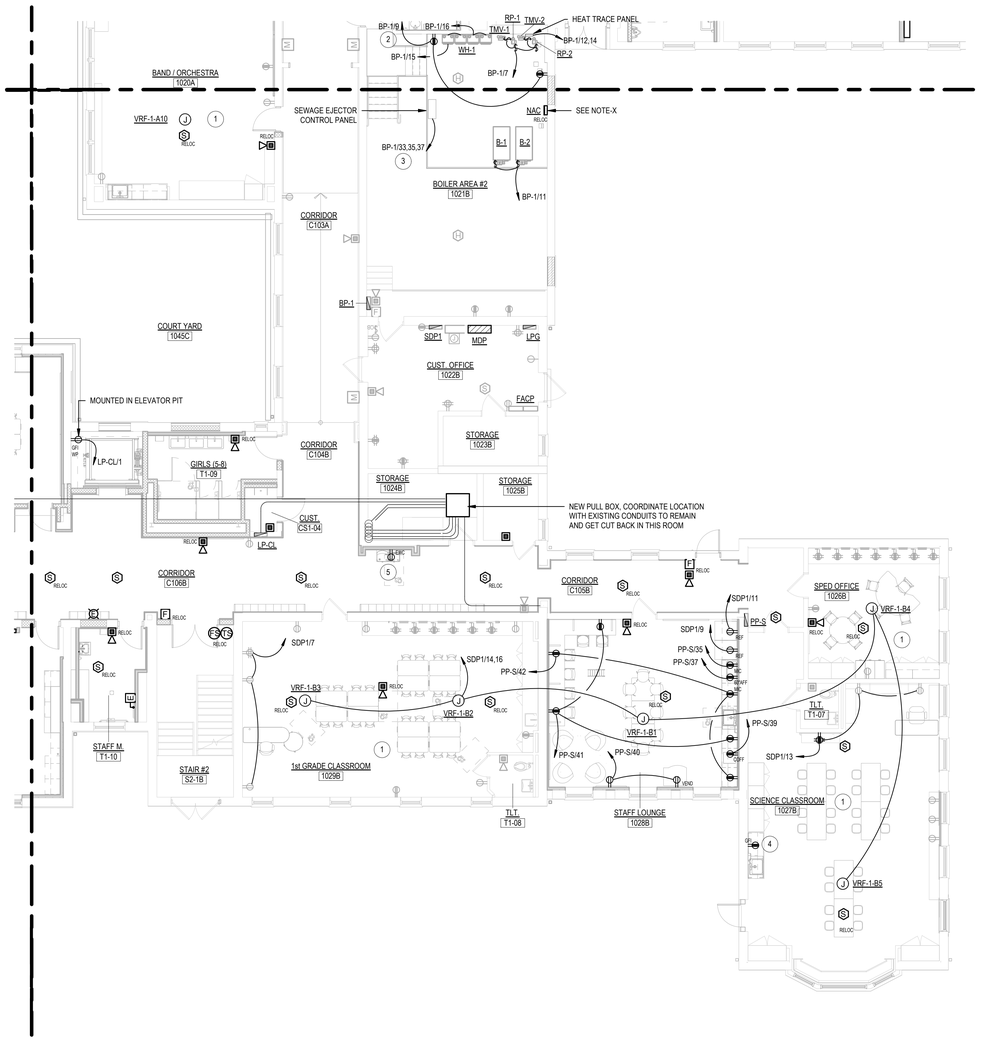


2 LOWER BOILER ROOM POWER PLAN
1/8" = 1'-0"



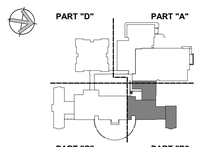
1 FIRST FLOOR POWER PLAN PART 'B'
1/8" = 1'-0"

GENERAL POWER NOTES

1. REFER TO DRAWING E001 FOR SYMBOLS AND ABBREVIATIONS.
2. ALL EXISTING DEVICES SHOWN HALF-TONE (LIGHT), ARE EXISTING TO REMAIN AND ALL WIRING TO THESE DEVICES SHALL REMAIN WIRED TO THEIR EXISTING BRANCH CIRCUIT(S) UNLESS OTHERWISE NOTED. CONTRACTOR IS RESPONSIBLE FOR MAINTAINING THE CONTINUITY OF ALL EXISTING BRANCH CIRCUITS EFFECTED BY THE RENOVATION AND PROVIDE ADDITIONAL WIRING AS NEEDED.
3. ALL NEW DEVICES MOUNTED ON EXISTING CONCRETE WALLS (POURED OR BLOCK) SHALL BE SURFACE MOUNTED WIREMOLD RACEWAY, TYPE 500 OR 700 SERIES FOR SINGLE SYSTEMS AND TYPE 4000 SERIES FOR MULTIPLE SYSTEMS. PROVIDE ALL NECESSARY ACCESSORIES, CONNECTIONS AND FITTINGS FOR A COMPLETE SYSTEM.
4. ALL NEW RECEPTACLES (15 AND 20 AMP 125V & 250V NON-LOCKING) SHALL BE TAMPER-RESISTANT TYPE PER NEC 406.12 UNLESS LOCATED MORE THAN 5'-6" ABOVE THE FLOOR OR SERVE A DEDICATED PIECE OF EQUIPMENT THAT CAN NOT BE EASLY MOVED TO EXPOSE THE PLUG.
5. ALL EXISTING FIRE ALARM PULL STATIONS TO REMAIN NEED TO BE LOWERED SO THAT THE TOP OF THE DEVICE IS AT 48 INCHES ABOVE THE FINISHED FLOOR TO MEET THE ADA CODE FOR TOP OF THE PULL HANDLE.

POWER KEY NOTES

1. CONTRACTOR SHALL MAINTAIN THE EXISTING BRANCH CIRCUITS IN THIS ROOM EXCEPT FOR THOSE INDICATED TO BE WIRED TO THE NEW GENERATOR DISTRIBUTION. THE EXISTING CIRCUITS SHALL BE REWIRED TO MAINTAIN CONTINUITY OF EXISTING CIRCUITING WITHIN THE ROOM. CONTRACTOR SHALL ALSO INSTALL A COLORED STICKER (DOT) ON EACH RECEPTACLE THAT IS NOW ON THE GENERATOR, CONFIRM WITH OWNER THE COLOR OF THE STICKER.
2. CONTRACTOR SHALL WIRE RECEPTACLES TO EXISTING SPARE 20A-1P CIRCUIT BREAKER IN PANEL 'BP-1' WITH 2 #12 + #12G IN 3/4"C. CONTRACTOR TO VARIFY BREAKER LABELED "SPARE" IS ACTUALLY A SPARE AND IF NOT PROVIDE NEW 20A-1P BREAKER IN AVAILABLE SPACE.
3. CONTRACTOR SHALL FEED SEWAGE EJECTOR PANEL FROM EXISTING 50A-3P CIRCUIT BREAKER THAT FED PUMP 1 REMOVED DURING DEMOLITION PHASE. WIRE PANEL WITH 4 #8 + #10G IN 1"C.
4. CONTRACTOR SHALL WIRE NEW DUPLEX RECEPTACLE FROM ONE OF THE EXISTING "NORMAL" BRANCH CIRCUITS CURRENTLY SERVING THE ROOM. CONFIRM EXISTING LOADS PRIOR TO CONNECTING AND ADD NEW DEVICE TO THE CIRCUIT WITH THE LOWER CURRENT LOAD. WIRE DEVICE WITH 2 #12 + #12G IN 3/4"C.
5. CONTRACTOR SHALL WIRE NEW DUPLEX RECEPTACLE SERVING ELECTRIC WATER COOLER (EWC) FROM EXISTING BRANCH CIRCUIT CURRENTLY SERVING CORRIDOR DEVICES. WIRE RECEPTACLE WITH 2 #12 + #12G IN 3/4"C.



KEY PLAN

Project Title:

ADDITION & ALTERATIONS TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
311 STATE STREET NEW LONDON CT 06320
203 230 9007 silverpetrucelli.com

Revision:	Description:	Date:	Revised By:

Drawing Title: FIRST FLOOR POWER PLAN - PART 'B'

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Drawn By: S. CROTEAU
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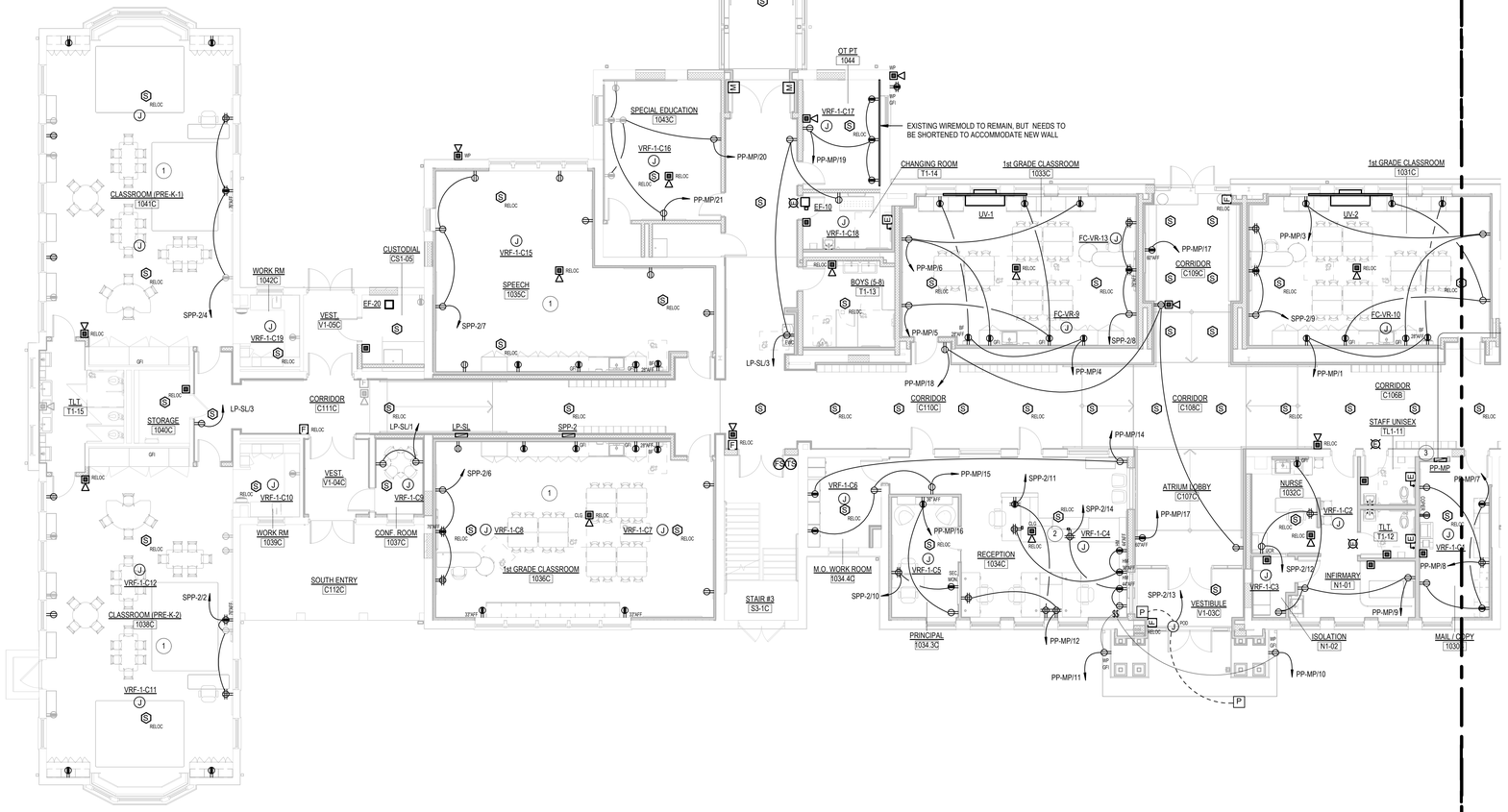


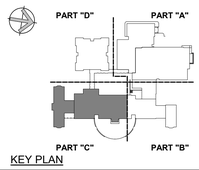
1 FIRST FLOOR POWER PLAN PART 'C'
1/8" = 1'-0"

GENERAL POWER NOTES

1. REFER TO DRAWING E001 FOR SYMBOLS AND ABBREVIATIONS.
2. ALL EXISTING DEVICES SHOWN HALF-TONE (LIGHT), ARE EXISTING TO REMAIN AND ALL WIRING TO THESE DEVICES SHALL REMAIN WIRED TO THEIR EXISTING BRANCH CIRCUIT(S) UNLESS OTHERWISE NOTED. CONTRACTOR IS RESPONSIBLE FOR MAINTAINING THE CONTINUITY OF ALL EXISTING BRANCH CIRCUITS EFFECTED BY THE RENOVATION AND PROVIDE ADDITIONAL WIRING AS NEEDED.
3. ALL NEW DEVICES MOUNTED ON EXISTING CONCRETE WALLS (POURED OR BLOCK) SHALL BE SURFACE MOUNTED WIREMOLD RACEWAY, TYPE 500 OR 700 SERIES FOR SINGLE SYSTEMS AND TYPE 4000 SERIES FOR MULTIPLE SYSTEMS. PROVIDE ALL NECESSARY ACCESSORIES, CONNECTIONS AND FITTINGS FOR A COMPLETE SYSTEM.
4. ALL NEW RECEPTACLES (15 AND 20 AMP 125V & 250V NON-LOCKING) SHALL BE TAMPER-RESISTANT TYPE PER NEC 406.12 UNLESS LOCATED MORE THAN 5'-6" ABOVE THE FLOOR OR SERVE A DEDICATED PIECE OF EQUIPMENT THAT CAN NOT BE EASLY MOVED TO EXPOSE THE PLUG.
5. ALL EXISTING FIRE ALARM PULL STATIONS TO REMAIN NEED TO BE LOWERED SO THAT THE TOP OF THE DEVICE IS AT 48 INCHES ABOVE THE FINISHED FLOOR TO MEET THE ADA CODE FOR TOP OF THE PULL HANDLE.

POWER KEY NOTES

1. CONTRACTOR SHALL WIRE ALL NEW RECEPTACLES NOT INDICATED TO GENERATOR PANEL "SPP-2" (STANDBY), TO THE EXISTING BRANCH CIRCUITS THAT PREVIOUSLY FED THIS ROOM. RECEPTACLES SHALL BE ALTERNATELY WIRED, EVERY OTHER OR THIRD DEVICE DEPENDING ON HOW MANY EXISTING NORMAL CIRCUITS SERVE THE ROOM. CONTRACTOR SHALL ALSO INSTALL A COLORED STICKER (DOT) ON EACH RECEPTACLE THAT IS NOW ON THE GENERATOR, CONFIRM WITH OWNER THE COLOR OF THE STICKER.
2. CONTRACTOR SHALL SURFACE MOUNT THE QUAD RECEPTACLE INDICATED TO FACE OF CABINET SLIGHTLY LEFT OF CENTER AND RUN CONDUIT/CABLE OVER TO WALL AND UP ABOVE CEILING. COORDINATE ROUTING OF CONDUIT/CABLE WITH MILLWORK MANUFACTURER'S APPROVED SHOP DRAWING.
3. INSTALL AND CONNECT EXISTING TVSS PANEL ABOVE THIS PANEL THAT WAS REMOVED PREVIOUSLY THAT SERVED PANEL 'PP-KP'.



KEY PLAN

Project Title:

ADDITION & ALTERATIONS TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
311 STATE STREET NEW LONDON CT 06320
203 230 9007 silverpetrucelli.com

Revision:	Description:	Date:	Revised By:

Drawing Title: FIRST FLOOR POWER PLAN - PART 'C'

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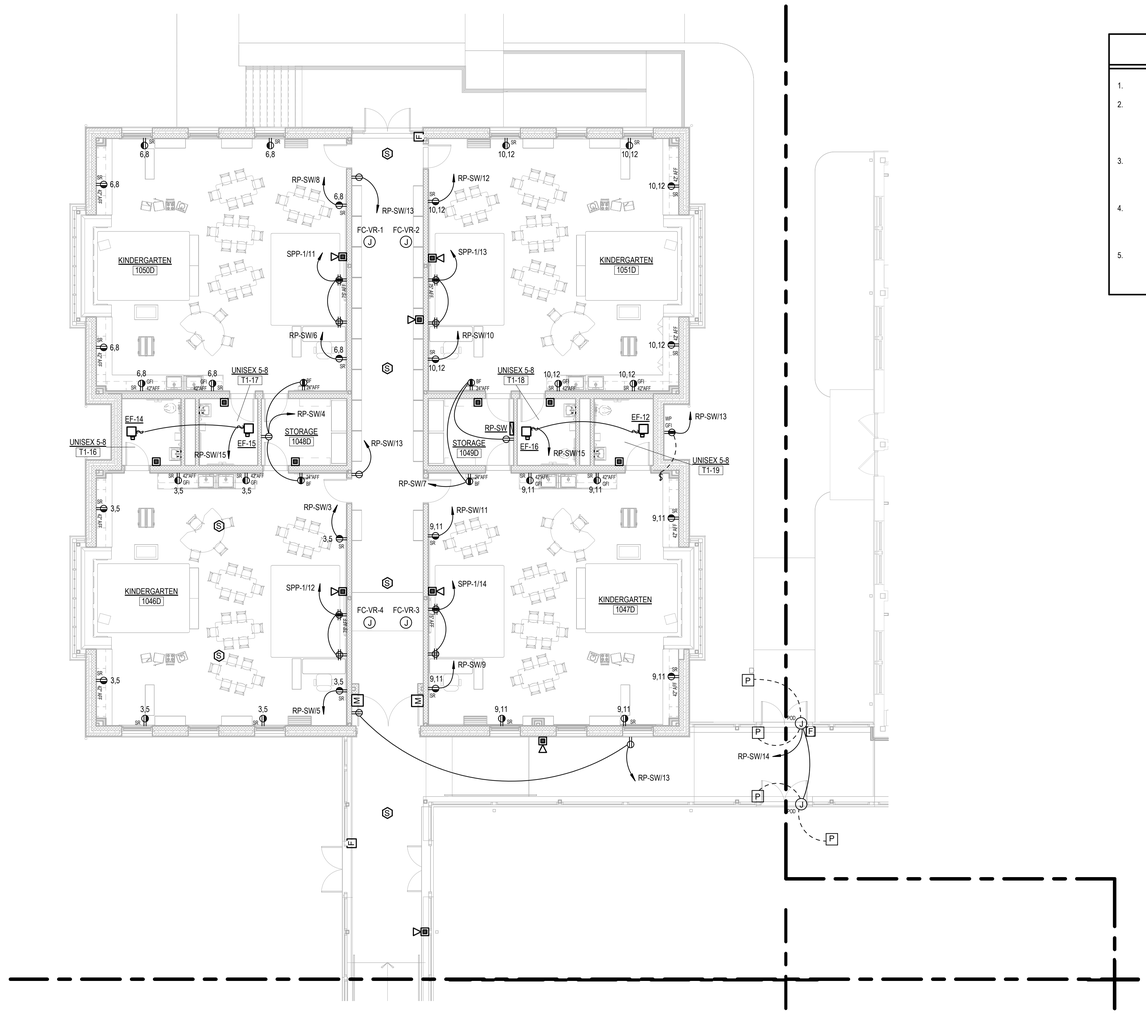
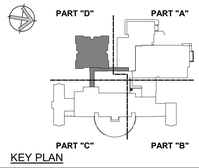


1 FIRST FLOOR POWER PLAN PART 'D'
1/8" = 1'-0"

GENERAL POWER NOTES

1. REFER TO DRAWING E001 FOR SYMBOLS AND ABBREVIATIONS.
2. ALL EXISTING DEVICES SHOWN HALF-TONE (LIGHT), ARE EXISTING TO REMAIN AND ALL WIRING TO THESE DEVICES SHALL REMAIN WIRED TO THEIR EXISTING BRANCH CIRCUIT(S) UNLESS OTHERWISE NOTED. CONTRACTOR IS RESPONSIBLE FOR MAINTAINING THE CONTINUITY OF ALL EXISTING BRANCH CIRCUITS EFFECTED BY THE RENOVATION AND PROVIDE ADDITIONAL WIRING AS NEEDED.
3. ALL NEW DEVICES MOUNTED ON EXISTING CONCRETE WALLS (POURED OR BLOCK) SHALL BE SURFACE MOUNTED WIREMOLD RACEWAY, TYPE 500 OR 700 SERIES FOR SINGLE SYSTEMS AND TYPE 4000 SERIES FOR MULTIPLE SYSTEMS. PROVIDE ALL NECESSARY ACCESSORIES, CONNECTIONS AND FITTINGS FOR A COMPLETE SYSTEM.
4. ALL NEW RECEPTACLES (15 AND 20 AMP 125V & 250V NON-LOCKING) SHALL BE TAMPER-RESISTANT TYPE PER NEC 406.12 UNLESS LOCATED MORE THAN 5'-6" ABOVE THE FLOOR OR SERVE A DEDICATED PIECE OF EQUIPMENT THAT CAN NOT BE EASLY MOVED TO EXPOSE THE PLUG.
5. ALL EXISTING FIRE ALARM PULL STATIONS TO REMAIN NEED TO BE LOWERED SO THAT THE TOP OF THE DEVICE IS AT 48 INCHES ABOVE THE FINISHED FLOOR TO MEET THE ADA CODE FOR TOP OF THE PULL HANDLE.



KEY PLAN

Project Title:

ADDITION & ALTERATIONS TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
311 STATE STREET NEW LONDON CT 06320
203 230 9007 silverpetrucelli.com

Revision:	Description:	Date:	Revised By:

Drawing Title: FIRST FLOOR POWER PLAN - PART 'D'

Date: 8/29/2024
Scale: As indicated
Drawn By: S. CROTEAU
Project Number: 22.382
Drawing Number: E204

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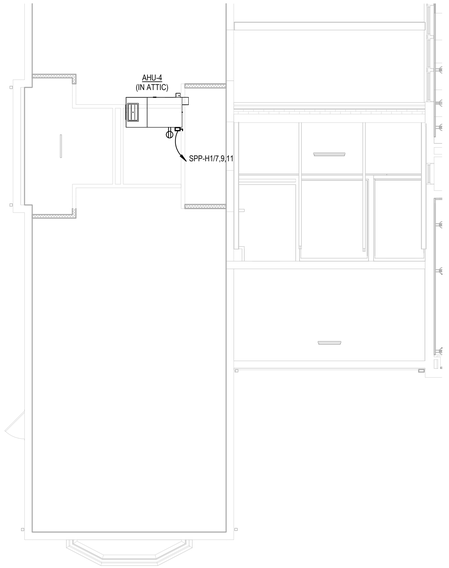
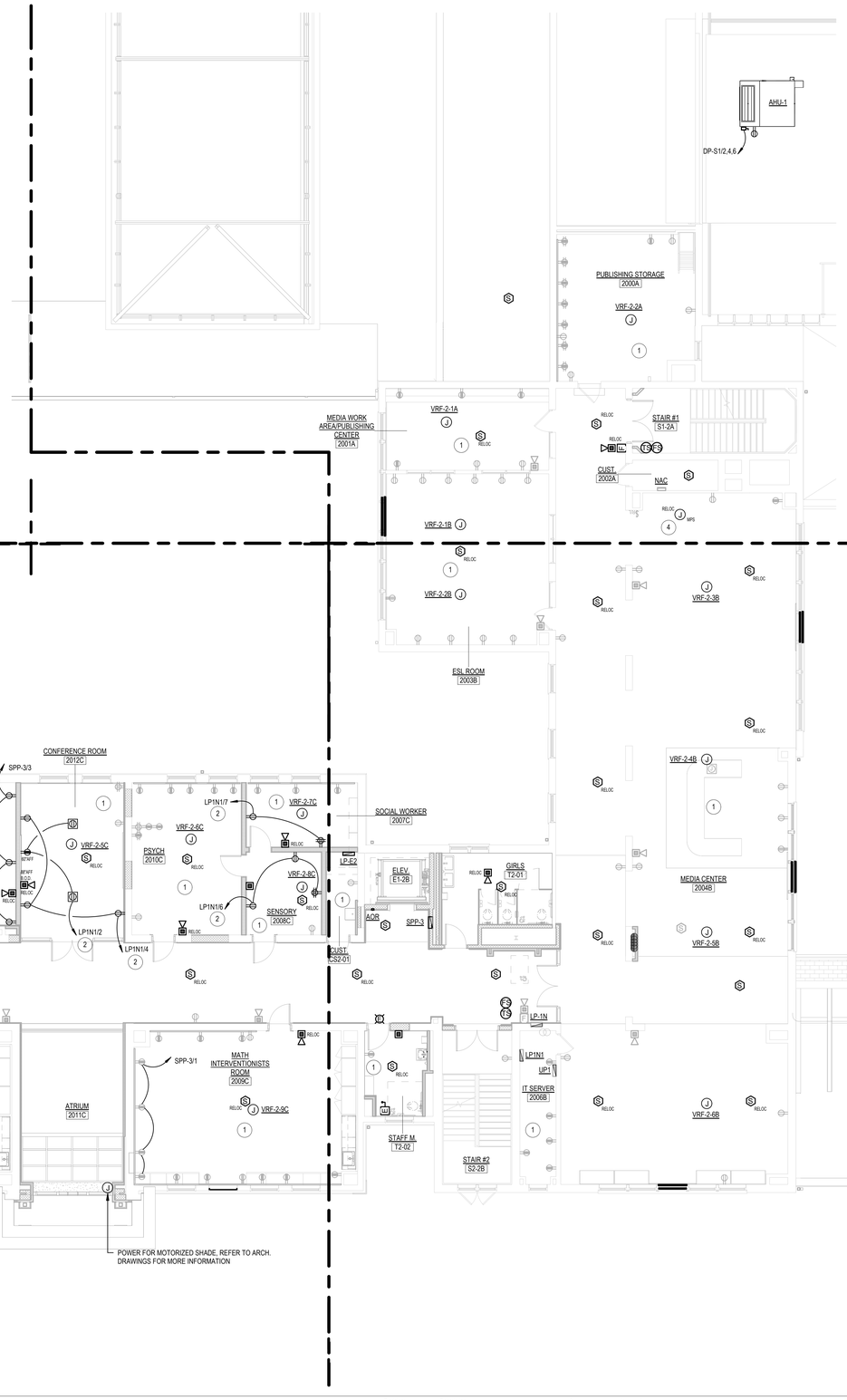


2 SECOND FLOOR PARTIAL PRE-K POWER PLAN

1/8" = 1'-0"



1 SECOND FLOOR POWER PLAN

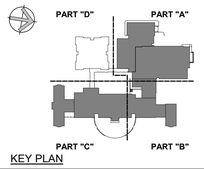
1/8" = 1'-0"

GENERAL POWER NOTES

1. REFER TO DRAWING E001 FOR SYMBOLS AND ABBREVIATIONS.
2. ALL EXISTING DEVICES SHOWN HALF-TONE (LIGHT), ARE EXISTING TO REMAIN AND ALL WIRING TO THESE DEVICES SHALL REMAIN WIRED TO THEIR EXISTING BRANCH CIRCUIT(S) UNLESS OTHERWISE NOTED. CONTRACTOR IS RESPONSIBLE FOR MAINTAINING THE CONTINUITY OF ALL EXISTING BRANCH CIRCUITS EFFECTED BY THE RENOVATION AND PROVIDE ADDITIONAL WIRING AS NEEDED.
3. ALL NEW DEVICES MOUNTED ON EXISTING CONCRETE WALLS (POURED OR BLOCK) SHALL BE SURFACE MOUNTED WIREMOLD RACEWAY, TYPE 500 OR 700 SERIES FOR SINGLE SYSTEMS AND TYPE 4000 SERIES FOR MULTIPLE SYSTEMS. PROVIDE ALL NECESSARY ACCESSORIES, CONNECTIONS AND FITTINGS FOR A COMPLETE SYSTEM.
4. ALL NEW RECEPTACLES (15 AND 20 AMP, 125V & 250V NON-LOCKING) SHALL BE TAMPER-RESISTANT TYPE PER NEC 406.12 UNLESS LOCATED MORE THAN 5'-6" ABOVE THE FLOOR OR SERVE A DEDICATED PIECE OF EQUIPMENT THAT CAN NOT BE EASLY MOVED TO EXPOSE THE PLUG.
5. ALL EXISTING FIRE ALARM PULL STATIONS TO REMAIN NEED TO BE LOWERED SO THAT THE TOP OF THE DEVICE IS AT 48 INCHES ABOVE THE FINISHED FLOOR TO MEET THE ADA CODE FOR TOP OF THE PULL HANDLE.

POWER KEY NOTES

1. CONTRACTOR SHALL MAINTAIN THE EXISTING BRANCH CIRCUITS IN THIS ROOM EXCEPT FOR THOSE INDICATED TO BE WIRED TO THE NEW GENERATOR DISTRIBUTION. THE EXISTING CIRCUITS SHALL BE REWIRED TO MAINTAIN CONTINUITY OF EXISTING CIRCUITING WITHIN THE ROOM. CONTRACTOR SHALL ALSO INSTALL A COLORED STICKER (DOT) ON EACH RECEPTACLE THAT IS NOW ON THE GENERATOR. CONFIRM WITH OWNER THE COLOR OF THE STICKER.
2. CONTRACTOR SHALL CONNECT DEVICES INDICATED TO EXISTING SPARE 20A-1P CIRCUIT BREAKER IN PANEL "LP1N1" AND WIRE WITH 2 #12 + #12G IN 3/4"C.
3. CONTRACTOR SHALL CONNECT DEVICES INDICATED TO EXISTING SPARE 20A-1P CIRCUIT BREAKER IN PANEL "PP-1S" AND WIRE WITH 2 #12 + #12G IN 3/4"C.
4. CONTRACTOR SHALL RECONNECT EXISTING MOTORIZED PROJECTION SCREEN TO THE EXISTING BRANCH CIRCUIT THAT PREVIOUSLY SERVED IT PRIOR TO IT BEING REMOVED FOR THE CEILING REMOVAL TO ACCOMMODATE NEW SPRINKLER SYSTEM. ALSO, RECONNECT EXISTING RAISE/LOWER SWITCH TO REINSTALLED PROJECTION SCREEN.



KEY PLAN

Project Title:

ADDITION & ALTERATIONS TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
311 STATE STREET NEW LONDON CT 06320
203 230 9007 silverpetrucelli.com

Revision:	Description:	Date:	Revised By:

Drawing Title:
SECOND FLOOR POWER PLAN - PART 'A', 'B' & 'C'

Date: 8/29/2024
Scale: As indicated
Drawn By: S. CROTEAU
Project Number: 22.382
Drawing Number: E210

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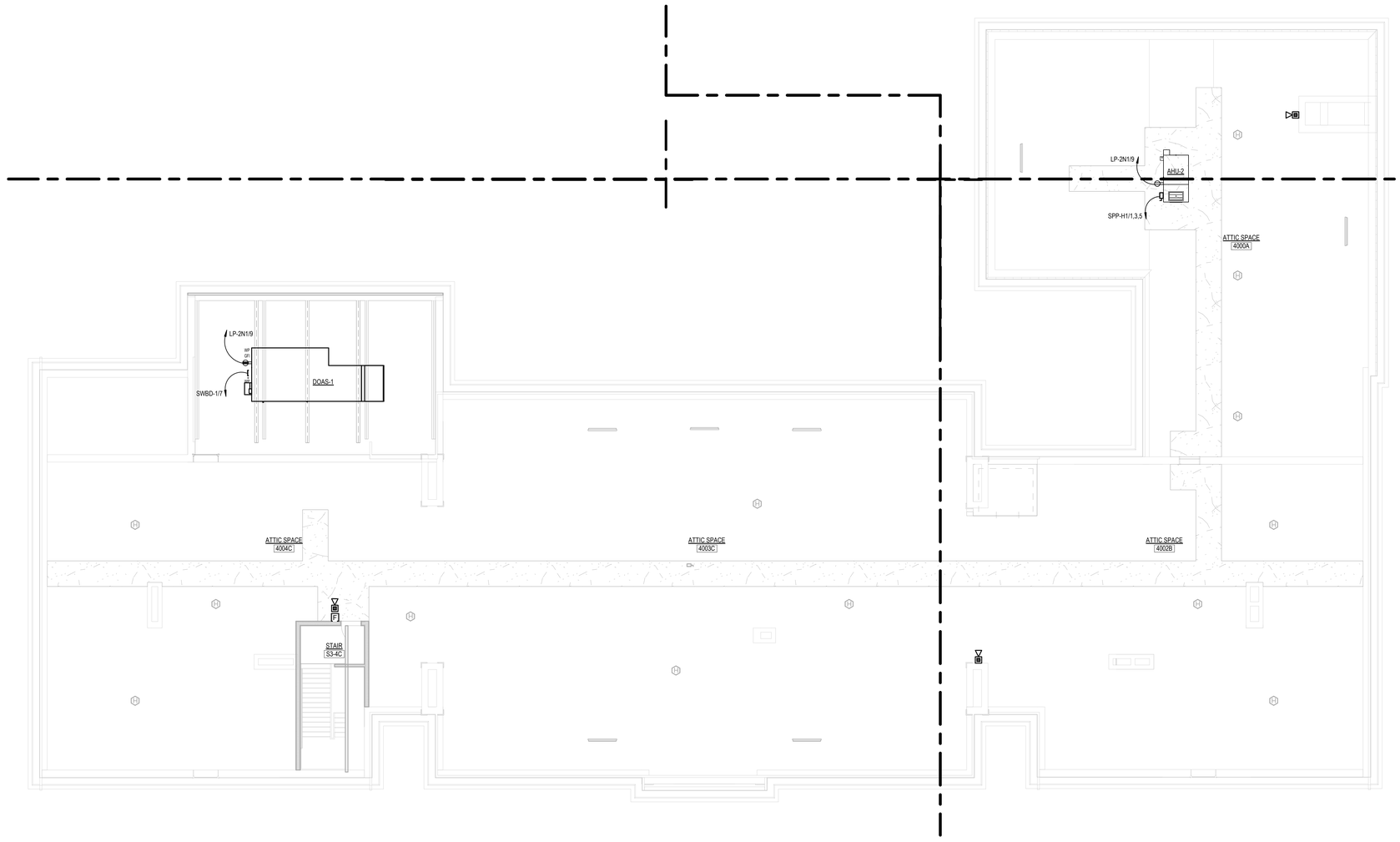
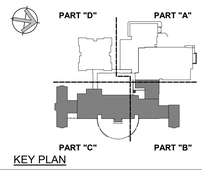


1 ATTIC LEVEL POWER PLAN
1/8" = 1'-0"

GENERAL POWER NOTES

1. REFER TO DRAWING E001 FOR SYMBOLS AND ABBREVIATIONS.
2. ALL EXISTING DEVICES SHOWN HALF-TONE (LIGHT), ARE EXISTING TO REMAIN AND ALL WIRING TO THESE DEVICES SHALL REMAIN WIRED TO THEIR EXISTING BRANCH CIRCUIT(S) UNLESS OTHERWISE NOTED. CONTRACTOR IS RESPONSIBLE FOR MAINTAINING THE CONTINUITY OF ALL EXISTING BRANCH CIRCUITS EFFECTED BY THE RENOVATION AND PROVIDE ADDITIONAL WIRING AS NEEDED.
3. ALL NEW DEVICES MOUNTED ON EXISTING CONCRETE WALLS (POURED OR BLOCK) SHALL BE SURFACE MOUNTED WIREMOLD RACEWAY, TYPE 500 OR 700 SERIES FOR SINGLE SYSTEMS AND TYPE 4000 SERIES FOR MULTIPLE SYSTEMS. PROVIDE ALL NECESSARY ACCESSORIES, CONNECTIONS AND FITTINGS FOR A COMPLETE SYSTEM.
4. ALL NEW RECEPTACLES (15 AND 20 AMP 125V & 250V NON-LOCKING) SHALL BE TAMPER-RESISTANT TYPE PER NEC 406.12 UNLESS LOCATED MORE THAN 5'-6" ABOVE THE FLOOR OR SERVE A DEDICATED PIECE OF EQUIPMENT THAT CAN NOT BE EASLY MOVED TO EXPOSE THE PLUG.
5. ALL EXISTING FIRE ALARM PULL STATIONS TO REMAIN NEED TO BE LOWERED SO THAT THE TOP OF THE DEVICE IS AT 48 INCHES ABOVE THE FINISHED FLOOR TO MEET THE ADA CODE FOR TOP OF THE PULL HANDLE.



KEY PLAN

Project Title:

ADDITION & ALTERATIONS TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

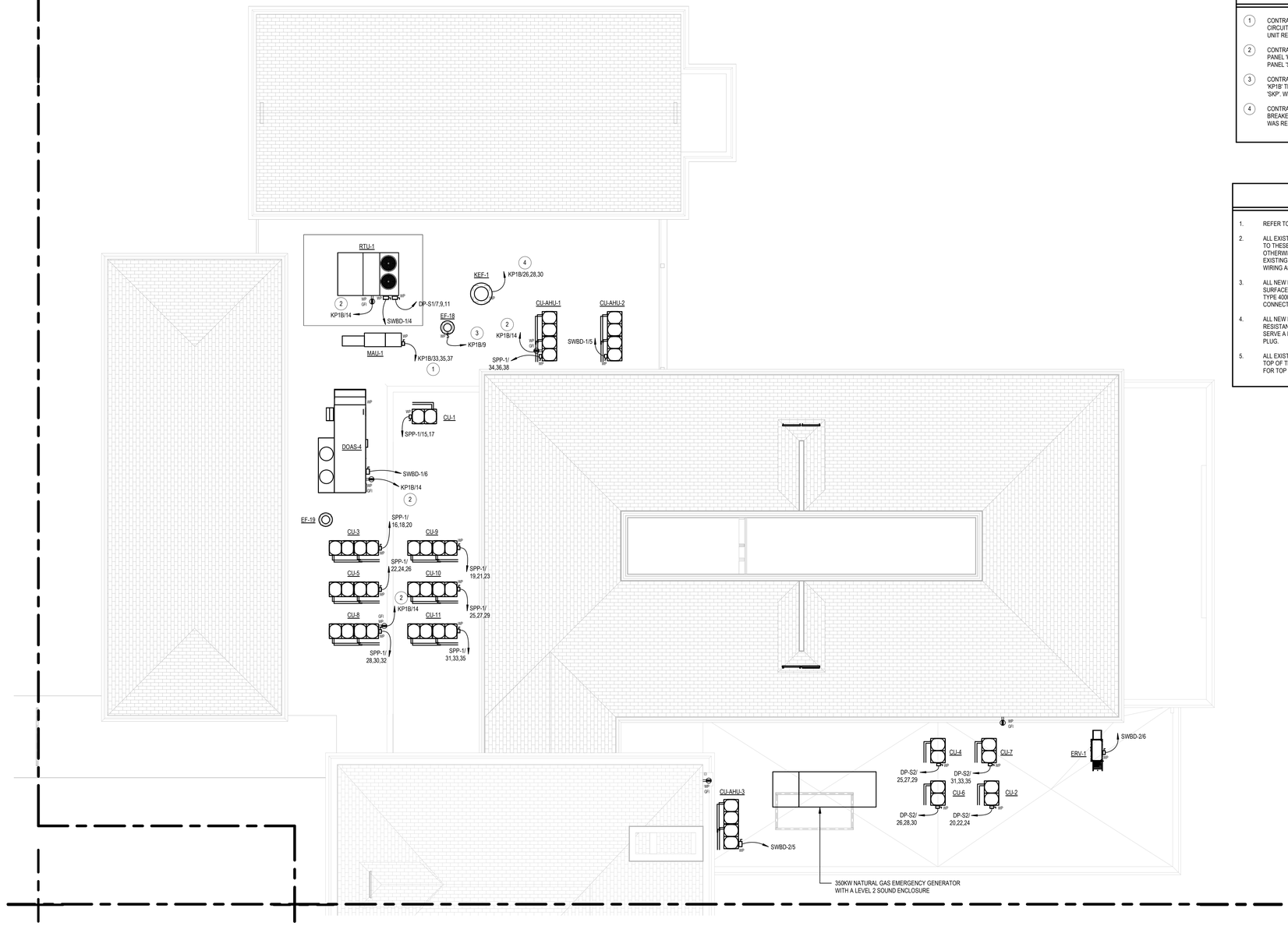
SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
311 STATE STREET NEW LONDON CT 06320
203 230 9007 silverpetrucelli.com

Revision:	Description:	Date:	Revised By:

Drawing Title: ATTIC POWER PLAN - PART 'B' & 'C'

Date: 8/29/2024
Scale: As indicated
Drawn By: S. CROTEAU
Project Number: 22.382
Drawing Number: E230

8/29/2024 1:44:17 PM



1 ROOF LEVEL POWER PLAN PART 'A'

1/8" = 1'-0"

POWER KEY NOTES

1. CONTRACTOR SHALL WIRE NEW KITCHEN MAKE-UP AIR UNIT (MAU-1) FROM EXISTING 15A-3P CIRCUIT BREAKER IN PANEL 'KP1B' THAT PREVIOUSLY SERVED THE PREVIOUS MAKE-UP AIR UNIT REMOVED DURING DEMOLISION PHASE. WIRE UNIT WITH 3 #12 + #12G IN 3/4"C.
2. CONTRACTOR SHALL WIRE NEW RECEPTACLES FROM SPARE 20A-1P CIRCUIT BREAKER IN PANEL 'KP1B' THAT PREVIOUSLY SERVED KITCHEN REFRIGERATION EQUIPMENT MOVED TO PANEL 'SKP'. WIRE NEW DEVICES WITH 2 #12 + #12G IN 3/4"C.
3. CONTRACTOR SHALL WIRE NEW FAN 'EF-18' FROM SPARE 15A-1P CIRCUIT BREAKER IN PANEL 'KP1B' THAT PREVIOUSLY SERVED KITCHEN REFRIGERATION EQUIPMENT MOVED TO PANEL 'SKP'. WIRE NEW DEVICES WITH 2 #12 + #12G IN 3/4"C.
4. CONTRACTOR SHALL WIRE NEW KITCHEN EXHAUST FAN 'KEF-1' FROM EXISTING 15A-3P CIRCUIT BREAKER IN PANEL 'KP1B' THAT PREVIOUSLY SERVED THE OLD KITCHEN EXHAUST FAN THAT WAS REMOVED. WIRE NEW FAN WITH 3 #12 + #12G IN 3/4"C.

GENERAL POWER NOTES

1. REFER TO DRAWING E001 FOR SYMBOLS AND ABBREVIATIONS.
2. ALL EXISTING DEVICES SHOWN HALF-TONE (LIGHT), ARE EXISTING TO REMAIN AND ALL WIRING TO THESE DEVICES SHALL REMAIN WIRED TO THEIR EXISTING BRANCH CIRCUIT(S) UNLESS OTHERWISE NOTED. CONTRACTOR IS RESPONSIBLE FOR MAINTAINING THE CONTINUITY OF ALL EXISTING BRANCH CIRCUITS EFFECTED BY THE RENOVATION AND PROVIDE ADDITIONAL WIRING AS NEEDED.
3. ALL NEW DEVICES MOUNTED ON EXISTING CONCRETE WALLS (POURED OR BLOCK) SHALL BE SURFACE MOUNTED WIREMOLD RACEWAY, TYPE 500 OR 700 SERIES FOR SINGLE SYSTEMS AND TYPE 4000 SERIES FOR MULTIPLE SYSTEMS. PROVIDE ALL NECESSARY ACCESSORIES, CONNECTIONS AND FITTINGS FOR A COMPLETE SYSTEM.
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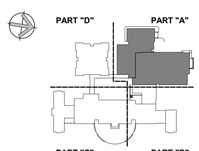

KEY PLAN

Project Title:

ADDITION & ALTERATIONS TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
311 STATE STREET NEW LONDON CT 06320
203 230 9007 silverpetrucelli.com

Revision:	Description:	Date:	Revised By:

Drawing Title: ROOF POWER PLAN - PART 'A'

Date: 8/29/2024
Scale: As indicated
Drawn By: S. CROTEAU
Project Number: 22.382
Drawing Number: E241

8/29/2024 1:44:41 PM

GENERAL POWER NOTES

1. REFER TO DRAWING E001 FOR SYMBOLS AND ABBREVIATIONS.
2. ALL EXISTING DEVICES SHOWN HALF-TONE (LIGHT), ARE EXISTING TO REMAIN AND ALL WIRING TO THESE DEVICES SHALL REMAIN WIRED TO THEIR EXISTING BRANCH CIRCUIT(S) UNLESS OTHERWISE NOTED. CONTRACTOR IS RESPONSIBLE FOR MAINTAINING THE CONTINUITY OF ALL EXISTING BRANCH CIRCUITS EFFECTED BY THE RENOVATION AND PROVIDE ADDITIONAL WIRING AS NEEDED.
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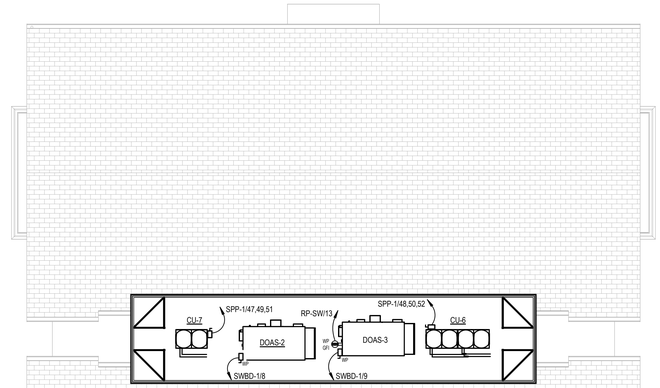
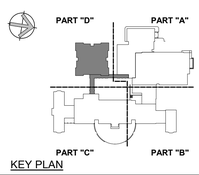


1 ROOF LEVEL POWER PLAN PART 'D'
1/8" = 1'-0"



KEY PLAN

Project Title:
ADDITION & ALTERATIONS TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

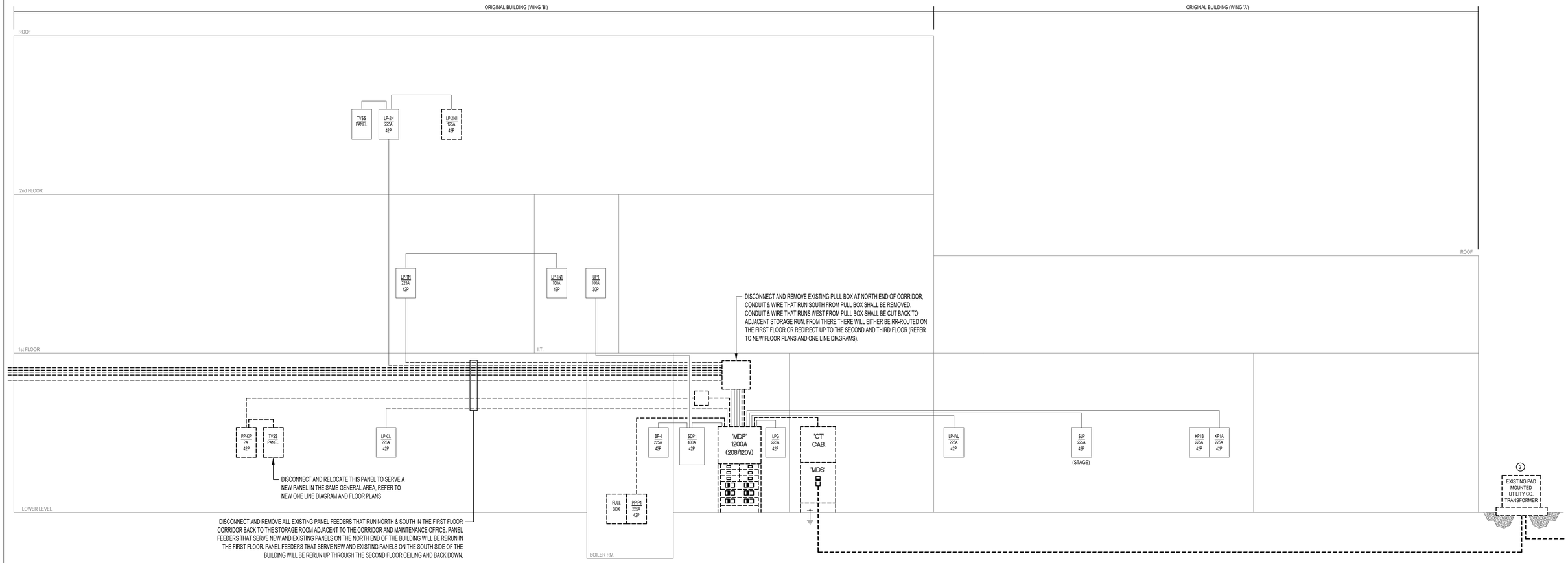
SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
311 STATE STREET NEW LONDON CT 06320
203 230 9007 silverpetrucelli.com

Revision:	Description:	Date:	Revised By:

Drawing Title:
ROOF POWER PLAN - PART 'D'

Date: 8/29/2024
Scale: As indicated
Drawn By: S. CROTEAU
Project Number: 22.382
Drawing Number: E242

8/29/2024 1:44:58 PM



1 ONE LINE DIAGRAM - NORTH SIDE
SCALE: NONE

Project Title:

ADDITION & ALTERATIONS TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
311 STATE STREET NEW LONDON CT 06320
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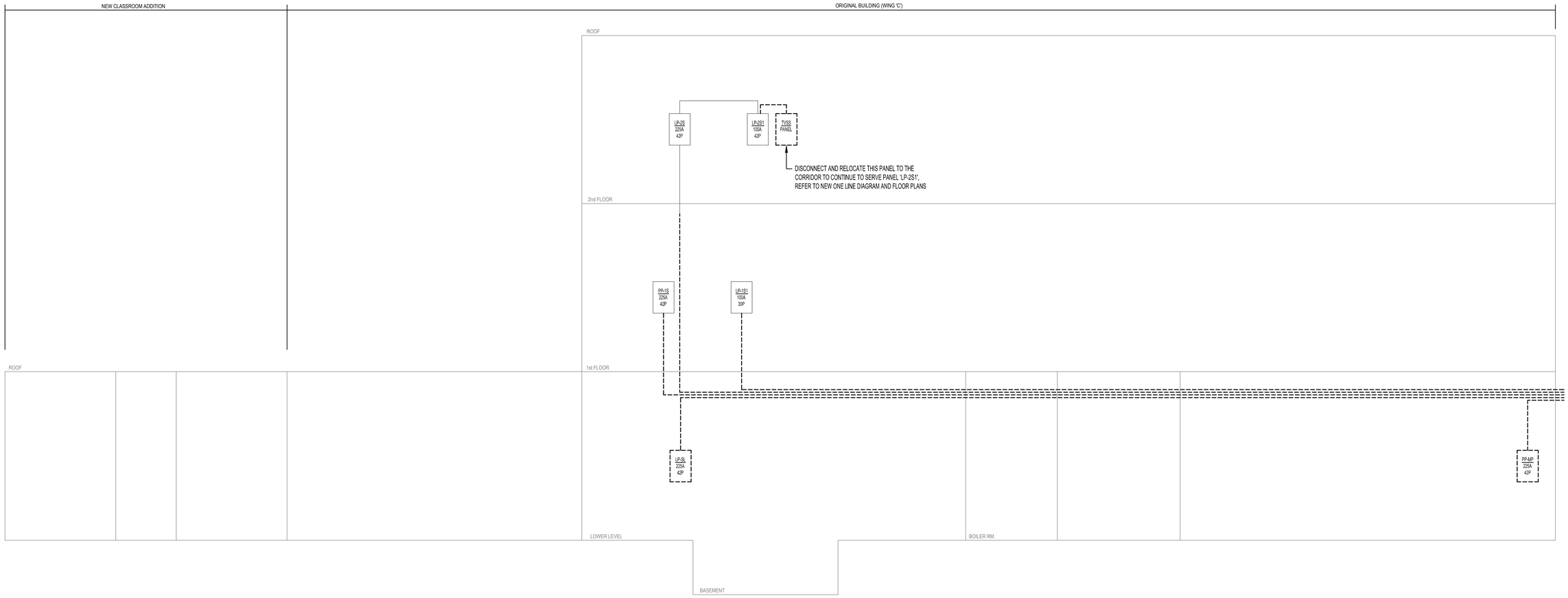
Revision:	Description:	Date:	Revised By:

Drawing Title:
EXISTING ONE LINE DIAGRAM - NORTH SIDE - ELECTRICAL DEMOLITION

Date: 08/29/2024
Scale: AS NOTED
Drawn By: S. CROTEAU
Project Number: 22.382

Drawing Number: E401



1 ONE LINE DIAGRAM - SOUTH SIDE
SCALE: NONE

Project Title:

ADDITION & ALTERATIONS TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
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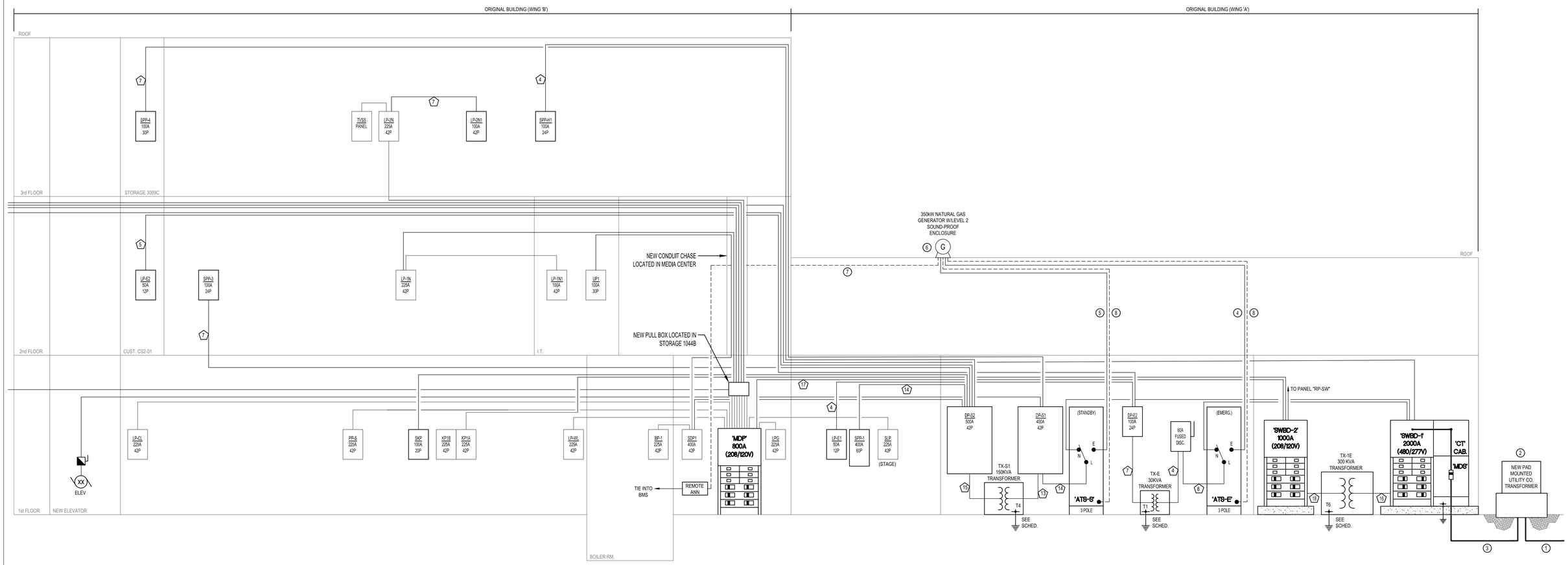
203 230 9007 silverpetrucelli.com

Revision:	Description:	Date:	Revised By:

Drawing Title:
EXISTING ONE LINE DIAGRAM - SOUTH SIDE - ELECTRICAL DEMOLITION

Date: 08/29/2024
Scale: AS NOTED
Drawn By: S. CROTEAU
Project Number: 22.382

Drawing Number: E402



1 ONE LINE DIAGRAM - NORTH SIDE

SCALE: NONE

CONDUCTOR AND CONDUIT SIZING TABLE, 3 PHASE

NOTE	CIRCUIT BREAKER	CONDUCTOR (THWN/THHN) (3 PH, 3W) WITH GROUND	CONDUCTOR (THWN/THHN) (3 PH, 4W) WITH GROUND	CONDUIT SIZE	NOTE	CIRCUIT BREAKER	CONDUCTOR (THWN/THHN) (3 PH, 3W) WITH GROUND	CONDUCTOR (THWN/THHN) (3 PH, 4W) WITH GROUND	CONDUIT SIZE
1	20 AMP	3 #12 & 1 #12 GND	4 #12 & 1 #12 GND	3/4"	11	225 AMP	3 #4/0 & 1 #4 GND	4 #4/0 & 1 #4 GND	2 1/2"
2	25,30 AMP	3 #10 & 1 #10 GND	4 #10 & 1 #10 GND	3/4"	12	250 AMP	3 #250kcmil & 1 #4 GND	4 #250kcmil & 1 #4 GND	3"
3	35,40,45,50 AMP	3 #8 & 1 #10 GND	4 #8 & 1 #10 GND	1"	13	300 AMP	3 #350kcmil & 1 #4 GND	4 #350kcmil & 1 #4 GND	3 1/2"
4	60 AMP	3 #6 & 1 #10 GND	4 #6 & 1 #10 GND	1"	14	400 AMP	3 #600kcmil & 1 #3 GND	4 #600kcmil & 1 #3 GND	4"
5	70,80 AMP	3 #4 & 1 #8 GND	4 #4 & 1 #8 GND	1 1/4"	15	500 AMP	(2 SETS) @ 3 #250kcmil & 1 #2 GND	(2 SETS) @ 4 #250kcmil & 1 #2 GND	(2) 3"
6	90 AMP	3 #3 & 1 #8 GND	4 #3 & 1 #8 GND	1 1/2"	16	600 AMP	(2 SETS) @ 3 #350kcmil & 1 #1 GND	(2 SETS) @ 4 #350kcmil & 1 #1 GND	(2) 3 1/2"
7	100 AMP	3 #2 & 1 #8 GND	4 #2 & 1 #8 GND	1 1/2"	17	800 AMP	(2 SETS) @ 3 #600kcmil & 1 #1/0 GND	(2 SETS) @ 4 #600kcmil & 1 #1/0 GND	(2) 4"
8	125 AMP	3 #1 & 1 #6 GND	4 #1 & 1 #6 GND	2"	18	1000 AMP	(3 SETS) @ 3 #400kcmil & 1 #2/0 GND	(3 SETS) @ 4 #400kcmil & 1 #2/0 GND	(3) 3 1/2"
9	150 AMP	3 #1/0 & 1 #6 GND	4 #1/0 & 1 #6 GND	2"	19	1200 AMP	(3 SETS) @ 3 #600kcmil & 1 #4/0 GND	(3 SETS) @ 4 #600kcmil & 1 #4/0 GND	(3) 4"
10	200 AMP	3 #3/0 & 1 #6 GND	4 #3/0 & 1 #6 GND	2 1/2"	20	1600 AMP	(4 SETS) @ 3 #600kcmil & 1 #4/0 GND	(4 SETS) @ 4 #600kcmil & 1 #4/0 GND	(4) 4"

CONDUCTOR NOTES:

1. ALL VALUES BASED ON COPPER CONDUCTORS.
2. FEEDERS
   UPGRADE WIRE TO MAINTAIN MAXIMUM OF 2 % VOLTAGE DROP.
   BRANCH CIRCUITS
   UPGRADE WIRE TO MAINTAIN MAXIMUM OF 3 % VOLTAGE DROP.
3. NUMBER OF WIRES SHALL BE DETERMINED WITH EQUIPMENT ELECTRICAL NAMEPLATE CHARACTERISTICS.
4. WHERE NEUTRALS ARE REQUIRED, IT SHALL MATCH FEEDER CONDUCTOR SIZE.
5. USE CONDUCTOR (THWN/THHN) (3PH, 3W) WITH GROUND PRIMARY FEEDER FOR TRANSFORMERS.

DRY TYPE TRANSFORMER SCHEDULE

SIZE	KVA	PRIMARY AMPS	SECONDARY AMPS	480 VOLT OVERCURRENT	208 VOLT (4) OVERCURRENT	480V FEEDER	120/208V FEEDER	GROUNDING SEE NOTE #5
T1	30	36	83	60A, 3P	100A, 3P	3#4 & 1#10G - 1"C.	4#1 & 1#8G - 1 1/2"C.	1#6 - 3/4"C
T2	75	90	208	150A, 3P	250A, 3P	3#1/0 & 1#6G - 1 1/2"C.	4#250 KCMIL & 1#4G - 3"C.	1#2 - 3/4"C
T3	112.5	135	313	200A, 3P	400A, 3P	3#3/0 & 1#6G - 2"C.	4#500 KCMIL & 1#3G - 4"C.	1#1/0 - 3/4"C.
T4	150	181	417	300A, 3P	500A, 3P	3#350 KCMIL & 1#4G - 3"C.	8#250 KCMIL & 2#2G 2-3"C.	1#1/0 - 3/4"C
T5	225	270	625	400A, 3P	800A, 3P	3#500 KCMIL & 1#3G - 3 1/2"C.	8#500 KCMIL & 2#1/0G 2-4"C.	1#3/0 - 3/4"C
T6	300	361	834	600A, 3P	1000A, 3P	6#350 KCMIL & 2#1G 2-3"C.	12#400 KCMIL & 3#2/0G 3-3"C.	1#3/0 - 3/4"C

TRANSFORMER NOTES:

1. BOND NEUTRAL OF TRANSFORMER SECONDARY TO TRANSFORMER CASE, WITH BONDING JUMPER.
2. GROUND THE CASING OF THE TRANSFORMER TO NEAREST AVAILABLE EFFECTIVELY GROUNDED WATER PIPE, STRUCTURAL STEEL AND/OR DRIVEN GROUND ROD IN ACCORDANCE WITH N.E.C. 250-30.
3. ALL CONDUCTOR SIZES ARE FOR COPPER CONDUCTORS, N.E.C. TABLE 310-15.
4. SECONDARY OVERCURRENT PROTECTION SHALL BE LOCATED WITHIN TEN (10) FEET OF THE TRANSFORMER SECONDARY TERMINALS EITHER IN A PANEL BOARD (MAIN BREAKER) OR AN INDIVIDUAL MOUNTED CIRCUIT BREAKER/DISCONNECT SWITCH.
5. TRANSFORMER BONDING JUMPER AND GROUNDING ELECTRODE CONDUCTOR.
6. 600KCMIL CONDUCTORS SHALL BE PROVIDED WITH MAC ADAPTERS AS REQUIRED TO COORDINATE WITH BREAKER LUG SIZES.

GENERAL NOTES

1. NEW PRIMARY SERVICE UNDERGROUND OVER TO EXISTING UTILITY POLE, CABLE BY EVERSOURCE IN (2) 4" CONDUITS BY CONTRACTOR. REFER TO SITE PLAN E140 FOR EXACT ROUTING.
2. NEW UTILITY COMPANY TRANSFORMER AND PAD, TRANSFORMER BY EVERSOURCE AND PAD BY CONTRACTOR PER EVERSOURCE STANDARDS. REFER TO DETAIL ON DRAWING E601.
3. NEW 2000 AMP SECONDARY FEEDER USING COPPER CONDUCTORS. PROVIDE (6) SETS OF (4) #400KCMIL IN (6) 3"C.
4. NEW 125 AMP GENERATOR DISTRIBUTION FEEDER USING COPPER CONDUCTORS, PROVIDE (4) #1/0 + #6G IN 2"C.
5. NEW 400 AMP GENERATOR DISTRIBUTION FEEDER USING COPPER CONDUCTORS, PROVIDE (4) #600KCMIL + #3G IN 4"C.
6. GENERATOR SHALL BE FURNISHED WITH TWO OUTPUT BREAKERS, A 125 AMP 3 POLE SERVING THE BUILDING EMERGENCY DISTRIBUTION AND A 400 AMP 3 POLE SERVING THE STAND-BY DISTRIBUTION.
7. PROVIDE (1) 1 1/2"C., 2 #12 & 12 #18 FOR GENERATOR REMOTE ANNUNCIATOR LOCATED IN CUSTODIAN'S OFFICE 1042B.
8. FURNISH AND INSTALL (2) 1 1/2"c. FROM GENERATOR TO AUTOMATIC TRANSFER SWITCH FOR ENGINE START AND ALL REQUIRED CONTROL WIRING.

Project Title:

ADDITION & ALTERATIONS TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

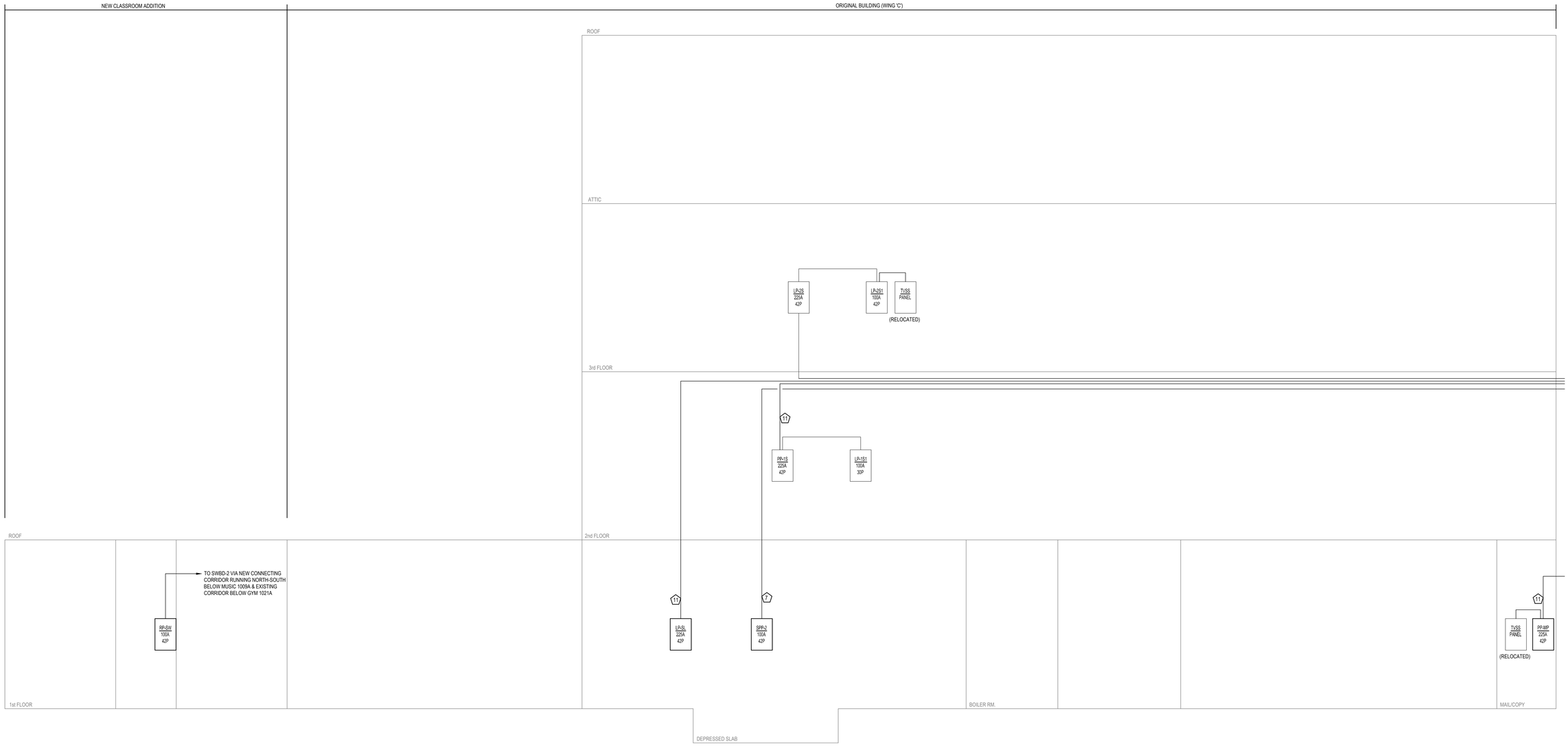
SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
311 STATE STREET NEW LONDON CT 06320
203 230 9007 silverpetrucelli.com

Revision:	Description:	Date:	Revised By:

Drawing Title:

ELECTRICAL ONE LINE DIAGRAM - NORTH SIDE

Date: 08/29/2024
Scale: AS NOTED
Drawn By: S. CROTEAU
Project Number: 22.382
Drawing Number: E403



1 ONE LINE DIAGRAM - SOUTH SIDE

SCALE: NONE

Project Title:

ADDITION & ALTERATIONS TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

SILVER PETRUCELLI + ASSOCIATES

3190 WHITNEY AVENUE HAMDEN CT 06518
311 STATE STREET NEW LONDON CT 06320
203 230 9007 silverpetrucelli.com

Revision:	Description:	Date:	Revised By:

Drawing Title:

ELECTRICAL ONE LINE DIAGRAM - SOUTH SIDE

Date: 08/29/2024
Scale: AS NOTED
Drawn By: S. CROTEAU
Project Number: 22.382

Drawing Number: E404

Switchboard: SWBD-1

Location: ELECTRICAL 1016A
Supply From:
Mounting: FLOOR
Enclosure:

Volts: 480/277 Wye
Phases: 3
Wires: 4

A.I.C. Rating:
Mains Type: MCB
Mains Rating: 2000 A
MCB Rating: 2000 A

Notes:

CKT	Circuit Description	# of Poles	Frame Size	Trip Rating	Load	Remarks
1	SWBD-2 VIA TX-1	3	800 A	600 A	66107 VA	
2	ATS-S	3	400 A	400 A	262829 VA	
3	ATS-E	3	225 A	125 A	7054 VA	
4	RTU-1	3	225 A	70 A	40968 VA	
5	CU-AHU-2	3	225 A	70 A	33240 VA	
6	DOAS-4	3	400 A	150 A	118833 VA	
7	DOAS-1	3	400 A	150 A	118833 VA	FEED WITH 2/0 WIRE
8	DOAS-2	3	225 A	25 A	15457 VA	
9	DOAS-3	3	225 A	25 A	15457 VA	
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						
				Total Conn. Load:	678776 VA	
				Total Amps:	816 A	

Legend:

Load Classification	Connected Load	Demand Factor	Estimated Demand	Panel Totals	
Lighting	14645 VA	125.00%	18306 VA		
Other	3820 VA	101.18%	3865 VA	**Total Conn. Load:**	678776 VA
Power	659951 VA	100.00%	659951 VA	**Total Est. Demand:**	682483 VA
Receptacle	360 VA	100.00%	360 VA	**Total Conn.:**	816 A
				Total Est. Demand:	821 A

Notes:

Switchboard: SWBD-2

Location: ELECTRICAL 1016A
Supply From: TX-1
Mounting: FLOOR
Enclosure:

Volts: 120/208 Wye
Phases: 3
Wires: 4

A.I.C. Rating:
Mains Type: MCB
Mains Rating: 2000 A
MCB Rating: 2000 A

Notes:

CKT	Circuit Description	# of Poles	Frame Size	Trip Rating	Load	Remarks
1	MDP	3	800 A	800 A	24130 VA	
2	RP-SW	3	225 A	100 A	11226 VA	
3	KP1A & KP1B	3	400 A	225 A	180 VA	
4	SLP	3	400 A	200 A	0 VA	
5	CU-AHU-3	3	225 A	100 A	23760 VA	
6	ERV-1	2	100 A	15 A	811 VA	
7	EDH-1	3	100 A	25 A	6000 VA	
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						
				Total Conn. Load:	66107 VA	
				Total Amps:	183 A	

Legend:

Load Classification	Connected Load	Demand Factor	Estimated Demand	Panel Totals	
Lighting	1432 VA	125.00%	1790 VA		
Other	1304 VA	102.26%	1334 VA	**Total Conn. Load:**	66107 VA
Power	63011 VA	100.00%	63011 VA	**Total Est. Demand:**	66494 VA
Receptacle	360 VA	100.00%	360 VA	**Total Conn.:**	183 A
				Total Est. Demand:	185 A

Notes:

Branch Panel: DP-S1

Location: GENERATOR 1017A
Supply From: ATS-S
Mounting: Surface
Enclosure: Type 1

Volts: 480/277 Wye
Phases: 3
Wires: 4

A.I.C. Rating:
Mains Type:
Mains Rating: 400 A
MCB Rating:

Notes:

CKT	Circuit Description	Wire & Conduit	Trip	Poles	A		B		C		Poles	Trip	Wire & Conduit	Circuit Description	CKT
1	DP-S2 VIA TX-S1		300 A	3	59506	5878					3	30 A		AHU-1	2
3	--	--	--	--			59622	5878			--	--	--	--	4
5	--	--	--	--					59587	5878	--	--	--	--	6
7	RTU-1		100 A	3	22160										8
9	--	--	--	--			22160								10
11	--	--	--	--					22160						12
13															14
15															16
17															18
19															20
21															22
23															24
25															26
27															28
29															30
31															32
33															34
35															36
37															38
39															40
41															42
				Total Load:	87544 VA		87660 VA		87625 VA						
				Total Amps:	316 A		317 A		316 A						

Legend:

Load Classification	Connected Load	Demand Factor	Estimated Demand	Panel Totals	
Lighting	9694 VA	125.00%	12117 VA		
Other	1382 VA	103.26%	1427 VA	**Total Conn. Load:**	262829 VA
Power	251753 VA	100.00%	251753 VA	**Total Est. Demand:**	265297 VA
				Total Conn. Current:	316 A
				Total Est. Demand Current:	319 A

Notes:

Branch Panel: LP-E1

Location: STAGE 1009A
Supply From: DP-E2
Mounting: Surface
Enclosure: Type 1

Volts: 120/208 Wye
Phases: 3
Wires: 4

A.I.C. Rating:
Mains Type:
Mains Rating: 100 A
MCB Rating: 1 A

Notes:

CKT	Circuit Description	Wire & Conduit	Trip	Poles	A		B		C		Poles	Trip	Wire & Conduit	Circuit Description	CKT
1	Lighting (Wing D)		15 A	1	302	0					1	20 A		Spare	2
3	Lighting (Gym)		15 A	1			652	0			1	20 A		Spare	4
5	Lighting (Wing A & B)		15 A	1					586	0	1	20 A		Spare	6
7															8
9															10
11															12
				Total Load:	302 VA		652 VA		586 VA						
				Total Amps:	3 A		6 A		5 A						

Legend:

Load Classification	Connected Load	Demand Factor	Estimated Demand	Panel Totals	
Lighting	1540 VA	125.00%	1925 VA		
Other	0 VA	0.00%	0 VA	**Total Conn. Load:**	1540 VA
				Total Est. Demand:	1925 VA
				Total Conn. Current:	4 A
				Total Est. Demand Current:	5 A

Notes:

Branch Panel: DP-E2

Location: GENERATOR 1017A
Supply From: TX-E1
Mounting: Surface
Enclosure: Type 1

Volts: 120/208 Wye
Phases: 3
Wires: 4

A.I.C. Rating:
Mains Type: MCB
Mains Rating: 100 A
MCB Rating: 60A

Notes:

CKT	Circuit Description	Wire & Conduit	Trip	Poles	A		B		C		Poles	Trip	Wire & Conduit	Circuit Description	CKT
1	LP-E1		50 A	3	302	1447					3	50 A		LP-E2	2
3	--	--	--	--			652	1207			--	--	--	--	4
5	--	--	--	--					586	1660	--	--	--	--	6
7	Nitrogen Generator		20 A	1	1200	0					1	20 A		Spare	8
9							0				1	20 A		Spare	10
11									0		1	20 A		Spare	12
13															14
15															16
17															18
19															20
21															22
23															24
				Total Load:	2949 VA		1859 VA		2246 VA						
				Total Amps:	25 A		15 A		19 A						

Legend:

Load Classification	Connected Load	Demand Factor	Estimated Demand	Panel Totals	
Lighting	3519 VA	125.00%	4399 VA		
Other	1134 VA	101.37%	1150 VA	**Total Conn. Load:**	7054 VA
Power	2400 VA	100.00%	2400 VA	**Total Est. Demand:**	7949 VA
				Total Conn. Current:	20 A
				Total Est. Demand Current:	22 A

Notes:

Branch Panel: DP-S2

Location: GENERATOR 1017A
Supply From: TX-S1
Mounting: Surface
Enclosure: Type 1

Volts: 120/208 Wye
Phases: 3
Wires: 4

A.I.C. Rating:
Mains Type: MCB
Mains Rating: 600 A
MCB Rating: 600 A

Notes:

CKT	Circuit Description	Wire & Conduit	Trip	Poles	A		B		C		Poles	Trip	Wire & Conduit	Circuit Description	CKT
1	Receptacles		20 A	1	540										2
3	SPP-4		100 A	3			2199								4
5	--	--	--	--					1588	3742	3	100 A		SPP-2	6
7	--	--	--	--	1080	2884					--	--	--	--	8
9									2808		--	--	--	--	10
11															12
13	SPP-5		100 A	3	3855	6489					3	300 A		SDP1	14
15	--	--	--	--			3847	6522			--	--	--	--	16
17	--	--	--	--					3544	6265	--	--	--	--	18
19	SPP-1		300 A	3	35037	2292					3	30 A		CU-2	20
21	--	--	--	--			34626	2292			--	--	--	--	22
23	--	--	--	--					34827	2292	--	--	--	--	24
25	CU-4		30 A	3	2443	2443					3	30 A		CU-6	26
27	--	--	--	--			2443	2443			--	--	--	--	28
29	--	--	--	--					2443	2443	--	--	--	--	30
31	CU-7		30 A	3	2443										32
33	--	--	--	--			2443								34
35	--	--	--	--					2443						36
37															38
39															40
41															42
				Total Load:	59506 VA		59622 VA		59587 VA						
				Total Amps:	496 A		497 A		497 A						

Legend:

Load Classification	Connected Load	Demand Factor	Estimated Demand	Panel Totals	
Lighting	9694 VA	125.00%	12117 VA		
Other	1382 VA	103.26%	1427 VA	**Total Conn. Load:**	178715 VA
Power	167639 VA	100.00%	167639 VA	**Total Est. Demand:**	181183 VA
				Total Conn. Current:	496 A
				Total Est. Demand Current:	503 A

Notes:

Branch Panel: SKP

Location: KITCHEN / SERVERY 1002A
Supply From: SPP-1
Mounting: Surface
Enclosure: Type 1

Volts: 120/208 Single
Phases: 1
Wires: 3

A.I.C. Rating:
Mains Type: MLO
Mains Rating: 100 A
MCB Rating:

Notes:

CKT	Circuit Description	Wire & Conduit	Trip	Poles	A		B		Poles	Trip	Wire & Conduit	Circuit Description	CKT
1	Exist. Load (Milk Disp.)		15 A	1	0	0			1	15 A		Exist. Load (Ice Cream...	2
3	Exist. Load (Ref.)		15 A	1			0	0	1	15 A		Exist. Load (2-Sec. Ref.)	4
5	Exist. Load (Walk-In)		15 A	1	0	0			1	20 A		Exist. Load (2-Sec. Freezer)	6
7	Exist. Load (Walk-In Heat...		20 A	1			0	0	2	30 A		Exist. Load (Walk-In Comp.)	8
9	Exist. Load (Walk-In Evap.)		20 A	2	0	0			--	--	--	--	10
11	--	--	--	--			0	0	1	20 A		Exist. Load (Cash Reg.)	12
13													14
15													16
17													18
19													20
			Total Load:		0 VA		0 VA						
			Total Amps:		0 A		0 A						

Legend:

Load Classification	Connected Load	Demand Factor	Estimated Demand	Panel Totals	
				Total Conn. Load:	0 VA
				Total Est. Demand:	0 VA
				Total Conn. Current:	0 A
				Total Est. Demand Current:	0 A

Notes:

Project Title:

ADDITION & ALTERATIONS TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
311 STATE STREET NEW LONDON CT 06320
203 230 9007 silverpetrucelli.com

Revision: | Description: | Date: | Revised By:

Drawing Title:
ELECTRICAL PANEL SCHEDULES - FIRST FLOOR PART 'A'

Date: 8/29/2024
Scale:
Drawn By: S. CROTEAU
Project Number: 22.382

Drawing Number: E501

8/29/2024 1:45:11 PM

Branch Panel: LP-WL

Location: CORRIDOR C102A
Supply From:
Mounting: Recessed
Enclosure: Type 1

Volts: 120/208 Wye
Phases: 3
Wires: 4

A.I.C. Rating:
Mains Type: MLO
Mains Rating: 225 A
MCB Rating:

Notes: (EXISTING PANEL)

CKT	Circuit Description	Wire & Conduit	Trip	Poles	A		B		C		Poles	Trip	Wire & Conduit	Circuit Description	CKT
1	Existing Load		15 A	1	0	0					1	15 A		Existing Load	2
3	Existing Load		15 A	1			0	0			1	15 A		Existing Load	4
5	Spare		15 A	1					0	0	1	15 A		Existing Load	6
7	Existing Load		15 A	1	0	0					1	15 A		Spare	8
9	Existing Load		15 A	1			0	0			1	15 A		Spare	10
11	Existing Load		15 A	1					0	0	1	15 A		Spare	12
13	Existing Load		15 A	1	0	0					1	15 A		Existing Load	14
15	Spare		15 A	1			0	0			1	15 A		Existing Load	16
17	Existing Load		15 A	1					0	0	1	15 A		Existing Load	18
19	Existing Load		15 A	1	0	0					1	15 A		Existing Load	20
21	Existing Load		15 A	1			0	720			1	20 A		Receptacles	22
23	Spare		15 A	1					0						24
25	Spare		15 A	1	0	0					1	15 A		Spare	26
27	Spare		20 A	1			0	0			1	15 A		Spare	28
29	Spare		20 A	1					0	0	1	15 A		Spare	30
31	Spare		20 A	1	0	0					1	20 A		Spare	32
33	Spare		20 A	1			0	0			1	20 A		Spare	34
35	Spare		15 A	1					0	0	1	20 A		Spare	36
37	Spare		15 A	1	0	0					1	20 A		Spare	38
39	Spare		20 A	1			0	0			1	20 A		Spare	40
41	Spare		15 A	1					0	0	1	20 A		Spare	42
			Total Load:		0 VA		720 VA		0 VA						
			Total Amps:		0 A		6 A		0 A						

Legend:

Load Classification	Connected Load	Demand Factor	Estimated Demand	Panel Totals	
Power	720 VA	100.00%	720 VA		
				Total Conn. Load:	720 VA
				Total Est. Demand:	720 VA
				Total Conn. Current:	2 A
				Total Est. Demand Current:	2 A

Notes:
REMOVE EXISTING 20A-2P BREAKER (#22-24) AND RETURN TO OWNER AS SPARE AND USE SPACE FOR NEW BREAKERS AS REQUIRED.

Branch Panel: MDP

Location: CUST. OFFICE 1022B
Supply From: SWBD-2
Mounting: Surface
Enclosure: Type 1

Volts: 120/208 Wye
Phases: 3
Wires: 4

A.I.C. Rating:
Mains Type: MLO
Mains Rating: 800 A
MCB Rating: 1 A

Notes:

CKT	Circuit Description	Wire & Conduit	Trip	Poles	A		B		C		Poles	Trip	Wire & Conduit	Circuit Description	CKT
1	LP-G		225 A	3	0	180					3	150 A		LP-CL	2
3	--	--	--	--			0	52			--	--	--	--	4
5	--	--	--	--					0	0	--	--	--	--	6
7	PP-S		200 A	3	1800	4500					3	150 A		PP-MP	8
9	--	--	--	--			2360	3420			--	--	--	--	10
11	--	--	--	--					2880	2880	--	--	--	--	12
13						360					3	200 A		LP-SL	14
15								1140			--	--	--	--	16
17										0	--	--	--	--	18
19	PP-1S		200 A	3	540	1080					3	20 A		LP-1N	20
21	--	--	--	--			0	540			--	--	--	--	22
23	--	--	--	--					0	720	--	--	--	--	24
25	LP-2S		150 A	3	0	52					3	20 A		LP-2N	26
27	--	--	--	--			0	1625			--	--	--	--	28
29	--	--	--	--					0	0	--	--	--	--	30
31															32
33															34
35															36
37															38
39															40
41															42
43															44
45															46
47															48
49															50
51															52
53															54
55															56
57															58
59															60
			Total Load:		8512 VA		9138 VA		6480 VA						
			Total Amps:		74 A		79 A		54 A						

Legend:

Load Classification	Connected Load	Demand Factor	Estimated Demand	Panel Totals	
Lighting	230 VA	125.00%	288 VA		
Other	0 VA	0.00%	0 VA	**Total Conn. Load:**	24130 VA
Power	23540 VA	100.00%	23540 VA	**Total Est. Demand:**	24188 VA
Receptacle	360 VA	100.00%	360 VA	**Total Conn. Current:**	67 A
				Total Est. Demand Current:	67 A

Notes:

Branch Panel: KP1A

Location: KITCHEN / SERVERY 1002A
Supply From: SWBD-2
Mounting: Recessed
Enclosure: Type 1

Volts: 120/208 Wye
Phases: 3
Wires: 4

A.I.C. Rating:
Mains Type: MLO
Mains Rating: 225 A
MCB Rating:

Notes: (EXISTING PANEL)

CKT	Circuit Description	Wire & Conduit	Trip	Poles	A		B		C		Poles	Trip	Wire & Conduit	Circuit Description	CKT
1	Existing Load		20 A	1	0	0					1	20 A		Existing Load	2
3	Existing Load		20 A	1			0	0			1	20 A		Existing Load	4
5	Existing Load		20 A	1					0	0	1	20 A		Existing Load	6
7	Existing Load		20 A	1	0	0					1	20 A		Spare	8
9	Existing Load		20 A	1			0	0			1	20 A		Existing Load	10
11	Existing Load		20 A	1					0	0	1	20 A		Existing Load	12
13	Existing Load		20 A	1	0	0					1	20 A		Existing Load	14
15	Existing Load		20 A	1			0	0			1	20 A		Existing Load	16
17	Existing Load		20 A	1					0	0	1	20 A		Spare	18
19	Existing Load		20 A	1	0	0					1	20 A		Spare	20
21	Existing Load		20 A	1			0	0			1	20 A		Existing Load	22
23	Cafe water cooler		20 A	1					180	0	1	20 A		Spare	24
25	Existing Load		20 A	1	0	0					2	40 A		Existing Load	26
27	Existing Load		20 A	1			0	0			--	--	--	--	28
29	Existing Load		20 A	1					0	0	2	20 A		Spare	30
31	Existing Load		20 A	1	0	0					--	--	--	--	32
33	Existing Load		20 A	1			0	0			2	20 A		Spare	34
35	Existing Load		20 A	1					0	0	--	--	--	--	36
37	Spare		20 A	3	0	0					3	20 A		Spare	38
39	--	--	--	--			0	0			--	--	--	--	40
41	--	--	--	--					0	0	--	--	--	--	42
			Total Load:		0 VA		0 VA		180 VA						
			Total Amps:		0 A		0 A		2 A						

Legend:

Load Classification	Connected Load	Demand Factor	Estimated Demand	Panel Totals	
Power	180 VA	100.00%	180 VA		
				Total Conn. Load:	180 VA
				Total Est. Demand:	180 VA
				Total Conn. Current:	0 A
				Total Est. Demand Current:	0 A

Notes:

Branch Panel: KP1B

Location: KITCHEN / SERVERY 1002A
Supply From:
Mounting: Recessed
Enclosure: Type 1

Volts: 120/208 Wye
Phases: 3
Wires: 4

A.I.C. Rating:
Mains Type: MLO
Mains Rating: 225 A
MCB Rating:

Notes: (EXISTING PANEL)

CKT	Circuit Description	Wire & Conduit	Trip	Poles	A		B		C		Poles	Trip	Wire & Conduit	Circuit Description	CKT
1	Existing Load		15 A	1	0	0					1	15 A		Existing Load	2
3	Recept. (Big Dipper)		15 A	1			1200	0			1	15 A		Existing Load	4
5	Existing Load		15 A	1					0	300	1	15 A		J.B. (POD)	6
7	Recept. (Big Dipper)		15 A	1	1200	0					1	15 A		Existing Load	8
9	EF-18		15 A	1			306	0			1	15 A		Existing Load	10
11	Existing Load		15 A	1					0	0	1	15 A		Spare	12
13	Existing Load		20 A	1	0	720					1	20 A		Recept. (Wing A Roof)	14
15	Existing Load		20 A	1			0	0			2	30 A		Spare	16
17	Existing Load		20 A	1					0	0	--	--	--	--	18
19	Existing Load		20 A	2	0	0					1	20 A		Existing Load	20
21	--	--	--	--			0	0			1	20 A		Existing Load	22
23	Existing Load		30 A	2					0	0	1	20 A		Existing Load	24
25	--	--	--	--	0	468					3	15 A		KEF-1	26
27	Existing Load		15 A	3			0	468			--	--	--	--	28
29	--	--	--	--					0	468	--	--	--	--	30
31	--	--	--	--	0	0					1	20 A		Existing Load	32
33	MAU-1		15 A	3			780	0			1	20 A		Existing Load	34
35	--	--	--	--					780	0	1	20 A		Existing Load	36
37	--	--	--	--	780	0					3	50 A		Existing Load	38
39	Existing Load		20 A	1			0	0			--	--	--	--	40
41	Existing Load		20 A	1					0	0	--	--	--	--	42
			Total Load:		3168 VA		2754 VA		1548 VA						
			Total Amps:		28 A		24 A		13 A						

Legend:

Load Classification	Connected Load	Demand Factor	Estimated Demand	Panel Totals	
Other	306 VA	125.00%	383 VA		
Power	7164 VA	100.00%	7164 VA	**Total Conn. Load:**	7470 VA
				Total Est. Demand:	7547 VA
				Total Conn. Current:	21 A
				Total Est. Demand Current:	21 A

Notes:

Branch Panel: SLP

Location:
Supply From: SWBD-2
Mounting: Surface
Enclosure: Type 1

Volts: 120/208 Wye
Phases: 3
Wires: 4

A.I.C. Rating:
Mains Type: MCB
Mains Rating: 225 A
MCB Rating: 200 A

Notes: (EXISTING PANEL)

CKT	Circuit Description	Wire & Conduit	Trip	Poles	A		B		C		Poles	Trip	Wire & Conduit	Circuit Description	CKT
1	Space		--	1	--	--					1	--		Space	2
3	Space		--	1			--	--			1	--		Space	4
5	Spare		20 A	1					0	0	2	20 A		Spare	6
7	Spare		15 A	1	0	0					--	--	--	--	8
9	Spare		15 A	1			0	0			1	20 A		Spare	10
11	Spare		20 A	1					0	0	1	20 A		Spare	12
13	Spare		20 A	1	0	0					1	20 A		Spare	14
15	Spare		20 A	1			0	0			1	20 A		Spare	16
17	Spare		20 A	1					0	0	1	20 A		Spare	18
19	Spare		20 A	1	0	0					1	20 A		Spare	20
21	Spare		20 A	1			0	0			1	20 A		Spare	22
23	Spare		20 A	1					0	0	1	20 A		Spare	24
25	Existing Load		20 A	1	0	0					1	20 A		Spare	26
27	Existing Load		20 A	1			0	0			1	20 A		Spare	28
29	Spare		20 A	1					0	0	1	20 A		Spare	30
31	Existing Load		20 A	1	0	0					1	20 A		Spare	32
33	Existing Load		20 A	1			0	0			1	20 A		Existing Load	34
35	Existing Load		20 A	1					0	0	1	20 A		Existing Load	36
37	Existing Load		20 A	1	0	0					1	20 A		Existing Load	38
39	Existing Load		20 A	1			0	0			1	20 A		Existing Load	40
41	Existing Load		20 A	1					0	0	1	20 A		Existing Load	42
43	Spare		20 A	3	0	0					3	200 A		MAIN	44
45	--	--	--	--			0	0			--	--	--	--	46
47	--	--	--	--					0	0	--	--	--	--	48
49															50
51															52
53															54
55															56
57															58
59															60
			Total Load:		0 VA		0 VA		0 VA						
			Total Amps:		0 A		0 A		0 A						

Legend:

Load Classification	Connected Load	Demand Factor	Estimated Demand	Panel Totals	
				Total Conn. Load:	0 VA
				Total Est. Demand:	0 VA
				Total Conn. Current:	0 A
				Total Est. Demand Current:	0 A

Notes:

Branch Panel: LP-G

Location: CUST. OFFICE 1022B
Supply From: MDP
Mounting: Surface
Enclosure: Type 1

Volts: 120/208 Wye
Phases: 3
Wires: 4

A.I.C. Rating:
Mains Type: MLO
Mains Rating: 225 A
MCB Rating:

Notes: (EXISTING PANEL)

CKT	Circuit Description	Wire & Conduit	Trip	Poles	A		B		C		Poles	Trip	Wire & Conduit	Circuit Description	CKT
1	Existing Load		15 A	1	0	0					3	50 A		Spare	2
3	Existing Load		15 A	1			0	0			--	--	--	--	4
5	Existing Load		15 A	1					0	0	--	--	--	--	6
7	Spare		15 A	1	0	0					1	15 A		Existing Load	8
9	Spare		15 A	1			0	0			1	15 A		Spare	10
11	Existing Load		15 A	1					0	0	1	15 A		Existing Load	12
13	Existing Load		15 A	1	0	0					1	15 A		Existing Load	14
15	Existing Load		15 A	1			0	0			1	15 A		Existing Load	16
17	Spare		15 A	1					0	0	3	30 A		Spare	18
19	Spare		15 A	1	0	0					--	--	--	--	20
21	Spare		20 A	1			0	0			--	--	--	--	22
23	Spare		20 A	1					0	0	1	20 A		Spare	24
25	Existing Load		20 A	1	0	0					1	15 A		Spare	26
27	Existing Load		20 A	1			0	0			1	20 A		Spare	28
29	Existing Load		20 A	1					0	0	1	20 A		Existing Load	30
31	Spare		20 A	1	0	0					1	20 A		Existing Load	32
33	Spare		20 A	2			0	0			2	40 A		Spare	34
35	--	--	--	--					0	0	--	--	--	--	36
37	Spare		25 A	3	0	0					3	20 A		Spare	38
39	--	--	--	--			0	0			--	--	--	--	40
41	--	--	--	--					0	0	--	--	--	--	42
			Total Load:		0 VA		0 VA		0 VA						
			Total Amps:		0 A		0 A		0 A						

Legend:

Load Classification	Connected Load	Demand Factor	Estimated Demand	Panel Totals	
				Total Conn. Load:	0 VA
				Total Est. Demand:	0 VA
				Total Conn. Current:	0 A
				Total Est. Demand Current:	0 A

Notes:

Project Title:
ADDITION & ALTERATIONS TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
311 STATE STREET NEW LONDON CT 06320
203 230 9007 silverpetrucelli.com

Revision:	Description:	Date:	Revised By:

Drawing Title:
ELECTRICAL PANEL SCHEDULES - FIRST FLOOR PART 'A' & 'B'

Date: 8/29/2024
Scale:
Drawn By: S. CROTEAU
Project Number: 22.382
Drawing Number: E502

8/29/2024 1:45:26 PM

Branch Panel: SDP1

Location: CUST. OFFICE 1022B
Supply From: DP-S2
Mounting: Surface
Enclosure: Type 1

Volts: 120/208 Wye
Phases: 3
Wires: 4

A.I.C. Rating:
Mains Type: MCB
Mains Rating: 400 A
MCB Rating: 400 A

Notes: (EXISTING PANEL)

CKT	Circuit Description	Wire & Conduit	Trip	Poles	A		B		C		Poles	Trip	Wire & Conduit	Circuit Description	CKT
1	Spare		100 A	3	0	0					3	100 A		UP1	2
3	--	--	--	--			0	0			--	--	--	--	4
5	--	--	--	--					0	0	--	--	--	--	6
7	Receptacles		20 A	1	720	0					3	100 A		Spare	8
9	Recept. (Refrig.)		20 A	1			1080	0			--	--	--	--	10
11	Recept. (Refrig.)		20 A	1					1080	0	--	--	--	--	12
13	Receptacles		20 A	1	720	34					2	15 A		VRF-1-B1, 2, 3, 4 & 5	14
15	Lighting		20 A	1			408	34			--	--	--	--	16
17															18
19															20
21															22
23															24
25															26
27															28
29															30
31	BP-1		225 A	3	5015										32
33	--	--	--	--			5000								34
35	--	--	--	--					5185						36
37															38
39															40
41															42
			Total Load:		6489 VA		6522 VA		6265 VA						
			Total Amps:		54 A		55 A		52 A						

Legend:

Load Classification	Connected Load	Demand Factor	Estimated Demand	Panel Totals	
Lighting	408 VA	125.00%	510 VA		
Other	550 VA	108.18%	595 VA	**Total Conn. Load:**	19276 VA
Power	18318 VA	100.00%	18318 VA	**Total Est. Demand:**	19423 VA
				Total Conn. Current:	54 A
				Total Est. Demand Current:	54 A

Notes:

Branch Panel: BP-1

Location: CUSTODIAL CS1-03
Supply From: SDP1
Mounting: Surface
Enclosure: Type 1

Volts: 120/208 Wye
Phases: 3
Wires: 4

A.I.C. Rating:
Mains Type: MCB
Mains Rating: 225 A
MCB Rating: 225 A

Notes: (EXISTING PANEL)

CKT	Circuit Description	Wire & Conduit	Trip	Poles	A		B		C		Poles	Trip	Wire & Conduit	Circuit Description	CKT
1	Spare		20 A	1	0	0					1	20 A		Spare	2
3	Spare		15 A	1			0	0			1	15 A		Existing Load	4
5	Spare		20 A	1					0	0	1	20 A		Spare	6
7	RP-1 & 2, TMV-1 & 2		20 A	1	190	0					1	20 A		Existing Load	8
9	Receptacles		20 A	1			360	0			1	20 A		Spare	10
11	B-1 & B-2		15 A	1					360	2185	2	30 A		Heat Trace Panel	12
13	Spare		20 A	1	0	2185					--	--	--	--	14
15	WH-1 (2-MODULES)		20 A	1			1000	1000			1	20 A		WH-1 (2-MODULES)	16
17									0	3	15 A			Spare	18
19						0					--	--	--	--	20
21							0				--	--	--	--	22
23															24
25															26
27															28
29															30
31															32
33	Sewage Ejec.Control Pnl		50 A	3			2640								34
35	--	--	--	--					2640						36
37	--	--	--	--	2640										38
39	Space		--	1			--								40
41	Space		--	1					--	--	1	--		Space	42
			Total Load:		5015 VA		5000 VA		5185 VA						
			Total Amps:		42 A		42 A		43 A						

Legend:

Load Classification	Connected Load	Demand Factor	Estimated Demand	Panel Totals	
Other	550 VA	108.18%	595 VA		
Power	14650 VA	100.00%	14650 VA	**Total Conn. Load:**	15200 VA
				Total Est. Demand:	15245 VA
				Total Conn. Current:	42 A
				Total Est. Demand Current:	42 A

Notes:
REMOVE ALL EXISTING THREE POLE BREAKERS NOT INDICATED TO BE REUSED AND RETURN TO OWNER AS SPARES.

Branch Panel: LP-CL

Location: CORRIDOR C106B
Supply From: MDP
Mounting: Recessed
Enclosure: Type 1

Volts: 120/208 Wye
Phases: 3
Wires: 4

A.I.C. Rating:
Mains Type: MLO
Mains Rating: 225 A
MCB Rating:

Notes: (EXISTING PANEL)

CKT	Circuit Description	Wire & Conduit	Trip	Poles	A		B		C		Poles	Trip	Wire & Conduit	Circuit Description	CKT
1	Recept. (Elev. Pit)		20 A	1	180	0					1	15 A		Existing Load	2
3	Lights (Elev. Pit)		15 A	1			52								4
5	Existing Load		15 A	1					0	0	1	15 A		Existing Load	6
7	Existing Load		15 A	1	0										8
9	Existing Load		15 A	1			0	0			1	15 A		Existing Load	10
11	Existing Load		15 A	1					0						12
13	Existing Load		15 A	1	0	0					1	15 A		Existing Load	14
15								0			1	15 A		Existing Load	16
17										0	1	15 A		Existing Load	18
19						0					1	15 A		Existing Load	20
21															22
23															24
25	Existing Load		15 A	1	0	0					1	15 A		Spare	26
27	Existing Load		15 A	1			0								28
29	Existing Load		15 A	1					0	0	1	15 A		Spare	30
31							0				1	15 A		Spare	32
33	Existing Load		15 A	1			0								34
35															36
37															38
39															40
41	Existing Load		15 A	1					0						42
			Total Load:		180 VA		52 VA		0 VA						
			Total Amps:		2 A		1 A		0 A						

Legend:

Load Classification	Connected Load	Demand Factor	Estimated Demand	Panel Totals	
Lighting	52 VA	125.00%	66 VA		
Other	0 VA	0.00%	0 VA	**Total Conn. Load:**	232 VA
Power	180 VA	100.00%	180 VA	**Total Est. Demand:**	246 VA
				Total Conn. Current:	1 A
				Total Est. Demand Current:	1 A

Notes:

Branch Panel: PP-S

Location: CORRIDOR C105B
Supply From: MDP
Mounting: Recessed
Enclosure: Type 1

Volts: 120/208 Wye
Phases: 3
Wires: 4

A.I.C. Rating:
Mains Type: MLO
Mains Rating: 225 A
MCB Rating:

Notes: (EXISTING PANEL)

CKT	Circuit Description	Wire & Conduit	Trip	Poles	A		B		C		Poles	Trip	Wire & Conduit	Circuit Description	CKT
1	Spare		15 A	1	0	0					1	15 A		Spare	2
3	Existing Load		15 A	1			0	0			1	15 A		Existing Load	4
5	Existing Load		15 A	1					0	0	1	15 A		Existing Load	6
7	Spare		15 A	1	0	0					1	15 A		Spare	8
9	Spare		15 A	1			0	0			1	15 A		Spare	10
11	Spare		15 A	1					0	0	1	15 A		Spare	12
13	Spare		15 A	1	0	0					2	30 A		Spare	14
15	Spare		15 A	1			0	0			--	--	--	--	16
17	Spare		20 A	1					0	0	1	20 A		Existing Load	18
19	Spare		20 A	1	0	0					1	20 A		Existing Load	20
21	Spare		20 A	1			0	0			1	20 A		Existing Load	22
23	Spare		20 A	1					0	0	1	20 A		Existing Load	24
25	Spare		20 A	1	0	0					1	20 A		Spare	26
27	Spare		20 A	1			0	0			1	20 A		Spare	28
29	Spare		20 A	1					0	0	1	20 A		Spare	30
31	Spare		20 A	1	0	0					2	20 A		Spare	32
33	Spare		20 A	1			0	0			--	--	--	--	34
35	Receptacle (MIC)		20 A	1					1800	0	2	30 A		Spare	36
37	Receptacle (MIC)		20 A	1	1800	0					--	--	--	--	38
39	Receptacle (Coffee)		20 A	1			1500	860			1	20 A		Receptacles	40
41	Receptacles		20 A	1					540	540	1	20 A		Receptacles	42
			Total Load:		1800 VA		2360 VA		2880 VA						
			Total Amps:		15 A		20 A		25 A						

Legend:

Load Classification	Connected Load	Demand Factor	Estimated Demand	Panel Totals	
Power	7040 VA	100.00%	7040 VA		
				Total Conn. Load:	7040 VA
				Total Est. Demand:	7040 VA
				Total Conn. Current:	20 A
				Total Est. Demand Current:	20 A

Notes:

Branch Panel: PP-MP

Location: MAIL / COPY 1030B
Supply From: MDP
Mounting: Recessed
Enclosure: Type 1

Volts: 120/208 Wye
Phases: 3
Wires: 4

A.I.C. Rating:
Mains Type: MLO
Mains Rating: 225 A
MCB Rating:

Notes:

CKT	Circuit Description	Wire & Conduit	Trip	Poles	A		B		C		Poles	Trip	Wire & Conduit	Circuit Description	CKT
1	Receptacles		20 A	1	540	540					1	20 A		Receptacles	2
3	Receptacles		20 A	1			540	540			1	20 A		Receptacles	4
5	Receptacles		20 A	1					540	540	1	20 A		Receptacles	6
7	Receptacles		20 A	1	540	540					1	20 A		Receptacles	8
9	Receptacles		20 A	1			720	180			1	20 A		Recept. (Ext.)	10
11	Recept. (Ext.)		20 A	1					180	720	1	20 A		Receptacles	12
13	Receptacles		20 A	1	720	360					1	20 A		Receptacles	14
15	Receptacles		20 A	1			540	360			1	20 A		Receptacles	16
17	Receptacles		20 A	1					360	540	1	20 A		Receptacles	18
19	Receptacles		20 A	1	720	540					1	20 A		Receptacles	20
21	Receptacles		20 A	1			540								22
23															24
25															26
27															28
29															30
31															32
33															34
35															36
37	Spare		20 A	1	0	0					1	20 A		Spare	38
39	Spare		20 A	1			0	0			1	20 A		Spare	40
41	Spare		20 A	1					0	0	1	20 A		Spare	42
			Total Load:		4500 VA		3420 VA		2880 VA						
			Total Amps:		38 A		29 A		24 A						

Legend:

Load Classification	Connected Load	Demand Factor	Estimated Demand	Panel Totals	
Power	10800 VA	100.00%	10800 VA		
				Total Conn. Load:	10800 VA
				Total Est. Demand:	10800 VA
				Total Conn. Current:	30 A
				Total Est. Demand Current:	30 A

Notes:

Branch Panel: LP-SL

Location: CORRIDOR C111C
Supply From: MDP
Mounting: Recessed
Enclosure: Type 1

Volts: 120/208 Wye
Phases: 3
Wires: 4

A.I.C. Rating:
Mains Type: MLO
Mains Rating: 225 A
MCB Rating:

Notes:

CKT	Circuit Description	Wire & Conduit	Trip	Poles	A		B		C		Poles	Trip	Wire & Conduit	Circuit Description	CKT
1	Receptacles		20 A	1	360	0					1	15 A		Spare	2
3	Receptacles		20 A	1			1140	0			1	15 A		Spare	4
5	Spare		15 A	1					0	0	1	15 A		Spare	6
7						0					1	15 A		Spare	8
9							0				1	15 A		Spare	10
11									0		1	15 A		Spare	12
13						0					1	15 A		Existing Load	14
15							0				1	15 A		Existing Load	16
17									0		1	15 A		Spare	18
19	Spare		15 A	1	0	0					1	15 A		Existing Load	20
21	Spare		15 A	1			0	0			1	15 A		Spare	22
23	Existing Load		20 A	1					0	0	1	15 A		Spare	24
25	Existing Load		20 A	1	0	0					1	15 A		Existing Load	26
27	Existing Load		20 A	1			0	0			1	20 A		Existing Load	28
29	Existing Load		20 A	1					0	0	1	20 A		Existing Load	30
31	Existing Load		20 A	1	0	0					1	20 A		Existing Load	32
33	Existing Load		20 A	1			0	0			1	20 A		Existing Load	34
35	Existing Load		20 A	1					0	0	1	20 A		Existing Load	36
37															38
39															40
41															42
			Total Load:		360 VA		1140 VA		0 VA						
			Total Amps:		3 A		10 A		0 A						

Legend:

Load Classification	Connected Load	Demand Factor	Estimated Demand	Panel Totals	
Power	1500 VA	100.00%	1500 VA		
				Total Conn. Load:	1500 VA
				Total Est. Demand:	1500 VA
				Total Conn. Current:	4 A
				Total Est. Demand Current:	4 A

Notes:
REMOVE ALL EXISTING 2-POLE CIRCUIT BREAKERS THAT SERVED AC UNITS IN THIS PANEL.

Project Title:

ADDITION & ALTERATIONS TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
311 STATE STREET NEW LONDON CT 06320
203 230 9007 silverpetrucelli.com

Revision: | Description: | Date: | Revised By:

Drawing Title:
ELECTRICAL PANEL SCHEDULES - FIRST FLOOR PART 'B' & 'C'

Date: 8/29/2024
Scale:
Drawn By: Author
Project Number: 22.382

Drawing Number: E503

8/29/2024 1:45:43 PM

Branch Panel: PP-1S

Location: CORRIDOR C200C
Supply From: MDP
Mounting: Recessed
Enclosure: Type 1

Volts: 120/208 Wye
Phases: 3
Wires: 4

A.I.C. Rating:
Mains Type: MLO
Mains Rating: 100 A
MCB Rating:

Notes: (EXISTING PANEL)

CKT	Circuit Description	Wire & Conduit	Trip	Poles	A		B		C		Poles	Trip	Wire & Conduit	Circuit Description	CKT
1	Existing Loads		15 A	1	0	0					1	15 A		Existing Loads	2
3	Existing Loads		15 A	1			0	0			1	15 A		Existing Loads	4
5	Existing Loads		15 A	1					0	0	1	15 A		Existing Loads	6
7	Existing Loads		15 A	1	0	0					1	15 A		Existing Loads	8
9	Existing Loads		15 A	1			0	0			1	15 A		Existing Loads	10
11	Existing Loads		15 A	1					0	0	1	15 A		Existing Loads	12
13	Existing Loads		15 A	1	0	0					1	15 A		Existing Loads	14
15	Existing Loads		15 A	1			0	0			1	15 A		Existing Loads	16
17	Existing Loads		15 A	1					0	0	1	15 A		Existing Loads	18
19	Existing Loads		15 A	1	0	0					1	15 A		Existing Loads	20
21	Existing Loads		20 A	2			0	0			1	15 A		Existing Loads	22
23	--	--	--	--					0	0	1	15 A		Existing Loads	24
25	Receptacles		20 A	1	540	0					1	15 A		Existing Loads	26
27	Existing Loads		30 A	2			0	0			1	15 A		Existing Loads	28
29	--	--	--	--					0	0	1	20 A		Existing Loads	30
31						0					1	20 A		Existing Loads	32
33								0			2	20 A		Existing Loads	34
35	LP1S1		100 A	3					0	0	--	--	--	--	36
37	--	--	--	--	0	0					1	20 A		Spare	38
39	--	--	--	--			0								40
41	Existing Loads		20 A	1					0	0	1	20 A		Existing Loads	42
			Total Load:		540 VA		0 VA		0 VA						
			Total Amps:		5 A		0 A		0 A						

Legend:

Load Classification	Connected Load	Demand Factor	Estimated Demand	Panel Totals
Power	540 VA	100.00%	540 VA	
				Total Conn. Load: 540 VA
				Total Est. Demand: 540 VA
				Total Conn. Current: 1 A
				Total Est. Demand Current: 1 A

Notes:

Branch Panel: LP1N1

Location: IT SERVER 2006B
Supply From: LP-1N
Mounting: Surface
Enclosure: Type 1

Volts: 120/208 Wye
Phases: 3
Wires: 4

A.I.C. Rating:
Mains Type: MCB
Mains Rating: 100 A
MCB Rating: 100 A

Notes: (EXISTING PANEL)

CKT	Circuit Description	Wire & Conduit	Trip	Poles	A		B		C		Poles	Trip	Wire & Conduit	Circuit Description	CKT
1	Existing Load		15 A	1	0	540					1	20 A		Receptacles	2
3	Existing Load		20 A	1			0	540			1	20 A		Receptacles	4
5	Existing Load		20 A	1					0	720	1	20 A		Receptacles	6
7	Receptacles		20 A	1	540	0					1	20 A		Existing Load	8
9	Existing Load		20 A	1			0	0			1	20 A		Existing Load	10
11	Existing Load		20 A	1					0	0	1	20 A		Existing Load	12
13	Existing Load		20 A	1	0	0					1	20 A		Existing Load	14
15	Existing Load		20 A	1			0	0			1	20 A		Existing Load	16
17	Existing Load		20 A	1					0	0	1	20 A		Existing Load	18
19	Existing Load		20 A	1	0	0					1	20 A		Existing Load	20
21	Existing Load		20 A	1			0								22
23	Existing Load		20 A	1					0	0	1	20 A		Existing Load	24
25	Existing Load		20 A	1	0	0					1	20 A		Existing Load	26
27	Existing Load		20 A	1			0	0			1	20 A		Existing Load	28
29	Existing Load		20 A	1					0	0	1	20 A		Existing Load	30
31	Existing Load		20 A	1	0	0					1	20 A		Existing Load	32
33	Existing Load		20 A	1			0	0			1	20 A		Existing Load	34
35										--	1	--		Space	36
37	Space		--	1	--	--					1	--		Space	38
39	Space		--	1			--	--			1	--		Space	40
41	Space		--	1					--	--	1	--		Space	42
			Total Load:		1080 VA		540 VA		720 VA						
			Total Amps:		9 A		5 A		6 A						

Legend:

Load Classification	Connected Load	Demand Factor	Estimated Demand	Panel Totals
Power	1980 VA	100.00%	1980 VA	
Receptacle	360 VA	100.00%	360 VA	**Total Conn. Load:** 2340 VA
				Total Est. Demand: 2340 VA
				Total Conn. Current: 6 A
				Total Est. Demand Current: 6 A

Notes:

Branch Panel: LP-1N

Location: CORRIDOR C200C
Supply From: MDP
Mounting: Recessed
Enclosure: Type 1

Volts: 120/208 Wye
Phases: 3
Wires: 4

A.I.C. Rating:
Mains Type: MLO
Mains Rating: 225 A
MCB Rating:

Notes: (EXISITNG PANEL)

CKT	Circuit Description	Wire & Conduit	Trip	Poles	A		B		C		Poles	Trip	Wire & Conduit	Circuit Description	CKT
1	Existing Load		15 A	1	0	0					1	15 A		Existing Load	2
3	Spare		15 A	1			0	0			2	30 A		Spare	4
5	Spare		15 A	1					0	0	--	--	--	--	6
7	Existing Load		15 A	1	0	0					1	15 A		Existing Load	8
9	Spare		15 A	1			0	0			1	15 A		Existing Load	10
11	Spare		30 A	2					0	0	1	15 A		Existing Load	12
13	--	--	--	--	0	0					1	15 A		Spare	14
15	Spare		30 A	2			0	0			1	15 A		Existing Load	16
17	--	--	--	--					0	0	1	15 A		Existing Load	18
19	Spare		15 A	1	0	0					1	15 A		Spare	20
21	Spare		15 A	1			0	0			1	15 A		Existing Load	22
23	Spare		15 A	1					0	0	1	20 A		Spare	24
25	Spare		15 A	1	0	0					2	30 A		Spare	26
27	Existing Load		15 A	1			0	0			--	--	--	--	28
29	Spare		15 A	1					0	0	1	15 A		Existing Load	30
31	Existing Load		15 A	1	0	0					1	15 A		Existing Load	32
33	Spare		20 A	1			0	0			1	15 A		Existing Load	34
35	Existing Load		15 A	1					0	0	1	15 A		Spare	36
37	Spare		20 A	2	0	1080					3	100 A		LP1N1	38
39	--	--	--	--			0	540					--	--	40
41	Existing Load		15 A	1					0	720	--	--	--	--	42
			Total Load:		1080 VA		540 VA		720 VA						
			Total Amps:		9 A		5 A		6 A						

Legend:

Load Classification	Connected Load	Demand Factor	Estimated Demand	Panel Totals
Power	1980 VA	100.00%	1980 VA	
Receptacle	360 VA	100.00%	360 VA	**Total Conn. Load:** 2340 VA
				Total Est. Demand: 2340 VA
				Total Conn. Current: 6 A
				Total Est. Demand Current: 6 A

Notes:

Branch Panel: UP1

Location: IT SERVER 2006B
Supply From: SDP1
Mounting: Surface
Enclosure: Type 1

Volts: 120/208 Wye
Phases: 3
Wires: 4

A.I.C. Rating:
Mains Type: MCB
Mains Rating: 100 A
MCB Rating: 100 A

Notes: (EXISITNG PANEL)

CKT	Circuit Description	Wire & Conduit	Trip	Poles	A		B		C		Poles	Trip	Wire & Conduit	Circuit Description	CKT
1	Spare		20 A	1	0	0					1	20 A		Spare	2
3	Spare		20 A	1			0	0			1	20 A		Spare	4
5	Spare		20 A	1					0	0	1	20 A		Spare	6
7	Spare		20 A	1	0	0					1	20 A		Spare	8
9	Spare		20 A	1			0	0			1	20 A		Spare	10
11	Spare		20 A	1					0	0	1	20 A		Spare	12
13	Spare		20 A	1	0	0					1	20 A		Spare	14
15	Spare		20 A	1			0	0			1	20 A		Spare	16
17	Spare		20 A	1					0	0	1	20 A		Spare	18
19	Spare		20 A	1	0	0					1	20 A		Spare	20
21	Spare		20 A	1			0	0			1	20 A		Spare	22
23	Spare		20 A	1					0	0	1	20 A		Spare	24
25	Spare		20 A	2	0	--					1	--		Space	26
27	--	--	--	--			0	--			1	--		Space	28
29	Space		--	1					--	--	1	--		Space	30
			Total Load:		0 VA		0 VA		0 VA						
			Total Amps:		0 A		0 A		0 A						

Legend:

Load Classification	Connected Load	Demand Factor	Estimated Demand	Panel Totals
				Total Conn. Load: 0 VA
				Total Est. Demand: 0 VA
				Total Conn. Current: 0 A
				Total Est. Demand Current: 0 A

Notes:

Branch Panel: SPP-3

Location: CORRIDOR C200C
Supply From: DP-S2
Mounting: Recessed
Enclosure: Type 1

Volts: 120/208 Wye
Phases: 3
Wires: 4

A.I.C. Rating:
Mains Type: MLO
Mains Rating: 100 A
MCB Rating: 1 A

Notes:

CKT	Circuit Description	Wire & Conduit	Trip	Poles	A		B		C		Poles	Trip	Wire & Conduit	Circuit Description	CKT
1	Receptacles (2nd Flr.)		20 A	1	720	540					1	20 A		Receptacles (2nd Flr.)	2
3	Receptacles (2nd Flr.)		20 A	1			540	540			1	20 A		Receptacles (2nd Flr.)	4
5	Receptacles (2nd Flr.)		20 A	1					540	540	1	20 A		Receptacles (2nd Flr.)	6
7	Lighting (2nd Flr.)		20 A	1	384	555					1	20 A		Lighting (2nd Flr.)	8
9	Lighting (2nd Flr.)		20 A	1			338	170			1	20 A		Lighting (2nd Flr.)	10
11															12
13															14
15															16
17															18
19															20
21															22
23															24
25															26
27															28
29															30
			Total Load:		2199 VA		1588 VA		1080 VA						
			Total Amps:		19 A		14 A		9 A						

Legend:

Load Classification	Connected Load	Demand Factor	Estimated Demand	Panel Totals
Lighting	1447 VA	125.00%	1808 VA	
Other	0 VA	0.00%	0 VA	**Total Conn. Load:** 4867 VA
Power	3420 VA	100.00%	3420 VA	**Total Est. Demand:** 5228 VA
				Total Conn. Current: 14 A
				Total Est. Demand Current: 15 A

Notes:

Branch Panel: LP1S1

Location: CORRIDOR C301B
Supply From: PP-1S
Mounting: Recessed
Enclosure: Type 1

Volts: 120/208 Wye
Phases: 3
Wires: 4

A.I.C. Rating:
Mains Type: MCB
Mains Rating: 100 A
MCB Rating: 100 A

Notes: (EXISTING PANEL)

CKT	Circuit Description	Wire & Conduit	Trip	Poles	A		B		C		Poles	Trip	Wire & Conduit	Circuit Description	CKT
1	Existing Load		20 A	1	0	0					1	20 A		Existing Load	2
3	Existing Load		20 A	1			0	0			1	20 A		Existing Load	4
5	Existing Load		20 A	1					0	0	1	20 A		Existing Load	6
7	Existing Load		20 A	1	0	0					1	20 A		Existing Load	8
9	Existing Load		20 A	1			0	0			1	20 A		Existing Load	10
11	Existing Load		20 A	1					0	0	1	20 A		Existing Load	12
13	Existing Load		20 A	1	0	0					1	20 A		Existing Load	14
15	Existing Load		20 A	1			0	0			1	20 A		Existing Load	16
17	Existing Load		20 A	1					0	0	1	20 A		Existing Load	18
19	Existing Load		20 A	1	0										20
21	Existing Load		30 A	2			0	0			2	20 A		Existing Load	22
23	--	--	--	--					0	0	--	--	--	--	24
25	Existing Load		30 A	2	0										26
27	--	--	--	--			0								28
29															30
			Total Load:		0 VA		0 VA		0 VA						
			Total Amps:		0 A		0 A		0 A						

Legend:

Load Classification	Connected Load	Demand Factor	Estimated Demand	Panel Totals
				Total Conn. Load: 0 VA
				Total Est. Demand: 0 VA
				Total Conn. Current: 0 A
				Total Est. Demand Current: 0 A

Notes:

Project Title:

ADDITION & ALTERATIONS TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
311 STATE STREET NEW LONDON CT 06320
203 230 9007 silverpetrucelli.com

Revision: | Description: | Date: | Revised By:

Drawing Title:
ELECTRICAL PANEL SCHEDULES - SECOND FLOOR

Date: 8/29/2024
Scale:
Drawn By: S. CROTEAU
Project Number: 22.382

Drawing Number: E504

8/29/2024 1:46:01 PM

Branch Panel: SPP-4

Location: STORAGE 3009C
Supply From: DP-S2
Mounting: Recessed
Enclosure: Type 1

Volts: 120/208 Wye
Phases: 3
Wires: 4

A.I.C. Rating:
Mains Type: MLO
Mains Rating: 100 A
MCB Rating: 1 A

Notes:

CKT	Circuit Description	Wire & Conduit	Trip	Poles	A		B		C		Poles	Trip	Wire & Conduit	Circuit Description	CKT
1	Receptacles (3rd Flr.)		20 A	1	540	720					1	20 A		Receptacles (3rd Flr.)	2
3	Lighting (3rd Flr)		20 A	1			768	1359			1	20 A		Lighting (3rd Flr)	4
5	Lighting (3rd Flr)		20 A	1					1056	768	1	20 A		Lighting (3rd Flr)	6
7	Lighting (3rd Flr)		20 A	1	975	540					1	20 A		Receptacles (3rd Flr.)	8
9	Receptacles (3rd Flr.)		20 A	1			540	540			1	20 A		Receptacles (3rd Flr.)	10
11	Receptacles (3rd Flr.)		20 A	1					540	540	1	20 A		Receptacles (3rd Flr.)	12
13	Receptacles (3rd Flr.)		20 A	1	540	540					1	20 A		Receptacles (3rd Flr.)	14
15	Receptacles (3rd Flr.)		20 A	1			540	100			2	15 A		VRF-3-B's	16
17	Receptacles (3rd Flr.)		20 A	1					540	100	--	--	--	--	18
19															20
21															22
23															24
25	Spare		20 A	1	0										26
27	Spare		20 A	1			0								28
29	Spare		20 A	1					0						30
				Total Load:	3855 VA		3847 VA		3544 VA						
				Total Amps:	33 A		32 A		30 A						

Legend:

Load Classification	Connected Load	Demand Factor	Estimated Demand	Panel Totals	
Lighting	4925 VA	125.00%	6157 VA		
Other	0 VA	0.00%	0 VA	**Total Conn. Load:**	11245 VA
Power	6320 VA	100.00%	6320 VA	**Total Est. Demand:**	12477 VA
				Total Conn. Current:	31 A
				Total Est. Demand Current:	35 A

Notes:

Branch Panel: LP-2S

Location: CORRIDOR C301B
Supply From: MDP
Mounting: Recessed
Enclosure: Type 1

Volts: 120/208 Wye
Phases: 3
Wires: 4

A.I.C. Rating:
Mains Type: MLO
Mains Rating: 225 A
MCB Rating:

Notes: (EXISTING PANEL)

CKT	Circuit Description	Wire & Conduit	Trip	Poles	A		B		C		Poles	Trip	Wire & Conduit	Circuit Description	CKT
1	Existing Load		15 A	1	0	0					1	15 A		Existing Load	2
3	Existing Load		15 A	1			0	0			1	15 A		Existing Load	4
5	Existing Load		15 A	1					0	0	1	15 A		Existing Load	6
7	Existing Load		15 A	1	0	0					1	15 A		Existing Load	8
9	Existing Load		15 A	1			0	0			1	15 A		Existing Load	10
11	Existing Load		15 A	1					0	0	1	15 A		Existing Load	12
13	Existing Load		15 A	1	0	0					1	15 A		Spare	14
15	Existing Load		15 A	1			0	0			1	15 A		Existing Load	16
17	Existing Load		15 A	1					0	0	1	15 A		Existing Load	18
19	Existing Load		15 A	1	0	0					1	15 A		Existing Load	20
21	Existing Load		15 A	1			0	0			1	15 A		Existing Load	22
23	Spare		15 A	1					0	0	1	15 A		Existing Load	24
25	Spare		30 A	2	0	0					1	20 A		Existing Load	26
27	--	--	--	--			0	0			1	20 A		Existing Load	28
29	LP2S1		100 A	3					0	0	1	20 A		Existing Load	30
31	--	--	--	--	0	0					1	20 A		Spare	32
33	--	--	--	--			0	0			1	20 A		Spare	34
35	Spare		20 A	1					0	0	1	20 A		Spare	36
37	Space		--	1	--	--					1	--		Space	38
39	Space		--	1			--	--			1	--		Space	40
41	Space		--	1					--	--	1	--		Space	42
				Total Load:	0 VA		0 VA		0 VA						
				Total Amps:	0 A		0 A		0 A						

Legend:

Load Classification	Connected Load	Demand Factor	Estimated Demand	Panel Totals	
				Total Conn. Load:	0 VA
				Total Est. Demand:	0 VA
				Total Conn. Current:	0 A
				Total Est. Demand Current:	0 A

Notes:

Branch Panel: LP-2N

Location: CORRIDOR C301B
Supply From: MDP
Mounting: Recessed
Enclosure: Type 1

Volts: 120/208 Wye
Phases: 3
Wires: 4

A.I.C. Rating:
Mains Type: MLO
Mains Rating: 225 A
MCB Rating:

Notes: (EXISTING PANEL)

CKT	Circuit Description	Wire & Conduit	Trip	Poles	A		B		C		Poles	Trip	Wire & Conduit	Circuit Description	CKT
1	Existing Load		15 A	1	0	0					1	15 A		Existing Load	2
3	Spare		15 A	1			0	0			1	15 A		Existing Load	4
5	Existing Load		15 A	1					0	0	1	15 A		Existing Load	6
7	Existing Load		15 A	1	0	0					1	15 A		Existing Load	8
9	Existing Load		15 A	1			0	0			1	15 A		Existing Load	10
11	Existing Load		15 A	1					0	0	1	15 A		Existing Load	12
13	Existing Load		15 A	1	0	0					1	15 A		Existing Load	14
15	Spare		15 A	1			0	0			1	15 A		Existing Load	16
17	Spare		15 A	1					0	0	1	15 A		Existing Load	18
19	Existing Load		15 A	1	0	0					1	15 A		Existing Load	20
21	Existing Load		15 A	1			0	0			1	15 A		Existing Load	22
23	Existing Load		15 A	1					0	0	1	15 A		Existing Load	24
25	Existing Load		15 A	1	0	0					1	15 A		Existing Load	26
27	Existing Load		15 A	1			0	0			1	15 A		Existing Load	28
29	Existing Load		15 A	1					0	0	1	15 A		Existing Load	30
31	Existing Load		15 A	1	0	0					3	20 A		Spare	32
33	Existing Load		15 A	1			0	0			--	--	--	--	34
35	Space		--	1					--	0	--	--	--	--	36
37	LP-2N1		100 A	3	52	0					3	100 A		Surge Suppressor	38
39	--	--	--	--			1625	0			--	--	--	--	40
41	--	--	--	--					0	0	--	--	--	--	42
				Total Load:	52 VA		1625 VA		0 VA						
				Total Amps:	1 A		14 A		0 A						

Legend:

Load Classification	Connected Load	Demand Factor	Estimated Demand	Panel Totals	
Lighting	178 VA	125.00%	222 VA		
Other	0 VA	0.00%	0 VA	**Total Conn. Load:**	1678 VA
Power	1500 VA	100.00%	1500 VA	**Total Est. Demand:**	1722 VA
				Total Conn. Current:	5 A
				Total Est. Demand Current:	5 A

Notes:

Branch Panel: LP-E2

Location: CUST. CS2-01
Supply From: DP-E2
Mounting: Surface
Enclosure: Type 1

Volts: 120/208 Wye
Phases: 3
Wires: 4

A.I.C. Rating:
Mains Type:
Mains Rating: 100 A
MCB Rating: 1 A

Notes:

CKT	Circuit Description	Wire & Conduit	Trip	Poles	A		B		C		Poles	Trip	Wire & Conduit	Circuit Description	CKT
1	Lighting (2nd Flr. Media)		15 A	1	400	1047					1	15 A		Lighting (1st Flr. B & C)	2
3	Lighting (3rd Floor)		15 A	1			564	643			1	15 A		Lighting (2nd Floor)	4
5	Nitrogen Generator		20 A	1					1200	460	1	15 A		Lighting (1st Flr. B & C)	6
7	Spare		20 A	1	0										8
9	Spare		20 A	1			0								10
11	Spare		20 A	1					0						12
				Total Load:	1447 VA		1207 VA		1660 VA						
				Total Amps:	12 A		10 A		14 A						

Legend:

Load Classification	Connected Load	Demand Factor	Estimated Demand	Panel Totals	
Lighting	1980 VA	125.00%	2475 VA		
Other	1134 VA	101.37%	1150 VA	**Total Conn. Load:**	4314 VA
Power	1200 VA	100.00%	1200 VA	**Total Est. Demand:**	4825 VA
				Total Conn. Current:	12 A
				Total Est. Demand Current:	13 A

Notes:

Branch Panel: LP2S1

Location: CORRIDOR C301B
Supply From: LP-2S
Mounting: Recessed
Enclosure: Type 1

Volts: 120/208 Wye
Phases: 3
Wires: 4

A.I.C. Rating:
Mains Type: MLO
Mains Rating: 100 A
MCB Rating:

Notes: (EXISTING PANEL)

CKT	Circuit Description	Wire & Conduit	Trip	Poles	A		B		C		Poles	Trip	Wire & Conduit	Circuit Description	CKT
1	Existing Load		20 A	1	0	0					1	20 A		Existing Load	2
3	Existing Load		20 A	1			0	0			1	20 A		Existing Load	4
5	Existing Load		20 A	1					0	0	1	20 A		Existing Load	6
7	Existing Load		20 A	1	0	0					1	20 A		Existing Load	8
9	Existing Load		20 A	1			0	0			1	20 A		Existing Load	10
11	Existing Load		20 A	1					0	0	1	20 A		Existing Load	12
13	Existing Load		20 A	1	0	0					1	20 A		Existing Load	14
15	Existing Load		20 A	1			0	0			1	20 A		Existing Load	16
17	Existing Load		20 A	1					0	0	1	20 A		Spare	18
19	Spare		30 A	2	0	0					2	30 A		Spare	20
21	--	--	--	--			0	0			--	--	--	--	22
23	Spare		30 A	2					0	0	2	30 A		Spare	24
25	--	--	--	--	0	0					--	--	--	--	26
27	Existing Load		20 A	1			0	0			3	100 A		Surge Suppressor	28
29	Space		--	1					--	0	--	--	--	--	30
31	Space		--	1	--	0					--	--	--	--	32
33	Space		--	1			--	--			1	--		Space	34
35	Space		--	1					--	--	1	--		Space	36
37	Space		--	1	--	--					1	--		Space	38
39	Space		--	1			--	--			1	--		Space	40
41	Space		--	1					--	--	1	--		Space	42
				Total Load:	0 VA		0 VA		0 VA						
				Total Amps:	0 A		0 A		0 A						

Legend:

Load Classification	Connected Load	Demand Factor	Estimated Demand	Panel Totals	
				Total Conn. Load:	0 VA
				Total Est. Demand:	0 VA
				Total Conn. Current:	0 A
				Total Est. Demand Current:	0 A

Notes:

Branch Panel: LP-2N1

Location: CORRIDOR C301B
Supply From: LP-2N
Mounting: Recessed
Enclosure: Type 1

Volts: 120/208 Wye
Phases: 3
Wires: 4

A.I.C. Rating:
Mains Type: MLO
Mains Rating: 100 A
MCB Rating:

Notes:

CKT	Circuit Description	Wire & Conduit	Trip	Poles	A		B		C		Poles	Trip	Wire & Conduit	Circuit Description	CKT
1	Existing Load		20 A	1	0	0					1	20 A		Existing Load	2
3	Existing Load		20 A	1			0	0			1	20 A		Existing Load	4
5	Existing Load		20 A	1					0	0	1	20 A		Existing Load	6
7	Existing Load		20 A	1	0	0					1	20 A		Existing Load	8
9	Lights & Recpt. (Attic)		20 A	1			485	0			1	20 A		Existing Load	10
11	Existing Load		20 A	1					0	0	1	20 A		Existing Load	12
13	Existing Load		20 A	1	0	0					1	20 A		Existing Load	14
15	Existing Load		20 A	1			0	0			1	20 A		Existing Load	16
17	Existing Load		20 A	1					0	0	1	20 A		Existing Load	18
19	Existing Load		20 A	1	0	52					1	20 A		Lights (Elev. Shaft)	20
21	Recept. (Elev. Shaft)		20 A	1			180	960			1	20 A		Recept. & EWC	22
23															24
25	Existing Load		20 A	1	0										26
27	Existing Load		20 A	1			0								28
29															30
31							0				1	20 A		Existing Load	32
33								0			1	20 A		Existing Load	34
35															36
37															38
39								0			1	20 A		Existing Load	40
41	Existing Load		20 A	1					0	0	1	20 A		Existing Load	42
				Total Load:	52 VA		1625 VA		0 VA						
				Total Amps:	1 A		14 A		0 A						

Legend:

Load Classification	Connected Load	Demand Factor	Estimated Demand	Panel Totals	
Lighting	178 VA	125.00%	222 VA		
Other	0 VA	0.00%	0 VA	**Total Conn. Load:**	1678 VA
Power	1500 VA	100.00%	1500 VA	**Total Est. Demand:**	1722 VA
				Total Conn. Current:	5 A
				Total Est. Demand Current:	5 A

Notes:

Project Title:

ADDITION & ALTERATIONS TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
311 STATE STREET NEW LONDON CT 06320
203 230 9007 silverpetrucelli.com

Revision: | Description: | Date: | Revised By:

Drawing Title:
ELECTRICAL PANEL SCHEDULES - THIRD FLOOR

Date: 8/29/2024
Scale:
Drawn By: S. CROTEAU
Project Number: 22.382
Drawing Number: E505

8/29/2024 1:46:20 PM

Branch Panel: SPP-2

Location: CORRIDOR C110C
Supply From: DP-S2
Mounting: Recessed
Enclosure: Type 1

Volts: 120/208 Wye
Phases: 3
Wires: 4

A.I.C. Rating:
Mains Type: MLO
Mains Rating: 100 A
MCB Rating:

Notes:

CKT	Circuit Description	Wire & Conduit	Trip	Poles	A		B		C		Poles	Trip	Wire & Conduit	Circuit Description	CKT
1	Lighting		15 A	1	382	900					1	20 A		Receptacles	2
3	Lighting		15 A	1			544	900			1	20 A		Receptacles	4
5	Lighting		15 A	1					408	900	1	20 A		Receptacles	6
7	Receptacles		20 A	1	540	900					1	20 A		Receptacles	8
9	Receptacles		20 A	1			900	540			1	20 A		Receptacles	10
11	Receptacles		20 A	1					720	780	1	20 A		Receptacles	12
13	J.B (POD)		20 A	1	300	720					1	20 A		Power	14
15															16
17															18
19															20
21															22
23															24
25															26
27															28
29															30
31															32
33															34
35															36
37															38
39															40
41															42
			Total Load:		3742 VA		2884 VA		2808 VA						
			Total Amps:		31 A		24 A		23 A						

Legend:

Load Classification	Connected Load	Demand Factor	Estimated Demand	Panel Totals	
Lighting	1334 VA	125.00%	1668 VA		
Power	8100 VA	100.00%	8100 VA	**Total Conn. Load:**	9434 VA
				Total Est. Demand:	9768 VA
				Total Conn. Current:	26 A
				Total Est. Demand Current:	27 A

Notes:

Branch Panel: SPP-H1

Location: CORRIDOR C301B
Supply From:
Mounting: Recessed
Enclosure: Type 1

Volts: 480/277 Wye
Phases: 3
Wires: 4

A.I.C. Rating:
Mains Type:
Mains Rating: 100 A
MCB Rating:

Notes:

CKT	Circuit Description	Wire & Conduit	Trip	Poles	A		B		C		Poles	Trip	Wire & Conduit	Circuit Description	CKT
1	AHU-2		15 A	3	1385	997					3	15 A		AHU-3	2
3	--	--	--	--			1385	997			--	--	--	--	4
5	--	--	--	--					1385	997	--	--	--	--	6
7	ahu-4		15 A	3	1002										8
9	--	--	--	--			1002								10
11	--	--	--	--					1002						12
13															14
15															16
17															18
19															20
21															22
23															24
			Total Load:		3384 VA		3384 VA		3384 VA						
			Total Amps:		12 A		12 A		12 A						

Legend:

Load Classification	Connected Load	Demand Factor	Estimated Demand	Panel Totals	
Power	10153 VA	100.00%	10153 VA		
				Total Conn. Load:	10153 VA
				Total Est. Demand:	10153 VA
				Total Conn. Current:	12 A
				Total Est. Demand Current:	12 A

Notes:

Branch Panel: SPP-1

Location: STAGE 1009A
Supply From: DP-S2
Mounting: Surface
Enclosure: Type 1

Volts: 120/208 Wye
Phases: 3
Wires: 4

A.I.C. Rating:
Mains Type: MLO
Mains Rating: 400 A
MCB Rating: 1 A

Notes:

CKT	Circuit Description	Wire & Conduit	Trip	Poles	A		B		C		Poles	Trip	Wire & Conduit	Circuit Description	CKT
1	Receptacles (Wing A)		20 A	1	540	540					1	20 A		Receptacles (Wing A)	2
3	Receptacles (Wing A)		20 A	1			540	540			1	20 A		Receptacles (Wing A)	4
5	Receptacles (Wing A)		20 A	1					540	600	1	20 A		JB - POD (Wing A)	6
7	Lighting (Wing D)		15 A	1	491	0					2	60 A		SKP	8
9	Lighting (Wing D)		15 A	1			535	0			--	--	--	--	10
11	Receptacles (Wing D)		20 A	1					720	720	1	20 A		Receptacles (Wing D)	12
13	Receptacles (Wing D)		20 A	1	720	720					1	20 A		Receptacles (Wing D)	14
15	CU-1		15 A	2			495	2292			3	30 A		CU-3	16
17	--	--	--	--					495	2292	--	--	--	--	18
19	CU-9		30 A	3	2443	2292					--	--	--	--	20
21	--	--	--	--			2443	2443			3	30 A		CU-5	22
23	--	--	--	--					2443	2443	--	--	--	--	24
25	CU-10		30 A	3	2443	2443					--	--	--	--	26
27	--	--	--	--			2443	2292			3	30 A		CU-8	28
29	--	--	--	--					2443	2292	--	--	--	--	30
31	CU-11		30 A	3	2443	2292					--	--	--	--	32
33	--	--	--	--			2443	5160			3	60 A		CU-AHU-1	34
35	--	--	--	--					2443	5160	--	--	--	--	36
37	Lighting (Wing A)		15 A	1	510	5160					--	--	--	--	38
39	Recept. (L6-30R)		30 A	2			540	460			1	15 A		Lighting (Wing A)	40
41	--	--	--	--					540	416	1	15 A		Lighting (Wing A)	42
43	Recept. (I.T. Clos.)		20 A	1	360	360					1	20 A		Recept. (I.T. Clos.)	44
45	Recept. (I.T. Clos.)		20 A	1			360	360			1	20 A		Recept. (I.T. Clos.)	46
47	CU-7		70 A	3					5640	5640	3	70 A		CU-6	48
49	--	--	--	--	5640	5640					--	--	--	--	50
51	--	--	--	--			5640	5640			--	--	--	--	52
53															54
55															56
57															58
59															60
			Total Load:		35037 VA		34626 VA		34827 VA						
			Total Amps:		292 A		289 A		290 A						

Legend:

Load Classification	Connected Load	Demand Factor	Estimated Demand	Panel Totals	
Lighting	1580 VA	125.00%	1975 VA		
Other	832 VA	100.63%	837 VA	**Total Conn. Load:**	104490 VA
Power	102078 VA	100.00%	102078 VA	**Total Est. Demand:**	104890 VA
				Total Conn. Current:	290 A
				Total Est. Demand Current:	291 A

Notes:

Branch Panel: RP-SW

Location: STORAGE 1049D
Supply From: SWBD-2
Mounting: Surface
Enclosure: Type 1

Volts: 120/208 Wye
Phases: 3
Wires: 4

A.I.C. Rating:
Mains Type: MLO
Mains Rating: 100 A
MCB Rating: 1 A

Notes:

CKT	Circuit Description	Wire & Conduit	Trip	Poles	A		B		C		Poles	Trip	Wire & Conduit	Circuit Description	CKT
1	Lights		15 A	1	549	549					1	15 A		Lights	2
3	Receptacles		20 A	1			720	540			1	20 A		Receptacles	4
5	Receptacles		20 A	1					720	720	1	20 A		Receptacles	6
7	Receptacles		20 A	1	540	720					1	20 A		Receptacles	8
9	Receptacles		20 A	1			720	720			1	20 A		Receptacles	10
11	Receptacles		20 A	1					720	720	1	20 A		Receptacles	12
13	Receptacles		20 A	1	1080	800					1	20 A		J.B. (2) POD's	14
15	EF-12, 14, 15 & 16		20 A	1			472	390			1	15 A		Lighting	16
17	Lighting (Cove Lights)		15 A	1					546						18
19															20
21															22
23															24
25															26
27															28
29															30
			Total Load:		4238 VA		3562 VA		3426 VA						
			Total Amps:		35 A		30 A		29 A						

Legend:

Load Classification	Connected Load	Demand Factor	Estimated Demand	Panel Totals	
Lighting	1202 VA	125.00%	1502 VA		
Other	1304 VA	102.26%	1334 VA	**Total Conn. Load:**	11226 VA
Power	8720 VA	100.00%	8720 VA	**Total Est. Demand:**	11556 VA
				Total Conn. Current:	31 A
				Total Est. Demand Current:	32 A

Notes:

Project Title:

ADDITION & ALTERATIONS TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
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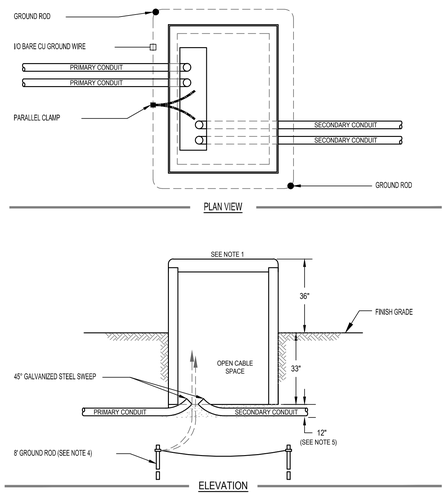
203 230 9007 silverpetrucelli.com

Revision: Description: Date: Revised By:

Drawing Title:
ELECTRICAL PANEL SCHEDULES - PART 'A' THRU 'D'

Date: 8/29/2024
Scale:
Drawn By: S. CROTEAU
Project Number: 22.382
Drawing Number: E506

8/29/2024 1:46:33 PM

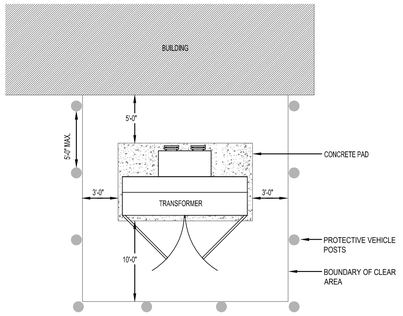


NOTES:

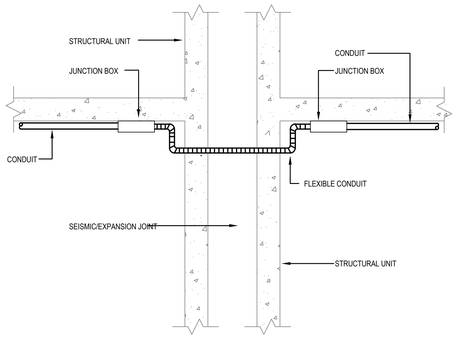
1. 75-300 KVA: INSTALL 76" X 54" X 36" PAD PER SPC P-05, P-06.

   500-1500 KVA: INSTALL 76" X 70" X 36" PAD PER SPC P-07, P-08.
2. PRIMARY CABLE:
   A. INSTALL CABLES IN CONDUIT A MINIMUM OF 30" BELOW GRADE
   B. LOOP CABLES IN CABLE VAULT BEFORE MAKING CONNECTIONS.
3. SECONDARY CABLE:
   LEAVE SLACK FOR FUTURE RECONNECTING TO TRANSFORMERS WITH HIGHER SECONDARY TERMINALS.
4. COPPERWELD GROUND RODS: INSTALL IN TRENCH AND CONNECT A BARE I/O COPPER CONDUCTOR FROM RODS THROUGH PAD OPENING AND EXTENDING 5 FT. ABOVE PAD.
5. THE EXCAVATION FOR THE PAD SHALL BE CARRIED TO A DEPTH OF 12" BELOW THE BOTTOM OF THE PAD WALLS. THE BACKFILL UNDER THE PAD WALLS SHALL BE A CLEAN GRAVEL, FREE OF FOREIGN MATTER AND CONSTRUCTION DEBRIS, AND IN ACCORDANCE WITH CONN D.O.T. SPEC. M.02.06 GRADING "A". BACKFILL SHALL BE PLACED IN 6" LAYERS AND COMPACTED WITH MECHANICAL TAMPERS TO NOT LESS THAN 95% OF THE MAXIMUM DRY DENSITY AS DETERMINED BY STANDARD COMPACTION TESTS, AASHTO T180 OR ASTM D698.

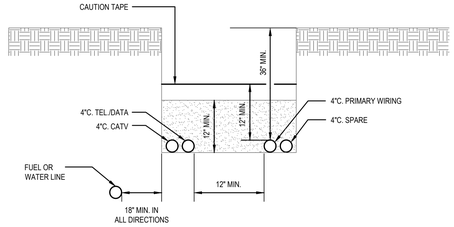
8 PRECAST CONCRETE TRANSFORMER PAD DETAIL
NOT TO SCALE



6 TYPICAL PA MOUNTED TRANSFORMER DETAIL
NOT TO SCALE



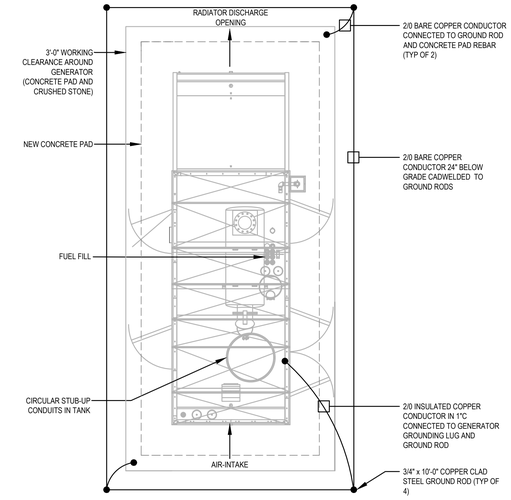
5 EXPANSION/SEISMIC JOINT FITTING DETAIL
NOT TO SCALE



INSTALLATION IN TRENCH
- ALL CONDUIT SHALL BE INSTALLED AT A DEPTH OF AT LEAST 40" IN THE FOLLOWING ORDER:

1. ENSURE THAT THE BOTTOM OF THE TRENCH IS WELL-TAMPED AND FREE OF ROCKS.
2. INSTALL THE CONDUIT,
3. INSTALL OTHER UTILITY CABLES OR CONDUITS IN THE TRENCH.
4. BACKFILL WITH 12 INCHES OF SAND.
5. INSTALL CABLE WARNING TAPE 12 INCHES OVER THE CONDUIT.
6. FILL IN THE REMAINDER OF THE TRENCH WITH NATIVE BACKFILL.

3 TRENCH DETAIL
NOT TO SCALE

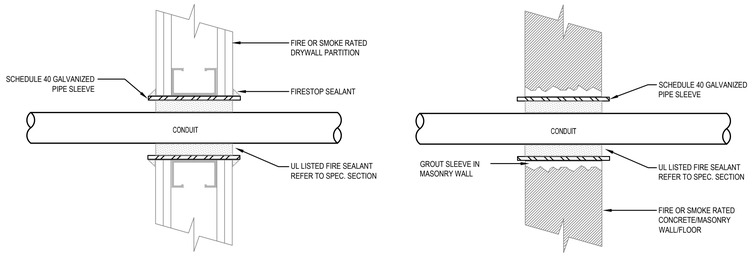


2 GENERATOR GROUNDING DETAIL
NOT TO SCALE

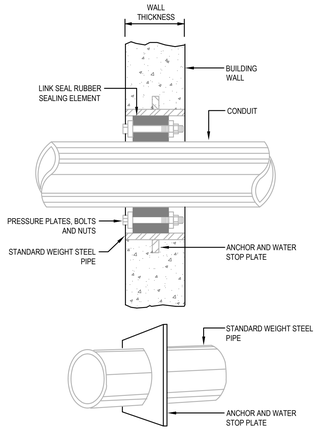
GENERAL NOTES:

PROVIDE UL LISTED FIRE/SMOKE PENETRATION ASSEMBLY IN ACCORDANCE W/ UL1479, ASTM E814 REQUIREMENTS FOR WALL TYPE, RATING, PIPE SIZE INSTALLED.

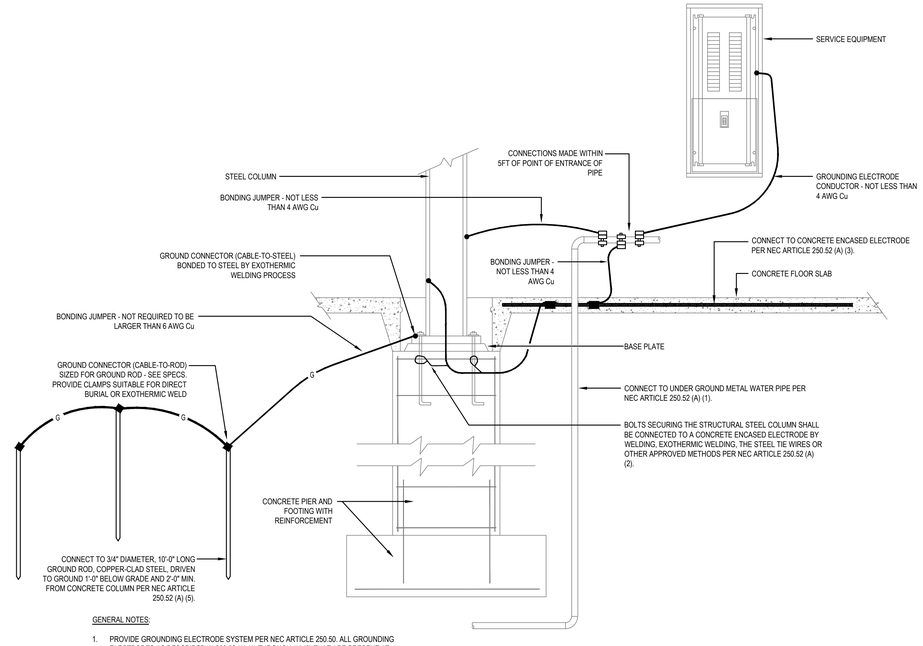
FIRE STOPPING SHALL HAVE A RATING EQUAL TO OR GREATER THAN THE WALL/FLOOR BEING PENETRATED - SEE SPECIFICATIONS. REFER TO ARCHITECTURAL DRAWINGS FOR WALL/FLOOR RATINGS AND LOCATIONS.



7 WALL/FLOOR PENETRATION W/FIRE-SMOKE SEAL DETAIL
NOT TO SCALE



4 WATER-TIGHT WALL SLEEVE DETAIL
NOT TO SCALE



GENERAL NOTES:

1. PROVIDE GROUNDING ELECTRODE SYSTEM PER NEC ARTICLE 250.50. ALL GROUNDING ELECTRODES AS DESCRIBED IN 250.52 (A) (1) THROUGH (A) (7) THAT ARE PRESENT AT EACH BUILDING OR STRUCTURE SERVED SHALL BE BONDED TOGETHER TO FORM THE GROUNDING ELECTRODE SYSTEM.

1 TYPICAL SERVICE GROUNDING DETAIL
NOT TO SCALE

Project Title:

ADDITION & ALTERATIONS TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
311 STATE STREET NEW LONDON CT 06320
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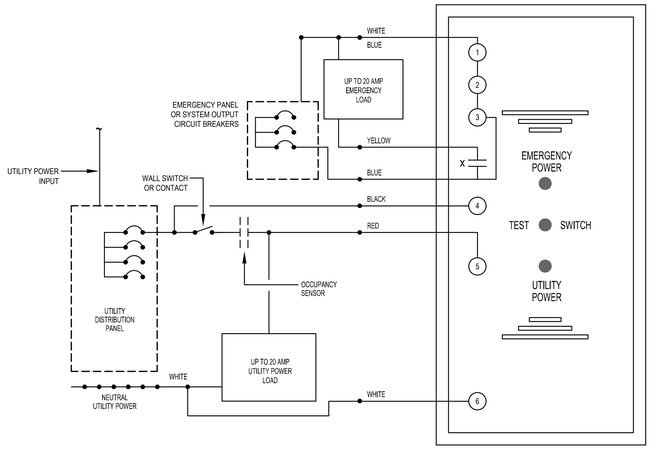
Revision:	Description:	Date:	Revised By:

Drawing Title: ELECTRICAL DETAILS

Date: 08/29/2024
Scale: AS NOTED
Drawn By: S. CROTEAU
Project Number: 22.382

Drawing Number: E601

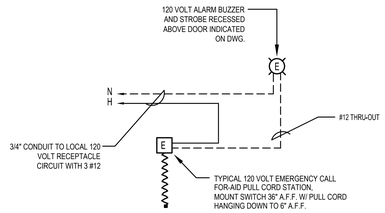


CONTRACTOR SHALL CONFIRM LOAD SERVED BY RELAY (DIMMING VS. SWITCHED) AND FURNISH THE APPROPRIATE RELAY

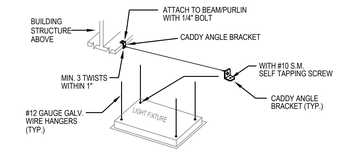
BY-PASS RELAY NOTES

1. CIRCUIT # 1 2 3 MONITOR THE 24 HOUR EMERGENCY PANEL POWER, ANY INTERRUPTION OF THE EMERGENCY POWER WILL GENERATE AN AUDIBLE ALARM AT THE EPC DEVICE (BY LVS).
2. CIRCUIT # 2 3 MONITORS UTILITY POWER AND PROVIDES POWER TO THE AUDIBLE DEVICE. ANY INTERRUPTION WILL CLOSE CONTACT X.
3. CIRCUIT # 3 SENSES WHEN ROOM SWITCH IS ON AND THEN CLOSES CONTACT X, PROVIDING POWER TO THE EMERGENCY LOAD.

10 BY-PASS RELAY WIRING DIAGRAM
NOT TO SCALE



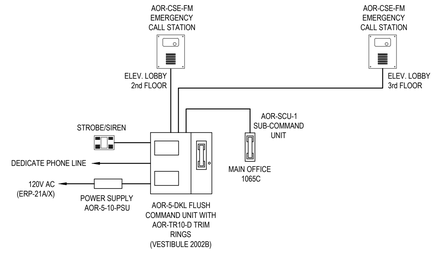
8 HANDICAP CALL-FOR-AID SYSTEM
NOT TO SCALE



NOTES:

1. ALL LIGHTING FIXTURES SHALL BE SECURED TO THE STRUCTURE BY THE ELECTRICAL CONTRACTOR.
2. FLUSH OR RECESSED LIGHT FIXTURES LESS THAN 56 POUNDS SHALL HAVE 2 - 12 GA. SLACK SAFETY WIRES FROM DIAGONAL CORNERS TO BUILDING STRUCTURE BY TRADE CONTRACTOR.
3. FLUSH OR RECESSED LIGHT FIXTURES MORE THAN 56 POUNDS SHALL HAVE 4 - 12 GA. SLACK SAFETY WIRES FROM DIAGONAL CORNERS TO BUILDING STRUCTURE BY TRADE CONTRACTOR.
4. SECURE SURFACE MOUNTED LIGHT FIXTURES W/ MINIMUM OF 2 - POSITIVE CLAMPING DEVICES OF 14 GA. MINIMUM STEEL AND W/ 12 GA. WIRE TO BUILDING STRUCTURE.

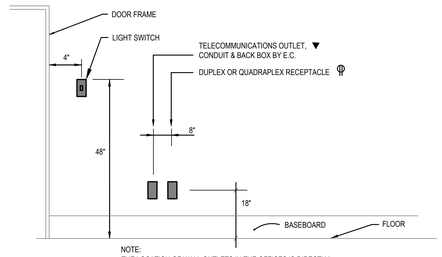
6 TYPICAL LAY-IN GRID LIGHT FIXTURE SUPPORT/MOUNTING DETAIL
NOT TO SCALE



NOTES:

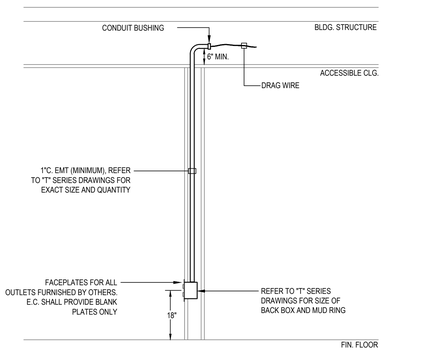
1. REFER TO PLANS AND SPECIFICATIONS FOR QUANTITIES AND LOCATIONS OF DEVICES.
2. MANUFACTURED BY TALK-A-PHONE OR EQUAL
3. WHEN ACTIVATED, SYSTEM SHALL REPORT TO THE LOCAL COMMAND UNIT, IF NOT ANSWERED IT WILL ROLL OVER TO THE MAIN OFFICE, AND THEN IF NOT ANSWERED ON TO OFF SITE SUPERVISED 24/7 FACILITY.

3 ELEVATOR 2-WAY COMMUNICATION WIRING DIAGRAM
NOT TO SCALE

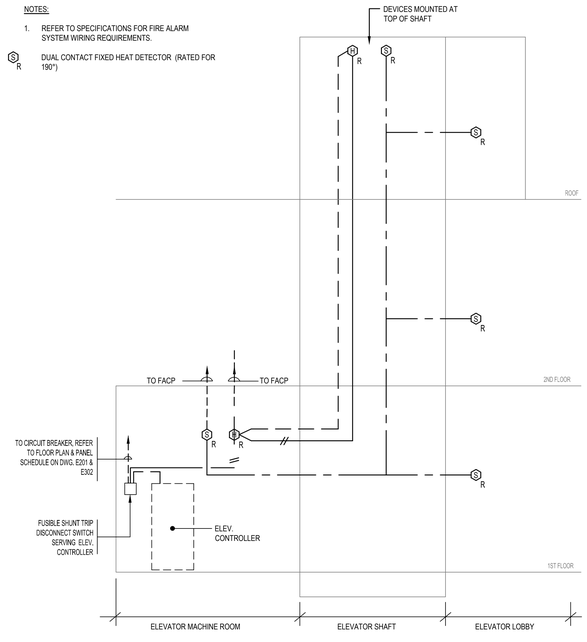


NOTE:
THE LOCATION OF WALL OUTLETS IN THE OFFICES IS DIRECTLY RELATED TO THE FURNITURE LOCATION. SPECIAL ATTENTION SHALL BE GIVEN TO LOCATING OUTLETS PER THIS DETAIL. DO NOT INSTALL OUTLETS BACK TO BACK.

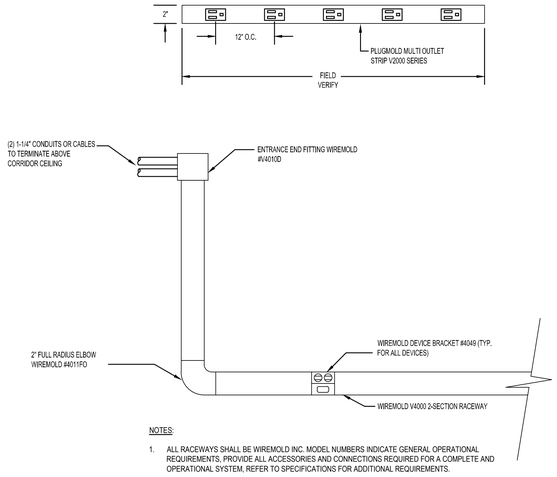
5 OUTLET MOUNTING DETAIL
NOT TO SCALE (TYPICAL FOR ALL OUTLETS UNLESS OTHERWISE NOTED)



2 VOICE/DATA/AV OUTLET INSTALLATION DETAIL
NOT TO SCALE



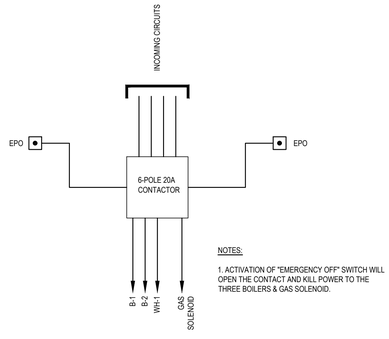
9 ELEVATOR SERVICE SHUNT-TRIP CONTROL DIAGRAM
NOT TO SCALE



NOTES:

1. ALL RACEWAYS SHALL BE WIREMOLD INC. MODEL NUMBERS INDICATE GENERAL OPERATIONAL REQUIREMENTS, PROVIDE ALL ACCESSORIES AND CONNECTIONS REQUIRED FOR A COMPLETE AND OPERATIONAL SYSTEM, REFER TO SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS.
2. REFER TO PLANS FOR QUANTITY OF DEVICES AND LENGTH OF RACEWAY.
3. COORDINATE WITH ARCHITECT FOR MOUNTING HEIGHT AND LOCATION PRIOR TO INSTALLATION.
4. CONTRACTOR SHALL WIRE (12) SIMPLEX RECEPTACLES OR (6) DUPLEX RECEPTACLES MAX PER 120V-20A CIRCUIT.

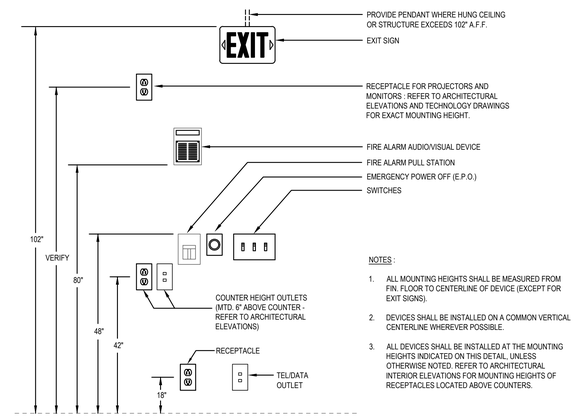
7 TYPICAL SURFACE RACEWAY DETAIL (SINGLE & MULTI SERVICE)
NOT TO SCALE



NOTES:

1. ACTIVATION OF "EMERGENCY OFF" SWITCH WILL OPEN THE CONTACT AND KILL POWER TO THE THREE BOILERS & GAS SOLENOID.

4 BOILER ROOM E.P.O. WIRING DIAGRAM
NOT TO SCALE



NOTES :

1. ALL MOUNTING HEIGHTS SHALL BE MEASURED FROM FIN. FLOOR TO CENTERLINE OF DEVICE (EXCEPT FOR EXIT SIGNS).
2. DEVICES SHALL BE INSTALLED ON A COMMON VERTICAL CENTERLINE WHEREVER POSSIBLE.
3. ALL DEVICES SHALL BE INSTALLED AT THE MOUNTING HEIGHTS INDICATED ON THIS DETAIL, UNLESS OTHERWISE NOTED. REFER TO ARCHITECTURAL INTERIOR ELEVATIONS FOR MOUNTING HEIGHTS OF RECEPTACLES LOCATED ABOVE COUNTERS.

1 TYPICAL DEVICE MOUNTING HEIGHT DETAIL
NOT TO SCALE

Project Title:

ADDITION & ALTERATIONS TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
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Revision:	Description:	Date:	Revised By:

Drawing Title: ELECTRICAL DETAILS

Date: 08/29/2024
Scale: AS NOTED
Drawn By: S. CROTEAU
Project Number: 22.382

Drawing Number: E602

COMMUNICATION CABLING INFRASTRUCTURE

REFER TO SPECIFICATION SECTION 27 1000 FOR DEVICES

SYMBOL	DESCRIPTION	OUTLET BOX & CONDUIT SIZES PROVIDED & INSTALLED BY ELECTRICAL CONTRACTOR: MOUNTING AFF UNLESS OTHERWISE NOTED	1 G - 2-1/2" DP	4 x 4" x 2-1/8" DP	1G DEVICE RING	1" C	CHIEF #PAC525FCW	LEGRAND #EFSB4		CABLE & TERMINATION PROVIDED & INSTALLED BY LOW VOLTAGE CONTRACTOR: CAT6A PLENUM CABLE	8P8C (RJ45) JACK - CAT6A	FACEPLATE - DATA	WALL PHONE MTG PLATE	HUBBELL #HS82WP	CAT6A SHIELDED PLENUM CABLE	8P8C (RJ45) JACK - CAT6A SHIELDED		COMMMENTS
W	WALL PHONE OUTLET	48" AFF	1		1	1				1	1		1					
1D	1 DATA OUTLET	18" AFF		1	1	1				1	1	1						
2D	2 DATA OUTLET	18" AFF		1	1	1				2	2	1						
3D	3 DATA OUTLET	18" AFF		1	1	1				3	3	1						
4D	4 DATA OUTLET	18" AFF		1	1	1				4	4	1						
1V1D	1 VOICE - 1 DATA OUTLET	18" AFF		1	1	1				2	2	1						
1V2D	1 VOICE - 2 DATA OUTLET	18" AFF		1	1	1				3	3	1						
2V2D	2 VOICE - 2 DATA OUTLET	18" AFF		1	1	1				4	4	1						
1V	1 VOICE OUTLET	18" AFF		1	1	1				1	1	1						
#V #D	FLOOR BOX						A/R			A/R	A/R	1						REFER TO ELECTRICAL DRAWINGS FOR FLOOR BOX CONDUIT REQUIREMENTS. # - DENOTES QTY OF CABLES
#V #D	CEILING MOUNTED BOX			1	1	A/R				A/R	A/R	1						CEILING MOUNTED DEVICES. # - DENOTES QTY OF CABLES
AP	WIRELESS ACCESS POINT CEILING MOUNTED													1	2	2		CEILING MOUNTED AP SHALL HAVE A 15FT SERVICE LOOP AND LOCATED AT APPROXIMATE LOCATIONS SHOWN ON PLANS. REFER TO DETAILS FOR ADDITIONAL INFORMATION. APS SHALL TERMINATE ONTO CAT6A SHIELDED JACKS ON DISCRETE 19" PATCH PANELS WITHIN THE DATA ROOMS.
AP	WIRELESS ACCESS POINT WALL MOUNTED		1		1	1								1	2	2		
	ETHERNET CABLE FOR CAMERA			1	1					1	1			1				INCLUDE 10 FT SERVICE LOOP FOR CABLING. CONFIRM NO OBSTRUCTIONS BLOCK THE INTENDED CAMERA FIELD OF VIEW PRIOR TO INSTALLATION OF CABLING, WHICH MAY INCLUDE SIGNAGE, PENDANT LIGHTS, SPEAKERS, TREES, OR ANY OTHER OBSTRUCTIONS IN THE IMMEDIATE FIELD OF VIEW. BRING ALL FIELD OF VIEW OBSTRUCTIONS TO THE ATTENTION OF THE SECURITY CONSULTANT.
	ETHERNET CABLE FOR CAMERA			1	1					1	1			1				
	ETHERNET CABLE FOR CAMERA			1	1					1	1			1				

PUBLIC ADDRESS & CLOCKS

REFER TO SPECIFICATION 27 5116 FOR PA DEVICES & 27 5313 OF CLOCK DEVICES

SYMBOL	DESCRIPTION	OUTLET BOX & CONDUIT SIZES PROVIDED & INSTALLED BY ELECTRICAL CONTRACTOR: MOUNTING AFF UNLESS OTHERWISE NOTED	2G - 2-1/2" DP	1G - DEVICE RING	3/4" C	CABLING PROVIDED & INSTALLED BY PA CONTRACTOR: PLENUM RATED CABLE A/R				COMMMENTS
S VC	PA SPEAKER W/BUILT-IN VOLUME CONTROLS					1				VERIFY COLOR WITH ARCHITECT
S	PA SPEAKER - 8" DIAMETER					1				
S 2x2	CLASSROOM SPEAKER 2' X 2' TILE					1				
S	PA WALL MOUNTED BOX SPEAKER		1		1	1				
VC	PA VOLUME CONTROL	48" AFF	1	1	1	1				VOLUME CONTROL SHALL CONTROL THE SPEAKERS SHOWN WITHIN THE SAME ROOM. CONFIRM COLOR WITH ARCHITECT.
PA	PA MASTER HANDSET BOGEN #MCDS4					1				INCLUDE CABLING A/R, DATA JACK, & FACEPLATE FOR CABLING.
CS	PA CALL SWITCH	48" AFF	1	1	1	1				CS SHALL ACTIVATE 2-WAY CONVERSATIONS BETWEEN CLASSROOM SPEAKERS AND MAIN OFFICE. CABLING A/R
H	PA HORN SPEAKER		1		1	1				SECURE HORNS TO STRUCTURE. EXTERIOR HORNS SHALL RECEIVE PROPER WEATHER PROOFING ASSEMBLY.
PSB	PA STROBE	108" AFF	1	1	1	1				
PS	PA PENDANT SPEAKER		1		1	1				
	CLOCK - ALL CLOCKS ARE 12" DIA. CLOCKS NOTED AS 16 ARE TO BE 16" DIA. CLOCKS	96" AFF								REFER TO ARCHITECTURAL PLAN FOR MOUNTING HEIGHT.

SECURITY

REFER TO SPECIFICATION 28 1300 FOR DEVICES

SYMBOL	DESCRIPTION	OUTLET BOX & CONDUIT SIZES PROVIDED & INSTALLED BY ELECTRICAL CONTRACTOR: MOUNTING AFF UNLESS OTHERWISE NOTED	1G - 2-1/2" DP	4 x 4" x 2-1/8" DP	1G DEVICE RING	2G DEVICE RING	3/4" C	1" C	1/2" FLEX	SURFACE MOUNTED BOX	CABLING PROVIDED & INSTALLED BY SECURITY CONTRACTOR (ALL CABLING TO BE PLENUM RATED): CAT 6A - CABLE TO NETWORK	CAT 6A - 5 ft. LONG PATCH CORD / CABLE	CAT 6A - 5 ft. LONG PATCH CORD / CABLE	#22 - 2C	#22 - 4C	#18 - 4C	#18 - 6C	#18 - 6C SHLD	PLENUM CABLE A/R	BELDEN #6584FJ COMPOSITE CABLE - FIRE RATED 18-6C SHLD, 22-2C, 22-4C, 18-4C	COMMMENTS
	FIXED DOME CAMERA - WALL MTG	As Noted											1								REFER TO CAMERA SCHEDULE FOR ADDITIONAL INFORMATION.
	FIXED DOME CAMERA - CEILING MTG - INTERIOR												1								REFER TO CAMERA SCHEDULE FOR ADDITIONAL INFORMATION.
	MULTI-SENSOR CAMERA	As Noted											1								REFER TO CAMERA SCHEDULE FOR ADDITIONAL INFORMATION.
CR	ACCESS CONTROL CARD READER HID MULTICLASS SE #RP10 of SE #RP40	46" AFF		1														1			
DC	DOOR POSITION SWITCH								1						1						SPECIFIED IN DIV 08 0671. DPS SHALL BE DPDT SHOWN ON THESE PLANS FOR FINAL CABLING CONNECTIONS.
JB	JUNCTION BOX			1				1	A/R											1	REFER TO DETALS FOR OUTLET AND CONDUIT INSTALLATION.
EL STK	ELECTRIC DOOR HARDWARE															1					SPECIFIED IN DIV 08 0671. SHOWN ON THESE PLANS FOR FINAL CABLING CONNECTIONS.
PS	POWER SUPPLY FOR DOOR HARDWARE															1					SPECIFIED IN DIV 08 0671. SHOWN ON THESE PLANS FOR FINAL CABLING CONNECTIONS.
ICD	VIDEO INTERCOM DOOR STATION	46" AFF		1				1			1								1		INTERCOM DOOR RELEASE SHALL RELEASE LOCKED DOOR FROM THE ACCESS CONTROL PANEL.
ICM	VIDEO MASTER STATION - INTERCOM - DOOR RELEASE										1										CONTRACTOR TO CONFIRM ROUTING OF ICD TO ICM'S, AND ROLLOVER, FROM THE OWNER PRIOR TO CONFIGURATION.
KPD	INTRUSION DETECTION KEYPAD	48" AFF		1		1												1			
M	MOTION SENSOR, CEILING MOUNTED - 360 DEGREE			1		1											1				
M	MOTION SENSOR - CORNER / WALL MOUNT	108" AFF		1		1											1				
DB	DURESS BUTTON SENTROL UL RATED #3050	*	1		1			1	1								2				* MOUNT BELOW DESKS. REFER TO DETAILS FOR ADDITIONAL INFORMATION. COORDINATE WITH FURNITURE INSTALLATION.
LD	EMERGENCY LOCK DOWN BUTTON	48" AFF	1			1											2				STI BOX SHALL BE GREEN - CUSTOM LABEL "LOCKDOWN". CONFIRM LOCATION WITH CONSULTANT PRIOR TO INSTALLATION.
DR	DOOR RELEASE BUTTON - DORTRONICS #5276-HD29 1 GANG, FSR #DSKB_385 TABLE BOX		1		1		1	1	1					1							MOUNT SWITCH TO TABLE BOX. LABEL SWITCH "DOOR # PUSH TO RELEASE". LABEL SHALL BE ENGRAVED.CONFIRM LOCATION ON DESK WITH OWNER AND FURNITURE CONTRACTOR.
SBE	BLUE SECURITY STROBE - EXTERIOR	As Noted	1				1												1		COORDINATE 120V POWER WITH ELECTRICIAN. REFER TO DETAILS AND WIRING DIAGRAMS FOR ADDITIONAL INFORMATION.
SBI	BLUE SECURITY STROBE - INTERIOR	As Noted	1				1												1		COORDINATE 120V POWER WITH ELECTRICIAN. REFER TO DETAILS AND WIRING DIAGRAMS FOR ADDITIONAL INFORMATION.
SM	SPOT MONITOR & MICRO PC	6' AFF	1				1				1		1								WORKSTATION BY OWNER. ALL CONNECTIONS BY CONTRACTOR AWARDED THIS PROJECT.
R	INTERNAL REQUEST TO EXIT SWITCH								1						1						SPECIFIED IN DIV 08 0671. SHOWN ON THESE PLANS FOR FINAL CABLING CONNECTIONS.
AB	ALERTUS ALERT BEACON	5' AFF		1			1				1								1		COORDINATE MTG HEIGHT OF ALARM WITH OWNER PRIOR TO ROUGH-IN. DURESS BUTTONS AND LOCKDOWN BUTTON SHALL TIE TO ALERT BEACON. BEACON TO CONNECT TO LAN. SEE WIRING DIAGRAM.
MP	LOCAL DOOR ALARM REMOTE MONITORING PLATE			1			1												1		COORDINATE MTG HEIGHT OF ALARM WITH OWNER PRIOR TO ROUGH-IN. REFER TO SECURITY DETAILS FOR ADDITIONAL INFO.
CPU	COMPUTER LOCATION FOR "SM" - TOWER WORKSTATION & DISPLAYS																				

TECHNOLOGY ABBREVIATIONS

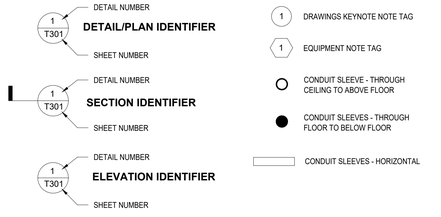
(NOTE: NOT ALL ABBREVIATIONS APPLICABLE)

AFF	ABOVE FINISH FLOOR
AFG	ABOVE FINISHED GRADE
A/C	ABOVE COUNTER
ACS	ACCESS CONTROL SYSTEM
ANSI	AMERICAN NATIONAL STANDARDS INSTITUTE
A/R	AS REQUIRED
AWG	AMERICAN WIRE GAUGE
BICSI	BUILDING INDUSTRY CONSULTING SERVICE INTERNATIONAL
BNC	BAYONET NEIL-CONCELMAN
C	CONDUIT(S)
DEMARC	DEMARCATION
DPDT	DOUBLE THROW DOUBLE PULL
EIA	ELECTRONICS INDUSTRIES ALLIANCE
EMT	ELECTRICAL METALLIC TUBING
FACP	FIRE ALARM CONTROL PANEL
F	FACSIMILE (FAX)
IDS	INTRUSION DETECTION SYSTEM
LAN	LOCAL AREA NETWORK
MER	MAIN EQUIPMENT ROOM
NEC	NATIONAL ELECTRIC CODE
NIC	NOT IN CONTRACT
NTS	NOT TO SCALE
OFE	OWNER FURNISHED EQUIPMENT
PA	PUBLIC ADDRESS
PBX	PRIVATE BRANCH EXCHANGE
PC	PERSONAL COMPUTER
PoE	POWER OVER ETHERNET
PP	PATCH PANEL
PVC	POLYVINYL CHLORIDE CONDUIT
QYT	QUANTITY
STP	SHIELDED TWISTED PAIR
TBB	TELECOMMUNICATIONS BONDING BACKBONE
TGB	TELECOMMUNICATIONS GROUNDING BUSBAR
TIA	TELECOMMUNICATIONS INDUSTRY ASSOCIATIONS
TMGB	TELECOMMUNICATIONS MAIN GROUNDING BUSBAR
TR	TELECOMMUNICATIONS ROOM
TV	TELEVISION
TYP	TYPICAL
UON	UNLESS OTHERWISE NOTED
UPS	UNINTERRUPTIBLE POWER SUPPLY
UTP	UNSHIELDED TWISTED PAIR
VGA	VIDEO GRAPHICS ARRAY
VoIP	VOICE OVER INTERNET PROTOCOL
VSS	VIDEO SURVEILLANCE SYSTEM
W	WALL TELEPHONE (VOICE)
WAN	WIDE AREA NETWORK
WAO	WORK AREA OUTLET
WAP	WIRELESS (DATA) ACCESS POINT
WG	WIRE GUARD
WP	WEATHERPROOF

GENERAL NOTES

1. DRAWINGS INDICATE THE GENERAL ARRANGEMENT OF SYSTEMS AND WORK INCLUDED IN THE CONTRACT.
2. ALL COMMUNICATION, SECURITY, AND AV OUTLETS MUST COINCIDE WITH ELECTRICAL POWER DRAWINGS. THE CONTRACTOR MUST COORDINATE ALL LOCATIONS OF THE ELECTRICAL OUTLETS WITH THESE OUTLETS.
3. REQUIRED CABLE COLORS: SUBMIT ALL CABLE AND JACK COLOR WITH PRODUCT SUBMITTALS PRIOR TO PROCUREMENT
4. LABEL ALL CABLES WITHIN 12" OF FINAL TERMINATION.
5. THE CONTRACTOR SHALL MAINTAIN THE TWIST OF THE INDIVIDUAL PAIRS TO WITHIN 1/2" OF FINAL TERMINATION FOR ALL CATEGORY 3 OR HIGHER CABLE.
6. USE ONLY HOOK AND LOOP CABLE TIES (VELCRO) FOR CABLES RATED CATEGORY 3 OR HIGHER.
7. ALL CABLES RUN IN CEILING AREAS SHALL BE PROPERLY SUPPORTED WITH CONDUIT OR J-HOOKS MOUNTED TO SLAT AT MINIMUM OF 5' INTERVALS. NO CABLE SHALL REST ON TOP OF OR TOUCH CEILING ASSEMBLIES. CABLES SHALL NOT BE INSTALLED EXPOSED IN OPEN CEILING AREAS.
8. ALL LABELS SHALL BE MACHINE PRINTED. NO HAND LETTERED CABLES SHALL BE USED.
9. USE ONLY PLENUM RATED CABLES.
10. DO NOT RUN ETHERNET CABLES PARALLEL TO POWER CABLES. CROSS POWER CABLES ONLY AT RIGHT ANGLES.
11. MAINTAIN 8" DISTANCE FROM ALL LIGHTING TRANSFORMERS.
12. COLOR AND STYLE OF TELECOMMUNICATION FACE PLATES SHALL MATCH ELECTRICAL FACE PLATES AND BE COORDINATED WITH AND CONFIRMED BY THE ARCHITECT.
13. OBTAIN AND EXTEND TO OWNER ALL AVAILABLE MANUFACTURER AND SYSTEM EXTENDED MANUFACTURER WARRANTEES. THE LOW VOLTAGE INSTALLATION CONTRACTOR SHALL SUBMIT ALL TEST RESULTS TO THE CABLE MANUFACTURER TO CERTIFY THE CABLING INSTALLATION AND ATTAIN AND DELIVER TO THE OWNER THE EXTENDED MANUFACTURER'S WARRANTY FOR MATERIAL AND WORKMANSHIP.
14. SPLICING CABLES IS NOT PERMITTED EXCEPT AS SPECIFICALLY NOTED.
15. DEVICE CABLING SHALL BE TERMINATED WITHIN THE INDICATED DATA ROOMS AND SHALL BE TERMINATED ONTO A 19" RACK MOUNTED, RJ45, 48 PORT, CATEGORY 6A RATED PATCH PANEL.
16. THE FOLLOWING CABLING SHALL BE TERMINATED ONTO IT'S OWN DISCRETE AND SEPARATE CATEGORY 6A RATED, RACK MOUNTED PATCH PANELS. REFER TO RACK ELEVATION DETAILS:
    A. ALL WIRELESS APS.
    B. ALL VIDEO SURVEILLANCE CAMERAS (REFER TO SECURITY DRAWINGS FOR PLACEMENT)
17. LOCATIONS OF EQUIPMENT FOR ALL OTHER TRADES SHALL BE COORDINATED BEFORE CONSTRUCTION.
18. THE CONTRACTOR SHALL COORDINATE LAYOUT LOCATIONS AND CLEARANCE OF ALL EQUIPMENT WITH OTHER TRADES AND ATTAIN OWNER'S APPROVAL PRIOR TO INSTALLATION.
19. CONTRACTOR SHALL COORDINATE ALL RACEWAYS, LOCATIONS, AND POWER REQUIREMENTS WITH THE ELECTRICAL CONTRACTOR.
20. ALL VOICE AND DATA OUTLETS THAT DO NOT HAVE AN ELECTRICAL OUTLET WITHIN 3FT SHALL BE BROUGHT TO THE IMMEDIATE ATTENTION OF THE THE PROJECT ARCHITECT, CONSTRUCTION MANAGER, AND TECHNOLOGY CONSULTANT PRIOR TO THE TIME OF INSTALLATION.
21. ALL DEVICES SHOWN ON THESE PLANS MUST BE COORDINATED AND APPROVED BY THE ARCHITECT. THE INSTALLATION CONTRACTOR SHALL DEPICT ALL DEVICES ONTO ELEVATION SUBMITTALS BEFORE INSTALLATION. ANY DEVICE THAT IS NOT APPROVED BY THE ARCHITECT PRIOR TO INSTALLATION MAY BE REQUIRED TO BE RELOCATED AS DIRECTED BY THE ARCHITECT AND CORRECTED BY THE CONTRACTOR WITH NO ADDITIONAL CHARGE TO THIS PROJECT.
22. ALL PATHWAYS, INCLUDING ALL WALL AND CEILING PENETRATIONS ARE REQUIRED TO INSTALL CABLING TO THE END DEVICE AND SHALL BE COORDINATED BETWEEN THE LOW VOLTAGE AND SECURITY CONTRACTOR AND THE ELECTRICAL CONTRACTOR AND SHALL BE INCLUDED AS PART OF THIS SECTION.
23. SECURE ATTACHMENT OF TECHNOLOGY AND SECURITY DEVICES:
    A. TO ENSURE PROPER ATTACHMENT OF FIXTURES, FURNISHINGS & EQUIPMENT ITEMS, INCLUDING AND TECHNOLOGY ITEMS, WHERE "ITEMS" ARE ATTACHED TO WALL, CEILING, OVERHEAD STRUCTURE, AND/OR FLOOR, CONTRACTOR SHALL PROVIDE INFORMATION ADEQUATE FOR ARCHITECT TO VERIFY ITEMS, ATTACHED TO WALL, CEILING, AND/OR FLOOR ARE ATTACHED SECURELY AND PER MANUFACTURER S RECOMMENDATIONS. ARCHITECT'S REVIEW MAY BE IMPLEMENTED DURING SUBMITTAL PROCESS.
    B. CONTRACTOR SHALL PROVIDE STRUTS, HANGERS, FASTENERS, SAFETY HARNESSES, CHANNELS, BOLTS, SCREWS, RODS, ETC. TO SECURELY ATTACH ITEMS TO THE EXISTING STRUCTURE AS REQUIRED TO MEET FIELD CONDITIONS AND MEET APPLICABLE CODES.
24. ALL CONDUIT IS INSTALLED TO ABOVE ACCESSIBLE CEILING UNLESS OTHERWISE NOTED.
25. PLACEMENT OF ALL SECURITY VIDEO SURVEILLANCE CAMERA CABLING MUST BE COORDINATED WITH THE SECURITY CONTRACTOR AND APPROVED BY THE SECURITY CONSULTANT AND/OR OWNER PRIOR TO CONSTRUCTION.

GENERAL PLAN SYMBOLS



Project Title:

ADDITIONS & ALTERATION TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
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203 230 9007 silverpetrucelli.com

Revision:	Description:	Date:	Revised By:

Drawing Title:
TECH-SEC-AV SYMBOL LEGEND AND GENERAL NOTES

95% SUBMISSION - AUGUST 29, 2024

Date: 08/29/2024
Scale: 12" = 1'-0"
Drawn By: MD
Project Number: 22-382

Drawing Number: T001

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Project Title:

ADDITIONS & ALTERATION TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
311 STATE STREET NEW LONDON CT 06320
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Revision:	Description:	Date:	Revised By:

Drawing Title:
TECH-SEC-AV OVERALL FIRST FLOOR DEMO PLAN

95% SUBMISSION - AUGUST 29, 2024

Date: 08/29/2024
Scale: 3/32" = 1'-0"
Drawn By: MD
Project Number: 22-382

Drawing Number: T010

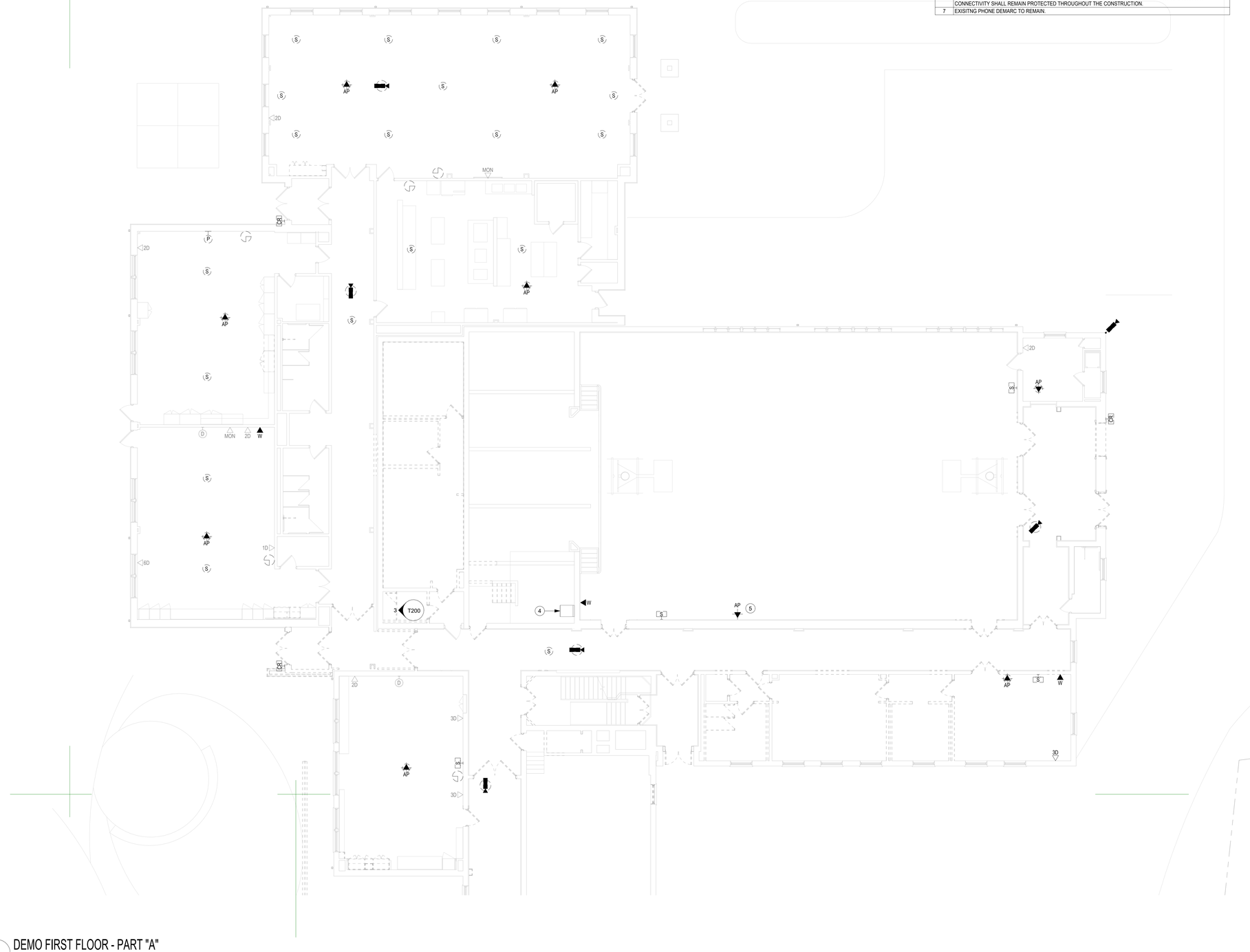
8/28/2024 5:16:33 PM

DEMO DRAWING KEYNOTE

NO.	DESCRIPTION
1	EXISITING MASTER CLOCK AND ACCESS CONTROL PANELS LOCATION.
2	EXISTING PA SYSTEM - TO BE REMOVED AND RETURNED TO OWNER.
3	EXISTING SERVER ROOM. RACKS TO REMAIN - ALL ETHERNET CABLING AND PATCH PANELS TO BE REMOVED AND REPLACED FOR NEW AS DESCRIBED ON THE NEW FLOOR PLANS.
4	EXISTING AV RACK FOR GYMNASIUM SOUND SYSTEM TO REMAIN.
5	AP ENCLOSURE TO REMAIN. INSTALL NEW ETHERNET CABING INTO ENCLOSURE.
6	EXISITNG CONDUIT FROM STREET TO EXISTING IT SERVER ROOM #2006B TO REMAIN. SERVICE PROVIDER CONNECTIVITY SHALL REMAIN PROTECTED THROUGHOUT THE CONSTRUCTION.
7	EXISITNG PHONE DEMARC TO REMAIN.

DEMOLITION SYMBOLS AND NOTES

- CR — ALL CARD READERS SHALL BE REMOVED AND DELIVERED TO THE OWNER. ALL CABLING SHALL BE REMOVED AND DISCARDED.
- ALL VIDEO SURVEILLANCE CAMERAS SHALL BE REMOVED FROM THE WALLS AND CEILINGS AND DELIVERED TO THE OWNER. ALL CABLING SHALL BE REMOVED AND DISCARDED.
- S — ALL PUBLIC ADDRESS SPEAKERS AND ASSOCIATED CABLING SHALL BE REMOVED AND DISCARDED.
- AP — ALL ACCESS POINTS AND ASSOCIATED ETHERNET CABLING SHALL BE REMOVED FROM THE CEILINGS AND RETURNED TO THE OWNER.
- ALL CLOCKS AND ASSOCIATED CABLING SHALL BE REMOVED AND DELIVERED TO THE OWNER.
- P — ALL PROJECTORS AND ASSOCIATED CABLING TO BE REMOVED AND RETURNED TO THE OWNER.
- D — ONLY THE INTERACTIVE DISPLAYS IN BOLD AND DOTTED SHALL BE REMOVED AND RETURNED TO THE OWNER. ALSO REMOVE ALL EXISTING ETHERNET CABLING BACK TO THE DATA ROOMS.
  INTERACTIVE DISPLAYS SHOWN IN GRAY SHALL REMAIN. ALL ETHERNET CABLING TO ALL DISPLAYS SHALL BE REMOVED AND DISCARDED.
- # — ALL DATA DROP ETHERNET CABLING SHALL BE REMOVED AND DISCARDED. ALL OUTELTS SHOWN IN BOLD SHALL INCLUDE REMOVAL OF OUTLET BOXES AND CONDUIT. ALL OUTLET BOXES SHOWN IN GRAY SHALL BE REUSED FOR NEW ETHERNET CABLING. # = CABLE QTY.
- H — ALL PUBLIC ADDRESS HORNS AND ASSOCIATED CABLING TO BE REMOVED AND DISCARDED.



1 DEMO FIRST FLOOR - PART "A"
1/8" = 1'-0"

Project Title:
ADDITIONS & ALTERATION TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
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Revision:	Description:	Date:	Revised By:

Drawing Title:
TECH-SEC-AV FIRST FLOOR PLAN
DEMO - PART "A"

95% SUBMISSION - AUGUST 29, 2024

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Drawn By: MD
Project Number: 22-382
Drawing Number: T011

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DEMO DRAWING KEYNOTE

NO.	DESCRIPTION
1	EXISITING MASTER CLOCK AND ACCESS CONTROL PANELS LOCATION.
2	EXISTING PA SYSTEM - TO BE REMOVED AND RETURNED TO OWNER.
3	EXISTING SERVER ROOM. RACKS TO REMAIN - ALL ETHERNET CABLING AND PATCH PANELS TO BE REMOVED AND REPLACED FOR NEW AS DESCRIBED ON THE NEW FLOOR PLANS.
4	EXISTING AV RACK FOR GYMNASIUM SOUND SYSTEM TO REMAIN.
5	AP ENCLOSURE TO REMAIN. INSTALL NEW ETHERNET CABING INTO ENCLOSURE.
6	EXISITNG CONDUIT FROM STREET TO EXISTING IT SERVER ROOM #2006B TO REMAIN. SERVICE PROVIDER CONNECTIVITY SHALL REMAIN PROTECTED THROUGHOUT THE CONSTRUCTION.
7	EXISITNG PHONE DEMARC TO REMAIN.

DEMOLITION SYMBOLS AND NOTES

CR — ALL CARD READERS SHALL BE REMOVED AND DELIVERED TO THE OWNER. ALL CABLING SHALL BE REMOVED AND DISCARDED.

ALL VIDEO SURVEILLANCE CAMERAS SHALL BE REMOVED FROM THE WALLS AND CEILINGS AND DELIVERED TO THE OWNER. ALL CABLING SHALL BE REMOVED AND DISCARDED.

S — ALL PUBLIC ADDRESS SPEAKERS AND ASSOCIATED CABLING SHALL BE REMOVED AND DISCARDED.

AP — ALL ACCESS POINTS AND ASSOCIATED ETHERNET CABLING SHALL BE REMOVED FROM THE CEILINGS AND RETURNED TO THE OWNER.

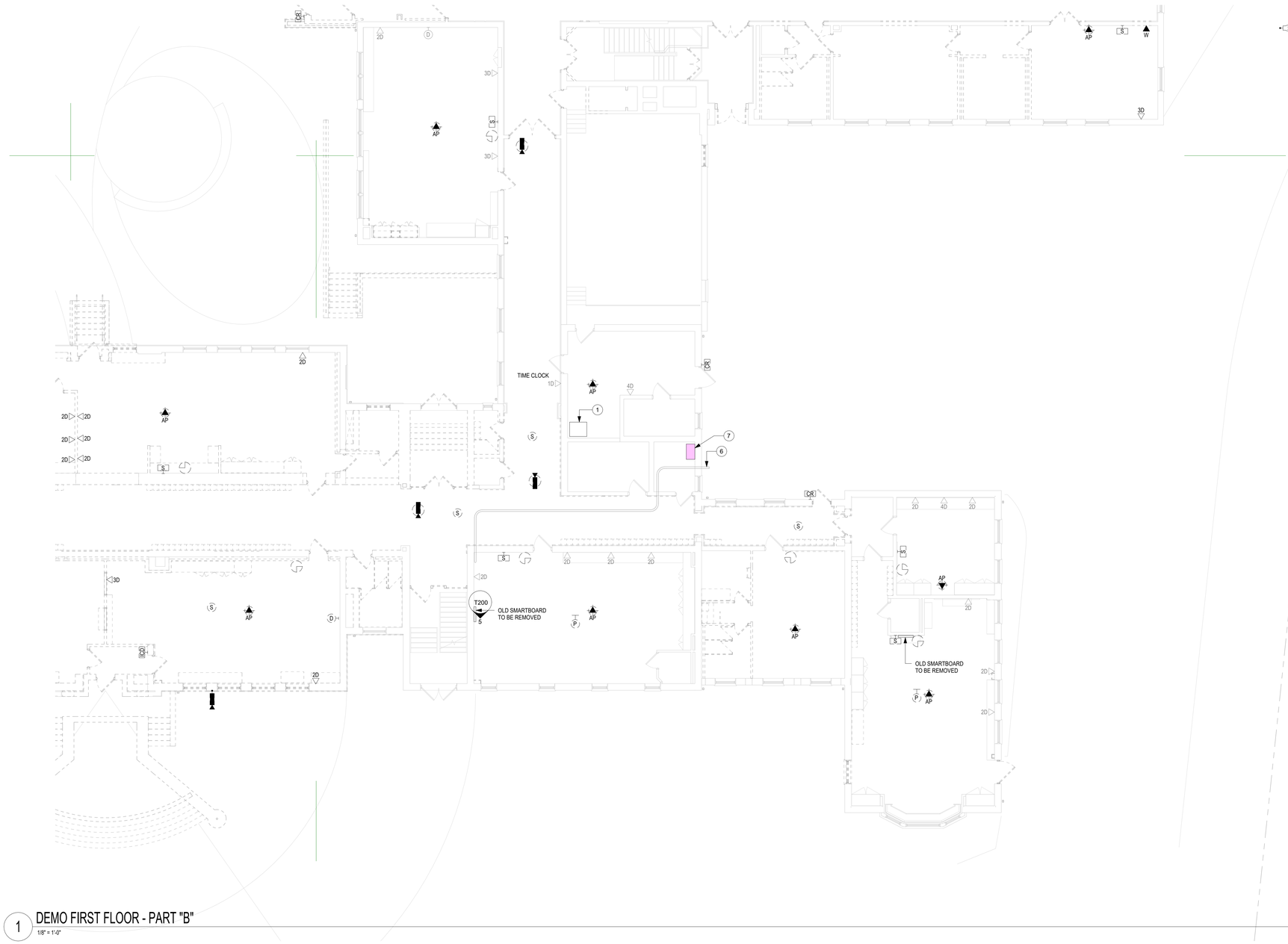
ALL CLOCKS AND ASSOCIATED CABLING SHALL BE REMOVED AND DELIVERED TO THE OWNER.

P — ALL PROJECTORS AND ASSOCIATED CABLING TO BE REMOVED AND RETURNED TO THE OWNER.

D — ONLY THE INTERACTIVE DISPLAYS IN BOLD AND DOTTED SHALL BE REMOVED AND RETURNED TO THE OWNER. ALSO REMOVE ALL EXISTING ETHERNET CABLING BACK TO THE DATA ROOMS.
INTERACTIVE DISPLAYS SHOWN IN GRAY SHALL REMAIN. ALL ETHERNET CABLING TO ALL DISPLAYS SHALL BE REMOVED AND DISCARDED.

— ALL DATA DROP ETHERNET CABLING SHALL BE REMOVED AND DISCARDED. ALL OUTELTS SHOWN IN BOLD SHALL INCLUDE REMOVAL OF OUTLET BOXES AND CONDUIT. ALL OUTLET BOXES SHOWN IN GRAY SHALL BE REUSED FOR NEW ETHERNET CABLING. # = CABLE QTY.

H — ALL PUBLIC ADDRESS HORNS AND ASSOCIATED CABLING TO BE REMOVED AND DISCARDED.



1 DEMO FIRST FLOOR - PART "B"
1/8" = 1'-0"

Project Title:
ADDITIONS & ALTERATION TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
311 STATE STREET NEW LONDON CT 06320
203 230 9007 silverpetrucelli.com

Revision:	Description:	Date:	Revised By:

Drawing Title:
TECH-SEC-AV FIRST FLOOR PLAN
DEMO - PART "B"

95% SUBMISSION - AUGUST 29, 2024

Date: 08/29/2024
Scale: As indicated
Drawn By: MD
Project Number: 22-382

Drawing Number: T012

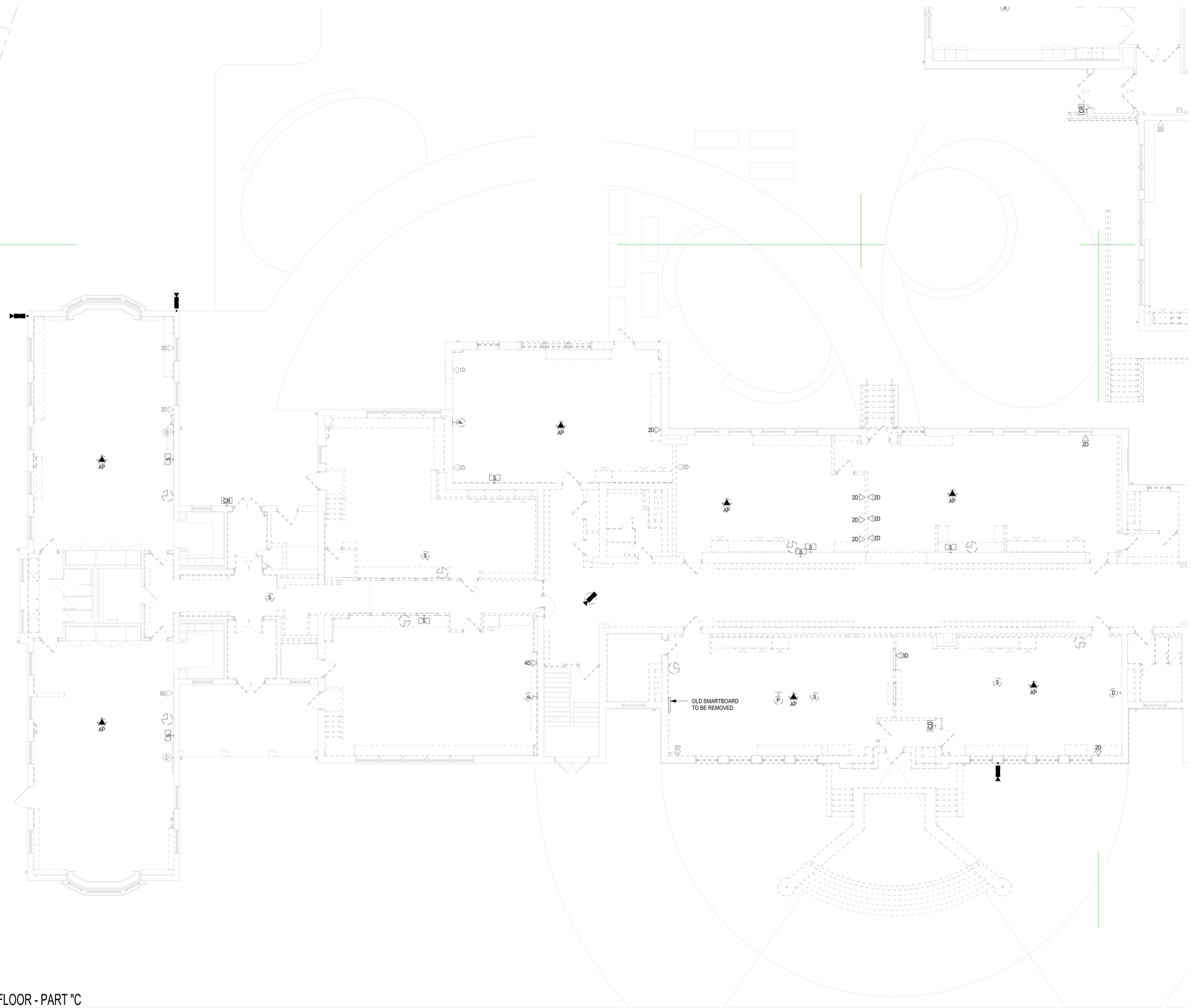
8/28/2024 5:16:37 PM

DEMO DRAWING KEYNOTE

NO.	DESCRIPTION
1	EXISITNG MASTER CLOCK AND ACCESS CONTROL PANELS LOCATION.
2	EXISTING PA SYSTEM - TO BE REMOVED AND RETURNED TO OWNER.
3	EXISTING SERVER ROOM. RACKS TO REMAIN - ALL ETHERNET CABLING AND PATCH PANELS TO BE REMOVED AND REPLACED FOR .NEW AS DESCRIBED ON THE NEW FLOOR PLANS.
4	EXISTING AV RACK FOR GYMNASIUM SOUND SYSTEM TO REMAIN.
5	AP ENCLOSURE TO REMAIN. INSTALL NEW ETHERNET CABING INTO ENCLOSURE.
6	EXISITNG CONDUIT FROM STREET TO EXISTING IT SERVER ROOM #2006B TO REMAIN. SERVICE PROVIDER CONNECTIVITY SHALL REMAIN PROTECTED THROUGHOUT THE CONSTRUCTION.
7	EXISITNG PHONE DEMARC TO REMAIN.

DEMOLITION SYMBOLS AND NOTES

- CR — ALL CARD READERS SHALL BE REMOVED AND DELIVERED TO THE OWNER. ALL CABLING SHALL BE REMOVED AND DISCARDED.
- ALL VIDEO SURVEILLANCE CAMERAS SHALL BE REMOVED FROM THE WALLS AND CEILINGS AND DELIVERED TO THE OWNER. ALL CABLING SHALL BE REMOVED AND DISCARDED.
- S — ALL PUBLIC ADDRESS SPEAKERS AND ASSOCIATED CABLING SHALL BE REMOVED AND DISCARDED.
- AP — ALL ACCESS POINTS AND ASSOCIATED ETHERNET CABLING SHALL BE REMOVED FROM THE CEILINGS AND RETURNED TO THE OWNER.
- ALL CLOCKS AND ASSOCIATED CABLING SHALL BE REMOVED AND DELIVERED TO THE OWNER.
- P — ALL PROJECTORS AND ASSOCIATED CABLING TO BE REMOVED AND RETURNED TO THE OWNER.
- D — ONLY THE INTERACTIVE DISPLAYS IN BOLD AND DOTTED SHALL BE REMOVED AND RETURNED TO THE OWNER. ALSO REMOVE ALL EXISTING ETHERNET CABLING BACK TO THE DATA ROOMS.
  INTERACTIVE DISPLAYS SHOWN IN GRAY SHALL REMAIN. ALL ETHERNET CABLING TO ALL DISPLAYS SHALL BE REMOVED AND DISCARDED.
- # — ALL DATA DROP ETHERNET CABLING SHALL BE REMOVED AND DISCARDED. ALL OUTELTS SHOWN IN BOLD SHALL INCLUDE REMOVAL OF OUTLET BOXES AND CONDUIT. ALL OUTLET BOXES SHOWN IN GRAY SHALL BE REUSED FOR NEW ETHERNET CABLING. # = CABLE QTY.
- H — ALL PUBLIC ADDRESS HORNS AND ASSOCIATED CABLING TO BE REMOVED AND DISCARDED.



1 DEMO FIRST FLOOR - PART "C"
1/8" = 1'-0"

Project Title:
ADDITIONS & ALTERATION TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
311 STATE STREET NEW LONDON CT 06320
203 230 9007 silverpetrucelli.com

Revision:	Description:	Date:	Revised By:

Drawing Title:
TECH-SEC-AV FIRST FLOOR PLAN
DEMO - PART "C"

95% SUBMISSION - AUGUST 29, 2024

Date: 08/29/2024
Scale: As indicated
Drawn By: MD
Project Number: 22-382
Drawing Number: T013

8/28/2024 5:16:38 PM



1
3/32" = 1'-0"

DEMO SECOND FLOOR OVERALL

Project Title:

ADDITIONS & ALTERATION TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
311 STATE STREET NEW LONDON CT 06320
203 230 9007 silverpetrucelli.com

Revision:	Description:	Date:	Revised By:

Drawing Title:
TECH-SEC-AV OVERALL SECOND FLOOR PLAN DEMO

95% SUBMISSION - AUGUST 29, 2024

Date: 08/29/2024
Scale: 3/32" = 1'-0"
Drawn By: MD
Project Number: 22-382

Drawing Number: T020

8/28/2024 5:16:40 PM

DEMO DRAWING KEYNOTE

NO.	DESCRIPTION
1	EXISITING MASTER CLOCK AND ACCESS CONTROL PANELS LOCATION.
2	EXISTING PA SYSTEM - TO BE REMOVED AND RETURNED TO OWNER.
3	EXISTING SERVER ROOM. RACKS TO REMAIN - ALL ETHERNET CABLING AND PATCH PANELS TO BE REMOVED AND REPLACED FOR .NEW AS DESCRIBED ON THE NEW FLOOR PLANS.
4	EXISTING AV RACK FOR GYMNASIUM SOUND SYSTEM TO REMAIN.
5	AP ENCLOSURE TO REMAIN. INSTALL NEW ETHERNET CABING INTO ENCLOSURE.
6	EXISITNG CONDUIT FROM STREET TO EXISTING IT SERVER ROOM #2006B TO REMAIN. SERVICE PROVIDER CONNECTIVITY SHALL REMAIN PROTECTED THROUGHOUT THE CONSTRUCTION.
7	EXISITNG PHONE DEMARC TO REMAIN.

DEMOLITION SYMBOLS AND NOTES

CR — ALL CARD READERS SHALL BE REMOVED AND DELIVERED TO THE OWNER. ALL CABLING SHALL BE REMOVED AND DISCARDED.

ALL VIDEO SURVEILLANCE CAMERAS SHALL BE REMOVED FROM THE WALLS AND CEILINGS AND DELIVERED TO THE OWNER. ALL CABLING SHALL BE REMOVED AND DISCARDED.

S — ALL PUBLIC ADDRESS SPEAKERS AND ASSOCIATED CABLING SHALL BE REMOVED AND DISCARDED.

AP — ALL ACCESS POINTS AND ASSOCIATED ETHERNET CABLING SHALL BE REMOVED FROM THE CEILINGS AND RETURNED TO THE OWNER.

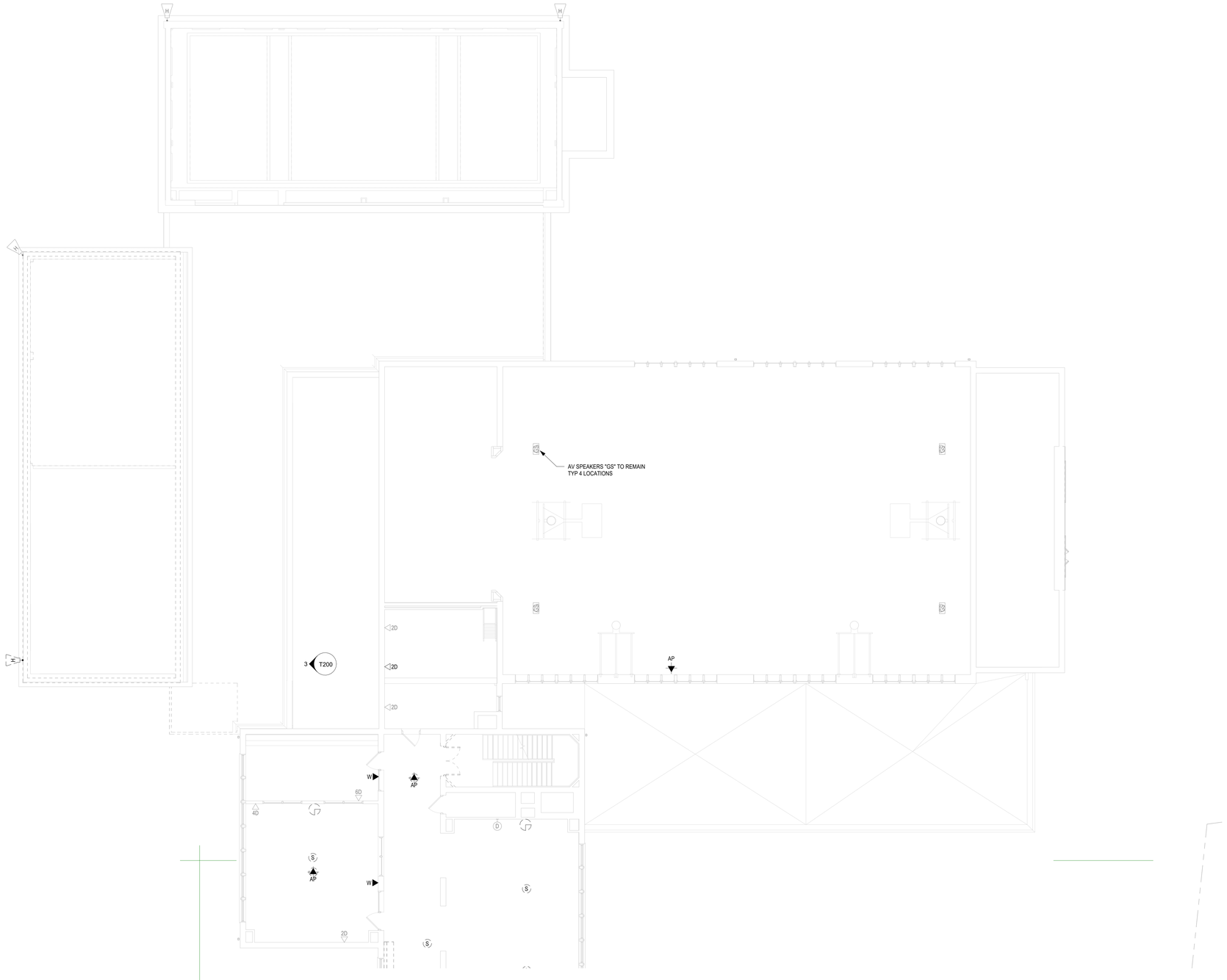
ALL CLOCKS AND ASSOCIATED CABLING SHALL BE REMOVED AND DELIVERED TO THE OWNER.

P — ALL PROJECTORS AND ASSOCIATED CABLING TO BE REMOVED AND RETURNED TO THE OWNER.

D — ONLY THE INTERACTIVE DISPLAYS IN BOLD AND DOTTED SHALL BE REMOVED AND RETURNED TO THE OWNER.
INTERACTIVE DISPLAYS SHOWN IN GRAY SHALL REMAIN. ALL EXISTING ETHERNET CABLING TO ALL DISPLAYS SHALL REMAIN ON THE 2ND AND 3RD FLOORS.

— ALL DATA DROP ETHERNET CABLING SHALL REMAIN ON THE 2ND AND 3RD FLOOR.

H — ALL PUBLIC ADDRESS HORNS AND ASSOCIATED CABLING TO BE REMOVED AND DISCARDED.



1 DEMO SECOND FLOOR - PART "A"
1/8" = 1'-0"

Project Title:

ADDITIONS & ALTERATION TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
311 STATE STREET NEW LONDON CT 06320
203 230 9007 silverpetrucelli.com

Revision:	Description:	Date:	Revised By:

Drawing Title:
TECH-SEC-AV SECOND FLOOR PLAN
DEMO - PART "A"

95% SUBMISSION - AUGUST 29, 2024

Date: 08/29/2024
Scale: As indicated
Drawn By: MD
Project Number: 22-382

Drawing Number: T021

8/28/2024 5:16:41 PM

DEMO DRAWING KEYNOTE

NO.	DESCRIPTION
1	EXISITING MASTER CLOCK AND ACCESS CONTROL PANELS LOCATION.
2	EXISTING PA SYSTEM - TO BE REMOVED AND RETURNED TO OWNER.
3	EXISTING SERVER ROOM. RACKS TO REMAIN - ALL ETHERNET CABLING AND PATCH PANELS TO BE REMOVED AND REPLACED FOR NEW AS DESCRIBED ON THE NEW FLOOR PLANS.
4	EXISTING AV RACK FOR GYMNASIUM SOUND SYSTEM TO REMAIN.
5	AP ENCLOSURE TO REMAIN. INSTALL NEW ETHERNET CABING INTO ENCLOSURE.
6	EXISITNG CONDUIT FROM STREET TO EXISTING IT SERVER ROOM #2006B TO REMAIN. SERVICE PROVIDER CONNECTIVITY SHALL REMAIN PROTECTED THROUGHOUT THE CONSTRUCTION.
7	EXISITNG PHONE DEMARC TO REMAIN.

DEMOLITION SYMBOLS AND NOTES

- CR — ALL CARD READERS SHALL BE REMOVED AND DELIVERED TO THE OWNER. ALL CABLING SHALL BE REMOVED AND DISCARDED.
- ALL VIDEO SURVEILLANCE CAMERAS SHALL BE REMOVED FROM THE WALLS AND CEILINGS AND DELIVERED TO THE OWNER. ALL CABLING SHALL BE REMOVED AND DISCARDED.
- S — ALL PUBLIC ADDRESS SPEAKERS AND ASSOCIATED CABLING SHALL BE REMOVED AND DISCARDED.
- AP — ALL ACCESS POINTS AND ASSOCIATED ETHERNET CABLING SHALL BE REMOVED FROM THE CEILINGS AND RETURNED TO THE OWNER.
- ALL CLOCKS AND ASSOCIATED CABLING SHALL BE REMOVED AND DELIVERED TO THE OWNER.
- P — ALL PROJECTORS AND ASSOCIATED CABLING TO BE REMOVED AND RETURNED TO THE OWNER.
- D — ONLY THE INTERACTIVE DISPLAYS IN BOLD AND DOTTED SHALL BE REMOVED AND RETURNED TO THE OWNER. INTERACTIVE DISPLAYS SHOWN IN GRAY SHALL REMAIN. ALL EXISTING ETHERNET CABLING TO ALL DISPLAYS SHALL REMAIN ON THE 2ND AND 3RD FLOORS.
- # — ALL DATA DROP ETHERNET CABLING SHALL REMAIN ON THE 2ND AND 3RD FLOOR.
- H — ALL PUBLIC ADDRESS HORNS AND ASSOCIATED CABLING TO BE REMOVED AND DISCARDED.



1 DEMO SECOND FLOOR - PART "B"
1/8" = 1'-0"

Project Title:
ADDITIONS & ALTERATION TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
311 STATE STREET NEW LONDON CT 06320
203 230 9007 silverpetrucelli.com

Revision:	Description:	Date:	Revised By:

Drawing Title:
TECH-SEC-AV SECOND FLOOR PLAN
DEMO - PART "B"

95% SUBMISSION - AUGUST 29, 2024

Date: 08/29/2024
Scale: As indicated
Drawn By: MD
Project Number: 22-382

Drawing Number: T022

8/28/2024 5:16:42 PM

DEMO DRAWING KEYNOTE

NO.	DESCRIPTION
1	EXISITING MASTER CLOCK AND ACCESS CONTROL PANELS LOCATION.
2	EXISTING PA SYSTEM - TO BE REMOVED AND RETURNED TO OWNER.
3	EXISTING SERVER ROOM. RACKS TO REMAIN - ALL ETHERNET CABLING AND PATCH PANELS TO BE REMOVED AND REPLACED FOR NEW AS DESCRIBED ON THE NEW FLOOR PLANS.
4	EXISTING AV RACK FOR GYMNASIUM SOUND SYSTEM TO REMAIN.
5	AP ENCLOSURE TO REMAIN. INSTALL NEW ETHERNET CABING INTO ENCLOSURE.
6	EXISITNG CONDUIT FROM STREET TO EXISTING IT SERVER ROOM #2006B TO REMAIN. SERVICE PROVIDER CONNECTIVITY SHALL REMAIN PROTECTED THROUGHOUT THE CONSTRUCTION.
7	EXISITING PHONE DEMARC TO REMAIN.

DEMOLITION SYMBOLS AND NOTES

CR — ALL CARD READERS SHALL BE REMOVED AND DELIVERED TO THE OWNER. ALL CABLING SHALL BE REMOVED AND DISCARDED.

ALL VIDEO SURVEILLANCE CAMERAS SHALL BE REMOVED FROM THE WALLS AND CEILINGS AND DELIVERED TO THE OWNER. ALL CABLING SHALL BE REMOVED AND DISCARDED.

S — ALL PUBLIC ADDRESS SPEAKERS AND ASSOCIATED CABLING SHALL BE REMOVED AND DISCARDED.

AP — ALL ACCESS POINTS AND ASSOCIATED ETHERNET CABLING SHALL BE REMOVED FROM THE CEILINGS AND RETURNED TO THE OWNER.

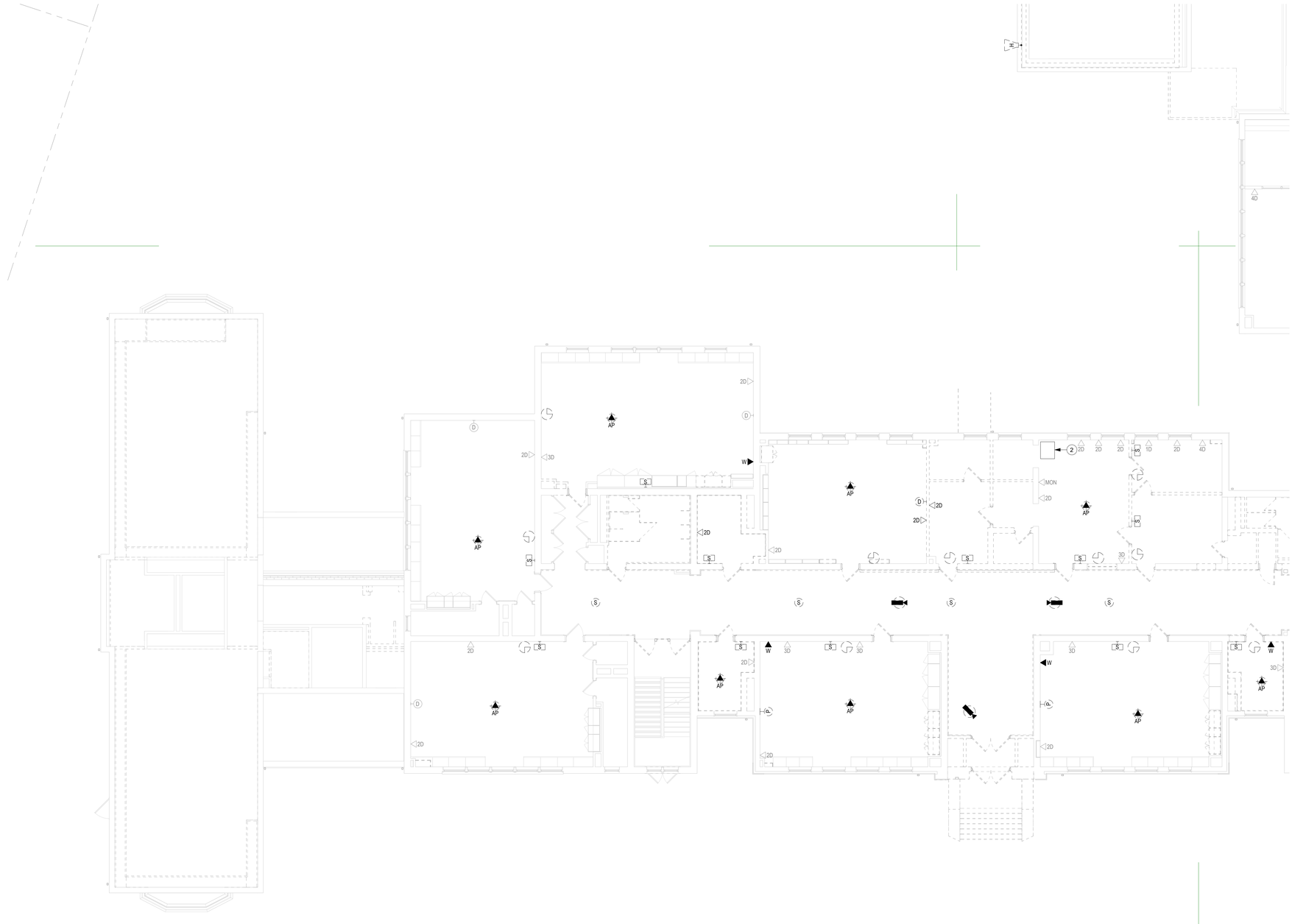
ALL CLOCKS AND ASSOCIATED CABLING SHALL BE REMOVED AND DELIVERED TO THE OWNER.

P — ALL PROJECTORS AND ASSOCIATED CABLING TO BE REMOVED AND RETURNED TO THE OWNER.

D — ONLY THE INTERACTIVE DISPLAYS IN BOLD AND DOTTED SHALL BE REMOVED AND RETURNED TO THE OWNER. INTERACTIVE DISPLAYS SHOWN IN GRAY SHALL REMAIN. ALL EXISTING ETHERNET CABLING TO ALL DISPLAYS SHALL REMAIN ON THE 2ND AND 3RD FLOORS.

— ALL DATA DROP ETHERNET CABLING SHALL REMAIN ON THE 2ND AND 3RD FLOOR.

ALL PUBLIC ADDRESS HORNS AND ASSOCIATED CABLING TO BE REMOVED AND DISCARDED.



1 DEMO SECOND FLOOR - PART "C"
1/8" = 1'-0"

Project Title:
ADDITIONS & ALTERATION TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
311 STATE STREET NEW LONDON CT 06320
203 230 9007 silverpetrucelli.com

Revision: | Description: | Date: | Revised By:

Drawing Title:
TECH-SEC-AV SECOND FLOOR PLAN
DEMO - PART "C"

95% SUBMISSION - AUGUST 29, 2024

Date: 08/29/2024
Scale: As indicated
Drawn By: MD
Project Number: 22-382

Drawing Number: T023

8/28/2024 5:16:43 PM

DEMO DRAWING KEYNOTE

NO.	DESCRIPTION
1	EXISITING MASTER CLOCK AND ACCESS CONTROL PANELS LOCATION.
2	EXISTING PA SYSTEM - TO BE REMOVED AND RETURNED TO OWNER.
3	EXISTING SERVER ROOM. RACKS TO REMAIN - ALL ETHERNET CABLING AND PATCH PANELS TO BE REMOVED AND REPLACED FOR .NEW AS DESCRIBED ON THE NEW FLOOR PLANS.
4	EXISTING AV RACK FOR GYMNASIUM SOUND SYSTEM TO REMAIN.
5	AP ENCLOSURE TO REMAIN. INSTALL NEW ETHERNET CABING INTO ENCLOSURE.
6	EXISITNG CONDUIT FROM STREET TO EXISTING IT SERVER ROOM #2006B TO REMAIN. SERVICE PROVIDER CONNECTIVITY SHALL REMAIN PROTECTED THROUGHOUT THE CONSTRUCTION.
7	EXISITNG PHONE DEMARC TO REMAIN.

DEMOLITION SYMBOLS AND NOTES

- CR — ALL CARD READERS SHALL BE REMOVED AND DELIVERED TO THE OWNER. ALL CABLING SHALL BE REMOVED AND DISCARDED.
- ALL VIDEO SURVEILLANCE CAMERAS SHALL BE REMOVED FROM THE WALLS AND CEILINGS AND DELIVERED TO THE OWNER. ALL CABLING SHALL BE REMOVED AND DISCARDED.
- S — ALL PUBLIC ADDRESS SPEAKERS AND ASSOCIATED CABLING SHALL BE REMOVED AND DISCARDED.
- AP — ALL ACCESS POINTS AND ASSOCIATED ETHERNET CABLING SHALL BE REMOVED FROM THE CEILINGS AND RETURNED TO THE OWNER.
- ALL CLOCKS AND ASSOCIATED CABLING SHALL BE REMOVED AND DELIVERED TO THE OWNER.
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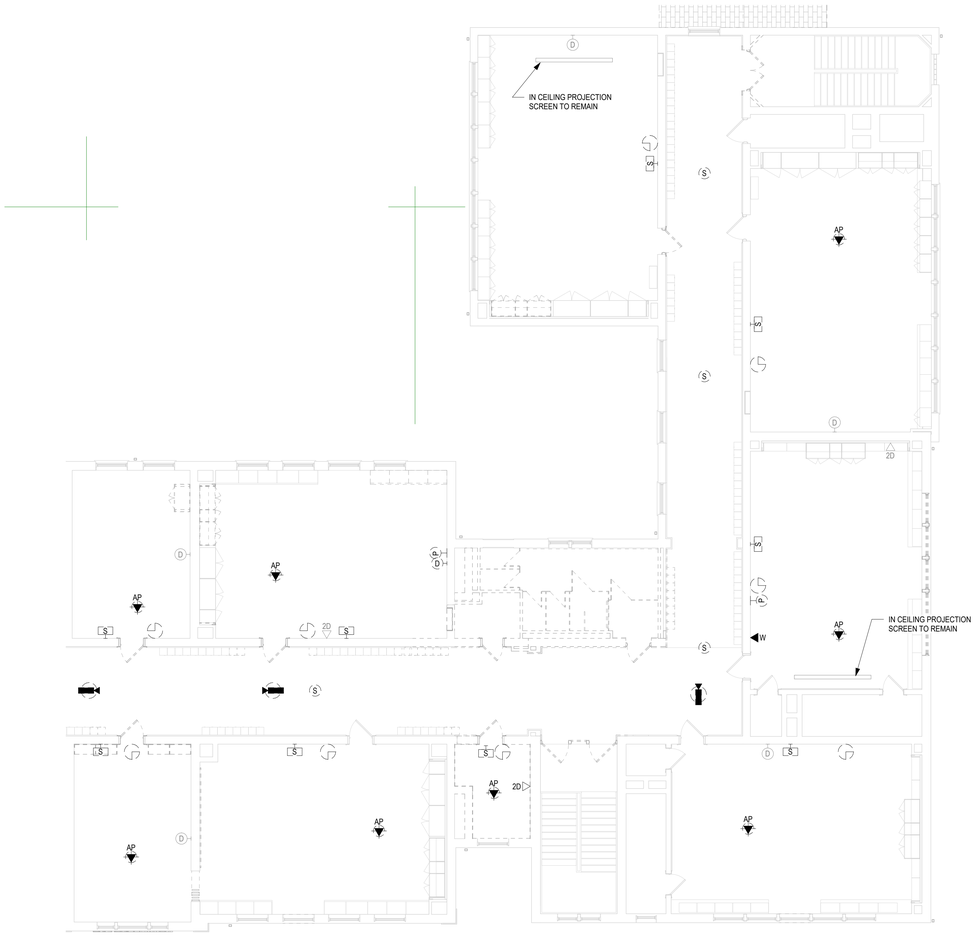
- #D — ALL DATA DROP ETHERNET CABLING SHALL REMAIN ON THE 2ND AND 3RD FLOOR.
- H — ALL PUBLIC ADDRESS HORNS AND ASSOCIATED CABLING TO BE REMOVED AND DISCARDED.



1 DEMO SECOND FLOOR DEMO - PART "B"
1/8" = 1'-0"

Project Title:
ADDITIONS & ALTERATION TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
311 STATE STREET NEW LONDON CT 06320
203 230 9007 silverpetrucelli.com

Revision:	Description:	Date:	Revised By:

Drawing Title:
TECH-SEC-AV THIRD FLOOR PLAN
DEMO - PART "B"

95% SUBMISSION - AUGUST 29, 2024

Date: 08/29/2024
Scale: As indicated
Drawn By: MD
Project Number: 22-382
Drawing Number: T032

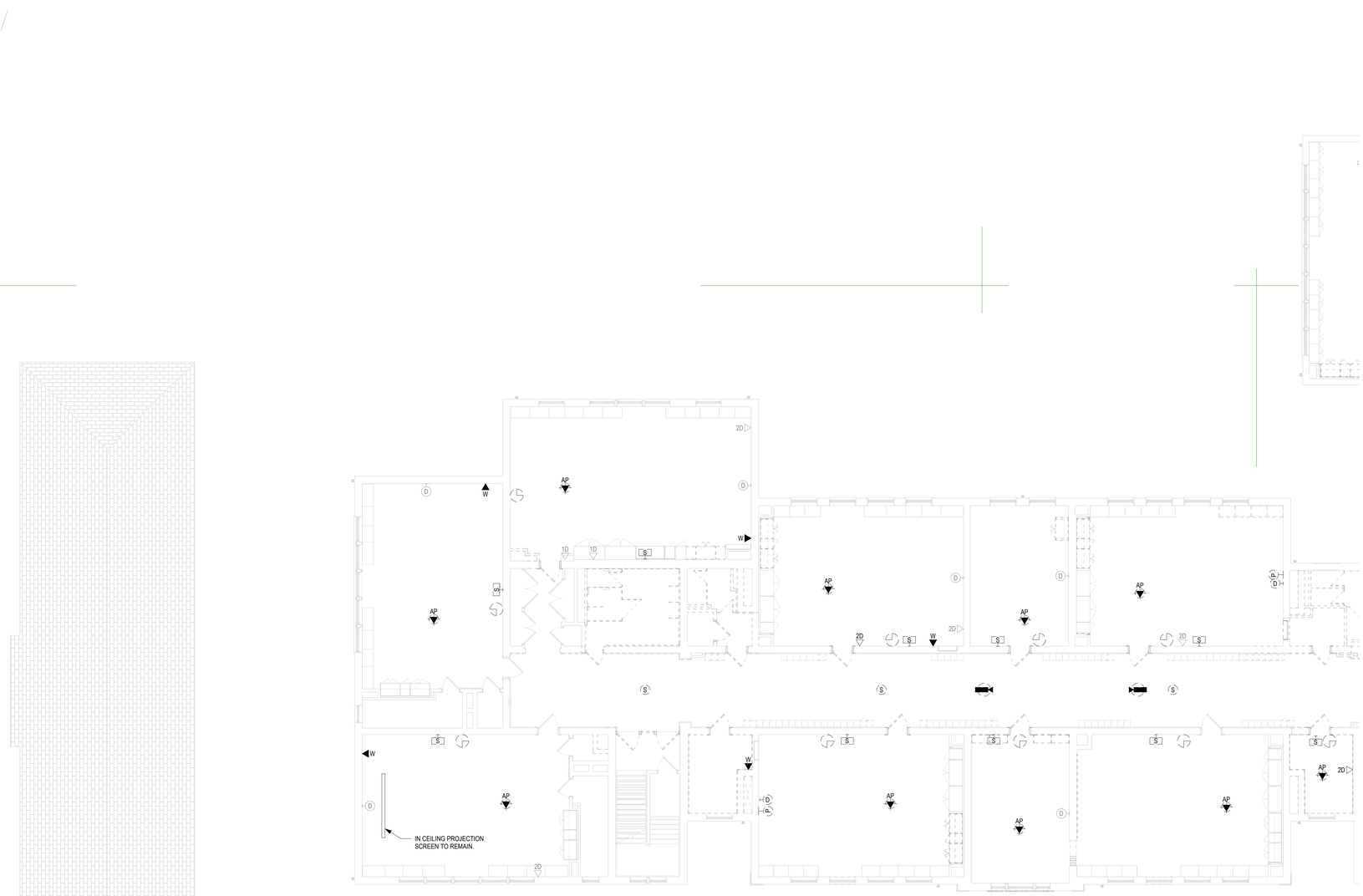
8/28/2024 5:16:45 PM

DEMO DRAWING KEYNOTE

NO.	DESCRIPTION
1	EXISITING MASTER CLOCK AND ACCESS CONTROL PANELS LOCATION.
2	EXISTING PA SYSTEM - TO BE REMOVED AND RETURNED TO OWNER.
3	EXISTING SERVER ROOM. RACKS TO REMAIN - ALL ETHERNET CABLING AND PATCH PANELS TO BE REMOVED AND REPLACED FOR NEW AS DESCRIBED ON THE NEW FLOOR PLANS.
4	EXISTING AV RACK FOR GYMNASIUM SOUND SYSTEM TO REMAIN.
5	AP ENCLOSURE TO REMAIN. INSTALL NEW ETHERNET CABING INTO ENCLOSURE.
6	EXISITNG CONDUIT FROM STREET TO EXISTING IT SERVER ROOM #2006B TO REMAIN. SERVICE PROVIDER CONNECTIVITY SHALL REMAIN PROTECTED THROUGHOUT THE CONSTRUCTION.
7	EXISITNG PHONE DEMARC TO REMAIN.

DEMOLITION SYMBOLS AND NOTES

- CR — ALL CARD READERS SHALL BE REMOVED AND DELIVERED TO THE OWNER. ALL CABLING SHALL BE REMOVED AND DISCARDED.
- ALL VIDEO SURVEILLANCE CAMERAS SHALL BE REMOVED FROM THE WALLS AND CEILINGS AND DELIVERED TO THE OWNER. ALL CABLING SHALL BE REMOVED AND DISCARDED.
- S — ALL PUBLIC ADDRESS SPEAKERS AND ASSOCIATED CABLING SHALL BE REMOVED AND DISCARDED.
- AP — ALL ACCESS POINTS AND ASSOCIATED ETHERNET CABLING SHALL BE REMOVED FROM THE CEILINGS AND RETURNED TO THE OWNER.
- ALL CLOCKS AND ASSOCIATED CABLING SHALL BE REMOVED AND DELIVERED TO THE OWNER.
- P — ALL PROJECTORS AND ASSOCIATED CABLING TO BE REMOVED AND RETURNED TO THE OWNER.
- D — ONLY THE INTERACTIVE DISPLAYS IN BOLD AND DOTTED SHALL BE REMOVED AND RETURNED TO THE OWNER. INTERACTIVE DISPLAYS SHOWN IN GRAY SHALL REMAIN. ALL EXISTING ETHERNET CABLING TO ALL DISPLAYS SHALL REMAIN ON THE 2ND AND 3RD FLOORS.
- # — ALL DATA DROP ETHERNET CABLING SHALL REMAIN ON THE 2ND AND 3RD FLOOR.
- ALL PUBLIC ADDRESS HORNS AND ASSOCIATED CABLING TO BE REMOVED AND DISCARDED.



1 DEMO SECOND FLOOR DEMO - PART "C"
1/8" = 1'-0"

Project Title:
ADDITIONS & ALTERATION TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
311 STATE STREET NEW LONDON CT 06320
203 230 9007 silverpetrucelli.com

Revision:	Description:	Date:	Revised By:

Drawing Title:
TECH-SEC-AV THIRD FLOOR PLAN
DEMO - PART "C"

95% SUBMISSION - AUGUST 29, 2024

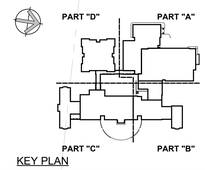
Date: 08/29/2024
Scale: As indicated
Drawn By: MD
Project Number: 22-382

Drawing Number: T033

8/28/2024 5:16:48 PM



1 1st Flr. Overall
3/32" = 1'-0"



KEY PLAN

Project Title:

ADDITIONS & ALTERATION TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
311 STATE STREET NEW LONDON CT 06320
203 230 9007 silverpetrucelli.com

Revision:	Description:	Date:	Revised By:

Drawing Title:
TECH-SEC-AV OVERALL FIRST FLOOR PLAN

95% SUBMISSION - AUGUST 29, 2024

Date: 08/29/2024
Scale: 3/32" = 1'-0"
Drawn By: MD
Project Number: 22-382
Drawing Number: T110

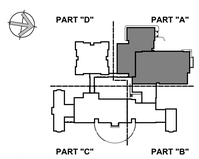
8/28/2024 5:16:50 PM

DRAWING KEYNOTES

NO.	DESCRIPTION
1	USE EXISTING OUTLET BOX AND PATHWAY FOR NEW CABLING AND DEVICES
2	EXISITNG CONDUIT FROM STREET TO EXISTING IT SERVER ROOM #2006B TO REMAIN. SERVICE PROVIDER CONNECTIVITY SHALL REMAIN PROTECTED THROUGHOUT THE CONSTRUCTION.
3	NEW \INTERACTIVE BOARD - OFE
4	EXTERIOR HORD TO REMAIN. INSTALL NEW CABLING FROM THE NEW PA HEADEND
5	USE EXISTING PENETRATION AND MOUNTING BOX FOR NEW DEVICE
6	EXISTING AV CABINET FOR GYMNASIUM SOUND SYSTEM TO REMAIN. INTEGRATE NEW PUBLIC ADDRESS FEED INTO EXISTING SOUND SYSTEM. CONTRACTOR SHALL FIELD VERIFY EXISTING SYSTEM TO ENSURE PROPER OVERIDE OF TEH PUBLIC ADDRESS ANNOUNCEMENTS.
7	EXISITNG PHONE DEMARC TO REMAIN.



1 FIRST FLOOR - PART "A"
1/8" = 1'-0"



KEY PLAN

Project Title:

ADDITIONS & ALTERATION TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
311 STATE STREET NEW LONDON CT 06320
203 230 9007 silverpetrucelli.com

Revision:	Description:	Date:	Revised By:

Drawing Title:
TECH-SEC-AV FIRST FLOOR PLAN - PART "A"

95% SUBMISSION - AUGUST 29, 2024

Date: 08/29/2024
Scale: 1/8" = 1'-0"
Drawn By: MD
Project Number: 22-382

Drawing Number: T111

8/28/2024 5:16:52 PM

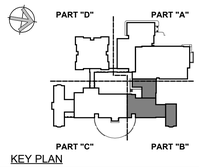
DRAWING KEYNOTES

NO.	DESCRIPTION
1	USE EXISTING OUTLET BOX AND PATHWAY FOR NEW CABLING AND DEVICES
2	EXISITNG CONDUIT FROM STREET TO EXISTING IT SERVER ROOM #2006B TO REMAIN. SERVICE PROVIDER CONNECTIVITY SHALL REMAIN PROTECTED THROUGHOUT THE CONSTRUCTION.
3	NEW \INTERACTIVE BOARD - OFE
4	EXTERIOR HORD TO REMAIN. INSTALL NEW CABLING FROM THE NEW PA HEADEND
5	USE EXISTING PENETRATION AND MOUNTING BOX FOR NEW DEVICE
6	EXISTING AV CABINET FOR GYMNASIUM SOUND SYSTEM TO REMAIN. INTEGRATE NEW PUBLIC ADDRESS FEED INTO EXISTING SOUND SYSTEM. CONTRACTOR SHALL FIELD VERIFY EXISTING SYSTEM TO ENSURE PROPER OVERIDE OF TEH PUBLIC ADDRESS ANNOUNCEMENTS.
7	EXISITNG PHONE DEMARC TO REMAIN.



1 FIRST FLOOR - PART "B"

1/8" = 1'-0"



KEY PLAN

Project Title:

ADDITIONS & ALTERATION TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
311 STATE STREET NEW LONDON CT 06320
203 230 9007 silverpetrucelli.com

Revision:	Description:	Date:	Revised By:

Drawing Title:
TECH-SEC-AV FIRST FLOOR PLAN - PART "B"

95% SUBMISSION - AUGUST 29, 2024

Date: 08/29/2024
Scale: 1/8" = 1'-0"
Drawn By: MD
Project Number: 22-382
Drawing Number: T112

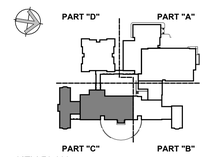
8/28/2024 5:16:56 PM

DRAWING KEYNOTES

NO.	DESCRIPTION
1	USE EXISTING OUTLET BOX AND PATHWAY FOR NEW CABLING AND DEVICES
2	EXISITNG CONDUIT FROM STREET TO EXISTING IT SERVER ROOM #2006B TO REMAIN. SERVICE PROVIDER CONNECTIVITY SHALL REMAIN PROTECTED THROUGHOUT THE CONSTRUCTION.
3	NEW \INTERACTIVE BOARD - OFE
4	EXTERIOR HORD TO REMAIN. INSTALL NEW CABLING FROM THE NEW PA HEADEND
5	USE EXISTING PENETRATION AND MOUNTING BOX FOR NEW DEVICE
6	EXISTING AV CABINET FOR GYMNASIUM SOUND SYSTEM TO REMAIN. INTEGRATE NEW PUBLIC ADDRESS FEED INTO EXISTING SOUND SYSTEM. CONTRACTOR SHALL FIELD VERIFY EXISTING SYSTEM TO ENSURE PROPER OVERIDE OF TEH PUBLIC ADDRESS ANNOUNCEMENTS.
7	EXISITNG PHONE DEMARC TO REMAIN.



1 FIRST FLOOR - PART "C"
1/8" = 1'-0"



KEY PLAN

Project Title:

ADDITIONS & ALTERATION TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
311 STATE STREET NEW LONDON CT 06320
203 230 9007 silverpetrucelli.com

Revision:	Description:	Date:	Revised By:

Drawing Title:
TECH-SEC-AV FIRST FLOOR PLAN - PART "C"

95% SUBMISSION - AUGUST 29, 2024

Date: 08/29/2024
Scale: 1/8" = 1'-0"
Drawn By: MD
Project Number: 22-382

Drawing Number: T113

8/28/2024 5:17:01 PM

DRAWING KEYNOTES

NO.	DESCRIPTION
1	USE EXISTING OUTLET BOX AND PATHWAY FOR NEW CABLING AND DEVICES
2	EXISITNG CONDUIT FROM STREET TO EXISTING IT SERVER ROOM #2006B TO REMAIN. SERVICE PROVIDER CONNECTIVITY SHALL REMAIN PROTECTED THROUGHOUT THE CONSTRUCTION.
3	NEW \INTERACTIVE BOARD - OFE
4	EXTERIOR HORD TO REMAIN. INSTALL NEW CABLING FROM THE NEW PA HEADEND
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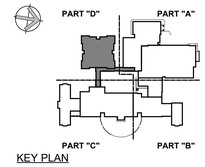
7	EXISITNG PHONE DEMARC TO REMAIN.



1 FIRST FLOOR - PART "D"
1/8" = 1'-0"



KEY PLAN

Project Title:

ADDITIONS & ALTERATION TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
311 STATE STREET NEW LONDON CT 06320
203 230 9007 silverpetrucelli.com

Revision:	Description:	Date:	Revised By:

Drawing Title:
TECH-SEC-AV FIRST FLOOR PLAN - PART "D"

95% SUBMISSION - AUGUST 29, 2024

Date: 08/29/2024
Scale: 1/8" = 1'-0"
Drawn By: MD
Project Number: 22-382
Drawing Number: T114

8/28/2024 5:17:04 PM



1 2nd Flr. Overall
3/32" = 1'-0"

KEY PLAN

Project Title:

ADDITIONS & ALTERATION TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
311 STATE STREET NEW LONDON CT 06320
203 230 9007 silverpetrucelli.com

Revision:	Description:	Date:	Revised By:

Drawing Title:
TECH-SEC-AV OVERALL SECOND FLOOR PLAN

95% SUBMISSION - AUGUST 29, 2024

Date: 08/29/2024
Scale: 3/32" = 1'-0"
Drawn By: MD
Project Number: 22-382

Drawing Number: T120

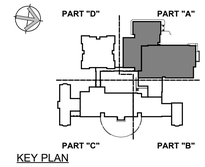
8/28/2024 5:17:06 PM

DRAWING KEYNOTES

NO.	DESCRIPTION
1	USE EXISTING OUTLET BOX AND PATHWAY FOR NEW CABLING AND DEVICES
2	EXISITNG CONDUIT FROM STREET TO EXISTING IT SERVER ROOM #2006B TO REMAIN. SERVICE PROVIDER CONNECTIVITY SHALL REMAIN PROTECTED THROUGHOUT THE CONSTRUCTION.
3	NEW \INTERACTIVE BOARD - OFE
4	EXTERIOR HORD TO REMAIN. INSTALL NEW CABLING FROM THE NEW PA HEADEND
5	USE EXISTING PENETRATION AND MOUNTING BOX FOR NEW DEVICE
6	EXISTING AV CABINET FOR GYMNASIUM SOUND SYSTEM TO REMAIN. INTEGRATE NEW PUBLIC ADDRESS FEED INTO EXISTING SOUND SYSTEM. CONTRACTOR SHALL FIELD VERIFY EXISTING SYSTEM TO ENSURE PROPER OVERIDE OF TEH PUBLIC ADDRESS ANNOUNCEMENTS.
7	EXISITNG PHONE DEMARC TO REMAIN.



1 SECOND FLOOR - PART "A"
1/8" = 1'-0"



KEY PLAN

Project Title:

ADDITIONS & ALTERATION TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
311 STATE STREET NEW LONDON CT 06320
203 230 9007 silverpetrucelli.com

Revision:	Description:	Date:	Revised By:

Drawing Title:
TECH-SEC-AV SECOND FLOOR PLAN - PART "A"

95% SUBMISSION - AUGUST 29, 2024

Date: 08/29/2024
Scale: 1/8" = 1'-0"
Drawn By: MD
Project Number: 22-382

Drawing Number: T121

8/28/2024 5:17:07 PM

DRAWING KEYNOTES

NO.	DESCRIPTION
1	USE EXISTING OUTLET BOX AND PATHWAY FOR NEW CABLING AND DEVICES
2	EXISITNG CONDUIT FROM STREET TO EXISTING IT SERVER ROOM #2006B TO REMAIN. SERVICE PROVIDER CONNECTIVITY SHALL REMAIN PROTECTED THROUGHOUT THE CONSTRUCTION.
3	NEW \INTERACTIVE BOARD - OFE
4	EXTERIOR HORD TO REMAIN. INSTALL NEW CABLING FROM THE NEW PA HEADEND
5	USE EXISTING PENETRATION AND MOUNTING BOX FOR NEW DEVICE
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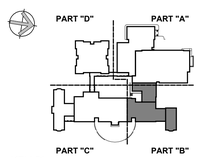
7	EXISITNG PHONE DEMARC TO REMAIN.



NO NEW CABLING OTHER THAN THE WALL RENOVATIONS

1 SECOND FLOOR - PART "B"
1/8" = 1'-0"



KEY PLAN

Project Title:

ADDITIONS & ALTERATION TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
311 STATE STREET NEW LONDON CT 06320
203 230 9007 silverpetrucelli.com

Revision:	Description:	Date:	Revised By:

Drawing Title: TECH-SEC-AV SECOND FLOOR PLAN - PART "B"

95% SUBMISSION - AUGUST 29, 2024

Date: 08/29/2024
Scale: 1/8" = 1'-0"
Drawn By: MD
Project Number: 22-382

Drawing Number: T122

8/28/2024 5:17:09 PM

DRAWING KEYNOTES

NO.	DESCRIPTION
1	USE EXISTING OUTLET BOX AND PATHWAY FOR NEW CABLING AND DEVICES
2	EXISITNG CONDUIT FROM STREET TO EXISTING IT SERVER ROOM #2006B TO REMAIN. SERVICE PROVIDER CONNECTIVITY SHALL REMAIN PROTECTED THROUGHOUT THE CONSTRUCTION.
3	NEW \INTERACTIVE BOARD - OFE
4	EXTERIOR HORD TO REMAIN. INSTALL NEW CABLING FROM THE NEW PA HEADEND
5	USE EXISTING PENETRATION AND MOUNTING BOX FOR NEW DEVICE
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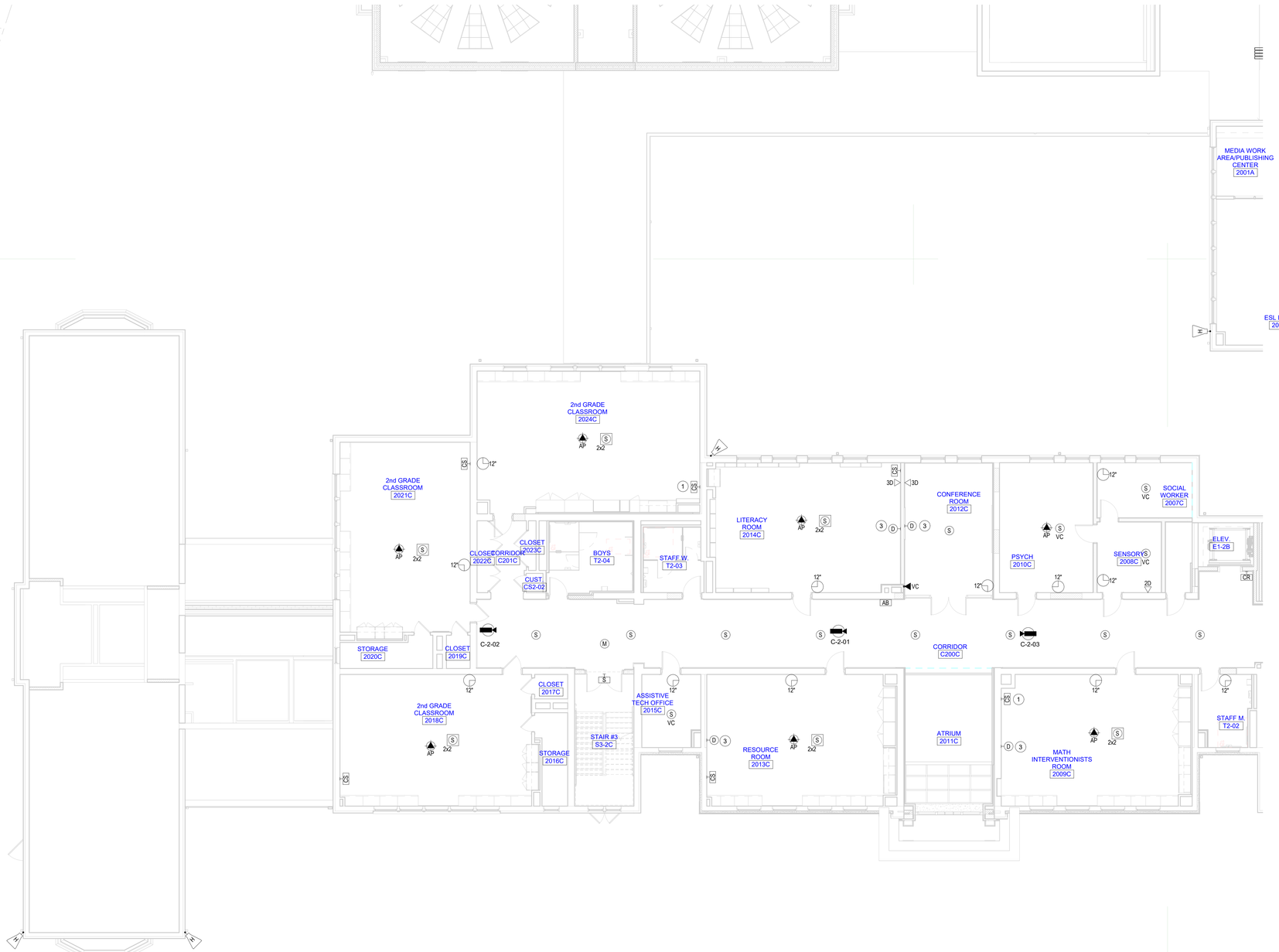
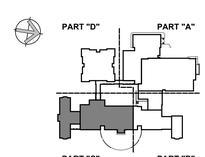
7	EXISITNG PHONE DEMARC TO REMAIN.



1 SECOND FLOOR - PART "C"
1/8" = 1'-0"



KEY PLAN

Project Title:

ADDITIONS & ALTERATION TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
311 STATE STREET NEW LONDON CT 06320
203 230 9007 silverpetrucelli.com

Revision:	Description:	Date:	Revised By:

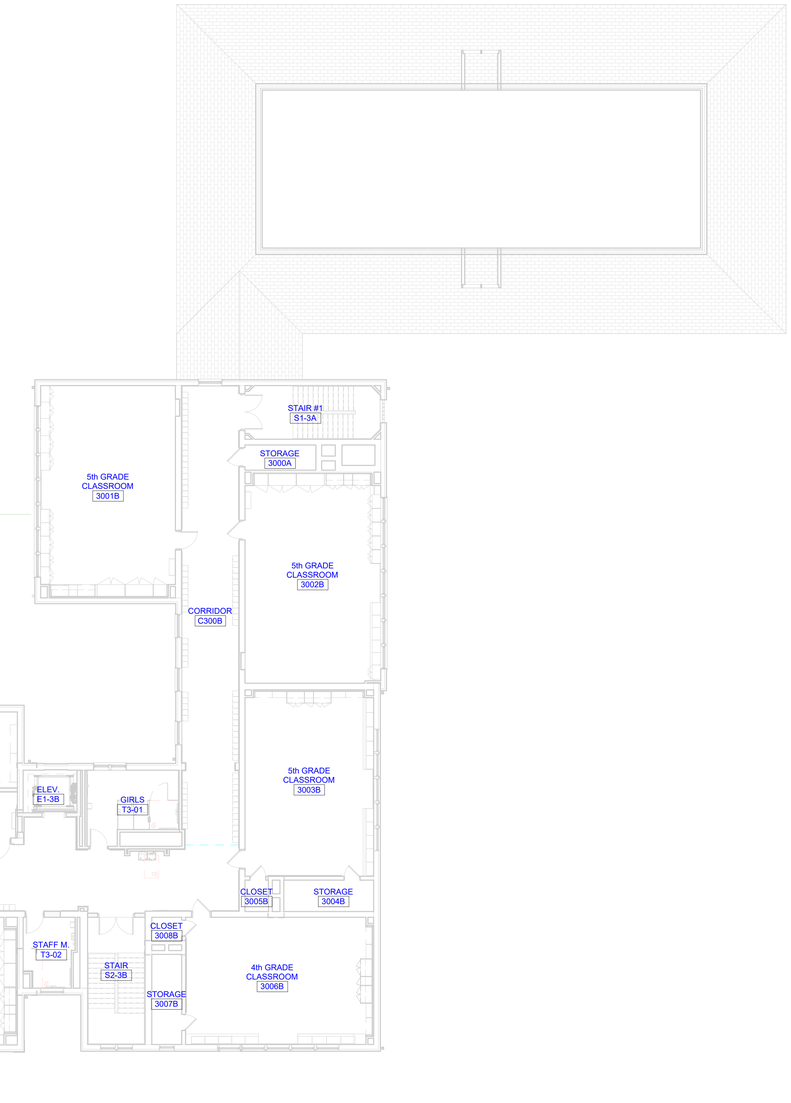
Drawing Title:
TECH-SEC-AV SECOND FLOOR PLAN - PART "C"

95% SUBMISSION - AUGUST 29, 2024

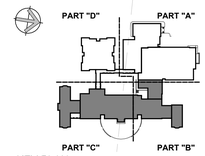
Date: 08/29/2024
Scale: 1/8" = 1'-0"
Drawn By: MD
Project Number: 22-382

Drawing Number: T123

8/29/2024 5:17:10 PM



1 THIRD FLOOR OVERALL
3/32" = 1'-0"



KEY PLAN

Project Title:

ADDITIONS & ALTERATION TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
311 STATE STREET NEW LONDON CT 06320
203 230 9007 silverpetrucelli.com

Revision:	Description:	Date:	Revised By:

Drawing Title:
TECH-SEC-AV OVERALL THIRD FLOOR PLAN

95% SUBMISSION - AUGUST 29, 2024

Date: 08/29/2024
Scale: 3/32" = 1'-0"
Drawn By: MD
Project Number: 22-382

Drawing Number: T130

8/28/2024 5:17:12 PM

DRAWING KEYNOTES

NO.	DESCRIPTION
1	USE EXISTING OUTLET BOX AND PATHWAY FOR NEW CABLING AND DEVICES
2	EXISITNG CONDUIT FROM STREET TO EXISTING IT SERVER ROOM #2006B TO REMAIN. SERVICE PROVIDER CONNECTIVITY SHALL REMAIN PROTECTED THROUGHOUT THE CONSTRUCTION.
3	NEW \INTERACTIVE BOARD - OFE
4	EXTERIOR HORD TO REMAIN. INSTALL NEW CABLING FROM THE NEW PA HEADEND
5	USE EXISTING PENETRATION AND MOUNTING BOX FOR NEW DEVICE
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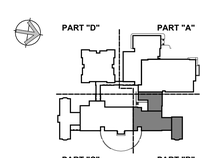
7	EXISITNG PHONE DEMARC TO REMAIN.



NO NEW CABLING OTHER THAN THE WALL RENOVATIONS

1 THIRD FLOOR - PART "B"
1/8" = 1'-0"



KEY PLAN

Project Title:
ADDITIONS & ALTERATION TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
311 STATE STREET NEW LONDON CT 06320
203 230 9007 silverpetrucelli.com

Revision:	Description:	Date:	Revised By:

Drawing Title:
TECH-SEC-AV THIRD FLOOR PLAN - PART "B"

95% SUBMISSION - AUGUST 29, 2024

Date: 08/29/2024
Scale: 1/8" = 1'-0"
Drawn By: MD
Project Number: 22-382
Drawing Number: T132

8/28/2024 5:17:13 PM

DRAWING KEYNOTES

NO.	DESCRIPTION
1	USE EXISTING OUTLET BOX AND PATHWAY FOR NEW CABLING AND DEVICES
2	EXISITNG CONDUIT FROM STREET TO EXISTING IT SERVER ROOM #2006B TO REMAIN. SERVICE PROVIDER CONNECTIVITY SHALL REMAIN PROTECTED THROUGHOUT THE CONSTRUCTION.
3	NEW \INTERACTIVE BOARD - OFE
4	EXTERIOR HORD TO REMAIN. INSTALL NEW CABLING FROM THE NEW PA HEADEND
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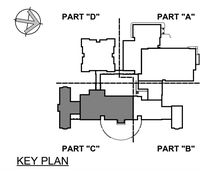
7	EXISITNG PHONE DEMARC TO REMAIN.



1 THIRD FLOOR - PART "C"
1/8" = 1'-0"



KEY PLAN

Project Title:

ADDITIONS & ALTERATION TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
311 STATE STREET NEW LONDON CT 06320
203 230 9007 silverpetrucelli.com

Revision:	Description:	Date:	Revised By:

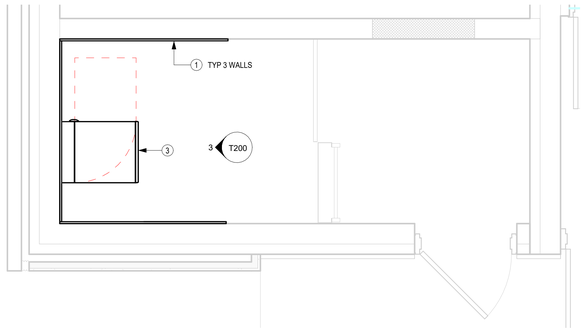
Drawing Title:
TECH-SEC-AV THIRD FLOOR PLAN - PART "C"

95% SUBMISSION - AUGUST 29, 2024

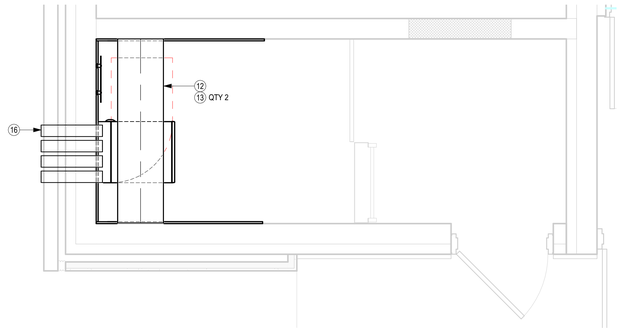
Date: 08/29/2024
Scale: 1/8" = 1'-0"
Drawn By: MD
Project Number: 22-382

Drawing Number: T133

8/28/2024 5:17:14 PM

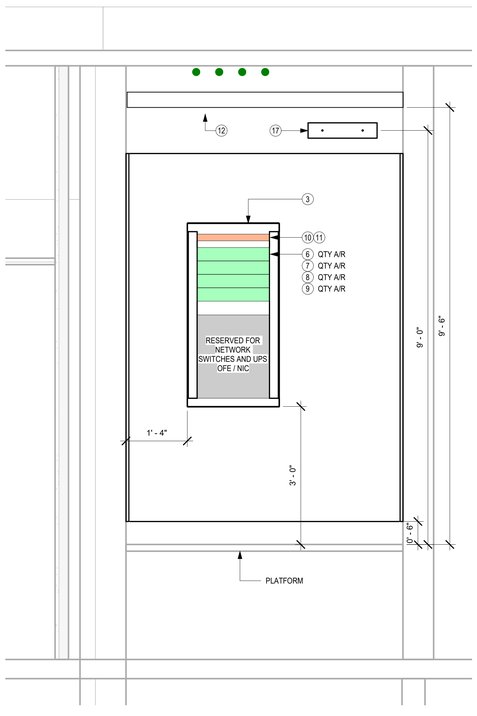


1 DATA ROOM #1008A PLAN VIEW
1/2" = 1'-0"

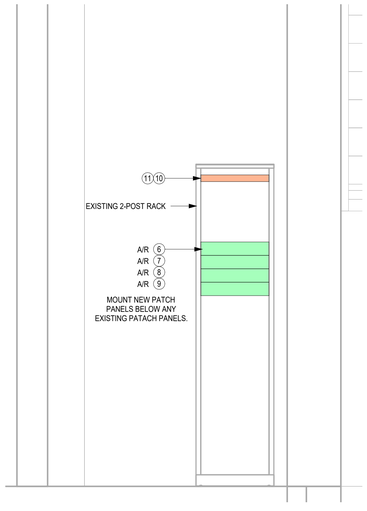


2 DATA ROOM #1008A RCP VIEW
1/2" = 1'-0"

PRODUCT DESCRIPTION		
KEY	DESCRIPTION	MANUFACTURER #
1	3/4" FIRE RATED PLYWOOD PAINTED WITH 2 COATS OF FIRE RETARDANT PAINT AS SPECIFIED. MOUNT BOTTOM OF PLAYWOOD AT 6" AFF.	AS REQUIRED
2	TWO-POST RACK; 45 RMU 19" W x 7 ' H x 3" D	CPI #46353-703 OR EQUIV
3	WALL MOUNTED CABINET, THREE-PART, SWING-OUT, 24"Wx30"Dx48"H (26RU) INCLUDE: LOW-DECIBEL DUAL-FAN AND FILTER KIT INCLUDE: REPLACEMENT FILTER KIT, PACK OF 5	CUBE-iT #12419-748 OR EQUIV CUBE-iT #40975-001 OR EQUIV CUBE-iT #40973-001 OR EQUIV
4	10" WIDE, DOUBLE SIDED VERTICAL WIRE MANAGER	CPI #13914-703 OR EQUIV
5	HORIZONTAL WIRE MANAGER - 1RU	AS SPECIFIED
6	48 PORT MODULAR ANGLED PATCH PANELS, 2RU	AS SPECIFIED
7	CATEGORY 6A JACK MODULE, BLUE (DATA)	AS SPECIFIED
8	CATEGORY 6A JACK MODULE, RED (WAP'S)	AS SPECIFIED
9	CATEGORY 6A JACK MODULE, YELLOW (VSS CAMERAS)	AS SPECIFIED
10	FIBER OPTIC CABINET - 1RU	AS SPECIFIED
11	LC ADAPTER PLATES, 6 LC DUPLEX (12 FIBER STRANDS), COLOR: AQUA	AS SPECIFIED
12	18" WIDE CABLE TRAY MOUNTED TO CEILING DECK. INCLUDE THREADED RODS W/PROTECTIVE COVERS, TRAPEZE BRIDGE SUPPORT AND ALL REQUIRED MOUNTING ACCESSORIES	CPI OR EQUIV
13	18" WIDE RADIUS DROP	CPI OR EQUIV
14	PUBLIC ADDRESS WALL CABINET	AS SPECIFIED
15	SECURITY PANEL LOCATION	AS SPECIFIED
16	4" CONDUITS SLEEVES	AS SPECIFIED
17	GROUNDING BUSBAR	FURNISHED BE DIV 26 0000
18	110 STYLE WALL MOUNTED VOICE BLOCK, 100 PAIR. COORDINATE LOCATIONS WITH SERVICE PROVIDERS DEMARCATION.	AS SPECIFIED



3 DATA ROOM #1008A ELEVATION
3/4" = 1'-0"

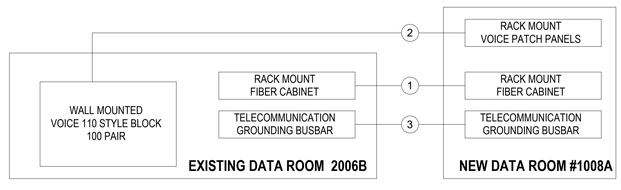


DEMO NOTES:
1. DO NOT REUSE ANY 8P8C (RJ45) PORTS THAT WERE PART OF THE DEMO. IF PATCH PANELS ARE EMPTY, REMOVE AND DISCARD.
2. ALL NEW CABLING SHALL RECIEVE NEW 8P8C (RJ45) PORTS AND PATCH PANELS.

5 EXISTING DATA ROOM 2006B
3/4" = 1'-0"

KEYNOTES:

1. 12 STRAND OM4 MULTI-MODE FIBER OPTIC PLENUM RATED ARMORED CABLE TERMINATED ONTO "LC" TYPE ADAPTER PLATES WHICH WILL BE TERMINATED WITHIN RACK MOUNTED FIBER OPTIC CABINETS AT EACH ENDS.
2. 25 PAIR CATEGORY 5E RATED PLENUM CABLE BETWEEN THE 100 PAIR 110 STYLE WALL MOUNTED BLOCK IN THE DATA ROOM 2006B AND TERMINATED ONTO 110 STYLE 24 PORT, RACK MOUNTED PATCH PANELS IN DATA ROOM 1008A. TERMINATE EACH PAIR OF THE COPPER RISER CABLES ON THE BLUE PAIR (PR 1) OF EACH PORT OF THE PATCH PANELS. COIL THE 25TH PAIR (VIOLET/SLATE) AT THE PATCH PANEL END OF EACH CABLE FOR REPAIR OR FUTURE USE
3. #6 AWG (OR AWG AS REQUIRED PER DISTANCES) GROUNDING BUSS WIRE TERMINATING ONTO GROUNDING BUSS BARS AT EACH END



6 BACKBONE WIRING DIAGRAM
12" = 1'-0"

Project Title:
ADDITIONS & ALTERATION TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

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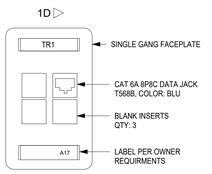
Revision:	Description:	Date:	Revised By:

Drawing Title:
TECH - DATA ROOM #1008A & 2006B DETAILS

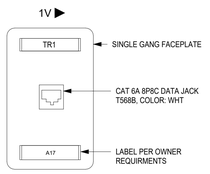
95% SUBMISSION - AUGUST 29, 2024

Date: 08/29/2024
Scale: As indicated
Drawn By: MD
Project Number: 22-382
Drawing Number: T200

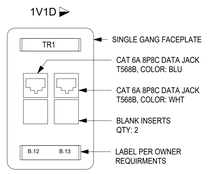
8/29/2024 5:17:15 PM



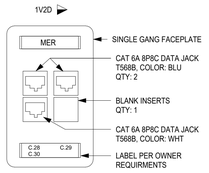
1 DATA OUTLET DETAIL - 1D
12" = 1'-0"



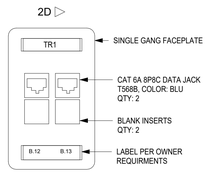
2 DATA OUTLET DETAIL - 1V
12" = 1'-0"



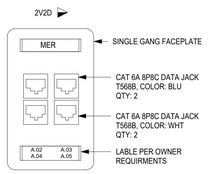
3 DATA OUTLET DETAIL - 1V1D
12" = 1'-0"



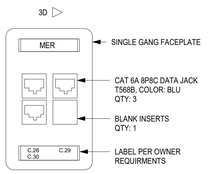
4 DATA OUTLET DETAIL - 1V2D
12" = 1'-0"



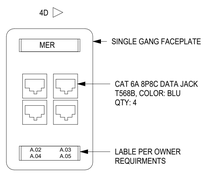
5 DATA OUTLET DETAIL - 2D
12" = 1'-0"



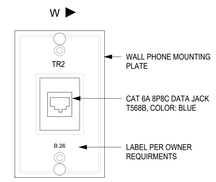
6 DATA OUTLET DETAIL - 2V2D
12" = 1'-0"



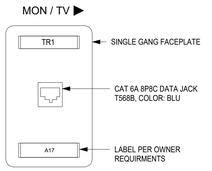
7 DATA OUTLET DETAIL - 3D
12" = 1'-0"



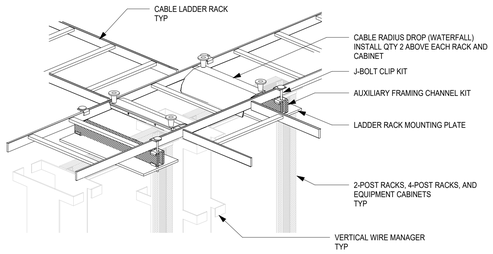
8 DATA OUTLET DETAIL - 4D
12" = 1'-0"



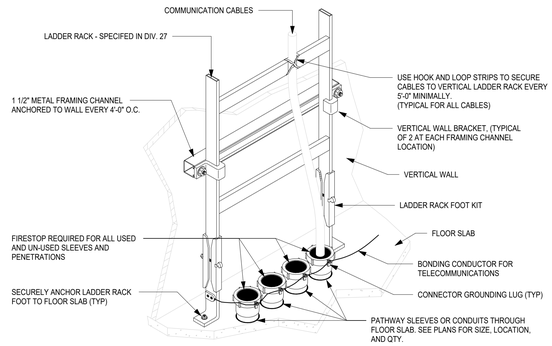
17 WALL PHONE MTG PLATE
12" = 1'-0"



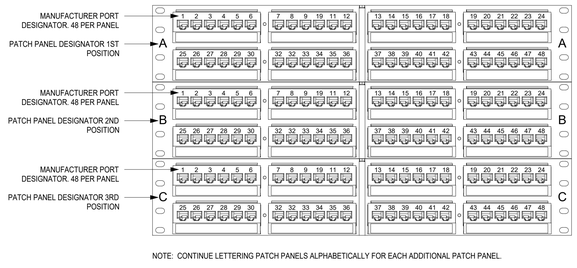
9 DATA OUTLET DETAIL - MON-TV
12" = 1'-0"



11 DATA ROOM - LADDER RACK INSTALL ABOVE RACKS
12" = 1'-0"

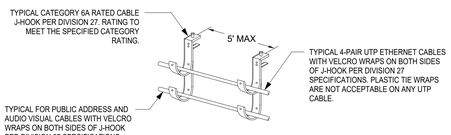


13 DATA ROOM - VERTICAL LADDER RACK DETAIL
12" = 1'-0"



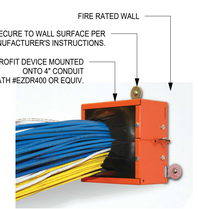
NOTE: CONTINUE LETTERING PATCH PANELS ALPHABETICALLY FOR EACH ADDITIONAL PATCH PANEL.

16 PATCH PANEL LABELING
12" = 1'-0"

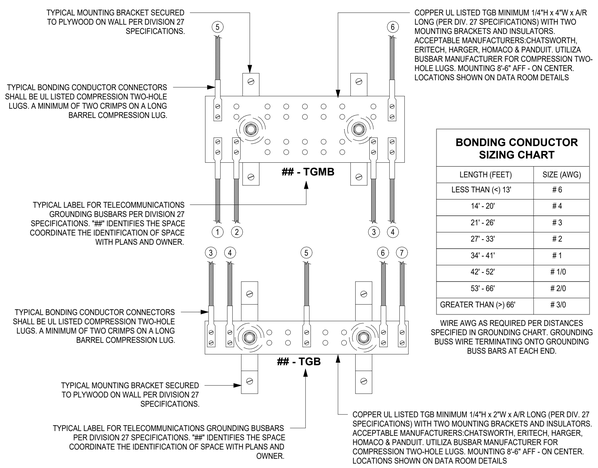


NOTE:
1. J HOOKS SHALL BE SIZED TO ACCOMMODATE TWICE AS MANY CABLES REQUIRED TO BE SUPPORTED INCLUDING AN ADDITIONAL 40% HEADROOM.

14 J-HOOK INSTALLATION - CABLING SUPPORT
12" = 1'-0"



15 FIRE STOP RETROFIT DETAIL
12" = 1'-0"



BONDING CONDUCTOR SIZING CHART	
LENGTH (FEET)	SIZE (AWG)
LESS THAN (<) 13'	# 6
14' - 20'	# 4
21' - 26'	# 3
27' - 33'	# 2
34' - 41'	# 1
42' - 52'	# 1/0
53' - 66'	# 2/0
GREATER THAN (>) 66'	# 3/0

WIRE AWG AS REQUIRED PER DISTANCES SPECIFIED IN GROUNDING CHART. GROUNDING BUSS WIRE TERMINATING ONTO GROUNDING BUSS BARS AT EACH END.

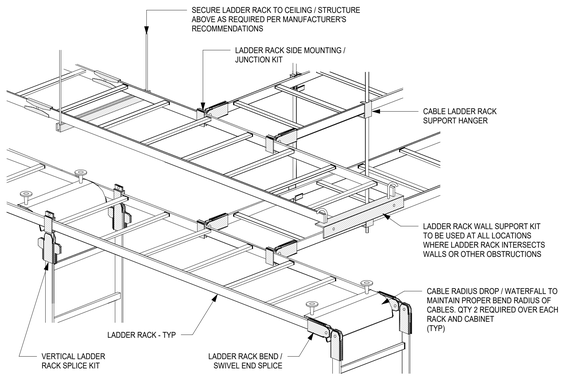
GROUNDING AND BONDING KEYNOTES

1. BONDING CONDUCTOR FOR TELECOMMUNICATIONS (BCT) TO BUILDING GROUNDING ELECTRODE. REFER TO RISER DIAGRAM.
2. BCT TO NEAREST BUILDING STEEL STRUCTURE. IF APPLICABLE. UTILIZE EXOTHERMIC WELDING CONNECTION TO BUILDING STEEL.
3. BCT TO NEAREST BUILDING ELECTRICAL PANELBOARD GROUND BAR. UTILIZE LISTED CONNECTOR TO PANELBOARD GROUND BUS. TELECOMMUNICATION BONDING BACKBONE (TBB) FOR GROUNDING EQUALIZER (GE), IF APPLICABLE. REFER TO RISER DIAGRAM.
4. TYPICAL TBB(S) THAT INTERCONNECTS ALL TGB(S) WITH THE TMGB. REFER TO RISER DIAGRAM.
5. BCT TO TELECOMMUNICATIONS CABLE RUNWAY(S), RACK(S), CABINET(S) AND APPLICABLE EQUIPMENT. DAISY CHAINING OF BCT AT RELAY IS NOT ACCEPTABLE. EACH RACK IS TO HAVE A BCT TO A COMPRESSION LUG TAP TO THE DEDICATED HOMERUN BCT BACK
6. TO THE TGB. SEE DETAILS.

GROUNDING AND BONDING GENERAL NOTES

A. REFER TO GROUNDING AND BONDING DIVISION 27 SPECIFICATIONS FOR ADDITIONAL INFORMATION.
B. REFER TO GROUNDING AND BONDING RISER DIAGRAM FOR ADDITIONAL INFORMATION.
C. PROVIDED 2"C SLEEVE PATHWAY AT EACH FLOOR AND WALL PENETRATIONS FOR THE TELECOMMUNICATION BONDING BACKBONE (TBB). COORDINATE PROPER METHODS FOR PENETRATIONS WITH FIRESTOPPING AS REQUIRED PER DIVISION 07 SPECIFICATIONS.
D. BONDING CONDUCTORS SHALL BE #3/0 AWG COLOR GREEN INSULATED COPPER CONDUCTOR OR SIZED PER "BONDING CONDUCTOR SIZING CHART" (ANSI J-STD-607-A) IN PATHWAY.
E. FASTENING BONDING CONNECTOR TWO-HOLE LUGS TO ALL BUSBARS SHALL BE CLEANED AND APPLY A COPPER ANTI-OXIDANT TO THE CONTACT AREA OF BOTH THE CONNECTOR LUG AND THE BUSBAR.
F. BONDING CONDUCTORS AND BUSBARS SHALL BE LABELED WITH IDENTIFICATION IN ACCORDANCE WITH THE REQUIREMENTS OF ANSI/TIA/EIA-606-A.
G. BONDING CONDUCTORS SHALL BE LABELED WITH IDENTIFICATION LABEL NOTED BELOW AND SECURED WITH CABLE TIE TO EACH CONDUCTOR. (ANSI J- STD-607-A). "IF THIS CONNECTOR OR CABLE IS LOOSE OR MUST BE REMOVED, PLEASE CALL THE BUILDING TELECOMMUNICATIONS MANAGER".
H. CONTINUITY TESTING MEASUREMENTS OF THE GROUNDING RESISTANCE TO NOT EXCEED 0.1 OHM BETWEEN:
H.1 THE TMGB AND THE NEAREST GROUNDING ELECTRODE.
H.2 EACH TGB AND THE NEAREST GROUNDING ELECTRODE.
H.3 EACH TGB AND PATHWAY(S), RACK(S), CABINET(S) AND APPLICABLE EQUIPMENT.

10 DATA ROOM - GROUNDING BUSS BAR TMGB & TGB
12" = 1'-0"



NOTE: ALL CONNECTION HARDWARE, PARTS AND PIECES ARE TO BE OF THE SAME MANUFACTURER AS THE LADDER RACK AND APPROVED BY THE MANUFACTURER AS APPROPRIATE FOR THIS APPLICATION.

12 DATA ROOM - LADDER RACK INSTALLATION
12" = 1'-0"

Project Title:

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Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

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311 STATE STREET NEW LONDON CT 06320
203 230 9007 silverpetrucelli.com

Revision:	Description:	Date:	Revised By:

Drawing Title: TECH-SEC-AV - DETAILS

95% SUBMISSION - AUGUST 29, 2024

Date: 08/29/2024
Scale: 12" = 1'-0"
Drawn By: MD
Project Number: 22-382
Drawing Number: T300

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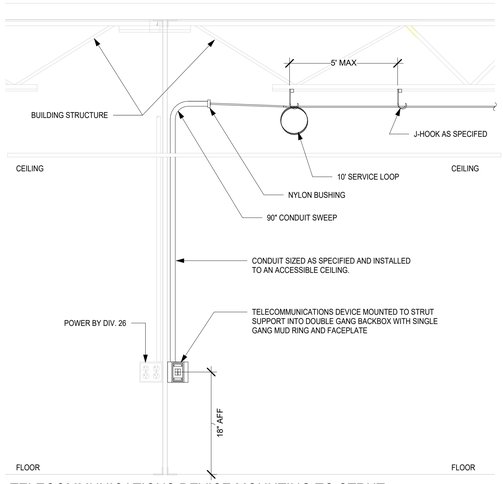
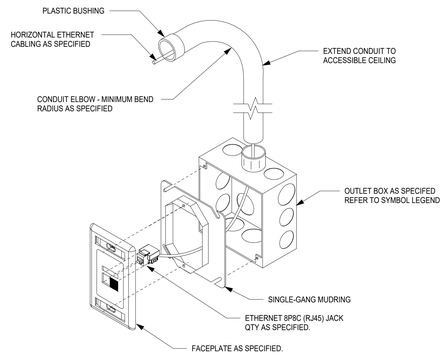


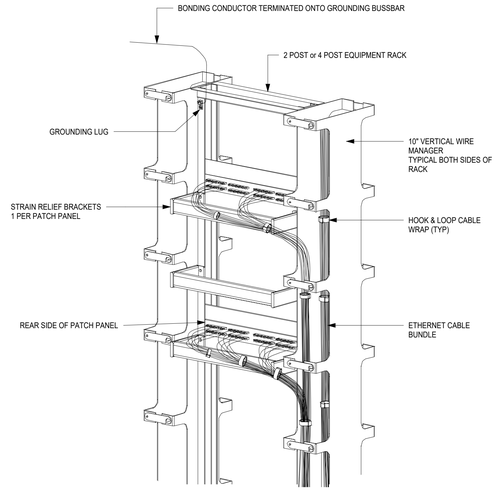
1 TELECOMMUNICATIONS DEVICE MOUNTING TO STRUT SUPPORT

12" = 1'-0"



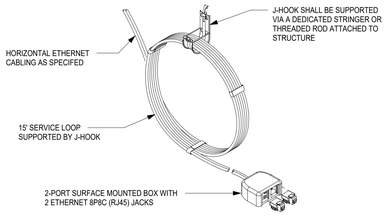
2 TELECOMMUNICATIONS DEVICE OUTLET ASSEMBLY

12" = 1'-0"



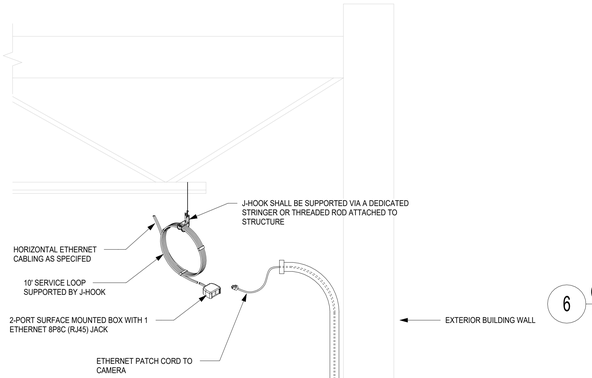
3 TYP RACK ASSEMBLY DETAIL

12" = 1'-0"



4 WAP - CEILING MOUNTED CABLING 2

12" = 1'-0"

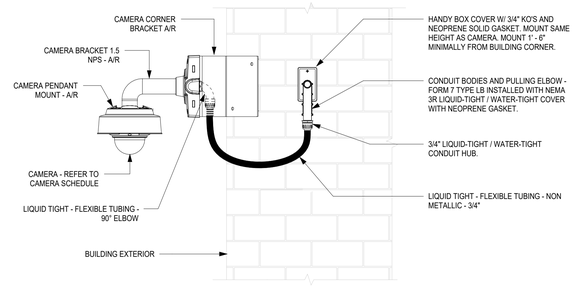


NOTES:

1. LOCATION OF PENETRATION AND JB SHALL BE COORDINATED WITH THE SECURITY CONTRACTOR AND PROVIDED BY THE GENERAL CONTRACTOR. CONDUIT SHALL BE INSTALLED WITH A 5-DEGREE ANGLE - THE INTERIOR SHALL BE HIGHER THAN THE EXTERIOR OPENING. PROVIDE A WATERTIGHT SEAL IN THE CONDUIT AFTER INSTALLATION.
2. NOT ALL PARTS ARE SHOWN. CONTRACTOR SHALL ENSURE A COMPLETE WORKING INSTALLATION.

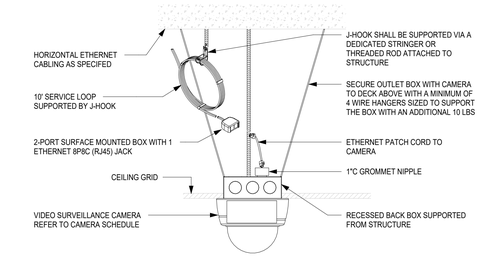
7 CAMERA - EXTERIOR WALL MOUNTED W/ PENDANT

12" = 1'-0"



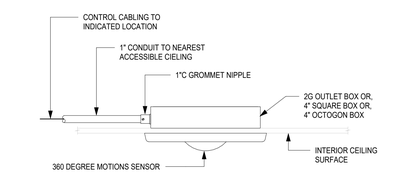
6 CAMERA - EXTERIOR CORNER MOUNT

12" = 1'-0"



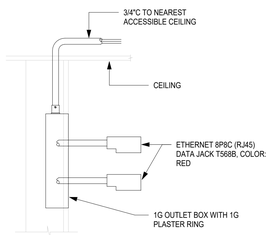
8 CAMERA - INTERIOR CEILING MOUNT

12" = 1'-0"



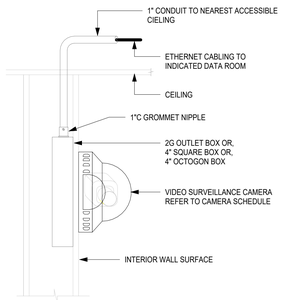
10 IDS - 360 DEGREE MOTION SENSOR

12" = 1'-0"



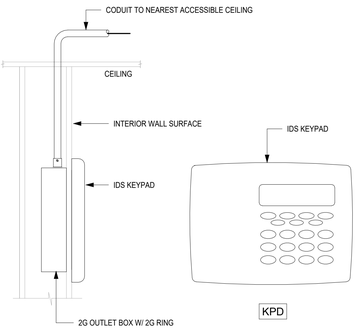
5 WAP - WALL MOUNTED CABLING

12" = 1'-0"



9 CAMERA - INTERIOR WALL MOUNT

12" = 1'-0"



11 IDS - KEYPAD DETAIL

12" = 1'-0"

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Old Greenwich School
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Scale: 12" = 1'-0"
Drawn By: MD
Project Number: 22-382
Drawing Number: T301

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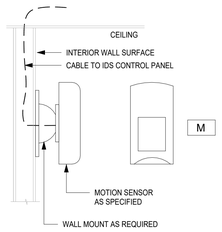
NOTES:

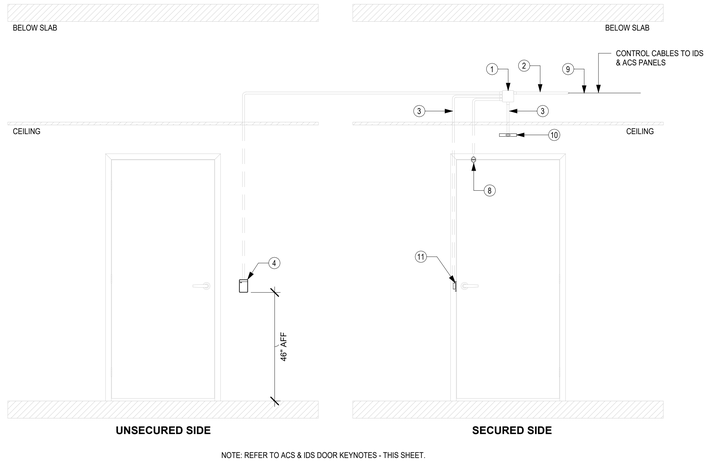
THE LOCKDOWN BUTTONS SHALL CONNECT TO THE ACCESS CONTROL SYSTEM, MASS NOTIFICATION SYSTEM (PUBLIC ADDRESS SYSTEM) AND FIRE ALARM SYSTEM. CONFIGURATION OF FUNCTIONALITY MUST BE COORDINATED WITH THE OWNER AND SECURITY CONSULTANT. AT A MINIMUM,THE FOLLOWING FEATURES SHALL BE OCCUR UPON ACTIVATION:

1. MUST LOCK DOWN ALL ACCESS CONTROLLED DOORS WITH ASSOCIATED THREAT LEVELS CONFIGURED INTO THE ACCESS CONTROLLED SYSTEM FOR ALL CONTROLLED DOORS. THIS THREAT LEVEL ACCESS SHALL BE DESCRIBED BY THE OWNER DURING CONFIGURATION OF THESE SECURITY SYSTEMS. AS AN EXAMPLE: THE PRINCIPAL, FIRE AND POLICE SHALL BE THE ONLY PEOPLE AUTHORIZED PERSONNEL ALLOWED ACCESS THROUGH THE CONTROLLED DOORS.
2. MUST INTERFACE WITH THE FIRE ALARM SYSTEM TO CLOSE SMOKE DOORS.
3. MUST NOTIFY THE SECURITY MONITORING COMPANY OF AN EMERGENCY EVENT.
4. MUST INITIATE AN EMERGENCY BROADCAST OVER THE MASS NOTIFICATION SYSTEM / PUBLIC ADDRESS SYSTEM. THIS PRE- RECORDED MESSAGE SHALL BE CREATED WITH THE OWNER DURING SYSTEM CONFIGURATION OF THE P/A SYSTEM.
5. THE LOCKDOWN BUTTON SHALL BE COLORED GREEN.
6. LABEL AS "LOCKDOWN"
7. MOUNT 48" AFF
8. REFER TO WRITTEN SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS.
9. LOCKDOWN BUTTON MUST IONCLUDE A PROTECTIVE, HINGED, COVER.

1 IDS - LOCKDOWN BUTTON
12" = 1'-0"

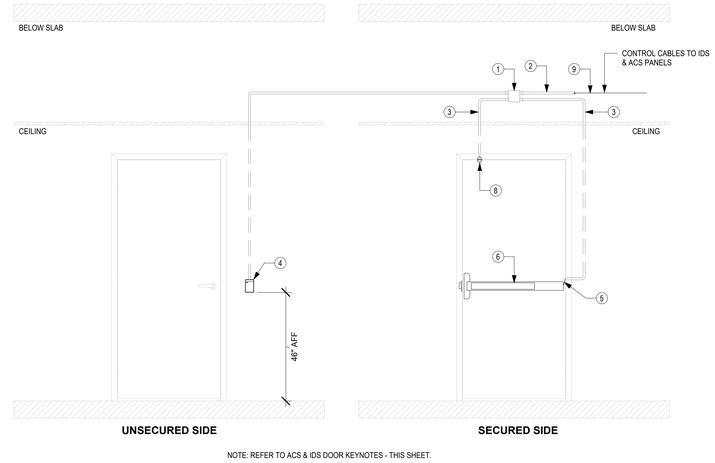


2 IDS - MOTION SENSOR WALL MTG
12" = 1'-0"



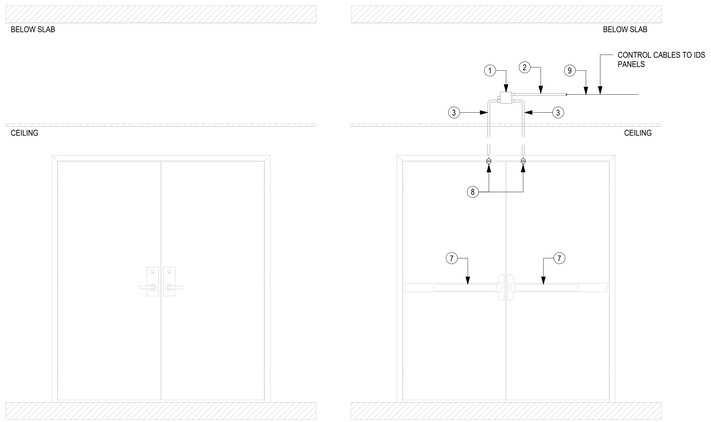
NOTE: REFER TO ACS & IDS DOOR KEYNOTES - THIS SHEET.

7 ACS - SINGLE DOOR W/ELECTRIC STRIKE
12" = 1'-0"



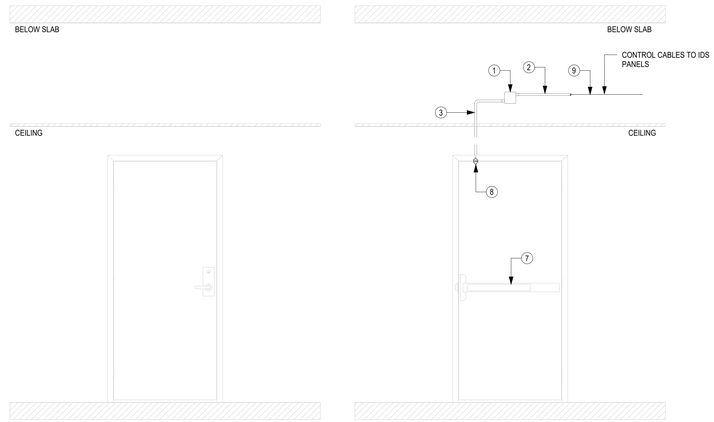
NOTE: REFER TO ACS & IDS DOOR KEYNOTES - THIS SHEET.

8 ACS - SINGLE DOOR W/ELECTRIC TRANSFER HINDGE
12" = 1'-0"



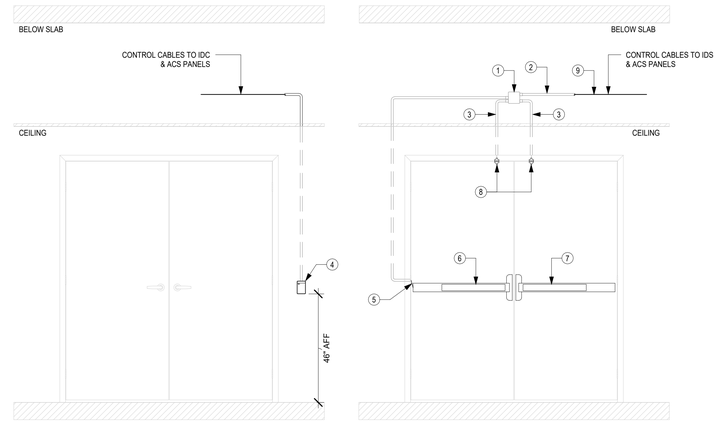
NOTE: REFER TO ACS & IDS DOOR KEYNOTES - THIS SHEET.

3 IDS DOUBLE DOOR -W/DPS
12" = 1'-0"



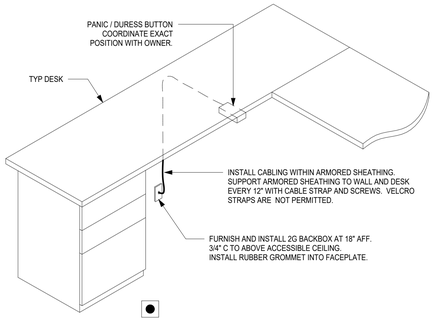
NOTE: REFER TO ACS & IDS DOOR KEYNOTES - THIS SHEET.

4 IDS SINGLE DOOR - W/DPS
12" = 1'-0"

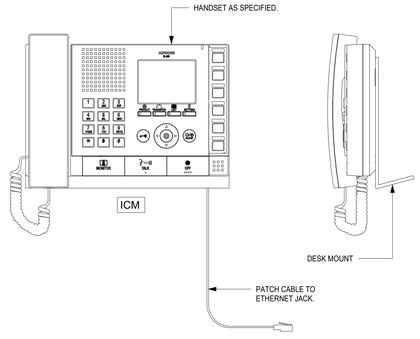


NOTE: REFER TO ACS & IDS DOOR KEYNOTES - THIS SHEET.

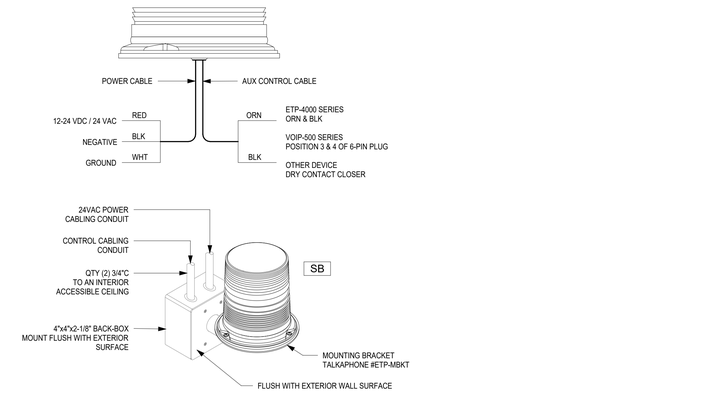
5 ACS - DOUBLE DOOR W/ELECTRIC TRANSFER HINDGE
12" = 1'-0"



6 ACS - PANIC / DURESS BUTTON MTG DETAIL
12" = 1'-0"



9 ACS - INTERCOM MASTER STATION
12" = 1'-0"



10 SECURITY - EMERGENCY STROBE LIGHT
12" = 1'-0"

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3190 WHITNEY AVENUE HAMDEN CT 06518
311 STATE STREET NEW LONDON CT 06320
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Revision:	Description:	Date:	Revised By:

Drawing Title: TECH-SEC-AV - DETAILS

95% SUBMISSION - AUGUST 29, 2024

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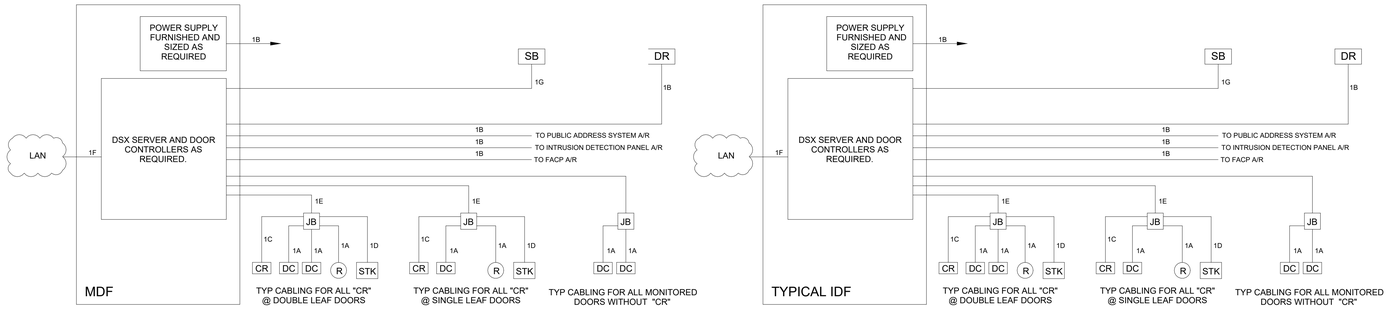


ELECTRIC LOCKSETS, REQUEST TO EXIT DEVICES, AND DOOR POSITION SWITCHES
REFER TO DIV 08 FOR DOOR HARDWARE

ELECTRIC LOCKSETS, REQUEST TO EXIT DEVICES, AND DOOR POSITION SWITCHES
REFER TO DIV 08 FOR DOOR HARDWARE

NOTES;
1. QTY OF DOOR CONTROLLERS SHALL BE PER CARD READER QUANTITIES ON PLANS.
2. INCLUDE ALL REQUIRED ELEVATOR CONTROL LICENSES. COORDINATE ELEVATOR FUNCTIONALITY WITH OWNER AND ELEVATOR CONTRACTOR.
   2.1. THERE SHALL BE A CARD READER DEDICATED TO EACH ELEVATOR ON EACH FLOOR. UPON PRESENTATION OF A VALID CREDENTIAL, THE ACCESS CONTROL SYSTEM SHALL CALL THE ELEVATOR FROM THE ELEVATOR CONTROL PANEL.
   2.2. INCLUDE ALL REQUIRED LICENSES, CABLING, AND CONFIGURATION REQUIRED FOR A FULLY FUNCTIONAL SYSTEM.
3. ALL REQUIRED CONTROL CABLING FROM THE DATA ROOMS TO EACH ACCESS CONTROL DEVICE IS REQUIRED AS PART OF HIS BID MANUAL.
4. ALL REQUIRED POWER CABLING TO EACH LOW VOLTAGE DEVICE AT EACH DOOR RECEIVING A CARD READER IS REQUIRED AS PART OF HIS BID MANUAL.
2. REFER TO DIVISION 08, DOOR HARDWARE SPECIFICATION TO ENSURE ALL REQUIRED POWER SUPPLIES AND SIZING OF SUCH SHALL ACCOMMODATE ALL CARD READERS, ELECTRONIC DOOR STRIKES / LOCKS AND REQUEST TO EXIT DEVICES WHICH ARE BUILT INTO THE DEVICES.
4. THE INTERCOM DOOR RELEASE AND DOOR RELEASE BUTTONS SHALL RELEASE THE DOORS FROM THE ACS PANEL. INCLUDE ALL ANALOG/IP RELAYS SUPPORTED BY THE INTERCOM DOOR RELEASE MANUFACTURER AS REQUIRED.
5. CONTROL CABLING TO THE FIRE ALARM CONTROL PANEL SHALL BE CAPABLE OF RELEASING THE MAGNETIC HOLD OPEN DOORS AS NOTED ON THE DRAWINGS DURING A LOCKDOWN EVENT.
6. ACTIVATION OF THE LOCKDOWN OR DURESS BUTTONS SHALL REGISTER AS AN ADDRESSABLE ALARM ON THE INTRUSION DETECTION PANEL AND DIAL-OUT TO THE CENTRAL MONITORING COMPANY.
7. ALERT BEACONS SHALL CONNECT TO DISTRICT ALERTUS SERVER. CONFIGURE THE ALERTBEACONS SO THAT LOCKDOWN AND DURESS BUTTONS WILL ACTIVATE ALERT BEACONS IN THE EVENT OF AN EMERGENCY. COORDINATE ALERT BEACON TEXT AND NOTIFICATION STATUS WITH OWNER DURING CONFIGURATION.
8. THE MERCURY CONTROLLER SHALL CONNECT TO THE BUILDING LAN. NETWORK SWITCHES ARE BY OTHERS. COORDINATE SECURITY VLAN AND IP ADDRSESING WITH OWNER'S IT TEAM.
9. THE ACCESS CONTROL SYSTEM SHALL CONNECT TO THE PUBLIC ADDRESS SYSTEM, VIDEO SURVEILLANCE SYSTEM, ALERTUS SYSTEM, AND FIRE ALARM SYSTEM FOR FULL INTEROPERABILITY AND NOTIFICATION OF ALARMS.

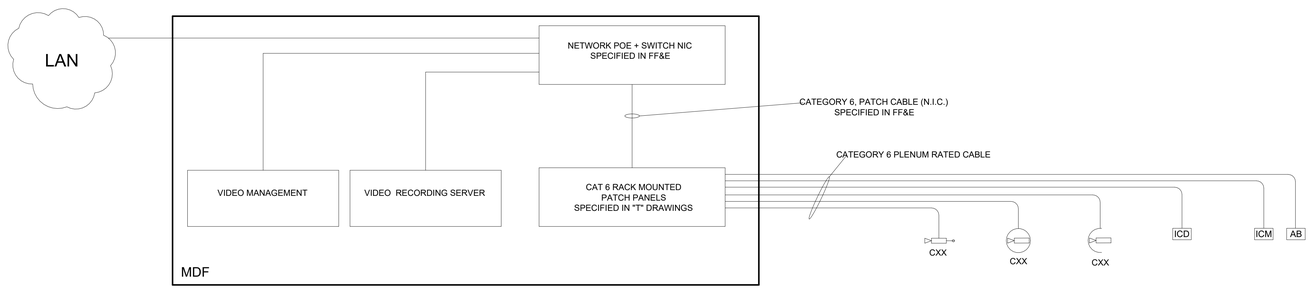
DESIGNATION	WIRE TYPE
1A	#22 - 2C, PLENUM
1B	CABLE A/R PER DEVICES & MANUFACTURER RECOMMENDATIONS
1C	#18-6C SH'D, PLENUM
1D	#18 - 2C SHL'D, PLENUM
1E	BELDEN #658AF-J COMPOSITE CABLE PLENUM or Equiv. #18-6C SHL'D, 22-2C, 22-4C, 18-4C
1G	#22-4C UNSHIELDED, SOLID, PLENUM
1H	CAT6A PLENUM

TYPICAL ACCESS CONTROL WIRING DIAGRAM | NONE | 01

CAMERA SCHEDULE

#	MANUFACTURER	MODEL	MOUNTING TYPE	MOUNTING HEIGHT	FACTORY REPAINT
C-1-01	ETR	ETR	ETR	0' - 0"	
C-1-02	ETR	ETR	ETR	0' - 0"	
C-1-03	AVIGILON	3.0C-H6M-D2-IR	WALL	0' - 0"	
C-1-03	AVIGILON	3.0C-H6M-D2-IR	WALL	8' - 0"	
C-1-04	AVIGILON	3.0C-H5A-CR1-IR	CORNER - CEILING	0' - 0"	
C-1-05	AVIGILON	3.0C-H6M-D2-IR	CEILING	0' - 0"	
C-1-06	AVIGILON	3.0C-H6M-D2-IR	CEILING	0' - 0"	
C-1-07	AVIGILON	3.0C-H6M-D2-IR	WALL	8' - 0"	
C-1-08	ETR	ETR	ETR	0' - 0"	
C-1-09	AVIGILON	3.0C-H6M-D2-IR	CEILING	0' - 0"	
C-1-10	AVIGILON	3.0C-H6M-D2-IR	CEILING	0' - 0"	
C-1-11	AVIGILON	3.0C-H6M-D2-IR	WALL	8' - 0"	
C-1-12	ETR	ETR	ETR	0' - 0"	
C-1-13	ETR	ETR	ETR	0' - 0"	
C-1-14	ETR	ETR	ETR	0' - 0"	
C-1-15	ETR	ETR	ETR	0' - 0"	
C-1-16	ETR	ETR	ETR	0' - 0"	
C-2-01	ETR	ETR	ETR	10' - 0"	
C-2-02	ETR	ETR	ETR	10' - 0"	
C-2-03	ETR	ETR	ETR	10' - 0"	
C-2-04	AVIGILON	3.0C-H6M-D2-IR	WALL	0' - 10"	
C-2-05	AVIGILON	3.0C-H6M-D2-IR	WALL	7' - 6"	
C-2-06	AVIGILON	3.0C-H6M-D2-IR	WALL	7' - 6"	
C-3-01	ETR	ETR	ETR	0' - 0"	
C-3-02	ETR	ETR	ETR	0' - 0"	
C-3-03	ETR	ETR	ETR	0' - 0"	
C-E-01	AVIGILON	4.0C-H6A-DO1-IR	WALL	8' - 0"	
C-E-02	AVIGILON	4.0C-H6A-DO1-IR	WALL	8' - 0"	
C-E-03	AVIGILON	15C-H5A-3MH	CORNER PENDANT	8' - 0"	
C-E-04	ETR	ETR	ETR	8' - 0"	
C-E-05	ETR	ETR	ETR	8' - 0"	
C-E-06	AVIGILON	4.0C-H6A-DO1-IR	WALL	8' - 0"	
C-E-07	AVIGILON	4.0C-H6A-DO1-IR	WALL	8' - 8"	
C-E-08	AVIGILON	H5DH-DO1-IR	WALL	8' - 0"	
C-E-09	AVIGILON	H5DH-DO1-IR	WALL	8' - 0"	
C-E-10	AVIGILON	4.0C-H6A-DO1-IR	WALL	8' - 0"	
C-E-11	AVIGILON	4.0C-H6A-DO1-IR	WALL	8' - 0"	
C-E-12	AVIGILON	15C-H5A-3MH	CORNER PENDANT	8' - 0"	
C-E-13	AVIGILON	4.0C-H6A-DO1-IR	WALL	8' - 0"	
C-E-14	ETR	ETR	ETR	8' - 0"	
C-E-15	AVIGILON	4.0C-H6A-DO1-IR	WALL	8' - 0"	
C-E-16	AVIGILON	15C-H5A-3MH	CORNER PENDANT	8' - 0"	
C-E-17	ETR	ETR	ETR	8' - 0"	

CAMERA SCHEDULE | NONE | 03



NOTES:
1. REFER TO "T" DRAWINGS TO DETERMINE WHICH DATA ROOM EACH CAMERA IS TERMINATED BACK TO.
2. VIDEO FROM THE INTERCOM DOOR RELEASES SHALL BE STORED ON THE VMS SERVERS, INCLUDE ALL APPROPRIATE LICENSES.
3. INTERCOM DOOR RELEASE SHALL RELEASE DOORS FROM ACCESS CONTROL PANEL.
4. ALERTUS ALERT BEACONS SHALL BE CONFIGURED TO ENGAGE WHEN LOCKDOWN, PANIC, OR SOFTWARE TRIGGER IS ENGAGED, ALERT BEACONS SHALL CONNECT TO DISTRICT ALERTUS SERVER. COORDINATE CONFIGURATION, TONES, AND MESSAGING FOR DIFFERENT EVENT TYPES WITH OWNER PRIOR TO CONFIGURATION.

TYPICAL VIDEO SURVEILLANCE & INTERCOM DOOR RELEASE WIRING DIAGRAM | NONE | 02

NOTES:
1. EACH DURESS / PANIC BUTTON AND LOCKDOWN BUTTON SHALL CONENCT TO AN ALERT BEACON.
2. EACH ALERTBEACON SHALL CONNECT TO THE NETWORK TO CONNECT TO THE OFFSITE ALERTUS SERVER.
3. THE ALERTUS TEXT TO SPEECH (TTS) DEVICE SHALL CONNECT TO THE FIRE ALARM ANNUNCIATION SYSTEM TO BROADCAST ANNOUNCEMENTS OVER THE FIRE ALARM ANNUNCIATORS.
4. ONE ALERT BEACON SHALL CONNECT TO THE DSX ACCESS CONTROL SYSTEM TO TRIGGER STROBES OVER THE ACS SYSTEM.
5. INCLUDE ALERT BEACONS AND TEXT TO SPEECH MODULES AS REQUIRED.
6. COORDINATE WITH FIRE ALARM VENDOR AND DISTRICT SECURITY VENDOR.

ALERT BEACON SIGNAL FLOW | NONE | 04

NOTES:
1. THE IDS CONTROL PANEL MODEL SHALL INCLUDE AN ADDITIONAL 40% OF HEADROOM FOR FUTURE EXPANSION OF SENSORS.
2. ZONING SHALL BE DESCRIBED BY THE OWNER PRIOR TO INSTALLATION. AT A MINIMUM, THE FOLLOWING ZONES SHALL BE CONFIGURED FOR SEPARATE ARMING AND DISARMING OF THE SYSTEM.
3. THE INTRUSION DETECTION SYSTEM SHALL BE CAPABLE OF ALERTING CENTRAL MONITORING VIA CELLULAR, POTS, AND IP. ALL THREE MEANS OF COMMUNICATION MUST BE PRESENT.
4. THE INTRUSION DETECTION SYSTEM SHALL BE CONFIGURED WITH A 'DAY-ALARM' THAT SENDS INFORMATION ON DOORS THAT ARE PROPPED OPEN TO SELECT USERS VIA TEXT AND EMAIL. THE SYSTEM SHALL BE CAPABLE OF BEING PROGRAMMED TO ALERT USERS OF A PROPPED OPEN DOOR BASED ON DIFFERENT DURATION.
5. THE INTRUSION DETECTION SYSTEM SHALL HAVE A GRAPHICAL USER INTERFACE OF A MAP OF THE FACILITY TO ALERT USERS OF A DOOR PROPPED OPEN SENSOR. INCLUDE ALL LICENSING AND SOFTWARE AS REQUIRED.
6. ALL ENCLOSURES, CABLING, TERMINATIONS, CONFIGURATION AND FINAL TESTING IS REQUIRED FOR A FULLY FUNCTIONAL SYSTEM.
7. INCLUDE ALL BATTERIES AND POWER SUPPLIES PER SPECIFICATION AND AS REQUIRED FOR A FULLY FUNCTIONAL SYSTEM.
8. INCLUDE ALL MODULES FOR A FULLY FUNCTIONAL SYSTEM.
9. EACH ENDPOINT, SHALL BE HOMERUN TO THE APPLICABLE MDF / IDF.
10. EACH SENSOR SHALL BE CONFIGURED WITH AS AN INDIVIDUALLY IDENTIFIED POINT TO DIRECT CENTRAL MONITORING TO THE EXACT SENSOR WHEN ALARMED.
11. SYSTEM SHALL FUNCTION AS ONE COMPLETE SYSTEM.
12. CONFIRM ALL WIRE GAUGES WITH MANUFACTURER PRIOR TO INSTALLATION. INCLUDE ALL EOL RESISTORS. DO NOT APPLY POWER UNTIL OSM REPRESENTATIVE INSPECTED THE INSTALLATION. IMPROPER INSTALLATION MAY DAMAGE EQUIPMENT.
13. ALL CABLING SHALL BE PLENUM RATED.
14. THE CONTRACTOR AWARDED THIS PROJECT SHALL SUBMIT A COMPLETE SHOP DRAWING DURING THE PRODUCT SUBMITTAL PHASE SHOWING EACH DEVICE AND INTERCONNECTION PRIOR TO ROUGH-IN OR THE PULLING OF CABLE.

TYPICAL INTRUSION DETECTION WIRING DIAGRAM | NONE | 05

Project Title:
ADDITIONS & ALTERATION TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
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Revision:	Description:	Date:	Revised By:

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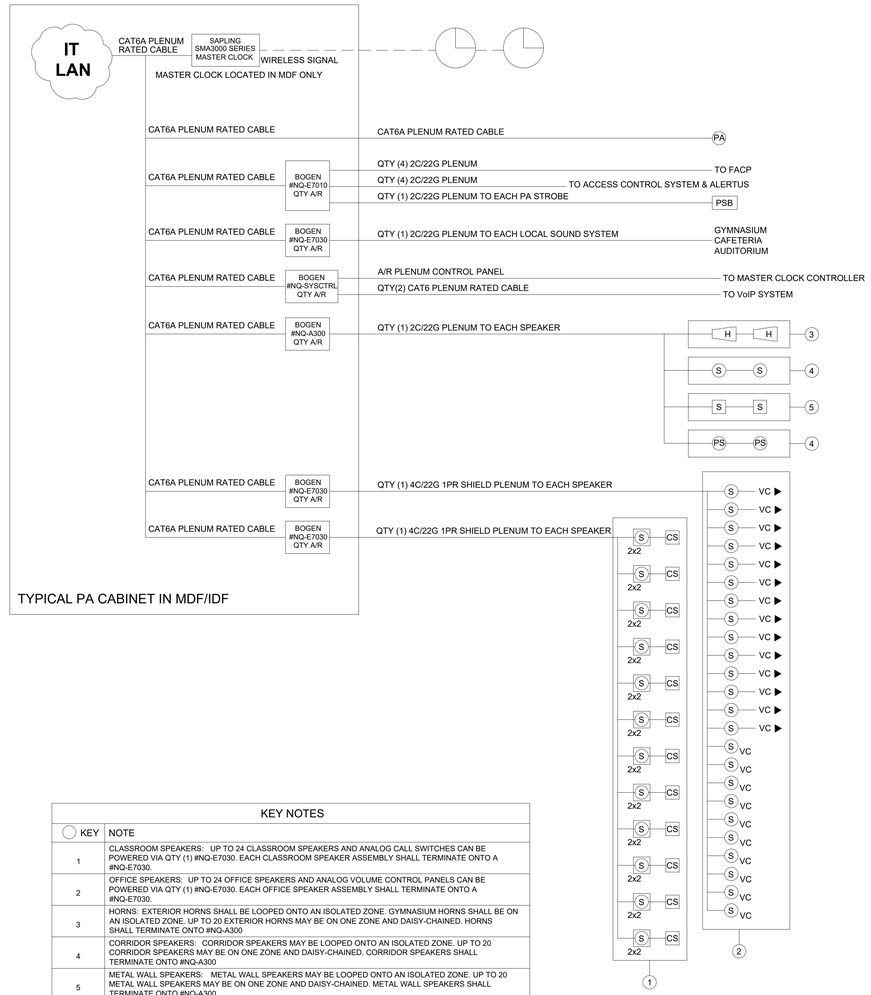

KEY NOTES	
KEY	NOTE
1	CLASSROOM SPEAKERS: UP TO 24 CLASSROOM SPEAKERS AND ANALOG CALL SWITCHES CAN BE POWERED V/A QTY (1) #NQ-E7030. EACH CLASSROOM SPEAKER ASSEMBLY SHALL TERMINATE ONTO A #NQ-E7030.
2	OFFICE SPEAKERS: UP TO 24 OFFICE SPEAKERS AND ANALOG VOLUME CONTROL PANELS CAN BE POWERED V/A QTY (1) #NQ-E7030. EACH OFFICE SPEAKER ASSEMBLY SHALL TERMINATE ONTO A #NQ-E7030.
3	HORNS: EXTERIOR HORNS SHALL BE LOOPED ONTO AN ISOLATED ZONE. GYMNASIUM HORNS SHALL BE ON AN ISOLATED ZONE. UP TO 20 EXTERIOR HORNS MAY BE ON ONE ZONE AND DAISY-CHAINED. HORNS SHALL TERMINATE ONTO #NQ-A300
4	CORRIDOR SPEAKERS: CORRIDOR SPEAKERS MAY BE LOOPED ONTO AN ISOLATED ZONE. UP TO 20 CORRIDOR SPEAKERS MAY BE ON ONE ZONE AND DAISY-CHAINED. CORRIDOR SPEAKERS SHALL TERMINATE ONTO #NQ-A300
5	METAL WALL SPEAKERS: METAL WALL SPEAKERS MAY BE LOOPED ONTO AN ISOLATED ZONE. UP TO 20 METAL WALL SPEAKERS MAY BE ON ONE ZONE AND DAISY-CHAINED. METAL WALL SPEAKERS SHALL TERMINATE ONTO #NQ-A300
6	PENDANT SPEAKERS: PENDANT SPEAKERS MAY BE LOOPED ONTO AN ISOLATED ZONE. UP TO 20 PENDANT SPEAKERS MAY BE ON ONE ZONE AND DAISY-CHAINED. PENDANT SPEAKERS SHALL TERMINATE ONTO #NQ-A300

CABLE ALL PA DEVICES TO THE CORESPONDING DATA ROOM INDICATED ON THE OVERALL CABLE DELINEATION PLANS. DATA ROOM # D127 SHALL NOT RECEIVE ANY PA CABLING

GENERAL NOTES

1. ALL PUBLIC ADDRESS CABLING FOR DEVICES SHALL BE CABLED TO THE DATA ROOMS AS INDICATED ON THE CABLE DECLINATIONS FOR LOW VOLTAGE CABLING.
2. RISER DIAGRAM ON THIS DRAWING IS FOR DESIGN PURPOSES ONLY. CONTRACTOR SHALL PROVIDE A COMPLETE RISER DIAGRAM WITH ACTUAL FIELD WIRING REQUIRED.
3. REFER TO SPECIFICATIONS FOR SYSTEM DESCRIPTION, SEQUENCE OF OPERATION AND OF WIRING.
4. FOR MICROPHONE CABLE RUNS, MAINTAIN A CLEARANCE OF A MINIMUM OF 12" FROM CONDUIT AND CABLES USED FOR ELECTRICAL POWER DISTRIBUTION. WHERE THIS IS NOT FEASIBLE, CROSS HIGHER VOLTAGE LINES PERPENDICULARLY.
5. ALL PENETRATION THROUGH FIRE RATED WALLS SHALL BE SEALED WITH AN APPROVED FIRE STOPPING MATERIAL.
6. SPEAKER CONDUCTORS INSTALLED IN ROOMS OF INSTRUCTION AND OFFICES SHALL BE ONE CONTINUOUS HOME RUN TO THE CENTRAL CONTROL RACK NO SPLICES SHALL BE ALLOWED.
7. THIS RISER DIAGRAM IS SHOWN AS REFERENCE TO INDICATE LOOPING AND ZONING REQUIREMENTS, ACTUAL QUANTITIES MUST BE CONFIRMED BY THE BIDDING CONTRACTOR AND BE OBTAINED FROM THE ARCHITECTURAL DRAWINGS, T-SERIES.
8. PA SHALL BE INSTALLED IN ACCORDANCE WITH NFPA 72, 2010 OR THE MOST CURRENT FIRE CODE STANDARD ADOPTED BY THE STATE OF CONNECTICUT.
9. THE FIRE ALARM CONNECTION WITH THE PA SYSTEM SHALL BE COORDINATED WITH OWNER, FIRE ALARM INSTALLER, SECURITY CONSULTANT, AND PA DESIGNER.
10. PRIORITY OVERRIDE LOADS IN EACH INTERACTIVE DISPLAY LOCATION MUST BE CALCULATED INTO THE PUBLIC ADDRESS AMPLIFIER LOADS.
11. A 1 WATT REPEATER SHALL BE INCLUDED IN EACH DATA CLOSET FOR THE 2-WIRED CLOCK SYSTEM.
12. ALL EXTERIOR HORNS SHALL BE ON AN ISOLATED ZONE AND CAPABLE OF BEING PROGRAMMED TO ONLY ENGAGE DURING BUS OR EMERGENCY ANNOUNCEMENTS.
13. ALL LAN CONNECTIONS SHOWN ON THE TYPICAL WIRING DIAGRAM SHALL TERMINATE ONTO THE REAR OF 19" CATEGORY 6 RATED PATCH PANELS MOUNTED IN THE TWO/FOUR POST RACKS AS SHOWN ON THE MDF/IDF TECHNOLOGY DETAILS.
14. REFER TO PUBLIC ADDRESS SPECIFICATION FOR ALL REQUIRED LICENSES.
15. NETWORK ELECTRONICS (NETWORK SWITCHES) WILL BE OWNER FURNISHED IN A LATER PHASE. IT IS THE RESPONSIBILITY OF THE CONTRACTOR AWARDED THIS PROJECT TO ADVISE THE OWNER ON IP ADDRESSING, CREATION OF VLANS, AND TO FURNISH THE CONFIGURATION REQUIRED FOR A FULLY FUNCTIONAL PUBLIC ADDRESS SYSTEM ON THE OWNER'S LAN. THE CONTRACTOR SHALL INCLUDE WORK HOURS REQUIRED TO CONFIGURE THIS SYSTEM WITH THE OWNER AFTER SUBSTANTIAL COMPLETION OF THE CONSTRUCTION PROJECT WHEN THE SWITCHES ARE FURNISHED AND INSTALLED.

PUBLIC ADDRESS & 2-WIRE CLOCK SYSTEM | NTS | 02

Project Title:

ADDITIONS & ALTERATION TO:
Old Greenwich School
285 SOUND BEACH AVENUE
OLD GREENWICH, CONNECTICUT 06870

SILVER PETRUCELLI + ASSOCIATES
3190 WHITNEY AVENUE HAMDEN CT 06518
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Date: 08/29/2024
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PROJECT MANUAL

TOWN OF GREENWICH
CONNECTICUT

ADDITIONS & ALTERATION

OLD GREENWICH SCHOOL
285 SOUND BEACH AVENUE
OLD GREENWICH, CT 06870

STATE PROJECT #057-____
S/P+A PROJECT #22.382

VOLUME 2 OF 4
(Division 01 – Section 122413)

DD Submission: January 19, 2024
95%CD Submission: August 29, 2024

Architects | Engineers | Interiors
Silver Petrucelli + Associates, Inc.
3190 Whitney Avenue, Hamden, CT 06518
311 State Street, New London, CT 06320

Town Officials

Building Inspector	Fire Marshal
Sanitation/Health Inspector	ADA/504 Coordinator

ADDITIONS & ALTERATION

OLD GREENWICH SCHOOL
285 SOUND BEACH AVENUE
OLD GREENWICH, CT 06870
STATE PROJECT #057-____ __

S/P+A PROJECT #22.382

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G020	SECOND FLOOR LIFE SAFETY CODE PLAN
G021-G029	NOT USED
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T114	TECH-SEC-AV FIRST FLOOR PLAN – PART ‘D’
T115-T119	NOT USED
T120	TECH-SEC-AV OVERALL SECOND FLOOR PLAN
T121	TECH-SEC-AV SECOND FLOOR PLAN – PART ‘A’
T122	TECH-SEC-AV SECOND FLOOR PLAN – PART ‘B’
T123	TECH-SEC-AV SECOND FLOOR PLAN – PART ‘C’
T124-T129	NOT USED
T130	TECH-SEC-AV OVERALL THIRD FLOOR PLAN
T131	NOT USED
T132	TECH-SEC-AV THIRD FLOOR PLAN – PART ‘B’
T133	TECH-SEC-AV THIRD FLOOR PLAN – PART ‘C’

END OF SECTION

SECTION 012100 - ALLOWANCES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements governing allowances.

1. Certain items are specified in the Contract Documents by allowances. Allowances have been established in lieu of additional requirements and to defer selection of actual materials and equipment to a later date when direction will be provided to the Contractor. If necessary, additional requirements will be issued by Change Order.

B. Types of allowances include the following:

1. Lump-sum allowances.

C. Related Sections:

1. Section 012200 "Unit Prices" for procedures for using unit prices.
2. Divisions 02 through 49 Sections for items of Work covered by allowances.

1.3 SELECTION AND PURCHASE

A. At the earliest practical date after award of the Contract, advise Architect of the date when final selection and purchase of each product or system described by an allowance must be completed to avoid delaying the Work.

B. At Architect's request, obtain proposals for each allowance for use in making final selections. Include recommendations that are relevant to performing the Work.

C. Purchase products and systems selected by Architect from the designated supplier.

1.4 SUBMITTALS

A. Submit proposals for purchase of products or systems included in allowances, in the form specified for Change Orders.

B. Submit invoices or delivery slips to show actual quantities of materials delivered to the site for use in fulfillment of each allowance.

C. Submit time sheets and other documentation to show labor time and cost for installation of allowance items that include installation as part of the allowance.

D. Coordinate and process submittals for allowance items in same manner as for other portions of the Work.

1.5 COORDINATION

A. Coordinate allowance items with other portions of the Work. Furnish templates as required to coordinate installation.

1.6 QUANTITY/LUMP-SUM ALLOWANCES

A. Allowance shall include cost to Contractor of specific products and materials ordered by Owner or selected by Architect under allowance and shall include taxes, freight, and delivery to Project site.

B. Unless otherwise indicated, Contractor's costs for receiving and handling at Project site, labor, installation, overhead and profit, and similar costs related to products and materials ordered by Owner under allowance shall be included as part of the Contract Sum and not part of the allowance.

C. Unused Materials: Return unused materials purchased under an allowance to manufacturer or supplier for credit to Owner, after installation has been completed and accepted.

1. If requested by Architect, retain and prepare unused material for storage by Owner. Deliver unused material to Owner's storage space as directed.

1.7 ADJUSTMENT OF ALLOWANCES

A. Allowance Adjustment: To adjust allowance amounts, prepare a Change Order proposal based on the difference between purchase amount and the allowance, multiplied by final measurement of work-in-place where applicable. If applicable, include reasonable allowances for cutting losses, tolerances, mixing wastes, normal product imperfections, and similar margins.

1. Include installation costs in purchase amount only where indicated as part of the allowance.
2. If requested, prepare explanation and documentation to substantiate distribution of overhead costs and other margins claimed.
3. Submit substantiation of a change in scope of work, if any, claimed in Change Orders related to unit-cost allowances.
4. Owner reserves the right to establish the quantity of work-in-place by independent quantity survey, measure, or count.

B. Submit claims for increased costs because of a change in scope or nature of the allowance described in the Contract Documents, whether for the purchase order amount or Contractor's handling, labor, installation, overhead, and profit.

1. Do not include Contractor's or subcontractor's indirect expense in the Change Order cost amount unless it is clearly shown that the nature or extent of work has changed from what could have been foreseen from information in the Contract Documents.
2. No change to Contractor's indirect expense is permitted for selection of higher- or lower-priced materials or systems of the same scope and nature as originally indicated.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine products covered by an allowance promptly on delivery for damage or defects. Return damaged or defective products to manufacturer for replacement.

3.2 PREPARATION

A. Coordinate materials and their installation for each allowance with related materials and installations to ensure that each allowance item is completely integrated and interfaced with related work.

3.3 SCHEDULE OF ALLOWANCES

A. A list of unit prices is included in the Bid Packages.

END OF SECTION 012100

SECTION 012200 - UNIT PRICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for unit prices.

B. Related Sections:

1. Section 012600 "Contract Modification Procedures" for procedures for submitting and handling Change Orders.

1.3 DEFINITIONS

A. Unit price is an amount incorporated in the Agreement, applicable during the duration of the Work as a price per unit of measurement for materials, equipment, or services, or a portion of the Work, added to or deducted from the Contract Sum by appropriate modification, if the scope of Work or estimated quantities of Work required by the Contract Documents are increased or decreased.

1.4 PROCEDURES

A. Unit prices include all necessary material, plus cost for delivery, installation, insurance, applicable taxes, overhead, and profit.

B. Measurement and Payment: Refer to individual Specification Sections for work that requires establishment of unit prices. Methods of measurement and payment for unit prices are specified in those Sections.

C. Owner reserves the right to reject Contractor's measurement of work-in-place that involves use of established unit prices and to have this work measured, at Owner's expense, by an independent surveyor acceptable to Contractor.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 SCHEDULE OF UNIT PRICES

A. A list of unit prices is included in the Bid Packages.

END OF SECTION 012200

SECTION 012300 - ALTERNATES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for alternates.

1.3 DEFINITIONS

A. Alternate: An amount proposed by bidders and stated on the Bid Form for certain work defined in the Bidding Requirements that may be added to or deducted from the base bid amount if Owner decides to accept a corresponding change either in the amount of construction to be completed or in the products, materials, equipment, systems, or installation methods described in the Contract Documents.

1. Alternates described in this Section are part of the Work only if enumerated in the Agreement.
2. The cost or credit for each alternate is the net addition to or deduction from the Contract Sum to incorporate alternate into the Work. No other adjustments are made to the Contract Sum.

1.4 PROCEDURES

A. Coordination: Modify or adjust affected adjacent work as necessary to completely integrate work of the alternate into Project.

1. Include as part of each alternate, miscellaneous devices, accessory objects, and similar items incidental to or required for a complete installation whether or not indicated as part of alternate.

B. Notification: Immediately following award of the Contract, notify each party involved, in writing, of the status of each alternate. Indicate if alternates have been accepted, rejected, or deferred for later consideration. Include a complete description of negotiated modifications to alternates.

C. Execute accepted alternates under the same conditions as other work of the Contract. No extensions of time shall be granted for accepted alternates.

D. Schedule: A schedule of alternates is included at the end of this Section. Specification Sections referenced in schedule contain requirements for materials necessary to achieve the work described under each alternate.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 SCHEDULE OF ALTERNATES

END OF SECTION 012300

SECTION 012500 - SUBSTITUTION PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for substitutions.

B. Related Sections:

1. Section 016000 "Product Requirements" for requirements for submitting comparable product submittals for products by listed manufacturers.
2. Divisions 02 through 49 Sections for specific requirements and limitations for substitutions.

1.3 DEFINITIONS

A. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by Contractor.

1. Substitutions for Cause: Changes proposed by Contractor that are required due to changed Project conditions, such as unavailability of product, regulatory changes, or unavailability of required warranty terms.
2. Substitutions for Convenience: Changes proposed by Contractor or Owner that are not required in order to meet other Project requirements but may offer advantage to Contractor or Owner.

1.4 SUBMITTALS

A. Substitution Requests: Submit request for consideration to Architect. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.

1. Substitution Request Form: Use **CSI Form 1.5C**, **13.1A**, or comparable form.
2. Documentation: Show compliance with requirements for substitutions and the following, as applicable:

a. Statement indicating why specified product or fabrication or installation cannot be provided, if applicable.
b. Coordination information, including a list of changes or modifications needed to other parts of the Work and to construction performed by Owner and separate contractors, that will be necessary to accommodate proposed substitution.
c. Detailed, SIDE-BY-SIDE comparison of significant qualities of proposed substitution with those of the Work specified. Include annotated copy of applicable specification section. Significant qualities may include attributes such as performance, weight, size, durability, visual effect, sustainable design characteristics, warranties, and specific features and requirements indicated. Indicate deviations, if any, from the Work specified.

d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
e. Samples, where applicable or requested.
f. Certificates and qualification data, where applicable or requested.
g. List of similar installations for completed projects with project names and addresses and names and addresses of Architects and Owners.
h. Material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.
i. Research reports evidencing compliance with building code in effect for Project, from ICC-ES.
j. Detailed comparison of Contractor's construction schedule using proposed substitution with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating date of receipt of purchase order, lack of availability, or delays in delivery.
k. Cost information, including a proposal of change, if any, in the Contract Sum.
l. Contractor's certification that proposed substitution complies with requirements in the Contract Documents except as indicated in substitution request, is compatible with related materials, and is appropriate for applications indicated.
m. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.

3. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within seven (7) days of receipt of a request for substitution. Architect will notify Contractor of acceptance or rejection of proposed substitution within fifteen (15) days of receipt of request, or seven (7) days of receipt of additional information or documentation, whichever is later.

a. Forms of Acceptance: Change Order, Construction Change Directive, or Architect's Supplemental Instructions for minor changes in the Work.
b. Use product specified if Architect does not issue a decision on use of a proposed substitution within time allocated.

1.5 QUALITY ASSURANCE

A. Compatibility of Substitutions: Investigate and document compatibility of proposed substitution with related products and materials. Engage qualified testing agency to perform compatibility tests recommended by manufacturers.

1.6 PROCEDURES

A. Coordination: Modify or adjust affected work as necessary to integrate work of the approved substitutions.

PART 2 - PRODUCTS

2.1 SUBSTITUTIONS

A. Procurement Substitution Request: Submit to Architect seven (7) days prior to date of bid opening.

B. Substitutions for Cause: Submit requests for substitution immediately upon discovery of need for change, but not later than fifteen (15) days prior to time required for preparation and review of related submittals.

1. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:

a. Requested substitution is consistent with the Contract Documents and will produce indicated results.
b. Substitution request is fully documented and properly submitted.
c. Requested substitution will not adversely affect Contractor's construction schedule.
d. Requested substitution has received necessary approvals of authorities having jurisdiction.
e. Requested substitution is compatible with other portions of the Work.
f. Requested substitution has been coordinated with other portions of the Work.
g. Requested substitution provides specified warranty.
h. If requested substitution involves more than one (1) contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

C. Substitutions for Convenience: Architect will consider requests for substitution if received within sixty (60) days after the Notice to Proceed. Requests received after that time may be considered or rejected at discretion of Architect.

1. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:

a. Requested substitution offers Owner a substantial advantage in cost, time, energy conservation, or other considerations, after deducting additional responsibilities Owner must assume. Owner's additional responsibilities may include compensation to Architect for redesign and evaluation services, increased cost of other construction by Owner, and similar considerations.
b. Requested substitution does not require extensive revisions to the Contract Documents.
c. Requested substitution is consistent with the Contract Documents and will produce indicated results.
d. Substitution request is fully documented and properly submitted.
e. Requested substitution will not adversely affect Contractor's construction schedule.
f. Requested substitution has received necessary approvals of authorities having jurisdiction.
g. Requested substitution is compatible with other portions of the Work.
h. Requested substitution has been coordinated with other portions of the Work.
i. Requested substitution provides specified warranty.
j. If requested substitution involves more than one (1) contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

PART 3 - EXECUTION (Not Used)

END OF SECTION 012500

SECTION 012600 - CONTRACT MODIFICATION PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for handling and processing Contract modifications.

B. Related Sections:

1. Section 016000 "Product Requirements" for administrative procedures for handling requests for substitutions made after Contract award.

1.3 MINOR CHANGES IN THE WORK

A. Architect will issue supplemental instructions authorizing minor changes in the Work, not involving adjustment to the Contract Sum or the Contract Time, on AIA Document G710, "Architect's Supplemental Instructions."

1.4 PROPOSAL REQUESTS

A. Owner-Initiated Proposal Requests: Architect will issue a detailed description of proposed changes in the Work that may require adjustment to the Contract Sum or the Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications.

1. Proposal Requests issued by Architect are not instructions either to stop work in progress or to execute the proposed change.
2. Within time specified in Proposal Request or twenty (20) days, when not otherwise specified, after receipt of Proposal Request, submit a quotation estimating cost adjustments to the Contract Sum and the Contract Time necessary to execute the change.

    a. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
    b. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
    c. Include costs of labor and supervision directly attributable to the change.
    d. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
    e. Quotation Form: Use forms acceptable to Architect.

B. Contractor-Initiated Proposals: If latent or changed conditions require modifications to the Contract, Contractor may initiate a claim by submitting a request for a change to the Architect.

1. Include a statement outlining reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and the Contract Time.
2. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
3. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
4. Include costs of labor and supervision directly attributable to the change.
5. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
6. Comply with requirements in Section 012500 "Substitution Procedures" if the proposed change requires substitution of one product or system for product or system specified.
7. Proposal Request Form: Use form acceptable to Architect.

1.5 CHANGE ORDER PROCEDURES

A. On Owner's approval of a Proposal Request, Architect will issue a Change Order for signatures of Owner and Contractor on AIA Document G701.

1.6 CONSTRUCTION CHANGE DIRECTIVE

A. Construction Change Directive: Architect may issue a Construction Change Directive on AIA Document G714. Construction Change Directive instructs Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order.

1. Construction Change Directive contains a complete description of change in the Work. It also designates method to be followed to determine change in the Contract Sum or the Contract Time.

B. Documentation: Maintain detailed records on a time and material basis of work required by the Construction Change Directive.

1. After completion of change, submit an itemized account and supporting data necessary to substantiate cost and time adjustments to the Contract.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 012600

SECTION 012900 - PAYMENT PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section specifies administrative and procedural requirements necessary to prepare and process Applications for Payment.

B. Related Sections:

1. Section 012600 "Contract Modification Procedures" for administrative procedures for handling changes to the Contract.
2. Section 013200 "Construction Progress Documentation" for administrative requirements governing the preparation and submittal of the Contractor's construction schedule.
3. Section 013300 "Submittal Procedures" for administrative requirements governing the preparation and submittal of the submittal schedule.

1.3 SCHEDULE OF VALUES

A. Coordination: Coordinate preparation of the schedule of values with preparation of Contractor's construction schedule.

1. Correlate line items in the schedule of values with other required administrative forms and schedules, including the following:

a. Application for Payment forms with continuation sheets.
b. Submittal schedule.
c. Items required to be indicated as separate activities in Contractor's construction schedule.

2. Submit the schedule of values to Architect at earliest possible date but no later than seven (7) days before the date scheduled for submittal of initial Applications for Payment.

B. Format and Content: Use the Project Manual table of contents as a guide to establish line items for the schedule of values. Provide at least one (1) line item for each Specification Section.

1. Identification: Include the following Project identification on the schedule of values:

a. Project name and location.
b. Name of Architect.
c. Architect's project number.
d. Contractor's name and address.
e. Date of submittal.

2. Arrange schedule of values consistent with format of AIA Document G703.
3. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Coordinate with the Project

Manual table of contents. Provide multiple line items for principal subcontract amounts in excess of five percent (5%) of Contract Sum.

4. Round amounts to nearest whole dollar; total shall equal the Contract Sum.
5. Provide a separate line item in the schedule of values for each part of the Work where Applications for Payment may include materials or equipment purchased or fabricated and stored, but not yet installed.

    a. Differentiate between items stored on-site and items stored off-site. If required, include evidence of insurance.

6. Provide separate line items in the schedule of values for initial cost of materials, for each subsequent stage of completion, and for total installed value of that part of the Work.
7. Each item in the schedule of values and Applications for Payment shall be complete. Include total cost and proportionate share of general overhead and profit for each item.

    a. Temporary facilities and other major cost items that are not direct cost of actual work-in-place may be shown either as separate line items in the schedule of values or distributed as general overhead expense, at Contractor's option.

8. Schedule Updating: Update and resubmit the schedule of values before the next Applications for Payment when Change Orders or Construction Change Directives result in a change in the Contract Sum.

1.4 APPLICATIONS FOR PAYMENT

A. Each Application for Payment shall be consistent with previous applications and payments as certified by Architect and paid for by Owner.

    1. Initial Application for Payment, Application for Payment at time of Substantial Completion, and final Application for Payment involve additional requirements.

B. Payment Application Times: The date for each progress payment is indicated in the Agreement between Owner and Contractor. The period of construction work covered by each Application for Payment is the period indicated in the Agreement.

C. Application for Payment Forms: Use AIA Document G702 and AIA Document G703 as form for Applications for Payment.

D. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. Architect will return incomplete applications without action.

    1. Entries shall match data on the schedule of values and Contractor's construction schedule. Use updated schedules if revisions were made.
    2. Include amounts for work completed following previous Application for Payment, whether or not payment has been received. Include only amounts for work completed at time of Application for Payment.
    3. Include amounts of Change Orders and Construction Change Directives issued before last day of construction period covered by application.
    4. Indicate separate amounts for work being carried out under Owner-requested project acceleration.
    5. Include updated and approved Contractor’s construction schedule, potential Change Order Log and Product Submittal Log.

E. Stored Materials: Include in Application for Payment amounts applied for materials or equipment purchased or fabricated and stored, but not yet installed. Differentiate between items stored on-site and items stored off-site.

1. Provide certificate of insurance, evidence of transfer of title to Owner, and consent of surety to payment, for stored materials.
2. Provide supporting documentation that verifies amount requested, such as paid invoices. Match amount requested with amounts indicated on documentation; do not include overhead and profit on stored materials.
3. Provide summary documentation for stored materials indicating the following:

    a. Materials previously stored and included in previous Applications for Payment.
    b. Work completed for this Application utilizing previously stored materials.
    c. Additional materials stored with this Application.
    d. Total materials remaining stored, including materials with this Application.

F. Transmittal: Submit three (3) signed and notarized original copies of each Application for Payment to Architect by a method ensuring receipt within 24 hours. One (1) copy shall include waivers of lien and similar attachments if required.

1. Transmit each copy with a transmittal form listing attachments and recording appropriate information about application.

G. Waivers of Mechanic's Lien: With each Application for Payment, submit waivers of mechanic's liens from subcontractors, sub-subcontractors, and suppliers for construction period covered by the previous application.

1. Submit partial waivers on each item for amount requested in previous application, after deduction for retainage, on each item.
2. When an application shows completion of an item, submit conditional final or full waivers.
3. Owner reserves the right to designate which entities involved in the Work must submit waivers.
4. Submit final Application for Payment with or preceded by conditional final waivers from every entity involved with performance of the Work covered by the application who is lawfully entitled to a lien.
5. Waiver Forms: Submit waivers of lien on forms, executed in a manner acceptable to Owner.

H. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:

1. List of subcontractors.
2. Schedule of values.
3. Contractor's construction schedule (preliminary if not final).
4. Products list (preliminary if not final).
5. Schedule of unit prices.
6. Submittal schedule (preliminary if not final).
7. List of Contractor's staff assignments.
8. List of Contractor's principal consultants.
9. Copies of building permits.
10. Copies of authorizations and licenses from authorities having jurisdiction for performance of the Work.
11. Initial progress report.
12. Report of preconstruction conference.
13. Certificates of insurance and insurance policies.
14. Performance and payment bonds.

15. Data needed to acquire Owner's insurance.

I. Application for Payment at Substantial Completion: After issuing the Certificate of Substantial Completion, submit an Application for Payment showing one hundred percent (100%) completion for portion of the Work claimed as substantially complete.

1. Include documentation supporting claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract Sum.
2. This application shall reflect Certificates of Partial Substantial Completion issued previously for Owner occupancy of designated portions of the Work.

J. Final Payment Application: Submit final Application for Payment with releases and supporting documentation not previously submitted and accepted, including, but not limited, to the following:

1. Evidence of completion of Project closeout requirements.
2. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
3. Updated final statement, accounting for final changes to the Contract Sum.
4. AIA Document G706, "Contractor's Affidavit of Payment of Debts and Claims."
5. AIA Document G706A, "Contractor's Affidavit of Release of Liens."
6. AIA Document G707, "Consent of Surety to Final Payment."
7. Evidence that claims have been settled.
8. Final meter readings for utilities, a measured record of stored fuel, and similar data as of date of Substantial Completion or when Owner took possession of and assumed responsibility for corresponding elements of the Work.
9. Final liquidated damages settlement statement.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 012900

SECTION 013100 - PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:

1. General project coordination procedures.
2. Administrative and supervisory personnel.
3. Coordination drawings.
4. Requests for Information (RFIs).
5. Project meetings.

B. Each contractor shall participate in coordination requirements. Certain areas of responsibility are assigned to a specific contractor.

C. Related Sections:

1. Section 013200 "Construction Progress Documentation" for preparing and submitting Contractor's construction schedule.
2. Section 017300 "Execution" for procedures for coordinating general installation and field-engineering services, including establishment of benchmarks and control points.
3. Section 017700 "Closeout Procedures" for coordinating closeout of the Contract.

1.3 DEFINITIONS

A. RFI: Request from Owner, Architect, or Contractor seeking information from each other during construction.

1.4 COORDINATION

A. Coordination: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations, included in different Sections, that depend on each other for proper installation, connection, and operation.

1. Schedule construction operations in sequence required to obtain the best results where installation of one (1) part of the Work depends on installation of other components, before or after its own installation.
2. Coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair.
3. Make adequate provisions to accommodate items scheduled for later installation.

B. Prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.

1. Prepare similar memoranda for Owner and separate Contractors if coordination of their Work is required.

C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:

1. Preparation of Contractor's construction schedule.
2. Preparation of the schedule of values.
3. Installation and removal of temporary facilities and controls.
4. Delivery and processing of submittals.
5. Progress meetings.
6. Pre-installation conferences.
7. Startup and adjustment of systems.
8. Project closeout activities.

D. Conservation: Coordinate construction activities to ensure that operations are carried out with consideration given to conservation of energy, water, and materials. Coordinate use of temporary utilities to minimize waste.

1. Salvage materials and equipment involved in performance of, but not actually incorporated into, the Work. Refer to other Sections for disposition of salvaged materials that are designated as Owner's property.

1.5 COORDINATION DRAWINGS

A. Coordination Drawings, General: Prepare coordination drawings in accordance with requirements in individual Sections, where installation is not completely shown on Shop Drawings, where limited space availability necessitates coordination, or if coordination is required to facilitate integration of products and materials fabricated or installed by more than one (1) entity.

1. Content: Project-specific information, drawn accurately to a scale large enough to indicate and resolve conflicts. Do not base coordination drawings on standard printed data. Include the following information, as applicable:

a. Use applicable Drawings as a basis for preparation of coordination drawings. Prepare sections, elevations, and details as needed to describe relationship of various systems and components.
b. Coordinate the addition of trade-specific information to the coordination drawings by multiple Contractors in a sequence that best provides for coordination of the information and resolution of conflicts between installed components before submitting for review.
c. Indicate functional and spatial relationships of components of architectural, structural, civil, mechanical, and electrical systems.
d. Indicate space requirements for routine maintenance and for anticipated replacement of components during the life of the installation.
e. Show location and size of access doors required for access to concealed dampers, valves, and other controls.
f. Indicate required installation sequences.
g. Indicate dimensions shown on the Drawings. Specifically note dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide alternate sketches to Architect indicating proposed resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract.

B. Coordination Drawing Organization: Organize coordination drawings as follows:

1. Floor Plans and Reflected Ceiling Plans: Show architectural and structural elements, and mechanical, plumbing, fire protection, fire alarm, and electrical Work. Show locations of visible ceiling-mounted devices relative to acoustical ceiling grid. Supplement plan drawings with section drawings where required to adequately represent the Work.
2. Plenum Space: Indicate subframing for support of ceiling and wall systems, mechanical and electrical equipment, and related Work. Locate components within ceiling plenum to accommodate layout of light fixtures indicated on Drawings. Indicate areas of conflict between light fixtures and other components.
3. Mechanical Rooms: Provide coordination drawings for mechanical rooms showing plans and elevations of mechanical, plumbing, fire protection, fire alarm, and electrical equipment.
4. Structural Penetrations: Indicate penetrations and openings required for all disciplines.
5. Slab Edge and Embedded Items: Indicate slab edge locations and sizes and locations of embedded items for metal fabrications, sleeves, anchor bolts, bearing plates, angles, door floor closers, slab depressions for floor finishes, curbs and housekeeping pads, and similar items.
6. Mechanical and Plumbing Work: Show the following:

    a. Sizes and bottom elevations of ductwork, piping, and conduit runs, including insulation, bracing, flanges, and support systems.
    b. Dimensions of major components, such as dampers, valves, diffusers, access doors, cleanouts, and electrical distribution equipment.

7. Electrical Work: Show the following:

    a. Runs of vertical and horizontal conduit 1¼-inch-diameter and larger.
    b. Light fixture, exit light, emergency battery pack, smoke detector, and other fire alarm locations.
    c. Panel board, switch board, switchgear, transformer, busway, generator, and motor control center locations.
    d. Location of pull boxes and junction boxes, dimensioned from column center lines.

8. Review: Architect will review coordination drawings to confirm that the Work is being coordinated, but not for the details of the coordination, which are the Contractor's responsibility. If the Architect determines that the coordination drawings are not being prepared in sufficient scope or detail, or are otherwise deficient, the Architect will so inform the Contractor, who shall make changes as directed and resubmit.
9. Coordination Drawing Prints: Prepare coordination drawing prints in accordance with requirements of Section 013300 "Submittal Procedures."

1.6 KEY PERSONNEL

A. Key Personnel Names: Within fifteen (15) days of starting construction operations, submit a list of key personnel assignments, including superintendent and other personnel in attendance at Project site. Identify individuals and their duties and responsibilities; list addresses and telephone numbers, including home, office, and cellular telephone numbers and email addresses. Provide names, addresses, and telephone numbers of individuals assigned as standbys in the absence of individuals assigned to Project.

1. Post copies of list in project meeting room, in temporary field office, and by each temporary telephone. Keep list current at all times.

1.7 REQUESTS FOR INFORMATION (RFIs)

A. General: Immediately on discovery of the need for additional information or interpretation of the Contract Documents, Contractor shall prepare and submit an RFI in the form specified.

1. Architect will return RFIs submitted to Architect by other entities controlled by Contractor with no response.
2. Coordinate and submit RFIs in a prompt manner so as to avoid delays in Contractor's work or work of subcontractors.

B. Content of the RFI: Include a detailed, legible description of item needing information or interpretation and the following:

1. Project name.
2. Project number.
3. Date.
4. Name of Contractor.
5. Name of Architect.
6. RFI number, numbered sequentially.
7. RFI subject.
8. Specification Section number and title and related paragraphs, as appropriate.
9. Drawing number and detail references, as appropriate.
10. Field dimensions and conditions, as appropriate.
11. Contractor's suggested resolution. If Contractor's solution(s) impacts the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
12. Contractor's signature.
13. Attachments: Include sketches, descriptions, measurements, photos, Product Data, Shop Drawings, coordination drawings, and other information necessary to fully describe items needing interpretation.

    a. Include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments on attached sketches.

C. RFI Forms: AIA Document G716 or comparable form.

D. Architect's Action: Architect will review each RFI, determine action required, and respond. Allow seven (7) working days for Architect's response for each RFI. RFIs received by Architect after 1:00 p.m. will be considered as received the following working day.

1. The following RFIs will be returned without action:

    a. Requests for approval of submittals.
    b. Requests for approval of substitutions.
    c. Requests for coordination information already indicated in the Contract Documents.
    d. Requests for adjustments in the Contract Time or the Contract Sum.
    e. Requests for interpretation of Architect's actions on submittals.
    f. Incomplete RFIs or inaccurately prepared RFIs.

2. Architect's action may include a request for additional information, in which case Architect's time for response will date from time of receipt of additional information.
3. Architect's action on RFIs that may result in a change to the Contract Time or the Contract Sum may be eligible for Contractor to submit Change Proposal according to Section 012600 "Contract Modification Procedures."

a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Architect in writing within ten (10) days of receipt of the RFI response.

E. On receipt of Architect's action, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify Architect within seven (7) days if Contractor disagrees with response.

F. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number. Submit log weekly. Include the following:

1. Project name.
2. Name and address of Contractor.
3. Name and address of Architect.
4. RFI number including RFIs that were dropped and not submitted.
5. RFI description.
6. Date the RFI was submitted.
7. Date Architect's response was received.
8. Identification of related Minor Change in the Work, Construction Change Directive, and Proposal Request, as appropriate.

1.8 PROJECT MEETINGS

A. General: Schedule and conduct meetings and conferences at Project site, unless otherwise indicated.

1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify Owner and Architect of scheduled meeting dates and times.
2. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.
3. Minutes: General Contractor or Construction Manager is responsible for recording significant discussions and agreements achieved. General Contractor or Construction Manager is also responsible for distributing the meeting minutes to everyone concerned including Owner and Architect, within three (3) days of the meeting.

B. Preconstruction Conference: Schedule and conduct a preconstruction conference before starting construction, at a time convenient to Owner and Architect, but no later than fifteen (15) days after execution of the Agreement.

1. Conduct the conference to review responsibilities and personnel assignments.
2. Attendees: Authorized representatives of Owner, Construction Administrator, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the conference. Participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
3. Agenda: Discuss items of significance that could affect progress, including the following:

a. Tentative construction schedule.
b. Phasing.
c. Critical work sequencing and long-lead items.
d. Designation of key personnel and their duties.
e. Lines of communications.
f. Procedures for processing field decisions and Change Orders.
g. Procedures for RFIs.
h. Procedures for testing and inspecting.
i. Procedures for processing Applications for Payment.

j. Distribution of the Contract Documents.
k. Submittal procedures.
l. Preparation of record documents.
m. Work restrictions.
n. Working hours.
o. Owner's occupancy requirements.
p. Responsibility for temporary facilities and controls.
q. Procedures for moisture and mold control.
r. Procedures for disruptions and shutdowns.
s. Parking availability.
t. Office, work, and storage areas.
u. Equipment deliveries and priorities.
v. First aid.
w. Security.
x. Progress cleaning.

4. Minutes: General Contractor or Construction Manager is responsible for recording and distributing meeting minutes.

C. Pre-installation Conferences: Conduct a pre-installation conference at Project site before each construction activity that requires coordination with other construction.

1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Architect of scheduled meeting dates.
2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:

a. Contract Documents.
b. Options.
c. Related RFIs.
d. Related Change Orders.
e. Purchases.
f. Deliveries.
g. Submittals.
h. Review of mockups.
i. Possible conflicts.
j. Compatibility problems.
k. Time schedules.
l. Weather limitations.
m. Manufacturer's written recommendations.
n. Warranty requirements.
o. Compatibility of materials.
p. Acceptability of substrates.
q. Temporary facilities and controls.
r. Space and access limitations.
s. Regulations of authorities having jurisdiction.
t. Testing and inspecting requirements.
u. Installation procedures.
v. Coordination with other work.
w. Required performance results.
x. Protection of adjacent work.
y. Protection of construction and personnel.

3. Record significant conference discussions, agreements, and disagreements, including required corrective measures and actions.
4. Reporting: Distribute minutes of the meeting to each party present and to other parties requiring information.
5. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.

D. Project Closeout Conference: Schedule and conduct a Project closeout conference, at a time convenient to Owner and Architect, but no later than thirty (30) days prior to the scheduled date of Substantial Completion.

1. Conduct the conference to review requirements and responsibilities related to Project closeout.
2. Attendees: Authorized representatives of Owner, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the meeting. Participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
3. Agenda: Discuss items of significance that could affect or delay Project closeout, including the following:

    a. Preparation of record documents.
    b. Procedures required prior to inspection for Substantial Completion and for final inspection for acceptance.
    c. Submittal of written warranties.
    d. Requirements for preparing operations and maintenance data.
    e. Requirements for demonstration and training.
    f. Preparation of Contractor's punch list.
    g. Procedures for processing Applications for Payment at Substantial Completion and for final payment.
    h. Submittal procedures.
    i. Responsibility for removing temporary facilities and controls.

4. Minutes: General Contractor or Construction Manager is responsible for recording and distributing meeting minutes.

E. Progress Meetings: Conduct progress meetings at biweekly intervals.

1. Coordinate dates of meetings with preparation of payment requests.
2. Attendees: In addition to representatives of Owner and Architect, each Contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
3. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.

    a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's construction schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.

        1) Review schedule for next period.

b. Review present and future needs of each entity present, including the following:

1) Interface requirements.
2) Sequence of operations.
3) Status of submittals.
4) Deliveries.
5) Off-site fabrication.
6) Access.
7) Site utilization.
8) Temporary facilities and controls.
9) Progress cleaning.
10) Quality and work standards.
11) Status of correction of deficient items.
12) Field observations.
13) Status of RFIs.
14) Status of proposal requests.
15) Pending changes.
16) Status of Change Orders.
17) Pending claims and disputes.
18) Documentation of information for payment requests.

4. Minutes: General Contractor or Construction Manager is responsible for recording and distributing meeting minutes.

a. Schedule Updating: Revise Contractor's construction schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.

F. Coordination Meetings: Conduct Project coordination meetings at required intervals. Project coordination meetings are in addition to specific meetings held for other purposes, such as progress meetings and preinstallation conferences.

1. Agenda: Review and correct or approve minutes of the previous coordination meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.

a. Combined Contractor's Construction Schedule: Review progress since the last coordination meeting. Determine whether each contract is on time, ahead of schedule, or behind schedule, in relation to combined Contractor's construction schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
b. Schedule Updating: Revise combined Contractor's construction schedule after each coordination meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with report of each meeting.
c. Review present and future needs of each contractor present, including the following:

1) Interface requirements.
2) Sequence of operations.
3) Status of submittals.
4) Deliveries.
5) Off-site fabrication.
6) Access.
7) Site utilization.

8) Temporary facilities and controls.
9) Work hours.
10) Hazards and risks.
11) Progress cleaning.
12) Quality and work standards.
13) Change Orders.

2. Reporting: Record meeting results and distribute copies to everyone in attendance and to others affected by decisions or actions resulting from each meeting.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 013100

SECTION 013200 - CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:

1. Contractor's construction schedule.
2. Daily construction reports.
3. Material location reports.
4. Field condition reports.
5. Special reports.

B. Related Sections:

1. Section 013300 "Submittal Procedures" for submitting schedules and reports.
2. Section 014000 "Quality Requirements" for submitting a schedule of tests and inspections.

1.3 DEFINITIONS

A. Activity: A discrete part of a project that can be identified for planning, scheduling, monitoring, and controlling the construction project. Activities included in a construction schedule consume time and resources.

1. Critical Activity: An activity on the critical path that must start and finish on the planned early start and finish times.
2. Predecessor Activity: An activity that precedes another activity in the network.
3. Successor Activity: An activity that follows another activity in the network.

B. Cost Loading: The allocation of the schedule of values for the completion of an activity as scheduled. The sum of costs for all activities must equal the total Contract Sum, unless otherwise approved by Architect.

C. Critical Path: The longest connected chain of interdependent activities through the network schedule that establishes the minimum overall Project duration and contains no float.

D. Event: The starting or ending point of an activity.

E. Float: The measure of leeway in starting and completing an activity.

1. Float time is not for the exclusive use or benefit of either Owner or Contractor, but is a jointly owned, expiring Project resource available to both parties as needed to meet schedule milestones and Contract completion date.
2. Free float is the amount of time an activity can be delayed without adversely affecting the early start of the successor activity.

3. Total float is the measure of leeway in starting or completing an activity without adversely affecting the planned Project completion date.

F. Resource Loading: The allocation of manpower and equipment necessary for the completion of an activity as scheduled.

1.4 INFORMATIONAL SUBMITTALS

A. Format for Submittals: Submit required submittals in the following format:

1. PDF electronic file.

B. Contractor's Construction Schedule: Initial schedule, of size required to display entire schedule for entire construction period.

1. Submit a working electronic copy of schedule, using software indicated, and labeled to comply with requirements for submittals. Include type of schedule (initial or updated) and date on label.

C. Daily Construction Reports: Submit at weekly intervals.

D. Material Location Reports: Submit at weekly intervals.

E. Field Condition Reports: Submit at time of discovery of differing conditions.

F. Special Reports: Submit at time of unusual event.

1.5 QUALITY ASSURANCE

A. Pre-scheduling Conference: Conduct conference at Project site to comply with requirements in Section 013100 "Project Management and Coordination." Review methods and procedures related to the Contractor's construction schedule, including, but not limited to, the following:

1. Review software limitations and content and format for reports.
2. Discuss constraints, including phasing, work stages and area separations.
3. Review time required for review of submittals and resubmittals.
4. Review requirements for tests and inspections by independent testing and inspecting agencies.
5. Review time required for completion and startup procedures.
6. Review and finalize list of construction activities to be included in schedule.
7. Review submittal requirements and procedures.
8. Review procedures for updating schedule.

1.6 COORDINATION

A. Coordinate preparation and processing of schedules and reports with performance of construction activities and with scheduling and reporting of separate contractors.

B. Coordinate Contractor's construction schedule with the schedule of values, list of subcontracts, submittal schedule, progress reports, payment requests, and other required schedules and reports.

1. Secure time commitments for performing critical elements of the Work from entities involved.

2. Coordinate each construction activity in the network with other activities and schedule them in proper sequence.

PART 2 - PRODUCTS

2.1 CONTRACTOR'S CONSTRUCTION SCHEDULE, GENERAL

A. Time Frame: Extend schedule from date established for the Notice to Proceed to date of Substantial Completion.

1. Contract completion date shall not be changed by submission of a schedule that shows an early completion date, unless specifically authorized by Change Order.

B. Activities: Treat each story or separate area as a separate numbered activity for each principal element of the Work. Comply with the following:

1. Activity Duration: Define activities so no activity is longer than twenty (20) days, unless specifically allowed by Architect.
2. Procurement Activities: Include procurement process activities for the following long lead items and major items, requiring a cycle of more than sixty (60) days, as separate activities in schedule. Procurement cycle activities include, but are not limited to, submittals, approvals, purchasing, fabrication, and delivery.
3. Submittal Review Time: Include review and resubmittal times indicated in Section 013300 "Submittal Procedures" in schedule. Coordinate submittal review times in Contractor's construction schedule with submittal schedule.
4. Startup and Testing Time: Include not less than fifteen (15) days for startup and testing.
5. Substantial Completion: Indicate completion in advance of date established for Substantial Completion and allow time for Architect's administrative procedures necessary for certification of Substantial Completion.
6. Punch List and Final Completion: Include not more than thirty (30) days for punch list and final completion.

C. Constraints: Include constraints and work restrictions indicated in the Contract Documents and as follows in schedule and show how the sequence of the Work is affected.

1. Phasing: Arrange list of activities on schedule by phase.
2. Work Restrictions: Show the effect of the following items on the schedule:

a. Uninterruptible services.
b. Use of premises restrictions.
c. Provisions for future construction.
d. Seasonal variations.
e. Environmental control.

3. Work Stages: Indicate important stages of construction for each major portion of the Work, including, but not limited to, the following:

a. Subcontract awards.
b. Submittals.
c. Purchases.
d. Mockups.
e. Fabrication.
f. Sample testing.
g. Deliveries.

h. Installation.
i. Tests and inspections.
j. Adjusting.
k. Curing.
l. Startup and placement into final use and operation.

4. Construction Areas: Identify each major area of construction for each major portion of the Work. Indicate where each construction activity within a major area must be sequenced or integrated with other construction activities to provide for the following:

a. Completion of mechanical installation.
b. Completion of electrical installation.
c. Substantial Completion.

D. Milestones: Include milestones indicated in the Contract Documents in schedule, including, but not limited to, the Notice to Proceed, Substantial Completion, and final completion**.**

E. Cost Correlation: At the head of schedule, provide a cost correlation line, indicating planned and actual costs. On the line, show dollar volume of the Work performed as of dates used for preparation of payment requests.

1. Refer to Section 012900 "Payment Procedures" for cost reporting and payment procedures.

F. Upcoming Work Summary: Prepare summary report indicating activities scheduled to occur or commence prior to submittal of next schedule update. Summarize the following issues:

1. Unresolved issues.
2. Unanswered RFIs.
3. Rejected or unreturned submittals.
4. Notations on returned submittals.

G. Recovery Schedule: When periodic update indicates the Work is fourteen (14) or more calendar days behind the current approved schedule, submit a separate recovery schedule indicating means by which Contractor intends to regain compliance with the schedule. Indicate changes to working hours, working days, crew sizes, and equipment required to achieve compliance, and date by which recovery will be accomplished.

H. Computer Scheduling Software: Prepare schedules using current version of a program that has been developed specifically to manage construction schedules.

2.2 CONTRACTOR'S CONSTRUCTION SCHEDULE (GANTT CHART)

A. Gantt-Chart Schedule: Submit a comprehensive, fully developed, horizontal Gantt-chart-type, Contractor's construction schedule within seven (7) days of date established for the Notice to Proceed.

B. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line.

1. For construction activities that require three months or longer to complete, indicate an estimated completion percentage in ten percent (10%) increments within time bar.

2.3 REPORTS

A. Daily Construction Reports: Prepare a daily construction report recording the following information concerning events at Project site:

1. List of subcontractors at Project site.
2. List of separate contractors at Project site.
3. Approximate count of personnel at Project site.
4. Equipment at Project site.
5. Material deliveries.
6. High and low temperatures and general weather conditions, including presence of rain or snow.
7. Accidents.
8. Meetings and significant decisions.
9. Unusual events (refer to special reports).
10. Stoppages, delays, shortages, and losses.
11. Meter readings and similar recordings.
12. Emergency procedures.
13. Orders and requests of authorities having jurisdiction.
14. Change Orders received and implemented.
15. Construction Change Directives received and implemented.
16. Services connected and disconnected.
17. Equipment or system tests and startups.
18. Partial completions and occupancies.
19. Substantial Completions authorized.

B. Material Location Reports: At weekly intervals, prepare and submit a comprehensive list of materials delivered to and stored at Project site. List shall be cumulative, showing materials previously reported plus items recently delivered. Include with list a statement of progress on and delivery dates for materials or items of equipment fabricated or stored away from Project site.

C. Field Condition Reports: Immediately on discovery of a difference between field conditions and the Contract Documents, prepare and submit a detailed report. Submit with a Request for Information. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.

2.4 SPECIAL REPORTS

A. General: Submit special reports directly to Owner within one (1) day of an occurrence. Distribute copies of report to parties affected by the occurrence.

B. Reporting Unusual Events: When an event of an unusual and significant nature occurs at Project site, whether or not related directly to the Work, prepare and submit a special report. List chain of events, persons participating, response by Contractor's personnel, evaluation of results or effects, and similar pertinent information. Advise Owner in advance when these events are known or predictable.

PART 3 - EXECUTION

3.1 CONTRACTOR'S CONSTRUCTION SCHEDULE

A. Contractor's Construction Schedule Updating: At monthly intervals, update schedule to reflect actual construction progress and activities. Issue schedule one (1) week before each regularly scheduled progress meeting.

1. Revise schedule immediately after each meeting or other activity where revisions have been recognized or made. Issue updated schedule concurrently with the report of each such meeting.
2. Include a report with updated schedule that indicates every change, including, but not limited to, changes in logic, durations, actual starts and finishes, and activity durations.
3. As the Work progresses, indicate final completion percentage for each activity.

B. Distribution: Distribute copies of approved schedule to Architect, Construction Administrator, Owner, separate contractors, testing and inspecting agencies, and other parties identified by Contractor with a need-to-know schedule responsibility.

1. Post copies in Project meeting rooms and temporary field offices.
2. When revisions are made, distribute updated schedules to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in performance of construction activities.

END OF SECTION 013200

SECTION 013233 - PHOTOGRAPHIC DOCUMENTATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for the following:

1. Periodic construction photographs.
2. Construction webcam.

B. Related Sections:

1. Section 013300 "Submittal Procedures" for submitting photographic documentation.
2. Section 017700 "Closeout Procedures" for submitting photographic documentation as project record documents at Project closeout.

1.3 INFORMATIONAL SUBMITTALS

A. Key Plan: Submit key plan of Project site and building with notation of vantage points marked for location and direction of each photograph. Indicate elevation or story of construction. Include same information as corresponding photographic documentation.

B. Digital Photographs: Submit image files within three (3) days of taking photographs.

1. Submit photos by uploading to web-based Project management software site. Include copy of key plan indicating each photograph's location and direction.

C. Time-Lapse Video: Submit time-lapse sequence video recordings within three (3) days of recording.

1. Submit time-lapse sequence video recordings monthly by uploading to web-based Project management software site.

1.4 FORMATS AND MEDIA

A. Digital Photographs: Provide color images in JPG format, produced by a digital camera with minimum sensor size of 12 megapixels, and at an image resolution of not less than 3200 by 2400 pixels. Use flash in low light levels or backlit conditions.

B. Digital Images: Submit digital media as originally recorded in the digital camera, without alteration, manipulation, editing, or modifications using image-editing software.

C. Metadata: Record accurate date and time from camera.

D. File Names: Name media files with date, Project area, and sequential numbering suffix.

1.5 CONSTRUCTION PHOTOGRAPHS

A. General: Take photographs using the maximum depth of field and in focus. Photographs with blurry or out-of-focus areas will not be accepted.

1. Maintain key plan with each set of construction photographs that identifies each photographic location.
2. Field Office Images: Maintain one (1) set of images accessible in the field office at Project site, available at all times for reference. Identify images in the same manner as those submitted to Architect.

B. Periodic Construction Photographs: Take eighteen to twenty (18-20) photographs weekly, coinciding with the cutoff date associated with each Application for Payment. Select vantage points to show status of construction and progress since last photographs were taken.

C. Additional Photographs: Architect may request photographs in addition to periodic photographs specified.

1. In emergency situations, take additional photographs within 24 hours of request.
2. Circumstances that could require additional photographs include, but are not limited to, the following:

a. Immediate follow-up when on-site events result in construction damage or losses.
b. Substantial Completion of a major phase or component of the Work.

1.6 CONSTRUCTION WEBCAM

A. Webcam: Provide one (1) fixed-location camera with weatherproof housing, mounted to provide unobstructed view of construction site from location approved by Architect, with the following characteristics:

1. Static view. **[Remotely controllable view with mouse-click user navigation for horizontal pan, vertical tile, and optical zoom of five hundred percent (500%) minimum.]**
2. Capable of producing minimum 12-megapixel images.
3. Provide pole mount, power supply, active high-speed data connection to service provider's network, and static public IP address for each camera.

B. Live Streaming: Provide web-accessible live feed of site when construction is underway.

C. Web-Based Interface: Provide online interface to allow viewing of each high-definition digital still image captured and stored during construction, from the Internet.

1. Access Control: Provide password-protected access for Project team administered by Contractor, providing current image access and archival image access by date and time, with images downloadable to viewer's device.
2. Software: Provide responsive software interface for use on computer, tablet, and mobile screens with accompanying iPhone/iPad app and Android apps.
3. Storage: Maintain images on the website for reference during entire construction period, and for not less than thirty (30) days after Final Completion. Provide sufficient memory on remote server to store all Project images.
4. Online Interface: Provide website interface with Project and client information and logos, calendar-based navigation interface for selecting images, and pan and zoom capability within high-definition images.

5. Forward and Reverse: Provide capability to browse through images, moving forward and backward in time by individual image and by day.
   Slideshow: Provide capability to automatically display current images from sites when there are three or more cameras used.
6. Time-Lapse: Provide capability for online display of project time-lapse.
7. Dashboard: Provide capability to view thumbnails of all cameras on one (1) screen.
8. Weather: Provide corresponding weather data for each image captured.
9. Provide public viewer open access to most recent Project camera image.

D. Maintain cameras and web-based access in good working order, according to web-based construction photographic documentation service provider's written instructions until Final Completion. Provide for service of cameras and related networking devices and software.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 013233

SECTION 013300 - SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes requirements for the submittal schedule and administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other submittals.

B. Related Sections:

1. Section 012900 "Payment Procedures" for submitting Applications for Payment and the schedule of values.
2. Section 013200 "Construction Progress Documentation" for submitting schedules and reports, including Contractor's construction schedule.
3. Section 017823 "Operation and Maintenance Data" for submitting operation and maintenance manuals.
4. Section 017839 "Project Record Documents" for submitting record Drawings, record Specifications, and record Product Data.

1.3 DEFINITIONS

A. Action Submittals: Written and graphic information and physical samples that require Architect's responsive action. Action submittals are those submittals indicated in individual Specification Sections as action submittals.

B. Informational Submittals: Written and graphic information and physical samples that do not require Architect's responsive action. Submittals may be rejected for not complying with requirements. Informational submittals are those submittals indicated in individual Specification Sections as informational submittals.

C. File Transfer Protocol (FTP): Communications protocol that enables transfer of files to and from another computer over a network and that serves as the basis for standard Internet protocols. An FTP site is a portion of a network located outside of network firewalls within which internal and external users are able to access files.

D. Portable Document Format (PDF): An open standard file format licensed by Adobe Systems used for representing documents in a device-independent and display resolution-independent fixed-layout document format.

1.4 ACTION SUBMITTALS

A. Submittal Schedule: Submit a schedule of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, ordering, manufacturing, fabrication, and delivery when establishing dates. Include additional time required for making corrections or modifications to submittals noted by the Architect and additional time for handling and reviewing submittals required by those corrections.

1. Coordinate submittal schedule with list of subcontracts, the schedule of values, and Contractor's construction schedule.
2. Submit concurrently with Contractor's construction schedule. Include submittals required during the first sixty (60) days of construction. List those submittals required to maintain orderly progress of the Work and those required early because of long lead time for manufacture or fabrication.

3. Format: Arrange the following information in a tabular format:

    a. Scheduled date for first submittal.
    b. Specification Section number and title.
    c. Submittal Category: Action, informational.
    d. Name of subcontractor.
    e. Description of the Work covered.
    f. Scheduled date for Architect's final release or approval.
    g. Scheduled dates for purchasing.
    h. Scheduled dates for installation.

1.5 SUBMITTAL ADMINISTRATIVE REQUIREMENTS

A. Architect's Digital Data Files: Electronic copies of the Building Information Model (BIM) of the Contract Drawings will **not** be provided by Architect for Vendor's use in preparing submittals unless requested and Architect's user agreement properly completed.

B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.

1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
2. Submit all submittal items required for each Specification Section concurrently unless partial submittals for portions of the Work are indicated on approved submittal schedule.
3. Submit action submittals and informational submittals required by the same Specification Section as separate packages under separate transmittals.
4. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.

    a. Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.

C. Processing Time: Allow time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Architect's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.

1. Initial Review: Allow ten (10) days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Architect will advise Contractor when a submittal being processed must be delayed for coordination.
2. Resubmittal Review: Allow ten (10) days for review of each resubmittal.
3. Sequential Review: Where sequential review of submittals by Architect's consultants, Owner, or other parties is indicated, allow fifteen (15) days for initial review of each submittal.

D. Identification and Information: Place a permanent label or title block on each paper copy submittal item for identification.

1. Indicate name of firm or entity that prepared each submittal on label or title block.
2. Provide a space on label or beside title block to record Contractor's review and approval markings and action taken by Architect.
3. Include the following information for processing and recording action taken:

    a. Project name.
    b. Date.
    c. Name of Architect.
    d. Name of Contractor.
    e. Name of subcontractor.
    f. Name of supplier.
    g. Name of manufacturer.
    h. Submittal number or other unique identifier, including revision identifier.

        1) Submittal number shall use Specification Section number followed by a decimal point and then a sequential number (e.g., 061000.01). Resubmittals shall include an alphabetic suffix after another decimal point (e.g., 061000.01.A).

    i. Number and title of appropriate Specification Section.
    j. Drawing number and detail references, as appropriate.
    k. Location(s) where product is to be installed, as appropriate.
    l. Other necessary identification.

E. Identification and Information: Identify and incorporate information in each electronic submittal file as follows:

1. Assemble complete submittal package into a single indexed file with links enabling navigation to each item.
2. Name file with submittal number or other unique identifier, including revision identifier.

    a. File name shall use project identifier and Specification Section number followed by a decimal point and then a sequential number (e.g., LNHS-061000.01). Resubmittals shall include an alphabetic suffix after another decimal point (e.g., LNHS-061000.01.A).

3. Provide means for insertion to permanently record Contractor's review and approval markings and action taken by Architect.
4. Include the following information on an inserted cover sheet:

    a. Project name.
    b. Date.
    c. Name and address of Architect.
    d. Name of Contractor.
    e. Name of firm or entity that prepared submittal.
    f. Name of subcontractor.
    g. Name of supplier.
    h. Name of manufacturer.
    i. Number and title of appropriate Specification Section.
    j. Drawing number and detail references, as appropriate.
    k. Location(s) where product is to be installed, as appropriate.
    l. Related physical samples submitted directly.
    m. Other necessary identification.

5. Include the following information as keywords in the electronic file metadata:

a. Project name.
b. Number and title of appropriate Specification Section.
c. Manufacturer name.
d. Product name.

F. Options: Identify options requiring selection by the Architect.

G. Deviations: Identify deviations from the Contract Documents on submittals.

H. Additional Paper Copies: Unless additional copies are required for final submittal, and unless Architect observes noncompliance with provisions in the Contract Documents, initial submittal may serve as final submittal.

I. Transmittal: Assemble each submittal individually and appropriately for transmittal and handling. Transmit each submittal using a transmittal form. Architect will return submittals, without review received from sources other than Contractor.

1. Transmittal Form: Provide locations on form for the following information:

a. Project name.
b. Date.
c. Destination (To:).
d. Source (From:).
e. Names of subcontractor, manufacturer, and supplier.
f. Category and type of submittal.
g. Submittal purpose and description.
h. Specification Section number and title.
i. Indication of full or partial submittal.
j. Drawing number and detail references, as appropriate.
k. Transmittal number**,** numbered consecutively.
l. Submittal and transmittal distribution record.
m. Remarks.
n. Signature of transmitter.

2. On an attached separate sheet, prepared on Contractor's letterhead, record relevant information, requests for data, revisions other than those requested by Architect on previous submittals, and deviations from requirements in the Contract Documents, including minor variations and limitations. Include same identification information as related submittal.

J. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.

1. Note date and content of previous submittal.
2. Note date and content of revision in label or title block and clearly indicate extent of revision.
3. Resubmit submittals until they are marked with approval notation from Architect's action stamp.

K. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.

L. Use for Construction: Use only final submittals that are marked with approval notation from Architect's action stamp.

PART 2 - PRODUCTS

2.1 SUBMITTAL PROCEDURES

A. General Submittal Procedure Requirements: Prepare and submit submittals required by individual Specification Sections. Types of submittals are indicated in individual Specification Sections.

1. Submit electronic submittals via email as PDF electronic files.

a. Architect will return annotated file. Annotate and retain one (1) copy of file as an electronic Project record document file.

2. Closeout Submittals and Maintenance Material Submittals: Comply with requirements specified in Section 017700 "Closeout Procedures."
3. Certificates and Certifications Submittals: Provide a statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.

a. Provide a digital signature with digital certificate on electronically submitted certificates and certifications where indicated.
b. Provide a notarized statement on original paper copy certificates and certifications where indicated.

4. Test and Inspection Reports Submittals: Comply with requirements specified in Section 014000 "Quality Requirements."

B. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.

1. If information must be specially prepared for submittal because standard published data is not suitable for use, submit as Shop Drawings, not as Product Data.
2. Mark each copy of each submittal to show which products and options are applicable.
3. Include the following information, as applicable:

a. Manufacturer's catalog cuts.
b. Manufacturer's product specifications.
c. Standard color charts.
d. Statement of compliance with specified referenced standards.
e. Testing by recognized testing agency.
f. Application of testing agency labels and seals.
g. Notation of coordination requirements.
h. Availability and delivery time information.

4. For equipment, include the following in addition to the above, as applicable:

a. Wiring diagrams showing factory-installed wiring.
b. Printed performance curves.
c. Operational range diagrams.
d. Clearances required to other construction, if not indicated on accompanying Shop Drawings.

5. Submit Product Data before or concurrent with Samples.

C. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data.

1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:

a. Identification of products.
b. Schedules.
c. Compliance with specified standards.
d. Notation of coordination requirements.
e. Notation of dimensions established by field measurement.
f. Relationship and attachment to adjoining construction clearly indicated.
g. Seal and signature of professional engineer if specified.

2. Sheet Size: Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets at least 8½ by 11 inches but no larger than 30 by 42 inches.

D. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other elements and for a comparison of these characteristics between submittal and actual component as delivered and installed.

1. Transmit Samples that contain multiple, related components such as accessories together in one (1) submittal package.
2. Identification: Attach label on unexposed side of Samples that includes the following:

a. Generic description of Sample.
b. Product name and name of manufacturer.
c. Sample source.
d. Number and title of applicable Specification Section.

3. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.

a. Samples that may be incorporated into the Work are indicated in individual Specification Sections. Such Samples must be in an undamaged condition at time of use.
b. Samples not incorporated into the Work, or otherwise designated as Owner's property, are the property of Contractor.

E. Product Schedule: As required in individual Specification Sections, prepare a written summary indicating types of products required for the Work and their intended location. Include the following information in tabular form:

1. Type of product. Include unique identifier for each product indicated in the Contract Documents.
2. Manufacturer and product name, and model number if applicable.
3. Number and name of room or space.
4. Location within room or space.

F. Contractor's Construction Schedule: Comply with requirements specified in Section 013200 "Construction Progress Documentation."

G. Application for Payment: Comply with requirements specified in Section 012900 "Payment Procedures."

H. Schedule of Values: Comply with requirements specified in Section 012900 "Payment Procedures."

I. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design**.** Include the following information in tabular form:

1. Name, address, and telephone number of entity performing subcontract or supplying products.
2. Number and title of related Specification Section(s) covered by subcontract.
3. Drawing number and detail references, as appropriate, covered by subcontract.

J. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, contact information of Architects and Owners, and other information specified.

K. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of Welding Procedure Specification and Procedure Qualification Record on American Welding Society (AWS) forms. Include names of firms and personnel certified.

L. Installer Certificates: Submit written statements on manufacturer's letterhead certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.

M. Manufacturer Certificates: Submit written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.

N. Product Certificates: Submit written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.

O. Material Certificates: Submit written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.

P. Material Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.

Q. Product Test Reports: Submit written reports indicating current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.

R. Research Reports: Submit written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project. Include the following information:

1. Name of evaluation organization.
2. Date of evaluation.
3. Time period when report is in effect.
4. Product and manufacturers' names.
5. Description of product.
6. Test procedures and results.
7. Limitations of use.

S. Schedule of Tests and Inspections: Comply with requirements specified in Section 014000 "Quality Requirements."

T. Preconstruction Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.

U. Compatibility Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion.

V. Field Test Reports: Submit reports indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.

W. Maintenance Data: Comply with requirements specified in Section 017823 "Operation and Maintenance Data."

PART 3 - EXECUTION

3.1 CONTRACTOR'S REVIEW

A. Action and Informational Submittals: Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Architect.

B. Project Closeout and Maintenance/Material Submittals: Refer to requirements in Section 017700 "Closeout Procedures."

C. Approval Stamp: Stamp each submittal with a uniform, approval stamp. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

3.2 ARCHITECT'S ACTION

A. General: Architect will not review submittals that do not bear Contractor's approval stamp and will return them without action.

B. Action Submittals: Architect will review each submittal, make marks to indicate corrections or modifications required, and return it. Architect will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action.

C. Informational Submittals: Architect will review each submittal and will not return it, or will return it if it does not comply with requirements. Architect will forward each submittal to appropriate party.

D. Partial submittals prepared for a portion of the Work will be reviewed when use of partial submittals has received prior approval from Architect.

E. Incomplete submittals are not acceptable, will be considered nonresponsive, and will be returned without review.

F. Submittals not required by the Contract Documents may not be reviewed and may be discarded.

END OF SECTION 013300

SECTION 014000 - QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for quality assurance and quality control.

B. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.

1. Specific quality-assurance and -control requirements for individual work results are specified in their respective Specification Sections. Requirements in individual Sections may also cover production of standard products.
2. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and quality-control procedures that facilitate compliance with the Contract Document requirements.
3. Requirements for Contractor to provide quality-assurance and quality-control services required by Architect, Owner, or authorities having jurisdiction are not limited by provisions of this Section.

C. Related Sections:

1. Divisions 02 through 49 Sections for specific test and inspection requirements.

1.3 DEFINITIONS

A. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.

B. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that actual products incorporated into the Work and completed construction comply with requirements. Contractor’s quality-control services do not include contract enforcement activities performed by Architect.

C. Mockups: Full-size physical assemblies that are constructed on-site either as freestanding temporary built elements or as part of permanent construction. Mockups are constructed to verify selections made under sample submittals; to demonstrate aesthetic effects and qualities of materials and execution; to review coordination, testing, or operation; to show interface between dissimilar materials; and to demonstrate compliance with specified installation tolerances. Mockups are not Samples. Unless otherwise indicated, approved mockups establish the standard by which the Work will be judged.

1. Integrated Exterior Mockups: Mockups of the exterior envelope construction on-site as freestanding temporary built elements or as part of permanent construction, consisting of multiple products, assemblies, and subassemblies.

D. Pre-construction Testing: Tests and inspections performed specifically for the Project before products and materials are incorporated into the Work, to verify performance or compliance with specified criteria.

E. Product Tests: Tests and inspections that are performed by a nationally recognized testing laboratory (NRTL) according to 29 CFR 1910.7, by a testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program (NVLAP), or by a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with specified requirements.

F. Source Quality-Control Tests: Tests and inspections that are performed at the source; for example, plant, mill, factory, or shop.

G. Field Quality-Control Tests: Tests and inspections that are performed on-site for installation of the Work and for completed Work.

H. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.

I. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform a particular construction operation, including installation, erection, application, and similar operations.

1. Use of trade-specific terminology in referring to a trade or entity does not require that certain construction activities be performed by accredited or unionized individuals, or that requirements specified apply exclusively to specific trade or trades.

J. Experienced: When used with an entity or individual, "experienced" unless otherwise further described means having successfully completed a minimum of five (5) previous projects similar in nature, size, and extent to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.

1.4 DELEGATED-DESIGN SERVICES

A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.

1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Architect.

1.5 CONFLICTING REQUIREMENTS

A. Conflicting Standards and Other Requirements: If compliance with two (2) or more standards or requirements are specified and the standards or requirements establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer conflicting requirements that are different, but apparently equal, to Architect for direction before proceeding.

B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the

minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Architect for a decision before proceeding.

1.6 ACTION SUBMITTALS

A. Shop Drawings: For mockups.

1. Include plans, sections, and elevations, indicating materials and size of mockup construction.
2. Indicate manufacturer and model number of individual components.
3. Provide axonometric drawings for conditions difficult to illustrate in two (2) dimensions.

B. Delegated-Design Services Submittal: In addition to Shop Drawings, Product Data, and other required submittals, submit a statement signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional, indicating that the products and systems are in compliance with performance and design criteria indicated. Include list of codes, loads, and other factors used in performing these services.

1.7 INFORMATIONAL SUBMITTALS

A. Contractor's Quality-Control Plan: For quality-assurance and quality-control activities and responsibilities.

B. Qualification Data: For Contractor's quality-control personnel.

C. Contractor's Statement of Responsibility: When required by authorities having jurisdiction, submit copy of written statement of responsibility submitted to authorities having jurisdiction before starting work on the following systems.

1. Seismic-force-resisting system, designated seismic system, or component listed in the Statement of Special Inspections.
2. Main wind-force-resisting system or a wind-resisting component listed in the Statement of Special Inspections.

D. Testing Agency Qualifications: For testing agencies specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.

E. Schedule of Tests and Inspections: Prepare in tabular form and include the following:

1. Specification Section number and title.
2. Entity responsible for performing tests and inspections.
3. Description of test and inspection.
4. Identification of applicable standards.
5. Identification of test and inspection methods.
6. Number of tests and inspections required.
7. Time schedule or time span for tests and inspections.
8. Requirements for obtaining samples.
9. Unique characteristics of each quality-control service.

F. Reports: Prepare and submit certified written reports and documents as specified.

G. Permits, Licenses, and Certificates: For Owner's record, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents established for compliance with standards and regulations bearing on performance of the Work.

1.8 CONTRACTOR'S QUALITY-CONTROL PLAN

A. Quality-Control Plan, General: Submit quality-control plan within ten (10) days of Notice to Proceed, and not less than five (5) days prior to preconstruction conference. Submit in format acceptable to Architect. Identify personnel, procedures, controls, instructions, tests, records, and forms to be used to carry out Contractor's quality-assurance and quality-control responsibilities. Coordinate with Contractor's construction schedule.

B. Quality-Control Personnel Qualifications: Engage qualified personnel trained and experienced in managing and executing quality-assurance and quality-control procedures similar in nature and extent to those required for Project.

C. Submittal Procedure: Describe procedures for ensuring compliance with requirements through review and management of submittal process. Indicate qualifications of personnel responsible for submittal review.

D. Testing and Inspection: Include in quality-control plan a comprehensive schedule of Work requiring testing or inspection, including the following:

1. Contractor-performed tests and inspections including subcontractor-performed tests and inspections. Include required tests and inspections and Contractor-elected tests and inspections. Distinguish source quality-control tests and inspections from field quality-control tests and inspections.
2. Special inspections required by authorities having jurisdiction and indicated on the "Statement of Special Inspections."
3. Owner-performed tests and inspections indicated in the Contract Documents.

E. Continuous Inspection of Workmanship: Describe process for continuous inspection during construction to identify and correct deficiencies in workmanship in addition to testing and inspection specified. Indicate types of corrective actions to be required to bring work into compliance with standards of workmanship established by Contract requirements and approved mockups.

F. Monitoring and Documentation: Maintain testing and inspection reports including log of approved and rejected results. Include work Architect has indicated as nonconforming or defective. Indicate corrective actions taken to bring nonconforming work into compliance with requirements. Comply with requirements of authorities having jurisdiction.

1.9 REPORTS AND DOCUMENTS

A. Test and Inspection Reports: Prepare and submit certified written reports specified in other Sections. Include the following:

1. Date of issue.
2. Project title and number.
3. Name, address, and telephone number of testing agency.
4. Dates and locations of samples and tests or inspections.
5. Names of individuals making tests and inspections.
6. Description of the Work and test and inspection method.
7. Identification of product and Specification Section.

8. Complete test or inspection data.
9. Test and inspection results and an interpretation of test results.
10. Record of temperature and weather conditions at time of sample taking and testing and inspecting.
11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
12. Name and signature of laboratory inspector.
13. Recommendations on retesting and reinspecting.

B. Manufacturer's Technical Representative's Field Reports: Prepare written information documenting manufacturer's technical representative's tests and inspections specified in other Sections. Include the following:

1. Name, address, and telephone number of technical representative making report.
2. Statement on condition of substrates and their acceptability for installation of product.
3. Statement that products at Project site comply with requirements.
4. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
5. Results of operational and other tests and a statement of whether observed performance complies with requirements.
6. Statement whether conditions, products, and installation will affect warranty.
7. Other required items indicated in individual Specification Sections.

C. Factory-Authorized Service Representative's Reports: Prepare written information documenting manufacturer's factory-authorized service representative's tests and inspections specified in other Sections. Include the following:

1. Name, address, and telephone number of factory-authorized service representative making report.
2. Statement that equipment complies with requirements.
3. Results of operational and other tests and a statement of whether observed performance complies with requirements.
4. Statement whether conditions, products, and installation will affect warranty.
5. Other required items indicated in individual Specification Sections.

1.10 QUALITY ASSURANCE

A. General: Qualifications paragraphs in this article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.

B. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units. As applicable, procure products from manufacturers able to meet qualification requirements, warranty requirements, and technical or factory-authorized service representative requirements.

C. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

D. Installer Qualifications: A firm or individual experienced in installing, erecting, applying, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.

E. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or product that are similar in material, design, and extent to those indicated for this Project.

F. Specialists: Certain Specification Sections require that specific construction activities shall be performed by entities who are recognized experts in those operations. Specialists shall satisfy qualification requirements indicated and shall be engaged for the activities indicated.

1. Requirements of authorities having jurisdiction shall supersede requirements for specialists.

G. Testing Agency Qualifications: An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspecting indicated, as documented according to ASTM E 329; and with additional qualifications specified in individual Sections; and where required by authorities having jurisdiction, that is acceptable to authorities.

H. Manufacturer's Technical Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to observe and inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

I. Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

J. Mockups: Before installing portions of the Work requiring mockups, build mockups for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work:

1. Build mockups in location and of size indicated or, if not indicated, as directed by Architect.
2. Notify Architect seven (7) days in advance of dates and times when mockups will be constructed.
3. Employ supervisory personnel who will oversee mockup construction. Employ workers that will be employed during the construction at the Project.
4. Demonstrate the proposed range of aesthetic effects and workmanship.
5. Obtain Architect's approval of mockups before starting work, fabrication, or construction.

    a. Allow seven (7) days for initial review and each re-review of each mockup.

6. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
7. Demolish and remove mockups when directed, unless otherwise indicated.

K. Integrated Exterior Mockups: Construct integrated exterior mockup according to approved Shop Drawings. Coordinate installation of exterior envelope materials and products for which mockups are required in individual Specification Sections, along with supporting materials. Comply with requirements in "Mockups" Paragraph.

1.11 QUALITY CONTROL

A. Owner Responsibilities: Where quality-control services are indicated as Owner's responsibility, Owner will engage a qualified testing agency to perform these services.

1. Owner will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of types of testing and inspecting they are engaged to perform.
2. Costs for retesting and reinspecting construction that replaces or is necessitated by work that failed to comply with the Contract Documents will be charged to Contractor, and the Contract Sum will be adjusted by Change Order.
3. Costs for testing that is cancelled will be charged to the Contractor, and the Contract Sum will be adjusted by Change Order.

B. Contractor Responsibilities: Tests and inspections not explicitly assigned to Owner are Contractor's responsibility. Perform additional quality-control activities, whether specified or not, to verify that the Work complies with requirements.

1. Unless otherwise indicated, provide quality-control services specified and those required by authorities having jurisdiction. Perform quality-control services required of Contractor by authorities having jurisdiction, whether specified or not.
2. Engage a qualified testing agency to perform these quality-control services.

    a. Contractor shall not employ same entity engaged by Owner, unless agreed to in writing by Owner.

3. Notify testing agencies at least 24 hours in advance of time when Work that requires testing or inspecting will be performed.
4. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.
5. Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
6. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.

C. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing as specified in Section 013300 "Submittal Procedures."

D. Manufacturer's Technical Services: Where indicated, engage a manufacturer's technical representative to observe and inspect the Work. Manufacturer's technical representative's services include participation in preinstallation conferences, examination of substrates and conditions, verification of materials, observation of Installer activities, inspection of completed portions of the Work, and submittal of written reports.

E. Retesting/Reinspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and reinspecting, for construction that replaced Work that failed to comply with the Contract Documents.

F. Testing Agency Responsibilities: Cooperate with Architect and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.

1. Notify Architect and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.

2. Determine the location from which test samples will be taken and in which in-situ tests are conducted.
3. Conduct and interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from requirements.
4. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.
5. Do not release, revoke, alter, or increase the Contract Document requirements or approve or accept any portion of the Work.
6. Do not perform any duties of Contractor.

G. Associated Contractor Services: Cooperate with agencies and representatives performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:

1. Access to the Work.
2. Incidental labor and facilities necessary to facilitate tests and inspections.
3. Adequate quantities of representative samples of materials that require testing and inspection. Assist agency in obtaining samples.
4. Facilities for storage and field curing of test samples.
5. Delivery of samples to testing agencies.
6. Preliminary design mix proposed for use for material mixes that require control by testing agency.
7. Security and protection for samples and for testing and inspecting equipment at Project site.

H. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and quality-control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.

1. Schedule times for tests, inspections, obtaining samples, and similar activities.

I. Schedule of Tests and Inspections: Prepare a schedule of tests, inspections, and similar quality-control services required by the Contract Documents Coordinate and submit concurrently with Contractor's construction schedule. Update as the Work progresses.

1. Distribution: Distribute schedule to Owner, Architect, testing agencies, and each party involved in performance of portions of the Work where tests and inspections are required.

1.12 SPECIAL TESTS AND INSPECTIONS

A. Special Tests and Inspections: Conducted by a qualified testing agency as required by authorities having jurisdiction, as indicated in individual Specification Sections, and as follows:

1. Verifying that manufacturer maintains detailed fabrication and quality-control procedures and reviewing the completeness and adequacy of those procedures to perform the Work.
2. Notifying Architect and Contractor promptly of irregularities and deficiencies observed in the Work during performance of its services.
3. Submitting a certified written report of each test, inspection, and similar quality-control service to Architect, Contractor and to authorities having jurisdiction.
4. Submitting a final report of special tests and inspections at Substantial Completion, which includes a list of unresolved deficiencies.
5. Interpreting tests and inspections and stating in each report whether tested and inspected work complies with or deviates from the Contract Documents.
6. Retesting and reinspecting corrected work.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 TEST AND INSPECTION LOG

A. Prepare a record of tests and inspections. Include the following:

1. Date test or inspection was conducted.
2. Description of the Work tested or inspected.
3. Date test or inspection results were transmitted to Architect.
4. Identification of testing agency or special inspector conducting test or inspection.

B. Maintain log at Project site. Post changes and modifications as they occur. Provide access to test and inspection log for Architect's reference during normal working hours.

1. Submit log at Project closeout as part of Project Record Documents.

3.2 REPAIR AND PROTECTION

A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.

1. Provide materials and comply with installation requirements specified in other Specification Sections or matching existing substrates and finishes. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible. Comply with the Contract Document requirements for cutting and patching in Section 017300 "Execution."

B. Protect construction exposed by or for quality-control service activities.

C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION 014000

SECTION 014200 - REFERENCES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 DEFINITIONS

A. General: Basic Contract definitions are included in the Conditions of the Contract.

B. "Approved": When used to convey Architect's action on Contractor's submittals, applications, and requests, "approved" is limited to Architect's duties and responsibilities as stated in the Conditions of the Contract.

C. "Directed": A command or instruction by Architect. Other terms including "requested," "authorized," "selected," "required," and "permitted" have the same meaning as "directed."

D. "Indicated": Requirements expressed by graphic representations or in written form on Drawings, in Specifications, and in other Contract Documents. Other terms including "shown," "noted," "scheduled," and "specified" have the same meaning as "indicated."

E. "Regulations": Laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, and rules, conventions, and agreements within the construction industry that control performance of the Work.

F. "Furnish": Supply and deliver to Project site, ready for unloading, unpacking, assembly, installation, and similar operations.

G. "Install": Unload, temporarily store, unpack, assemble, erect, place, anchor, apply, work to dimension, finish, cure, protect, clean, and similar operations at Project site.

H. "Provide": Furnish and install, complete and ready for the intended use.

I. "Project Site": Space available for performing construction activities. The extent of Project site is shown on Drawings and may or may not be identical with the description of the land on which Project is to be built.

1.3 INDUSTRY STANDARDS

A. Applicability of Standards: Unless the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.

B. Publication Dates: Comply with standards in effect as of date of the Contract Documents unless otherwise indicated.

1. For standards referenced by applicable building codes, comply with dates of standards as listed in building codes.

C. Copies of Standards: Each entity engaged in construction on Project should be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Contract Documents.

1. Where copies of standards are needed to perform a required construction activity, obtain copies directly from publication source.

1.4 ABBREVIATIONS AND ACRONYMS

A. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities indicated in Gale's "Encyclopedia of Associations: National Organizations of the U.S." or in Columbia Books' "National Trade & Professional Associations of the United States."

1. AABC - Associated Air Balance Council; www.aabc.com.
2. AAMA - American Architectural Manufacturers Association; www.aamanet.org.
3. AAPFCO - Association of American Plant Food Control Officials; www.aapfco.org.
4. AASHTO - American Association of State Highway and Transportation Officials; www.transportation.org.
5. AATCC - American Association of Textile Chemists and Colorists; www.aatcc.org.
6. ABMA - American Bearing Manufacturers Association; www.americanbearings.org.
7. ABMA - American Boiler Manufacturers Association; www.abma.com.
8. ACI - American Concrete Institute; (Formerly: ACI International); www.concrete.org.
9. ACPA - American Concrete Pipe Association; www.concrete-pipe.org.
10. AEIC - Association of Edison Illuminating Companies, Inc. (The); www.aeic.org.
11. AF&PA - American Forest & Paper Association; www.afandpa.org.
12. AGA - American Gas Association; www.aga.org.
13. AHAM - Association of Home Appliance Manufacturers; www.aham.org.
14. AHRI - Air-Conditioning, Heating, and Refrigeration Institute (The); www.ahrinet.org.
15. AI - Asphalt Institute; www.asphaltinstitute.org.
16. AIA - American Institute of Architects (The); www.aia.org.
17. AISC - American Institute of Steel Construction; www.aisc.org.
18. AISI - American Iron and Steel Institute; www.steel.org.
19. AITC - American Institute of Timber Construction; www.aitc-glulam.org.
20. AMCA - Air Movement and Control Association International, Inc.; www.amca.org.
21. ANSI - American National Standards Institute; www.ansi.org.
22. AOSA - Association of Official Seed Analysts, Inc.; www.aosaseed.com.
23. APA - APA - The Engineered Wood Association; www.apawood.org.
24. APA - Architectural Precast Association; www.archprecast.org.
25. API - American Petroleum Institute; www.api.org.
26. ARI - Air-Conditioning & Refrigeration Institute; (See AHRI).
27. ARI - American Refrigeration Institute; (See AHRI).
28. ARMA - Asphalt Roofing Manufacturers Association; www.asphaltroofing.org.
29. ASCE - American Society of Civil Engineers; www.asce.org.
30. ASCE/SEI - American Society of Civil Engineers/Structural Engineering Institute; (See ASCE).
31. ASHRAE - American Society of Heating, Refrigerating and Air-Conditioning Engineers; www.ashrae.org.
32. ASME - ASME International; (American Society of Mechanical Engineers); www.asme.org.
33. ASSE - American Society of Sanitary Engineering; www.asse-plumbing.org.
34. ASSP - American Society of Safety Professionals (The); www.assp.org.
35. ASTM - ASTM International; www.astm.org.
36. ATIS - Alliance for Telecommunications Industry Solutions; www.atis.org.
37. AVIXA - Audiovisual and Integrated Experience Association; (Formerly: Infocomm International); www.soundandcommunications.com.

38. AWEA - American Wind Energy Association; www.awea.org.
39. AWI - Architectural Woodwork Institute; www.awinet.org.
40. AWMAC - Architectural Woodwork Manufacturers Association of Canada; www.awmac.com.
41. AWPA - American Wood Protection Association; www.awpa.com.
42. AWS - American Welding Society; www.aws.org.
43. AWWA - American Water Works Association; www.awwa.org.
44. BHMA - Builders Hardware Manufacturers Association; www.buildershardware.com.
45. BIA - Brick Industry Association (The); www.gobrick.com.
46. BICSI - BICSI, Inc.; www.bicsi.org.
47. BIFMA - BIFMA International; (Business and Institutional Furniture Manufacturer's Association); www.bifma.org.
48. BISSC - Baking Industry Sanitation Standards Committee; www.bissc.org.
49. BWF - Badminton World Federation; (Formerly: International Badminton Federation); www.bissc.org.
50. CDA - Copper Development Association; www.copper.org.
51. CE - Conformite Europeenne; www.ec.europa.eu/growth/single-market/ce-marking.
52. CEA - Canadian Electricity Association; www.electricity.ca.
53. CFFA - Chemical Fabrics and Film Association, Inc.; www.chemicalfabricsandfilm.com.
54. CFSEI - Cold-Formed Steel Engineers Institute; www.cfsei.org.
55. CGA - Compressed Gas Association; www.cganet.com.
56. CIMA - Cellulose Insulation Manufacturers Association; www.cellulose.org.
57. CISCA - Ceilings & Interior Systems Construction Association; www.cisca.org.
58. CISPI - Cast Iron Soil Pipe Institute; www.cispi.org.
59. CLFMI - Chain Link Fence Manufacturers Institute; www.chainlinkinfo.org.
60. CPA - Composite Panel Association; www.compositepanel.org.
61. CRI - Carpet and Rug Institute (The); www.carpet-rug.org.
62. CRRC - Cool Roof Rating Council; www.coolroofs.org.
63. CRSI - Concrete Reinforcing Steel Institute; www.crsi.org.
64. CSA - CSA Group; www.csa-group.org.
65. CSI - Construction Specifications Institute (The); www.csiresources.org.
66. CSSB - Cedar Shake & Shingle Bureau; www.cedarbureau.org.
67. CTA - Consumer Technology Association; www.cta.tech.
68. CTI - Cooling Technology Institute; (Formerly: Cooling Tower Institute); www.coolingtechnology.org.
69. CWC - Composite Wood Council; (See CPA).
70. DASMA - Door and Access Systems Manufacturers Association; www.dasma.com.
71. DHA - Decorative Hardwoods Association; (Formerly: Hardwood Plywood & Veneer Association); www.decorativehardwoods.org.
72. DHI - Door and Hardware Institute; www.dhi.org.
73. ECA - Electronic Components Association; (See ECIA).
74. ECAMA - Electronic Components Assemblies & Materials Association; (See ECIA).
75. ECIA - Electronic Components Industry Association; www.ecianow.org.
76. EIA - Electronic Industries Alliance; (See TIA).
77. EIMA - EIFS Industry Members Association; www.eima.com.
78. EJMA - Expansion Joint Manufacturers Association, Inc.; www.ejma.org.
79. EOS/ESD Association; (Electrostatic Discharge Association); www.esda.org.
80. ESTA - Entertainment Services and Technology Association; (See PLASA).
81. ETL - Intertek (See Intertek); www.intertek.com.
82. EVO - Efficiency Valuation Organization; www.evo-world.org.
83. FCI - Fluid Controls Institute; www.fluidcontrolsinstitute.org.
84. FIBA - Federation Internationale de Basketball; (The International Basketball Federation); www.fiba.com.
85. FIVB - Federation Internationale de Volleyball; (The International Volleyball Federation); www.fivb.org.
86. FM Approvals - FM Approvals LLC; www.fmglobal.com.

87. FM Global - FM Global; (Formerly: FMG - FM Global); www.fmglobal.com.
88. FRSA - Florida Roofing, Sheet Metal Contractors Association, Inc.; www.floridaroof.com.
89. FSA - Fluid Sealing Association; www.fluidsealing.com.
90. FSC - Forest Stewardship Council U.S.; www.fscus.org.
91. GA - Gypsum Association; www.gypsum.org.
92. GANA - Glass Association of North America; (See NGA).
93. GS - Green Seal; www.greenseal.org.
94. HI - Hydraulic Institute; www.pumps.org.
95. HI/GAMA - Hydronics Institute/Gas Appliance Manufacturers Association; (See AHRI).
96. HMMA - Hollow Metal Manufacturers Association; (See NAAMM).
97. HPVA - Hardwood Plywood & Veneer Association; (See DHA).
98. HPW - H. P. White Laboratory, Inc.; www.hpwhite.com.
99. IAPSC - International Association of Professional Security Consultants; www.iapsc.org.
100. IAS - International Accreditation Service; www.iasonline.org.
101. ICBO - International Conference of Building Officials; (See ICC).
102. ICC - International Code Council; www.iccsafe.org.
103. ICEA - Insulated Cable Engineers Association, Inc.; www.icea.net.
104. ICPA - International Cast Polymer Association; www.theicpa.com.
105. ICRI - International Concrete Repair Institute, Inc.; www.icri.org.
106. IEC - International Electrotechnical Commission; www.iec.ch.
107. IEEE - Institute of Electrical and Electronics Engineers, Inc. (The); www.ieee.org.
108. IES - Illuminating Engineering Society; (Formerly: Illuminating Engineering Society of North America); www.ies.org.
109. IESNA - Illuminating Engineering Society of North America; (See IES).
110. IEST - Institute of Environmental Sciences and Technology; www.iest.org.
111. IGMA - Insulating Glass Manufacturers Alliance; www.igmaonline.org.
112. IGSHPA - International Ground Source Heat Pump Association; www.igshpa.org.
113. II - Infocomm International; (See AVIXA).
114. ILI - Indiana Limestone Institute of America, Inc.; www.iliai.com.
115. Intertek - Intertek Group; (Formerly: ETL SEMCO; Intertek Testing Service NA); www.intertek.com.
116. ISA - International Society of Automation (The); (Formerly: Instrumentation, Systems, and Automation Society); www.isa.org.
117. ISAS - Instrumentation, Systems, and Automation Society (The); (See ISA).
118. ISFA - International Surface Fabricators Association; (Formerly: International Solid Surface Fabricators Association); www.isfanow.org.
119. ISO - International Organization for Standardization; www.iso.org.
120. ISSFA - International Solid Surface Fabricators Association; (See ISFA).
121. ITU - International Telecommunication Union; www.itu.int.
122. KCMA - Kitchen Cabinet Manufacturers Association; www.kcma.org.
123. LMA - Laminating Materials Association; (See CPA).
124. LPI - Lightning Protection Institute; www.lightning.org.
125. MBMA - Metal Building Manufacturers Association; www.mbma.com.
126. MCA - Metal Construction Association; www.metalconstruction.org.
127. MFMA - Maple Flooring Manufacturers Association, Inc.; www.maplefloor.org.
128. MFMA - Metal Framing Manufacturers Association, Inc.; www.metalframingmfg.org.
129. MHI - Material Handling Industry of America; www.mhia.org.
130. MIA - Marble Institute of America; (See NSI).
131. MMPA - Moulding & Millwork Producers Association; www.wmmpa.com.
132. MPI - Master Painters Institute; www.paintinfo.com.
133. MSS - Manufacturers Standardization Society of The Valve and Fittings Industry Inc.; www.mss-hq.org.
134. NAAMM - National Association of Architectural Metal Manufacturers; www.naamm.org.
135. NACE - NACE International; (National Association of Corrosion Engineers International); www.nace.org.
136. NADCA - National Air Duct Cleaners Association; www.nadca.com.

137. NAIMA - North American Insulation Manufacturers Association; www.naima.org.
138. NALP - National Association of Landscape Professionals; www.landscapeprofessionals.org.
139. NBGQA - National Building Granite Quarries Association, Inc.; www.nbgqa.com.
140. NBI - New Buildings Institute; www.newbuildings.org.
141. NCAA - National Collegiate Athletic Association (The); www.ncaa.org.
142. NCMA - National Concrete Masonry Association; www.ncma.org.
143. NEBB - National Environmental Balancing Bureau; www.nebb.org.
144. NECA - National Electrical Contractors Association; www.necanet.org.
145. NeLMA - Northeastern Lumber Manufacturers Association; www.nelma.org.
146. NEMA - National Electrical Manufacturers Association; www.nema.org.
147. NETA - InterNational Electrical Testing Association; www.netaworld.org.
148. NFHS - National Federation of State High School Associations; www.nfhs.org.
149. NFPA - National Fire Protection Association; www.nfpa.org.
150. NFPA - NFPA International; (See NFPA).
151. NFRC - National Fenestration Rating Council; www.nfrc.org.
152. NGA - National Glass Association (The); (Formerly: Glass Association of North America); www.glass.org.
153. NHLA - National Hardwood Lumber Association; www.nhla.com.
154. NLGA - National Lumber Grades Authority; www.nlga.org.
155. NOFMA - National Oak Flooring Manufacturers Association; (See NWFA).
156. NOMMA - National Ornamental & Miscellaneous Metals Association; www.nomma.org.
157. NRCA - National Roofing Contractors Association; www.nrca.net.
158. NRMCA - National Ready Mixed Concrete Association; www.nrmca.org.
159. NSF - NSF International; www.nsf.org.
160. NSI - National Stone Institute; (Formerly: Marble Institute of America); www.naturalstoneinstitute.org.
161. NSPE - National Society of Professional Engineers; www.nspe.org.
162. NSSGA - National Stone, Sand & Gravel Association; www.nssga.org.
163. NTMA - National Terrazzo & Mosaic Association, Inc. (The); www.ntma.com.
164. NWFA - National Wood Flooring Association; www.nwfa.org.
165. NWRA - National Waste & Recycling Association; www.wasterecycling.org
166. PCI - Precast/Prestressed Concrete Institute; www.pci.org.
167. PDI - Plumbing & Drainage Institute; www.pdionline.org.
168. PLASA - PLASA; (Formerly: ESTA - Entertainment Services and Technology Association); www.plasa.org.
169. RCSC - Research Council on Structural Connections; www.boltcouncil.org.
170. RFCI - Resilient Floor Covering Institute; www.rfci.com.
171. RIS - Redwood Inspection Service; www.redwoodinspection.com.
172. SAE - SAE International; www.sae.org.
173. SCTE - Society of Cable Telecommunications Engineers; www.scte.org.
174. SDI - Steel Deck Institute; www.sdi.org.
175. SDI - Steel Door Institute; www.steeldoor.org.
176. SEFA - Scientific Equipment and Furniture Association (The); www.sefalabs.com.
177. SEI/ASCE - Structural Engineering Institute/American Society of Civil Engineers; (See ASCE).
178. SIA - Security Industry Association; www.siaonline.org.
179. SJI - Steel Joist Institute; www.steeljoist.org.
180. SMA - Screen Manufacturers Association; www.smainfo.org.
181. SMACNA - Sheet Metal and Air Conditioning Contractors' National Association; www.smacna.org.
182. SMPTE - Society of Motion Picture and Television Engineers; www.smpte.org.
183. SPFA - Spray Polyurethane Foam Alliance; www.sprayfoam.org.
184. SPIB - Southern Pine Inspection Bureau; www.spib.org.
185. SPRI - Single Ply Roofing Industry; www.spri.org.
186. SRCC - Solar Rating & Certification Corporation; www.solar-rating.org.

187. SSINA - Specialty Steel Industry of North America; www.ssina.com.
188. SSPC - SSPC: The Society for Protective Coatings; www.sspc.org.
189. STI - Steel Tank Institute; www.steeltank.com.
190. SWI - Steel Window Institute; www.steelwindows.com.
191. SWPA - Submersible Wastewater Pump Association; www.swpa.org.
192. TCA - Tilt-Up Concrete Association; www.tilt-up.org.
193. TCNA - Tile Council of North America, Inc.; www.tileusa.com.
194. TEMA - Tubular Exchanger Manufacturers Association, Inc.; www.tema.org.
195. TIA - Telecommunications Industry Association (The); (Formerly: TIA/EIA - Telecommunications Industry Association/Electronic Industries Alliance); www.tiaonline.org.
196. TIA/EIA - Telecommunications Industry Association/Electronic Industries Alliance; (See TIA).
197. TMS - The Masonry Society; www.masonrysociety.org.
198. TPI - Truss Plate Institute; www.tpinst.org.
199. TPI - Turfgrass Producers International; www.turfgrasssod.org.
200. TRI - Tile Roofing Institute; www.tileroofing.org.
201. UL - Underwriters Laboratories Inc.; www.ul.com.
202. UNI - Uni-Bell PVC Pipe Association; www.uni-bell.org.
203. USAV - USA Volleyball; www.usavolleyball.org.
204. USGBC - U.S. Green Building Council; www.usgbc.org.
205. USITT - United States Institute for Theatre Technology, Inc.; www.usitt.org.
206. WA - Wallcoverings Association; www.wallcoverings.org.
207. WCLIB - West Coast Lumber Inspection Bureau; www.wclib.org.
208. WCMA - Window Covering Manufacturers Association; www.wcmanet.org.
209. WDMA - Window & Door Manufacturers Association; www.wdma.com.
210. WI - Woodwork Institute; www.wicnet.org.
211. WSRCA - Western States Roofing Contractors Association; www.wsrca.com.
212. WWPA - Western Wood Products Association; http://www.wwpa.org.

B. Code Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. This information is believed to be accurate as of the date of the Contract Documents.

1. IAPMO - International Association of Plumbing and Mechanical Officials; www.iapmo.org.
2. ICC - International Code Council; www.iccsafe.org.
3. ICC-ES - ICC Evaluation Service, LLC; www.icc-es.org.

C. Federal Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Information is subject to change and is up to date as of the date of the Contract Documents.

1. COE - Army Corps of Engineers; www.usace.army.mil.
2. CPSC - Consumer Product Safety Commission; www.cpsc.gov.
3. DOC - Department of Commerce; National Institute of Standards and Technology; www.nist.gov.
4. DOD - Department of Defense; www.quicksearch.dla.mil.
5. DOE - Department of Energy; www.energy.gov.
6. EPA - Environmental Protection Agency; www.epa.gov.
7. FAA - Federal Aviation Administration; www.faa.gov.
8. FG - Federal Government Publications; www.gpo.gov/fdsys.
9. GSA - General Services Administration; www.gsa.gov.
10. HUD - Department of Housing and Urban Development; www.hud.gov.
11. LBL - Lawrence Berkeley National Laboratory; Environmental Energy Technologies Division; www.eetd.lbl.gov.

12. OSHA - Occupational Safety & Health Administration; www.osha.gov.
13. SD - Department of State; www.state.gov.
14. TRB - Transportation Research Board; National Cooperative Highway Research Program; The National Academies; www.trb.org.
15. USDA - Department of Agriculture; Agriculture Research Service; U.S. Salinity Laboratory; www.ars.usda.gov.
16. USDA - Department of Agriculture; Rural Utilities Service; www.usda.gov.
17. USDOJ - Department of Justice; Office of Justice Programs; National Institute of Justice; www.ojp.usdoj.gov.
18. USP - U.S. Pharmacopeial Convention; www.usp.org.
19. USPS - United States Postal Service; www.usps.com.

D. Standards and Regulations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the standards and regulations in the following list. This information is subject to change and is believed to be accurate as of the date of the Contract Documents.

1. CFR - Code of Federal Regulations; Available from Government Printing Office; www.govinfo.gov.
2. DOD - Department of Defense; Military Specifications and Standards; Available from DLA Document Services; www.quicksearch.dla.mil.
3. DSCC - Defense Supply Center Columbus; (See FS).
4. FED-STD - Federal Standard; (See FS).
5. FS - Federal Specification; Available from DLA Document Services; www.quicksearch.dla.mil.

    a. Available from Defense Standardization Program; www.dsp.dla.mil.
    b. Available from General Services Administration; www.gsa.gov.
    c. Available from National Institute of Building Sciences/Whole Building Design Guide; www.wbdg.org.

6. MILSPEC - Military Specification and Standards; (See DOD).
7. USAB - United States Access Board; www.access-board.gov.
8. USATBCB - U.S. Architectural & Transportation Barriers Compliance Board; (See USAB).

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 014200

SECTION 015000 - TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes requirements for temporary support, security, and protection facilities.

B. Related Requirements:

1. Section 011000 "Summary of Work" for work restrictions and limitations on utility interruptions.

1.3 USE CHARGES

A. General: Installation and removal of and use charges for temporary facilities shall be included in the Contract Sum unless otherwise indicated. Allow other entities to use temporary services and facilities without cost, including, but not limited to, Architect, testing agencies, and authorities having jurisdiction.

B. Water and Sewer Service from Existing System: Water from Owner's existing water system is available for use without metering and without payment of use charges. Provide connections and extensions of services as required for construction operations.

C. Electric Power Service from Existing System: Electric power from Owner's existing system is available for use without metering and without payment of use charges. Provide connections and extensions of services as required for construction operations.

1.4 INFORMATIONAL SUBMITTALS

A. Site Plan: Show temporary facilities, utility hookups, staging areas, and parking areas for construction personnel.

B. Project Identification and Temporary Signs: Show fabrication and installation details, including plans, elevations, details, layouts, typestyles, graphic elements, and message content.

1.5 QUALITY ASSURANCE

A. Electric Service: Comply with NECA, NEMA, and UL standards and regulations for temporary electric service. Install service to comply with NFPA 70.

PART 2 - PRODUCTS

2.1 TEMPORARY FACILITIES

A. Field Offices:

1. Prefabricated or mobile units with serviceable finishes, temperature controls, and foundations adequate for normal loading, if required by Contractor. Unit must be large enough for regular job meetings, plan review areas, submittal storage and other job file and administrative functions.

    a. If provided, Contractor will be responsible for its complete installation. Coordinate location with Owner.
    b. No building space will be provided by the Owner for the Contractor's field office.

B. Storage and Fabrication Sheds: Provide sheds sized, furnished, and equipped to accommodate materials and equipment for construction operations.

1. Sheds to be metal box storage units or have wood floors raised above the ground.

    a. Store combustible materials apart from building.

2.2 EQUIPMENT

A. Fire Extinguishers: Portable, UL rated; with class and extinguishing agent as required by locations and classes of fire exposures.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Locate facilities where they will serve Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required by progress of the Work.

B. Provide each facility ready for use when needed to avoid delay. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

3.2 TEMPORARY UTILITY INSTALLATION

A. General: Install temporary service or connect to existing service.

1. Arrange with utility company, Owner, and existing users for time when service can be interrupted, if necessary, to make connections for temporary services.

B. Water Service: Connect to Owner's existing water service facilities. Clean and maintain water service facilities in a condition acceptable to Owner. At Substantial Completion, restore these facilities to condition existing before initial use.

C. Sanitary Facilities: Provide temporary toilets, wash facilities, and drinking water for use of construction personnel. Comply with requirements of authorities having jurisdiction for type, number, location, operation, and maintenance of fixtures and facilities.

D. Electric Power Service: Connect to Owner's existing electric power service. Maintain equipment in a condition acceptable to Owner.

E. Electronic Communication Service: Regardless of availability of Owner's service, the Contractor shall maintain at his expense secure and reliable WiFi wireless connection to internet with provisions for access by Architect, the Owner's staff, Municipal Officials or Inspectors, and all subcontractors.

3.3 SUPPORT FACILITIES INSTALLATION

A. General: Comply with the following:

1. Provide construction for temporary sheds located within construction area or within 30 feet of building lines that is noncombustible according to ASTM E 136. Comply with NFPA 241.
2. Maintain support facilities until Architect schedules Substantial Completion inspection. Remove before Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to Owner.

B. Traffic Controls: Comply with requirements of authorities having jurisdiction.

1. Protect existing site improvements to remain including curbs, pavement, and utilities.
2. Maintain access for fire-fighting equipment and access to fire hydrants.

C. Parking: Provide temporary parking areas for construction personnel. Coordinate with Owner.

D. Project Signs: Provide Project signs as indicated and required by Owner. Unauthorized signs are not permitted.

1. Identification Signs: Provide Project identification signs.
2. Temporary Signs: Provide other signs as indicated and as required to inform public and individuals seeking entrance to Project.

a. Provide temporary, directional signs for construction personnel and visitors.

3. Maintain and touch up signs so they are legible at all times.

E. Waste Disposal Facilities: Provide waste-collection containers in sizes adequate to handle waste from construction operations. Comply with requirements of authorities having jurisdiction. Comply with progress cleaning requirements in Section 017300 "Execution."

3.4 SECURITY AND PROTECTION FACILITIES INSTALLATION

A. Protection of Existing Facilities: Protect existing vegetation, equipment, structures, utilities, and other improvements at Project site and on adjacent properties, except those indicated to be removed or altered. Repair damage to existing facilities.

1. The Contractor shall locate and mark the exact locations of the utilities or services and adequately protect them from damage during the work. In the event that any are accidentally disturbed, the Contractor shall repair or replace such damage immediately and restore service as promptly as possible.

B. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction as required to comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects.

C. Barricades, Warning Signs, and Lights: Comply with requirements of authorities having jurisdiction for erecting structurally adequate barricades, including warning signs and lighting.

D. Temporary Enclosures: Provide temporary enclosures for protection of construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities. Provide temporary weathertight enclosure for building exterior.

3.5 OPERATION, TERMINATION, AND REMOVAL

A. Temporary Facility Changeover: Do not change over from using temporary security and protection facilities to permanent facilities until Substantial Completion.

B. Termination and Removal: Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.

1. Materials and facilities that constitute temporary facilities are property of Contractor. Owner reserves right to take possession of Project identification signs.
2. At Substantial Completion, repair, renovate, and clean permanent facilities used during construction period. Comply with final cleaning requirements specified in Section 017700 "Closeout Procedures."

END OF SECTION 015000

SECTION 016000 - PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; and comparable products.

B. Related Sections:

1. Section 012500 "Substitution Procedures" for requests for substitutions.
2. Section 014200 "References" for applicable industry standards for products specified.

1.3 DEFINITIONS

A. Products: Items obtained for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.

1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation shown or listed in manufacturer's published product literature, that is current as of date of the Contract Documents.
2. New Products: Items that have not previously been incorporated into another project or facility. Products salvaged or recycled from other projects are not considered new products.
3. Comparable Product: Product that is demonstrated and approved through submittal process to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.

B. Basis-of-Design Product Specification: A specification in which a specific manufacturer's product is named and accompanied by the words "basis-of-design product," including make or model number or other designation, to establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products of additional manufacturers named in the specification.

1.4 ACTION SUBMITTALS

A. Comparable Product Requests: Submit request for consideration of each comparable product. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.

1. Include data to indicate compliance with the requirements specified in "Comparable Products" Article.

2. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within one (1) week of receipt of a comparable product request. Architect will notify Contractor of approval or rejection of proposed comparable product request within fifteen (15) days of receipt of request, or seven (7) days of receipt of additional information or documentation, whichever is later.

    a. Form of Approval: As specified in Section 013300 "Submittal Procedures."
    b. Use product specified if Architect does not issue a decision on use of a comparable product request within time allocated.

B. Basis-of-Design Product Specification Submittal: Comply with requirements in Section 013300 "Submittal Procedures." Show compliance with requirements.

1.5 QUALITY ASSURANCE

A. Compatibility of Options: If Contractor is given option of selecting between two (2) or more products for use on Project, select product compatible with products previously selected, even if previously selected products were also options.

1. Each contractor is responsible for providing products and construction methods compatible with products and construction methods of other contractors.
2. If a dispute arises between contractors over concurrently selectable but incompatible products, Architect will determine which products shall be used.

1.6 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft and vandalism. Comply with manufacturer's written instructions.

B. Delivery and Handling:

1. Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.
2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
3. Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
4. Inspect products on delivery to determine compliance with the Contract Documents and to determine that products are undamaged and properly protected.

C. Storage:

1. Store products to allow for inspection and measurement of quantity or counting of units.
2. Store materials in a manner that will not endanger Project structure.
3. Store products that are subject to damage by the elements, under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation.
4. Store foam plastic from exposure to sunlight, except to extent necessary for period of installation and concealment.
5. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
6. Protect stored products from damage and liquids from freezing.

1.7 PRODUCT WARRANTIES

A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.

1. Manufacturer's Warranty: Written warranty furnished by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.
2. Special Warranty: Written warranty required by the Contract Documents to provide specific rights for Owner.

B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution.

1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.
2. Specified Form: When specified forms are included with the Specifications, prepare a written document using indicated form properly executed.
3. Refer to Divisions 02 through 49. Sections for specific content requirements and particular requirements for submitting special warranties.

PART 2 - PRODUCTS

2.1 PRODUCT SELECTION PROCEDURES

A. General Product Requirements: Provide products that comply with the Contract Documents, are undamaged and, unless otherwise indicated, are new at time of installation.

1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
3. Owner reserves the right to limit selection to products with warranties not in conflict with requirements of the Contract Documents.
4. Where products are accompanied by the term "as selected," Architect will make selection.
5. Descriptive, performance, and reference standard requirements in the Specifications establish salient characteristics of products.
6. Or Equal: For products specified by name and accompanied by the term "or equal," or "or approved equal," or "or approved," comply with requirements in "Comparable Products" Article to obtain approval for use of an unnamed product.

B. Product Selection Procedures:

1. Product: Where Specifications name a single manufacturer and product, provide the named product that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.
2. Manufacturer/Source: Where Specifications name a single manufacturer or source, provide a product by the named manufacturer or source that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.
3. Products:

a. Restricted List: Where Specifications include a list of names of both manufacturers and products, provide one (1) of the products listed that complies with requirements. Comparable products or substitutions for Contractor's convenience will be considered, unless otherwise indicated.
b. Non-Restricted List: Where Specifications include a list of names of both available manufacturers and products, provide one (1) of the products listed, or an unnamed product, that complies with requirements. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product.

4. Manufacturers:

a. Restricted List: Where Specifications include a list of manufacturers' names, provide a product by one (1) of the manufacturers listed that complies with requirements. Comparable products or substitutions for Contractor's convenience will be considered, unless otherwise indicated.
b. Non-Restricted List: Where Specifications include a list of available manufacturers, provide a product by one (1) of the manufacturers listed, or a product by an unnamed manufacturer, that complies with requirements. Comply with requirements in "Comparable Products" Article for consideration of an unnamed manufacturer's product.

5. Basis-of-Design Product: Where Specifications name a product, or refer to a product indicated on Drawings, and include a list of manufacturers, provide the specified or indicated product or a comparable product by one (1) of the other named manufacturers. Drawings and Specifications indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product by one (1) of the other named manufacturers.

C. Visual Matching Specification: Where Specifications require "match Architect's sample", provide a product that complies with requirements and matches Architect's sample. Architect's decision will be final on whether a proposed product matches.

1. If no product available within specified category matches and complies with other specified requirements, comply with requirements in Section 012500 "Substitution Procedures" for proposal of product.

D. Visual Selection Specification: Where Specifications include the phrase "as selected by Architect from manufacturer's full range" or similar phrase, select a product that complies with requirements. Architect will select color, gloss, pattern, density, or texture from manufacturer's product line that includes both standard and premium items.

2.2 COMPARABLE PRODUCTS

A. Conditions for Consideration: Architect will consider Contractor's request for comparable product when the following conditions are satisfied. If the following conditions are not satisfied, Architect may return requests without action, except to record noncompliance with these requirements:

1. Evidence that the proposed product does not require revisions to the Contract Documents, that it is consistent with the Contract Documents and will produce the indicated results, and that it is compatible with other portions of the Work.
2. Detailed, SIDE-BY-SIDE comparison of significant qualities of proposed product with those named in the Specifications. Significant qualities include attributes such as

performance, weight, size, durability, visual effect, and specific features and requirements indicated.

3. Evidence that proposed product provides specified warranty.
4. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners, if requested.
5. Samples, if requested.

PART 3 - EXECUTION (Not Used)

END OF SECTION 016000

SECTION 017300 - EXECUTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes general administrative and procedural requirements governing execution of the Work including, but not limited to, the following:

1. Installation of the Work.
2. Cutting and patching.
3. Progress cleaning.
4. Starting and adjusting.
5. Protection of installed construction.
6. Correction of the Work.

B. Related Sections:

1. Section 013300 "Submittal Procedures" for submitting surveys.
2. Section 017700 "Closeout Procedures" for submitting final property survey with Project Record Documents, recording of Owner-accepted deviations from indicated lines and levels, and final cleaning.

1.3 DEFINITIONS

A. Cutting: Removal of in-place construction necessary to permit installation or performance of other work.

B. Patching: Fitting and repair work required to restore construction to original conditions after installation of other work.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For land surveyor licensed in the State of Connecticut.

B. Certificates: Submit certificate signed by land surveyor certifying that location and elevation of improvements comply with requirements.

C. Landfill Receipts: Submit copy of receipts issued by a landfill facility, licensed to accept hazardous materials, for hazardous waste disposal.

1.5 QUALITY ASSURANCE

A. Cutting and Patching: Comply with requirements for and limitations on cutting and patching of construction elements.

1. Structural Elements: When cutting and patching structural elements, notify Architect of locations and details of cutting and await directions from the Architect before proceeding.

Shore, brace, and support structural element during cutting and patching. Do not cut and patch structural elements in a manner that could change their load-carrying capacity or increase deflection.

2. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety.
3. Other Construction Elements: Do not cut and patch other construction elements or components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety.
4. Visual Elements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch exposed construction in a manner that would, in Architect's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.

B. Manufacturer's Installation Instructions: Obtain and maintain on-site manufacturer's written recommendations and instructions for installation of products and equipment.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: Comply with requirements specified in other Sections.

B. In-Place Materials: Use materials for patching identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.

1. If identical materials are unavailable or cannot be used, use materials that, when installed, will provide a match acceptable to the Architect for the visual and functional performance of in-place materials.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Existing Conditions: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify the existence and location of underground utilities, mechanical and electrical systems, and other construction affecting the Work.

1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, water-service piping, underground electrical services, and other utilities.
2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.

B. Examination and Acceptance of Conditions: Before proceeding with each component of the Work, examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.

1. Written Report: Where a written report listing conditions detrimental to performance of the Work is required by other Sections, include the following:

    a. Description of the Work.
    b. List of detrimental conditions, including substrates.
    c. List of unacceptable installation tolerances.
    d. Recommended corrections.

2. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
3. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
4. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
5. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Existing Utility Information: Furnish information to local utility that is necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by construction. Coordinate with authorities having jurisdiction.

B. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

C. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.

D. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents caused by differing field conditions outside the control of the Contractor, submit a request for information to Architect according to requirements in Section 013100 "Project Management and Coordination."

3.3 INSTALLATION

A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.

1. Make vertical work plumb and make horizontal work level.
2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
3. Conceal pipes, ducts, and wiring in finished areas, unless otherwise indicated.
4. Maintain minimum headroom clearance of 96 inches in occupied spaces and 90 inches in unoccupied spaces.

B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.

C. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.

D. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.

E. Tools and Equipment: Do not use tools or equipment that produce harmful noise levels.

F. Templates: Obtain and distribute to the parties involved templates for work specified to be factory prepared and field installed. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.

G. Attachment: Provide blocking and attachment plates and anchors and fasteners of adequate size and number to securely anchor each component in place, accurately located and aligned with other portions of the Work. Where size and type of attachments are not indicated, verify size and type required for load conditions.

1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.
2. Allow for building movement, including thermal expansion and contraction.
3. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

H. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.

I. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

3.4 CUTTING AND PATCHING

A. Cutting and Patching, General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.

1. Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.

B. Temporary Support: Provide temporary support of work to be cut.

C. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.

D. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.

1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots neatly to minimum size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
3. Concrete and Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.

4. Excavating and Backfilling: Comply with requirements in applicable Division 31 Sections where required by cutting and patching operations.
5. Proceed with patching after construction operations requiring cutting are complete.

E. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other work. Patch with durable seams that are as invisible as practicable. Provide materials and comply with installation requirements specified in other Sections, where applicable.

1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate physical integrity of installation.
2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will minimize evidence of patching and refinishing.

    a. Clean piping, conduit, and similar features before applying paint or other finishing materials.
    b. Restore damaged pipe covering to its original condition.

3. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition.

F. Cleaning: Clean areas and spaces where cutting and patching are performed. Remove paint, mortar, oils, putty, and similar materials from adjacent finished surfaces.

3.5 PROGRESS CLEANING

A. General: Clean Project site and work areas daily at the end of each workday, including common areas. Empty or remove dumpsters at the end of each work week. Enforce requirements strictly. Dispose of materials lawfully.

1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
2. Do not hold waste materials more than seven (7) days during normal weather or three (3) days if the temperature is expected to rise above 80 deg F (27 deg C).
3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.

    a. Utilize containers intended for holding waste materials of type to be stored.

4. Coordinate progress cleaning for joint-use areas where more than one installer has worked.

B. Site: Maintain Project site free of waste materials and debris.

C. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.

1. Remove liquid spills promptly.
2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.

D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning

materials that are not hazardous to health or property and that will not damage exposed surfaces.

E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.

F. Exposed Surfaces in Finished Areas: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.

G. Waste Disposal: Do not bury or burn waste materials on-site. Do not wash waste materials down sewers or into waterways. Comply with waste disposal requirements in Section 015000 "Temporary Facilities and Controls."

H. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.

I. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.

J. Limiting Exposures: Supervise construction operations to assure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

3.6 STARTING AND ADJUSTING

A. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.

B. Adjust equipment for proper operation. Adjust operating components for proper operation without binding.

C. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

D. Manufacturer's Field Service: Comply with qualification requirements in Section 014000 "Quality Requirements."

3.7 PROTECTION OF INSTALLED CONSTRUCTION

A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.

B. Comply with manufacturer's written instructions for temperature and relative humidity.

3.8 CORRECTION OF THE WORK

A. Repair or remove and replace defective construction. Restore damaged substrates and finishes.

1. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment.

B. Restore permanent facilities used during construction to their specified condition.

C. Remove and replace damaged surfaces that are exposed to view if surfaces cannot be repaired without visible evidence of repair.

D. Repair components that do not operate properly. Remove and replace operating components that cannot be repaired.

E. Remove and replace chipped, scratched, and broken glass or reflective surfaces.

END OF SECTION 017300

SECTION 017419 - CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for the following:

1. Salvaging nonhazardous construction waste.
2. Recycling nonhazardous construction waste.
3. Disposing of nonhazardous construction waste.

B. Construction Waste: Building and site improvement materials and other solid waste resulting from construction, remodeling, renovation, or repair operations. Construction waste includes packaging.

C. Disposal: Removal off-site of demolition and construction waste and subsequent sale, recycling, reuse, or deposit in landfill or incinerator acceptable to authorities having jurisdiction.

D. Recycle: Recovery of demolition or construction waste for subsequent processing in preparation for reuse.

E. Salvage: Recovery of construction waste and subsequent sale or reuse in another facility.

F. Salvage and Reuse: Recovery of construction waste and subsequent incorporation into the Work.

1.3 PERFORMANCE REQUIREMENTS

A. General: Achieve end-of-Project rates for salvage/recycling of seventy-five percent (75%) by weight of total non-hazardous solid waste generated by the Work. Practice efficient waste management in the use of materials in the course of the Work. Use all reasonable means to divert construction and demolition waste from landfills and incinerators. Facilitate recycling and salvage of materials, including the following:

1. Construction Waste:

a. Lumber.
b. Wood sheet materials.
c. Wood trim.
d. Metals.
e. Electrical conduit.
f. Packaging: Regardless of salvage/recycle goal indicated in paragraph above, salvage or recycle one hundred percent (100%) of the following uncontaminated packaging materials:

1) Paper.
2) Cardboard.

3) Boxes.
4) Plastic sheet and film.
5) Polystyrene packaging.
6) Wood crates.
7) Plastic pails.

1.4 ACTION SUBMITTALS

A. Waste Management Plan: Submit plan within seven (7) days of date established for the Notice to Proceed.

1.5 INFORMATIONAL SUBMITTALS

A. Waste Reduction Progress Reports: Concurrent with each Application for Payment, submit report. Use Form CWM-7 for construction waste. Include the following information:

1. Material category.
2. Generation point of waste.
3. Total quantity of waste in tons.
4. Quantity of waste salvaged, both estimated and actual in tons.
5. Quantity of waste recycled, both estimated and actual in tons.
6. Total quantity of waste recovered (salvaged plus recycled) in tons.
7. Total quantity of waste recovered (salvaged plus recycled) as a percentage of total waste.

B. Waste Reduction Calculations: Before request for Substantial Completion, submit calculated end-of-Project rates for salvage, recycling, and disposal as a percentage of total waste generated by the Work.

C. Records of Donations: Indicate receipt and acceptance of salvageable waste donated to individuals and organizations. Indicate whether organization is tax exempt.

D. Records of Sales: Indicate receipt and acceptance of salvageable waste sold to individuals and organizations. Indicate whether organization is tax exempt.

E. Recycling and Processing Facility Records: Indicate receipt and acceptance of recyclable waste by recycling and processing facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.

F. Landfill and Incinerator Disposal Records: Indicate receipt and acceptance of waste by landfills and incinerator facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.

G. HPBS Submittal: HPBS letter, signed by Contractor, tabulating total waste material, quantities diverted and means by which it is diverted, and statement that requirements for the credit have been met.

H. Qualification Data: For waste management coordinator.

1.6 QUALITY ASSURANCE

A. Waste Management Coordinator Qualifications: Experienced firm, with a record of successful waste management coordination of Projects with similar requirements, certified by USGBC, as waste management coordinator.

B. Regulatory Requirements: Comply with hauling and disposal regulations of authorities having jurisdiction.

C. Waste Management Conference: Conduct conference at Project site to comply with requirements in Section 013100 "Project Management and Coordination." Review methods and procedures related to waste management including, but not limited to, the following:

1. Review and discuss waste management plan including responsibilities of waste management coordinator.
2. Review requirements for documenting quantities of each type of waste and its disposition.
3. Review and finalize procedures for materials separation and verify availability of containers and bins needed to avoid delays.
4. Review procedures for periodic waste collection and transportation to recycling and disposal facilities.
5. Review waste management requirements for each trade.

1.7 WASTE MANAGEMENT PLAN

A. General: Develop a waste management plan according to ASTM E 1609 and requirements of this Section. Plan shall consist of waste identification, waste reduction work plan, and cost/revenue analysis. Indicate quantities by weight or volume but use same units of measure throughout waste management plan.

B. Waste Identification: Indicate anticipated types and quantities of site-clearing and construction waste generated by the Work. Use Form CWM-1 for construction waste. Include estimated quantities and assumptions for estimates.

C. Waste Reduction Work Plan: List each type of waste and whether it will be salvaged, recycled, or disposed of in landfill or incinerator. Use Form CWM-3 for construction waste. Include points of waste generation, total quantity of each type of waste, quantity for each means of recovery, and handling and transportation procedures.

1. Salvaged Materials for Reuse: For materials that will be salvaged and reused in this Project, describe methods for preparing salvaged materials before incorporation into the Work.
2. Salvaged Materials for Sale: For materials that will be sold to individuals and organizations, include list of their names, addresses, and telephone numbers.
3. Salvaged Materials for Donation: For materials that will be donated to individuals and organizations, include list of their names, addresses, and telephone numbers.
4. Recycled Materials: Include list of local receivers and processors and type of recycled materials each will accept. Include names, addresses, and telephone numbers.
5. Disposed Materials: Indicate how and where materials will be disposed of. Include name, address, and telephone number of each landfill and incinerator facility.
6. Handling and Transportation Procedures: Include method that will be used for separating recyclable waste including sizes of containers, container labeling, and designated location on Project site where materials separation will be located.

D. Cost/Revenue Analysis: Indicate total cost of waste disposal as if there was no waste management plan and net additional cost or net savings resulting from implementing waste management plan. Use Form CWM-5 for construction waste. Include the following:

1. Total quantity of waste.
2. Estimated cost of disposal (cost per unit). Include hauling and tipping fees and cost of collection containers for each type of waste.

3. Total cost of disposal (with no waste management).
4. Revenue from salvaged materials.
5. Revenue from recycled materials.
6. Savings in hauling and tipping fees by donating materials.
7. Savings in hauling and tipping fees that are avoided.
8. Handling and transportation costs. Include cost of collection containers for each type of waste.
9. Net additional cost or net savings from waste management plan.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 PLAN IMPLEMENTATION

A. General: Implement approved waste management plan. Provide handling, containers, storage, signage, transportation, and other items as required to implement waste management plan during the entire duration of the Contract.

B. Waste Management Coordinator: Engage a waste management coordinator to be responsible for implementing, monitoring, and reporting status of waste management work plan. Coordinator shall be present at Project site full time for duration of Project.

C. Training: Train workers, subcontractors, and suppliers on proper waste management procedures, as appropriate for the Work occurring at Project site.

1. Distribute waste management plan to everyone concerned within three (3) days of submittal return.
2. Distribute waste management plan to entities when they first begin work on-site. Review plan procedures and locations established for salvage, recycling, and disposal.

D. Site Access and Temporary Controls: Conduct waste management operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.

1. Designate and label specific areas on Project site necessary for separating materials that are to be salvaged, recycled, reused, donated, and sold.

3.2 RECYCLING CONSTRUCTION WASTE, GENERAL

A. General: Recycle paper and beverage containers used by on-site workers.

B. Recycling Receivers and Processors: List below is provided for information only; available recycling receivers and processors include, but are not limited to, the following:

1. Babylon Recycling Center, LLC, 1221 Harvey Lane, Suffield, CT (860.746.3200)
2. Calamari Recycling Company, Inc., 20 Town Dump Road, Essex, CT (860.767.2267)
3. Central Recycling & Transfer, 22 Burton Drive, Cheshire, CT (203.272.1992)
4. Connecticut Waste Processing Materials, LLC 475 Christian Lane, Berlin, CT (860.229.5368)
5. Connecticut Waste Transfer, LLC, 46 Oliver Terrace, Shelton, CT (203.929.5488)
6. Dainty Rubbish Services, Inc., 80-90 Industrial Park Road, Middletown, CT (860.632.0666)

7. Murphy Road Recycling, LLC, 19 Wheeler Street, New Haven, CT (860.746.3200)
8. Shoham Road Transfer Center, LLC, 9-11 Shoham Road, East Windsor, CT (860.746.3200)
9. USA Hauling & Recycling, Inc., 15 Mullen Road, Enfield, CT (860.746.3200)
10. Waste Conversion Technology, Inc, 221 Old Gate Road, Milford, CT (203.882.5353)

C. Recycling Incentives: Revenues, savings, rebates, tax credits, and other incentives received for recycling waste materials shall accrue to Owner.

D. Preparation of Waste: Prepare and maintain recyclable waste materials according to recycling or reuse facility requirements. Maintain materials free of dirt, adhesives, solvents, petroleum contamination, and other substances deleterious to the recycling process.

E. Procedures: Separate recyclable waste from other waste materials, trash, and debris. Separate recyclable waste by type at Project site to the maximum extent practical according to approved construction waste management plan.

1. Provide appropriately marked containers or bins for controlling recyclable waste until they are removed from Project site. Include list of acceptable and unacceptable materials at each container and bin.

    a. Inspect containers and bins for contamination and remove contaminated materials if found.

2. Stockpile processed materials on-site without intermixing with other materials. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
3. Stockpile materials away from construction area. Do not store within drip line of remaining trees.
4. Store components off the ground and protect from the weather.
5. Remove recyclable waste off Owner's property and transport to recycling receiver or processor.

3.3 RECYCLING CONSTRUCTION WASTE

A. Packaging:

1. Cardboard and Boxes: Break down packaging into flat sheets. Bundle and store in a dry location.
2. Polystyrene Packaging: Separate and bag materials.
3. Pallets: As much as possible, require deliveries using pallets to remove pallets from Project site. For pallets that remain on-site, break down pallets into component wood pieces and comply with requirements for recycling wood.
4. Crates: Break down crates into component wood pieces and comply with requirements for recycling wood.

B. Wood Materials:

1. Clean Cut-Offs of Lumber: Grind or chip into small pieces.
2. Clean Sawdust: Bag sawdust that does not contain painted or treated wood.

3.4 DISPOSAL OF WASTE

A. General: Except for items or materials to be salvaged, recycled, or otherwise reused, remove waste materials from Project site and legally dispose of them in a landfill or incinerator acceptable to authorities having jurisdiction.

1. Except as otherwise specified, do not allow waste materials that are to be disposed of accumulate on-site.
2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

B. Burning: Do not burn waste materials.

C. Disposal: Transport waste materials off Owner's property and legally dispose of them.

3.5 ATTACHMENTS

A. Form CWM-1 for construction waste identification.

B. Form CWM-3 for construction waste reduction work plan.

C. Form CWM-5 cost/revenue analysis of construction waste reduction work plan.

D. Form CWM-7 for construction waste.

END OF SECTION 017419

FORM CWM-1: CONSTRUCTION WASTE IDENTIFICATION							
MATERIAL CATEGORY	**GENERATION POINT**	**EST. QUANTITY OF MATERIALS RECEIVED* (A)**	**EST. WASTE - % (B)**	**TOTAL EST. QUANTITY OF WASTE* (C = A x B)**	**EST. VOLUME CY**	**EST. WEIGHT TONS**	**REMARKS AND ASSUMPTIONS**
Packaging: Cardboard							
Packaging: Boxes							
Packaging: Plastic Sheet or Film							
Packaging: Polystyrene							
Packaging: Pallets or Skids							
Packaging: Crates							
Packaging: Paint Cans							
Packaging: Plastic Pails							
Site-Clearing Waste							
Masonry or CMU							
Lumber: Cut-Offs							
Lumber: Warped Pieces							
Plywood or OSB (scraps)							
Wood Forms							
Wood Waste Chutes							
Wood Trim (cut-offs)							
Metals							
Insulation							
Roofing							
Joint Sealant Tubes							
Gypsum Board (scraps)							
Carpet and Pad (scraps)							
Piping							
Electrical Conduit							
Other:							

* Insert units of measure.

FORM CWM-3: CONSTRUCTION WASTE REDUCTION WORK PLAN						
MATERIAL CATEGORY	GENERATION POINT	TOTAL EST. QUANTITY OF WASTE TONS	DISPOSAL METHOD AND QUANTITY			HANDLING AND TRANSPORTION PROCEDURES
			EST. AMOUNT SALVAGED TONS	EST. AMOUNT RECYCLED TONS	EST. AMOUNT DISPOSED TO LANDFILL TONS	
Packaging: Cardboard						
Packaging: Boxes						
Packaging: Plastic Sheet or Film						
Packaging: Polystyrene						
Packaging: Pallets or Skids						
Packaging: Crates						
Packaging: Paint Cans						
Packaging: Plastic Pails						
Site-Clearing Waste						
Masonry or CMU						
Lumber: Cut-Offs						
Lumber: Warped Pieces						
Plywood or OSB (scraps)						
Wood Forms						
Wood Waste Chutes						
Wood Trim (cut-offs)						
Metals						
Insulation						
Roofing						
Joint Sealant Tubes						
Gypsum Board (scraps)						
Carpet and Pad (scraps)						
Piping						
Electrical Conduit						
Other:						

FORM CWM-5: COST/REVENUE ANALYSIS OF CONSTRUCTION WASTE REDUCTION WORK PLAN								
MATERIALS	TOTAL QUANTITY OF MATERIALS (VOL. OR WEIGHT) (A)	EST. COST OF DISPOSAL (B)	TOTAL EST. COST OF DISPOSAL (C = A x B)	REVENUE FROM SALVAGED MATERIALS (D)	REVENUE FROM RECYCLED MATERIALS (E)	LANDFILL TIPPING FEES AVOIDED (F)	HANDLING AND TRANSPORTATION COSTS AVOIDED (G)	NET COST SAVINGS OF WORK PLAN (H = D+E+F+G)
Packaging: Cardboard								
Packaging: Boxes								
Packaging: Plastic Sheet or Film								
Packaging: Polystyrene								
Packaging: Pallets or Skids								
Packaging: Crates								
Packaging: Paint Cans								
Packaging: Plastic Pails								
Site-Clearing Waste								
Masonry or CMU								
Lumber: Cut-Offs								
Lumber: Warped Pieces								
Plywood or OSB (scraps)								
Wood Forms								
Wood Waste Chutes								
Wood Trim (cut-offs)								
Metals								
Insulation								
Roofing								
Joint Sealant Tubes								
Gypsum Board (scraps)								
Carpet and Pad (scraps)								
Piping								
Electrical Conduit								
Other:								

FORM CWM-7: CONSTRUCTION WASTE REDUCTION PROGRESS REPORT								
MATERIAL CATEGORY	GENERATION POINT	TOTAL QUANTITY OF WASTE TONS (A)	QUANTITY OF WASTE SALVAGED		QUANTITY OF WASTE RECYCLED		TOTAL QUANTITY OF WASTE RECOVERED TONS (D = B + C)	TOTAL QUANTITY OF WASTE RECOVERED % (D / A x 100)
			ESTIMATED TONS	ACTUAL TONS (B)	ESTIMATED TONS	ACTUAL TONS (C)		
Packaging: Cardboard								
Packaging: Boxes								
Packaging: Plastic Sheet or Film								
Packaging: Polystyrene								
Packaging: Pallets or Skids								
Packaging: Crates								
Packaging: Paint Cans								
Packaging: Plastic Pails								
Site-Clearing Waste								
Masonry or CMU								
Lumber: Cut-Offs								
Lumber: Warped Pieces								
Plywood or OSB (scraps)								
Wood Forms								
Wood Waste Chutes								
Wood Trim (cut-offs)								
Metals								
Insulation								
Roofing								
Joint Sealant Tubes								
Gypsum Board (scraps)								
Carpet and Pad (scraps)								
Piping								
Electrical Conduit								
Other:								

SECTION 017700 - CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:

1. Substantial Completion procedures.
2. Final completion procedures.
3. Warranties.

B. Related Sections:

1. Section 017300 "Execution" for progress cleaning of Project site.
2. Section 017823 "Operation and Maintenance Data" for operation and maintenance manual requirements.
3. Section 017839 "Project Record Documents" for submitting Record Drawings, Record Specifications, and Record Product Data.
4. Section 017900 "Demonstration and Training" for requirements for instructing Owner's personnel.
5. Divisions 02 through 49 Sections for specific closeout and special cleaning requirements for the Work in those Sections.

1.3 SUBSTANTIAL COMPLETION

A. Preliminary Procedures: Before requesting inspection for determining date of Substantial Completion, complete the following. List items below that are incomplete with request.

1. Prepare a list of items to be completed and corrected (punch list), the value of items on the list, and reasons why the Work is not complete.
2. Advise Owner of pending insurance changeover requirements.
3. Submit specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
4. Obtain and submit releases permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
5. Prepare and submit Project Record Documents, operation and maintenance manuals, final completion construction photographic documentation, damage or settlement surveys, property surveys, and similar final record information.
6. Deliver tools, spare parts, extra materials, and similar items to location designated by Owner. Label with manufacturer's name and model number where applicable.
7. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
8. Complete startup testing of systems.
9. Submit test/adjust/balance records.

10. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
11. Advise Owner of changeover in heat and other utilities.
12. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.
13. Complete final cleaning requirements, including touchup painting.
14. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.

B. Inspection: Submit a written request for inspection for Substantial Completion. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Architect, that must be completed or corrected before certificate will be issued.

1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.
2. Results of completed inspection will form the basis of requirements for final completion.

1.4 FINAL COMPLETION

A. Preliminary Procedures: Before requesting final inspection for determining final completion, complete the following:

1. Submit a final Application for Payment according to Section 012900 "Payment Procedures".
2. Submit certified copy of Architect's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Architect. The certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
3. Submit evidence of final, continuing insurance coverage complying with insurance requirements.
4. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems.
5. Secure and provide both temporary and final Certificate of Occupancy from the Building Official, meeting all local and state permit closeout requirements.

B. Inspection: Submit a written request for final inspection for acceptance. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.

1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

1.5 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

A. Organization of List: Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction. Use **CSI Form 14.1A** or comparable form.

1. Organize list of spaces in sequential order, starting with exterior areas first and proceeding from lowest floor to highest floor.

2. Organize items applying to each space by major element, including categories for ceiling, individual walls, floors, equipment, and building systems.
3. Include the following information at the top of each page:

    a. Project name.
    b. Date.
    c. Name of Architect.
    d. Name of Contractor.
    e. Page number.

4. Submit list of incomplete items in the following format:

    a. PDF electronic file. Architect will return annotated file.

1.6 WARRANTIES

A. Submittal Time: Submit written warranties on request of Architect for designated portions of the Work where commencement of warranties other than date of Substantial Completion is indicated.

B. Organize warranty documents into an orderly sequence based on the table of contents of the Project Manual.

1. Bind warranties and bonds in heavy-duty, three-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8½-by-11-inch paper.
2. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number of Installer.
3. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name, and name of Contractor.
4. Scan warranties and bonds and assemble complete warranty and bond submittal package into a single indexed electronic PDF file with links enabling navigation to each item. Provide table of contents at beginning of document.

C. Provide additional copies of each warranty to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

PART 3 - EXECUTION (Not Used)

END OF SECTION 017700

SECTION 017823 - OPERATION AND MAINTENANCE DATA

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for preparing operation and maintenance manuals, including the following:

1. Operation and maintenance documentation directory.
2. Emergency manuals.
3. Systems and equipment operation manuals.
4. Systems and equipment maintenance manuals.
5. Product maintenance manuals.

B. Related Sections:

1. Section 013300 "Submittal Procedures" for submitting copies of submittals for operation and maintenance manuals.
2. Divisions 02 through 49 Sections for specific operation and maintenance manual requirements for the Work in those Sections.

1.3 DEFINITIONS

A. System: An organized collection of parts, equipment, or subsystems united by regular interaction.

B. Subsystem: A portion of a system with characteristics similar to a system.

1.4 CLOSEOUT SUBMITTALS

A. Manual Content: Operations and maintenance manual content is specified in individual specification sections, and as reviewed and approved at the time of Section submittals. Submit reviewed manual content formatted and organized as required by this Section.

1. Architect will comment on whether content of operation and maintenance submittals is acceptable.
2. Where applicable, clarify and update reviewed manual content to correspond to revisions and field conditions.

B. Format: Submit operations and maintenance manuals in the following format:

1. Two (2) thumb drives. Enable review comments on draft submittals.
2. Two (2) paper copies. Include a complete operation and maintenance directory. Enclose title pages and directories in clear plastic sleeves. Architect will return both copies to be given to the Owner.

C. Initial Manual Submittal: Submit draft copy of each manual at least thirty (30) days before commencing demonstration and training. Architect will comment on whether general scope and content of manual are acceptable.

D. Final Manual Submittal: Submit each manual in final form prior to requesting inspection for Substantial Completion and at least fifteen (15) days before commencing demonstration and training. Architect will return copy with comments.

1. Correct or modify each manual to comply with Architect's comments. Submit copies of each corrected manual within fifteen (15) days of receipt of Architect's comments and prior to commencing demonstration and training.

E. Comply with Section 017700 "Closeout Procedures" for schedule for submitting operation and maintenance documentation.

1.5 FORMAT OF OPERATION AND MAINTENANCE MANUALS

A. Manuals, Electronic Files: Submit manuals in the form of a multiple file composite electronic PDF file for each manual type required.

1. Electronic Files: Use electronic files prepared by manufacturer where available. Where scanning of paper documents is required, configure scanned file for minimum readable file size.
2. File Names and Bookmarks: Bookmark individual documents based on file names. Name document files to correspond to system, subsystem, and equipment names used in manual directory and table of contents. Group documents for each system and subsystem into individual composite bookmarked files, then create composite manual, so that resulting bookmarks reflect the system, subsystem, and equipment names in a readily navigated file tree. Configure electronic manual to display bookmark panel on opening file.

B. Manuals, Paper Copy: Submit manuals in the form of hard copy, bound and labeled volumes.

1. Binders: Heavy-duty, three-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, sized to hold 8½-by-11-inch paper; with clear plastic sleeve on spine to hold label describing contents and with pockets inside covers to hold folded oversize sheets.

a. If two (2) or more binders are necessary to accommodate data of a system, organize data in each binder into groupings by subsystem and related components. Cross-reference other binders if necessary to provide essential information for proper operation or maintenance of equipment or system.
b. Identify each binder on front and spine, with printed title "OPERATION AND MAINTENANCE MANUAL," Project title or name, subject matter of contents, and indicate Specification Section number on bottom of spine. Indicate volume number for multiple-volume sets.

2. Dividers: Heavy-paper dividers with plastic-covered tabs for each section of the manual. Mark each tab to indicate contents. Include typed list of products and major components of equipment included in the section on each divider, cross-referenced to Specification Section number and title of Project Manual.
3. Protective Plastic Sleeves: Transparent plastic sleeves designed to enclose diagnostic software storage media for computerized electronic equipment. Enclose title pages and directories in clear plastic sleeves.
4. Supplementary Text: Prepared on 8½-by-11-inch white bond paper.

5. Drawings: Attach reinforced, punched binder tabs on drawings and bind with text.

    a. If oversize drawings are necessary, fold drawings to same size as text pages and use as foldouts.
    b. If drawings are too large to be used as foldouts, fold and place drawings in labeled envelopes and bind envelopes in rear of manual. At appropriate locations in manual, insert typewritten pages indicating drawing titles, descriptions of contents, and drawing locations.

1.6 REQUIREMENTS FOR EMERGENCY, OPERATION, AND MAINTENANCE MANUALS

A. Organization of Manuals: Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual shall contain the following materials, in the order listed:

1. Title page.
2. Table of contents.
3. Manual contents.

B. Title Page: Include the following information:

1. Subject matter included in manual.
2. Name and address of Project.
3. Name and address of Owner.
4. Date of submittal.
5. Name and contact information for Contractor.
6. Name and contact information for Architect.
7. Names and contact information for major consultants to the Architect that designed the systems contained in the manuals.
8. Cross-reference to related systems in other operation and maintenance manuals.

C. Table of Contents: List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number in Project Manual.

1. If operation or maintenance documentation requires more than one (1) volume to accommodate data, include comprehensive table of contents for all volumes in each volume of the set.

D. Manual Contents: Organize into sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment. If possible, assemble instructions for subsystems, equipment, and components of one (1) system into a single binder.

1.7 EMERGENCY MANUALS

A. Emergency Manual: Assemble a complete set of emergency information indicating procedures for use by emergency personnel and by Owner's operating personnel for types of emergencies indicated.

B. Content: Organize manual into a separate section for each of the following:

1. Type of emergency.
2. Emergency instructions.
3. Emergency procedures.

C. Type of Emergency: Where applicable for each type of emergency indicated below, include instructions and procedures for each system, subsystem, piece of equipment, and component:

1. Fire.
2. Flood.
3. Gas leak.
4. Water leak.
5. Power failure.
6. Water outage.
7. System, subsystem, or equipment failure.
8. Chemical release or spill.

D. Emergency Instructions: Describe and explain warnings, trouble indications, error messages, and similar codes and signals. Include responsibilities of Owner's operating personnel for notification of Installer, supplier, and manufacturer to maintain warranties.

E. Emergency Procedures: Include the following, as applicable:

1. Instructions on stopping.
2. Shutdown instructions for each type of emergency.
3. Operating instructions for conditions outside normal operating limits.
4. Required sequences for electric or electronic systems.
5. Special operating instructions and procedures.

1.8 SYSTEMS AND EQUIPMENT OPERATION MANUALS

A. Systems and Equipment Operation Manual: Assemble a complete set of data indicating operation of each system, subsystem, and piece of equipment not part of a system. Include information required for daily operation and management, operating standards, and routine and special operating procedures.

1. Engage a factory-authorized service representative to assemble and prepare information for each system, subsystem, and piece of equipment not part of a system.
2. Prepare a separate manual for each system and subsystem, in the form of an instructional manual for use by Owner's operating personnel.

B. Content: In addition to requirements in this Section, include operation data required in individual Specification Sections and the following information:

1. System, subsystem, and equipment descriptions. Use designations for systems and equipment indicated on Contract Documents.
2. Performance and design criteria if Contractor is delegated design responsibility.
3. Operating standards.
4. Operating procedures.
5. Operating logs.
6. Wiring diagrams.
7. Control diagrams.
8. Piped system diagrams.
9. Precautions against improper use.
10. License requirements including inspection and renewal dates.

C. Descriptions: Include the following:

1. Product name and model number. Use designations for products indicated on Contract Documents.

2. Manufacturer's name.
3. Equipment identification with serial number of each component.
4. Equipment function.
5. Operating characteristics.
6. Limiting conditions.
7. Performance curves.
8. Engineering data and tests.
9. Complete nomenclature and number of replacement parts.

D. Operating Procedures: Include the following, as applicable:

1. Startup procedures.
2. Equipment or system break-in procedures.
3. Routine and normal operating instructions.
4. Regulation and control procedures.
5. Instructions on stopping.
6. Normal shutdown instructions.
7. Seasonal and weekend operating instructions.
8. Required sequences for electric or electronic systems.
9. Special operating instructions and procedures.

E. Systems and Equipment Controls: Describe the sequence of operation, and diagram controls as installed.

F. Piped Systems: Diagram piping as installed, and identify color-coding where required for identification.

1.9 SYSTEMS AND EQUIPMENT MAINTENANCE MANUALS

A. Systems and Equipment Maintenance Manuals: Assemble a complete set of data indicating maintenance of each system, subsystem, and piece of equipment not part of a system. Include manufacturers' maintenance documentation, preventive maintenance procedures and frequency, repair procedures, wiring and systems diagrams, lists of spare parts, and warranty information.

1. Engage a factory-authorized service representative to assemble and prepare information for each system, subsystem, and piece of equipment not part of a system.
2. Prepare a separate manual for each system and subsystem, in the form of an instructional

B. Content: For each system, subsystem, and piece of equipment not part of a system, include source information, manufacturers' maintenance documentation, maintenance procedures, maintenance and service schedules, spare parts list and source information, maintenance service contracts, and warranty and bond information, as described below.

C. Source Information: List each system, subsystem, and piece of equipment included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual and drawing or schedule designation or identifier where applicable.

D. Manufacturers' Maintenance Documentation: Include the following information for each component part or piece of equipment:

1. Standard maintenance instructions and bulletins; include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one (1) item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.

    a. Prepare supplementary text if manufacturers' standard printed data are not available and where the information is necessary for proper operation and maintenance of equipment or systems.

2. Drawings, diagrams, and instructions required for maintenance, including disassembly and component removal, replacement, and assembly.
3. Identification and nomenclature of parts and components.
4. List of items recommended to be stocked as spare parts.

E. Maintenance Procedures: Include the following information and items that detail essential maintenance procedures:

1. Test and inspection instructions.
2. Troubleshooting guide.
3. Precautions against improper maintenance.
4. Disassembly; component removal, repair, and replacement; and reassembly instructions.
5. Aligning, adjusting, and checking instructions.

F. Maintenance and Service Schedules: Include service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine maintenance and service with standard time allotment.

1. Scheduled Maintenance and Service: Tabulate actions for daily, weekly, monthly, quarterly, semiannual, and annual frequencies.
2. Maintenance and Service Record: Include manufacturers' forms for recording maintenance.

G. Spare Parts List and Source Information: Include lists of replacement and repair parts, with parts identified and cross-referenced to manufacturers' maintenance documentation and local sources of maintenance materials and related services.

H. Maintenance Service Contracts: Include copies of maintenance agreements with name and telephone number of service agent.

I. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.

1. Include procedures to follow and required notifications for warranty claims.

J. Drawings: Prepare drawings supplementing manufacturers' printed data to illustrate the relationship of component parts of equipment and systems and to illustrate control sequence and flow diagrams. Coordinate these drawings with information contained in record Drawings to ensure correct illustration of completed installation.

1. Do not use original project record documents as part of maintenance manuals.

1.10 PRODUCT MAINTENANCE MANUALS

A. Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.

B. Content: Organize manual into a separate section for each product, material, and finish. Include source information, product information, maintenance procedures, repair materials and sources, and warranties and bonds, as described below.

C. Source Information: List each product included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual and drawing or schedule designation or identifier where applicable.

D. Product Information: Include the following, as applicable:

1. Product name and model number.
2. Manufacturer's name.
3. Color, pattern, and texture.
4. Material and chemical composition.
5. Reordering information for specially manufactured products.

E. Maintenance Procedures: Include manufacturer's written recommendations and the following:

1. Inspection procedures.
2. Types of cleaning agents to be used and methods of cleaning.
3. List of cleaning agents and methods of cleaning detrimental to product.
4. Schedule for routine cleaning and maintenance.
5. Repair instructions.

F. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.

G. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.

1. Include procedures to follow and required notifications for warranty claims.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 017823

SECTION 017839 - PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for project record documents, including the following:

1. Record Drawings.
2. Record Specifications.
3. Record Product Data.
4. Miscellaneous record submittals.

B. Related Sections:

1. Section 017700 "Closeout Procedures" for general closeout procedures.
2. Section 017823 "Operation and Maintenance Data" for operation and maintenance manual requirements.
3. Divisions 02 through 49 Sections for specific requirements for project record documents of the Work in those Sections.

1.3 CLOSEOUT SUBMITTALS

A. Record Drawings: Comply with the following:

1. Number of Copies: Submit one (1) set(s) of marked-up record prints.

B. Record Specifications: Submit one (1) paper copy of Project's Specifications, including addenda and contract modifications.

C. Record Product Data: Submit one (1) paper copy of each submittal.

1. Where record Product Data are required as part of operation and maintenance manuals, submit duplicate marked-up Product Data as a component of manual.

PART 2 - PRODUCTS

2.1 RECORD DRAWINGS

A. Record Prints: Maintain one (1) set of marked-up paper copies of the Contract Drawings and Shop Drawings.

1. Preparation: Mark record prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to provide information for preparation of corresponding marked-up record prints.

a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
b. Accurately record information in an acceptable drawing technique.
c. Record data as soon as possible after obtaining it.
d. Record and check the markup before enclosing concealed installations.
e. Cross-reference record prints to corresponding archive photographic documentation.

2. Content: Types of items requiring marking include, but are not limited to, the following:

a. Dimensional changes to Drawings.
b. Revisions to details shown on Drawings.
c. Locations and depths of underground utilities.
d. Revisions to routing of piping and conduits.
e. Revisions to electrical circuitry.
f. Actual equipment locations.
g. Duct size and routing.
h. Locations of concealed internal utilities.
i. Changes made by Change Order or Construction Change Directive.
j. Changes made following Architect's written orders.
k. Details not on the original Contract Drawings.
l. Field records for variable and concealed conditions.
m. Record information on the Work that is shown only schematically.

3. Mark the Contract Drawings and Shop Drawings completely and accurately. Utilize personnel proficient at recording graphic information in production of marked-up record prints.
4. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.
5. Mark important additional information that was either shown schematically or omitted from original Drawings.
6. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.

B. Format: Identify and date each record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location.

1. Record Prints: Organize record prints and newly prepared record Drawings into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets.
2. Format: Paper copy.
3. Identification: As follows:

a. Project name.
b. Date.
c. Designation "PROJECT RECORD DRAWINGS."
d. Name of Architect.
e. Name of Contractor.

2.2 RECORD SPECIFICATIONS

A. Preparation: Mark Specifications to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications.

1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
2. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.
3. Record the name of manufacturer, supplier, Installer, and other information necessary to provide a record of selections made.
4. For each principal product, indicate whether record Product Data has been submitted in operation and maintenance manuals instead of submitted as record Product Data.
5. Note related Change Orders, record Product Data, and record Drawings where applicable.

B. Format: Submit record Specifications as paper copy.

2.3 RECORD PRODUCT DATA

A. Preparation: Mark Product Data to indicate the actual product installation where installation varies substantially from that indicated in Product Data submittal.

1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
2. Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.
3. Note related Change Orders, record Specifications, and record Drawings where applicable.

B. Format: Submit record Product Data as paper copy.

1. Include record Product Data directory organized by specification section number and title, electronically linked to each item of record Product Data.

PART 3 - EXECUTION

3.1 RECORDING AND MAINTENANCE

A. Recording: Maintain one (1) copy of each submittal during the construction period for project record document purposes. Post changes and modifications to project record documents as they occur; do not wait until the end of Project.

B. Maintenance of Record Documents and Samples: Store record documents and Samples in the field office apart from the Contract Documents used for construction. Do not use project record documents for construction purposes. Maintain record documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to project record documents for Architect's reference during normal working hours.

END OF SECTION 017839

SECTION 017900 - DEMONSTRATION AND TRAINING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for instructing Owner's personnel, including the following:

1. Demonstration of operation of systems, subsystems, and equipment.
2. Training in operation and maintenance of systems, subsystems, and equipment.

B. Related Sections:

1. Divisions 02 through 49 Sections for specific requirements for demonstration and training for products in those Sections.

1.3 INFORMATIONAL SUBMITTALS

A. Instruction Program: Submit outline of instructional program for demonstration and training, including a list of training modules and a schedule of proposed dates, times, length of instruction time, and instructors' names for each training module. Include learning objective and outline for each training module.

1. Indicate proposed training modules utilizing manufacturer-produced demonstration for systems, equipment, and products **in lieu of** video recording of live instructional module.

B. Attendance Record: For each training module, submit list of participants and length of instruction time.

C. Evaluations: For each participant and for each training module, submit results and documentation of performance-based test.

1.4 QUALITY ASSURANCE

A. Facilitator Qualifications: A firm or individual experienced in training or educating maintenance personnel in a training program similar in content and extent to that indicated for this Project, and whose work has resulted in training or education with a record of successful learning performance.

B. Instructor Qualifications: A factory-authorized service representative, complying with requirements in Section 014000 "Quality Requirements," experienced in operation and maintenance procedures and training.

C. Pre-Instruction Conference: Conduct conference at Project site to comply with requirements in Section 013100 "Project Management and Coordination." Review methods and procedures related to demonstration and training including, but not limited to, the following:

1. Inspect and discuss locations and other facilities required for instruction.
2. Review and finalize instruction schedule and verify availability of educational materials, instructors' personnel, audiovisual equipment, and facilities needed to avoid delays.
3. Review required content of instruction.
4. For instruction that must occur outside, review weather and forecasted weather conditions and procedures to follow if conditions are unfavorable.

1.5 COORDINATION

A. Coordinate instruction schedule with Owner's operations. Adjust schedule as required to minimize disrupting Owner's operations.

B. Coordinate instructors, including providing notification of dates, times, length of instruction time, and course content.

C. Coordinate content of training modules with content of approved emergency, operation, and maintenance manuals. Do not submit instruction program until operation and maintenance data has been reviewed and approved by Architect.

PART 2 - PRODUCTS

2.1 INSTRUCTION PROGRAM

A. Program Structure: Develop an instruction program that includes individual training modules for each system and for equipment not part of a system, as required by individual Specification Sections.

B. Training Modules: Develop a learning objective and teaching outline for each module. Include a description of specific skills and knowledge that participant is expected to master. For each module, include instruction for the following as applicable to the system, equipment, or component:

1. Basis of System Design, Operational Requirements, and Criteria: Include the following:

    a. System, subsystem, and equipment descriptions.
    b. Performance and design criteria if Contractor is delegated design responsibility.
    c. Operating standards.
    d. Regulatory requirements.
    e. Equipment function.
    f. Operating characteristics.
    g. Limiting conditions.
    h. Performance curves.

2. Documentation: Review the following items in detail:

    a. Emergency manuals.
    b. Operations manuals.
    c. Maintenance manuals.
    d. Project record documents.
    e. Identification systems.
    f. Warranties and bonds.
    g. Maintenance service agreements and similar continuing commitments.

3. Emergencies: Include the following, as applicable:

a. Instructions on meaning of warnings, trouble indications, and error messages.
b. Instructions on stopping.
c. Shutdown instructions for each type of emergency.
d. Operating instructions for conditions outside of normal operating limits.
e. Sequences for electric or electronic systems.
f. Special operating instructions and procedures.

4. Operations: Include the following, as applicable:

a. Startup procedures.
b. Equipment or system break-in procedures.
c. Routine and normal operating instructions.
d. Regulation and control procedures.
e. Control sequences.
f. Safety procedures.
g. Instructions on stopping.
h. Normal shutdown instructions.
i. Operating procedures for emergencies.
j. Operating procedures for system, subsystem, or equipment failure.
k. Seasonal and weekend operating instructions.
l. Required sequences for electric or electronic systems.
m. Special operating instructions and procedures.

5. Adjustments: Include the following:

a. Alignments.
b. Checking adjustments.
c. Noise and vibration adjustments.
d. Economy and efficiency adjustments.

6. Troubleshooting: Include the following:

a. Diagnostic instructions.
b. Test and inspection procedures.

7. Maintenance: Include the following:

a. Inspection procedures.
b. Types of cleaning agents to be used and methods of cleaning.
c. List of cleaning agents and methods of cleaning detrimental to product.
d. Procedures for routine cleaning
e. Procedures for preventive maintenance.
f. Procedures for routine maintenance.
g. Instruction on use of special tools.

8. Repairs: Include the following:

a. Diagnosis instructions.
b. Repair instructions.
c. Disassembly; component removal, repair, and replacement; and reassembly instructions.
d. Instructions for identifying parts and components.
e. Review of spare parts needed for operation and maintenance.

PART 3 - EXECUTION

3.1 PREPARATION

A. Assemble educational materials necessary for instruction, including documentation and training module. Assemble training modules into a training manual organized in coordination with requirements in Section 017823 "Operations and Maintenance Data."

B. Set up instructional equipment at instruction location.

3.2 INSTRUCTION

A. Facilitator: Engage a qualified facilitator to prepare instruction program and training modules, to coordinate instructors, and to coordinate between Contractor and Owner for number of participants, instruction times, and location.

B. Engage qualified instructors to instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.

1. Architect will furnish an instructor to describe basis of system design, operational requirements, criteria, and regulatory requirements.
2. Owner will furnish Contractor with names and positions of participants.

C. Scheduling: Provide instruction at mutually agreed on times. For equipment that requires seasonal operation, provide similar instruction at start of each season.

1. Schedule training with Owner with at least seven (7) days advance notice.

D. Evaluation: At conclusion of each training module, assess and document each participant's mastery of module by use of a demonstration performance-based test and ask Owner to sign-off on for acceptance.

E. Cleanup: Collect used and leftover educational materials and give to Owner. Remove instructional equipment. Restore systems and equipment to condition existing before initial training use.

END OF SECTION 017900

SECTION 018113 - SUSTAINABLE DESIGN REQUIREMENTS – HIGH-PERFORMANCE BUILDING STANDARDS FOR SCHOOLS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes general requirements and procedures for compliance with Connecticut High Performance Building Standards (HPBS) based on *Connecticut Building Standard Guidelines Compliance Manual for High Performance Buildings*. Regulations are outlined in the State of Connecticut Regulation Section 16a-38k-1 through 9: The Establishment of High-Performance Building Construction Standards for State-Funded Buildings. It contains guidelines and requirements for meeting both mandatory (eighteen (18) total) and optional strategies (meeting a minimum of twenty-eight (28)) to ensure compliance with the regulation.

1. Other requirements needed to obtain HPBS certification depend on product selections and may not be specifically identified as HPBS requirements. Compliance with guidelines and requirements needed to obtain HPBS may be used as one criterion to evaluate substitution requests and comparable product requests.
2. Additional HPBS requirements needed to obtain the indicated HPBS compliance depend on Architect's design and other aspects of Project that are not part of the Work of the Contract.
3. A copy of the HPBS checklist is attached at the end of this Section for information only.

B. Related Requirements:

1. Divisions 01 through 33 contain sections for HPBS requirements specific to the work of each of these Sections. Requirements may or may not include reference to HPBS.

1.3 DEFINITIONS (for full list of HPBS definitions, see HPBS Manual and/or State of Connecticut Regulation Section 16a-38k-1 through 9)

A. Chain-of-Custody Certificates: Certificates signed by manufacturers certifying that wood used to make products was obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship." Certificates shall include evidence that manufacturer is certified for chain of custody by an FSC-accredited certification body.

B. Regional Materials: Materials that have been extracted, harvested, or recovered, as well as manufactured, within five hundred (500) miles of Project site. If only a fraction of a product or material is extracted/harvested/recovered and manufactured locally, then only that percentage (by weight) shall contribute to the regional value. Mechanical, electrical, plumbing components and specialty items (such as elevators) shall not be included in this calculation.

C. Recycled Content: The recycled content value of a material assembly shall be determined by weight. The recycled fraction of the assembly is then multiplied by the cost of assembly to determine the recycled content value.

1. "Post-consumer" material is defined as waste material generated by households or by commercial, industrial, and institutional facilities in their role as end users of the product, which can no longer be used for its intended purpose.
2. "Pre-consumer" material is defined as material diverted from the waste stream during the manufacturing process. Excluded is reutilization of materials such as rework, regrind, or scrap generated in a process and capable of being reclaimed within the same process that generated it.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Respond to questions and requests from Architect and the State of Connecticut regarding HPBS credits that are the responsibility of the Contractor, that depend on product selection or product qualities, or that depend on Contractor's procedures until the State of Connecticut has made its determination on the project's HPBS certification application. Document responses as informational submittals.

1.5 ACTION SUBMITTALS

A. General: Submit additional HPBS submittals required by other Specification Sections.

B. HPBS submittals are in addition to other submittals. If submitted item is identical to that submitted to comply with other requirements, submit duplicate copies as a separate submittal to verify compliance with indicated HPBS requirements.

C. HPBS Documentation Submittals:

1. Section 16a-38k-6(a)(11): Product data and wiring diagrams for sensors and data collection system used to provide continuous metering of building energy-consumption performance over time.
2. Section 16a-38k-6(d)(9): Product data and certification letter indicating percentages by weight of post-consumer and pre-consumer recycled content for products having recycled content. Include statement indicating costs for each product having recycled content.
3. Section 16a-38k-6(d)(10): Product data for regional materials indicating location and distance from Project of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include statement indicating cost for each regional material and the fraction by weight that is considered regional.
4. Section 16a-38k-6(d)(13): Product data and chain-of-custody certificates for products containing certified wood. Include statement indicating cost for each certified wood product.
5. Section 16a-38k-3(e): Construction indoor-air-quality management plan.

    a. Product data for temporary filtration media.
    b. Product data for filtration media used during occupancy.
    c. Construction Documentation: Six (6) photographs at three (3) different times during the construction period, along with a brief description of the SMACNA approach employed, documenting implementation of the indoor-air-quality management measures, such as protection of ducts and on-site stored or installed absorptive materials.

6. Section 16a-38k-5(d): Laboratory test reports for the following products and systems installed inside the weatherproofing system indicating that they are certified for low emissions of volatile organic compounds (VOC) using specifications or certification programs listed in the *Connecticut Building Standard Guidelines Compliance Manual for High Performance Buildings*:

a. Fifty percent (50%) of adhesives and sealants.
b. Acoustic ceiling tiles and wall panels.
c. Paints and coatings.
d. Wall coverings.
e. Carpet systems and associated adhesives.
f. Composite wood and agrifiber products.
g. Resilient flooring and associated adhesives.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For HPBS coordinator.

B. Energy Star Specification: Energy consuming products installed in the building shall be ENERGY STAR compliant if the product category has an ENERGY STAR specification. Provide list for all eligible products and associated documentation. Equipment includes, but is not limited to:

1. Computers
2. Monitors
3. Printers
4. Scanners
5. Copy machines
6. Water coolers
7. Refrigerators
8. Ceiling fans
9. Washing machines
10. Vending machines
11. Compact fluorescent lamps
12. Exit signs
13. Residential/small commercial HVAC equipment

C. Project Materials Cost Data: Provide statement indicating total cost for materials used for Project. Costs exclude labor, overhead, and profit. Include breakout of costs for the following categories of items:

1. Furniture.
2. Plumbing.
3. Mechanical.
4. Electrical.
5. Specialty items such as elevators and equipment.
6. Wood-based construction materials.

D. HPBS Action Plans: Provide preliminary submittals not less than thirty (30) days of date established for commencement of the Work indicating how the following requirements will be met:

1. Section 16a-38k-6(d)(9): List of proposed materials with recycled content. Indicate cost, post-consumer recycled content, and pre-consumer recycled content for each product having recycled content.
2. Section 16a-38k-6(d)(10): List of proposed regional materials. Identify each regional material, including its source, cost, and the fraction by weight that is considered regional.
3. Section 16a-38k-6(d)(13): List of proposed certified wood products. Indicate each product containing certified wood, including its source and cost of certified wood products.
4. Section 16a-38k-3(e): Construction Indoor-Air-Quality Management Plan.

E. HPBS Progress Reports: Concurrent with each Application for Payment, submit reports comparing actual construction and purchasing activities with HPBS action plans for the following:

1. Sections 16a-38k-6(d)(9): Recycled content.
2. Section 16a-38k-6(d)(10): Regional materials.
3. Section 16a-38k-6(d)(13): Certified wood products.

1.7 QUALITY ASSURANCE

A. HPBS Coordinator: Engage an experienced HPBS-Accredited Professional to coordinate HPBS requirements. HPBS coordinator may also serve as waste management coordinator.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

A. Provide products and procedures necessary to obtain HPBS requirements and guidelines in this Section. Although other Sections may specify some requirements that contribute to HPBS, the Contractor shall determine additional materials and procedures necessary to obtain HPBS requirements indicated.

2.2 RECYCLED CONTENT OF MATERIALS

A. Section 16a-38k-6(d)(9): Building materials shall have recycled content such that post-consumer recycled content plus one-half (½) of pre-consumer recycled content for Project constitutes a minimum of twenty percent (20%) of cost of materials used for Project.

1. Cost of post-consumer recycled content plus one-half (½) of pre-consumer recycled content of an item shall be determined by dividing weight of post-consumer recycled content plus one-half (½) of pre-consumer recycled content in the item by total weight of the item and multiplying by cost of the item.
2. Do not include plumbing, mechanical, and electrical components, and specialty items such as elevators and equipment in the calculation.

2.3 REGIONAL MATERIALS

A. Sections 16a-38k-6(d)(10): Not less than ten percent (10%) of building materials (by cost) shall be regional materials.

2.4 CERTIFIED WOOD

A. Section 16a-38k-6(d)(13): Not less than fifty percent (50%) (by cost) of wood-based materials shall be produced from wood obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship." Only include materials permanently installed on the project.

1. Wood-based materials include, but are not limited to, the following materials when made from wood, engineered wood products, or wood-based panel products:

a. Rough carpentry.
b. Miscellaneous carpentry.
c. Heavy timber construction.
d. Wood decking.

e. Metal-plate-connected wood trusses.
f. Structural glued-laminated timber.
g. Finish carpentry.
h. Architectural woodwork.
i. Wood paneling.
j. Wood veneer wall covering.
k. Wood flooring.
l. Wood cabinets.
m. Furniture.

2.5 LOW-EMITTING MATERIALS

A. Section 16a-38k-5(d): The following products and systems, where installed inside the weatherproofing system, shall meet the testing and product requirements indicating that they are certified for low emissions of volatile organic compounds (VOC) using specifications or certification programs listed in the *Connecticut Building Standard Guidelines Compliance Manual for High Performance Buildings*:

a. Fifty percent (50%) of adhesives and sealants.
b. Acoustic ceiling tiles and wall panels.
c. Paints and coatings.
d. Wall coverings.
e. Carpet systems and associated adhesives.
f. Composite wood and agrifiber products.
g. Resilient flooring and associated adhesives.

PART 3 - EXECUTION

3.1 CHLOROFLUOROCARBON (CFC) REFRIGERANT BAN OR PHASE OUT

A. CFC-based refrigerants shall not be utilized for energy systems in new construction.

B. Section 16a-38k-3(k): Remove CFC-based refrigerants from existing HVAC&R equipment indicated to remain and replace with refrigerants that are not CFC based or initiate a CFC phase-out conversion. Replace or adjust existing equipment to accommodate new refrigerant as described in HVAC Sections.

3.2 BUILDING OCCUPANT SURVEY

A. Section 16a-38k-6(b)(7): Building facility personnel, under direction of the building Owner, shall administer an anonymous survey for building occupants within the first 12 months after initial occupancy to assess occupant satisfaction and implement corrective actions for recurrent issues.

1. At minimum, the survey shall cover thermal building comfort, lighting, security issues, indoor air quality, functionality of space, and acoustics. If greater than twenty percent (20%) of the respondents express dissatisfaction with any specific issue, the building Owner shall prepare a plan for remedial action.

3.3 CONSTRUCTION INDOOR-AIR-QUALITY MANAGEMENT

A. Section 16a-38k-3(e): Comply with SMACNA's "SMACNA IAQ Guideline for Occupied Buildings under Construction."

1. If Owner authorizes use of permanent heating, cooling, and ventilating systems during construction period as specified in "Temporary Facilities and Controls," install filter media having a MERV 8 according to ASHRAE 52.2 at each return-air inlet for the air-handling system used during construction.
2. Replace all air filters immediately prior to occupancy.

B. Section 16a-38k-6(b)(1): Install permanent indoor air monitoring systems to provide performance feedback on ventilation systems. Such monitoring systems, at minimum, shall include devices to measure temperature, relative humidity, carbon dioxide, and dew point. Carbon dioxide measurement sensors shall measure both interior and exterior levels of CO_2.

1. Air-Quality Testing:

a. Conduct baseline indoor-air-quality testing, after construction ends and prior to occupancy, using testing protocols consistent with the EPA's "Compendium of Methods for the Determination of Air Pollutants in Indoor Air," and as additionally detailed in the USGBC's "Green Building Design and Construction Reference Guide."
b. Demonstrate that the contaminant maximum concentrations listed below are not exceeded:

1) Formaldehyde: 27 ppb.
2) Particulates (PM10): 50 micrograms/cu. m.
3) Total Volatile Organic Compounds (TVOC): 500 micrograms/cu. m.
4) 4-Phenylcyclohexene (4-PH): 6.5 micrograms/cu. m.
5) Carbon Monoxide: 9 ppm and no greater than 2 ppm above outdoor levels.

c. For each sampling point where the maximum concentration limits are exceeded, conduct additional flush-out with outside air and retest the specific parameter(s) exceeded to indicate the requirements are achieved. Repeat procedure until all requirements have been met. When retesting noncomplying building areas, take samples from same locations as in the first test.
d. Air-sample testing shall be conducted as follows:

1) All measurements shall be conducted prior to occupancy but during normal occupied hours, and with building ventilation system starting at the normal daily start time and operated at the minimum outside air flow rate for the occupied mode throughout the duration of the air testing.
2) Building shall have all interior finishes installed including, but not limited to, millwork, doors, paint, carpet, and acoustic tiles. Nonfixed furnishings such as workstations and partitions are encouraged, but not required, to be in place for the testing.
3) Number of sampling locations will vary depending on the size of building and number of ventilation systems. For each portion of building served by a separate ventilation system, the number of sampling points shall not be less than one per 25,000 sq. ft. or for each contiguous floor area, whichever is larger, and shall include areas with the least ventilation and greatest presumed source strength.
4) Air samples shall be collected between 3 and 6 feet from the floor to represent the breathing zone of occupants, and over a minimum 4-hour period.

C. Section 16a-38k-6(b)(10): Mold Prevention.

1. To prevent mold, heating, ventilating and air conditioning systems (HVAC) shall be designed to limit space relative humidity to sixty percent (60%) or less during load

conditions whether the building is occupied or non-occupied; an ongoing indoor air quality management plan shall be implemented as required.

3.4 HEPA VACUUMING

A. Sections 16a-38k-5(f): Prior to substantial completion of building, vacuum all carpeted and soft surfaces with a high-efficiency particulate arrestor (HEPA) vacuum. For phased or occupied renovations, HEPA vacuum the carpet daily in occupied areas.

1. In addition to thorough vacuuming, install carpet and other textile material after all sanding and sawing is complete. If dust producing activities are unavoidable after the installation of the carpet/textile material, perform the activities in a contained area and protect all exposed soft surfaces with tape-sealed plastic sheeting.

3.5 BUILDING FLUSHOUT

A. Section 16a-38k-6(b)(3): After construction ends and with all interior finishes installed but prior to building occupancy, flush the building continuously for at least ten (10) calendar days with outside air while maintaining an internal temperature between 60°F and 78°F and relative humidity no higher than sixty percent (60%). Do not “bake out” the building by increasing the temperature of the space. Alternatively, use the following strategy: Flush out each space separately until 3,500 cubic feet of outside air per square foot of floor space has been delivered to that space. The space shall then be ventilated at the rate of 0.3 cubic feet per minute per square foot of floor space or the design minimum outside air rate, whichever is greater. This shall be performed for a minimum of 3 hours prior to occupancy and then during occupancy until a total of 14,000 cubic feet of outside air per square foot of floor area has been delivered to that space.

B. Install new MERV 13 filtration media prior to beginning the flush-out procedure.

C. After flush-out, install new MERV 13 filtration media, except for those filters processing only outdoor air.

END OF SECTION 018113

Old Greenwich School

	HIGH PERFORMANCE BUILDING STANDARDS SCHOOL CONSTRUCTION CHECKLIST
	Mandatory Requirements
x	16a-38k-3(a) Building Commissioning
x	16a-38k-3(b) Integrated Design Process
x	16a-38k-3(c) Base Energy Performance 21% Better Than Code
x	16a-38k-3(d) ENERGY STAR Products
x	16a-38k-3(e) Indoor Air Quality Management Plan
x	16a-38k-3(f) Water Efficiency
x	16a-38k-3(g) Recycling of Materials
x	16a-38k-3(h) Erosion and Sedimentation Control
x	16a-38k-3(i) No Smoking Policy
x	16a-38k-3(j) Integrated Pest Management Plan
x	16a-38k-3(k) CFC Refrigerant Ban or Phase-out Plan
x	16a-38k-3(l) Minimum Ventilation
x	16a-38k-5(a) Acoustical Standards
x	16a-38k-5(b) Properly Locate Outside Air Intakes
x	16a-38k-5(c) Electronic Ignition on Natural Gas Equipment
x	16a-38k-5(d) Use of Low VOC Products
x	16a-38k-5(e) Environmental Site Assessment
x	16a-38k-5(f) HEPA Vacuuming
	(A minimum of 28 of the following strategies must be implemented.)
x	16a-38k-6(a)(1) Energy Performance 24.5% Better Than Code
	16a-38k-6(a)(2) Energy Performance 28% Better Than Code
	16a-38k-6(a)(3) Energy Performance 31.5% Better Than Code
	16a-38k-6(a)(4) Energy Performance 35% Better Than Code
	16a-38k-6(a)(5) Energy Performance 38.5% Better Than Code
	16a-38k-6(a)(6) Energy Performance 42% Better Than Code
	16a-38k-6(a)(7) On-Site Renewable Energy – 3%
	16a-38k-6(a)(8) On-Site Renewable Energy – 7%
	16a-38k-6(a)(9) On-Site Renewable Energy – 10%
	16a-38k-6(a)(10) Purchase Renewable Energy
	16a-38k-6(a)(11) Energy Measurement and Verification Plan
x	16a-38k-6(b)(1) Install Permanent Indoor Air Monitoring Systems
x	16a-38k-6(b)(2) Provide Increased Outdoor Ventilation
x	16a-38k-6(b)(3) Building Flushout
	16a-38k-6(b)(4) Composite Wood and Agrifiber Products
x	16a-38k-6(b)(5) Individual Lighting Control
x	16a-38k-6(b)(6) Individual Thermal Comfort Control
x	16a-38k-6(b)(7) Building Occupant Survey
x	16a-38k-6(b)(8) Daylight Contribution
x	16a-38k-6(b)(9) Visual Gazing – Views to the Outdoor Environment
x	16a-38k-6(b)(10) Mold Prevention
x	16a-38k-6(b)(11) Low VOC Furniture
x	16a-38k-6(b)(12) Isolation of Chemical Use Areas
	16a-38k-6(b)(13) Control of Particulates at Pedestrian Entryways

x	16a-38k-6(c)(1) Reduce Total Potable Water Usage by 30%
x	16a-38k-6(c)(2) Reduce Water Consumption for Landscaping 50%
x	16a-38k-6(c)(3) Eliminate Potable Water Usage for Landscaping
	16a-38k-6(c)(4) Reduce Total Potable Water Usage by 50%
	16a-38k-6(d)(1) Maintain 75% of an Existing Building Structure
	16a-38k-6(d)(2) Maintain 95% of an Existing Building Structure
	16a-38k-6(d)(3) Re-use Existing Non-Structural Building Elements
x	16a-38k-6(d)(4) Recycle or Salvage 50% of Construction and Demolition Debris
	16a-38k-6(d)(5) Recycle or Salvage 75% of Construction and Demolition Debris
x	16a-38k-6(d)(6) Use 5% Refurbished, Salvaged, or Reused materials
	16a-38k-6(d)(7) Use 10% Refurbished, Salvaged, or Reused materials
x	16a-38k-6(d)(8) Use 10% Recycled Content Materials
	16a-38k-6(d)(9) Use 20% Recycled Content Materials
x	16a-38k-6(d)(10) Use 10% Local Materials
	16a-38k-6(d)(11) Use 20% Local Materials
	16a-38k-6(d)(12) Use Building Materials Made from Short Harvest Cycle Plants
	16a-38k-6(d)(13) Use Forest Stewardship Council (FSC) Certified Wood Products
x	16a-38k-6(e)(1) Re-develop a Local Site
x	16a-38k-6(e)(2) Select a Site with Public Transportation Access
x	16a-38k-6(e)(3) Encourage Bicycle Transportation
x	16a-38k-6(e)(4) Encourage Low-Emission Vehicle Use with Preferred Parking
	16a-38k-6(e)(5) Encourage Car and Van-pooling
	16a-38k-6(e)(6) Protect Natural Areas at the Construction Site
	16a-38k-6(e)(7) Maximize Open Space
	16a-38k-6(e)(8) Implement a Stormwater Management Plan Reducing Run-off by 25%
	16a-38k-6(e)(9) Implement a Stormwater Management Plan that Treats 90% of Annual Rainfall
x	16a-38k-6(e)(10) Reduce Heat Island Effect Through Landscaping Strategies
x	16a-38k-6(e)(11) Select Roofing Materials to Reduce Heat Island Effect
x	16a-38k-6(e)(12) Reduce Outdoor Light Pollution
	16a-38k-6(e)(13) Orient Building for Daylighting and Energy Performance
x	16a-38k-6(e)(14) No Building in Floodplain and Sustainable Site Development
x	16a-38k-6(e)(15) Site Building away from External Sources of Excessive Noise
x	16a-38k-6(f)(1) Eliminate the use of CFCs, HCFCs and Halons
	16a-38k-6(f)(2) Building Innovation
	16a-38k-6(f)(3) Curriculum on Sustainable Building Features
29	Total Building Standard Optional Strategies

SECTION 019100 – COMMISSIONING OF MEP-FA-FP SYSTEMS (HOW IS BUILDING ENVELOPE BEING ADDRESSED)

PART 1 - GENERAL (MORGANTI GENERAL COMMENT - NEEDS TO BE VETTED AGAINST SCOPE THAT WAS ISSUED BY THE TOWNS RFP, SO SCOPE CREEP DOESN'T OCCUR BY AKF, SOME COMMENTS NOTED BELOW THAT ARE BEYOND WHAT RFP ASKED FOR.)

1.1 GENERAL REQUIREMENTS

A. Work under this contract shall conform under requirements of Division 010000, General Requirements, Conditions of the Contract, and Supplementary Conditions. This specification covers commissioning of MEP-FA-FP systems which are part of this project.

B. Furnish labor and material to accomplish complete plumbing systems commissioning as specified herein.

C. All trades must adhere to the applicable commissioning and testing guidelines and best practices.

1.2 SECTION INCLUDES

A. This specification section provides a general overview of the Commissioning process and must be read in conjunction with the following related sections:

1. Construction Documents for affected building systems.
2. Section includes the general commissioning process requirements for MEP, HVAC&R, Fire Protection, Fire Alarm and building systems, assemblies, and equipment.
3. Trade specific commissioning sections in Division 210000, 220000, 230000, 260000, and 280000.
4. Applicable Pre-Purchased Equipment Specifications.
5. This ~~project is pursuing LEED Certification. See related specifications for sustainable design requirements affecting work of this Section~~.

1.3 INTRODUCTION

A. Overview: Commissioning is intended to achieve the following specific objectives:

1. Ensure that applicable equipment and systems are procured and installed properly and receive adequate operational checkout by installing contractors.
2. For commissioning of any equipment contractors shall abide to contract documents, commissioning plan and testing procedure.
3. Ensure that commissioning activities such as commissioning integrity testing, pre-functional inspections, and functional testing are completed as outlined in all related specification sections.
4. Ensure that all the measured parameters during field testing and Cx are documented in a working copy by the contractors and signed off by all Stake holders (Commissioning Agent, Design consultants, Owner representative, Construction Manager, Facilities Operations).
5. Verify and document proper performance of equipment and systems.
6. Ensure that O&M documentation provided is accurate, project specific and complete.
7. Ensure that the Owner's operating personnel are adequately trained.
8. Ensure as-built documentation is accurate, site specific, and complete.
9. Ensure the as tested set points and approved sequences of operation are documented and verified during functional and integrated system testing.

B. Definitions

1. BEQAP: Building Envelope Quality Assurance Program
2. Commissioning Plan: a document that outlines the organization, schedule, allocation of resources, and documentation requirements of the commissioning process.
3. Commissioning report: the document that records the results of the commissioning process, including the as-built performance of the MEP/FA/FP systems and unresolved issues.
4. Commissioning specification: the contract document that details the objective, scope, and implementation of the construction and acceptance phases of the commissioning process as developed in the design-phase Commissioning Plan.
5. Commissioning Stake holder: a team consisting of Commissioning Agent, MEP consultant, Owners representative / Construction Manager / General Contractor etc.
6. Commissioning team: those identified entities and point persons responsible for working together in carrying out the commissioning process.
7. CxA: Commissioning Agent.
8. Design intent document: A detailed written document, evolving throughout the commissioning process, clearly defining items and criteria of the design intent.
9. Design intent: a detailed explanation of the ideas, concepts, and criteria that are defined by the owner to be important. This typically is an expansion of the information provided in the Owner's Program.
10. FAT: Factory Acceptance Test
11. FP: Fire Protection
12. Functional performance testing (FPT): the process of determining the ability of the equipment and systems to deliver the intended services in accordance with the final design intent, approved sequence of operations, and integrated functionality for expected modes of operation.
13. HVAC&R: Heating, Ventilating, Air Conditioning, and Refrigeration.
14. IAQ: Indoor Air Quality
15. LEED: ~~Leadership in Energy and Environmental Design is a set of rating systems for the design, construction, operation, and maintenance of green buildings~~.
16. OPR: Owner Performance Requirement programming document.
17. Pre-Functional (PF) and Installation Checklists (IC): The process of documenting and verifying the installing contractors have met the pre-requisites in preparation for functional testing of the equipment and systems.
18. Pull-the-Plug Test: The Pull-the-Plug (PTP) test is a procedure to validate that all building systems perform as designated after a total building power outage. This test procedure is used as a validation of the MEP/FA/FP infrastructure as an integrated system. It requires participation of all trades including BMS, Fire Alarm, Fire Protection, and Security.
19. SAT: Site Acceptance Test
20. Systems Manual: a composite document that expands the scope of the operation manual and maintenance manual by including the additional information gathered during the commissioning process.
21. Systems, Subsystems, Equipment, and Components: where these terms are used together or separately, they shall mean "as-built" systems, subsystems, equipment, and components.
22. Verification: that full range of checks and tests carried out to determine if all components, subsystems, systems, and interfaces between systems operate in accordance with the contract documents. In this context, “operate” includes all modes and sequences of control operation, interlocks and conditional control responses, and specified responses to abnormal or emergency conditions.
23. BOD: Basis of Design document.

C. General Management Process

1. In general, the CxA coordinates the commissioning activities. Commissioning shall be performed as outlined in the specifications. The Specifications will take precedence over the Commissioning Plan. All members work together to fulfill their contracted responsibilities and meet the objectives of the Contract Documents.

D. General Role Descriptions

1. The members of the commissioning team consist of the Owner, Commissioning Agent (CxA), assigned members of the Construction Manager (CM) or General Contractor (GC), A/E, the mechanical contractor, electrical contractor, plumbing contractor, fire protection contractor, fire alarm contractor, Testing, Adjusting and Balancing (TAB) representative, controls contractor, any other installing contractors or suppliers of the commissioned equipment and systems. If known, the Owner's building or plant operator/ engineer is also a member of the commissioning team.
2. BIM-Revit coordinator: Facilitate sufficient data is captured by the commissioning process in order to integrate into the Owner's CMMS for ongoing commissioning, maintenance and repair.
3. CM/GC – Facilitates the Cx process. Ensures that Contractors perform their responsibilities. Integrates Cx into the construction process and schedule.
4. Consultants: witness the test and also validate the results along with all the stake holders, perform construction observation, approve O&M manuals and assist in resolving problems.
5. Contractors – Install complete equipment and systems in order to demonstrate and document proper system performance.
6. CxA – Leads the commissioning team and coordinates the Cx process tasks and activities in accordance with the contract documents and commissioning plan to verify the installed commissioned systems meet the design intent requirements.
7. Design Team: Overall responsible for ensuring the contract documents can be installed to meet the program requirements and design intent. The Design professionals review and approve the equipment and system submittals, RFI and construction administration related activities in support of the commissioning effort.
8. LEED ~~and Grant Coordinators: Facilitate meetings to ensure the expected or required data is captured and properly documented during the commissioning process to generate reports as needed for compliance~~. SHOULD CHPS BE REFERENCED IN LIEU OF LEED PROJECT IS NOT LEED.
9. Manufacturer/Vendors – The equipment manufacturers and vendors provide documentation to facilitate the commissioning work and perform contracted FAT, SAT and startup.
10. Owner – Facilitates and supports the Cx process and gives final approval of the Cx work.

1.4 ROLES AND RESPONSIBILITIES

A. Commissioning Agent (CxA) SOME COMMENTS BELOW BUT NEEDS TO TIE OUT WITH RFP ISSUED BY TOWN.

1. Develop the commissioning requirements and all related testing, verification and quality control sections.
2. Prepare the commissioning program required as part of the Commissioning Specification. Include lists of all contractors for commissioning events by name, firm, and trade specialty. Include all testing, verification, and quality control required in the commissioning process.
3. Manage the process to deliver the LEED Specified tasks for the Fundamental Commissioning and Enhanced Commissioning credit objectives of this project for the Energy Systems.
4. Execute the MEP/FA/FP commissioning program, through organization of all tests, meetings, demonstrations, training events and performance verifications described in the Contract Documents and the approved MEP/FA/FP commissioning program. Organizational Responsibilities include preparation of agendas, attendance lists, and arrangements for facilities and timely notification to participants for each commissioning event. The Commissioning Agent shall act as chairman at all commissioning events and assure the execution of all agenda items. The Commissioning Agent shall prepare minutes of every commissioning event and send copies to all those in attendance and the Owner.
5. Review the design documents for their effect on the commissioning process and the final performance of the MEP/FA/FP system. The includes ensuring that appropriate commissioning guidelines have been followed, and that there are adequate devices

included in the design to ensure the ability to properly test, adjust and balance the systems, and to document the performance of equipment and each system.

6. Review submittals (e.g. equipment, ductwork, piping, automatic controls, and TAB procedures) for their effect on the commissioning process and the final performance of the MEP/FA/FP system.
7. Schedule the Construction Phase coordination meeting within 90 days of the award of the contract, at some convenient location and at a time suitable to the Contractor and Design Professional. This meeting shall be for the purpose of reviewing the complete mechanical commissioning program and establishing tentative schedules for mechanical system orientation and inspections, O&M submittals, training sessions, system flushing and testing, job completion, test, adjust and balance (TAB) work and verification and functional performance testing. Receive and review the Operation and Maintenance (O&M) manuals as approved by the Engineer of Record.
8. Prior to the contractor initiating the TAB work, the Commissioning Agent shall meet with the Owner, mechanical Contractor, Design Professional, and TAB Contractor. The TAB Contractor shall outline TAB procedures and get concurrence from the Design Professional and Commissioning Agent. Ensure that the TAB Contractor has all forms required for the job database and understands their importance and use.
9. Help coordinate the O&M training sessions. These training sessions are to be attended by the Owner, ~~Commissioning Agent~~ BELIVE THIS WAS NOT REUIRED PER THE RFP, Design Professional, Contractors and equipment suppliers as necessary. The format shall follow the outline in the O&M training agendas.
10. Upon receipt of notification from the Design Professional that the mechanical systems have been completed and are operational, the Commissioning Agent shall proceed to verify the TAB report and operation of the control systems in accordance with the Commissioning Specification.
11. Witness ~~integrity tests including but not limited to hydrostatic testing, duct leakage testing, and insulation resistance testing~~.BELIEVE NOT REQUIRED PER RFP
12. Provide detailed checklist data sheets to document functional testing, and pre-functional inspections.
13. Direct Pre-Functional Inspections. Record any equipment deficiencies during pre-functional inspections.
14. Direct Functional Performance Tests. Record any equipment deficiencies during functional testing.
15. Submit functional performance test report for review to the Engineer of Record.
16. Perform Functional Performance Tests to accommodate seasonal tests during the warranty period.
17. Prepare the final commissioning report. Assemble the final project documentation which shall include the commissioning report and all as-built records. Submit this documentation to the Design Professional for review and acceptance.
18. Document the Systems Manual for the commissioned Energy Systems.
19. Conduct in near end of warranty period evaluation of the Commissioned Systems.

B. Design Team

1. Provide Design Criteria documentation based on Owner's Project Requirements.
2. Provide system design parameters including coordination of trades and obtain approval of Owner.
3. Ensure contract documents incorporate the respective Commissioning Specification requirements.
4. Specify adequate maintenance accessibility for each piece of equipment in the contract documents, and review access provided in shop drawings and installation.
5. Prepare contract documents that coordinate interfaces between commissioned systems (including electrical ladder wiring diagrams, interrelationships between life safety systems and HVAC systems and equipment and the building automation system).
6. Attend construction-phase kick-off meeting scheduled by the Commissioning Agent.
7. Perform shop drawing review as contracted.

8. Attend select Owner training sessions. Conduct the mechanical training session pertaining to the overview of the system design, the system design goals and the reasoning behind the selection of the equipment.
9. Attend initial meeting with TAB representative as scheduled by Commissioning Agent
10. Review select verification and functional performance testing procedures submitted by the Commissioning Agent, only as it pertains to design-related queries.
11. Perform TAB review as contracted.
12. Participate in the Pull the Plug testing, as conducted by the Commissioning Agent.
13. Review as-built records as contracted.
14. Review and comment on the final commissioning report, only as it pertains to design-related queries.

C. Owner

1. Assembles, contracts, and funds the overall project team to deliver this new construction project.
2. Creates the OPR and programming documents along with the Design Team. It is at the discretion of the project team whether these are separate documents or all the information is contained within a BOD.

D. Construction Manager

1. The Construction Manager (CM) is part of the project reporting directly to the Owner and is authorized to act on behalf of the Owner in order to manage the construction team to fulfill the commissioning process intent. Commissioning (Cx) requires the participation of the CxA, Stakeholders and MEP/FA/FP Contractors to ensure that all systems are operating in a manner consistent with the Contract Documents.
2. The CM shall ensure the MEP/FA/FP Contractors shall become familiar with all parts of the Commissioning requirements and shall execute all commissioning responsibilities assigned to them in the Contract Documents.
3. Assign a commissioning point of contract representative for the CM to attend and actively participate in commissioning co-ordination meetings as well as weekly / monthly commissioning update meetings as per schedule.
4. Separate team shall be appointed by contractor for commissioning & Quality assurance (Different from the execution team) during the project phase & assign a commissioning manager who shall co-ordinate with the CxA / stake holder from time to time during project execution
5. Execute commissioning activities for systems as required for temporary acceptance and final acceptance. Systems which will be utilized in a temporary fashion for occupancy and in subsequent phases undergo modifications will require to have their functionality demonstrated during each phase prior to final acceptance.
6. Include cost for commissioning requirements in the contract pricing. Construction Manager shall verify completeness of building envelope, perimeter and interior items which affect proper operation and control of MEP/FA/FP equipment and systems.

E. Contractors for the MEP/FA/FP commissioned equipment and systems NEED TO REVIEW THESE ITEMS AS COMPLETE SYSTEMS MAY NOT BE ABLE TO BE INSTALLED DUE TO PHASED NATURE OF THIS PROJECT…

1. Identify a commissioning point of contact for each trade.
2. Testing shall be carried out in accordance with contract requirements, by personnel specializing in this work.
3. Contractors shall provide required manpower, Instruments for commissioning activities as per the project requirements specified in the commissioning plan or as instructed by the CxA/stakeholders.
4. Complete the installation, integration and interconnection for all HVAC, Electrical, Plumbing, Fire Alarm and Fire Protection equipment per the contract documents.
5. Provide startup for all HVAC, Electrical, Plumbing, Fire Alarm and Fire Protection equipment.

6. Perform and document all static tests or integrity tests as required within Division 210000, Division 220000, Division 230000, Division 260000, and Division 280000. Static/integrity tests include but are not limited to hydrostatic test, pressure tests, duct leakage tests, flushing and cleaning, electrical integrity tests, electrical NETA Testing, insulation resistance testing, etc.
7. Prepare a preliminary schedule for pipe and duct system testing, flushing and cleaning, equipment start-up and TAB start and completion for use by the CxA. Update the schedule as appropriate. Coordinating with any Special Inspection agents as needed.
8. Installing contractor to notify the Owner / Stake holder depending on protocol, when pipe and duct system testing, flushing, cleaning, startup of each piece of equipment and TAB will occur. Be responsible to notify the CM, ahead of time, when commissioning activities not yet performed or not yet scheduled will delay construction. Be proactive in seeing that commissioning processes are executed and that the CxA and CM both have the scheduling information needed to efficiently execute the commissioning process.
9. Assist and cooperate with the Testing and Balancing (TAB) contractor and CxA by:

    a. Putting all equipment and systems into operation and continuing the operation during each working day of TAB and commissioning, as required.
    b. Including cost of sheaves, belts, and filter changes that may be required by TAB.
    c. Providing clearances for test holes in ducts and plenums where directed by TAB to allow air measurements and air balancing.
    d. Providing temperature and pressure taps according to the Construction Documents.
    e. Assist the TAB in the location and operation of all volume, control, and fire/smoke dampers.
    f. List and clearly identify on the as-built drawings the locations of all P/T plugs, air-flow stations and all other such measure and verification devices.

10. Include and itemize the cost of testing (FAT & SAT) & commissioning in the contract price and requisition break down. Also inform the manufacturers of the factory and site testing requirements.
11. In each purchase order or subcontract written, include these general commissioning requirements for submittal data, commissioning documentation, testing, O&M data and training.
12. Attend commissioning scoping meetings and other meetings necessary to facilitate the Cx process.
13. Provide additional requested documentation, prior to normal O&M manual submittals, to the CxA for development of pre-functional and functional testing procedures.

    a. Typically, this will include detailed manufacturer installation and start- up, operating, troubleshooting and maintenance procedures, full details of any owner-contracted tests, fan and pump curves, full factory testing reports, if any, and full warranty information, including all responsibilities of the Owner to keep the warranty in force clearly identified. In addition, the installation, start-up and checkout materials that are actually shipped inside the equipment and the actual field checkout sheet forms to be used by the factory or field technicians shall be submitted to the Commissioning Agent.

14. The Commissioning Agent may request further documentation necessary for the commissioning process.
15. Provide a copy of the O&M manuals and approved submittals of commissioned equipment to the CxA for review.
16. Contractors shall assist (along with the design engineers) in clarifying the operation and control of commissioned equipment in areas where the specifications, control drawings or equipment documentation is not sufficient for writing detailed testing procedures.
17. Provide limited assistance to the CxA in preparing the specific pre-functional and functional performance test procedures as outlined in the Commissioning Plan. Subs shall review test procedures to ensure feasibility, safety and equipment protection and provide necessary written alarm limits to be used during the tests.

18. Develop a full start-up and initial checkout plan using manufacturer's start-up method of procedures (MOPs) and the pre-functional checklists from the CxA for all commissioned equipment. Submit to CxA for review and approval prior to startup.
19. During the startup and initial checkout process, execute the mechanical and electrical-related portions of the pre-functional checklists for all commissioned equipment.
20. Participate in Installation Inspections. Prior to acceptance, inspect, operate and test all equipment, materials and components, whether such tests are detailed in this specification or not. Tests will be witnessed by all the stake holders (*Commissioning Agent, MEP consultant, Owners representative, etc)*, as prescribed in the commissioning plan; to ensure that the operation of the systems and components satisfies the requirements of the Contract Documents. Repair any equipment deficiencies during installation inspections.
21. Participate in Pre-Functional Inspections. Repair any equipment deficiencies during pre-functional inspections.
22. Execute Functional Performance Tests as directed by the CxA. Record any equipment deficiencies during functional testing.
23. Notify the Commissioning Agent a minimum of two weeks in advance of readiness of installation inspections, pre-functional inspections, and system start up, so that the witnessing equipment and system start-up and testing can begin.
24. Notify the Commissioning Agent a minimum of two weeks in advance of the time for start of the TAB work. Attend the initial TAB meeting for review of the official TAB procedures.
25. Include any specific testing required by CxA / Stake holder, or any other body having jurisdiction over the installation, and as directed by the Owner / stake holder.
26. Provide all tools, equipment, labor and materials required to perform the mechanical and electrical testing. Provide *three copies of the test reports to the Owner.*
27. Any deficiencies in test results shall be immediately reported to the CxA / stake holder.
28. Correct deficiencies (differences between specified and observed performance) as interpreted by the owner / stake holder and retest the equipment.
29. If any test fails the test shall be repeated after taking necessary corrective measures. Ensure that retesting is not required due to contractor or vendor preparedness. The Contractor shall confirm that troubleshooting and field QA testing is complete and the commissioned equipment and systems are ready for Functional Performance Testing.
30. Test in accordance with the applicable standards issued by the local authorities having jurisdiction (e.g. ASHRAE, SMACNA, DW143, IEEE, NETA, NEBB, ASME, NFPA, DOB), and with the recommendations of the manufacturers.
31. Include the cost of all testing in the bid price, whether performed in the field or at the factory. Inform the manufacturers of the factory and site testing requirements.
32. Make test records in a neat and legible manner, fully identifying the equipment or system being tested, type of test equipment, calculation, and expiry date for the same, the test results and the date of the test. Submit to the Commissioning Team at the end of each test. All the test results & records to be maintained as prescribed in the Commissioning plan & the same to be approved from the owners representative / commissioning Agent prior to final submission to the owner.
33. Do not energize any equipment until the test results have been reviewed, passed and approved by the EOR, Owner, CxA / Stakeholders.
34. Carryout all tests in accordance to an approved procedure by the Owner / stake holder and all necessary data and results which may be requested by the Owner / Stake holder.
35. Prior to acceptance, inspect, operate and test all equipment, materials and components, whether such tests are detailed in this specification or not. Tests will be witnessed by all the stake holders (*Commissioning Agent, MEP consultant, Owners representative, etc)*, as prescribed in the commissioning plan; to ensure that the operation of the systems and components satisfies the requirements of the Contract Documents.
36. Perform and clearly document all completed startup and system operational checkout procedures, providing a copy to the CxA.
37. Address all site observation and quality issue list items provided by EOR, Owner, CxA / stake holder during pre-functional testing before executing functional testing. Air and water Testing and Balancing (TAB) shall be completed with discrepancies and problems remedied before functional testing of the respective air- or water- related systems.

38. Attend Commissioning coordination meetings and provided assistance and cooperate in the preparation of a commissioning schedule with the CM and CxA.
39. Prepare preliminary schedule for MEP/FA/FP system orientations and inspections, O&M manual submissions, training sessions, pipe and duct system testing, flushing and cleaning, equipment start-up, TAB and task completion for use by the Commissioning Agent. Update schedule as appropriate throughout the construction period.
40. Commissioning Tasks shall be performed by the same personnel who were involved in the installation and are familiar with the equipment.
41. Provide commissioning team to execute starting of equipment and to execute the functional performance tests under the direction of the CxA for specified equipment outlined in the Commissioning Plan. Ensure that they are available and present during the agreed upon schedules and for sufficient duration to complete the necessary tests, adjustments and problem-solving.
42. Prepare O&M manuals according to the Contract Documents, including clarifying and updating the original sequences of operation to as-built conditions.
43. During construction, maintain as-built red-line drawings for all drawings and final CxA as-builts for contractor-generated coordination drawings. Update after completion of commissioning (excluding deferred testing).
44. Provide training of the Owner's operating staff using expert qualified personnel, as specified.
45. Provide training plan submittal and obtain approval prior to training from CxA.
46. Coordinate with equipment manufacturers to determine specific requirements to maintain the validity of the warranty.
47. Provide standby and assistance for specific testing requiring the coordination of multiple trades and where this contractor's equipment and systems are a part of the test or must be functioning to allow for complete performance and testing verification. This shall include but not be limited to the "Pull the Plug" test, emergency generator testing.
48. Coordinate with other MEP/FA/FP Division contractors (additional subs and other trades) on the project as required and directed by the CM and CxA.
49. Ensure that retesting is not required due to contractor or vendor preparedness. The Contractor shall verify that the commissioned equipment and systems are ready for Functional Performance Testing.
50. Execute seasonal or deferred functional performance testing, witnessed by the CxA, according to the specifications.
51. Correct deficiencies and make necessary adjustments to O&M manuals and as- built drawings for applicable issues identified in any seasonal testing.
52. In compliance with the requirements of LEED, the project must perform near end of warranty re-testing and commissioning. This shall be performed by Owner personnel. Contractors shall return to the site with personnel originally involved with the commissioning of the project to assist the Owner personnel by providing any information needed to correct problems and instruct in the proper operation of the equipment and systems.
53. Support final testing once all construction is completed.

F. Controls Contractor. The commissioning responsibilities of the controls contractor, during construction and acceptance phases in addition to those listed in are:

1. Sequences of Operation Submittals.

    a. The Controls Contractor's submittals of control drawings shall include complete detailed sequences of operation for each piece of equipment, regardless of the completeness and clarity of the sequences in the specifications. They shall include:
    b. An overview narrative of the system (1 or 2 paragraphs) generally describing its purpose, components and function.
    c. All interactions and interlocks with other systems.
    d. Detailed delineation of control between any packaged controls and the building automation system, listing what points the BMS monitors only and what BMS points are control points and are adjustable.

e. Written sequences of control for packaged controlled equipment. (Equipment manufacturers' stock sequences may be included, but will generally require additional narrative).
f. Start-up sequences.
g. Warm-up mode sequences.
h. Normal operating mode sequences.
i. Unoccupied mode sequences.
j. Shutdown sequences.
k. Capacity control sequences and equipment staging.
l. Temperature and pressure control: setbacks, setups, resets, etc.
m. Detailed sequences for all control strategies, e.g., economizer control, optimum start/stop, staging, optimization, demand limiting, etc.
n. Effects of power or equipment failure with all standby component functions.
o. Sequences for all alarms and emergency shut downs.
p. Define full sequences for damper operation including fire smoke and alarm activation.
q. Seasonal operational differences and recommendations.
r. Initial and recommended values for all adjustable settings, setpoints and parameters that are typically set or adjusted by operating staff; and any other control settings or fixed values, delays, etc. that will be useful during testing and operating the equipment.
s. Schedules, as clarified.
t. To facilitate referencing in testing procedures, all sequences shall be written in small statements, each with a number for reference. For a given system, numbers will not repeat for different sequence sections, unless the sections are numbered. An updated as-built version of the control drawings and sequences of operation shall be included in the final controls O&M manual submittal.

2. Assist and cooperate with the TAB contractor in the following manner:

a. Meet with the TAB contractor prior to beginning TAB and review the TAB plan to determine the capabilities of the control system toward completing TAB. Provide the TAB any needed unique instruments for setting DDC controllers and other control devices and/or interfaces and instruct TAB in their use (handheld control system interface for use around the building during TAB, etc.).
b. For a given area, have all required pre-functional checklists, calibrations, startup and selected functional tests of the system completed and approved by the CxA prior to TAB.
c. Provide a qualified technician to operate the controls to assist the TAB contractor in performing TAB, or provide sufficient training for TAB to operate the system without assistance.
d. Assist the TAB in the location and operation of all control and fire/smoke dampers, valve actuators, static pressure controllers, thermostats, measure and verification devices, etc.
e. TAB shall be responsible for the checking of the calibration of all flow measuring devices. Controls contractor shall coordinate with the TAB to validate and demonstrate proper measurements and calibration to the CxA.

3. Assist and cooperate with the CxA in the following manner:

a. Using a skilled technician who is familiar with this building, execute the functional testing of the controls system as specified for the controls contractor in the Commissioning Plan. Assist in the functional testing of all equipment specified in the Commissioning Plan. Provide two-way radios during the testing.
b. The functional testing of equipment with respect to the building automation system shall include both commissioning of any temporary network and re-commissioning of the systems after migrating to the permanent network. Re-commissioning activities may consist of a re-verification of safeties and confirmation of any IP address updates.

c. Execute all control system trend logs as requested by the Owner and/or CxA to demonstrate performance but also on request to trouble shoot system and equipment problems.

4. The controls contractor shall prepare a written point-to-point test plan indicating in a step-by-step manner, the procedures that will be followed to test, checkout and adjust the control system prior to functional performance testing.

a. At minimum, the plan shall include for each type of equipment controlled by the automatic controls:

1) System name.
2) List of devices.
3) Step-by-step procedures for testing each controller after installation, including:
4) Process of verifying proper hardware and wiring installation.
5) Process of downloading programs to local controllers and verifying that they are addressed correctly.
6) Process of performing operational checks of each controlled component.
7) Plan and process for calibrating valve and damper actuators and all sensors.
8) A description of the expected field adjustments for transmitters, controllers and control actuators should control responses fall outside of expected values.
9) A copy of the log and field checkout sheets that will document the process. This log must include a place for initial and final read values during calibration of each point and clearly indicate when a sensor or controller has “passed” and is operating within the contract parameters.
10) A description of the instrumentation required for testing.
11) Indicate what tests on what systems should be completed prior to TAB using the control system for TAB work. Coordinate with the CxA and TAB contractor for this determination.

b. Provide a signed and dated certification to the CxA and CM upon completion of the point-to-point checkout of each controlled device, equipment and system prior to functional testing for each piece of equipment or system, that all system programming is complete as to all respects of the Contract Documents, to demonstrate the functional testing requirements.

G. Testing, Adjusting and Balancing (TAB) Contractor.

1. The duties of the TAB contractor, in addition to those listed in (A) as well as the applicable Specifications for Testing, Adjusting and Balancing are:
2. Two months prior to starting TAB, submit to the CM the qualifications of the site technician for the project, including the name of the contractors and facility managers of recent projects the technician on which was lead. The Owner will approve the site technician’s qualifications for this project.
3. Submit the outline of the TAB plan and approach for each system and component to the CxA, CM and the controls contractor six (6) months prior to starting the TAB. This plan will be developed after the TAB has some familiarity with the control system.
4. The submitted plan will include:

a. Certification that the TAB contractor has reviewed the construction documents, contractor coordination drawings and the systems with the design engineers and contractors to sufficiently understand the design for each system.
b. An explanation of the intended use of the building control system. The controls contractor will comment on feasibility of the plan.
c. All field checkout sheets and logs to be used that list each piece of equipment to be tested, adjusted and balanced with the data cells to be gathered for each.

d. Discussion of what notations and markings will be made on the duct and piping drawings during the process.
e. Final test report forms to be used. The information gathered and the format of the sheets is subject to review and shall be altered as requested by the CxA and/or Owner.
f. Detailed step-by-step procedures for TAB work for each system and issue: terminal flow calibration (for each terminal type), diffuser proportioning, branch / submain proportioning, total flow calculations, rechecking, diversity issues, expected problems and solutions, etc. Criteria for using air flow straighteners or relocating flow stations and sensors will be discussed. Provide the analogous explanations for the water side.
g. List of all air flow, water flow, sound level, system capacity and efficiency measurements to be performed and a description of specific test procedures, parameters, formulas to be used.
h. Details of how total flow will be determined (Air: sum of terminal flows via BMS calibrated readings or via hood readings of all terminals, supply (SA) and return air (RA) pitot traverse, SA or RA flow stations. Water: pump curves, circuit setter, flow station, ultrasonic, etc.).
i. The identification and types of measurement instruments to be used and their most recent calibration date.
j. Specific procedures that will ensure that both air and water side are operating at the lowest possible pressures and provide methods to verify this.
k. Confirmation that TAB understands the outside air ventilation criteria under all conditions.
l. Details of whether and how minimum outside air cfm will be verified and set, and for what level (total building, zone, etc.).
m. Details of how building static and exhaust fan / relief damper capacity will be checked.
n. Proposed selection points for sound measurements and sound measurement methods.
o. Details of methods for making any specified coil or other system plant capacity measurements.
p. Details of any TAB work to be done in phases (by floor, etc.), or of areas to be built out later.
q. Details regarding specified deferred or seasonal TAB work.
r. Details of any specified false loading of systems to complete TAB work.
s. Details of all exhaust fan balancing and capacity verifications, including any required room pressure differentials.
t. Details of any required interstitial cavity differential pressure measurements and calculations.
u. Plan for hand-written field technician logs of discrepancies, deficient or uncompleted work by others, contract interpretation requests and lists of completed tests (scope and frequency).
v. Plan for formal progress reports (scope and frequency).
w. Plan for formal deficiency reports (scope, frequency and distribution).
x. Air Balancing of filtered equipment shall be done with the filter static pressure drop equal to twice that of a clean filter. All unit component pressure drops shall be listed on the final balancing forms.
y. Air Balancing shall be done with variable frequency drives at from 55 to 60Hz and sheave adjustment with fixed sheave pending.
z. Air Balancing reports shall compare total connected CFM to total CFM at the unit. No deviation over 5% is allowed.

5. A running log of events and issues shall be kept by the TAB field technicians. Submit hand-written reports of discrepancies, deficient or uncompleted work by others, contract interpretation requests and lists of completed tests to the CxA and CM at least twice a week.

6. Communicate in writing to the controls contractor all setpoint and parameter changes made or problems and discrepancies identified during TAB which affect the control system setup and operation.
7. Provide a draft TAB report within two weeks of completion. A copy will be provided to the CxA. The report will contain a full explanation of the methodology, assumptions and the results in a clear format with designations of all uncommon abbreviations and column headings. The report should follow the latest and most rigorous reporting recommendations by AABC, NEBB or ASHRAE Standard 111.
8. Provide the CxA with any requested data, gathered, but not shown on the draft reports.
9. Provide a final TAB report for the CxA with details, as in the preliminary draft reports
10. Conduct functional performance tests and checks on the original TAB as specified for TAB in the commissioning Plan.

H. Equipment Suppliers and Miscellaneous Contractors

1. Include cost for commissioning requirements in the contract price.
2. Provide submittals, and appropriate O&M manual section(s).
3. Attend initial commissioning coordination meeting scheduled by the CxA.
4. Participate in training sessions as coordinated.
5. Demonstrate performance of equipment as applicable.
6. Provide warranty phase services as applicable.

1.5 COMMISSIONING DOCUMENTATION (PRODUCT WITH RESPONSIBLE PARTY)

A. Below is a list of various commissioning documents and the responsible party:

1.	Final commissioning plan	CxA
2.	Commissioning Meeting minutes	CxA
3.	Commissioning schedules	CM/~~GC~~ with Contractors (review and input by CxA)
4.	Pre-functional Test Procedures	CxA with A/E (Spec)
5.	Sequence clarifications	Contractors with A/E
6.	FAT- SAT Method of Procedures (MOPs)	Contractors and CM/~~GC~~
7.	Pre-functional checklist verification	Created by CxA and completed by CM/~~GC~~ with Contractors
8.	Startup and initial checkout plan	Contractors and CM/~~GC~~ delete word “GC” typically (compilation of existing documents)
9.	Startup and initial checkout forms filled out	Contractors and CM/GC
10.	BIM- Revit data capture for CMMS	Contractors and CM/GC with Revit Coordinator
11.	~~LEED Cx / MBCX Documentation~~	~~LEED Coordinator with Commissioning~~ Team
12.	Final TAB report	TAB
13.	Punchlist	A/E and CM/GC
14.	Issues Log/Deficiency reports	CxA and CM/GC
15.	Functional test forms	CxA and Contractors
16.	Filled out functional tests	CxA and Contractors
17.	O&M manuals	Contractors
18.	Overall training plan	CxA and CM/GC
19.	Specific training agendas	Contractors/Manufacturers
20.	Systems manual	CxA and Contractors
21.	Special Inspections	Special Inspection agency
22.	Final commissioning report	CxA
23.	Misc. approvals	CxA with Owner

PART 2 - PRODUCTS

2.1 TEST EQUIPMENT NEED TO PROVIDE DETAILED WRITEUP AS TO WHAT THE EXPECTATION IS SINCE THIS IS A MULTI PHASED PROJECT

A. All standard testing equipment required to perform startup and initial checkout and required functional performance testing shall be provided by the Division contractor for the equipment being tested. For example, the mechanical contractor of Division 23 shall ultimately be responsible for all standard testing equipment for the mechanical system and controls system in Division 23, except for equipment specific to and used by TAB in their commissioning responsibilities. The Contractor shall review all test requirements and have on hand any devices needed so as not delay the process in the field. An example would be amperage readings shall require the Contractor to have an amp probe immediately on hand. Two-way radios shall be provided by the Contractor.

B. Special equipment, tools and instruments (only available from vendor, specific to a piece of equipment) required for testing equipment, according to these Contract Documents shall be included in the base bid price of the Contractor and left on site, except for stand-alone datalogging equipment that may be used by the CA.

C. All data-logging equipment and software required to commission equipment shall be provided by the Controls Contractor, and shall become the property of the Owner.

D. All testing equipment shall be of sufficient quality and accuracy to test and/or measure system performance with the tolerances specified in the Specifications. If not otherwise noted, the following minimum requirements apply: Temperature sensors and digital thermometers shall have a certified calibration within the past year to an accuracy of 0.5°F and a resolution of + or - 0.1°F. Pressure sensors shall have an accuracy of + or - 2.0% of the value range being measured (not full range of meter) and have been calibrated within the last year. All equipment shall be calibrated according to the manufacturer's recommended intervals and when dropped or damaged. Calibration tags shall be affixed or certificates readily available.

E. Refer to the Commissioning Plan for details regarding equipment that may be required to simulate required test conditions.

PART 3 - EXECUTION

3.1 GENERAL – NEED TO PROVIDE DETAILED WRITEUP AS TO WHAT THE EXPECTATION IS SINCE THIS IS A MULTI PHASED PROJECT

A. The general process of the Execution of the Commissioning Process will require the completion of the following steps/functions/procedures:

1. The Vendor / Manufacturer will be required to perform factory testing as described in the specific equipment documentation / specifications and provide certified factory test reports on certain pieces of equipment. Not every section of the specification will require a factory test. Where factory testing is called for, each piece of equipment must be tested unless noted otherwise.
2. The contractor will generate the initial method of procedures for FAT and SAT events as coordinated with the Owner, Operations, and commissioning team.
3. The contractor with the assistance of the Vendor / Manufacturer will be required to perform a field startup test (manufacturer's startup) of specific pieces of equipment as described in the specific equipment documentation / specifications.
4. Upon completion of factory testing, submittal of factory test report(s) that is approved by the Engineer and completion of the manufacturer's field start up test, the vendor can complete the pre-functional checks as identified in the Commissioning Plan.
5. Contractors develop a plan for specified static/integrity tests for CxA review and execute the plan. All results are to be provided to the CxA and design engineer for review.

6. The CxA will meet with the Contractor to develop proper test procedures and observe each Contractor performing the initial test of one Pre-functional Check of a specific piece of equipment or testing process. Once one check is administered, the contractor / vendor will be responsible for completing the remainder of the similar checks under the supervision of the CM. The Contractor shall be responsible for completing the forms electronically and submitting them to the CxA for review and approval.
7. The Controls Contractor is to complete the point-to-point verifications prior to functional testing.
8. Contractor to certify that MEP/FA/FP instrumentation and control systems have been completed and calibrated, that they are operating according to the Contract Documents, and that pretest set points have been recorded.
9. Upon submission of pre-functional testing and approval of pre-functional testing forms by the CxA, the vendor can then schedule the functional testing of the equipment that will be witnessed at a minimum by the CxA and CM.
10. Contractor to certify that testing, adjusting, and balancing procedures have been completed and that testing, adjusting, and balancing reports have been submitted, discrepancies corrected, and corrective work approved.
11. The Contractor to set systems, subsystems, and equipment into operating mode to be tested (e.g., normal shutdown, normal auto position, normal manual position, unoccupied cycle, emergency power, and alarm conditions).
12. The Contractor is to inspect and verify the position of each device and interlock identified on checklists.
13. The Contractor is to check safety cutouts, alarms, and interlocks with smoke control and life-safety systems during each mode of operation.
14. The CxA will observe and administer each Functional Test of each piece of equipment and will document the results of the test.
15. Upon successful completion of the functional system test and sign-off from all parties involved the vendor can schedule any training sessions with site personnel that may be required.
16. Contractor shall support CxA and make necessary arrangements for scheduling system tests. Contractor shall provide all the necessary manpower and instruments required to perform the test as directed by CxA.
17. Contractor needs to follow the entire documentation expectation as prescribed in the commissioning plan.
18. Simulated conditions may need to be imposed using an artificial load when it is not practical to test under design conditions. Before simulating conditions, calibrate testing instruments. Provide equipment to simulate loads. Set simulated conditions as directed by the CxA and document simulated conditions and methods of simulation. After tests, return settings to normal operating conditions.
19. The CxA may direct that set points be altered when simulating conditions is not practical.
20. The CxA may direct that sensor values be altered with a signal generator when design or simulating conditions and altering set points are not practical.
21. See the commissioning Plan for additional information

B. General Testing Requirements

1. Provide technicians, instrumentation, and tools as required to perform the functional commissioning tests at the direction of the CxA.
2. Scope of HVAC&R testing shall include entire HVAC&R installation, from central equipment for heat generation and refrigeration through distribution systems to each conditioned space. Testing shall include measuring capacities and effectiveness of operational and control functions.
3. Scope of electrical testing shall include entire electrical installation, from point of project equipment to distribution equipment.
4. Scope of life safety equipment testing shall include all project installed equipment and interconnections with other systems.
5. Scope of fire protection equipment testing shall include all project installed equipment and interconnections with other systems.

6. Test all operating modes, interlocks, control responses, and responses to abnormal or emergency conditions, and verify proper response of building automation system controllers and sensors.
7. The CxA along with the installing subcontractor, testing and balancing subcontractor (where applicable), and the Control subcontractor shall prepare detailed testing plans, procedures, and checklists for systems, subsystems, and equipment.
8. Tests will be performed using design conditions whenever possible.
9. Simulated conditions may need to be imposed using an artificial load when it is not practical to test under design conditions. Before simulating conditions, calibrate testing instruments. Provide equipment to simulate loads. Set simulated conditions as directed by the CxA and document simulated conditions and methods of simulation. After tests, return settings to normal operating conditions.
10. The CxA may direct that set points be altered when simulating conditions is not practical.
11. The CxA may direct that sensor values be altered with a signal generator when design or simulating conditions and altering set points are not practical.
12. If tests cannot be completed because of a deficiency outside the scope of the systems to be commissioned, document the deficiency, and report it to the Owner. After deficiencies are resolved, reschedule tests.
13. If the testing plan indicates specific seasonal testing, complete appropriate initial performance tests and documentation and schedule seasonal tests.

3.2 TESTING AND BALANCING VERIFICATION – NEED TO PROVIDE DIRECTION ON HOW THIS WILL OCCUR SINCE IT'S A MULTI PHASED PROJECT

A. Prior to performance of testing and balancing Work, provide copies of reports, sample forms, checklists, and certificates to the CxA. Provide TAB plan.

B. Notify the CxA at least 10 days in advance of testing and balancing Work, and provide access for the CxA to witness testing and balancing Work.

C. Provide technicians, instrumentation, and tools to verify testing and balancing of HVAC&R systems at the direction of the CxA. CxA may require spot check of readings listed on TAB report.

1. The CxA will notify Construction Manager and testing and balancing subcontractor 5 days in advance of the date of field verification. Notice will not include data points to be verified.
2. The testing and balancing subcontractor shall use the same instruments (by model and serial number) that were used when original data were collected.
3. Failure of an item includes, other than sound, a deviation of more than 10 percent. Failure of more than 10 percent of selected items shall result in rejection of final testing, adjusting, and balancing report. For sound pressure readings, a deviation of 3 dB shall result in rejection of final testing. Variations in background noise must be considered.
4. Remedy the deficiency and notify the CxA so verification of failed portions can be performed.

3.3 STARTUP – NEED TO DISCUSS AND AGREE ON HOW THIS WILL HAPPEN SINCE THIS IS A MULTI PHASED PROJECT

A. The MEP and controls contractors shall follow the start-up and initial checkout procedures listed in the Responsibilities list in this section and in the Commissioning Plan. All MEP Divisions have start-up responsibility and are required to complete systems and sub-systems so they are fully functional, meeting the design objectives of the Contract Documents. The commissioning procedures and pre-functional and functional testing do not relieve or lessen this responsibility or shift that responsibility partially to the Commissioning Authority, CM or Owner.

B. Functional testing is intended to begin upon completion of a system. Functional testing may proceed prior to the completion of systems or sub-systems at the discretion of the CxA and

Owner. Beginning system testing before full completion, does not relieve the Contractor from fully completing the system, including all pre-functional checklists as soon as possible.

3.4 PRE-FUNCTIONAL AND FUNCTIONAL PERFORMANCE TESTS – SAME AS ABOVE

A. Refer to the Commissioning Plan for a list of systems to be commissioned for a description of the process and for specific details on the required functional performance tests.

B. Pre-functional and Installation Checklist (PF or IC) - a list of items to inspect and elementary component tests to conduct to verify proper installation of equipment, provided by the CxA to the Sub. Pre-functional checklists are primarily static inspections and procedures to prepare the equipment or system for initial operation (e.g., belt tension, oil levels OK, labels affixed, gages in place, sensors calibrated, etc.). However, some pre-functional checklist items entail simple testing of the function of a component, a piece of equipment or system (such as measuring the voltage imbalance on a three-phase pump motor of a chiller system). The word pre-functional refers to before functional testing. Pre-functional checklists augment and are combined with the manufacturer's start-up checklist. Even without a commissioning process, contractors typically perform some, if not many, of the pre-functional checklist items a commissioning authority will recommend. However, few contractors document in writing the execution of these checklist items. Therefore, for most equipment, the contractors execute the checklists on their own. The commissioning authority only requires that the procedures be documented in writing, and does not witness much of the pre-functional checks, except for larger or more critical pieces of equipment.

C. Pipe system cleaning, flushing, hydrostatic tests, and chemical treatment requirements are specified in Division 210000, Division 220000. and Division 230000 piping Sections. These tests are referred to as static tests within the Commissioning Plan. The respective subcontractor shall prepare a pipe system cleaning, flushing, and hydrostatic testing plan. Provide cleaning, flushing, testing, and treating plan and final reports to the CxA. Plan shall include the following:

1. Sequence of testing and testing procedures for each section of pipe to be tested, identified by pipe zone or sector identification marker. Markers shall be keyed to Drawings for each pipe sector, showing the physical location of each designated pipe test section. Drawings keyed to pipe zones or sectors shall be formatted to allow each section of piping to be physically located and identified when referred to in pipe system cleaning, flushing, hydrostatic testing, and chemical treatment plan.
2. Description of equipment for flushing operations.
3. Minimum flushing water velocity.
4. Tracking checklist for managing and ensuring that all pipe sections have been cleaned, flushed, hydrostatically tested, and chemically treated.

D. Functional Performance Test (FT) - test of the dynamic function and operation of equipment and systems using manual (direct observation) or monitoring methods. Functional testing is the dynamic testing of systems (rather than just components) under full operation (e.g., the chiller pump is tested interactively with the chiller functions to see if the pump ramps up and down to maintain the differential pressure setpoint). Systems are tested under various modes, such as during low cooling or heating loads, high loads, component failures, unoccupied, varying outside air temperatures, fire alarm, power failure, etc. The systems are run through all the control system's sequences of operation and components are verified to be responding as the sequences state. Traditional air or water test and balancing (TAB) is not functional testing, in the commissioning sense of the word. TAB's primary work is setting up the system flows and pressures as specified, while functional testing is verifying that which has already been set up. The commissioning authority develops the functional test procedures in a sequential written form, coordinates, oversees and documents the actual testing, which is usually performed by the installing contractor or vendor. Functional Tests are performed after static/integrity tests, point-to-point verifications, pre-functional checklists, and startups are complete.

E. HVAC&R System Testing

1. HVAC&R System Testing: Provide technicians, instrumentation, tools, and equipment to test performance of HVAC&R equipment specified within the systems to be commissioned. The CxA shall determine the sequence of testing and testing procedures for each equipment item and pipe section to be tested.
2. HVAC&R Instrumentation and Control System Testing: Field testing plans and testing requirements are specified in Division 23 Sections "Instrumentation and Control for HVAC" and "Sequence of Operations for HVAC Controls." Contractors to assist the CxA with preparation of testing plans.
3. HVAC&R Distribution System Testing: Provide technicians, instrumentation, tools, and equipment to test performance of air, steam, and hydronic distribution systems; special exhaust; and other distribution systems, including HVAC&R terminal equipment and unitary equipment.

F. Electrical System Testing:

1. Conform to General Requirements for Electrical Services of Division 26.
2. Prior to acceptance, inspect, operate and test all electrical equipment, materials and components, whether such tests are detailed in this specification or not. Tests will be witnessed by all the stake holders (Commissioning Authority, MEP consultant, Owners representative / Construction Manager / General Contractor), as prescribed in the commissioning plan; to ensure that the operation of the systems and components satisfies the requirements of the Contract Documents.
3. Include any specific testing required by the Authorities, or any other body having jurisdiction over the installation, and as directed by the Owner / stake holder.
4. Provide all tools, equipment, labor and materials required to perform the electrical testing.
5. Provide and maintain record copies of the test reports for the Owner.
6. Ensure that phasing and phase rotation is the same throughout the system. Ensure that all devices are wired for the same polarity.
7. Test all electrical systems and installation in accordance to the related standards and in accordance to the equipment manufacturers testing procedure.
8. Provide all testing to demonstrate proper operation as required by these Specifications and the authorities having jurisdiction of the electric system, equipment and components as indicated on the Drawings and as specified herein. Tests shall include, but not be limited to the items specified in this section and in other Division 26 Specification sections.

G. Fire Protection System Testing: Provide technicians, instrumentation, tools, and equipment to test performance of fire protection systems and equipment at the direction of the CxA. The CxA shall determine the sequence of testing and testing procedures for each equipment item and pipe section to be tested.

H. Fire Alarm System Testing: Provide technicians, instrumentation, tools, and equipment to test performance of life systems and equipment at the direction of the CxA. The CxA shall determine the sequence of testing and testing procedures for each equipment item and system interconnection to be tested.

I. Energy Supply System Testing: Provide technicians, instrumentation, tools, and equipment to test performance of oil, gas, steam, and hot-water systems and equipment at the direction of the CxA. The CxA shall determine the sequence of testing and testing procedures for each equipment item and pipe section to be tested.

J. Vibration Critical Frequency and Sound Tests: Provide technicians, instrumentation, tools, and equipment to test performance of vibration isolation, critical frequency isolation, audible level, and seismic controls.

3.5 TESTING DOCUMENTATION, NON-CONFORMANCE AND APPROVALS

A. Documentation. The CxA shall witness and document the results of all functional performance tests using the specific procedural forms developed for that purpose. Prior to testing, these forms are provided to the contractor for implementation.

B. Non-Conformance

1. The contractor will perform all the functional test as per the commissioning plan. Contractor and CxA will record the results of the functional test on the procedure or test form. All deficiencies or non-conformance issues shall be noted and reported to the CxA / stake holder on a standard non-compliance form.
2. Corrections of minor deficiencies identified may be made during the tests at the discretion of the CxA. In such cases the deficiency and resolution will be documented on the procedure form.
3. Every effort will be made to expedite the testing process and minimize unnecessary delays, while not compromising the integrity of the procedures. However, the CxA will not be pressured into overlooking deficient work or loosening acceptance criteria to satisfy scheduling or cost issues, unless there is an overriding reason to do so at the request of the Owner.
4. As tests progress and a deficiency is identified, the CxA discusses the issue with the executing contractor.

    a. When there is no dispute on the deficiency and the contractor accepts responsibility to correct it:

        1) The CxA documents the deficiency and the contractor's response and intentions and they go on to another test or sequence. After the day's work, the CxA submits the non-compliance reports to the CM for signature, if required. A copy is provided to the -contractor and CxA. The contractor corrects the deficiency, signs the statement of correction at the bottom of the non-compliance form certifying that the equipment is ready to be retested and sends it back to the CxA.
        2) The CxA reschedules the test and the test is repeated.

    b. If there is a dispute about a deficiency, regarding whether it is a deficiency or who is responsible:

        1) The deficiency shall be documented on the non-compliance form with the contractor's response and a copy given to the CM and to the contractor representative assumed to be responsible.
        2) Resolutions are made at the lowest management level possible. Other parties are brought into the discussions as needed. Final interpretive authority is with the CxA / stake holder. Final acceptance authority is with the Owner.
        3) The CxA documents the resolution process.
        4) Once the interpretation and resolution have been decided, the contractor corrects the deficiency, signs the statement of correction on the non-compliance form and provides it to the CxA. The CxA reschedules the test and the test is repeated until satisfactory performance is achieved.

5. Cost of Retesting

    a. The cost for the contractor to retest a pre-functional or functional test, if they are responsible for the deficiency, shall be theirs. If they are not responsible, any cost recovery for retesting costs shall be negotiated with the CM.
    b. For a deficiency identified, not related to any pre-functional checklist or start-up fault, the following shall apply: The CxA and CM will direct the retesting of the

equipment once at no “charge” to the contractor for their time. However, the CxA’s and CM’s time for a second retest will be charged to the contractor.

c. The time for the CxA and CM to direct any retesting required because a specific pre-functional checklist or start-up test item, reported to have been successfully completed, but determined during functional testing to be faulty, will be back charged to the contractor for executing the faulty pre-functional test.

d. Refer to the Commissioning Plan for requirements for testing and retesting identical equipment.

6. The Contractor shall respond in writing to the CxA and CM at least as often as commissioning meetings are being scheduled concerning the status of each apparent outstanding discrepancy identified during commissioning. Discussion shall cover explanations of any disagreements and proposals for their resolution.
7. The CxA retains the original non-conformance forms until the end of the project.
8. Any required retesting by any contractor shall not be considered a justified reason for a claim of delay or for a time extension by the prime contractor.

C. Failure Due to Manufacturer Defect

1. If 10%, or three, whichever is greater, of identical pieces (size alone does not constitute a difference) of equipment fail to perform to the Contract Documents (mechanically or substantively) due to manufacturing defect, not allowing it to meet its submitted performance spec, all identical units may be considered unacceptable by the CxA / stake holder . In such case, the Contractor shall provide the with the following:

a. Within one week of notification from the CxA / stake holder, the Contractor or manufacturer’s representative shall begin examining all other identical units until a representative number of units, as determined by the Engineer, are examined sufficient to determine the extent and cause of the failure. The findings shall be recorded and provided to the CxA / stake holder within two weeks of the original notice.

b. Within two weeks of the original notification, the Contractor or manufacturer shall provide a signed and dated, written explanation of the problem, cause of failures, etc. and all proposed solutions which shall include full equipment submittals. The proposed solutions shall not significantly exceed the specification requirements of the original installation.

c. The CxA / stake holder will determine whether a replacement of all identical units or a repair is acceptable.

d. Two examples of the proposed solution will be installed by the Contractor and the CxA / stake holder will be allowed to test the installations for up to one week, upon which the CxA / stake holder will decide whether to accept the solution.

e. Upon acceptance, the Contractor and/or manufacturer shall replace or repair all identical items, at their expense and extend the warranty accordingly, if the original equipment warranty had begun. The replacement/repair work shall proceed with reasonable speed beginning within one week from when parts can be obtained.

D. Approval

1. The CxA notes each satisfactorily demonstrated function on the test form. Formal approval of the functional test is made later after review by the CxA / stake holder, if necessary. The CxA recommends acceptance of each test to the CM using a standard form. The CxA gives final approval on each test using the same form, providing a signed copy to the Contractor.

3.6 OPERATION AND MAINTENANCE (O&M) MANUALS

A. Contractors shall comply with the requirements of specification Sections of Division 01 regarding O&M Manuals.

3.7 TRAINING OF OWNER PERSONNEL

A. Construction Manager - The CM shall be responsible for training coordination and scheduling and ultimately to ensure that training is completed. The Construction Manager will schedule the O&M training sessions through the Owner / CxA. These training sessions are to be attended by the Owner, Contractors and equipment suppliers as necessary. The format shall follow the outline in the O&M manuals.

B. Commissioning Authority – The CxA shall be responsible for overseeing and approving the content and adequacy of the training of Owner personnel for commissioned equipment. REFER TO RFP I THINK THIS SCOPE IS BEYOND WHAT WE ASKED FOR.

C. MEP-FP-FA Contractors - The contractor shall perform training utilizing both classroom instruction and field demonstrations with approved manufacturer representatives.

D. Controls Contractor - The controls contractor shall perform training utilizing on and off-site classroom instruction and field demonstrations

E. Testing and Balancing Contractor - The TAB contractor shall perform training on the results of TAB reports and measuring techniques. Contractors shall comply with the requirements of specification Sections of Division 01 regarding Training.

3.8 DEFERRED TESTING

A. Unforeseen Deferred Tests. If any check or test cannot be completed due to the building structure, required occupancy condition or other deficiency, execution of checklists and functional testing may be delayed upon approval of the CM. These tests will be conducted in the same manner as the seasonal tests as soon as possible. Services of necessary parties will be negotiated.

B. Seasonal Testing. During the warranty period, seasonal testing (tests delayed until weather conditions are closer to the system's design) specified in Commissioning Plan shall be completed as part of this contract. The CxA and CM shall coordinate this activity. Tests will be executed, documented and deficiencies corrected by the appropriate Subs, with facilities staff and the CxA witnessing. Any final adjustments to the O&M manuals and as-builts due to the testing will be made. Seasonal tests shall be carried out through the first year of building operation and shall be scheduled based on building occupancy and under proper load conditions.COMPARE AGAINST RFP SCOPE ISSUED BY TOWN.

3.9 COMMISSIONED EQUIPMENT AND SYSTEMS and how are we handling envelope????

A. Equipment including but not limited to: compare and refer to rfp issued by Town so scope matches…

1. Building HVAC and Energy Systems

   a. Electric Duct Heater
   b. Outside Air Fan
   c. Transfer Exhaust Fan
   d. Electric Unit Heater
   e. Fan Powered Box
   f. Variable Air Volume Box
   g. BMS Controls and Integration (temporary and permanent)
   h. Kitchen Exhaust System
   i. Pre-Purchased Packaged AC Unit (Mammoth)
   j. Pre-Purchased CRAC Units

2. Plumbing Systems

a. Electric Water Heater
b. Leak Detection
c. Heat Trace
d. BMS Integration (temporary and permanent)

3. Electrical Systems

a. Lighting Controls
b. High Voltage Panel Board
c. Low Voltage Panel Board
d. Bus Duct
e. Digital Meter
f. Fused Disconnect Switch
g. Emergency Lighting
h. Daylight Dimming/Harvesting
i. BMS Integration

4. Fire Protection Systems

a. Pre-Action Systems
b. Sprinkler Systems
c. BMS Integration

5. Fire Alarm Systems

a. Fire Alarm Initiating Devices

1) Area Smoke Detectors
2) Duct Smoke Detectors
3) Carbon Monoxide Detectors (if applicable)
4) Pull Stations
5) Tamper Switches
6) Water Flow Switches

b. Fire Alarm Panels
c. Alarm Annunciators

1) Alarms
2) Strobes
3) Speakers

d. BMS Integration

END OF SECTION 019100

SECTION 020100 – PROTECTION OF EXISTING UTILITIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawing and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

B. Section 310000 - Earthwork

C. Section 312333 - Trench Excavation and Backfill for Utilities

D. Section 312316 - Excavation, Backfill and Subgrade Preparation for Pavement

E. Contract Drawings and Documents

1.2 SCOPE OF WORK

A. Identification and field mark out of all on-site utility lines to remain in operation during construction.

B. Identification and field markout of all off-site utility lines within construction work areas.

C. Submission of procedures to be used to ensure the safety of the utility.

D. Conduct test pit excavation at all proposed utility crossings prior to construction.

E. Repair of any damage during construction operations.

F. Relocate utilities that are indicated as such.

1.3 PROJECT RECORD DOCUMENTS

A. Accurately record actual locations of capped utilities and utility lines encountered during construction.

B. Accurately record actual locations and elevations of existing utilities at proposed utility crossings prior to utility and storm sewer construction. Submit recorded data to Owner’s Engineer for verification of proposed design.

1.4 REGULATORY REQUIREMENTS

A. Contractor shall notify all affected utility companies, agencies, authorities, owners, etc. at least 48 hours prior to the commencement of work or as required by each agency and shall comply with their requirements.

B. Contractor shall contact the “Call Before You Dig” service for an official utility mark out.

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION

3.1 IDENTIFICATION

A. Prior to commencement of work, contractor shall locate all existing utilities which are to remain in service and/or require relocating during construction as shown on the Contract Drawings. Contractor shall record location, depth from existing grade, size and type of existing utility. If existing utilities are in conflict with proposed improvements shown on the contract drawings, it shall be the responsibility of the contractor to inform the Owner and Owner's Engineer prior to commencement of work to determine alternate resolutions of conflict. Contractor shall take responsibility of utility relocation in the absence of such coordination prior to commencement of work.

3.2 PROTECTION

A. Flag, barricade or suitably protect existing utilities during construction operations and equipment movement. Install shoring and bracing as required.

B. Prevent interruption of existing utility service to occupied or used facilities, except when authorized in writing by authorities having jurisdiction.

3.3 LATERAL DISCONNECTION

A. Where a utility line is to be disconnected from portions to remain, the lateral pipes shall be cut and suitably plugged/capped in accordance with the Contract Drawings and applicable utility or agency requirements.

3.4 REPAIRS

A. Any damage to existing, operational utilities by the Contractor or his subcontractors during the on-going construction operation shall be immediately repaired to operational standards at the Contractor's expense. If the repairs are not immediately addressed by the Contractor, the utility owner and/or the Owner shall have the right to contract for the repair at the Contractor's expense.

3.5 RELOCATIONS

A. Where utility lines are designated to be relocated, construct new utilities as shown and in accordance with these specifications and then remove former service to minimize disruption to the best extent practical. This operation shall be coordinated with the appropriate Authorities, as necessary.

B. Coordinate with the Owner for necessary shut-offs or temporary disruption to existing services.

END OF SECTION 020100

SECTION 022113 – PROJECT SURVEYING AND LAYOUT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawing and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

B. Section 310000 – Earthwork

C. Section 321216 – Asphaltic Concrete Pavement

D. Section 321613 – Concrete Curb and Sidewalks

E. Section 334100 – Storm Sewer Systems

F. Section 333000 – Site Sanitary Sewers

G. Section 337100 – Utilities

H. Contract Drawings and Documents

1.2 SCOPE OF WORK

A. The Contractor shall employ a Connecticut Licensed Land Surveyor to do all necessary surveying required to construct all elements of the Project as shown on the Contract Drawings and specified herein.

B. Once survey items are laid out, it is the contractors' responsibility to ensure that all survey stakes are protected and that data remains in good usable condition. Should the survey marks or data need to be replaced, additional survey work will be the responsibility of the contractor, and will be performed at no additional cost to the Owner.

C. All surveys shall be signed and sealed by the Contractor's Land Surveyor, licensed to practice in the State of Connecticut.

D. All project installations improperly constructed as a result of Contractor error shall be properly relocated by the Contractor at no cost to the Owner.

1.3 REFERENCE STANDARDS

A. In accordance with local rules and regulations.

SECTION 022113 – PROJECT SURVEYING AND LAYOUT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawing and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

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C. Section 321216 – Asphaltic Concrete Pavement

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1.2 SCOPE OF WORK

A. The Contractor shall employ a Connecticut Licensed Land Surveyor to do all necessary surveying required to construct all elements of the Project as shown on the Contract Drawings and specified herein.

B. Once survey items are laid out, it is the contractors' responsibility to ensure that all survey stakes are protected and that data remains in good usable condition. Should the survey marks or data need to be replaced, additional survey work will be the responsibility of the contractor, and will be performed at no additional cost to the Owner.

C. All surveys shall be signed and sealed by the Contractor's Land Surveyor, licensed to practice in the State of Connecticut.

D. All project installations improperly constructed as a result of Contractor error shall be properly relocated by the Contractor at no cost to the Owner.

1.3 REFERENCE STANDARDS

A. In accordance with local rules and regulations.

1.4 QUALITY ASSURANCE

A. All construction layout work shall be performed under the direction of a Professional Land Surveyor.

B. The survey crew will discuss all layout procedures with the Contractor’s supervisor prior to commencing work.

C. The survey crew daily report shall be filled out and signed by the Contractor’s supervisor at the end of that day’s layout.

D. Copies of sketches, cut sheets, etc. shall be provided to the Contractor by the end of the next workday.

E. All costs related to re-staking due to construction or Contractor’s work resulting in destruction or movement of stakes shall be paid for by the Contractor and at no additional expense to the Owner.

F. Building dimensions to be coordinated with approved architectural plans.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Provide all instruments, equipment, stakes, monuments, marking paints and other materials necessary to perform the work satisfactorily.

PART 3 - EXECUTION

3.1 GENERAL

A. Qualified personnel and adequate equipment shall be made available by the Contractor to maintain control points and layout all lines and grades throughout the duration of the Contract.

B. The exact position of all work points shall be established from control points, base line transit points and/or other points of similar nature based upon information provided in Contract Documents.

C. The Contractor shall establish, re-establish when necessary and maintain control points throughout the life of the Contract to permit the Engineer to make the necessary preliminary, interim and final measurements and to check the Contractor's layout.

D. The Contractor shall be responsible for the preservation of all control points. If control points are damaged, lost or moved, they shall be reset at no additional expense to the Owner. Control points outside as well as inside the Contract Limits shall be used for construction.

E. The Contractor shall provide and maintain offset stakes for each base line, at each station, and out of the limits of grading and construction. Each stake shall be identified and marked to show the offset distance from the base line and the Contractor shall furnish sheets showing cuts and fills to the finished profile and cross section lines.

F. Any error, apparent discrepancy or absence of data shown or required for accurately accomplishing the survey work shall be referred to the Owner's Engineer for interpretation or furnishing when such is observed or required.

G. The Owner's Engineer may check all or any portion of the survey work or notes made by the Contractor. Any necessary correction to the work shall be made immediately by the Contractor. Such verification by the Owner's Engineer shall not relieve the Contractor of any responsibilities for the accuracy and completeness of his work.

H. The Contractor shall keep a survey transit and level with tripod and survey rod on the project at all times to be used for checking inverts, surveyor's stakes, etc.

I. The Contractor shall submit all survey data for daily checks, to the office of the Owner's Engineer after the data is obtained.

J. The Contractor shall submit cut sheets for the Owner's Engineers approval prior to any construction activity, for the purpose of verifying the construction layout. Cut sheets for any particular item of work shall be submitted prior to the need for approval. All cut sheets shall be prepared by a Licensed Land Surveyor and shall bear his seal and signature.

K. In cases where extra excavation is required, before and after cut sheets shall be submitted for determination of quantities for excavation and backfill and extra bedding.

L. All project installation improperly constructed or located as a result of inadequate or erroneous survey layout shall be relocated or reconstructed, after demolition and/or removal of the improper work as necessary, by the Contractor at no charge to the Owner.

3.2 LAYOUT

A. Building Layout – Set a minimum of 6 corners with 2 offsets per corner. Also included will be a finished floor elevation and/or benchmark within close proximity to the proposed building.

B. Curb Layout – Stakes will be located at 50-ft stationing and also at the point of curvature, points of tangency and radius points with 4-ft offsets to the face of the curb. Cut sheets shall be provided to the Contractor by the Surveyor.

C. Storm drainage and sanitary sewer lines (including manholes and catch basins) – Stakes will be located at 50-ft stationing along the centerline of the utility at 15-ft offsets. Manholes and catch basins will have 2 offsets per structure. Cut sheets shall be provided to the Contractor by the Surveyor.

D. Water Layout – Offset stakes will be located at deflections and at hydrant locations. Hydrant elevations will be to grade ring.

E. Grade Stakes – Stakes will be located @ 50 ft. stationing along the centerline of the roadway at finished grade elevations. Off roadway areas will be at a 50 ft. grid at finished grade elevations. Cut sheets shall be provided to the contractor.

F. Lighting Layout – Centerline of lighting structure with 5-ft offsets and finished grade elevations.

G. Allowable tolerances for the project shall be generally as follows:

1. Structural work, site furnishings: horizontal location 0.1 feet; vertical elevation 0.01 feet.
2. Paving, fine grading: vertical elevation 0.1 feet.
3. Utility lines and structures: vertical elevation 0.1 feet
4. Light Poles: horizontal location 0.1 feet; vertical elevation 0.1 feet
5. Trees: horizontal location 0.5 feet.

END OF SECTION 022113

SECTION 024113 – SITE DEMOLITION

PART 1- GENERAL

1.1 RELATED SECTIONS AND DOCUMENTS

A. Drawing and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

B. The Contract Drawings and all other specification sections along with all provisions included within this contract package, instructions to bidders, and other general conditions apply to this section. The Contractor must accept the site as is and shall be deemed to have inspected the site and reviewed all Contract Documents prior to submitting a bid.

C. Section 020100 - Protection of Existing Utilities

D. Section 311100 – Clearing and Grubbing

E. Section 312500 - Soil Erosion and Sediment Control

F. Section 312333 - Trench Excavation and Backfill for Utilities

G. Section 329000 - Planting

H. Construction Drawings

1.2 SCOPE OF WORK

A. Overall work under this Contract shall include all labor, materials, equipment, supervision, coordination efforts, permitting costs, certificate costs, services, filing fees, testing costs, security, insurance and all other associated or related items specified herein that are necessary and are required to complete the Work. Work includes all demolition required to complete the project regardless of whether the demolition is specifically indicated on the drawings. Elements shall include, but not be limited to the following:

1. Demolition and removal of all existing site structures not indicated to remain including, but not limited, to modular buildings, fencing, gates, walls, railings, and free-standing items (e.g. bollards, signs, sign posts, light poles, light pole bases, canopies, benches, etc.)
2. Demolition, removal, and/or disposal of all excess topsoil, stumps, roots and organic materials, removal of existing sidewalks, drives, curbs, pavement, infield surfacing, etc.
3. Removal/Abandonment of existing above-ground and underground utilities and associated structures, including septic fields, tanks, sanitary pump station, roof leaders, other utility appurtenances and irrigation. It shall be the responsibility of the Contractor to accurately locate all facilities and to determine their extent. If such facilities obstruct the progress of the work and are not indicated to be removed or relocated, they shall be removed or relocated only as directed by the Owner.
4. Installation and maintenance of soil erosion and sediment control measures.
5. Removal from site and disposal of all excess and unusable material in accordance with applicable regulations.
6. Transportation and disposal in an appropriately licensed landfill of all demolition debris not recycled or reused on-site.

1.3 REFERENCE STANDARDS

A. National Association of Demolition Contractors (NADC) - Demolition Safety Manual, latest edition.

B. All applicable OSHA requirements and other Federal, State, and local codes, laws, ordinances, regulations, and guidelines for demolition and related work.

C. International Building Code, latest edition.

1.4 QUALITY ASSURANCE

A. The Contractor shall provide and maintain a capable and experienced field person representing the Contractor to oversee all demolition operations. The representative shall be on site during all operating hours of the project and shall prepare field reports documenting the progress of the demolition.

B. The Contractor shall obtain and pay for any permits, bonds, licenses, etc., required for demolition work.

C. The Contractor shall conduct any work within street or highway right-of-ways in accordance with the requirements of the governmental agencies having jurisdiction and shall not begin until these governing authorities have been notified. The Contractor shall restore to their present conditions any public right-of-way that is disturbed by the work under this section. All pavement restoration work in public rights-of-way shall be performed to the proper satisfaction of the governmental agencies having jurisdiction.

D. The Contractor shall dispose all construction debris in accordance with all jurisdictional agencies.

1.5 SUBMITTALS

A. PERMITS

1. Prior to the commencement of work, the Contractor shall submit to the Owner record copies of all required permits and certificates obtained for the work in this section. The Contractor shall incur all fees and other requirements associated with obtaining the required permits and certificates.

1.6 ENVIRONMENTAL REQUIREMENTS

A. Noise-producing activities shall be held to a minimum. Internal combustion engines and compressors, etc., shall be equipped with mufflers to reduce noise to a minimum. The Contractor shall comply with all noise abatement ordinances.

B. The work areas shall be sufficiently dampened to prevent dust from rising during demolition activities.

C. The Contractor shall see to it that trucks leaving the site shall use construction entrances only, as indicated on the project soil erosion and sediment control documents and do so in such a manner that mud and earth will not be deposited on adjacent street pavements. Any mud or earth deposited on street pavements shall be promptly removed by the Contractor.

D. Trucks exiting the site shall be appropriately covered.

1.7 TEMPORARY SHORING AND PROTECTION

A. Any damage done by the Contractor to existing pipe lines, utilities, etc., to remain shall be repaired by the Contractor and at his expense in a manner acceptable to the Owner of the damaged property. The Contractor shall report any existing damage prior to his beginning work.

B. The Contractor shall provide necessary temporary shoring, bracing, etc., and maintenance thereto required in accordance with all applicable OSHA Standards for the completion of demolition work. The contractor shall submit copies of all temporary excavation bracing designs intended for use onsite, signed and sealed by a Professional Engineer licensed in the state of Connecticut to the Owners Site Engineer for review prior to constructing the bracing onsite.

C. The Contractor shall insure the provisions of adequate bracing, shoring, lamps, fencing, warning signs, and flags as required by agencies having jurisdiction and as directed by the Owner. Remove same when necessity for protection ceases.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Materials are as specified on the Contract Drawings. See related sections for additional product specifications.

PART 3 - METHOD OF CONSTRUCTION

3.1 GENERAL

A. The Contractor is responsible for the demolition of existing buildings, concrete slabs, retaining walls, walks and curb, asphalt pavement, utilities, signs and miscellaneous items encountered. All demolition debris shall be disposed off-site in accordance with all applicable Federal, State, and Local codes and regulation governing legal transportation and disposal of work.

B. The general scope of demolition work is shown on the Contract Drawings. The Contractor shall include for all demolition work necessary to accomplish the construction project.

3.2 SITE VISIT

A. The Contractor shall visit the site and verify the location of all pertinent items prior to submitting a bid so that the difficulties associated with execution of the contract are fully understood. No additional compensation will be allowed for failure to be so informed.

3.3 UTILITIES

A. GENERAL:

1. Existing utilities service shall not be interrupted unless authorized in writing by authorities having jurisdiction and the Owner of the utility. Any temporary interruption necessary shall be directly coordinated and supervised by utility company personnel. The Contractor shall provide temporary services during interruptions to existing utilities, as acceptable to governing authorities and the affected utility companies and users.

B. MAINTENANCE:

1. The Contractor shall maintain and protect from damage all existing above and below ground utilities that are to remain. Other utilities to remain include, but are not necessarily limited to, above ground utility lines and transformers within the public right-of-ways. The Contractor shall immediately repair or have repaired by the appropriate utility company any damage incurred by utilities during demolition work at no cost to the Owner or municipality. The Contractor shall be responsible for notifying and coordinating with the appropriate utility companies the shut-off of utilities that are to be abandoned as part of this Contract.

C. ABANDONMENT/REMOVAL:

1. The Contractor shall disconnect and cap/terminate all services including but not limited to water, storm and sanitary sewers, gas, electric, telephone, cable TV, etc. prior to demolition. The Contractor shall determine if utility laterals to be demolished are direct and exclusive to a building before disconnection is performed.

2. Prior to removal, all utilities and sewers shall be properly purged and evacuated of all residual gases, oils, etc. or de-energized in the case of electric, telephone or other communications services. All purging and testing shall be approved by local utility or sewer companies and governing authorities having jurisdiction.

3. All utility disconnections shall be performed no later than 15 days prior to the scheduled start of demolition and must precede the demolition permit application procedure.

D. RESTORATION:

1. All underground utility lateral removals shall be properly backfilled and all disturbed pavements within the public right-of-way shall be restored to their pre-demolition (existing) condition. This includes the restoration of concrete pavement, concrete curbing, and asphalt pavement within the public right-of-way. All pavement and curbing shall be saw-cut prior to excavation in order to produce a clean and neat edge. Replacement pavement and curbing shall be equal in design performance to the existing condition and as directed by the Consultant and/or the local authority having jurisdiction. All restoration work shall be performed immediately following utility removal and backfill completion.

3.4 DISPOSAL OF DEMOLISHED MATERIALS

A. GENERAL:

1. The Contractor shall remove from the site all debris, rubbish and other materials resulting from demolition and shall safely and legally dispose of all these items in accordance with applicable Federal, State and local codes and regulations.

B. REMOVAL:

1. The Contractor shall legally and safely transport and dispose off-site all demolished materials in accordance with local, State and Federal regulations governing such operations.

2. The Contractor shall be responsible for locating and making arrangements for the safe, legal disposal of demolition material off-site during the entire course of the Contract.

END OF SECTION 024113

SECTION 024119 - SELECTIVE DEMOLITION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Demolition and removal of selected portions of building or structure.
2. Demolition and removal of selected site elements.
3. Salvage of existing items to be reused or recycled.

B. Related Requirements:

1. Section 011000 "Summary of Work" for restrictions on use of the premises, Owner-occupancy requirements, and phasing requirements.
2. Section 017300 "Execution" for cutting and patching procedures.

1.3 DEFINITIONS

A. Remove: Detach items from existing construction and dispose of them off-site unless indicated to be salvaged or reinstalled.

B. Remove and Salvage: Detach items from existing construction, in a manner to prevent damage, and deliver to Owner ready for reuse.

C. Remove and Reinstall: Detach items from existing construction, in a manner to prevent damage, prepare for reuse, and reinstall where indicated.

D. Remove and Replace: Detach items from existing construction and dispose of them off-site unless indicated to be salvaged or reinstalled. Provide and install new items as specified.

E. Existing to Remain: Leave existing items that are not to be removed and that are not otherwise indicated to be salvaged or reinstalled.

F. Dismantle: To remove by disassembling or detaching an item from a surface, using gentle methods and equipment to prevent damage to the item and surfaces; disposing of items unless indicated to be salvaged or reinstalled.

1.4 MATERIALS OWNERSHIP

A. Unless otherwise indicated, demolition waste becomes property of Contractor.

B. Historic items, relics, antiques, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, and other items of interest or value to Owner that may be uncovered during demolition remain the property of Owner.

1. Carefully salvage in a manner to prevent damage and promptly return to Owner.

1.5 PRE-INSTALLATION MEETINGS

A. Pre-demolition Conference: Conduct conference at Project site.

1. Inspect and discuss condition of construction to be selectively demolished.
2. Review structural load limitations of existing structure.
3. Review and finalize selective demolition schedule and verify availability of materials, demolition personnel, equipment, and facilities needed to make progress and avoid delays.
4. Review requirements of work performed by other trades that rely on substrates exposed by selective demolition operations.
5. Review areas where existing construction is to remain and requires protection.

1.6 INFORMATIONAL SUBMITTALS

A. Proposed Protection Measures: Submit report, including Drawings, that indicates the measures proposed for protecting individuals and property, for environmental protection, for dust control and for noise control. Indicate proposed locations and construction of barriers.

B. Schedule of Selective Demolition Activities: Indicate the following:

1. Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity. Ensure Owner's on-site operations are uninterrupted.
2. Interruption of utility services. Indicate how long utility services will be interrupted.
3. Coordination for shutoff, capping, and continuation of utility services.

C. Pre-demolition Photographs: Show existing conditions of adjoining construction, including finish surfaces, that might be misconstrued as damage caused by demolition operations. Comply with Section 013233 "Photographic Documentation." Submit before Work begins.

1.7 CLOSEOUT SUBMITTALS

A. Inventory: Submit a list of items that have been removed and salvaged.

B. Landfill Records: Indicate receipt and acceptance of hazardous wastes by a landfill facility licensed to accept hazardous wastes.

1.8 FIELD CONDITIONS

A. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.

B. Notify Architect of discrepancies between existing conditions and Drawings before proceeding with selective demolition.

D. Hazardous Materials: Present in buildings and structures to be selectively demolished. A report on the presence of hazardous materials is included elsewhere in the Contract Documents for review and use. Examine report to become aware of locations where hazardous materials are present.

1. Hazardous material remediation is specified elsewhere in the Contract Documents.
2. Do not disturb hazardous materials or items suspected of containing hazardous materials except under procedures specified elsewhere in the Contract Documents.

E. Storage or sale of removed items or materials on-site is not permitted.

F. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.

1. Maintain fire-protection facilities in service during selective demolition operations.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.

B. Standards: Comply with ASSE A10.6 and NFPA 241.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that utilities have been disconnected and capped before starting selective demolition operations.

B. Review Project Record Documents of existing construction or other existing conditions and hazardous material information provided by Owner. Owner does not guarantee that existing conditions are same as those indicated in Project Record Documents.

1. When unanticipated mechanical, electrical, or structural elements that conflict with intended function or design are encountered, investigate and measure the nature and extent of conflict. Promptly submit a written report to Architect.

C. Perform an engineering survey of condition of building to determine whether removing any element might result in structural deficiency or unplanned collapse of any portion of structure or adjacent structures during selective building demolition operations.

1. Perform surveys as the Work progresses to detect hazards resulting from selective demolition activities.

D. Survey of Existing Conditions: Record existing conditions by use of measured drawings and preconstruction photographs.

1. Comply with requirements specified in Section 013233 "Photographic Documentation."
2. Inventory and record the condition of items to be removed and salvaged. Provide photographs of conditions that might be misconstrued as damage caused by salvage operations.

3.2 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

A. Existing Services/Systems to Remain: Maintain services/systems indicated to remain and protect them against damage.

B. Existing Services/Systems to Be Removed, Relocated, or Abandoned: Locate, identify, disconnect, and seal or cap off utility services and mechanical/electrical systems serving areas to be selectively demolished.

1. Owner will arrange to shut off indicated services/systems when requested by Contractor.
2. If services/systems are required to be removed, relocated, or abandoned, provide temporary services/systems that bypass area of selective demolition and that maintain continuity of services/systems to other parts of building.
3. Disconnect, demolish, and remove fire-suppression systems, plumbing, and HVAC systems, equipment, and components indicated on Drawings to be removed.

    a. Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.
    b. Piping to Be Abandoned in Place: Drain piping and cap or plug piping with same or compatible piping material and leave in place.
    c. Equipment to Be Removed: Disconnect and cap services and remove equipment.
    d. Equipment to Be Removed and Reinstalled: Disconnect and cap services and remove, clean, and store equipment; when appropriate, reinstall, reconnect, and make equipment operational.
    e. Equipment to Be Removed and Salvaged: Disconnect and cap services and remove equipment and deliver to Owner.
    f. Ducts to Be Removed: Remove portion of ducts indicated to be removed and plug remaining ducts with same or compatible ductwork material.
    g. Ducts to Be Abandoned in Place: Cap or plug ducts with same or compatible ductwork material and leave in place.

3.3 PROTECTION

A. Temporary Protection: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.

1. Provide protection to ensure safe passage of people around selective demolition area.
2. Provide temporary weather protection, during interval between selective demolition of existing construction on exterior surfaces and new construction, to prevent water leakage and damage to structure and interior areas.
3. Protect walls, ceilings, floors, and other existing finish work that are to remain or that are exposed during selective demolition operations.
4. Cover and protect furniture, furnishings, and equipment that have not been removed.
5. Comply with requirements for temporary enclosures, dust control, heating, and cooling specified in Section 015000 "Temporary Facilities and Controls."

B. Temporary Shoring: Design, provide, and maintain shoring, bracing, and structural supports as required to preserve stability and prevent movement, settlement, or collapse of construction and finishes to remain, and to prevent unexpected or uncontrolled movement or collapse of construction being demolished.

1. Strengthen or add new supports when required during progress of selective demolition.

C. Remove temporary barricades and protections where hazards no longer exist.

3.4 SELECTIVE DEMOLITION, GENERAL

A. General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:

1. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction.

Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping. Temporarily cover openings to remain.

2. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
3. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain portable fire-suppression devices during flame-cutting operations.
4. Maintain adequate ventilation when using cutting torches.
5. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
6. Remove structural framing members and lower to ground by method suitable to avoid free fall and to prevent ground impact or dust generation.
7. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
8. All removed materials and rubbish shall be constantly sprinkled with water or other dusting agent to mitigate dust. Provide drop cloths or other type of coverings to prevent infiltration of dust to other parts of the existing building.
9. Dispose of demolished items and materials promptly. Comply with requirements in Section 017419 "Construction Waste Management and Disposal."

B. Removed and Salvaged Items:

1. Clean salvaged items.
2. Pack or crate items after cleaning. Identify contents of containers.
3. Store items in a secure area until delivery to Owner.
4. Transport items to Owner's storage area designated by Owner.
5. Protect items from damage during transport and storage.

C. Removed and Reinstalled Items:

1. Clean and repair items to functional condition adequate for intended reuse.
2. Pack or crate items after cleaning and repairing. Identify contents of containers.
3. Protect items from damage during transport and storage.
4. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make item functional for use indicated.

D. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by Architect, items may be removed to a suitable, protected storage location during selective demolition and cleaned and reinstalled in their original locations after selective demolition operations are complete.

3.5 SELECTIVE DEMOLITION PROCEDURES FOR SPECIFIC MATERIALS

A. Concrete: Demolish in sections. Cut concrete full depth at junctures with construction to remain and at regular intervals using power-driven saw, and then remove concrete between saw cuts.

B. Masonry: Demolish in small sections. Cut masonry at junctures with construction to remain, using power-driven saw, and then remove masonry between saw cuts.

C. Concrete Slabs-on-Grade: Saw-cut perimeter of area to be demolished, and then break up and remove.

3.6 DISPOSAL OF DEMOLISHED MATERIALS

A. Remove demolition waste materials from Project site and dispose of them in an EPA-approved construction and demolition waste landfill acceptable to authorities having jurisdiction.

1. Do not allow demolished materials to accumulate on-site.
2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
3. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.
4. Comply with requirements specified in Section 017419 "Construction Waste Management and Disposal."

B. Burning: Do not burn demolished materials.

3.7 CLEANING

A. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before selective demolition operations began.

END OF SECTION 024119

SECTION 028200 - SELECTIVE HAZARDOUS BUILDING MATERIALS ABATEMENT DEMOLITION

PART 1 - GENERAL

1.1 SUMMARY

A. Provide selective demolition to remove existing carpeting/multiple layers of flooring/ wood/concrete and demolish ceilings/walls/floors/doors/millwork/shelving/ countertops/ window systems/door systems/concrete/boilers/chases/mechanical systems/ductwork/piping/roofing/ masonry /stone/brick/wall and ceiling systems/raised flooring/wall materials (bulletin/chalk/white /etc. boards, mirrors), non-moveable objects, etc. as necessary to access all asbestos/ PCB/other hazardous containing materials as specified herein, and as required for complete and proper abatement.

B. The hazardous building materials contractor (contractor) will be responsible for performing selective interior and exterior demolition throughout the building that is scheduled for renovation (only demolish materials scheduled for selective demolition/demolition). Contractor shall open up walls, chases and ceilings to check for hidden piping and ductwork (as required for entire building in areas of work) as well as demolishing millwork, cabinetry, all non-moveable objects, walls, chases etc. to located potential asbestos containing flooring materials and other suspect asbestos containing materials that may be hidden, buried, inaccessible.

C. The contractor(s) will be responsible for hiring an engineer and other appropriate personnel to ensure that all required selective demolition and demolition activities are safe to perform for all personnel on site. The contractor(s) will be financially responsible for any damage that may occur to the site, on-site personnel, fines, penalties, etc. They will also be responsible for paying/reimbursing all legal fees/costs for all parties involved with the project should selective demolition or demolition activities cause injury or death to any persons on site.

D. Please note there are several layers of flooring, ceilings, walls, chases, non-moveable objects requiring demolition to access all asbestos containing materials, some of which are contaminated with asbestos/PCBs and require disposal as such.

E. Required permits shall be obtained by the Contractor at no additional cost to the Owner.

F. Notes: Contractor is responsible for removing all asbestos containing materials (behind walls, ceilings, windows, chases, doors, windows, concrete, brick, non-moveable objects, etc.) in selective demolition/demolition areas as noted by the architect's specifications and drawings.

G. The contractor will be required to remove carpeting and other flooring, wood floors, classroom wall and ceiling structures, raised flooring, multiple layers of mixed flooring to gain access to the asbestos flooring and/or mastic and carpet adhesives in all areas. There are more than one layer of flooring in most locations. All layers of floor tile, leveling materials, mastic, concrete, wood, thinset, sheet flooring, rubber, rolled or poured flooring, carpet adhesives, etc. are included in the base work, no extra change will be accepted. Demolition or moving typical non-movable objects by the abatement contractor is required to gain access to all flooring materials to be removed. SD sheets for chemicals to be used during the project must be submitted to the owners' representative prior to site delivery.

H. The contractor will be required to remove roofing, window and door systems, mechanical systems, flooring, walls, ceilings, wall applications/masonry, brick, concrete, glazed block, millwork, shelving and cabinetry to access all asbestos containing materials for abatement/remediation and packaging for recycling/removal/abatement and disposal.

I. Related Sections:

1. Section 028213 – Asbestos Abatement
2. Section 028313 – Lead-Based Paint Awareness
3. Section 028416 – Universal Waste Removal and Recycling
4. Section 028432 – PCB Remediation
5. HBM – 01, 02, 03, 04, 05, 06 & 07 – Hazardous Building Materials Abatement Drawings

1.2 PROJECT CONDITIONS

A . Occupancy:

1 Areas of the buildings in which selective demolition/demolition will occur will be unoccupied during work.

B. Existing Conditions:

1. After the project is begun, the Contractor is responsible for the condition of the structures to be selectively demolished.
2. Unforeseen Conditions: Should unforeseen conditions be encountered that affect design or function of project, investigate and fully submit an accurate, detailed, written report to the office of the Consultant. While awaiting a response, reschedule operations if necessary to avoid delay of overall project.

PART 2 - PRODUCTS

NOT USED.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that utilities have been disconnected and sealed.

B. Insofar as is practicable, arrange operations to reveal unknown or concealed conditions for examination and verification before removal or demolition.

C. Verify actual conditions to determine, in advance, whether removal or demolition of any element will result in structural deficiency, overloading, failure, or unplanned collapse.

1. Demolish and remove connections to all electrical gas, and plumbing fixtures required to remove asbestos containing materials.

3.2 PREPARATION

A. Traffic: Do not obstruct walks or public ways without the written permission of governing authorities and of the Owner. Where routes are permitted to be closed, provide alternate routes if required.

B. Protection:

1. Provide for the protection of persons passing around or through the area of demolition.
2. Perform demolition so as to prevent damage to adjacent improvements and facilities to remain.

3. Protect walls, floors, and other new or existing work from damage during demolition operations.

C. Damages: Without cost to the Owner and without delay, repair any damage caused to facilities to remain.

3.3 POLLUTION CONTROLS

A. Control as much as practicable the spread of dust and dirt.

B. Observe environmental regulations.

C. Do not allow water usage resulting in freezing or flooding.

D. Do not allow adjacent improvements to remain to become soiled by demolition operations.

3.4 DEMOLITION - GENERAL

A. Remove: Items indicated to be removed shall be removed by the Contractor.

B. Existing to Remain: Construction or items indicated to remain shall be protected against damage during demolition operations. Where practical, and with the Owner's permission, the Contractor may elect to remove items to a suitable storage location during demolition and then properly clean and reinstall the items.

C. Perform work in a systematic manner.

D. Demolish and remove existing construction only to the extent required, as indicated in the Contract Documents.

E. Perform selective demolition using methods that are least likely to damage work to remain and which will provide proper surfaces for patching.

F. Remove debris daily.

G. Use any methods permitted by governing regulations and the requirements of the Contract Documents.

3.5 DISPOSAL OF DEMOLISHED MATERIALS

A. Promptly dispose of materials resulting from demolition operations. Non-contaminated material (materials not containing residue asbestos, lead, PCB or other hazardous, regulated or special waste) may be disposed of as construction waste. Do not allow materials to accumulate on site.

B. All rubbish and waste material from the Work shall be neatly stacked or kept in suitable containers and removed from the premises daily. The premises shall be kept clean and in an orderly condition at all times to the satisfaction of the Owner and the Consultant.

C. Transport materials resulting from demolition operations and legally dispose of off-site.

D. Off-site disposal location shall not be within one-half mile of any portion of the project site or within sight of the project site.

E. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.

3.6 CLEANING

A. Throughout the construction period, the Contractor shall maintain the building and site free of rubbish, debris, surplus materials, and other items not required for the Work.

B. Remove such material from the site daily to prevent accumulations.

C. Remove all construction debris from work areas, and remove all hazardous waste and asbestos waste as required by the most current federal, state, and local regulations and the requirements of the specifications.

END OF SECTION 028200

SECTION 028213 - ASBESTOS ABATEMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and General Provisions of Contract, including General Supplementary Conditions and Division 1 Specifications Sections, apply to this Section.

B. Sections containing requirements related to this Section include, but are not limited to:

1. Section 028200 – Selective Hazardous Building Materials Abatement Demolition
2. Section 028313 – Lead-Based Paint Awareness
3. Section 028416 – Universal Waste Removal and Recycling
4. Section 028432 – PCB Remediation
5. HBM – 01, 02, 03, 04, 05, 06 & 07 – Hazardous Building Materials Abatement Drawings

1.2 CONSULTANT

A. The Owner shall retain Langan for the purposes of project management and monitoring during Asbestos Abatement. The Consultant will represent the Owner in all phases of the abatement project at the discretion of the Owner. The Asbestos Abatement Contractor will regard the Consultant's direction as authoritative and binding as provided herein, in matters particularly but not limited to approval of work areas, review of monitoring results, completion of the various segments of work, final completion of the abatement, submission of data, and daily field punch list items. The State of Connecticut licensed Asbestos Consultant — Project Designer is Matthew Myers (license no. 000058).

1.3 USE OF THE CONTRACT DOCUMENTS

A. It shall be incumbent upon the Contractor to visit the Site and determine what exists, its condition, and what will be required to accomplish the Work intended by the Contract Documents. No increase in the Contract Sum will be permitted as a result of the Contractor's failure to visit the Site and understand the existing conditions.

B. All work shall comply with the Contract Documents and with applicable Codes, laws, regulations, and ordinances wherever applicable. The most stringent of all the foregoing shall govern.

C. It is not intended that the Specifications show every detail of the Work, but the Contractor shall be required to furnish within the Contract Sum all material and labor necessary for the completion of the Work in accordance with the intent of the Specifications.

D. In case of ambiguity among the Contract documents, the more stringent requirement as determined by the Consultant shall prevail.

E. The Work of this Contract includes making modifications as necessary, subject to approval by Owner in consultation with the Consultant, to correct any conflicts.

F. All items, not specifically mentioned in the Specifications but implied by trade practices to complete the work, shall be included.

G. This specification and drawings cover the proper and legal removal and disposal of all asbestos-containing materials (ACM) and asbestos contaminated waste from the Old Greenwich School renovation project site located in Greenwich, Connecticut. The abatement activities shall comply with all aspects of the contract documents and Federal, State and local requirements.

H. Whenever there is a conflict or overlap within these specifications and between applicable codes and regulations, the most stringent provision specified shall apply.

1.4 EXAMINATION OF THE SITE

A. It is understood that the Contractor has examined the Site and made his own estimates of the facilities and difficulties attending the execution of the Work, and has based his price thereon.

B. Except for unforeseeable concealed conditions as determined by the Consultant, the Contractor shall make no claim for additional cost due to the existing conditions at the Site.

1.5 CONTRACTOR QUALIFICATIONS

A. All bidders shall submit a record of prior experience in asbestos abatement projects, listing no less than three (3) completed jobs in the past year, with all projects of similar size and scope. The Contractor shall list the experience and training of the project foremen and all on-site personnel. The information that should be included is as follows:

1. Project Name and Address
2. Owner's Name and Address
3. Architect/Consultant
4. Contract Amount
5. Date of Completion
6. Extras and Changes

B. The Contractor selected must appear on the approved list of Asbestos Abatement contractors on file at the State of Connecticut Department of Public Health (CT DPH) and hold a valid license for asbestos abatement within the State of Connecticut.

C. Submit a written statement regarding whether the Contractor has ever been found out-of-compliance with federal or state asbestos and/or lead regulations pertaining to worker protection, removal, transport, or disposal.

D. The Contractor shall be responsible for obtaining all necessary or required permits from the Federal, State and local agencies having jurisdiction over this asbestos abatement project. Failure on behalf of the Contractor to obtain these permits shall not result in any extension for the timely results of completion of the work set forth in the Contract. The Contractor shall be responsible and shall be required to pay any administrative penalties imposed on the owner for actions taken or lack thereof by the Contractor.

E. Work includes any and all selective demolition and protective measures required to access and remove ACM and maintain a safe working environment.

F. Upon completion of asbestos removal, the contractor shall provide completed, signed and notarized statements indicating that all asbestos-containing materials identified in the scope of work and project description (Section 1.08 and 1.09) were properly removed and disposed of in accordance with applicable Federal, State, and local regulations.

G. All contractors submitting a bid for this work shall visit the work site, attend a pre-bid meeting and walk-through, to be scheduled by the Owner, and be familiar with the work in its entirety. The

contractors pre-meeting attendance and bid submission affirms his/her acceptance of the work, site, and building conditions as is.

H. All Contractor personnel involved with asbestos removal work must be thoroughly familiar with the standard operating procedures of the Contractor for removal work as well as all applicable Federal and State regulations governing asbestos removal work.

I. The Supervisor and Asbestos Abatement workers shall be accredited in accordance with EPA regulation 40 CFR Part 763, subpart E, Appendix C; and CT DPH regulations as outlined in Section 19a-332a-1 through 19a-332a-16 (Standards for Asbestos Abatement), and Section 20-440-1 through 20-440-9 (Licensure and Training Requirements for Persons Engaged in Asbestos Abatement and Consulting Services).

J. The Contractor shall be aware of all conditions of the Project and is responsible for verifying quantities and locations of all Work to be performed. Failure to do so shall not relieve the Contractor of its obligation to furnish all labor and materials necessary to perform the work. Any discrepancies noted shall be brought to the attention of the Owner and Engineer prior to bidding the project. No claims for extras shall be made during construction/abatement /demolition.

K. Work includes necessary selective demolition and protective measures required to access and remove ACM and maintain a safe working environment. Asbestos containing materials that would be impacted by selective demolition of wall, ceiling and floor cavities shall be performed within negative pressure enclosure.

L. It is the sole responsibility of the Contractor to determine what, if any patents are applicable to the Project. The Contractor will pay all royalties and/or license fees, and will defend all suits or claims for infringement of any patent rights and save the Owner, Architect, Asbestos Safety Control Monitor, Design Sub-Consultant, and Construction Manager harmless from loss, including attorney's fees, on account thereof.

M. The Contractor shall coordinate with the Consultant and maintain the project schedule.

N. The abatement contractor shall hold and document daily pre-abatement safety tool box meeting to review safe work practices and emergency communication program for the project. The abatement contractor's supervisor and the consultant's project monitor must also ensure that proper fire extinguishing equipment is present. The supervisor shall be knowledgeable in use of fire extinguishing equipment, and emergency exit plans.

1.6 TESTING LABORATORY SERVICES

A. The Contractor shall submit to the Consultant the name; address and qualifications of proposed laboratories intended to be utilized for sample analysis as required by this section and the laboratories must be approved by CT DPH.

1.7 ADDITIONAL GENERAL REQUIREMENTS

A. The Asbestos Abatement Contractor shall employ a competent Asbestos Abatement Supervisor with at least three (3) years' experience on projects of similar scope and magnitude who shall be responsible for all work involving asbestos abatement as described in the specifications and defined in applicable regulations, and have full time daily supervision of the same. The Supervisor shall be the competent person as defined by OSHA regulations.

B. The Contractor shall allow the work of this contract to be inspected if required by local, state, federal, and any other authorities having jurisdiction over such work. The Contractor shall

immediately notify the Owner and Consultant and shall maintain written evidence of such inspection for review by the Owner and Consultant.

C. The Contractor shall incur the cost of all fines resulting from regulatory non-compliance as issued by federal, state, and local agencies. The Contractor shall incur the cost of all work requirements mandated by federal, state, and local agencies as a result of regulatory non-compliance or negligence.

D. The Contractor shall immediately notify the Owner and Consultant of the delivery of all permits, licenses, certificates of inspection, of approval, or occupancy, etc., and any other such instruments required under codes by authorities having jurisdiction, regardless of who issued, and shall cause them to be displayed to the Owner and Consultant for verification and recording.

1.8 SCOPE OF WORK

A. This specification and drawings HBM – 01, 02, 03, 04, 05, 06 & 07 cover the proper and legal removal and disposal of all asbestos-containing materials (ACM) and asbestos contaminated waste to be impacted by renovation activities from the Old Greenwich School renovation project site located in Greenwich, Connecticut. The abatement activities shall comply with all aspects of the contract documents and Federal, State and local requirements. There is interior friable and non-friable asbestos containing materials (thermal system insulation, surfacing materials and miscellaneous materials) identified on the site. Lead-based paint was identified on interior and exterior metal stairwell components, metal and wood window, door and vent system components, plaster ceilings and walls (assumed based on ceiling testing) and exterior painted trim (eaves, gutters, upper decorative trim, dormers, etc.). Sealant compounds in the original building, 1925, 1950 and 1957 additions are assumed to contain greater than 50 ppm PCB (bulk product waste). Universal wastes are located throughout areas of renovation.

1.9 PROJECT DESCRIPTION

A. Old Greenwich School was constructed in 1902 with additions in 1925, 1950, 1957 and 1995. The school is a three story building with attic and has tunnels and crawl spaces throughout and is approximately 68,500 square feet. A new addition will be constructed and renovation activities will occur throughout the building.

B. The base bid includes the removal and disposal of all asbestos containing materials as identified herein, and on the architects drawings by workers meeting requirements of OSHA 1926.1101 for Class 1 and 2 work. The base bid will include the cost for removal and disposal of asbestos-containing pipe/pipe fitting/roof drain insulation, flooring materials, sink undercoating, sink backsplash caulking compound, wall and ceiling plaster, duct insulation and residue, “chalk”boards/bulletin boards/mirror/other wall adhesives/glue daubs, ceramic wall tile adhesive, interior and exterior door and window system sealant compounds, exterior vent caulking compounds, wall and foundation damp-proofing materials, and limited roofing/gutter materials. Work includes filing and permitting all necessary applications, notifications, requirements and fees; insurance; necessary design services; providing skilled, licensed and certified labor; materials; and equipment necessary for proper preparation, handling, removal and legal disposal of all asbestos-containing materials and asbestos contaminated waste from the subject building in accordance with all requirements of applicable federal, state and local regulations, these specifications and the contract drawings. The following materials and amounts are included in the base bid work.

Base Bid

Material	Location	Estimated Quantity of ACM
Pipe, Pipe Fitting, Pipe Hanger and Roof Drain Insulation – Thermal System Insulation	Throughout 1902 Original Building, 1925, 1950 and 1957 Additions Mostly Inaccessible – Assumed Behind Walls, Ceilings and Chases and Possibly in Tunnels/Crawl Spaces	ALL – Visible in Exterior Storage Room Adjacent Classroom 3 and Inside Classroom 6 Estimate up to 2,700 Linear Feet Negotiated Unit Pricing will be used to add or deduct to the estimated asbestos quantity if the amount removed is different by less/more than 20%
White Duct Insulation (Residue) – Thermal System Insulation (Substrates Contaminated)	Mechanical Room Above Room 29 (Above Gymnasium)	ALL - Estimate up to 4,000 Square Feet Negotiated Unit Pricing will be used to add or deduct to the estimated asbestos quantity if the amount removed is different by less/more than 20%
Gray Duct Insulation – Thermal System Insulation (Substrates Contaminated)	Exterior Storage Room Adjacent Classroom 3	ALL - 225 Square Feet
9”x9” Floor Tiles and/or Black Mastic – Miscellaneous Materials (Substrates Contaminated)	Ground Floor Custodial Closet (with Ramp) Adjacent Room 10 Throughout 1902 Original Building, 1925, 1950 and 1957 Additions - Underneath Millwork, Cabinetry, Unit Ventilators, Radiators, Lockers, Other Non-Moveable Objects to be Demolished	ALL - 170 Square Feet in Custodial Closet ALL – Assume Containments Are Required for Each Room/Area For Hidden Flooring Materials Underneath Non-Moveable Objects to be Demolished – See Architects Plans/Drawings Negotiated Unit Pricing will be used to deduct Containments if Flooring Materials are not Found in each Room/Area and no other Abatement is Required in Corresponding Room/Area

Material	Location	Estimated Quantity of ACM
Wall and Ceiling Plaster Finish/Rough Coats – Surfacing Materials (Substrates Contaminated – Surfaces on Both Sides and Supported by Wood and Metal Lathes and Plaster is also Directly applied on Block, Brick, etc Substrates) (Located Behind Multiple Layers of Ceiling and Wall Materials (Tiles, Sheetrock, Plaster, etc.) Throughout)	Throughout 1902 Original Building	ALL – Ceilings Throughout All Rooms/Corridors/Areas All Walls Throughout are to be Removed From Ceiling/Roof Deck Down to Four Inches Below Ceiling Tile Grid Support Systems Remove Walls Around All Door/Door and Window Openings to be Removed – Eight Inches or More Around All Sides Depending on the Work in Each Area Remove Walls Four Inches Up from Glazed Ceramic Block Walls to be Removed in Corridors Remove Sections of Walls for New Windows/Door Openings, Around Some Chimney Areas, Areas that will have Sink and Countertop/Millwork/ Cabinetry/Bulletin Board/"Chalk" Board/Mirror Removal and other Wall Areas to be Demolished Removes All Walls In Areas of Gut Renovation (Toilet Rooms, Classrooms and Closets in Rooms 5, 7, 8 & 9, Elevator (to be installed) Areas, Main Offices and Main Entryway See Architects Plans/Drawings Edges of Walls to Remain Must be Encapsulated

Material	Location	Estimated Quantity of ACM
White and Pink Sink Undercoating and Sink Countertop Caulking Compounds – Miscellaneous Materials (Substrates Contaminated) (Caulking Compounds are Assumed PCB Bulk Product Waste)	Sinks in Classrooms 1, 2, 12, 20, 28, 33, 38, 40 and 41 Sink Countertop Caulking Compounds Throughout Building – See Architects Plans/Drawings for Selective Demolition Locations (Approximately 21 Locations)	ALL
Ceramic Wall Tile Adhesive (Dark Brown) – Miscellaneous Material (Substrates Contaminated)	Girls Locker Room Rear Shower Room	ALL - Estimate up to 100 Square Feet Negotiated Unit Pricing will be used to add or deduct to the estimated asbestos quantity if the amount removed is different by less/more than 20%
Bulletin Board, “Chalk” Board, Mirror and Other Wall Adhesives – Miscellaneous Materials (Substrates Contaminated)	All Toilet Rooms Throughout 1902 Original Building, 1925, 1950 and 1957 Additions to be Demolished/Renovated Classrooms 1-9, 31, Corridors Adjacent Rooms 1 & 10 and Main Offices, Main Offices, Teachers Lounge and Classroom 11 Areas	ALL – Estimate up to 2,000 Square Feet Negotiated Unit Pricing will be used to add or deduct to the estimated asbestos quantity if the amount removed is different by less/more than 20% See Architects Plans/Drawings
Wall Black Damp-proofing Material(s) – Miscellaneous Material (Substrates Contaminated)	Classroom 6 Exterior Walls Between Classroom 43 and Media Center and New Door Opening at Classroom 11 Window Lintels At Gymnasium Wing Windows (Approximately 11 Windows)	ALL – Estimate up to 1,800 Square Feet Negotiated Unit Pricing will be used to add or deduct to the estimated asbestos quantity if the amount removed is different by less/more than 20% See Architects Plans/Drawings

Material	Location	Estimated Quantity of ACM
Exterior Foundation Damp-proofing Tar/Materials – Miscellaneous Material (Substrates Contaminated)	Exterior 1957 Addition Foundations	ALL – Estimate up to 1,250 Square Feet Negotiated Unit Pricing will be used to add or deduct to the estimated asbestos quantity if the amount removed is different by less/more than 20%
Interior Door Caulking Compounds, Door Window Glazing Compounds, Window Caulking and Glazing Compounds – Miscellaneous Materials (Substrates Contaminated) (Caulking and Glazing Compounds are Assumed PCB Bulk Product Waste)	Throughout 1902 Original Building, 1925, 1950 and 1957 Additions	ALL – 90 Door, Window and Window/Door Openings (Openings are Varying Sizes – Single and Double Doors, Doors and Adjacent Attached Windows, etc.) See Architects Plans/Drawings
Exterior/Interior Window Caulking/Glazing/Lintel Compounds – Miscellaneous Materials (Substrates Contaminated) (Caulking Compounds are Assumed PCB Bulk Product Waste)	Exterior/Interior – Classrooms 2-6, 8, 9, 11, 43, Boiler Room, Media Room, Toilet Room Adjacent Room 8, Main Office and Gymnasium Wing	20 Window Openings (Varying Sizes/Windows Per Opening) (Some Windows to be Saved and Reinstalled) and 11 Window Lintels at Gymnasium Wing, Two Windows at Rooms 2 and 11 are Limited to Window Repairs (Caulk/Glaze) See Architects Plans/Drawings
Exterior/Interior Door and Door/Window Caulking Compounds (Glazing Compound Also at Main Front Entry and Gymnasium), Door Window Glazing Compounds – Miscellaneous Materials (Substrates Contaminated) (Caulking and Glazing Compounds are Assumed PCB Bulk Product Waste)	Exterior Throughout 1902 Original Building, 1925, 1950 and 1957 Additions	ALL - 14 Door and Door/Window Openings (Varying Sizes Per Opening) See Architects Plans/Drawings

Material	Location	Estimated Quantity of ACM
Exterior Vent Caulking Compound – Miscellaneous Materials (Substrates Contaminated) (Caulking Compounds are Assumed PCB Bulk Product Waste)	Exterior Throughout 1902 Original Building, 1925, 1950 and 1957 Additions	ALL - 28 Vent Openings (Openings are Varying Sizes) See Architects Plans/Drawings

C. Abatement and Remediation in all areas will start with removing materials at the ceiling level and end with the materials at the flooring level. The hazardous building materials contractor will coordinate and perform enough selective demolition/demolition to access all materials to be removed/abated/remediated. Contractor shall open walls and ceilings to check for hidden piping, ductwork, etc. (as required for entire building in areas of work) as well as demolishing millwork, cabinetry, desktops, flooring, all non-moveable objects, walls, chases etc. to locate potential asbestos containing flooring materials and other suspect asbestos containing materials that may be hidden, buried, inaccessible (only demolish materials scheduled for selective demolition /demolition). Exterior abatement/remediation will be either removed in containment (interior) or the abatement/remediation contractor will install polyethylene sheeting on the interior of the building and remove materials from the exterior. All ground and roof surfaces must also be protected with tarps, plywood and two layers 10-mil reinforced polyethylene sheeting. This ground protection must extend at least 20 feet away from the building foundation (or farther - enough to prevent building materials from touching unprotected ground and floor surfaces). The contractor will pay for all contamination/remediation/ abatement of interior and exterior surfaces, including ground surfaces if Langan deems they have contaminated these surfaces.

D. The hazardous building materials contractor will be required to perform multiple mobilizations for the abatement/remediation work.

E. Additional materials as discovered outside of those listed will be covered by unit prices if all is not listed as the quantity. Quantities are estimates only and should be verified by the Contractor. Safety data sheets for chemicals to be used during the project must be submitted to the Owner's Representative prior to site delivery. The contractor is responsible for providing temporary water, power, and heat as needed at the site. Temporary lighting/Blast Trac machines/Negative air units within the work areas must be connected to Ground Fault Circuit Interrupter (GFCI) Power Panels installed by a State of Connecticut licensed electrician and located outside of the work areas.

F. The contractor shall be responsible for paying the utility bills for the use of power and water (unless owner agrees to supply at no cost to contractor). However, if any such temporary facilities cannot be provided, it shall be the contractor's responsibility to provide all fixed and temporary connections and hook-ups as well as obtaining permits and paying all fees for making such services available for his work as is necessary. If necessary, the Contractor shall provide temporary services as specified herein, and as required or as necessary to carry out the work. This may include such items as portable generators, water tank trucks, pumps and necessary accessories or the means and equipment and services necessary to temporarily connect to and maintain such services from adjacent utility systems. The use of portable generators will require 24 hour a day, 7 day a week continuous operation if negative air machines in containments are powered by them. This continuous operation must remain in place from the time the pre-abatement visual is completed up until clearance re-occupancy sampling results have passed. The contractor will pay the owner a $2,500 penalty should the power found to not be running the negative air machines in active abatement containments. This penalty will apply daily and the

contractor is also responsible for paying all CT DPH fines that may be imposed on the contractor and owner. The contractor shall also comply with any local permits that may be required as well as local noise ordinances.

G. The general/abatement contractors shall only use heavy equipment operators that have proper asbestos and/or HAZWOPER training when disturbing/removing/moving and packing asbestos, lead-based paint and PCB containing materials. Acceptable training for asbestos can be 32 or 40 hour asbestos worker/supervisor with annual refresher training. 40 hour HAZWOPER training and annual refresher training is required for operators handling lead and/or PCB containing/contaminated materials. All operators must also have current medicals, fit test data and wear respirators during work.

H. The remediation/asbestos abatement contractor, their subcontractors, waste transporters and/or landfill(s) do not have permission to take/analyze building materials for PCB content/ concentrations without written permission from the building owner prior to such sampling. Should the contractor or other parties listed above take/analyze PCB samples without the owner's permission and PCB's are found to be >1 ppm, the hazardous materials/remediation contractor will be responsible for **all costs** associated with the abatement/ remediation/replacement of all the interior/exterior building materials and adjacent surfaces, including soil/asphalt/concrete/etc. as well as all costs associated with project delays, attorney fees for all parties affected and all costs resulting from CT DEEP/EPA requirements that may occur as a result.

I. The remediation/asbestos abatement contractor, their subcontractors, waste transporters must submit landfill information to Langan and the owner prior to the shipment of any waste. The contractor(s)/hauler(s) cannot ship waste until Langan and the owner have approved the landfill the contractor/hauler is/are proposing to ship the waste to. PCB TCLP sampling of the waste may be required by the landfills permits and this testing must be performed by the contractor (if testing is approved by Langan and the owner), with Langan present during sampling, and the results made available to Langan and the owner prior to waste shipment. If Langan is not present during the sampling, Langan may perform additional PCB TCLP sampling to confirm the contractor's results and these results will supersede the contractors sample results.

J. The contractor(s) will be responsible for hiring an engineer and other appropriate personnel to ensure that all required selective demolition and demolition activities are safe to perform for all personnel on site. The contractor(s) will be financially responsible for any damage that may occur to the site, on-site personnel, fines, penalties, etc. They will also be responsible for paying/reimbursing all legal fees/costs for all parties involved with the project should selective demolition or demolition activities cause injury or death to any persons on site.

K. The Owner shall retain a Consultant for the purposes of project management and monitoring during asbestos abatement. The Consultant will represent the Owner in all phases of the abatement project at the discretion of the Owner. The asbestos abatement contractor will regard the consultant's direction as authoritative and binding as provided herein, in matters particularly but not limited to approval of work areas, review of monitoring results, completion of the various segments of work, final completion of the abatement, submission of data, and daily field punch list items. The State of Connecticut licensed Asbestos Consultant — Project Designer is Matthew Myers (license no. 000058).

1.10 DEFINITIONS

A. The following definitions relative to asbestos abatement apply:

1. Abatement - Procedures to control fiber release from asbestos-containing materials; includes removal, encapsulation, and enclosure.
2. Air Monitoring - The process of measuring the fiber concentration of an area or of a person.
3. Amended Water - Water to which a surfactant has been added.

4. Asbestos - The name given to a number of naturally occurring fibrous silicates. This includes the serpentine forms and the amphiboles and includes chrysotile, amosite, crocidolite, tremolite, anthophyllite, and actinolite, or any of these forms, which have been chemically altered.
5. Asbestos Felt - a product made by saturating felted asbestos with asphalt or other suitable bindery, such as a synthetic elastomer.
6. Asbestos Fibers - Those particles with a length greater than five (5) microns and a length to diameter ratio of 3:1 or greater.
7. Asbestos Work Area - a regulated area as defined by OSHA 29 CFR 1926.1101 where asbestos abatement operations are performed which is isolated by physical barriers to prevent the spread of asbestos dust, fibers, or debris. The regulated area shall comply with requirements of regulated area for demarcation, access, respirators, prohibited activities, competent persons and exposure assessments and monitoring.
8. Asphalt Shingles, Composition Shingles or Strip Slates: (Pitched Roof Shingle) - a roofing material manufactured by saturating a dry felt with asphalt then coating the saturated felt with a harder asphalt mixed with a fine mineral, glass fiber, asbestos or organic stabilizer. All or part of the weather side may be covered with mineral granules, or with powdered talc or mica.
9. Base Flashing (roof) - the flashing provided by upturned edges of a water tight membrane on a roof. May contain metal and associated waterproofing material or combination of roofing felts and waterproofing at the joint between a roofing surface and a vertical surface such as a wall or parapet. Also base flashing may be present at perimeter of completely flat roof.
10. Built-Up Roofing (Composition Roofing, Felt and Gravel Roofing, Gravel Roofing) - a continuous roof covering made up of laminations or plies of saturated or coated roofing felts, alternated with layers of asphalt or coal-tar pitch and surfaced with gravel, paint or finish coat.
11. Caulking - resilient mastic compound often having a silicone bituminous or rubber base; used to seal cracks, fill joints, and prevent leakage. Typical applications: around windows, and doors. Caulking is at joints between two dissimilar materials. (i.e. masonry to wood, masonry to steel)
12. Clean Room - An uncontaminated area or room, which is a part of the worker decontamination enclosure with provisions for storage of workers' street clothes and protective equipment.
13. Clearance Sampling - Final air sampling performed aggressively after the completion of the abatement project in a regulated area.
    Air samples collected by the air sampling professional having a fiber concentration of less than 0.01 fibers/cc of air in each of five (5) samples collected inside the containment will denote acceptable clearance sampling by Phase Contrast Microscopy.
    or
    Five air samples collected inside the containment by the air sampling professional having an average asbestos concentration of less than 70 structures per square millimeter of air will denote acceptable clearance sampling for Transmission Electron Microscopy.
14. Competent Person - As defined by 29 CFR 1926.1101, a representative of the Abatement Contractor who is capable of identifying existing asbestos hazards in the workplace and selecting the appropriate control strategy for asbestos exposure. Who has authority to take prompt corrective measures to eliminate such hazards during asbestos removal. Competent person shall be properly trained in accordance with EPA's Model Accreditation Plan.
15. Curtained Doorway - A device to allow ingress and egress from one area to another while permitting minimal air movement between the areas. Two curtained doorways spaced a minimum of six feet apart can form an airlock.
16. Damp Proofing - application of a water impervious material to surface such as wall to prevent penetration of moisture, typically at foundation or below grade surface.
17. Decontamination Enclosure System - A series of connected areas, with curtained doorways between any two adjacent areas, for the decontamination of workers and equipment. A decontamination enclosure system always contains at least one airlock and is adjacent and connected to the regulated area, where possible.

18. Encapsulant - A liquid material which can be applied to asbestos-containing materials which controls the possible release of asbestos fibers from the materials either by creating a membrane over the surface (bridging encapsulant) or penetrating the material and binding its components together (penetrating encapsulant).
19. Equipment Room - Any contaminated area or a room that is part of the worker decontamination enclosure with provisions for storage of contaminated clothing and equipment.
20. Fixed Object - Unit of equipment or furniture in the work areas that cannot be removed from the work area.
21. Friable Asbestos Materials - Any material that contains more than 1% asbestos by weight, that can be crumbled, pulverized or reduced to powder by hand pressure.
22. Glazing Compound - any compound used to hold window glass in place, also referred to as putty, or glazier's putty, is not field applied, usually installed during manufacture of windows.
23. HEPA Filter - High Efficiency Particulate Air (HEPA) filter in compliance with ANSI Z9.2-1979.
24. HEPA Vacuum Equipment - Vacuum equipment equipped with an HEPA filter system for filtering the effluent air from the unit.
25. Movable Object - Unit of equipment of furniture in the work area that can be removed from the work area.
26. Negative Air Pressure Equipment - A portable local exhaust system equipped with HEPA filtration used to create negative pressure in a regulated area (negative with respect to adjacent unregulated areas) and capable of maintaining a constant, low velocity air flow into regulated areas from adjacent unregulated areas.
27. NESHAPS - National Emissions Standard for Hazardous Air Pollutants regulations enforced by the EPA.
28. Permissible Exposure Level (PEL) - The maximum airborne concentration of asbestos fibers to which an employee is allowed to be exposed. The new level established by OSHA 29 CFR 1926.1101 is 0.1 fibers per cubic centimeter of air as an eight (8) hour time weighted average and 1.0 fibers /cc averaged over a sampling period of 30 minutes as an Excursion Limit. The Contractor is responsible for maintaining work areas in a manner that this standard is not exceeded.
29. Project Monitor - A professional capable of conducting air monitoring and analysis of schemes. This individual should be an industrial hygienist, an environmental scientist, or an engineer with experience in asbestos air monitoring and worker protection equipment and procedures. This individual should have demonstrated proficiency in conducting air sample collection in accordance with 29 CFR 1910.1001 and 29 CFR 1926.1101.
30. Regulated Area - An area established by the employer to demarcate where Class I, II, and III asbestos work is conducted and any adjoining area where debris and waste from such asbestos work accumulate, and a work area within which airborne concentrations of asbestos exceed or there is a reasonable possibility that they may exceed the PEL.
31. Shower Room - A room between the clean room and the equipment room in the work decontamination enclosure with hot and cold running water and suitably arranged for employee showering during decontamination. The shower room is located in an airlock between the contaminated area and the clean area.
32. Waterproofing - material, usually a membrane or applied compound (tar/mastic), used to make a surface impervious to water, includes concealed conditions (applications around doors, windows, and in wall cavities). Sometimes combined with felts.

1.11 SUBMITTALS

A. Pre-Work Submittals: Within 7 days prior to the pre-construction conference, the Contractor shall submit 3 copies of the documents listed below to the Owner and Engineer for review:

1. Valid Contractor's Asbestos Removal license issued by the Connecticut Department of Public Health (CT DPH).
2. Certificate of insurance covering work of this Contract.
3. Name, experience of supervisors, and copies of valid Asbestos Supervisor permits issued by the CT DPH.
4. Citations/Violations/Legal Proceedings: Submit a statement describing:

    a. Any citations, violations, criminal charges, or legal proceedings undertaken or issued within the past two years by any law enforcement, regulatory agency, or consultant concerning performance on previous abatement contracts. Briefly describe the circumstances citing the Project and involved persons and agencies as well as the outcome of any actions.
    b. Any litigation or arbitration proceedings arising out of performance on past Projects.

5. Work Schedule:

    a. Show the complete sequence of abatement activities and the sequencing of work within each building section.
    b. Show the dates for the beginning and completion of each major element of work including substantial completion dates for each work area, building, or phase.
    c. Show projected percentage of completion for each item, as of the first day of each month.
    d. Show final inspection dates.

6. Project Notifications: As required by Federal, State, and local regulatory agencies together with proof of transmittal (i.e. certified mail return receipt). The contractor shall notify the Connecticut Department of Public Health and US EPA Region 1 at least ten (10) days prior to the start of asbestos abatement, as required by the Regulations of Connecticut State Agencies, Section 19a-332a-3 and EPA.
7. Abatement Work Plan: The Contractor shall design, prepare and submit to the Authority for review and approval, a detailed asbestos removal plan for the project in accordance with the applicable regulations and these specifications. The plan shall, at minimum, show limits of containment and work areas, methods of removal, location of decontamination units, number and location of negative air units, waste routes, waste storage location, entrance and exits, emergency exits, and any necessary details. Work shall not commence until the Authority has reviewed, commented and approved the contractor's asbestos removal plan. Provide plans which clearly indicate the following:

    a. All Work Areas/containment numbered sequentially.
    b. Locations and types of all decontamination enclosures.
    c. Entrances and exits to the Work Areas/containment.
    d. Type of abatement activity/technique for each Work Area/containment.
    e. Number and location of negative air units and exhaust. Also provide calculations for determining number of negative air pressure units.
    f. Proposed location and construction of storage facilities and field office.
    g. Location of water and electrical connections to building services.
    h. Waste transport routes through the building to the waste storage container.

8. Contingency plan.
9. Name, location, and applicable licenses for primary and secondary landfill for disposal of asbestos-containing material and asbestos contaminated waste.
10. Summary of proposed materials, and equipment to be used.
11. Certification that vacuums, temporary ventilation equipment, and other equipment to be used meet the ANSI 29.2-79 requirement for airborne fiber filtration.

12. If rental equipment is to be used in work area or to transport asbestos contaminated waste, provide notice to rental agency stating intended use of equipment, with copy to the Authority.
13. Summary of the Contractor's workforce by disciplines. Include a notarized statement signed by the Contractor documenting that all proposed workers, by name, have received all required medical examinations and have been properly trained and certified in asbestos removal work, respirator use, to appropriate EPA and OSHA standards for asbestos removal. Include on statement Contractor's compliance with OSHA medical surveillance requirements.
14. The Contractor shall submit his/her Health and Safety Plan and Standard Operating Procedures for this project for use in complying with the requirements of these Specifications and applicable regulations. The Plan shall include, but shall not be limited to: distribution and use of amended water, the sequencing of asbestos work, detailed schedules and dates, shift times, and work activities during that shift, the interface of other trades involved in the performance of work, methods to be used to assure the safety of building occupants and visitors to the Site, security of the work areas, and a detailed description of the methods to be employed to control airborne fiber concentrations.
15. Written description of emergency procedures to be followed in case of injury or fire. This section must also include evacuation procedures, sources of medical assistance and procedures for access by medical personnel.
16. Level of respiratory protection intended for each operation for the project.

B. Project Closeout Submittals: Submit the following to Owner and Consultant at the close out of the Project (no later than 15 days subsequent to site demobilization):

1. Originals of all waste disposal manifests, seals, and disposal logs.
2. OSHA compliance air monitoring records conducted during the work.
3. Daily progress log.

a. A list of all workers used in the performance of the Project, including name, social security number, and CT DPH certification number.
b. For each worker used in the performance of the project, submit required employee statements including Medical Examination Statement, Worker's Acknowledgment Statement, Respirator Fit Test, and Employee Training Statement.
c. Certification for the laboratory that analyzed the OSHA personnel air samples.
d. A notarized “Release of Liens” in a form acceptable to the owner. Such notarized release of liens shall certify that all sub-contractors, labor suppliers, etc. have been paid their pro rate share of all payments to date for the project, that the contractor has no basis for further claims, and will not make further claims for payment in any account after the first payment is made to him.

1.12 MEDICAL REQUIREMENTS

A. Prior to potential exposure to airborne asbestos fibers, provide workers with a comprehensive medical examination as required by 29 CFR 1910.1001, and 29 CFR 1926.1101.

1. This examination is not required if adequate records show the employee has been examined as required by 29 CFR 1910.1001, and 29 CFR 1926.1101 within the past year.
2. The same medical examination shall be given on an annual basis to employees engaged in an occupation involving asbestos fibers and within thirty (30) calendar days before or after the termination of employment in such occupations.

B. As required by 29 CFR 1910.1001, and 29 CFR 1926.1101 maintain complete and accurate records of employees' medical examinations for a period of thirty (30) years after termination of employment and make records of the required medical examinations available for inspection and copying to: The Assistant Secretary of Labor for Occupational Safety and Health, the Director of

the National Institute for Occupational Safety and Health (NIOSH), authorized representatives of either of them, and an employee's physician upon the request of the employee or former employee.

C. The Contractor shall furnish the Owner evidence of its firm's medical surveillance program required under 29 CFR 1910.1001, and 29 CFR 1926.1101.

1.13 REGULATIONS AND STANDARDS

Regulatory compliance includes but is not necessarily limited to applicable requirements set forth by:

A. Federal Regulations:

1. 29 CFR 1910 and 1926 – Construction and General Industry Standards
2. 29 CFR 1910.1001, "Asbestos" (OSHA)
3. 29 CFR 1910.1200, "Hazard Communication" (OSHA)
4. 29 CFR 1910.134, "Respiratory Protection" (OSHA)
5. 29 CFR 1910.145, "Specification for Accident Prevention Signs and Tags" (OSHA)
6. 29 CFR 1910.146, "Permit Required Confined Spaces" (OSHA)
7. 29 CFR 1926, "Construction Industry" (OSHA)
8. 29 CFR 1926.1101, "Asbestos, Tremolite, Anthophyllite, and Actinolite" (OSHA)
9. 29 CFR 1926.500 "Guardrails, Handrails and Covers" (OSHA)
10. 40 CFR 61, Subpart A, "General Provisions" (EPA)
11. 40 CFR 61, Subpart M, "National Emission Standards for Hazardous Air Pollutants (NESHAP)" (EPA)
12. 40 CFR 763 Subpart E, "Asbestos in Schools Regulations" (EPA)
13. 49 CFR 171-172, Transportation Standards (DOT)

B. Connecticut Regulations:
State requirements which govern asbestos abatement work and hauling and disposal of asbestos waste materials include but are not necessarily limited to the following:

1. Connecticut Department of Energy and Environmental Protection (Solid Waste Management Regulations).
2. Connecticut Department of Public Health (CT DPH) regulations outlined in Section 19a-332a-1 through 19a-332a-16 "Standards for Asbestos Abatement"
3. CT DPH regulations outlined in Section 20-440-1 through 20-440-9 "Licensure and Training Requirements for Persons Engaged in Asbestos Abatement and Consulting Services"
4. Connecticut Department of Labor (CT DOL)
5. Connecticut Department of Transportation (CT DOT)

C. Local Regulations:
Local agencies which may govern or have certain requirements regarding asbestos abatement work or hauling and disposal of asbestos waste materials include but are not necessarily limited to the following:

1. Building Department
2. Health Department
3. Fire Department

D. Standards and Guidance Documents:

1. American National Standard Institute (ANSI) Z88.2-80, Practices for Respiratory Protection

2. ANSI Z9.2-79, Fundamentals Governing the Design and Operation of Local Exhaust Systems
3. EPA 560/585-024, Guidance for Controlling Asbestos Containing Materials in Buildings (Purple Book)
4. EPA 530-SW-85-007, Asbestos Waste Management Guidance

1.14 EXEMPTIONS

A. Any deviations from these specifications require the written approval and authorization from the Owner and Consultant.

B. Any modifications from the standard work practices identified in the CT DPH Standards for Asbestos Abatement, Sections 19a-332a-1 to 19a-332a-16 must be requested in writing, and approved in writing from the CT DPH.

1.15 FINAL AIR CLEARANCE

A. Following the completion of the encapsulation phase of the work, the Consultant shall collect final air clearance samples inside the work area per AHERA regulation 40 CFR Part 763 and in compliance with CT DPH regulations. The Owner of the facility shall be responsible for payment of the sampling and analysis of the initial final air clearance samples only. The contractor shall be responsible for payment of all costs associated with the collection and analysis of additional final air clearance samples if the first set of samples fail to satisfy the clearance criteria.

1.16 NOTIFICATIONS, POSTINGS, SUBMITTALS, AND PERMITS

A. The contractor shall make the following notifications, and provide the submittals to the following agencies prior to the commencement of removal work. This notification is required ten (10) calendar days prior to the start of the abatement project:

1. U.S. EPA, Region 1
   5 Post Office Square, Suite 100 (OES05-4)
   Boston, MA 02109-3912

2. Connecticut Department of Public Health
   410 Capital Avenue MS #12 AIR
   P.O. Box 340308
   Hartford, CT 06134

B. The minimum information included in the notification to these agencies includes:

1. Name and address of building Owner/Operator
2. Building location
3. Building size, age, and use
4. Amount of friable asbestos
5. Work schedule, including proposed start and completion date
6. Asbestos removal procedures to be used
7. Name and location of disposal site for generated asbestos waste, residue, and debris
8. If landfill opens in Connecticut to accept ACM waste, Consultant will notify CT DEEP prior to utilizing said landfill.

1.17 WORK SITE SAFETY PLAN

A. The contractor shall establish a set of emergency procedures and shall post them in a conspicuous place at the work site. The safety plan should include provisions for the following:

1. Evacuation of injured workers.
2. Emergency and fire exit routes from all work areas.
3. Emergency first aid treatment
4. Local telephone numbers for emergency services including ambulance, fire, and police.
5. A method to notify occupants of the building in the event of a fire or other emergency requiring evacuation of the building.

B. The contractor is responsible for training all workers in these procedures.

1.18 INDEPENDENT AIR SAMPLING AND ASBESTOS ABATEMENT MONITORING

A. This section describes independent air sampling work being performed on behalf of the Owner. This work is not in the Contract Sum. This section describes air monitoring carried out by the Owner's Consultant to verify that the building beyond the work area and the outside environment remains uncontaminated. (Personal air monitoring required by OSHA is work to be performed by the Contractor and is within the Contract Sum.)

B. The purpose of the Owner's Consultant's air monitoring is to detect faults in the work are isolation such as:

1. Contamination of the building outside of the work area by airborne asbestos fibers.
2. Failure of filtration or rupture in the differential pressure system.
3. Contamination of air outside the building envelope by airborne asbestos fibers.
   Should any of the above occur the Contractor shall immediately cease asbestos abatement activities until the fault is corrected. Do not recommence work until authorized by the Owner's Consultant.

C. The Owner's Consultant will monitor airborne fiber counts in the Work Area. The purpose of this air monitoring will be to detect airborne asbestos concentrations, which may challenge the ability of the Work Area isolation procedures to protect the balance of the building or outside of the building from contamination by airborne fibers.

D. To determine if the elevated airborne fiber counts encountered during abatement operations have been reduced to an acceptable level, the Consultant will sample and analyze air in accordance with clearance air sampling requirements.

E. The Owner's Consultant will perform on-site monitoring throughout the course of the project, as follows:

1. All work procedures shall be continuously monitored by the Consultant to assure that areas outside the designated work locations in the buildings will not be contaminated.
2. Prior to work on any given day, the Contractor's designated "competent person" shall discuss the day's work schedule with the Consultant to evaluate job tasks with respect to safety procedures and requirements specified to prevent contamination of the building or the employees. This includes a visual survey of the work area and the decontamination of the building or the employees. This includes a visual survey of the work area and the decontamination enclosure systems.

1.19 CONTRACTOR’S AIR SAMPLING RESPONSIBILITY

A. The contractor shall independently retain a CT licensed asbestos project monitor to monitor airborne asbestos concentrations in the workers' breathing zone and to establish conditions and work procedures for maintaining compliance with OSHA Regulations 29 CFR 1910.1001 and 1926.1101.

B. The Contractor's project monitor shall document all air sampling results and provide a report to the Consultant within 24 hours after sample collection.

C. All air sampling shall be conducted in accordance with methods described in OSHA Standards 29 CFR 1910.1001 and 1926.1101 and the OSHA Respiratory Protection Standard 29 CFR 1910.134.

D. A minimum of 20% of all workers in each working category (i.e., gross removal, final clearance, etc.) must be monitored each day of asbestos removal activities.

E. Phase Contrast Microscopy may be used to analyze personal air samples. The Contractor shall arrange and pay for all costs of the testing. Laboratories used shall be currently enrolled in the American Industrial Hygiene Association Proficiency Analytical Testing Program or an equivalent recognized program and approved by CT DPH.

1.20 PROPER WORKER PROTECTION

A. This section describes the equipment and procedures required for protecting workers against asbestos contamination and other workplace hazards except for respiratory protection.

B. All workers are to be accredited as abatement workers as required by the AHERA regulation 40 CFR 763 Appendix C to Subpart E, February 3, 1994.

C. The contractor is required to be certified and accredited as required by the State of Connecticut Department of Public Health Services.

D. In accordance with 29 CFR 1926 and 20-440-7 RCSA, all workers shall receive a training course covering the dangers inherent in handling asbestos, the dangers of breathing asbestos dust, proper work procedures, and proper worker protective measures. This course must include but is not limited to the following:

1. Methods of recognizing asbestos
2. Health effects associated with asbestos
3. Relationship between smoking and asbestos in producing lung cancer
4. Nature of operations that could result in exposure to asbestos
5. Importance of and instruction in the use of necessary protective controls, practices and procedures to minimize exposure including:

    a. Engineering controls
    b. Work Practices
    c. Respirators
    d. Housekeeping procedures
    e. Hygiene facilities
    f. Protective clothing
    g. Decontamination procedures
    h. Emergency procedures

6. Waste disposal procedures
7. Purpose, proper use, fitting, instructions, and limitations of respirators as required by 29 CFR 1910.134
8. Appropriate work practices for the work
9. Requirements of medical surveillance program
10. Review of 29 CFR 1926
11. Pressure Differential Systems
12. Work practices including hands on or on-job training

13. Personal Decontamination procedures
14. Air monitoring, personal and area

E. The Contractor shall provide medical examinations for all workers who may encounter an airborne fiber level of 0.1 f/cc or greater for an 8-hour Time Weighted Average and/or enter regulated areas. In the absence of specific airborne fiber data provide medical examinations for all workers who will enter the Work Area for any reason. Examination shall, at a minimum, meet OSHA requirements as set forth in 29 CFR 1926 In addition, provide an evaluation of the individual's ability to work in environments capable of producing heat stress in the worker.

F. Submit the following to the consultant for review. The contractor shall not start work until these submittals are returned with consultant action stamp indicating that they are approved.

1. Submit copies of certificates from an EPA-approved AHERA abatement workers course for each worker as evidence that each asbestos abatement worker is accredited as required by the AHERA Regulation 40 CFR 763 Appendix C to Subpart E, February 3, 1994.
2. Submit evidence that the contractor is certified to perform asbestos abatement work by the State of Connecticut Department of Public Health services.
3. Submit documents verifying that each worker has had a medical examination within the last 12 months as part of compliance with OSHA medical surveillance requirements. Submit, at a minimum, for each worker the following:

    a. Name and Social Security Number
    b. Physicians Written Opinion from examining physician including at a minimum the following:

4. Whether worker has any detected medical conditions that would place the worker at an increased risk of material health impairment from exposure to asbestos.
5. Any recommended limitations on the worker or on the use of personal protective equipment such as respirators.
6. Statement that the worker has been informed by the physician of the results of the medical examination and of any medical conditions that may result from asbestos exposure.
7. Copy of information that was provided to physician in compliance with 29 CFR 1926
8. Statement that worker is able to wear and use the type of respiratory protection proposed for the project, and is able to work safely in an environment capable of producing heat stress in the worker.
9. Submit copies of certificates for the site supervisor and the workers issued by CT DPH.

G. Submit certification signed by an officer of the abatement-contracting firm and notarized that exposure measurements, medical surveillance, and worker training records are being kept in conformance with 29 CFR 1926.

H. The Contractor shall maintain control of and be responsible for access to all work areas to ensure the following requirements:

1. Non-essential personnel are prohibited from entering the area.
2. All authorized personnel entering the work area shall read the "Worker Protection Procedures" which are posted at the entry points to the enclosure system, and shall be equipped with properly fitted respirators and protective clothing.
3. All personnel who are exiting from the decontamination enclosure system shall be properly decontaminated.
4. Asbestos waste that is taken out of the work area must be properly bagged and labeled in accordance with these specifications. The surface of the bags shall be decontaminated. Asbestos leaving the enclosure system must be immediately

transported off-site or immediately placed in locked, posted temporary storage on-site, and removed within 24 hours of the project conclusion.

5. Any material, equipment, or supplies that are brought out of the decontamination enclosure system shall be cleaned and decontaminated by wet cleaning and/or HEPA vacuuming of all surfaces.

1.21 ALTERNATE WORK PRACTICES

A. The contractor and/or consultant may obtain services of a CT DPH certified asbestos project designer and submit application for variances to the CT DPH, as applicable for any alterations, modifications or non-conforming methods intended of asbestos removal. Methods requiring variances include but are not necessarily limited to glove-bagging, use of tent procedures, remote decons, etc. The alternative procedures shall be submitted in writing and hand delivered or post marked at least ten (10) days before the project start date. CT DPH may approve an alternative procedure for an asbestos abatement project with certain conditions that would provide equivalent or a greater measure of asbestos emission control than the conventional work practices. The alternate work practice request form shall be signed and sealed by a Licensed Designer. Any fees associated with the application shall be paid by the Contractor. All alternative work practices (AWPs) must be approved and accepted by Langan's project designer regardless if they have been approved by CT DPH. The abatement contractor will be required to propose a credit to the building owner/client/consultant that must be reviewed and accepted prior to AWP submission to CT DPH.

1.22 POST-PROJECT CLOSEOUT

A. The contractor shall provide all required documentation as required by this specification once his/her work is complete, final clearances passed and asbestos waste disposed of. This should include but not be limited to: bound copy of the daily log containing log of daily work activities, all supervisor and worker certificates of training and Connecticut licenses, certificates of insurance, daily sign in sheets, containment entry/exit logs, copy of recording manometer charts, waste shipment records, personal air monitoring laboratory reports and chain-of-custody documentation, and project completion certificate. Final payment shall not be made to the contractor until all required documentation is submitted and verified.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Deliver all materials in the original packages, containers, or bundles bearing the name of the manufacturer and the brand name and product technical description.

B. Damaged or deteriorating materials shall not be used and shall be removed from the premises. Material that becomes contaminated with asbestos shall be decontaminated or disposed of as asbestos waste.

C. Polyethylene sheet in a roll size to minimize the frequency of joints shall be delivered to the job site with factory label indicating 4 or 6 mil.

D. Polyethylene disposable bags shall be six (6) mil with pertinent pre-printed label. Tie wraps for bags shall be plastic, five (5) inches long (minimum), pointed and looped to secure filled plastic bags.

E. Tape or adhesive spray will be capable of sealing joints in adjacent polyethylene sheets and for attachment of polyethylene sheet to finished or unfinished surfaces of dissimilar materials and capable of adhering under both dry and wet conditions, including use of amended water.

F. Surfactant (wetting agent), shall consist of fifty (50) percent polyoxyethylene ether and fifty (50) percent polyoxyethylene ester, or equivalent, and shall be mixed with water to provide a concentration of one (1) ounce surfactant to five (5) gallons of water or as directed by manufacturer.

G. Removal encapsulant shall be non-flammable factory prepared penetrating chemical encapsulant found acceptable to Consultant. Usage shall be in accordance with manufacturer's printed technical data.

H. The contractor shall have available spray equipment capable of mixing wetting agent with water and capable of generating sufficient pressure and volume and having sufficient hose length to reach all areas with asbestos.

I. Impermeable containers are to be used to received and retain any asbestos-containing or contaminated materials until disposal at an acceptable disposal site. The containers shall be labeled in accordance with OSHA Standard 29 CFR 1926.1101. Containers must be both air and watertight.

J. Labels and signs, as required by OSHA Standard 29 CFR 1926.1101, will be used.

K. Encapsulant shall be bridging or penetrating type which has been found acceptable to the consultant. Usage shall be in accordance with manufacturer's printed technical data.

L. HEPA filtered local exhaust ventilation shall be utilized during the installation of enclosures and supports where asbestos-containing materials may be disturbed.

2.2 TOOLS AND EQUIPMENT

A. The contractor shall provide all tools and equipment necessary for asbestos removal, encapsulation and enclosure.

B. The contractor's air monitoring professional shall have air-monitoring equipment of type and quantity to monitor operations and conduct personnel exposure surveillance per OSHA requirements.

C. The contractor shall have available sufficient inventory or dated purchase orders for materials necessary for the job including protective clothing, respirators, filter cartridges, polyethylene sheeting of proper size and thickness, tape and air filters.

D. The contractor shall provide (as needed) temporary electrical power panels, electrical power cables, and electrical power sources (such as generators). Any electrical connection work affecting the building electrical power system shall be performed by a State of Connecticut licensed electrician and the contractor shall obtain all necessary local permits.

E. The contractor shall have available shower stalls and plumbing to support same to include sufficient hose length and drain system or an acceptable alternate.

F. Exhaust air filtration system units shall contain HEPA filter(s) capable of sufficient air exhaust to create negative pressure of -0.02 inches of water within enclosure with respect to outside area. Equipment shall be checked for proper operation by smoke tubes or differential pressure gauge before the start of each shift and at least twice during the shift. Adequate exhaust air shall be

provided for a minimum of four (4) air changes per hour within the enclosure. No air movement system or air filtering equipment shall discharge unfiltered air outside.

G. Vacuum units, of suitable size and capacities for the project, shall have HEPA filter(s) capable of trapping and retaining at least 99.97 percent of all monodispersed particles of 0.3 micrometers in diameter or larger.

H. The contractor will have reserve units so that systems will operate continuously.

2.3 RESPIRATORY PROTECTION

A. Select respirators from those approved by the Mine Safety and Health Administration (MSHA), and the National Institute for Occupational Safety and Health (NIOSH), Department of Health and Human Services.

B. Respirators shall be individually fit-tested to personnel under the direction of an Industrial Hygienist on a yearly basis. Fit-tested respirators shall be permanently marked to identify the individual fitted, and use shall be limited to that individual. Fit-test records shall be maintained on-site for each employee.

C. Where fiber levels permit, and in compliance with regulatory requirements, Powered Air Purifying Respirators (PAPR) are the minimum allowable respiratory protection permitted to be utilized during gross removal operations. The Contractor shall use supplied air respirator for confined space requirements. PAPR's are the minimal respiratory protection required for all thermal system insulation and surfacing asbestos abatement.

D. No respirators shall be issued to personnel without such personnel participating in a respirator training program.

E. High Efficiency Particulate Air (HEPA) respirator filters shall be approved by NIOSH and shall conform to the OSHA requirements in 29 CFR 1910.134 and 29 CFR 1926.1101.

F. A storage area for respirators shall be provided by the contractor in the clean room side of the personnel decontamination enclosure where they will be kept in a clean environment.

G. The contractor shall provide and make available a sufficient quantity of respirator filters so that filter changes can be made as necessary during the work day. Filters will be removed and discarded during the decontamination process. Filters cannot be reused. Filters must be changed if breathing becomes difficult.

H. Filters used with negative pressure air purifying respirators shall not be used any longer than one eight (8) hour work day.

I. Any authorized visitor, worker, or supervisor found in the work area not wearing the required respiratory protection shall be removed from the project site and not be permitted to return.

J. The contractor shall have at least two (2) Powered Air Purifying Respirators stored on-site designated for authorized visitors use. Appropriate respirator filters for authorized visitors shall be made available by the contractor.

K. Establish a respirator program as required by ANSI Z88.2 and 29 CFR 1910.134, and 29 CFR 1926.1101. Provide respirator training and fit-testing.

2.4 PROTECTIVE CLOTHING

A. Provide personnel utilized during the Project with disposable protective whole body clothing, head coverings, gloves and foot coverings. Provide disposable plastic or rubber gloves to protect hands. Cloth gloves may also be worn. Make sleeves secure at the wrists and make foot coverings secure at the ankles by the use of tape, or provide disposable coverings with elastic wrists or tops.

B. Provide sufficient quantities of protective clothing to assure a minimum of four (4) complete disposable outfits per day for each individual performing abatement Work.

C. Eye protection and hard hats shall be provided and made available for all personnel entering any work area.

D. Authorized visitors shall be provided with suitable protective clothing, headgear, eye protection, and footwear whenever they enter the work area.

PART 3 - EXECUTION

3.1 PRE-ABATEMENT MEETING

A. At least one week prior to the start of work a Pre-Construction Meeting will be scheduled and must be attended by the contractor and any sub-contractors. The assigned contractor site supervisor is also required to attend this meeting.

B. The contractor shall present a detailed project schedule and project submittals at the Pre-Construction Meeting. Variations, amendments, and corrections to the presented schedule will be discussed, and the Owner and consultant will inform the contractor of any scheduling adjustments for this project.

C. Following the Pre-Construction Meeting, the contractor shall submit a revised schedule (if needed) no later than one week after the meeting.

3.2 WORK AREA PREPARATION

A. Where necessary, shut down electrical power, including receptacles and light fixtures. Under no circumstances during the decontamination procedures will lighting fixtures be permitted to be operating when the spraying of amended water may contact the fixture. Provide GFCI devices, temporary power, and temporary lighting installed in compliance with the applicable electrical codes. All installations are to be made by a State of Connecticut licensed electrician.

B. Shut down and/or isolate heating, cooling, and ventilation air systems or zones to prevent contamination and fiber dispersal to other areas of the structure. During the work, vents within the work area shall be "criticalled" with duct tape and polyethylene sheeting.

C. The contractor shall be responsible for removing furniture from the work areas. The contractor shall pre-clean moveable objects within the proposed work areas using HEPA vacuum equipment and/or wet cleaning methods as appropriate and remove such objects from work areas to a temporary location. For example, cabinets to gain access to floor tile and associated mastic.

D. Seal off all openings, including, but not limited to, windows, corridors, doorways, skylights, ducts, grills, diffusers, and any other penetration of the work areas, with polyethylene sheeting a minimum of six (6) mils thick, sealed with duct tape. This includes doorways and corridors that will not be used for passage during work areas and occupied areas.

E. Pre-clean fixed objects within the work areas, using HEPA vacuum equipment and/or wet cleaning methods as appropriate, and enclose with a minimum six (6) mil plastic sheeting sealed with duct tape.

F. Clean the proposed work areas using HEPA vacuum equipment or wet cleaning methods as appropriate. Do not use methods that raise dust, such as dry sweeping or vacuuming with equipment not equipped with HEPA filters.

G. After HEPA vacuum cleaning, cover fixed walls with two (2) layers of four (4) mil polyethylene sheeting to the floor level. Where fixed walls are not used, two layers of six (6) mil polyethylene sheeting will be applied to a rigid framework of wood, metal, or PVC. Where floor tile/mastic is not being abated, cover the floor with two (2) layers of six-mil polyethylene sheeting. All overlaps shall be sealed with tape or spray adhesive.

H. Maintain emergency and fire exits from the work areas, or establish alternate exits satisfactory to fire officials.

I. Clean and remove ceiling mounted objects, such as lights and other items not sealed off, which interfere with asbestos abatement. Use hand-held amended water spraying or HEPA vacuuming equipment during fixture removal to reduce settled fiber dispersal.

J. Create pressure differential between work areas and uncontaminated areas by the use of acceptable negative air pressure equipment sufficient to provide four (4) air changes per hour and create negative pressure of -0.02 inches of water within enclosure with respect to outside area as measured on a water gauge.

3.3 DECONTAMINATION SYSTEM

A. The following requirements shall be followed for the worker decontamination unit:

1. At all asbestos abatement projects, work areas shall be equipped with decontamination facilities consisting of: a clean room, a shower room, and an equipment room attached to each containment.
2. The decontamination enclosure system chambers shall be constructed to meet the criteria of the Specification. The decontamination enclosure shall be installed watertight to prevent water leaks. The interior shall be lined with two layers of 6-mil fire-retardant plastic sheeting, with a minimum overlap of 16 inches at seams and sealed (airtight) by tape and adhesive. The interior floor shall be sheathed with (2) layers of reinforced fire retardant plastic sheeting with a minimum overlap on the wall of sixteen (16) inches. The contractor shall ensure compliance with local building codes and other regulations governing temporary structures.
3. Curtained Doorways: Three overlapping sheets of 6-mil polyethylene shall be placed over a framed doorway and secured along the top of the doorway. Secure the vertical edge of the outer sheets along one vertical side of the doorway and the vertical edge of the center sheet along the opposite vertical side of the doorway. The sheets shall be weighted so that they close quickly after being released.
4. Air Locks: Air locks shall consist of two curtained doorways placed a minimum of three feet apart.

    a. Clean Room: In this room, persons remove and leave all street clothes and put on clean disposable coveralls. Approved respiratory protection equipment is stored in this area. The floor of the clean room must be kept dry at all times. At the end of each shift, the room must be cleaned using wet rags. Also, a lockable door may be installed. No asbestos-containing materials are allowed in this room. The clean room

shall be equipped with suitable hooks, lockers, shelves, etc. for workers to store personal articles and clothing. THIS IS NOT A CONTAMINATED AREA.

b. Shower Room: Provide a completely watertight operational shower to be used by cleanly dressed workers heading for the Work area from the clean room or for showering workers headed out of the Work Area after dressing in the Equipment Room. Shower must be constructed so that water leakage is minimized. The shower shall have one shower per six full shift abatement people, calculated on the basis of the largest shift. Any leaking water must be cleaned immediately. Showers must be equipped with hot and cold running water, soap and sufficient disposable towels for the number of workers at the job site. Arrange water shut off and drain pump operation controls, so that a single individual can shower without assistance from either inside or outside the work area. THIS IS A CONTAMINATED AREA.

   Pump wastewater into a polyethylene lined 55-gallon drum located in the work area to be added to the asbestos waste. If the water is allowed by the work treatment workers to be pumped into a drain, provide 20 micron and 5 micron waste water filters in line to drain. Change filters at a minimum of once a day. Locate filters inside the shower unit, so that the shower pan catches the water lost during filter change.

c. Equipment Room: Work equipment, footwear, and all other contaminated work clothing are to be left here upon exiting work area. A walk-off pan filled with water shall be located in the work area just outside the equipment room for workers to clean foot coverings while exiting the work area. This is a change and transit area for workers. Provide a drop cloth layer of sheet plastic on the floor of the Equipment Room for every shift change. Roll drop cloth layer in upon itself at the end of each shift and dispose of as contaminated waste. THIS IS A CONTAMINATED AREA.

   Each room shall be separated from the other and from the work area by airlocks such as will prevent the free passage of air or asbestos fibers and shall be accessible through doorways protected with three (3) overlapping 6 mil polyethylene sheets which shall be weighed, so as to fall into place when people pass through the area. The shower room shall be contiguous to the clean room and equipment room. All personnel entering or leaving the work area shall pass through the shower room. The number of showers provided shall satisfy the requirements of OSHA 29 CFR 1910.141. Hot and cold water shall be supplied to the showers. The equipment room (dirty room) shall be situated between the shower room and the work area and separated from both by means of suitable barriers or overlapping flaps such as will prevent the free passage of air or asbestos fibers.

   Decontamination chamber doors shall be of sufficient height and width to enable replacement of equipment, which may fall, and to safely stretcher or carry an injured worker from the site without destruction of the chamber or unnecessary risk to the integrity of the work area. Such doors must be at least four (4) feet wide, and the distance between sets of doors must be at least four (4) feet.

5. No person or equipment shall leave the asbestos abatement project work area unless first decontaminated by showering, wet washing or HEPA vacuuming to remove all asbestos debris. No asbestos contaminated materials or persons shall enter the clean room.
6. Where feasible, decontamination systems shall abut the work area. In situations where it is not possible, due to unusual conditions, to establish decontamination systems contiguous to the work area, personnel shall be directed to remove visible asbestos debris from their persons by HEPA-filtered vacuuming prior to donning clean disposable coveralls while still in the work area, and proceeding directly to a remote decontamination system to shower and change clothes to follow work area exit procedures.
7. In specific situations where the asbestos contractor determines that it is not feasible to establish a contiguous decontamination system at a work site, the asbestos contractor shall utilize a remote decontamination system if approved by Langan. Such systems must be operated in conformance with 29 CFR 1926.1101, Appendix F.

B. Remote Decontamination Facility:

For exterior work on the roof, glove bag or tent procedures, when full containment enclosure is not feasible, the Contractor shall provide remote personnel decontamination enclosure system if approved by the Consultant - Langan.

C. Occupied areas and/or building space not within the work areas shall be separated from asbestos abatement work areas by means of airtight barriers.

D. Construct the decontamination system with wood or metal framing, 3/8" sheathing and cover both sides with a double layer of six (6) mil polyethylene sheeting, spray glued or taped at the joints. Caulk joints watertight at floor, walls, and ceiling.

E. The contractor and the consultant shall visually inspect barrier several times daily to assure effective seal and the contractor shall repair defects immediately

F. Waste/Equipment Decontamination Enclosure System:
This system is located adjacent to the work area. The equipment decontamination enclosure system, consisting of two totally enclosed spaces, shall be constructed as follows:

1. Equipment Washroom: An equipment washroom shall have two air locks: one adjacent to the work area and one common air lock which separate it from the holding area. The washroom shall have facilities for washing material containers and equipment. Gross removal of dust and debris from contaminated material containers and equipment shall be accomplished in the work area, prior to moving to the washroom.
2. Holding Area: A holding area shall share a common air lock with the equipment washroom and shall have a curtained doorway to outside areas. A hinged, lockable door shall be placed at the holding area entrance to prevent unauthorized access into the work area.
3. Remote Decontamination Facility: For exterior work on the roof, glove bag or tent procedures, when full containment enclosure is not required, the contractor shall provide remote Waste/Equipment decontamination enclosure system as specified.

3.4 ABATEMENT REMOVAL PROCEDURES

A. Regulatory compliance will include, but is not necessarily limited to, applicable requirements set forth by the Federal Environmental Protection Agency (EPA), Connecticut Departments of Public Health (CT DPH), Connecticut Department of Environmental Protection, and Greenwich/local Health and Building Departments.

B. The following procedures shall be followed while performing the abatement activities:

1. No asbestos abatement work, including preparation, shall be performed or continued without having proper notification and a certified supervisor at the work area. The contractor shall have a designated "competent person" on the job at all times to ensure establishment of a proper enclosure system and proper work practices throughout the project.
2. Abatement work will not commence until authorized by the consultant.
3. Provide and display danger signs at every entrance to the work areas in clearly visible locations indicating that asbestos removal work is being conducted and unauthorized and not protected persons should not enter.
Signs must use the following legend:

DANGER
ASBESTOS
MAY CAUSE CANCER

CAUSES DAMAGE TO LUNGS
AUTHORIZED PERSONNEL ONLY
WEAR RESPIRATORY PROTECTION AND
PROTECTIVE CLOTHING IN THIS AREA

Signs shall be posted which meet the specifications set forth in 29 CFR 1926.1101 at all approaches to the work area. Signs shall be posted a sufficient distance from the work area to permit a person to read the sign and take precautionary measures to avoid exposure to asbestos.

4. The worker decontamination enclosure system shall be installed or constructed prior to plasticizing the work area or before disturbing ACM. The waste decontamination enclosure system shall be installed or constructed prior to commencement of gross removal work.
5. All asbestos handlers shall wear disposable suits, including gloves, hood and footwear, and appropriate respiratory equipment, after removing street clothes in the clean room.
6. Abatement of asbestos-containing materials shall be done by wet methods only.
7. ACM shall be sprayed with amended water in sufficient frequency and quantity for enhanced penetration. Sufficient time shall be allowed for penetration to occur prior to removal action or other disturbance-taking place. Dry removal of asbestos materials is prohibited.
8. In order to maintain indoor asbestos concentrations to the minimum, the wet asbestos must be removed in manageable sections. Material drop shall not exceed eight (8) feet. For heights up to 15 feet, provide inclined chutes or scaffolding to intercept drop.
9. Remove asbestos containing materials as appropriate by standard methods. Fill disposal containers as removal proceeds; seal filled containers and clean containers before removal to equipment decontamination system. Wet clean each container thoroughly, double bag and apply caution label. Ensure that workers do not exit the work area thorough the equipment decontamination enclosure.
10. After completion of stripping work, all surfaces from which asbestos has been removed shall be wet brushed, using a nylon brush, wet wiped, and sponged or cleaned by an equivalent method to remove all visible material (wire brushes are not permitted). During this work, the surfaces being cleaned shall be kept wet.
11. Remove and containerize all visible accumulations of asbestos-containing and/or asbestos-contaminated debris. During cleanup, utilize brooms, rubber dustpan, and rubber squeegees to minimize damage to floor covering.
12. Retrieve all free water in contaminated areas and place in plastic lined leak-tight drums.
13. Sealed disposal containers, and all equipment used in the work area, shall be included in the cleanup and shall be removed from work areas via the equipment decontamination enclosure at an appropriate time in the cleaning sequence. All asbestos waste in 6-mil polyethylene disposal bags shall be double bagged in the equipment decontamination enclosure before removal from the Site.
14. At any time during asbestos removal, should the consultant suspect contamination of areas outside the work area(s), he shall cause all abatement work to stop until the contractor takes steps to decontaminate these areas and eliminate the causes of such contamination. Unprotected individuals shall be prohibited from entering suspected contaminated areas until air sampling and visual inspections certify decontamination.
15. After completion of the initial final cleaning procedure including removal of the inner layers of polyethylene sheeting, but prior to encapsulation, a pre-sealant inspection shall be conducted by the consultant. The pre-sealant inspection shall verify that ACM and residual dust has been removed from the work area.
16. After the work area has been inspected by the Engineer and rendered free of visible debris, a thin coat of a pigmented (non-transparent) encapsulating agent shall be applied to all surfaces in the work area from which ACM was removed, to lockdown nonvisible fibers.
17. Removal of asbestos containing materials shall be done under negative pressure containment. All OSHA Class I, Class III, and interior Class II asbestos abatement

projects shall employ HEPA negative air pressure equipment ventilation. The negative air pressure equipment shall operate continuously, twenty-four (24) hours a day, from startup of negative air pressure equipment, through the cleanup operations. A negative air pressure, relative to areas outside of the enclosure, shall be maintained at all times in the regulated abatement work area during the asbestos abatement project to ensure that contaminated air in the regulated abatement work area does not escape back to an uncontaminated area. A manometer shall be used to document the pressure differential for all OSHA Class I Large and Small size asbestos project regulated abatement work areas. A minimum of -0.02 column inches of water pressure differential, relative to pressure outside the regulated abatement work area, shall be maintained within the regulated abatement work area, as evidenced by manometric measurements.

3.5 CONSULTANT

A. The Owner has retained Langan Engineering (Langan) as the Hazardous Materials Consultant for the purpose of project design, construction administration, and project monitoring during Asbestos Abatement. Mr. Matthew Myers (License #000058) of Langan is the DPH-approved Asbestos Project Designer for this project. The Consultant will represent the Owner in all tasks of the abatement project at the discretion of the Owner. The Asbestos Abatement Contractor will regard the Consultant's direction as authoritative and binding as provided herein, in matters particularly but not limited to approval of work areas, review of monitoring results, completion of the various segments of work, final completion of the abatement, submission of data, and daily field punch list items.

3.6 CONSULTANT'S RESPONSIBILITIES

A. Air sampling shall be conducted by the consultant to ascertain the integrity of controls that protect the building from asbestos contamination. Independently, the contractor shall monitor air quality within the work area to ascertain the protection of employees and to comply with OSHA regulations.

B. The consultant's CT DPH licensed asbestos project monitor shall collect and analyze air samples during two time periods:

1. Abatement Period: If required, the consultant's project monitor shall collect samples on a daily basis during the work period. A sufficient number of area samples shall be taken outside of the work area, at the exhaust of the negative pressure system, and outside of the building to judge the degree of cleanliness or contamination of the building during removal. Additional samples may be taken inside the work area and decontamination enclosure system, at the discretion of the project monitor.
2. Post-Abatement Period: The consultant's project monitor shall conduct air sampling following the final cleanup phase of the project, once the "no visible residue" criterion, as established by the project monitor, has been met. Five (5) samples shall be collected inside the work area utilizing aggressive methods to comply with the State of Connecticut Department of Public Health Standards for Asbestos Abatement, sections 19a-332a-12. Analysis of the samples to determine airborne concentrations of asbestos shall be conducted by Transmission Electron Microscopy (TEM) method with an average limit of 70.0 structures per square millimeter of filter surface or by Phase Contrast Microscopy (PCM) with a limit of 0.010 fibers per cubic centimeters of air in accordance with the above Connecticut regulation sections.

C. The consultant's project monitor shall provide continual evaluation of the air quality of the building during removal, using his/her best professional judgment in respect to the State of Connecticut Department of Public Health guideline of 0.010 fibers/cc and the background air quality established during the pre-abatement period.

D. If the project monitor determines that the building air quality has become contaminated from the project, he/she shall immediately inform the contractor to cease all removal operations and implement a work stoppage clean up procedure. The contractor shall conduct a thorough cleanup of the areas of the building designated by the consultant. No further removal work can take place until the project monitor has assessed that the building air has been decontaminated.

E. Pre-abatement and abatement air samples shall be collected as required to obtain a volume of 1,200 liters. Samples shall be analyzed by Phase Contrast Microscopy (PCM) methodology using the NIOSH 7400 protocol.

3.7 CONSULTANT'S INSPECTION RESPONSIBILITIES

A. The consultant shall conduct inspection throughout the progress of the abatement project. Inspections shall be conducted in order to document the progress of the abatement work as well as the procedures and practices employed by the abatement contractor.

B. The consultant shall perform the following inspections during the course of abatement activities:

1. Pre-commencement Inspection: Pre-commencement inspections shall be performed at the time requested by the abatement contractor. The consultant shall be informed 12 hours prior to the time the inspection is needed. If, during the course of the pre-commencement inspection, deficiencies are found, the contractor shall perform the necessary adjustments in order to obtain compliance.
2. Work Area Inspections: Work area inspections shall be conducted on a daily basis at the discretion of the consultant. During the course of the work inspections, the consultant shall observe the contractor's removal procedures, verify barrier integrity, monitor negative air filtration devices, assess project progress, and inform the abatement contractor of specific remedial activities if deficiencies are noted.
3. Pre-encapsulation/Final Visual Inspection: The consultant, upon the request of the abatement Contractor, shall conduct a pre-sealant inspection. The consultant shall be informed 24 hours prior the time that the inspection is needed. The pre-encapsulation inspection shall be conducted after completion of the all cleaning procedures, but prior to encapsulation. The pre-encapsulation inspection shall verify that all ACM and residual debris have been removed from the work area. If, during the course of the pre-encapsulation inspection, the consultant identifies residual dust or debris, the contractor shall comply with the request of the consultant in order to render the area "dust free."

3.8 CLEARANCE AIR TESTING

A. After the visual inspection is completed and all surfaces in the abatement area have dried, final air clearance sampling shall be performed by the consultant. Aggressive air monitoring will be used. Selection of location and samples shall be the responsibility of the consultant. Air monitoring volumes shall be sufficient to provide a detection limit of 0.010 f/cc using NIOSH-approved method for PCM analysis. For air clearance by Transmission Electron Microscopy, air-monitoring volumes shall be sufficient to provide a detection limit of 0.005 f/cc using the AHERA Level II Yamate Method.

B. Areas which do not comply with the Standard for Cleaning for Initial Clearance shall continue to be cleaned by and at the contractor's expense until the specified Standard of Cleaning is achieved as evidenced by results of air testing as previously specified.

3.9 ASBESTOS WASTE DISPOSAL

A. The contractor shall package, label, and remove all asbestos waste from the work area in accordance with Connecticut DEEP and DPH regulations, all other applicable regulations, and as

specified below. Packaging shall be accomplished in a manner that minimizes waste volume, but insures waste containers shall not tear or break. All waste shall be transported in leak tight containers.

B. Asbestos wastes may include building materials, insulation, disposable clothing and protective equipment, plastic sheeting and tape, exhaust systems or vacuum filters, contractor equipment, or other materials designated by state or local authorities which have been potentially contaminated with asbestos and have not been fully cleaned.

C. Waste Labeling

1. Warning labels, having waterproof print and permanent adhesive in compliance with OSHA, EPA, CT DEEP/DOT and CT DPH requirements, shall be affixed to or printed on the sides of all waste bags or transfer containers. Warning labels shall be conspicuous and legible, and contain the following words:

   DANGER
   CONTAINS ASBESTOS FIBERS
   MAY CAUSE CANCER
   CAUSES DAMAGE TO LUNGS
   DO NOT BREATHE DUST
   AVOID CREATING DUST

2. In compliance with NESHAP, 40 CFR, Part 61.150, all waste containers or bags shall be labeled with the following generator information:

   a. Name of waste generator
   b. Location of where waste was generated

D. Wetting of Waste: A fine water spray shall be used to keep the top layers of waste in containers thoroughly wet at all times. When a waste bag is full, air within the bags shall be evacuated with a HEPA equipped vacuum and be securely sealed with tape or other secure fastener.

E. Use and Decontamination of Fiber Drums: The Contractor's use and decontamination of fiber drums shall be in accordance with CT DPH, EPA and DOT requirements. The drums shall be lined with a minimum of two layers of 6-mil asbestos waste bags. The waste will be appropriately labeled and sealed. The drums shall be sealed with an airtight lid and shall be decontaminated and/or additionally bagged if the drums are filled inside the containment and visible debris/contamination is observed on the exterior of the drums. All waste shall be labeled as previously described. The drums and waste will be re-containerized should their integrity be compromised and/or liquid is visibly passing through or staining the container.

F. Waste Container Storage: The container used for the storage of bagged contaminated waste shall be an enclosed dumpster. The dumpster shall have a solid metal roof and a solid metal door with padlock. At a minimum, line the cargo area with two layers of a 6-mil polyethylene sheeting to prevent contamination from damaged or leaking containers. Floor sheeting shall be installed first and shall extend up the sidewalls 24 inches minimum. Wall sheeting shall be overlapped and taped securely into place. No un-bagged contaminated waste or non-asbestos waste shall be stored in these dumpsters. Ensure that bags placed in dumpsters are undamaged. Warning signs shall be posted on the dumpster in accordance with Sections 29 CFR 1926.1101 of the OSHA regulations.

G. Waste Removal Scheduling: All waste containers shall be decontaminated and removed from the Site before final cleanup is started and isolation barriers are taken down.

H. Waste Transportation and Disposal

1. It is the responsibility of the contractor to determine and insure that the contractor and his/her subcontractor are complying with: 1) current waste handling regulations; and 2) the current regulations for transporting and disposing waste at the ultimate disposal landfill. The contractor must comply fully with these regulations, and with all U.S. Department of Transportation, State, local, and EPA requirements.
2. The contractor's waste hauler and disposal contractor shall maintain a valid hazardous waste transporter's permit and identification number; and obtain complete, and fully comply with any other local hazardous waste manifesting requirements.
3. Exercise care before and during transport to ensure that no unauthorized persons have access to the containerized ACW.
4. Do not transport ACW on open trucks. Treat and dispose of drums that have been contaminated as asbestos-containing waste.
5. A copy of ACW manifest forms shall be sent to the Owner after each disposal is completed and all required data and signatures have been inserted.
6. The contractor shall return the original Disposal Certificate (landfill receipt) to the Owner within 10 working days of waste shipment from the Site.

END OF SECTION 028213

SECTION 028313 – LEAD-BASED PAINT AWARENESS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. General Provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

B. Refer to all drawings and/or other Sections of these specifications to determine the type and extent of work therein affecting the work of this Section, whether or not such work is specifically mentioned herein.

C. Sections containing requirements related to this Section include, but are not limited to:

1. Section 028200 – Selective Hazardous Building Materials Abatement Demolition
2. Section 028213 – Asbestos Abatement
3. Section 028416 – Universal Waste Removal and Recycling
4. Section 028432 – PCB Remediation
5. HBM – 01, 02, 03, 04, 05, 06 & 07 – Hazardous Building Materials Abatement Drawings

1.2 SUMMARY OF WORK

A. Work of this Section includes requirements for worker protection and waste disposal related to the renovation work involving components and surfaces containing lead at the Old Greenwich School project site located in Greenwich, Connecticut. All materials should be considered to contain some amounts of lead. XRF screening identified lead-based paint on metal stairwell components, metal and wood window, door and vent system components, plaster ceilings and walls (assumed based on ceiling testing) and exterior painted trim (eaves, gutters, upper decorative trim, dormers, etc.). The contractor must have proper training to perform paint removal on these materials (for materials to remain) and removal of components/materials (for materials/substrates to be removed and replaced) (RRP or CT DPH licensed lead abatement contractor) and follow lead-safe work practices (including protection of ground and roof surfaces to prevent possible contamination and proper disposal of lead hazardous waste). The hazardous building materials abatement contractor will be required to place tarps and polyethylene sheeting below areas of work on ground and roof surfaces after pre-cleaning the ground and roof surfaces. Please see 3.6 Waste Disposal for additional disposal information.

B. The procedures referenced herein shall be utilized during required demolition work specified elsewhere in the Architect's Specification that might impact lead.

C. Renovation and demolition activities may result in dust and debris exposing workers to levels of lead above the OSHA Action Level. Worker protection, training, and engineering controls referenced herein shall be strictly adhered to, until completion of exposure assessment with results indicating exposures below the "Action Level". This section does not involve lead abatement by CT DPH regulation, but identified worker protection requirements for trades involved in the demolition and disposal procedures if lead is involved in the waste stream.

1.3 DEFINITIONS

A. The following definitions relative to lead paint as used in this Section are offered:

1. Action Level (AL): The allowable employee exposure, without regard to use of respiratory protection, to an airborne concentration of lead over an eight (8) hour time weighted average (TWA), as defined by OSHA. The current action level is thirty micrograms per cubic meter of air (30 µg/m^3).
2. Area Monitoring: The sampling of lead concentrations, which is representative of the airborne lead concentrations that may reach the breathing zone of personnel potentially exposed to lead.
3. Biological Monitoring: The analysis of a person's blood and/or urine, to determine the level of lead concentration in the body.
4. Change Room: An area provided with separate facilities for clean protective work clothing and equipment and for street clothes, which prevents cross-contamination.
5. Competent Person: A person employed by the Contractor who is capable of identifying existing and predictable lead hazards in the surroundings or working conditions, and who has authorization to take prompt corrective measures to eliminate them as defined by OSHA.
6. Exposure Assessment: An assessment conducted by an employer to determine if any employee may be exposed to lead at or above the action level.
7. "High Efficiency Particulate Air" (HEPA): A type of filtering system capable of filtering out particles of 0.3 microns diameter from a body of air at 99.97% efficiency or greater.
8. Lead: Refers to metallic lead, inorganic lead compounds and organic lead soaps. Excluded from this definition are other organic lead compounds.
9. Lead Work Area: An area enclosed in a manner to prevent the spread of lead dust, paint chips, or debris resulting from lead-containing paint disturbance.
10. Lead Paint: Refers to paints, glazes and other surface coverings containing a toxic level of lead.
11. Permissible Exposure Limit (PEL): The maximum allowable limit of exposure to an airborne concentration of lead over an eight (8) hour time weighted average (TWA), as defined by OSHA. The current PEL is fifty micrograms per cubic meter of air (50 µg/m^3). Extended workdays lower the PEL by the formula: PEL equals 400 divided by the number of hours of work.
12. Personal Monitoring: Sampling of lead concentrations within the breathing zone of an employee to determine the 8-hour time weighted average concentration in accordance with 29 CFR 1926.62 and 29 CFR 1910.1025. Samples shall be representative of the employee's work tasks. Breathing zone shall be considered an area within a sphere with a radius of 18 inches and centered at the nose or mouth of an employee.
13. Resource Conservation Recovery Act (RCRA): RCRA establishes regulatory levels of hazardous chemicals. There are eight (8) heavy metals of concern for disposal: arsenic, barium, cadmium, chromium, lead, mercury, selenium, and silver. Six (6) of the metals are typically found in paints, excluding selenium and silver.
14. Toxic Level Of Lead: A level of lead, when present in dried paint or plaster, contains more than 0.50% lead by dry weight as measured by atomic absorption spectrophotometry (AAS) or 1.0 mg/cm^2 as measured by on-site testing utilizing an x-ray fluorescence analyzer. (Term is specific to State of CT regulations and HUD guidelines only)
15. Toxicity Characteristic Leachate Procedure (TCLP): The U.S. Environmental Protection Agency (US EPA) required sample preparation and analysis for determining the hazard characteristics of a waste material.

1.4 REGULATIONS AND STANDARDS

A. The following regulations, standards, and ordinances of federal, state, and local agencies are applicable and made a part of this specification by reference:

1. American National Standards Institute (ANSI) ANSI 288.2 - 1980 Respiratory Protection
2. Code of Federal Regulation (CFR)

a. 29 CFR 1910.134 - Respiratory Protection
b. 29 CFR 1910.1025 - Lead
c. 29 CFR 1926.62 - Lead in Construction Interim Final Rule
d. 29 CFR 1910.1200 - Hazard Communication
e. 29 CFR 1926.59 - Hazard Communication in Construction
f. 29 CFR 1926.55 - Gases, Vapors, Fumes, Dusts, and Mists
g. 29 CFR 1926.57 - Ventilation
h. 40 CFR 260 - Hazardous Waste Management Systems: General

3. 40 CFR 261 - Identification and Listing of Hazardous Waste
4. 40 CFR 262 - Generators of Hazardous Waste
5. 40 CFR 263 - Transporters of Hazardous Waste
6 40 CFR 264 - Owner and Operators of Hazardous Waste Treatment, Storage, and
7. Disposal Facilities

a. 40 CFR 265 - Interim Statutes for Owner and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities
b. 40 CFR 268 - Lead Disposal Restrictions
c. 40 CFR 172 - Hazardous Materials Tables and Communication Regulations
d. 40 CFR 178 - Shipping Container Specifications
e. 40 CFR 270 and 124 - Hazardous Waste Permits

8. Underwriters Laboratories, Inc. (UL) UL586 - 1990 High Efficiency Particulate Air Filter Units

1.5 QUALITY ASSURANCE

A. Hazard Communication Program
The Contractor shall establish and implement a Hazard Communication Program as required by 29 CFR 1926.59.

B. Compliance Plan (Site Specific)
The contractor shall establish a written compliance plan, which is specific to the project site, to include the following:

1. A description of work activity involving lead including equipment used, material included, controls in place, crew size, employee job responsibilities, operating procedures, and maintenance practices.
2. Methods of engineering controls to be used to control lead exposure.
3. The proposed technology the Contractor will implement in meeting the PEL.
4. Air monitoring data documenting the source of lead emissions.
5. A detailed schedule for implementing the program, including documentation of appropriate supply of equipment, etc.
6. Proposed work practice which establishes proper protective work clothing, housekeeping methods, hygiene facilities, and practices.
7. Worker rotation schedule, if proposed, to reduce TWA.
8 A description of methods for informing workers of potential lead exposure.

C. Hazardous Waste Management
The Contractor shall establish a Hazardous Waste Management Plan, which shall comply with applicable regulations and address the following:

1. Identification of hazardous wastes
2. Estimated quantity of waste to be disposed of

3. Names and qualifications of each sub-contractor that will be transporting, storing, treating, and disposing of wastes
4. Disposal facility location and 24 hour point of contact
5. Establish EPA state hazardous waste and identification numbers if applicable
6. Names and qualifications (experience and training) of personnel who will be working on-site with hazardous wastes
7. List of waste handling equipment to be used in performing the work to include cleaning, volume reduction, if applicable, and transport equipment
8. Qualifications of laboratory to be utilized for TCLP sampling and analysis
9. Spill prevention, containment, and cleanup contingency measures
10. Work plan and schedule for waste containment, removal, treatment, and disposal

D. Medical Examinations

1. Before exposure to lead contaminated dust, provide workers with a comprehensive medical examination as required by 29 CFR 1910.1025 and 29 CFR 1926.62.
2. The examination shall not be required if adequate records show that employees have been examined as required by 29 CFR 1926.62 within the last year.
3. Medical examination shall include, at a minimum, approval to wear respiratory protection and biological monitoring.

E. Training

1. The Contractor shall ensure that workers are trained to perform lead paint disturbing activities and disposal operations prior to the start of work in accordance with 29 CFR 1926.62.

F. Respiratory Protection Program

1. The Contractor shall furnish each employee required to wear a negative pressure respirator with a respirator fit test at the time of initial fitting and at least once every six (6) months thereafter as required by 29 CFR 1926.62.
2. The Contractor shall establish a Respiratory Protection Program in accordance with ANSI Z88.2, 29 CFR 1910.134, and 29 CFR 1926.62.

1.6 SUBMITTALS

A. The Contractor shall submit to the Owner the following submittals prior to start of work:

1. Copies of medical records for each employee to be used on the project, including results of biological monitoring and a notarized statement by the examining physician that such an examination took place.
2. Copies of workers' training certificates.
3. Submit record of successful respirator fit testing performed by a qualified individual within the previous six (6) months, for each employee to be used on this project with the employee's name and social security number with each record.
4. The name and address of Contractor's blood lead testing lab, OSHA-CDC listing, and Certification in the State of Connecticut.
5. The name and address of Contractor's personal air monitoring and waste disposal lead testing laboratory/ies.
6. Name, address, and ID number of the hazardous waste hauler, waste transfer route, and proposed disposal site.

B. The Contractor shall submit to the Owner the following submittals during the job:

1. Results from personal air samples.

2. Medicals, certificates, and fit test 24 hours in advance of any new employee starting on the project.

C. The Contractor shall submit to the Owner the following submittals upon completion of the work:

1. Copies of manifests and receipts acknowledging disposal of all hazardous waste material from the project showing delivery date, quantity, and appropriate signature of landfill's authorized representative.

1.7 PERSONAL PROTECTION

A. Exposure Assessment

1. The Contractor shall determine if any worker will be exposed to lead at or above the action level.
2. The exposure assessment shall identify the level of exposure a worker would be subjected to without respiratory protection.
3. The exposure assessment shall be achieved by obtaining personal monitoring samples representative of a full shift at least (8-hour TWA).
4. During the period of the exposure assessment, the Contractor shall institute the following procedures for protection of workers.

a. Protective clothing shall be utilized
b. Respiratory protection
c. Change areas shall be provided
d. Hand washing facilities and shower
e. Biological monitoring
f. Training of workers

B. Respiratory Protection

1. The Contractor shall furnish appropriate respirators approved by NIOSH/MSHA for use in atmospheres containing lead dust.
2. Respirators shall comply with the requirements of 29 CFR 1926.62.
3. Workers shall be instructed in all aspects of respiratory protection.
4. The Contractor shall have an adequate supply of HEPA filter elements and spare parts on site for all types of respirators in use.
5. The following minimum respirator protection for use during paint removal or demolition of components and surfaces with lead paint shall be the 1/2 mask air purifying respirator with high efficiency filters for exposures (not in excess of 500 ug/m^3 or 10 x PEL).

C. Protective Clothing

1. Personal protective clothing shall be provided for all workers, supervisors, and authorized visitors entering the work area.
2. Each worker shall be provided with a minimum of two (2) complete disposable coverall suits.
3. Removal workers shall not be limited to two (2) suits, and the Contractor shall supply additional suits as necessary.
4. Under no circumstances shall anyone entering the abatement area be allowed to re-use a contaminated disposable suit.
5. Disposable suits, such as TYVEK suits, and other personal protective equipment (PPE) shall be donned prior to entering the lead control area. A change room shall be provided for workers to put on suits and other personal protective equipment with separate areas to store their street clothes.

6. Eye protection for personnel engaged in lead operations shall be furnished when the use of a full-face respirator is not required.
7. Goggles with side shields shall be worn when working with power tools or a material that may splash or fragment, or if protective eye wear is specified on the Safety Data Sheet (SDS) for a particular product to be used on the project.

1.8 PERSONAL MONITORING

A. General: The Contractor is required to perform the personal air sampling activities during lead paint disturbing work. The results of such sampling shall be posted, provided to individual workers and submitted to the Owner as described herein.

B. Sampling: Samples shall be taken for the duration of the work shift or for eight hours, whichever is less. Personal samples need not be taken every day after the first day if working conditions remain unchanged, but must be taken every time there is a change in removal operations, either in terms of the location or the type of work. Sampling will be used to determine eight-hour Time-weighted averages (TWA). The Contractor is responsible for personal sampling as outlined in OSHA Standard 29 CFR 1926.62 and 29 CFR 1910.1025.

C. Sampling Results: Air sampling results shall be reported to individual workers in written form no more than forty-eight (48) hours after the completion of a sampling cycle. The reporting document shall list each sample's result, sampling time and date, personnel monitored and their social security numbers, flow rate, sample duration, sample yield, cassette size, and analysts' name and company, and shall include an interpretation of the results. Air sample analysis results will be reported in micrograms/cubic meter ($\mu g/m^3$).

D. Testing Laboratory: The Contractor's testing lab shall be participating in AIHA's Environmental Lead Laboratory Accreditation Program (ELLAP). The Contractor shall submit to the Consultant for review and acceptance, the name and address of the laboratory, certification(s) of AIHA participation, a listing of relevant experience in air lead analysis, and presentation of a documented Quality Assurance and Quality Control Program.

PART 2 - PRODUCTS

2.1 GENERAL

A. Any substitution in materials, equipment, or methods to those specified shall be approved by the Owner prior to use. Any requests for substitution shall be provided in writing to the Owner. The request shall clearly state the rationale for the substitution.

B. Submit to the Owner product data of all materials and equipment and samples of all materials to be considered as an alternate.

C. Product data shall consist of manufacturer; catalog sheets, brochures, diagrams, schedules, performance charts, illustrations, safety data sheets (SDS), and other standard descriptive data. Submittal data shall be clearly marked to identify pertinent materials, products or equipment and show performance characteristics and capacities.

D. Samples shall be of sufficient size and quantity to clearly illustrate the functional characteristics of the product or material with integrally related parts and attachment devices.

2.2 MATERIALS AND PRODUCTS

A. Deliver all materials in the original packages, containers, or bundles bearing the name of the manufacturer and the brand name and product technical description.

B. Damaged or deteriorating materials shall not be used and shall be removed from the premises.

C. The Contractor shall have available sufficient inventory or dated purchase orders for materials necessary for the job including protective clothing, respirators, filter cartridges, polyethylene sheeting of proper size and thickness, tape, and air filters.

D. Materials:

1. Polyethylene sheet in a roll size to minimize the frequency of joints shall be delivered to job site with factory label indicating 6 mil.
2. Polyethylene disposable bags shall be six (6) mil. Tie wraps for bags shall be plastic, five (5) inches long (minimum), pointed and looped to secure filled plastic bags.
3. Tape or adhesive spray will be capable of sealing joints in adjacent polyethylene sheets and for attachment of polyethylene sheet to finished or unfinished surfaces of dissimilar materials and capable of adhering under both dry and wet conditions, including use of amended water.
4. Impermeable containers are to be used to receive and retain any lead containing or contaminated materials until disposal at an acceptable disposal site. (The containers shall be labeled in accordance with EPA and DOT standards.)
5. HEPA filtered exhaust systems shall be used during powered dust generating abatement operations. The use of powered equipment without HEPA exhausts is prohibited.

2.3 TOOLS AND EQUIPMENT

A. Provide suitable tools for all lead disturbing operations.

B. The Contractor shall have available power cables or sources such as generators (where required).

C. Vacuum units, of suitable size and capacities for the project, shall have HEPA filter(s) capable of trapping and retaining 99.97% of all mono-dispersed particles of 0.3 micrometers in diameter.

PART 3 - EXECUTION

3.1 WORKER PROTECTION/TRAINING

A. The Contractor shall provide appropriate training, respiratory and other personal protection, and biological monitoring for each worker and ensure proper usage during potential lead exposure and the initial exposure assessment.

B. Workers who will perform procedures must have completed one of the following training courses:

1. EPA Lead Abatement Supervisor (40 hours)
2. EPA Lead Abatement Worker (32 hours)
3. HUD/EPA course "Work Smart, Work Wet, and Work Clean to Work Lead Safe" (8 hours)
4. HUD/NARI course "The Remodeler's and Renovator's Lead Based Paint Training Program" (8 hours).
5. HUD "Lead Safe Work Practices" (8 hours)

3.2 CONTRACTOR'S RESPONSIBILITIES

A. The Contractor is responsible for establishing and maintaining controls referenced herein to prevent dispersal of lead contamination from the lead work area.

B. The Contractor is also responsible for conducting work with applicable federal, state, and local regulations as referenced herein.

3.3 WORKER HYGIENE PRACTICES (REQUIRED DURING INITIAL EXPOSURE ASSESSMENT AND IF RESULTS OF AIR SAMPLING ARE ABOVE OSHA ACTION LEVEL)

A. Work Area Entry: Workers shall don personal protective equipment prior to entering work area, including respiratory protection, disposable coveralls, gloves, headgear, and footwear.

B. Work Area Departure: While leaving respirators on, workers shall remove all gross contamination, debris, and dust from disposable coveralls and proceed to change room and remove coveralls and footwear and place in hazardous waste disposal container.

C. Hand washing Facilities: All workers must wash their hands and faces upon leaving the work area.

D. Equipment: All equipment used by workers inside the work area shall be wet wiped or bagged for later decontamination before removal from the work area.

E. Prohibited Activities: Under no circumstances shall workers eat, drink, smoke, chew gum, or tobacco, or remove their respirators in the work area.

F. Shock Hazards: The Contractor is responsible for using safe procedures to avoid electrical hazards. All temporary electrical wiring will be protected by ground fault circuit interrupters (GFI).

3.4 LEAD WORK AREA (REQUIRED DURING INITIAL EXPOSURE ASSESSMENT AND IF RESULTS OF AIR SAMPLING ARE ABOVE OSHA ACTION LEVEL)

A. The Contractor shall place warning signs at all entrances and exits from the work area. Signage shall be a minimum of 20" x 14" and shall state the following:

DANGER
LEAD WORK AREA
MAY DAMAGE FERTILITY OR THE UNBORN CHILD
CAUSES DAMAGE TO THE CENTRAL NERVOUS SYSTEM
DO NOT EAT, DRINK OR SMOKE IN THIS AREA

B. The Contractor shall designate a change room as specified in this Section. The change room shall consist of two (2) layers of sheeting on the floor surface adjacent to the lead work area. The change room shall have separate storage facilities for street clothes to avoid cross contamination.

C. The Contractor shall provide potable water for hand and face washing and provide a portable shower unit.

D. The Contractor shall place six-mil polyethylene drop cloths on floor/ground surfaces prior to beginning removal work to facilitate clean-up.

3.5 WORK AREA CLEAN UP

A. The Contractor shall remove all loose chips and debris from floor surfaces and place in hazardous waste disposal bags.

B. The Contractor shall HEPA vacuum adjacent surfaces to remove dust and debris.

C. Polyethylene drop cloths shall be properly disposed of.

3.6 WASTE DISPOSAL

A. The Contractor's contractual liability shall be the proper disposal of all non-hazardous and hazardous wastes generated at the site in accordance with all applicable federal, state, and local regulations as referenced herein. Metal lead based paint components may be segregated for recycling at an approved facility. Lead TCLP sampling will be performed by the owner's representative Langan (if required by landfill – for selective demolition debris and/or paint chip/debris/waste). The contractor will be responsible for all costs associated with lead/hazardous waste disposal should they, their haulers and/or the landfill of their choosing take samples and declare the waste as hazardous waste. **The abatement contractor will include one 40-yard dumpster for hazardous lead based-paint disposal in their base bid.**

END OF SECTION 028313

SECTION 028416 - UNIVERSAL WASTE REMOVAL AND RECYCLING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. General Provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

B. Refer to all drawings and/or other Sections of these specifications to determine the type and extent of work therein affecting the work of this Section, whether or not such work is specifically mentioned herein.

C. Sections containing requirements related to this Section include, but are not limited to:

1. Section 028200 – Selective Hazardous Building Materials Abatement Demolition
2. Section 028213 – Asbestos Abatement
3. Section 028313 – Lead-Based Paint Awareness
4. Section 028432 – PCB Remediation
5. HBM – 01, 02, 03, 04, 05, 06 & 07 – Hazardous Building Materials Abatement Drawings

1.2 SUMMARY OF WORK

A. Work of this Section includes, but is not necessarily limited to, all which is necessary for complete removal and recycling/disposal of all PCB-containing ballasts, newer ballasts, mercury containing devices, electronics, alarms, smoke detectors, sensors, emergency lighting, signage, paints, chemicals, chemicals/contaminated piping/waste traps, batteries, air conditioning units, CFC's, boiler and HVAC controls, other hazardous materials, wastes and special wastes that exist in the interior/exterior of the building structure(s) that will be impacted by proposed renovation of the building. The hazardous materials contractor will supply the packaging materials and pay for the proper disposal of these materials. The hazardous materials contractor will provide the labor to put the materials into the proper packaging for disposal.

1. All work including the removal, characterization (any testing that may be required by disposal facility) and disposal of hazardous materials and chemicals.
2. Removal, characterization (any testing that may be required by disposal facility) and disposal of fluorescent light ballasts and capacitors throughout all site structures.
3. Removal, characterization (any testing that may be required by disposal facility) and disposal of all containers, drums and unknown materials as well as fire extinguishers.
4. Removal, characterization (any testing that may be required by disposal facility) and disposal of contained gear oils, hydraulic oils and refrigeration liquids, etc. from various pieces of equipment.
5. Removal, characterization (any testing that may be required by disposal facility) and recycling/disposal of batteries, electronic devices, lighting signage, etc.
6. Removal, characterization (any testing that may be required by disposal facility) and recycling/disposal of science equipment, contaminated piping, chemicals, waste traps, etc.
7. File all necessary notices, obtain all permits and licenses, and pay all governmental taxes, fees, and other costs in connection with the work. Obtain all necessary approvals of all governmental departments having jurisdiction.
8. Comply with Health and Safety Plans.

B. The Contractor, under this Section, shall provide all materials, labor, equipment and appliances as necessary to properly remove and recycle/dispose of materials.

1.3 DESCRIPTION OF WORK

A. This specification covers the proper and legal removal and disposal of all Hazardous/Universal Waste to be affected by renovation/selective demolition activities from the Old Greenwich School project site located in Greenwich, Connecticut. The removal and disposal activities shall comply with all aspects of the contract documents and federal, state and local requirements.

B. Universal Wastes shall include, but not be limited to, fluorescent bulbs, light fixture ballasts containing polychlorinated bi-phenyls (PCBs) or DEHP, mercury lamps, mercury containing devices, electronics, alarms, smoke detectors, sensors, emergency lighting, signage, paints, chemicals, chemicals/contaminated piping/waste traps, batteries, air conditioning units, CFC's, boiler and HVAC controls, other hazardous materials, wastes and special wastes that exist in the interior/exterior of the building structure(s) that might be impacted by proposed selective demolition and renovation of the original building and additions. Whenever there is a conflict or overlap within these specifications and between applicable codes and regulations, the most stringent provision specified shall apply.

C. The Old Greenwich School building was constructed in 1902, with additions constructed in 1925, 1950, 1957, and 1995. It has three stories, attic, crawl spaces and tunnels and a total square footage of approximately 68,500 square feet.

D. The proposed redevelopment consists of renovation of the original building and additions.

E. The Contractor shall independently identify and quantify all Universal Waste Items.

1.4 SUBMITTALS

A. Before Start of Work: Submit the following to the Owner's Representative for review. Do not start work until these submittals are returned with Owner's Representative's approval.

1. Copy of State or local license for hazardous waste hauler;
2. Certification of at least one on-site supervisor which has satisfactorily completed the OSHA 40 Hour Health and Safety Course for Handling Hazardous Materials;
3. Certificates of workers which have successfully completed at least the OSHA 40-Hour Health and Safety Course for Hazardous Materials;
4. Certificates of workers which have successfully completed the required employee training for universal/hazardous waste or appropriate type of training to the type of wastes being managed;
5. Name and address of the universal waste handler and/or a destination facility where the waste materials is to be treated, deposited or recycled in accordance with all regulatory requirements (include contact person and telephone numbers), if the universal waste meets the definition of hazardous waste, the name and address of the hazardous waste treatment, storage and disposal (TSD) facility;
6. Work Plan: Provide a detailed written work plan that describes the procedures for the removal,

    a. Proposed level of worker training for each type of regulated and/or hazardous material to be removed.
    b. Names and applicable licenses of key personnel.
    c. Proof of appropriate training for workers.
    d. Proof of a current medical surveillance program for all personnel.

e. Safety Data Sheets (SDS) for any chemicals to be used on the project. All products to be used on this project must have SDS approved by the Owner's Environmental Consultant.
f. Proposed detailed work schedule.

7. Following final removal, and disposal or destruction, provide Owner with waste transport and disposal documents (e.g., manifests), as well as certificates of destruction and recycling as appropriate.

1.5 CODES AND REGULATIONS

A. Regulatory compliance includes but is not necessarily limited to applicable requirements set forth by:
1. Federal Regulations:
a. 29 CFR 1910, "Occupational Safety and Health Standards" (General Industry Standards)
b. 29 CFR 1910.134 "Respiratory Protection"
c. 29 CFR 1910.1200 "Hazard Communication"
d. 29 CFR 1926, "Safety and Health Regulations for Construction" (Construction Industry Standards)
e. 40 CFR 50, "National Primary and Secondary Ambient Air Quality Standards"
f. 40 CFR 60, "Standards of Performance for New Stationary Sources," Appendix B, "Test Methods"
g. 40 CFR 117, "Determination of Reportable Quantities for Hazardous Substances"
h. 40 CFR 122, "USEPA Administered Permit Program: The National Pollutant Discharge Elimination System"
i. 40 CFR 172, "Hazardous Waste Transportation"
j. 40 CFR 261, "Identification and Listing of Hazardous Waste"
k. 40 CFR 262, "Standards Applicable to Generators of Hazardous Waste"
l. 40 CFR 263, "Standards Applicable to Transporters of Hazardous Waste"
m. 40 CFR 268, "Land Disposal Restrictions"
n. 40 CFR 273, "Universal Waste Rule"
o. 40 CFR 300, "National Oil and Hazardous Substances Pollution Contingency Plan"
p. 40 CFR 302, "Designation, Reportable Quantities, and Notification"
q. 40 CFR 112 (oil pollution prevention)
r. 40 CFR 279 (used oil)
s. 40 CFR 273 (Universal Wastes)
t. 40 CFR 761 (PCBs)

2. Toxic Substances Control Act (TSCA), US-EPA

3. Resource Conservation and Recovery Act (RCRA)
a. Comprehensive Environmental Response, Compensation & Liability Act (CERCLA) (Superfund Law)

4. Connecticut Regulations:
State requirements which govern universal waste removal and disposal include but are not necessarily limited to the following:

a. Connecticut Department of Energy and Environmental Protection (CT DEEP) (Hazardous and Universal Waste Management Regulations); Section 22a-454, 456 Waste Facility and Section 22a-449(c)-113 of the Regulations of Connecticut State Agencies (RCSA), respectively.

b. Connecticut DEEP; 310 CMR 40 Connecticut Contingency Plan, 310 CMR 30 Hazardous Waste Regulations, 310 CMR 1-7 Clean Water Act, 310 CMR 16, 19 Solid Waste Regulations, 314 CMR 1-8 Clean Air Act
c. Local Town, City or County Bylaws, rules and regulations.

B. Under TSCA, items that contain more than 500 parts per million (PPM) of PCBs are classified as PCB material, items that contain between 50 ppm and 500 ppm of PCB are classified as PCB-contaminated and items that contain less than 50 ppm of PCBs are classified as non-PCB items.

Under the Small Capacitor Exemption, TSCA has allowed the disposal of non-leaking, intact "small capacitors", defined as containing less than three pounds of PCB dielectric fluid, in a municipal solid waste landfill. Light ballasts containing a small PCB capacitor are covered under this category. The intent of the "small capacitor" disposal rule is for "random disposal" in a landfill by "householders and other infrequent disposers". When commercial and industrial entities dispose of large quantities of small PCB capacitors, the EPA strongly encourages voluntary collection and disposal of PCB capacitors in chemical waste landfills or high-temperature incinerators.

C. Under the "Superfund" laws, PCBs are specifically listed as a hazardous substance. The "release" of more than one pound of PCBs into the environment triggers a "Superfund" notification and cleanup requirement.

Since twenty-five ballasts collectively contain approximately one pound of PCBs, the disposal of twenty five or more PCB-containing ballast in a landfill would trigger a "Superfund" action.

D. The State of Connecticut General Hazardous Waste Statue 22A 454, 456 requires that PCB ballast must be incinerated or sent to a chemical waste landfill. The statue defines PCB waste, including PCB ballast, as Connecticut Regulated Wastes.

E. Other Regulations: The other relevant regulations affecting disposal of PCBs include the following:

1. Department of Transportation (DOT) regulations – DOT regulation HM-181 regulates transportation of hazardous materials, including PCBs.
2. Occupational Safety and Health Administration (OSHA) – OSHA regulates worker's safety and exposure to a variety of chemicals including PCB's.
3. Resource Conservation and Recovery Act (RCRA) – RCRA regulates wastes, which fail Toxic Characteristic Leachate Procedure (TCLP) and which contain more than 50 ppm of PCBs.

PART 2 - PRODUCTS

2.1 GENERAL

A. 35 or 55-gallon metal, fiber drums or containers with lids that can be secured and sealed, DOT approved.

B. Appropriate waste labels identifying contents as regulated and hazardous wastes as defined by 49 CFR 172.

C. Fluorescent Lamp Disposal (Crusher) units, such as DexTrite Fluorescent® Lamp Disposal equipment, or equivalent. Such equipment must be capable of capturing fugitive mercury vapors during the bulb crushing process, as well as the fractured and broken waste products.

D. HEPA and charcoal filter equipped mercury capture vacuum.

E. Cardboard boxes and sleeves for packaging lamps that will be removed from the site intact or unbroken.

F. Recovery tanks to temporarily hold compressed gasses.

G. Health & Safety equipment complying with health and safety plan.

PART 3 - EXECUTION

3.1 GENERAL

A. Procedures and methods contained herein are to provide guidance to protect from the contamination of the environment, and exposure to workers, while handling hazardous waste and regulated waste-streams for disposal/recycling/destruction.

B. Owner to Stop Work: The Owner's representative and the Owner's Environmental Consultant shall have the authority to stop the work at any time that conditions are not within Specification and/or applicable regulations. The stoppage of work shall continue until conditions have been corrected to the satisfaction of the Owner's representative or Owner's Environmental Consultant. Standby time to resolve the problems shall be at the Contractor's expense.

C. Personal Protective Equipment:

1. Personal protective equipment shall consist of (at a minimum) safety goggles or other protective eye-ware, work shoes with non-slip soles (e.g., neoprene), chemical resistant gloves that cover the hand and an apron that covers the front of the worker's body from shoulder to toes (e.g., neoprene or nitrile gloves).
2. Personal protective equipment contaminated by handling operations should be disposed of as contaminated waste.
3. Hammering or sudden impact methods for removing ballasts from the light fixture shall not be employed, as such methods may cause leakage in an otherwise non-leaking ballast.
4. Throwing and tossing of ballasts into disposal drums shall not be conducted, as such activities may cause leakage in an otherwise non-leaking ballast.

D. Work Procedures

1. Contractor shall obtain a hazardous waste generator number from Region I, US EPA for the Owner.
2. During the light fixture removal stage during demolition, the following procedures (or equivalent alternate but protective measures) shall be followed:

    a. Carefully remove fixtures, and stack them in a designated portion of the work area.
    b. Designate an area where the fixtures can be disassembled, and components removed and segregated (e.g., lamps, ballasts). The area should be remote from other demolition activities, and have adequate ventilation and lighting.
    c. The work area for fixture disassembly shall (at a minimum) have the floor lined with one layer of 6-mil fire-retardant polyethylene plastic to control accidental spills or breakage. The work area should have a table or other solid work platform to facilitate disassembly of the fixtures, and the protective plastic sheeting should cover the work table area and waste drums/lamp crushing/lamp repackaging equipment.

d. Carefully remove lamps from fixtures, and either crush them or repackage them for disposal.
e. In the event a lamp breaks, utilize the mercury capture vacuum to remove all debris generated.

3. Carefully remove ballasts, and segregate for disposal in the following manner:

a. Ballasts labeled as "No-PCBs" shall NOT be segregated and shall be treated as PCB waste as potting material may contain PCBs and DEHP. Handle and dispose of in the same manner as ballasts containing PCBs and/or DEHP.
b. Non-leaking ballasts shall be segregated and drummed for disposal as hazardous wastes. These ballasts may be destroyed by high temperature incineration, or land filled at a properly permitted facility.
c. Leaking ballasts shall be segregated and drummed. Punctures or damage to these ballasts exposes an oily or tar-like substance. These ballasts, and all materials it contacts, MUST be incinerated under TSCA; they cannot be landfilled.

E. Miscellaneous Stored Materials In Containers

1. Miscellaneous materials may include antifreeze, cleaning solutions, paints, and other miscellaneous materials.
2. During removing/recycling of materials enclosed in their original container, the Contractor shall package, and label (lab packed) by waste classification in accordance with appropriate RCRA and Connecticut Department of Transportation (ConnDOT). In turn these containers shall be transported, under proper manifesting procedures, to a recycling facility. The facility shall forward a certificate of recycling or disposal to the Contractor, who shall submit this information to the Owner.

F. Universal Waste

Universal waste includes, but is not limited to, fluorescent bulbs, light fixture ballasts containing polychlorinated bi-phenyls (PCBs) or DEHP, mercury lamps and switches, batteries, fire extinguishers, Halon fire suppression systems, paint, refrigerants, electronic devices (computers and monitors), and other compressed gases, mechanical fluids, oils, and lubricants, as defined in 40 CFR 273 and Section 22a-449(c)-113 of the Regulations of Connecticut State Agencies (RCSA). Follow procedures for handling, storage, labeling, shipping, recording keeping and other procedures as required in 40 CFR 273 and Section 22a-449(c)-113.

G. Regulated Waste

1. Non-thermostat mercury switches: Handle and dispose of in accordance with State regulation and applicable Federal regulations.
2. Used oil: Handle and dispose of in accordance with State regulations.
3. Refrigerants: Prior to disposal of refrigerant containing equipment, verify that refrigerant has been removed per the requirements of 40 CFR Part 82 (Protection of Stratospheric Ozone).
4. Diesel fuel: If possible, use on site to run equipment. Dispose of or recycle any remaining fuel as per applicable regulations.
5. Fire extinguishers: Contact manufacturer for recycling or donate to local fire department.
6. Halon Fire Suppression System: For recovery and management of Halon, utilize a technician EPA certified in appropriate level for the system. Technician is to use an EPA-certified reclaimer for disposal.

H. Transportation

1. Transport waste materials using properly permitted vehicles operated by drivers with Commercial Drivers Licenses (CDLs) and Hazardous Materials endorsements. Coordinate transportation routes with Connecticut Department of Transportation (ConnDOT). Provide Owner with copies of transporter certifications and EPA ID number a minimum of seven (7) days prior to first use. Chain of custody records shall be maintained which include the date of pickup, number of drums, name of transporter and destination.

I. Waste Disposal Documentation

1. Waste shipment records and manifests for all materials transported from the site as required by regulations and disposal facility are to be provided to the Owner every five (5) business days. Incorporate this information into the close out package to be provided to the Owner. Within thirty (30) days of generation, Contractor shall provide waste manifests/shipment records and Certificates of Recycling and Disposal (CRD) to Owner.

2. Certificates of Discontinuance for all equipment and fixtures.

J. Disposal Facilities

1. Contractor shall use only disposal facilities which have been pre-approved by the Owner and its insurers and with valid regulatory permits for type of waste being handled. Provide Owner with copies of disposal facility regulatory permits and EPA identification number a minimum of seven (7) days prior to shipping to that facility. Provide disposal facility required documentation including additional waste sampling.

END OF SECTION 028416

SECTION 02432 – PCB REMEDIATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and General Provisions of Contract, including General Supplementary Conditions apply to this Section.

B. Sections containing requirements related to this Section include, but are not limited to:
1. Section 028200 – Selective Hazardous Building Materials Abatement Demolition
2. Section 028213 – Asbestos Abatement
3. Section 028313 – Lead-Based Paint Awareness
4. Section 028416 – Universal Waste Removal and Recycling
5. HBM – 01, 02, 03, 04, 05, 06 & 07 – Hazardous Building Materials Abatement Drawings

1.2 CONSULTANT

A. Langan CT, Inc. (Langan) has been retained as the Consultant for the purposes of construction administration and project monitoring during PCB Remediation. The Consultant will represent the Owner in all phases of the remediation project at the discretion of the Owner. The PCB Remediation Contractor shall regard the Consultant's direction as authoritative and binding as provided herein, in matters particularly but not limited to approval of work areas, review of monitoring results, completion of the various segments of work, final completion of the remediation, submission of data, and daily field punch list items.

1.3 USE OF THE CONTRACT DOCUMENTS

A. It shall be incumbent upon the PCB Remediation Contractor to visit the Site and determine what exists, its condition, and what will be required to accomplish the Work intended by the Contract Documents. No increase in the Contract Sum will be permitted as a result of the PCB Remediation Contractor's failure to visit the Site and understand the existing conditions.

B. All work shall comply with applicable Codes, laws, regulations, and ordinances wherever applicable. The most stringent of all the foregoing shall govern.

C. It is not intended that the Specifications show every detail of the Work, but the PCB Remediation Contractor shall be required to furnish within the Contract Sum all material and labor necessary for the completion of the Work in accordance with the intent of the Specifications.

D. In case of ambiguity among the Contract Documents, the more stringent requirement as determined by the Consultant shall prevail.

E. The Work of this Contract includes making modifications as necessary, subject to approval by Owner in consultation with the Consultant, to correct any conflicts.

F. All items, not specifically mentioned in the Specifications but implied by trade practices to complete the work, shall be included.

1.4 EXAMINATION OF THE SITE

A. It is understood that the PCB Remediation Contractor has examined the Site and made his/her own estimates of the facilities and difficulties attending the execution of the Work, and has based his price thereon.

B. Except for unforeseeable concealed conditions as determined by the Consultant, the PCB Remediation Contractor shall make no claim for additional cost due to the existing conditions at the Site.

1.5 CONTRACTOR QUALIFICATIONS

A. All bidders shall submit a record of prior experience in PCB remediation projects, specifically including removal of PCB-containing materials listing no less than three (3) completed jobs in the past year, with all projects being of similar size and scope. The PCB Remediation Contractor shall list the experience and training of the project foremen and all on-site personnel. The information that should be included is as follows:
1. Project Name and Address
2. Owner's Name and Address
3. Architect/Consultant
4. Contract Amount
5. Date of Completion
6. Extras and Changes

B. Submit a written statement regarding whether the PCB Remediation Contractor has ever been found out-of-compliance with federal or state regulations pertaining to worker protection, removal, transport, or disposal.

1.6 TESTING LABORATORY SERVICES

A. The PCB Remediation Contractor shall submit to the Consultant the name; address and qualifications of proposed laboratories intended to be utilized for sample analysis as required by this section.

1.7 GENERAL REQUIREMENTS

A. The PCB Remediation Contractor shall furnish all labor, materials, facilities, equipment, installation services, employee training, notifications, permits, licenses, certifications, agreements and incidentals necessary to perform the specified work. Work shall be performed in accordance with the contract documents, the latest regulations from the Occupational Safety and Health Administration (OSHA), the United States Environmental Protection Agency (US EPA), Connecticut Department of Energy and Environmental Protection (CTDEEP) and all other applicable federal, state and local agencies. Whenever the requirements of the above references conflict or overlap, the more stringent provision shall apply.

B. All project personnel engaged in the work covered under this section shall be trained in accordance with OSHA Regulations 29 CFR 1910.1000 and 29 CFR 1910.1200. It should also be noted that work associated with PCB removal may also involve exposure to PCBs during demolition and removal activities specified herein and the PCB Remediation Contractor shall perform required exposure assessment for PCBs.

C. The PCB Remediation Contractor shall provide a Project Health and Safety Officer having a minimum of eight (8) hours of supervisor training in hazardous waste site operations in accordance with the requirements of 29 CFR 1910.1200. The supervisor must be on site at all times during remediation work. This supervisor and other contractor representatives must attend a pre-remediation meeting to be scheduled by the building owner/owner’s representative.

D. This section specifies the procedures for removal of the existing building materials (1902 original building and 1925, 1950 and 1957 additions) assumed to contain polychlorinated biphenyls (PCB), equal to or greater than (>) 50 parts per million (ppm) bulk product waste (most materials also contain asbestos), in the form of:

Base Bid

- Interior Sink Countertop Caulking Compounds – Approximately 21 Locations Throughout (Substrates Contaminated) (See Architects Plans/Drawings for Locations);

- Interior Door Caulking Compounds, Door Window Glazing Compounds, Window Caulking and Glazing Compounds – Approximately 90 Door, Window and Window/Door Openings Throughout (Varying Sizes) (Substrates Contaminated) (See Architects Plans/Drawings for Locations);

- Exterior/Interior Window Caulking/Glazing/Lintel Compounds – Exterior/Interior – Classrooms 2-6, 8, 9, 11, 43, Boiler Room, Media Room, Toilet Adjacent Room 8, Main Office and Gymnasium Wing (20 Window Openings – Varying Sizes and 11 Window Lintels at Gymnasium Wing and Two Windows at Rooms 2 and 11) (Substrates Contaminated) (See Architects Plans/Drawings for Locations);

- Exterior/Interior Door and Door/Window Caulking Compounds (Glazing Compound Also at Main Front Entry and Gymnasium), Door Window Glazing Compounds – Exterior Throughout (14 Door and Door/Window Openings – Varying Sizes) (Substrates Contaminated) (See Architects Plans/Drawings for Locations); and

- Exterior Vent Caulking Compounds – Exterior Throughout (28 Vent Openings - Varying Sizes) (Substrates Contaminated) (See Architects Plans/Drawings for Locations).

The materials throughout the 1902 original building and 1925, 1950 and 1957 additions are assumed PCB Bulk Product Waste (EPA Bulk Product Waste Reinterpretation dated October 24, 2012) (most are asbestos-containing also). Remediated surfaces may have to pass EPA post remediation verification sampling (if sampling of source materials is performed prior to abatement/remediation) and areas that fail will require additional remediation at no additional cost to the owner, until verification sampling passes and/or visual inspection deems all the materials have been removed (contractor owns additional remediation for verification sampling failures up to 20% however if the contractor is deemed by Langan to have contaminated the wall surfaces, all additional remediation is to be performed by the contractor at no additional cost to the owner). Abatement and Remediation in all areas will start with removing materials at the ceiling level and end with the materials at the flooring level. The contractor shall assume they will be setting up full containments throughout the work areas. The contractor will coordinate and perform enough selective demolition/demolition to access all materials to be removed/abated/remediated. Exterior abatement/remediation will be either removed in containment (interior) or the abatement/ remediation contractor will install polyethylene sheeting on the interior of the building and remove materials from the exterior. All ground surfaces must also be protected with plywood and two layers 10-mil reinforced polyethylene sheeting. This ground protection must extend at least 20 feet away from the building foundation (or farther - enough to prevent building materials from touching unprotected ground and floor surfaces). The contractor will pay for all contamination/ remediation/ abatement of interior and exterior surfaces, including ground surfaces if Langan deems they have contaminated these surfaces. The contractor will supply lifts, scaffolding, staging, etc. to Langan in areas of remediation/abatement until all post remediation visual inspections have passed.

The contractor must dispose of Remediation Waste (all source materials, window and door systems and “newer” sealants, segregated adjacent materials, materials that fail verification sampling, sandblasted paint/debris and waste from remediation - suits, polyethylene sheeting, towels/rags, respirator cartridges, etc.).

E. Disturbance or removal of polychlorinated biphenyls (PCB) containing materials may cause a health hazard to workers and building occupants. The PCB Remediation Contractor shall disclose

to all of his workers, supervisory personnel, subcontractors and consultants who will be at job site of the seriousness of the hazard and of proper work procedures which must be followed.

F. Where in the performance of the work, workers, supervisory personnel, subcontractors, or consultants may encounter, disturb or otherwise function in the immediate vicinity of polychlorinated biphenyls (PCB) containing materials, appropriate, continuous measures as necessary to protect all workers from the hazard of exposure shall be taken. Such measures shall include the procedures and methods described herein, regulations of the OSHA, US EPA, and local requirements as applicable.

G. The PCB Remediation Contractor shall employ a Competent Person (Supervisor) with at least three (3) years' experience on projects of similar scope and magnitude who shall be responsible for all work involving PCB remediation as described in the specifications and defined in applicable regulations, and have full time daily supervision of the same. The Supervisor shall be the Competent Person as defined by OSHA regulations and have experience in the proper removal and disposal of PCB-Containing Materials.

H. The PCB Remediation Contractor shall allow the work of this contract to be inspected, if required, by local, state, federal, and any other authorities having jurisdiction over such work. The PCB Remediation Contractor shall immediately notify the Owner and Consultant and shall maintain written evidence of such inspection for review by the Owner and Consultant.

I. The PCB Remediation Contractor shall incur the cost of all fines resulting from regulatory non-compliance as issued by federal, state, and local agencies. The PCB Remediation Contractor shall incur the cost of all work requirements mandated by federal, state, and local agencies as a result of regulatory non-compliance or negligence. The PCB Remediation Contractor shall incur all costs associated with contaminating the school property and adjacent properties, including but not limited to all possible litigation costs of the owners, consultants, and other involved parties.

J. The PCB Remediation Contractor shall immediately notify the Owner and Consultant of the delivery of all permits, licenses, certificates of inspection, of approval, or occupancy, etc., and any other such instruments required under codes by authorities having jurisdiction, regardless of who issued, and shall cause them to be displayed to the Owner and Consultant for verification and recording.

K. The PCB Remediation Contractor shall provide enough labor to guarantee completion of the work within the time frame given and within the normal operating hours of the buildings.

L. The remediation/asbestos abatement contractor, their subcontractors, waste transporters and/or landfill(s) do not have permission to take/analyze building materials for PCB content/ concentrations without written permission from the building owner prior to such sampling. Should the contractor or other parties listed above take/analyze PCB samples without the owner's permission and PCB's are found to be >1 ppm, the hazardous materials/remediation contractor will be responsible for **all costs** associated with the abatement/ remediation/replacement of all the interior/exterior building materials and adjacent surfaces, including soil/asphalt/concrete/etc. as well as all costs associated with project delays, attorney fees for all parties affected and all costs resulting from CT DEEP/EPA requirements that may occur as a result.

1.8 SCOPE OF WORK

A. This specification covers the proper and legal removal and disposal of the building existing "older" materials assumed to contain polychlorinated biphenyls (PCB), equal to or greater than (>)50 parts per million (ppm) bulk product waste (most materials are asbestos-containing also) throughout the planned renovation areas at Old Greenwich School located in Greenwich,

Connecticut. The remediation activities shall comply with all aspects of the contract documents and federal, state and local requirements.

B. Whenever there is a conflict or overlap within these specifications and between applicable codes and regulations, the most stringent provision specified shall apply.

C. The General Contractor or Remediation Subcontractor shall be aware of all conditions of the Project and is responsible for verifying quantities and locations of all Work to be performed. Failure to do so shall not relieve the General Contractor or Remediation Subcontractor of its obligation to furnish all labor and materials necessary to perform the Work.

D. Work outlined in this Section includes all work necessary for the complete removal and disposal of all PCB-Containing Materials impacted by the proposed work associated with the renovation project for the Old Greenwich School renovation project site located in Greenwich, Connecticut.

E. Note the work in this section is subject to TSCA regulation 40 CFR 761 and Connecticut General Statutes in accordance with CT DEEP requirements for materials containing >50/1 ppm (PCB-Containing Materials). The Owner or the Owner's Authorized Representative is responsible for notifying the CT DEEP.

F. The quantities, if given below, are provided to establish the order of magnitude of the remediation project. Actual quantities may vary. The PCB Remediation Contractor is responsible for verification of all quantities scheduled for removal. This verification shall include an on-site walk-through inspection of the building. The materials/quantities listed are estimates and no extra will be accepted. All of the listed materials are included in the base bid work (no extra cost accepted) until <1 ppm PCB is obtained by verification sampling and/or visual inspection deems all the materials have been removed (contractor owns additional remediation for verification sampling failures up to 20% however if the contractor is deemed by Langan to have contaminated the wall surfaces, all additional remediation is to be performed by the contractor at no additional cost to the owner). Location, materials, and estimated quantities included in the base bid are noted below:

G. The scope of work is summarized as the following:

1. PCB Summary

The following materials are assumed to contain PCBs above the EPA threshold of >50 ppm source material bulk product waste (1902 original building and 1925, 1950 and 1957 additions) (most materials are asbestos containing also):

Base Bid

- Interior Sink Countertop Caulking Compounds – Approximately 21 Locations Throughout (Substrates Contaminated) (See Architects Plans/Drawings for Locations);

- Interior Door Caulking Compounds, Door Window Glazing Compounds, Window Caulking and Glazing Compounds – Approximately 90 Door, Window and Window/Door Openings Throughout (Varying Sizes) (Substrates Contaminated) (See Architects Plans/Drawings for Locations);

- Exterior/Interior Window Caulking/Glazing/Lintel Compounds – Exterior/Interior – Classrooms 2-6, 8, 9, 11, 43, Boiler Room, Media Room, Toilet Adjacent Room 8, Main Office and Gymnasium Wing (20 Window Openings – Varying Sizes and 11 Window

Lintels at Gymnasium Wing and Two Windows at Rooms 2 and 11) (Substrates Contaminated) (See Architects Plans/Drawings for Locations);

- Exterior/Interior Door and Door/Window Caulking Compounds (Glazing Compound Also at Main Front Entry and Gymnasium), Door Window Glazing Compounds – Exterior Throughout (14 Door and Door/Window Openings – Varying Sizes) (Substrates Contaminated) (See Architects Plans/Drawings for Locations); and

- Exterior Vent Caulking Compounds – Exterior Throughout (28 Vent Openings - Varying Sizes) (Substrates Contaminated) (See Architects Plans/Drawings for Locations).

H. Project Scope Locations and Work Statement: The remediation site is the located at 285 Sound Beach Avenue, Greenwich, Connecticut. The proposed removal and disposal activities to be performed by PCB Remediation Contractor shall include the following:
   1. Site preparation and controls to facilitate remediation of PCBs. Containment procedures referenced for the remediation zone must be utilized for PCB Bulk Product Waste/Remediation Waste removal.
   2. Health and Safety in accordance with Occupation Safety and Health Administration (OSHA) requirements.
   3. Remove and dispose of entire/all materials assumed to contain PCBs > 50 ppm listed above throughout the original building planned areas of work. All exterior protection shall include the use of water impervious membrane covering which shall be secured to the ground surface. Edges shall be raised to prevent water run-off used for dust control during cutting and demolition of structures/systems. Plywood will be installed on all exterior ground surfaces first. The exterior membrane shall be covered with a minimum of 2 layers of 10-mil reinforced polyethylene sheeting securely fastened to foundation. This ground protection must extend at least 20 feet away from the building foundation.
   4. Cleaning of each work area following complete removal of PCB containing materials to ensure adherence for post cleaning verification levels and/or visual inspection.
   5. Recordkeeping and distribution as required in accordance with 40 CFR part 761.125 (c)(5).

I. Abatement and Remediation in all areas will start with removing materials at the ceiling level and end with the materials at the flooring level. The contractor shall assume they will be setting up full containments throughout all areas of planned work. The contractor will coordinate and perform enough selective demolition/demolition to access all materials to be removed/abated/remediated. Exterior abatement/remediation will be either removed in containment (interior) or the abatement/remediation contractor will install polyethylene sheeting on the interior of the building and remove materials from the exterior. All ground surfaces must also be protected with plywood and two layers 10-mil reinforced polyethylene sheeting. This ground protection must extend at least 20 feet away from the building foundation (far enough to prevent building materials from touching unprotected ground and floor surfaces). The contractor will pay for all contamination/remediation/ abatement of interior and exterior surfaces, including ground surfaces if Langan deems they have contaminated these surfaces. The contractor will supply lifts, scaffolding, staging, etc. to Langan in areas of remediation/abatement until all post remediation visual inspections have passed. The contractor will provide temporary shoring in areas that require it.

J. Additional materials as discovered outside of those listed will be covered by unit prices if all is not listed as the quantity. Quantities are estimates only and should be verified by the Contractor. Safety data sheets for chemicals to be used during the project must be submitted to the Owner's Representative prior to site delivery. The contractor is responsible for providing temporary water, power, and heat as needed at the site. Temporary lighting/Blast Trac machines/Negative air units within the work areas must be connected to Ground Fault Circuit Interrupter (GFCI) Power Panels installed by a State of Connecticut licensed electrician and located outside of the work areas. The contractor shall be responsible for paying for the use of power and water unless the

owner agrees to supply free of charge. It shall also be the contractor's responsibility to provide all fixed and temporary connections and hook-ups as well as obtaining permits and paying all fees for making such services available for his work as is necessary. The Contractor shall provide services as specified herein, and as required or as necessary to carry out the work. This will include such items as temporary hard-line installation, portable generators for short term work, water tank trucks, pumps and necessary accessories or the means and equipment and services necessary to temporarily connect to and maintain such services from adjacent utility systems. The contractor is responsible for contacting all utility services and getting power connections from the electrical lines located on or adjacent to the properties. All power and water must be supplied 24 hours a day throughout the abatement project. CT DPH will be notified immediately if active containments do not have sufficient negative pressure throughout the abatement process until acceptable reoccupancy air results are received. The use of portable generators will require 24 hour a day, 7 day a week continuous operation if negative air machines in containments are powered by them. This continuous operation must remain in place from the time the pre-abatement visual is completed up until clearance re-occupancy sampling results have passed. The contractor will pay the owner a $2,500 penalty should the power found to not be running the negative air machines in active abatement containments. This penalty will apply daily, and the contractor is also responsible for paying all CT DPH fines that may be imposed on the contractor and owner.

K. The contractor(s) will be responsible for hiring an engineer and other appropriate personnel to ensure that all required selective demolition and demolition activities are safe to perform for all personnel on site. The contractor(s) will be financially responsible for any damage that may occur to the site, on-site personnel, fines, penalties, etc. They will also be responsible for paying/reimbursing all legal fees/costs for all parties involved with the project should selective demolition or demolition activities cause injury or death to any persons on site.

L. The general/remediation contractors shall only use heavy equipment operators that have proper asbestos and/or HAZWOPER training when disturbing/removing/moving and packing asbestos, lead and PCB containing materials. Acceptable training for asbestos can be 32/40 hour asbestos worker/supervisor training with annual refresher training. 40 hour HAZWOPER training and annual refresher training is required for operators handling lead and/or PCB containing/contaminated materials. All operators must also have current medicals, fit test data and wear respirators during work.

M. The hazardous building materials contractor may be required to perform multiple mobilizations for some of the abatement/remediation work. The contractor will need to coordinate the abatement/remediation with the owner’s representative and/or general contractor.

N. The remediation/asbestos abatement contractor, their subcontractors, waste transporters must submit landfill information to Langan and the owner prior to the shipment of any waste. The contractor(s)/hauler(s) cannot ship waste until Langan and the owner have approved the landfill the contractor/hauler is/are proposing to ship the waste to. PCB TCLP sampling of the waste may be required by the landfills permits and this testing must be performed by the contractor (if testing is approved by Langan and the owner), with Langan present during sampling, and the results made available to Langan and the owner prior to waste shipment. If Langan is not present during the sampling, Langan may perform additional PCB TCLP sampling to confirm the contractor’s results and these results will supersede the contractors sample results.

O. The General Contractor, or Remediation Subcontractor, is responsible for conducting all work involving the removal, management, storage, and disposal of PCB waste materials in accordance with this specification, with all referenced documents included as part of this specification, with the standards and guidance documents listed below, and with all Federal, state and local regulations. The General Contractor or Remediation Subcontractor shall provide all labor, materials, and equipment necessary to complete the work of this Section.

1.9 REFERENCES

A. The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only. Where a conflict or overlap among regulations and/or these specifications exist, the most stringent requirements shall apply.

1. American National Standards Institute (ANSI)
   a. ANSI.Z89.1 Personnel Protective Equipment - Protective Headwear for Industrial Worker's Requirements (Latest Revision)
   b. ANSI.Z87
2. Code of Federal Regulations (CFR)
   a. 29 CFR Subpart D- Walking, Working Surfaces
   b. 29 CFR 1910.120 - Hazardous Waste Operations and Emergency Response (HAZWOPER).
   c. 29 CFR 1910.134 - Respiratory Protection Standard
   d. 29 CFR 1910.146 - Permit-Required Confined Spaces
   e. 29 CFR 1910.1000 — Air Contaminants (Table Z-1)
   f. 29 CFR 1910.1200 - Hazard Communication
   g. 29 CFR 1926.20 - General Health and Safety Provisions
   h. 29 CFR 1926.57 – Ventilation
   i. 29 CFR 1926.59 - Hazard Communication Program
   j. 29 CFR 1926.62 - Lead Exposure in Construction
   k. 29 CFR 1926.95 - Criteria for Personal Protective Equipment
   l. 29 CFR 1926, Subpart H - Materials Handling, Storage, Use and Disposal
   m. 29 CFR 1926, Subpart L - Scaffolding
   n. 29 CFR 1926, Subpart M -Fall Protection
   o. 29 CFR 1926, Subpart X – Ladders
   p. 29 CFR 1926, Subpart Z - Toxic and Hazardous Substances
   q. 40 CFR 50.6 - National Primary and Secondary Ambient Air Quality Standards for Particulate Matter
   r. 40 CFR 260 - Hazardous Waste Management System: General
   s. 40 CFR 261 - Identification and Listing of Hazardous Waste
   t. 40 CFR 262 - Standards Applicable to Generators of Hazardous Waste
   u. 40 CFR 263 - Standards Applicable to Transporters of Hazardous Waste
   v. 40 CFR 264 - Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities
   w. 40 CFR 265 - Interim Status Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities
   x. 40 CFR 268 - Land Disposal Restrictions
   y. 40 CFR 700 - Toxic Substances Control Act (TSCA)
   z. 40 CFR 761- PCBs Manufacturing, Processing, Distribution in Commerce, and Use Prohibitions
   aa. 49 CFR 105 - Hazardous Materials Program Definitions and General Procedures
   bb. 49 CFR 171 - General Information, Regulations and Definitions
   cc. 49 CFR 172 - Hazardous Material Table, Special Provisions, Hazardous Materials Communications, Emergency Response Information, and Training Requirements
   dd. 49 CFR 173 - Shippers-General Requirements for Shipments and Packaging
   ee. 49 CFR 177 - Carriage by Public Highway
   ff. 49 CFR 176 - Specifications for Packaging
3. National Institute for Occupational Safety and Health (NIOSH)
   a. Publication Number 87-106 Respiratory Decision Logic
   b. NIOSH /OSHA Booklet 3142 Lead in Construction
   c. Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities (NIOSH Publication 85-115)
4. U.S. Environmental Protection Agency (US EPA), Toxic Substances Control Act (TSCA)

a. Polychlorinated Biphenyl (PCB) Site Revitalization Guidance Under the Toxic Substances Control Act
b. 40 CFR Part 761.50 - Applicability (b) (1-8)
c. 40 CFR Part 761.61 - PCB Remediation Waste
d. 40 CFR Part 761.62 - PCB Bulk Product Waste
e. 40 CFR Part 761.79 – Decontamination

5. Center for Disease Control (CDC): Air Pollution and Respiratory Health.

1.10 DEFINITIONS

A. The following definitions as used within this technical specification as well as references to specific sections of the Code of Federal Regulation section 40 CRF Part 761 are provided. Definitions are extracted in part from 40 CFR Part 761.3, for full definitions refer to the specified section of regulations.

1. CERCLA means the Comprehensive Environmental Response, Compensation, and Liability Act (42 U.S.C. 9601-9657).
2. Chemical waste landfill means a landfill at which protection against risk of injury to health or the environment from migration of PCBs to land, water, or the atmosphere is provided from PCBs and PCB Items deposited therein by locating, engineering, and operating the landfill as specified in §761.75.
3. Cleanup Site means the areal extent of contamination and all suitable areas in very close proximity to the contamination necessary for implementation of a cleanup of PCB remediation waste, regardless of whether the site was intended for management of waste.
4. Containment means the enclosure within the building which establishes a contaminated area and surrounds the location where PCB and/or other toxic or hazardous substance removal is taking place and establishes a Control Work Area.
5. Designated Facility means the off-site disposer or commercial storer of PCB waste designated on the manifest as the facility that will receive a manifested shipment of PCB waste.
6. Disposal means intentionally or accidentally to discard, throw away, or otherwise complete or terminate the useful life of PCBs and PCB Items. Disposal includes spills, leaks, and other uncontrolled discharges of PCBs as well as actions related to containing, transporting, destroying, degrading, decontaminating, or confining PCBs and PCB Items.
7. DOT means the United States Department of Transportation.
8. EPA identification number means the 12-digit number assigned to a facility by EPA upon notification of PCB waste activity under §761.205.
9. Excluded PCB products means PCB materials which appear at concentrations less than 50 ppm as defined in 40 CFR §761.3.
10. Fixed Object means mechanical equipment, electrical equipment, fire detection systems, alarms, and all other fixed equipment, fixtures or other items which cannot be removed from the work area.
11. Generator of PCB waste means any person whose act or process produces PCBs that are regulated for disposal under subpart D of 40 CFR Part 761, or whose act first causes PCBs or PCB Items to become subject to the disposal requirements of subpart D, or who has physical control over the PCBs when a decision is made that the use of the PCBs has been terminated and therefore is subject to the disposal requirements of subpart D. Unless another provision of 40 CFR Part 761 specifically requires a site-specific meaning, "generator of PCB waste" includes all of the sites of PCB waste generation owned or operated by the person who generates PCB waste.
12. HEPA means High Efficiency Particulate Air filtration efficiency of 99.97 percent down to 0.3 microns. Filtration provided on specialized vacuums and air filtration devices to trap particles.
13. High occupancy area means any area where PCB remediation waste has been disposed of on-site and where occupancy for any individual not wearing dermal and respiratory protection for a calendar year is: 840 hours or more (an average of 16.8 hours or more per

week) for non-porous surfaces and 335 hours or more (an average of 6.7 hours or more per week) for bulk PCB remediation waste. Examples could include a residence, school, day care center, sleeping quarters, a single or multiple occupancy 40 hours per week workstation, a school class room, a cafeteria in an industrial facility, a control room, and a work station at an assembly line.

14. Incinerator means an engineered device using controlled flame combustion to thermally degrade PCBs and PCB Items. Examples of devices used for incineration include rotary kilns, liquid injection incinerators, cement kilns, and high temperature boilers.
15. Laboratory means a facility that analyzes samples for PCBs and is unaffiliated with any entity whose activities involve PCBs.
16. Liquid PCBs means a homogenous flowable material containing PCBs and no more than 0.5 percent by weight non-dissolved material.
17. Low occupancy area means any area where PCB remediation waste has been disposed of on-site and where occupancy for any individual not wearing dermal and respiratory protection for a calendar year is: less than 840 hours (an average of 16.8 hours per week) for non-porous surfaces and less than 335 hours (an average of 6.7 hours per week) for bulk PCB remediation waste. Examples could include an electrical substation or a location in an industrial facility where a worker spends small amounts of time per week (such as an unoccupied area outside a building, an electrical equipment vault, or in the non-office space in a warehouse where occupancy is transitory).
18. Manifest means the shipping document EPA form 8700-22 and any continuation sheet attached to EPA form 8700-22, originated and signed by the generator of PCB waste in accordance with the instructions included with the form and subpart K of this part.
19. Mark means the descriptive name, instructions, cautions, or other information applied to PCBs and PCB Items, or other objects subject to these regulations.
20. Marked means the marking of PCB Items and PCB storage areas and transport vehicles by means of applying a legible mark by painting, fixation of an adhesive label, or by any other method that meets the requirements of these regulations.
21. Municipal solid wastes means garbage, refuse, sludges, wastes, and other discarded materials resulting from residential and non-industrial operations and activities, such as household activities, office functions, and commercial housekeeping wastes.
22. Non-liquid PCBs means materials containing PCBs that by visual inspection do not flow at room temperature (25°C or 77°F) or from which no liquid passes when a 100 g or 100 ml representative sample is placed in a mesh number 60 ±5 percent paint filter and allowed to drain at room temperature for 5 minutes.
23. Non-porous surface means a smooth, unpainted solid surface that limits penetration of liquid containing PCBs beyond the immediate surface. Examples are: smooth un-corroded metal; natural gas pipe with a thin porous coating originally applied to inhibit corrosion; smooth glass; smooth glazed ceramics; impermeable polished building stone such as marble or granite; and high density plastics, such as polycarbonates and melamines, that do not absorb organic solvents.
24. On site means within the boundaries of a contiguous property unit.
25. PCB and PCBs means any chemical substance that is limited to the biphenyl molecule that has been chlorinated to varying degrees or any combination of substances which contains such substance. Refer to §761.1(b) for applicable concentrations of PCBs. PCB and PCBs as contained in PCB items are defined in §761.3. For any purposes under this part, inadvertently generated non-Aroclor PCBs are defined as the total PCBs calculated following division of the quantity of mono-chlorinated biphenyls by 50 and di-chlorinated biphenyls by 5.
26. PCB Article means any manufactured article, other than a PCB Container, that contains PCBs and whose surface(s) has been in direct contact with PCBs. "PCB Article" includes capacitors, transformers, electric motors, pumps, pipes and any other manufactured item (1) which is formed to a specific shape or design during manufacture, (2) which has end use function(s) dependent in whole or in part upon its shape or design during end use, and (3) which has either no change of chemical composition during its end use or only those

changes of composition which have no commercial purpose separate from that of the PCB Article.

27. PCB Article Container means any package, can, bottle, bag, barrel, drum, tank, or other device used to contain PCB Articles or PCB Equipment, and whose surface(s) has not been in direct contact with PCBs.
28. PCB Bulk Product Waste means waste derived from manufactured products containing PCBs in a non-liquid state, at any concentration where the concentration at the time of designation for disposal is >50 ppm PCBs. PCB bulk product waste does not include PCBs or PCB Items regulated for disposal under §761.60(a) through (c), §761.61, §761.63, or §761.64. PCB bulk product waste is further defined in 40 CFR §761.3. Note in accordance with October 2012 re-interpretation from the U.S. Environmental Protection Agency (EPA), adjacent porous materials in contact with PCB Bulk Products shall be considered PCB Bulk Product Material for disposal purposes.
29. PCB Capacitor means any capacitor that contains >500 ppm PCB. Concentration assumptions applicable to capacitors appear under §761.2.
30. PCB Container means any package, can, bottle, bag, barrel, drum, tank, or other device that contains PCBs or PCB Articles and whose surface(s) has been in direct contact with PCBs.
31. PCB-Contaminated means a non-liquid material containing PCBs at concentrations >50 ppm but < 500 ppm; a liquid material containing PCBs at concentrations >50 ppm but < 500 ppm or where insufficient liquid material is available for analysis, a non-porous surface having a surface concentration >10 pg/100 cm2 but < 100 pg/100 cm2, measured by a standard wipe test as defined in §761.123.
32. PCB Equipment means any manufactured item, other than a PCB Container or a PCB Article Container, which contains a PCB Article or other PCB Equipment, and includes microwave ovens, electronic equipment, and fluorescent light ballasts and fixtures.
33. PCB Item means any PCB Article, PCB Article Container, PCB Container, PCB Equipment, or anything that deliberately or unintentionally contains or has as a part of it any PCB or PCBs.
34. PCB Remediation Waste means waste containing PCBs as a result of a spill, release, or other unauthorized disposal, at the following concentrations: Materials disposed of prior to April 18, 1978, that are currently at concentrations >50 ppm PCBs, regardless of the concentration of the original spill; materials which are currently at any volume or concentration where the original source was >500 ppm PCBs beginning on April 18, 1978, or >50 ppm PCBs beginning on July 2, 1979; and materials which are currently at any concentration if the PCBs are spilled or released from a source not authorized for use under this part. PCB remediation waste means soil, rags, and other debris generated as a result of any PCB spill cleanup, as further defined in 40 CFR §761.3.
35. PCB waste(s) means those PCBs and PCB Items that are subject to the disposal requirements of subpart D in 40 CFR Part 761.
36. Porous surface means any surface that allows PCBs to penetrate or pass into itself including, but not limited to, paint or coating on metal; corroded metal; fibrous glass or glass wool; unglazed ceramics; ceramics with a porous glaze; porous building stone such as sandstone, travertine, limestone, or coral rock; low-density plastics such as Styrofoam and low-density polyethylene; coated (varnished or painted) or uncoated wood; concrete or cement; plaster; plasterboard; wallboard; rubber; fiberboard; chipboard; asphalt; or tar paper. For purposes of cleaning and disposing of PCB remediation waste, porous surfaces have different requirements than nonporous surfaces.
37. RCRA means the Resource Conservation and Recovery Act (40 U.S.C. 6901 et seq.).
38. Standard wipe sample means a sample collected for chemical extraction and analysis using the standard wipe test as defined in §761.123. Except as designated elsewhere in part 761, the minimum surface area to be sampled shall be 100 cm2.
39. Storage for disposal means temporary storage of PCBs that have been designated for disposal.

40. SW-846 means the document having the title "SW-846, Test Methods for Evaluating Solid Waste,"
41. Totally enclosed manner means any manner that will ensure no exposure of human beings or the environment to any concentration of PCBs.
42. Transfer facility means any transportation-related facility including loading docks, parking areas, and other similar areas where shipments of PCB waste are held during the normal course of transportation. Transport vehicles are not transfer facilities under this definition, unless they are used for the storage of PCB waste, rather than for actual transport activities. Storage areas for PCB waste at transfer facilities are subject to the storage facility standards of §761.65, but such storage areas are exempt from the approval requirements of §761.65(d) and the recordkeeping requirements of §761.180, unless the same PCB waste is stored there for a period of more than 10 consecutive days between destinations.
43. Transporter of PCB waste means, for the purposes of subpart K of 40 CFR Part 761, any person engaged in the transportation of regulated PCB waste by air, rail, highway, or water for purposes other than consolidation by a generator.
44. Transport vehicle means a motor vehicle or rail car used for the transportation of cargo by any mode. Each cargo-carrying body (e.g., trailer, railroad freight car) is a separate transport vehicle.
45. TSCA means the Toxic Substances Control Act (15 U.S.C. 2601 et seq.).

1.11 SUBMITTALS

A. A pre-remediation meeting shall occur with the PCB Remediation Contractor, Owner or the Owner's Authorized Representative, and environmental consultant two weeks prior to commencement of work. The following documents shall be submitted immediately upon project award to the Owner prior to commencement of PCB Removal work:
   1. Site Specific Health and Safety Plan (HASP): The PCB Remediation Contractor shall prepare a site specific HASP plan for protection of workers and control of the work site in accordance with OSHA regulatory requirements. The HASP shall govern all work conducted at the site during the remediation of PCB materials and related debris; waste handling, sampling, waste management; and waste transportation. At a minimum, the HASP shall address the requirements set forth in 29 CFR 1910.120, as further outlined below:
      a. Health and Safety Organization
      b. Site Description and Hazard Assessment
      c. Training
      d. Medical Surveillance
      e. Work Areas
      f. Personal Protective Equipment
      g. Personal Hygiene and Decontamination
      h. Standard Operating Procedures and Engineering Controls
   2. Emergency Equipment and First Aid Provisions
      a. Equipment Decontamination
      b. Air Monitoring
   3. Telephone List
      a. Emergency Response and Evacuation Procedures and Routes
      b. Site Control
      c. Permit-Required Confined Space Procedures
      d. Spill prevention and Containment Plan
      e. Heat and Cold Stress
      f. Record Keeping
      g. Community Protection Plan
   4. Training Documentation: Documentation of OSHA 40-Hour HAZWOPER Training for all employees and subcontractors to be used for the remediation work, and 8-Hour

HAZWOPER Supervisor Training for the designated on-site Health and Safety Officer for the remediation work.

5. PCB and or other Toxic or Hazardous Substances Disposal Plan: A written plan that details the PCB Remediation Contractor's plan for transportation and disposal of PCB-containing or other Toxic or Hazardous Substance wastes generated during the project. The Disposal Plan shall identify:
   a. Waste packaging, labeling, placarding and manifesting procedures.
   b. The name, address and 24-hour contact number for the proposed treatment or disposal facility or facilities to which waste generated during the project will be transported.
   c. The name, address, contact person(s) and state-specific permit numbers for proposed waste transporters, and EPA identification number for firms that will transport waste.
   d. The license plate numbers of vehicles to be used in transporting of the waste from the site to the disposal facility.
   e. The route(s) by which the waste will be transported to the designated disposal facility, and states or territories through which the waste will pass.
   f. disposal facility, and states or territories through which the waste will pass.
6. Safely Data Sheets: Safety Data Sheets (OSHA Form 174 or equivalent) and manufacturer's information shall be provided for all chemicals and materials to be used during the project including but not limited to specialty cleaners and chemical stripping products.

B. The following documents shall be submitted to the Owner within fifteen (15) work days following removal of waste from the site:
   1. Waste Profile Sheets
   2. Pre-Disposal Analysis Test Results (If required by disposal facility)
   3. Manifests signed by the disposal facility
   4. Tipping Receipts provided by the disposal facility
   5. Certification of Final Treatment/Disposal signed by the responsible disposal facility official.

C. PCB Work Closeout Submittals:
   1. Disposal Site Receipts: Copy of waste shipment record and disposal site receipt showing the PCB-containing or other Toxic or Hazardous Substances materials have been properly disposed.

D. Product Data: Catalog sheets, specifications, and application instructions for any removal products, if used.

1.12 REGULATIONS AND STANDARDS

A. The PCB Remediation Contractor shall be solely responsible for conducting this project and supervising all work in a manner that will be in conformance with all federal, state, and local regulations and guidelines pertaining to PCB Containing Material removal. Specifically, The PCB Remediation Contractor shall comply with the requirements of the following as applicable to the work to be performed:
   1. Toxic Substance Control Act (TSCA) (40 CFR Part 761).
   2. Comprehensive Environmental Response, Compensation, and Liability Act (Superfund Law).
   3. Department of Transportation (DOT) regulations - DOT regulation HM-181 regulates transportation of hazardous materials, including PCBs.
   4. Occupational Safety and Health Administration (OSHA) - OSHA regulates workers' safety and exposure to a variety of chemicals including PCBs.
   5. Connecticut Basic Building Code (BOCA) (including Connecticut Supplements);
   6. Life Safety Code (NFPA); and

7. Local health and safety codes, ordinances or regulations pertaining to hazardous materials remediation and all national codes and standards including ASTM, ANSI, and Underwriter's Laboratories.

1.13 FINAL VISUAL CLEARANCE

A. Following the completion of the work, the Consultant shall perform a final visual inspection of the work area per guidelines EPA and State of Connecticut CT DEEP regulations and to assess that the above-indicated PCB-containing materials were removed.

1.14 POSTING AND RECORD MAINTENANCE REQUIREMENTS

A. The following items shall be conspicuously displayed proximate but outside of remediation work areas.
1. Exit Routes -Emergency exit procedures and routes.
2. Emergency Phone Numbers - A list indicating the telephone numbers and locations of the local hospital(s); the local emergency squad; the local fire department; the local police department; the Poison Control Center; Chemical Emergency Advise (CHEMTREC); the local Department of Health's local office; the PCB Remediation Contractor (on-site and after-hours numbers); and the environmental consultant (on-site and after hours numbers).
3. Warning Signs - Warning signs shall be in English and the language of any workers onsite who do not speak English, and be of sufficient size to be clearly legible and display the following or similar language in accordance with 29 CFR 1910.1200:

WARNING
HAZARDOUS WASTE WORK AREA
PCBs-POISON
NO SMOKING, EATING OR DRINKING
AUTHORIZED PERSONNEL ONLY
PROTECTIVE CLOTHING IS REQUIRED IN THIS AREA

In addition, all entrances to work areas shall be posted with a PCB M_L marker.

B. The PCB Remediation Contractor shall maintain the following items on-site and available for review by all employees and authorized visitors:
1. PCB Remediation Contractor's Project Specific Health and Safety Plan
2. Certificates of Training for all employees and the project Supervisor
3. Codes, Standards and Publications
4. Safety Data Sheets (SDS) for all chemicals used during the project.
5. Copies of the PCB Remediation Contractor's written hazard communication, respiratory protection, and confined space entry programs.

C. Fees, Permits and Licenses. The PCB Remediation Contractor shall pay all licensing fees, royalties, and other costs necessary for the use of any copyrighted or patented product, design, invention, or processing in the performance of the work specified in this Section.
1. The PCB Remediation Contractor shall be solely responsible for costs, damages, or losses resulting from any infringement of these patent rights or copyrights. The PCB Remediation Contractor shall hold the Owner and the Owner's Authorized Representative harmless from any costs, damages, and losses resulting from any infringement of these patent rights or copyrights.
2. The PCB Remediation Contractor shall be responsible for securing all necessary permits for work under this Section, including hauling, removal, and disposal, fire, and materials usage, or any other permits required to perform the specified work.

1.15 QUALITY ASSURANCE

A. The PCB Remediation Contractor shall provide and assure that the quality of work practices and procedures to be utilized are consistent with the above listed agencies and regulations. PCB Remediation Contractor shall utilize the latest edition, including all addenda, revisions and supplements for all regulatory agencies codes, etc.

B. Worker's Qualifications: The persons performing PCB remediation and their supervisors shall be personally experienced in PCB remediation work and shall have been regularly employed by a company performing PCB remediation for a minimum of 3 years.

C. Pre-Work Conference: Before the Work of this Section is scheduled to commence, a conference will be held by the Owner at the Site for the purpose of reviewing the Contract Documents, discussing requirements for the Work, and reviewing the Work procedures.

1. The conference shall be attended by the PCB Remediation Contractor, and the Owner's Authorized Representative employed by the Owner. This pre-remediation meeting may consist of multiple meetings.

1.16 MINIMUM REQUIREMENTS FOR WORKER HEALTH AND SAFETY

A. The PCB Remediation Contractor is responsible and liable for the health and safety of all onsite personnel and the offsite community affected by the project. All onsite workers or other persons entering the remediation work areas, decontamination areas or waste handling and staging areas shall be knowledgeable of and comply with the requirements of the site specific Health and Safety Plan at all times. The PCB Remediation Contractor's HASP shall comply with all applicable federal, state, and local regulations protecting human health and the environment from the hazards posed by the work to be performed under this project.

B. Consistent disregard for the provisions of the HASP shall be deemed as sufficient cause for immediate stoppage of work and termination of the Contract or any Sub Contracts without compromise or prejudice to the rights of the Owner or the Owner's Authorized Representative.

C. Any discrepancies between the PCB Remediation Contractor's HASP and these specifications or federal and state regulations shall be resolved in favor of the more stringent requirements that provide the highest degree of protection to the project personnel and the surrounding community and environment.

D. In addition to exposure concerns relating to the presence of PCBs, other health and safety considerations will apply to the work. The PCB Remediation Contractor shall be responsible for recognizing such hazards and shall be responsible for the health and safety of PCB Remediation Contractor employees at all times. It is the PCB Remediation Contractor's responsibility to comply with all applicable health and safety regulations.

E. The HASP shall be reviewed by all persons prior to entry into the remediation, decontamination, or waste staging areas, whether a representative of the PCB Remediation Contractor, owner, architect/engineer, environmental consultant, subcontractor(s), waste transporter or federal, state or local regulatory agency. Such review shall be acknowledged and documented by the PCB Remediation Contractor's Health and Safety Officer by obtaining the name, signature and affiliation of all persons reviewing the HASP.

F. The HASP shall be maintained so as to be readily accessible and reviewable by all site personnel throughout the duration of the remediation project and until all waste materials are removed from the site and disposed of at the appropriate disposal facility.

G. The PCB Remediation Contractor's on-site Health and Safety Officer shall be responsible for ensuring that project personnel and site visitors are informed of and comply with the provisions of the HASP at all times during the project.

1.17 WORK AREAS AND ZONES

A. The PCB Remediation Contractor shall lay-out and clearly identify work areas in the field. Access by equipment, site personnel, and the public to the work areas shall be limited as follows:

1. Remediation Zone: The Remediation Zone(s) shall consist of all interior and exterior areas where removal of PCBs and other Toxic or Hazardous Substances and waste handling and staging activities are on-going and the immediately surrounding locale or other areas where contamination could occur. The Remediation Zone for purposes of interior and exterior removal of PCB materials or other Toxic or Hazardous Substances for disposal shall be performed within a containment to isolate work areas from non-work areas. The containment shall be visibly delineated with appropriate warning signs at all approaches to Remediation (including a PCB ML marker), and be restricted from access by all persons except those directly necessary for the completion of the respective remediation tasks. The Remediation Zone shall be located and delineated as necessary to limit access to the remediation area and to minimize risk of exposure to site workers and the general public. Access shall be controlled at the periphery of the Remediation Zone to regulate the flow of personnel and equipment into and out of the zone and to help verify that proper procedures for entering and exiting are followed. All persons within the Remediation Zone shall wear the appropriate level of protection established in the HASP.
2. Decontamination Zone: The Decontamination Zone is the transition zone between the remediation area and the clean support zone of the project site, and is intended to reduce the potential for contaminants from being dispersed from the Remediation Zone to clean areas of the site. The Decontamination Zone shall consist of a buffer area surrounding the Remediation Zone through which the transfer of equipment, materials, personnel and containerized waste products will occur and in which decontamination of equipment, personnel, and clothing will occur. The Decontamination Zones shall be constructed as a three-chamber decontamination unit for workers and a two chamber equipment room for waste load out as detailed in Section 3.4. All emergency response and first aid equipment shall be readily maintained in this Zone. All protective equipment and clothing shall be removed or decontaminated in the Decontamination Zone prior to exiting to the Support Zone.
3. Support Zone: The Support Zone will consist of the area outside the Decontamination Zone and the remainder of the project site. Administrative and other support functions and any activities that by nature need not be conducted in the Remediation or Decontamination Zone related to the project shall occur in the Support Zone, Access to the Remediation and Decontamination Zones shall be controlled by the Health and Safety Officer and limited to those persons necessary to complete the remediation work and which have reviewed and signed the HASP.
4. The remediation contractor is responsible for supplying the direct-reading particulate meter, performing testing and documenting the daily readings. The consultant may choose to perform independent sampling as well.

1.18 PERSONNEL PROTECTIVE EQUIPMENT

A. The PCB Remediation Contractor shall be responsible to determine and provide the appropriate level of personal protective equipment in accordance with applicable regulations and standards necessary to protect the PCB Remediation Contractor's employees from all hazards present.

B. The PCB Remediation Contractor shall provide all employees with the appropriate safety equipment and protective clothing to ensure an appropriate level of protection for each task,

taking into consideration the chemical, physical, ergonomic and biological hazards posed by the site and work activities.

C. The PCB Remediation Contractor shall establish in the HASP criteria for the selection and use of personal protective equipment (PPE).

D. The PPE to be utilized for the project shall be selected based upon the potential hazards associated with the project site and the work to be performed. Appropriate protective clothing shall be worn at all times within the Remediation Zone.

E. The PCB Remediation Contractor shall provide the appropriate level of respiratory protection to all field personnel engaged in activities where respiratory hazards exist or there is a potential for such hazard to exit.

F. The PCB Remediation Contractor shall provide, as necessary, protective coveralls, disposable gloves and other protective clothing for all personnel that will be actively involved in remediation activities or waste handling activities or otherwise present in the Remediation Zones. Coveralls shall be of Tyvek or equivalent material. Should the potential for exposure to liquids exist, splash resistant disposable suits shall be provided and utilized.

G. Protective coveralls, and other protective clothing shall be donned and removed within the Decontamination Zone and shall be disposed of at the end of each day. Ripped coveralls shall be immediately replaced after appropriate decontamination has been completed to the satisfaction of the Health and Safety Officer. Protective clothing shall not be worn outside of the Decontamination Zone.

H. Hard Hats, protective eyewear, rubber boots and or other non-skid footwear shall be provided by the PCB Remediation Contractor as required for workers and authorized visitors.

I. All contaminated protective clothing, respirator cartridges and disposable protective items shall be placed into proper containers to be provided by the PCB Remediation Contractor for transport and proper disposal in accordance with 40 CFR 262.

1.19 EMERGENCY EQUIPMENT AND FIRST AID REQUIREMENTS

A. The PCB Remediation Contractor shall provide and maintain at the site, at a minimum, the following Emergency and First Aid Equipment:

1. Fire Extinguishers: A minimum one (1) fire extinguisher shall be supplied and maintained at the site by the PCB Remediation Contractor throughout the duration of the project. Each extinguisher shall be a minimum of a 20 pound Class ABC dry fire extinguisher with Underwriters Laboratory approval per 29 CFR 1910.157.
2. First Aid Kit: A minimum of one (1) first aid kit meeting the requirements of 29 CFR 1910,151 shall be supplied and maintained at the site by the PCB Remediation Contractor throughout the duration of the project.
3. Communications: Telephone communications (either cellular or land line) shall be provided by the PCB Remediation Contractor for use by site personnel at all times during the project.

B. The Health and Safely Officer shall be notified immediately in the event of personal injury, potential exposure to contaminants, or other emergency. The Health and Safety Officer shall then immediately notify the Owner's Authorized Representative.

1.20 STANDARD SAFETY AND HEALTH PROCEDURES AND ENGINEERING CONTROLS

A. The following provisions shall be employed to promote overall safety, personnel hygiene and personnel decontamination:

1. Each PCB Remediation Contractor or Subcontractor shall ensure that all safety equipment and protective clothing to be utilized by its personnel is maintained in a clean and readily accessible manner at the site.
2. All prescription eyeglasses in use on this project shall be safety glasses conforming to ANSI Standard Z87.1. No contact lenses shall be allowed on the site.
3. Prior to exiting the delineated Decontamination Zone(s), all personnel shall remove protective clothing, and place disposable items in appropriate disposal containers to be dedicated to that purpose. Following removal of PPE, personnel shall thoroughly wash and rinse their face, hands, arms and other exposed areas with soap and tap water wash and subsequent tap water rinse. A fresh supply of tap water shall be provided at the site on each work day by the PCB Remediation Contractor for this purpose.
4. All PPE used on site shall be decontaminated or disposed of at the end of each work day. Discarded PPE shall be placed in sealed DOT approved 55-gallon barrels for off-site disposal.
5. Respirators, if necessary due to an upgrade to Level C PPE, shall be dedicated to each employee, and not interchanged between workers without cleaning and sanitizing.
6. Eating, drinking, chewing gum or tobacco, smoking, and any other practice that increases the likelihood of hand to mouth contact shall be prohibited within the delineated remediation and decontamination work zones. Prior to performing these activities, each employee shall thoroughly cleanse their face, hands, arms and other exposed areas.
7. All personnel shall thoroughly cleanse their face hands, arms and other exposed areas prior to using toilet facilities.
8. No alcohol, tobacco, illicit drugs or firearms will be allowed on the site at any time.
9. Contact with potentially contaminated surfaces should be avoided, if possible. Field personnel should minimize walking through standing water/puddles, mud or other wet or discolored surfaces; kneeling on ground; and placing equipment, materials or food on ground or other potentially contaminated surface.
10. The use of the "Buddy System" shall be employed at all times while conducting work at the site. Each employee shall frequently monitor other workers for signs of heat stress or chemical exposure or fatigue: periodically examine others PPE for signs of wear or damage; routinely communicate with others; and notify the Health and Safety Officer in the case of an emergency.

B. Workers must wear protective suits, protective gloves, eye protection and a minimum of half-face respirator with HEPA filter cartridge for all projects. Respiratory protection shall be in accordance with OSHA regulation 1910.134 and ANSI Z88.2.

C. Workers must be trained as per OSHA and US EPA requirements, have medical clearance and must have recently received pulmonary function test (PFT) and respirator fit tested by a trained professional.
1. A personal air sampling program shall be in place as required by OSHA.
2. The use of respirators must also follow a complete respiratory protection program as specified by OSHA.

1.21 INDEPENDENT INSPECTION AND MONITORING

A. This section describes independent visual inspection and monitoring work being performed on behalf of the Owner. This work is not in the Contract Sum. This section describes monitoring carried out by the Owner's Consultant (Langan) to verify that the building beyond the work area and the outside environment remains uncontaminated.

B. The purpose of the Owner's Consultant's monitoring is to detect faults in the work area isolation such as:
1. Contamination of the building outside of the work area by PCB dust.
2. Failure of filtration or rupture in the differential pressure system as applicable.

3. Contamination of the outside of the containment.

C. Should any of the above occur, the PCB Remediation Contractor shall immediately cease removal activities until the fault is corrected. Do not recommence work until authorized by the Owner's Consultant.

D. The Owner's Consultant may monitor the Work Area. The purpose of this monitoring will be to detect dust outside containment, which may challenge the ability of the Work Area isolation procedures to protect the balance of the building or outside of the building from contamination.

E. The Owner's Consultant will perform on-site monitoring throughout the course of the project, as follows:
1. All work procedures shall be continuously monitored by the Consultant to assure that areas outside the designated work locations in the buildings will not be contaminated.
2. Prior to work on any given day, The PCB Remediation Contractor's designated "competent person" shall discuss the day's work schedule with the Consultant to evaluate job tasks with respect to safety procedures and requirements specified to prevent contamination of the building or the employees. This includes a visual survey of the work area and the decontamination of the building or the employees.

PART 2 - PRODUCTS

2.1 REMEDIATION PRODUCTS

A. Deliver all materials in the original packages, containers, or bundles bearing the name of the manufacturer and the brand name and product technical description.

B. Damaged or deteriorating materials shall not be used and shall be removed from the premises. Material that becomes contaminated with PCBs shall be decontaminated or disposed of as PCB waste.

C. Polyethylene sheet in a roll size to minimize the frequency of joints shall be delivered to the job site with factory label indicating:
1. Type: Minimum 6 mil., opaque, fire retardant polyethylene sheets.
2. Floor/Ground Protective Layer: Minimum of multiple layers of 10 mil., reinforced polyethylene sheets (minimum of 20 feet out/away from building footprint).

D. Respirators:
1. Type: Approved by the Mine Safety and Health Administration (MSHA), Department of Labor, or the National Institute for Occupational Safety and Health (NIOSH), Department of Health and Human Services.

E. Polyethylene disposable bags shall be six (6) mil with pertinent pre-printed label. Tie wraps for bags shall be plastic, five (5) inches long (minimum), pointed and looped to secure filled plastic bags.

F. Tape or adhesive spray will be capable of sealing joints in adjacent polyethylene sheets and for attachment of polyethylene sheet to finished or unfinished surfaces of dissimilar materials and capable of adhering under both dry and wet conditions, including use of amended water.

G. Cleaning Products: Contractor shall at their discretion utilize specialty cleaning products such as Capsur, TechXtract or other cleaners for use in decontaminating porous and nonporous surfaces to remain. All such products shall be utilized in accordance with manufacturer's specifications as intended. PCB Remediation Contractor shall ensure appropriate use and disposal associated with

use in accordance with the SDS sheets for each product utilized. It shall be incumbent upon the PCB Remediation Contractor to determine the need for use of specialty products to meet required cleaning verification levels established herein and in accordance with the SIP or Performance Based Plan.

H. The PCB Remediation Contractor shall have available spray equipment capable of mixing wetting agent with water and capable of generating sufficient pressure and volume and having sufficient hose length to reach all areas with PCBs.

I. HEPA filtered local exhaust ventilation shall be utilized during the installation of enclosures and supports where PCB-containing materials may be disturbed.

2.2 TOOLS AND EQUIPMENT

A. The PCB Remediation Contractor shall provide a sufficient supply of disposable mops, rags, and sponges for work area cleaning and decontamination shall be available.

B. The PCB Remediation Contractor shall provide a sufficient supply of scaffolding, ladders, lifts, and hand tools (e.g., scrapers, wire cutters, brushes, utility knives, wire saws, etc.) shall be provided as needed.

C. The PCB Remediation Contractor shall provide all tools and equipment necessary for PCB removal.

D. The PCB Remediation Contractor's air monitoring professional shall have air-monitoring equipment of type and quantity to monitor operations and conduct personnel exposure surveillance per OSHA requirements.

E. The Remediation Contractor is responsible for supplying direct-reading particulate meters, performing testing and documenting the daily readings for exterior, and if requested, interior areas. The consultant may choose to perform independent sampling as well.

F. The PCB Remediation Contractor shall have available sufficient inventory or dated purchase orders for materials necessary for the job including protective clothing, respirators, filter cartridges, polyethylene sheeting of proper size and thickness, tape and air filters.

G. The PCB Remediation Contractor shall provide (as needed) temporary electrical power panels, electrical power cables, and electrical power sources (such as generators). Any electrical connection work affecting the building electrical power system shall be performed by a State of Connecticut licensed electrician.

H. The PCB Remediation Contractor shall have available shower stalls and plumbing to support same to include sufficient hose length and drain system or an acceptable alternate.

I. Exhaust air filtration system units shall contain HEPA filter(s) capable of sufficient air exhaust to create negative pressure of -0.02 inches of water within enclosure with respect to outside area. Equipment shall be checked for proper operation by smoke tubes or differential pressure gauge before the start of each shift and at least twice during the shift. Adequate exhaust air shall be provided for a minimum of four (4) air changes per hour within the enclosure. No air movement system or air filtering equipment shall discharge unfiltered air outside.

J. Vacuum units, of suitable size and capacities for the project, shall have HEPA filter(s) capable of trapping and retaining at least 99.97 percent of all mono-dispersed particles of 0.3 micrometers in diameter or larger.

2.3 PERSONNEL PROTECTION

A. Safety equipment (e.g., hard hats meeting the requirements of ANSI Standard 289.11981, eye protection meeting the requirements of ANSI Standard Z87.1-1979, safety shoes meeting the requirements of ANSI Standard Z41.1-1967, disposable PVC gloves or other work gloves), shall be provided to all workers and authorized visitors.

B. Non-skid footwear shall be provided to all remediation workers. Disposable clothing shall be adequately sealed to the footwear to prevent body contamination.

PART 3 - EXECUTION

3.1 WORK AREA PROTECTION — REMEDIATION ZONE GENERAL

A. Protection of Existing Construction: Perform PCB Bulk Product Waste and PCB Remediation Waste removal work without damage or contamination of adjacent areas, asphalt and/or concrete paving, soils, and existing construction.

B. Prior to commencement of PCB remediation activities at each work area, a containment system shall be constructed by the PCB Remediation Contractor to capture and contain all materials removed during the remediation. Containment procedures referenced for the remediation zone must be utilized for PCB Bulk Product Waste removal.

C. During all remediation activities, PCB Remediation Contractor shall maintain control of all entrances and exits to the work areas to ensure only authorized personnel enter the work areas and are afforded proper personal protective equipment and as required respiratory protection. All approaches to work areas shall be demarcated with appropriately worded warning signs.

D. Work zones shall be established in accordance with this section to include remediation zone, decontamination zone, and support zone.

E. Negative pressure containments shall be constructed consisting of two layers of 6-mil polyethylene sheeting on wall surfaces and two layers of 10-mil polyethylene sheeting on floor surfaces if required.

3.2 WORK AREA PROTECTION — REMEDIATION ZONE FOR PCB BULK PRODUCT

A. Ground protection to prevent debris from escaping the remediation zone and to protect areas outside of remediation zone from PCB contamination shall be utilized. Protection shall include the use of water impervious membrane covering which shall be secured to the ground surface. Edges shall be raised to prevent water run-off used for dust control during cutting and demolition of structures/systems. The membrane shall be covered with plywood and multiple layers of 10-mil reinforced polyethylene sheeting securely fastened to foundation (extending a minimum of 20 feet away from the building foundation). All interior removal will occur with full containments – negative pressure enclosures including hard solid barriers (wood or similar material), 6 and 10-mil fire retardant polyethylene sheeting on the interior/exterior to maintain containment integrity and abutting decontamination units.

B. Isolation barriers shall be installed on the interior of the building to isolate the building exterior where work shall be performed. Protection shall be affixed to the inside finish surfaces to isolate window. One layer of 6-mil polyethylene sheeting shall create the exterior critical barrier between the Remediation Zone and Interior of the Building.

C. All other openings to the building interior such as ducts, grilles, etc. shall be securely sealed with a single layer of 6-mil polyethylene sheeting from the building exterior.

D. Ground protection and isolation barriers shall remain in place throughout work to collect dust and debris resulting from PCB Bulk Product Waste removal.

E. All debris and dust generated during operations shall be HEPA vacuumed continuously throughout the work shift and at the end of a work shift to avoid accumulation. Any tears or rips that occur in protections shall be repaired or removed and replaced with new protections.

F. All surfaces adjacent to materials removed shall be properly decontaminated upon completing the removal of PCB Bulk Product Waste.

G. Warning Signage: Post warning signs in accordance with 29 CFR 1910.1200 at all approaches to the work area. Signs shall be conspicuously posted to permit a person to read signs and take precautionary measures to avoid exposure to PCBs or other Toxic or Hazardous Substances. These signs should include the PCB M_L markers at each entrance to the work area.

H. Waste Containers for PCB Bulk Product Waste: Appropriate PCB waste containers shall be placed adjacent to remediation zones. Containers shall be lined covered and secured. The PCB waste containers shall be properly marked as described in 40 CFR part §761.40. Marking shall include a PCB M_L marker formatted in accordance with 40 CFR part §761.45.

3.3 DECONTAMINATION ZONE

A. The PCB Remediation Contractor shall establish contiguous to the work area, a decontamination enclosure consisting of equipment room, shower room, and clean room in series. The only access between contaminated and uncontaminated areas shall be through this decontamination enclosure. The PCB Remediation Contractor shall ensure that employees enter and exit the Remediation Zone through the decontamination area.

B. Access between rooms in the decontamination system shall be through double flap curtain opening airlocks. The clean room, shower and equipment room within the decontamination enclosure, shall be completely sealed ensuring that the sole source of airflow through this area originates from uncontaminated areas outside the work area.

C. Construct the decontamination systems with wood or metal framing, 3/8" sheathing and cover both sides with a double layer of six (6) mil polyethylene sheeting, spray glued or taped at the joints. Caulk joints watertight at floor, walls, and ceiling.

D. The PCB Remediation Contractor shall visually inspect interior and exterior critical barriers that separate the Remediation Zone and the Interior of the Building, respectively, several times daily to assure effective seal and the PCB Remediation Contractor shall repair defects immediately.

E. Equipment room. The equipment room shall be supplied with impermeable, labeled bags and containers for the containment and disposal of contaminated protective equipment.

F. Shower area. Shower facilities shall be provided which comply with 29 CFR 1910.141(d)(3). The showers shall be adjacent both to the equipment room and the clean room.

G. Clean change room. The clean room shall be equipped with a locker or appropriate storage container for each worker's use. Following showering, each worker must then change into street clothing in clean change areas.

H. Decontamination area entry procedures. The PCB Remediation Contractor shall ensure that all workers follow proper decontamination procedures for entry into a Regulated Work area including but not limited to the following:
1. Enter the decontamination area through the clean room;
2. Remove and deposit street clothing within a locker provided for their use;
3. Put on protective clothing and respiratory protection before leaving the clean room.
4. Before entering the Remediation Zone, the PCB Remediation Contractor shall ensure that workers pass through the equipment room.

I. Decontamination area exit procedures. The PCB Remediation Contractor shall ensure that all workers follow proper decontamination procedures for exit from a Regulated Work area including but not limited to the following:
1. Before leaving the regulated area, workers shall remove all gross contamination and debris from their protective clothing.
2. Workers shall remove their protective clothing in the equipment room and deposit the clothing in labeled impermeable bags or containers.
3. Workers shall not remove their respirators in the equipment room.
4. Workers shall shower prior to entering the clean room.
5. After showering, workers shall enter the clean room before changing into street clothes.

J. Equipment Room for Waste Removal: The PCB Remediation Contractor shall establish a two chamber equipment room or area that is adjacent to the Remediation Zone for the decontamination of waste containers and equipment as noted above.
1. The area must be of sufficient size as to accommodate cleaning of equipment and removing waste without spreading contamination beyond the area (as determined by visible accumulations).
2. All equipment and surfaces of containers filled with PCB waste must be cleaned prior to removing them from the equipment room or area.

3.4 PCB BULK PRODUCT MATERIAL REMOVAL

A. PCB Bulk Product Waste Materials – Interior and exterior materials listed in 1.08 Scope of Work per the EPA PCB Bulk Waste Reinterpretation Memorandum dated October 24, 2012. The PCB Bulk Product Waste will also include asbestos containing materials (see asbestos specifications).

B. Materials shall be removed in a manner which does not breakdown the materials into fine dust or powder to the extent feasible. Equipment and tools to be utilized shall include hand tools and mechanical equipment such as demolition hammers to remove materials from adjacent substrates. Mechanical removal equipment shall as appropriate be fitted with dust collection systems.

C. Any dry or brittle sealant/caulking/glazing materials shall be removed with additional engineering controls such as use of a HEPA vacuum to remove accumulated dust or debris during removal.

D. Sequence of removal shall follow the following general requirements:
1. Site preparation and controls shall be completed. Work shall not proceed until authorized by owner's representative.
2. The materials listed in 1.08 shall be removed in their entirety for disposal as PCB Bulk Product Waste. The removal of the systems shall be performed so that the sealant/caulking/glazing compounds and other source/adjacent materials are not disturbed.
3. The adjacent surfaces shall be cleaned of all residues using EPA recommended methods.

E. Waste shall be immediately containerized in temporary 6-mil polyethylene disposal bags for disposal. These containers shall be sealed in remediation zone when full during collection and

then placed in disposal containers/storage trailers. The containers shall not be emptied into other containers to avoid dispersal of dust or fugitive emissions.

F. The use of minimal quantities of water to moisten the generated dust prior to collection shall be utilized. Under no circumstances shall the PCB waste show evidence of free liquid water, pooling or ponding within the waste stream. Any liquid used to wet the dust and debris to control fugitive emissions shall be properly containerized and decontaminated in accordance with 40 CFR Part §761.79 (b)(1) or disposed of in accordance with 40 CFR Part §761.60 (a).

G. PCB Bulk Product Waste shall be stored for disposal in accordance with 40 CFR Part §761.65 and marked in accordance with 40 CFR Part §761.40 and §761.45.

H. All waste containers shall be appropriately labeled in accordance with 40 CFR Part §761.40 and §761.45. Labeling shall include the PCB M_L marker.

3.5 PCB REMEDIATION WASTE — IF VERFIFICATON SAMPLING FINDS >1 PPM PCB

A. All adjacent components (if failing verification sampling – if required) shall be removed, in containments and transported off-site for disposal as PCB Remediation Waste. This includes adjacent building materials/asphalt/soil failing verification sampling (if contractor contaminates these surfaces/materials) and will be performed at no extra cost to the owner. The contractor owns additional remediation for verification sampling failures up to 20% however if the contractor is deemed by Langan to have contaminated the wall surfaces, all additional remediation is to be performed by the contractor at no additional cost to the owner.

B. All PCB Remediation Waste shall be stored for disposal in accordance with 40 CFR Part §761.65.

C. All waste containers shall be appropriately labeled in accordance with 40 CFR Part §761.40 and §761.45. Marking shall include the PCB M_L marker.

D. Soil excavations will be backfilled with certified clean soil meeting the CT DEEP Remediation Standards Regulations (RSRs) for the Residential Direct Exposure Criteria (RDEC) and Groundwater Classification A (GB) Pollutant Mobility Criteria (PMC). Asphalt excavations shall be replaced in kind. Additionally brushes removed during soil excavation shall be replaced in kind.
   1. Scope for soil sample collection:
      a. Owner's Representative will review the characterization data of soil being brought on-site.
      b. Collect one composite soil sample (made up of three sample locations) for every 500 cubic yards (CY) of material planned to be brought to the site for use as clean fill.
   2. Laboratory analysis of soil characterization shall include the following:
      a. Volatile Organic Compounds (VOCs by method 8260)
      b. Polynuclear Aromatic Hydrocarbons (PAHs by method 8270)
      c. Extractable Total Petroleum Hydrocarbons (ETPH)
      d. Polychlorinated Biphenyls (PCBs by method 8082)
      e. Pesticides and Herbicides (by method 8081)
      f. RSR metals (Mass and SPLP)

3.6 CLEANING AND DECONTAMINATION

A. The PCB Remediation Contractor shall be responsible for complete cleaning and decontamination of the Remediation Zone upon completion of work. The Remediation Zone will be required to meet proposed Verification Sampling limits prior to containment tear down.

B. The PCB Remediation Contractor shall utilize HEPA vacuum and wet cleaning products to remove all visible dust and debris from all surfaces within the work area. If specialty products are

utilized the PCB Remediation Contractor shall utilize in accordance with manufacturer's specifications including any additional safety and disposal requirements for such use.

C. Cleaning of containment barriers shall be performed prior to removal leaving critical barriers at openings, decontamination units and negative air filtration devices in place until results of post verification sampling indicate acceptable limits. Cleaning shall be performed from ceiling to floors.

D. Any liquid used to wet the dust and debris to control fugitive emissions shall be collected and decontaminated in accordance with 40 CFR Part §761.79 (b)(1) or disposed of in accordance with §761.60 (a).

E. All rags and other cleaning materials used to clean shall also be properly disposed as PCB Remediation Waste. All PCB Remediation Waste shall be stored for disposal in accordance with 40 CFR Part §761.65. All waste containers shall be appropriately marked in accordance with 40 CFR Part §761.40 and §761.45.

F. Equipment to be utilized in connection with the removal of PCB Bulk Product Waste and PCB Remediation Waste including waste collection or that will or may come in direct contact with the site contaminants shall be decontaminated prior to leaving the site to prevent migration of the contaminated residues from the project site. Decontamination shall be in accordance with 40 CFR Part §761.79 and Subpart S procedures.

G. All non-disposable equipment and tools employed in the course of the project will be decontaminated at the conclusion of each work day through the following sequence:

Initial tap water rinse, to remove gross contaminants.
1. Tap water and hexane or equivalent wash
2. Tap water rinse
3. Second tap water and hexane or equivalent wash
4. Second tap water rinse

H. The wash water and decontamination liquids shall be captured and containerized in DOT approved 55-gallon barrels for off-site disposal.

3.7 CONSULTANTS INSPECTION RESPONSIBILITIES

A. The Owner shall retain an industrial hygiene firm (Owner's Authorized Representative) to perform periodic inspections and sampling during the work. Site visits shall be scheduled based on the progress of the work and at critical time periods.

B. Consultant shall conduct inspections throughout the progress of the removal project. Inspections shall be conducted in order to document the progress of the removal work as well as the procedures and practices employed by the PCB Remediation Contractor.

C. The Consultant shall perform the following inspections during the course of remediation activities:
1. Pre-commencement Inspection. Pre-commencement inspections shall be performed at the time requested by the remediation Contractor. The Consultant shall be informed 12 hours prior to the time the inspection is needed. If, during the course of the pre-commencement inspection, deficiencies are found, the PCB Remediation Contractor shall perform the necessary adjustments in order to obtain compliance.
2. Work Area Inspections. Work area inspections shall be conducted on a daily basis at the discretion of the Consultant. During the course of the work inspections, the Consultant shall observe the PCB Remediation Contractor's removal procedures, verify barrier integrity, assess project progress, and inform the remediation Contractor of specific remedial activities if deficiencies are noted.

D. The Owner's Authorized Representative may perform real time monitoring for dust particulate using Dust Trak or equivalent monitoring devices for total dust. Sampling may be performed prior to remediation for background comparison to during remediation sampling. In addition, air sampling outside of the Remediation Zone, may be performed periodically during active removal activities at the Owner's Authorized Representative's discretion for laboratory confirmation. **The remediation contractor is responsible for supplying the direct-reading particulate meters (minimum of 2), performing testing and documenting the daily readings. The consultant may choose to perform independent sampling as well.**

E. It should be noted that if the results of air samples exceed established action levels or ambient background conditions for real time monitoring whichever is less the PCB Remediation Contractor will be required to implement work stoppage to determine causes of exceeding results and as necessary utilize additional containment measures or engineering controls. Any resulting decontamination of areas beyond the Remediation Zone shall be responsibility of the PCB Remediation Contractor.

F. The Owner's Authorized Representative shall perform post removal and decontamination visual clearance inspection as necessary to determine complete removal of PCB's. Verification sampling may be performed on adjacent building materials.

G. Once verification sampling and/or visual inspection has documented the Remediation Zone meets required criteria, the PCB Remediation Contractor shall be permitted to remove decontamination unit, critical barriers, etc. These areas shall be subjected to a visual inspection to ensure no visible dust is present.

3.8 MARKING OF WASTE CONTAINERS

A. All waste containers must be marked with the name of the waste contained; the date in which the first material was placed in the vessel; and the last date at which addition of waste occurred. All waste containers must be marked with a PCB M_L marker.

B. All waste containers containing PCB Bulk Product Waste, Bulk PCB Remediation Waste and PCB contaminated debris, containment system components, used personnel protective equipment, personal and equipment wash water and decontamination fluids, or other wastes generated during the remediation work shall be labeled as follows:

DOT Class 9 UN3432 (solid)
Or UN2315 (liquid) PCB Waste
RQ
Waste for Disposal
Federal law prohibits improper disposal.
If found, contact the nearest police or public safety authority or the U.S. Environmental Protection Agency.
Generator's Information: NOa-g
Manifest Tracking No.:
Accumulation Start Date:
EPA ID No.:
EPA Waste No.:
Total Weight:
Container No.:
HANDLE WITH CARE!

In addition, these containers must be marked with a PCB M_L marker.

Such marking must be durable, in English and printed on or affixed to the surface of the package or on a label, tag or sign; displayed on a background of sharply contrasting color; un-obscured by labels or attachments and located away from any other marking (such as advertising) that could substantially reduce its effectiveness.

3.9 ON-SITE WASTE MANAGEMENT AND DISPOSAL OF SOLID HAZARDOUS WASTES

A. All solid waste material, containment system components, used personnel protective equipment, and other solid wastes generated during the work, shall be placed directly in appropriate waste receptacles immediately upon removal from its in-situ position. Suitable waste receptacles may consist of roll-off containers or DOT-approved 55-gallon barrels.

B. The PCB Remediation Contractor shall be responsible for all packaging, labeling, transport, disposal and record-keeping associated with PCB or PCB contaminated waste in accordance with all federal, state and local regulations.

C. The PCB Remediation Contractor shall ensure that the person transporting the waste holds a valid permit issued in accordance with appropriate federal, state, and local regulations.

D. The PCB Remediation Contractor shall provide to the transporter at the time of transfer appropriate shipping records or uniform waste manifests as required by the federal, state and local regulations with a copy to the Owner and Owner's Authorized Representative.

E. PCB Remediation Contractor shall maintain proper follow up procedures to assure that waste materials have been received by the designated waste site in a timely manner and in accordance with all federal, state and local regulations.

F. The PCB Remediation Contractor shall assure that disposal of polychlorinated biphenyls (PCB) containing waste material is at a facility approved to accept such waste and shall provide a tracking/manifest form signed by the landfill's authorized representative.

G. If roll-off containers are to be utilized for containerization of the remediation wastes the following shall apply:
   1. All roll-off containers or other similar vessels utilized shall be watertight and lined with 6-mil polyethylene sheeting or equivalent impermeable lining, and equipped with a secured and impermeable cover.
   2. The impermeable cover shall remain securely in place at all times when material is not being actively placed in the vessels. The PCB Remediation Contractor shall be responsible for ensuring that the cover remains securely intact until the container is removed from the site.

H. If 55-Gallon barrels are to be utilized for waste containerization, the barrels shall consists of suitable DOT-approved 55-gallon barrels that are watertight and free of corrosion, perforations, punctures, or other damage. All barrels shall be securely covered and sealed at the conclusion of each work day.

I. The waste containers shall remain staged at the site with a secure impermeable cover in place until the materials are transported from the site to be delivered to the designated disposal facility.

J. A waste roll-off and barrel staging area shall be designated prior to initiation of the remediation work, and approved by the Owner's Authorized Representative. If this area is located outside of the building, the area (or areas) shall be surrounded by a chain-link fence with a minimum height of six feet. The fence shall be labeled with a PCB ML marker.

K. Properly containerized waste must be transported by a licensed hauler and shipped as PCB Bulk Product Waste for disposal at a permitted waste facility in accordance with 761.62.

L. PCB Remediation Waste must be transported by a licensed hauler and shipped as PCB Remediation Waste for disposal in accordance with 40 CFR 761.61(b) to a EPA TSCA permitted hazardous waste landfill (EQ's Wayne Disposal Landfill in Belleville, Michigan, CWM Model City Disposal Landfill in Youngstown, NY or equivalent); and dispose of non-liquid PCB remediation waste in a high temperature incinerator approved under 761.70, alternate disposal method approved under 761.60(e), and/or a chemical waste landfill approved under 40 CFR 761.75 which is an EPA, TSCA approved facility for PCB Remediation Waste. Provide required copies of the uniform waste manifests for hazardous wastes to the Owner, waste generation State and waste destination State as required.

M. Bulk Product Waste will be transported under manifest for off-site disposal to a hazardous waste landfill (EQ's Wayne Disposal Landfill in Belleville, Michigan or equivalent); and/or other appropriate waste will be transported under manifest for off-site disposal at a non-hazardous waste landfill permitted to accept such materials (Waste Management's Turnkey Landfill in Rochester, New Hampshire, Minerva, Ohio or GROWS Landfill in Morrisville, Pennsylvania or equivalent).

N. Provide required copies of the uniform waste manifests for hazardous wastes to the Owner, waste generation State and waste destination State as required.

O. Any PCB Liquid Water Waste shall be properly containerized and decontaminated in accordance with 40 CFR Part §761.79 (b)(1) or disposed of in accordance with 40 CFR Part §761.60 (a).

P. Any chemicals, solvents or other products used during decontamination shall be properly containerized as PCB Liquid Waste. Waste must be properly decontaminated or disposed in accordance with 40 CFR Part §761.60 (a) or 40 CFR Part §761.79 (g). PCB Liquid Waste shall be transported by a licensed hauler and shipped for treatment or disposal. Provide required copies of the uniform waste manifests for hazardous wastes to the Owner, waste generation State and waste destination State as required.

Q. All contaminated waste shall be carefully loaded on trucks or other appropriate vehicles for transport. Before and during transport, care shall be exercised to ensure that no unauthorized persons have access to the material.

R. Transporters of the waste are prohibited from "back hauling" any freight after the disposition of the Owner's waste stream until decontamination of the vehicle and/or trailer is assured.

END OF SECTION 028432

SECTION 033000 - CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes cast-in-place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes, for the following:

1. Footings.
2. Foundation walls.
3. Slabs-on-grade.
4. Concrete Repairs

B. Related Sections:

1. Division 31 Section "Earth Moving" for drainage fill under slabs-on-grade.
2. Division 32 Section "Concrete Paving" for concrete pavement and walks.

1.3 DEFINITIONS

A. Cementitious Materials: Portland cement alone or in combination with one or more of the following: blended hydraulic cement, fly ash and other pozzolans, ground granulated blast-furnace slag, and silica fume; subject to compliance with requirements.

1.4 SUBMITTALS

B. Product Data: For each type of product indicated.

C. Shop Drawings

1. Submit shop drawings of all members to be furnished. Detail drawings of the members and their connections shall follow standard practice as set forth in the AISC "Manual of Structural Steel Detailing" (Second Edition). Welding shall be shown, using standard AWS welding symbols. Show on detail drawings the paint to be used.

2. Shop drawings will not be accepted for review by the Engineer unless there is substantial evidence that the General Contractor or Construction Manager on the project has reviewed the submittal for compliance with the contract documents and has addressed questions to be responded to by the Contractor. All coordination items with other trades and submittals are to be performed and the submittal marked accordingly before submission. Failure to provide the above will result in the submittal being returned and not reviewed.

3. Contractor shall perform review and schedule shop drawing submittals to permit a minimum of 15 calendar days for review by the Engineer. Shop Drawings will be returned to the Architect for their required review and processing.

4. Shop drawings will not be reviewed unless accompanied by erection drawings which locates and identifies the members. Copies or reproductions of contract drawings will not be accepted or reviewed as shop drawings.

5. Shop drawings shall be submitted in the form of an electronic file (PDF).

6. The following is the definitions for the Shop Drawing stamp disposition:

   No Exceptions Taken - Re-submission is not required unless document is revised.

   Make Corrections Noted - If checked, fabrication may be undertaken. Contractor is responsible for making noted corrections. Re-submission of record copies are required.

   Revise and Resubmit - If checked, fabrication may not be undertaken. Resubmit corrected copies for final review, with all changes clouded.

   Rejected - Resubmit for review.

   Reviewed – Reviewed for general compliance with the structural Contract Documents. Proprietary items or items designed by Others are reviewed only and shall not be approved by MHAI. Resubmission is not required.

   Corrections or comments made on shop drawings during this review do not relieve the Contractor from compliance with the requirements of the project drawings and specifications. This check is only for the review of general conformance with the information given in the Contract Documents. The Contractor is responsible for confirming and correlating all quantities and dimensions, selecting fabrication processes, techniques and sequence of construction, coordinating his work with that of other trades, and performing his work in accordance with OSHA requirements and other sections of the Project Specifications.

D. Design Mixtures: For each concrete mixture. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.

E. Steel Reinforcement Shop Drawings: Placing drawings that detail fabrication, bending, and placement. Include bar sizes, lengths, material, grade, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, splices and laps, mechanical connections, tie spacing, hoop spacing, and supports for concrete reinforcement.

F. Construction Joint Layout: Indicate proposed construction joints required to construct the structure.

   1. Location of construction joints is subject to approval of the Architect.

G. Material Certificates: For each of the following, signed by manufacturers:

   1. Cementitious materials.
   2. Admixtures.
   3. Steel reinforcement and accessories.
   4. Fiber reinforcement.
   5. Waterstops.
   6. Curing compounds.
   7. Floor and slab treatments.
   8. Bonding agents.
   9. Adhesives.

10. Vapor retarders.
11. Semi-rigid joint filler.
12. Repair materials.

H. Material Test Reports: For the following, from a qualified testing agency, indicating compliance with requirements:

1. Aggregates.

I. Floor surface flatness and levelness measurements indicating compliance with specified tolerances.

J. Field quality-control reports.

K. Minutes of pre-installation conference.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who employs on Project personnel qualified as ACI-certified Flatwork Technician and Finisher and a supervisor who is an ACI-certified Concrete Flatwork Technician.

B. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.

1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."

C. Testing Agency Qualifications: An independent agency, acceptable to authorities having jurisdiction, qualified according to ASTM C 1077 and ASTM E 329 for testing indicated.

1. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-1 or an equivalent certification program.
2. Personnel performing laboratory tests shall be ACI-certified Concrete Strength Testing Technician and Concrete Laboratory Testing Technician - Grade I. Testing Agency laboratory supervisor shall be an ACI-certified Concrete Laboratory Testing Technician - Grade II.

D. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from single source, and obtain admixtures from single source from single manufacturer.

E. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:

1. ACI 301, "Specifications for Structural Concrete. Sections 1 through 5 and Section 7, "Lightweight Concrete."
2. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."

F. Concrete Testing Service: Engage a qualified independent testing agency to perform material evaluation tests and to design concrete mixtures.

G. Preinstallation Conference: Conduct conference at Project site.

1. Before submitting design mixtures, review concrete design mixture and examine procedures for ensuring quality of concrete materials. Require representatives of each entity directly concerned with cast-in-place concrete to attend, including the following:

    a. Contractor's superintendent.
    b. Independent testing agency responsible for concrete design mixtures.
    c. Ready-mix concrete manufacturer.
    d. Concrete subcontractor.
    e. Special concrete finish subcontractor.

2. Review special inspection and testing and inspecting agency procedures for field quality control, concrete finishes and finishing, cold- and hot-weather concreting procedures, curing procedures, construction contraction and isolation joints, and joint-filler strips, semi-rigid joint fillers, forms and form removal limitations, vapor-retarder installation, anchor rod and anchorage device installation tolerances, steel reinforcement installation, floor and slab flatness and levelness measurement, concrete repair procedures, and concrete protection.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage.

B. Waterstops: Store waterstops under cover to protect from moisture, sunlight, dirt, oil, and other contaminants.

PART 2 - PRODUCTS

2.1 FORM-FACING MATERIALS

A. Smooth-Formed Finished Concrete: Form-facing panels that will provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.

1. Plywood, metal, or other approved panel materials.
2. Exterior-grade plywood panels, suitable for concrete forms, complying with DOC PS 1, and as follows:

    a. High-density overlay, Class 1 or better.
    b. Medium-density overlay, Class 1 or better; mill-release agent treated and edge sealed.
    c. Structural 1, B-B or better; mill oiled and edge sealed.
    d. B-B (Concrete Form), Class 1 or better; mill oiled and edge sealed.

B. Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.

C. Chamfer Strips: Wood, metal, PVC, or rubber strips, 3/4 by 3/4 inch (19 by 19 mm), minimum.

D. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.

1. Formulate form-release agent with rust inhibitor for steel form-facing materials.

E. Form Ties: Factory-fabricated, removable or snap-off metal or glass-fiber-reinforced plastic form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.

1. Furnish units that will leave no corrodible metal closer than 1 inch (25 mm) to the plane of exposed concrete surface.
2. Furnish ties that, when removed, will leave holes no larger than 1 inch (25 mm) in diameter in concrete surface.
3. Furnish ties with integral water-barrier plates to walls indicated to receive dampproofing or waterproofing.

2.2 STEEL REINFORCEMENT

A. Recycled Content of Steel Products: Provide products with an average recycled content of steel products so postconsumer recycled content plus one-half of preconsumer recycled content is not less than 25 percent.

B. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (Grade 420), deformed.

C. Steel Bar Mats: ASTM A 184/A 184M, fabricated from ASTM A 615/A 615M, Grade 60, deformed bars, assembled with clips.

D. Deformed-Steel Wire: ASTM A 496/A 496M.

E. Plain-Steel Welded Wire Reinforcement: ASTM A 185/A 185M, plain, fabricated from as-drawn steel wire into flat sheets.

F. Epoxy-Coated Welded Wire Reinforcement: ASTM A 884/A 884M, Class A coated, Type 1, plain steel.

2.3 REINFORCEMENT ACCESSORIES

A. Joint Dowel Bars: ASTM A 615/A 615M, Grade 60 (Grade 420), plain-steel bars, cut true to length with ends square and free of burrs.

B. Epoxy-Coated Joint Dowel Bars: ASTM A 615/A 615M, Grade 60 (Grade 420), plain-steel bars, ASTM A 775/A 775M epoxy coated.

C. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice," of greater compressive strength than concrete and as follows:

1. For concrete surfaces exposed to view where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected steel wire or CRSI Class 2 stainless-steel bar supports.
2. For epoxy-coated reinforcement, use epoxy-coated or other dielectric-polymer-coated wire bar supports.
3. For zinc-coated reinforcement, use galvanized wire or dielectric-polymer-coated wire bar supports.

2.4 CONCRETE MATERIALS

A. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source, throughout Project:

1. Portland Cement: ASTM C 150 Type I/II, gray.

B. Normal-Weight Aggregates: ASTM C 33, Class 3S coarse aggregate or better, graded. Provide aggregates from a single source[with documented service record data of at least 10 years' satisfactory service in similar applications and service conditions using similar aggregates and cementitious materials].

1. Maximum Coarse-Aggregate Size: 3/4 inch nominal.
2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.

C. Water: ASTM C 94/C 94M and potable.

2.5 ADMIXTURES

A. Air-Entraining Admixture: ASTM C 260.

B. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and that will not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.

1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
2. Retarding Admixture: ASTM C 494/C 494M, Type B.
3. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
4. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.
6. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.

2.6 WATERSTOPS

A. Self-Expanding Butyl Strip Waterstops: Manufactured rectangular or trapezoidal strip, butyl rubber with sodium bentonite or other hydrophilic polymers, for adhesive bonding to concrete, 3/4 by 1 inch (19 by 25 mm).

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Carlisle Coatings & Waterproofing, Inc.; MiraSTOP.
b. CETCO; Volclay Waterstop-RX.
c. Concrete Sealants Inc.; Conseal CS-231.
d. Greenstreak; Swellstop.
e. Henry Company, Sealants Division; Hydro-Flex.
f. JP Specialties, Inc.; Earth Shield Type 20.

2.7 VAPOR RETARDERS

A. Sheet Vapor Retarder: ASTM E 1745, Class A. Include manufacturer's recommended adhesive or pressure-sensitive tape.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Carlisle Coatings & Waterproofing, Inc.; Blackline 400.
b. Fortifiber Building Systems Group; Moistop Ultra 15.
c. Grace Construction Products, W. R. Grace & Co.; Florprufe 120.
d. Raven Industries Inc.; Vapor Block 15.

e. Stego Industries, LLC; Stego Wrap 15 mil Class A.

2.8 LIQUID FLOOR TREATMENTS

A. Penetrating Liquid Floor Treatment: Clear, chemically reactive, waterborne solution of inorganic silicate or siliconate materials and proprietary components; odorless; that penetrates, hardens, and densifies concrete surfaces.

B. Products: Subject to compliance with requirements, provide one of the following:

1. Euco Chemical Co.; Euco Diamond Hard
2. Dayton Superior Corporation; Day-Chem Sure Hard.
3. BASF Chemical Company; Kure-N-Harden.

2.9 CURING MATERIALS

A. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. (305 g/sq. m) when dry.

B. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.

C. Water: Potable.

2.10 RELATED MATERIALS

A. Expansion- and Isolation-Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber.

B. Bonding Agent: ASTM C 1059/C 1059M, Type II, non-redispersible, acrylic emulsion or styrene butadiene.

C. Reglets: Fabricate reglets of not less than 0.022-inch- (0.55-mm-) thick, galvanized-steel sheet. Temporarily fill or cover face opening of reglet to prevent intrusion of concrete or debris.

D. Dovetail Anchor Slots: Hot-dip galvanized-steel sheet, not less than 0.034 inch (0.85 mm) thick, with bent tab anchors. Temporarily fill or cover face opening of slots to prevent intrusion of concrete or debris.

2.11 REPAIR MATERIALS

A. Repair Underlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch (3.2 mm) and that can be feathered at edges to match adjacent floor elevations.

1. Cement Binder: ASTM C 150, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
2. Primer: Product of underlayment manufacturer recommended for substrate, conditions, and application.
3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch (3.2 to 6 mm) or coarse sand as recommended by underlayment manufacturer.
4. Compressive Strength: Not less than 4100 psi at 28 days when tested according to ASTM C 109/C 109M.

B. Repair Overlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/4 inch (6.4 mm) and that can be filled in over a scarified surface to match adjacent floor elevations.

1. Cement Binder: ASTM C 150, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
2. Primer: Product of topping manufacturer recommended for substrate, conditions, and application.
3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch (3.2 to 6 mm) or coarse sand as recommended by topping manufacturer.
4. Compressive Strength: Not less than 5000 psi at 28 days when tested according to ASTM C 109/C 109M.

2.12 CONCRETE MIXTURES, GENERAL

A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301.

1. Use a qualified independent testing agency for preparing and reporting proposed mixture designs based on laboratory trial mixtures.

B. Cementitious Materials: Use fly ash, pozzolan, ground granulated blast-furnace slag, and silica fume as needed to reduce the total amount of portland cement, which would otherwise be used, by not less than 40 percent.

C. Limit water-soluble, chloride-ion content in hardened concrete to 0.06 percent by weight of cement.

D. Admixtures: Use admixtures according to manufacturer's written instructions.

1. Use high-range water-reducing or plasticizing admixture in concrete, as required, for placement and workability.
2. Use water reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
3. Use water-reducing admixture in pumped concrete, and concrete with a water-cementitious materials ratio below 0.50.
4. Use corrosion-inhibiting admixture in concrete mixtures where indicated.

2.13 CONCRETE MIXTURES FOR BUILDING ELEMENTS

A. Footings and foundation walls: Proportion normal-weight concrete mixture as follows:

1. Minimum Compressive Strength: 4500 psi at 28 days.
2. Maximum Water-Cementitious Materials Ratio: 0.45.
3. Slump Limit: 4 inches for concrete with verified slump of 2 to 4 inches before adding high-range water-reducing admixture or plasticizing admixture, plus or minus 1 inch.
4. Air Content: 6 percent, plus or minus 1.5 percent at point of delivery for 3/4-inch nominal maximum aggregate size.

B. Slabs-on-Grade: Proportion normal-weight concrete mixture as follows:

1. Minimum Compressive Strength: 3500 psi at 28 days.
2. Water/ Cement ratio not to exceed 0.50.
3. Slump Limit: 4 inches, plus or minus 1 inch.
4. Air Content: Do not allow air content of trowel-finished floors to exceed 3 percent.

2.14 FABRICATING REINFORCEMENT

A. Fabricate steel reinforcement per CRSI's "Manual of Standard Practice."

2.15 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete per ASTM C 94 and ASTM C 1116, and furnish batch ticket information.

1. When air temperature is between 85 and 90 deg F (30 and 32 deg C), reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F (32 deg C), reduce mixing and delivery time to 60 minutes.

PART 3 - EXECUTION

3.1 FORMWORK

A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.

B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.

C. Limit concrete surface irregularities, designated by ACI 347 as abrupt or gradual, as follows:

1. Class A, 1/8 inch for smooth-formed finished surfaces.
2. Class B, 1/4 inch for rough-formed finished surfaces.

D. Construct forms tight enough to prevent loss of concrete mortar.

E. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.

1. Install keyways, reglets, recesses, and the like, for easy removal.
2. Do not use rust-stained steel form-facing material.

F. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike-off templates or compacting-type screeds.

G. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.

H. Do not chamfer exterior corners and edges of permanently exposed concrete.

I. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.

J. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.

K. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.

L. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

3.2 EMBEDDED ITEMS

A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

1. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC's "Code of Standard Practice for Steel Buildings and Bridges."
2. Install dovetail anchor slots in concrete structures as indicated.

3.3 REMOVING AND REUSING FORMS

A. General: Formwork for sides of beams, walls, columns, and similar parts of the Work that does not support weight of concrete may be removed after cumulatively curing at not less than 50 deg F for 24 hours after placing concrete. Concrete has to be hard enough to not be damaged by form-removal operations and curing and protection operations need to be maintained.

B. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material will not be acceptable for exposed surfaces. Apply new form-release agent.

C. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for exposed concrete surfaces unless approved by Architect.

3.4 VAPOR RETARDERS

A. Sheet Vapor Retarders: Place, protect, and repair sheet vapor retarder according to ASTM E 1643 and manufacturer's written instructions.

1. Lap joints 6 inches and seal with manufacturer's recommended tape.

3.5 STEEL REINFORCEMENT

A. General: Comply with CRSI's "Manual of Standard Practice" for placing reinforcement.

1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.

B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that would reduce bond to concrete.

C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover.

D. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.

E. Install welded wire reinforcement in longest practicable lengths on bar supports spaced to minimize sagging. Lap edges and ends of adjoining sheets at least one mesh spacing. Offset laps of adjoining sheet widths to prevent continuous laps in either direction. Lace overlaps with wire.

3.6 JOINTS

A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.

B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.

1. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints unless otherwise indicated. Do not continue reinforcement through sides of strip placements of floors and slabs.
2. Form keyed joints as indicated. Embed keys at least 1-1/2 inches (38 mm) into concrete.
3. Locate joints for beams, slabs, joists, and girders in the middle third of spans. Offset joints in girders a minimum distance of twice the beam width from a beam-girder intersection.
4. Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top of footings or floor slabs.
5. Space vertical joints in walls 30 feet maximum. Locate joints beside piers integral with walls, near corners, and in concealed locations where possible.
6. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
7. Use epoxy-bonding adhesive at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.

C. Contraction Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth depth of concrete thickness slabs for typical slabs and a maximum of 1” for with embedded piping for radiant heat:
1. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.

D. Isolation Joints in Slabs-on-Grade: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.

1. Extend joint-filler strips full width and depth of joint, terminating flush with finished concrete surface unless otherwise indicated.
2. Terminate full-width joint-filler strips not less than 1/2 inch or more than 1 inch below finished concrete surface where joint sealants, specified in Division 07 Section "Joint Sealants," are indicated.
3. Install joint-filler strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together.

E. Doweled Joints: Install diamond dowel and support assemblies at joints where indicated.

3.7 WATERSTOPS

A. Self-Expanding Strip Waterstops: Install in construction joints and at other locations indicated, according to manufacturer's written instructions, adhesive bonding, mechanically fastening, and firmly pressing into place. Install in longest lengths practicable.

3.8 CONCRETE PLACEMENT

A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed.

B. Do not add water to concrete during delivery, at Project site, or during placement unless approved by Architect.

C. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301.

1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.

D. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.

1. Deposit concrete in horizontal layers of depth to not exceed formwork design pressures and in a manner to avoid inclined construction joints.
2. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.
3. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.

E. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.

1. Consolidate concrete during placement operations so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
2. Maintain reinforcement in position on chairs during concrete placement.
3. Screed slab surfaces with a straightedge and strike off to correct elevations.
4. Slope surfaces uniformly to drains where required.
5. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface. Do not further disturb slab surfaces before starting finishing operations.

F. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.

1. When average high and low temperature is expected to fall below 40 deg F (4.4 deg C) for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301.
2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.

G. Hot-Weather Placement: Comply with ACI 301 and as follows:

1. Maintain concrete temperature below 90 deg F (32 deg C) at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

3.9 FINISHING FORMED SURFACES

A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defects repaired and patched. Remove fins and other projections that exceed specified limits on formed-surface irregularities.

1. Apply to concrete surfaces not exposed to public view.

B. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defects. Remove fins and other projections that exceed specified limits on formed-surface irregularities.

1. Apply to concrete surfaces exposed to public view, to receive a rubbed finish.

C. Rubbed Finish: Apply the following to smooth-formed finished as-cast concrete where indicated:

1. Smooth-Rubbed Finish: Not later than one day after form removal, moisten concrete surfaces and rub with carborundum brick or another abrasive until producing a uniform color and texture. Do not apply cement grout other than that created by the rubbing process.
2. Grout-Cleaned Finish: Wet concrete surfaces and apply grout of a consistency of thick paint to coat surfaces and fill small holes. Mix one part portland cement to one and one-half parts fine sand with a 1:1 mixture of bonding admixture and water. Add white portland cement in amounts determined by trial patches so color of dry grout will match adjacent surfaces. Scrub grout into voids and remove excess grout. When grout whitens, rub surface with clean burlap and keep surface damp by fog spray for at least 36 hours.

D. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces unless otherwise indicated.

3.10 FINISHING FLOORS AND SLABS

A. General: Comply with ACI 302.1R recommendations for screeding, re-straightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.

B. Scratch Finish: While still plastic, texture concrete surface that has been screeded and bull-floated or darbied. Use stiff brushes, brooms, or rakes to produce a profile amplitude of 1/4 inch in one direction.

1. Apply scratch finish to surfaces indicated and to receive concrete floor toppings.

C. Float Finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power driven floats. Re-straighten, cut down high spots, and fill low spots.

Repeat float passes and re-straightening until surface is left with a uniform, smooth, granular texture.

1. Apply float finish to surfaces to receive trowel finish and to be covered with fluid-applied or sheet waterproofing, built-up or membrane roofing.

D. Trowel Finish: After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.

1. Apply a trowel finish to surfaces exposed to view or to be covered with resilient flooring, carpet, ceramic or quarry tile set over a cleavage membrane, paint, or another thin-film-finish coating system.
2. Finish surfaces to the following tolerances, according to ASTM E 1155 (ASTM E 1155M):
   a. Specified overall values of flatness, F(F) 35; and of levelness, F(L) 25; with minimum local values of flatness, F(F) 24; and of levelness, F(L) 17; for typical slabs-on-grade.

3. Finish and measure surface so gap at any point between concrete surface and an unleveled, freestanding, 10-ft.- (3.05-m-) long straightedge resting on two high spots and placed anywhere on the surface does not exceed 3/16 inch.

E. Trowel and Fine-Broom Finish: Apply a first trowel finish to surfaces where ceramic or quarry tile is to be installed by either thickset or thin-set method. While concrete is still plastic, slightly scarify surface with a fine broom.

1. Comply with flatness and levelness tolerances for trowel-finished floor surfaces.

F. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, ramps, and elsewhere as indicated.

1. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route. Coordinate required final finish with Architect before application.

3.11 MISCELLANEOUS CONCRETE ITEMS

A. Filling In: Fill in holes and openings left in concrete structures after work of other trades is in place unless otherwise indicated. Mix, place, and cure concrete, as specified, to blend with in-place construction. Provide other miscellaneous concrete filling indicated or required to complete the Work.

B. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and by steel-troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.

C. Equipment Bases and Foundations: Provide machine and equipment bases and foundations as shown on Drawings. Set anchor bolts for machines and equipment at correct elevations, complying with diagrams or templates from manufacturer furnishing machines and equipment.

D. Steel Pan Stairs: Provide concrete fill for steel pan stair treads, landings, and associated items. Cast-in inserts and accessories as shown on Drawings. Screed, tamp, and trowel finish concrete surfaces.

3.12 CONCRETE PROTECTING AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 301 for hot-weather protection during curing.

B. Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces. If forms remain during curing period, moist cure after loosening forms. If removing forms before end of curing period, continue curing for the remainder of the curing period.

C. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs and other surfaces.

D. Cure concrete according to ACI 308.1, by one or a combination of the following methods:

1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:

    a. Water.
    b. Continuous water-fog spray.
    c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-inch (300-mm) lap over adjacent absorptive covers.

2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches (300 mm), and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period using cover material and waterproof tape.

    a. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive floor coverings.
    b. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive penetrating liquid floor treatments.
    c. Cure concrete surfaces to receive floor coverings with either a moisture-retaining cover or a curing compound that the manufacturer certifies will not interfere with bonding of floor covering used on Project.

3.13 LIQUID FLOOR TREATMENTS

A. Penetrating Liquid Floor Treatment: Prepare, apply, and finish penetrating liquid floor treatment according to manufacturer's written instructions.

1. Remove curing compounds, sealers, oil, dirt, laitance, and other contaminants and complete surface repairs.
2. Do not apply to concrete that is less than seven days' old.
3. Apply liquid until surface is saturated, scrubbing into surface until a gel forms; rewet; and repeat brooming or scrubbing. Rinse with water; remove excess material until surface is dry. Apply a second coat in a similar manner if surface is rough or porous.

B. Sealing Coat: Uniformly apply a continuous sealing coat of curing and sealing compound to hardened concrete by power spray or roller according to manufacturer's written instructions.

3.14 JOINT FILLING

A. Prepare, clean, and install joint filler according to manufacturer's written instructions.

1. Defer joint filling until concrete has aged at least one month(s). Do not fill joints until construction traffic has permanently ceased.

B. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joint clean and dry.

C. Install semirigid joint filler full depth in saw-cut joints and at least 2 inches (50 mm) deep in formed joints. Overfill joint and trim joint filler flush with top of joint after hardening.

3.15 CONCRETE SURFACE REPAIRS

A. Defective Concrete: Repair and patch defective areas when approved by Architect. Remove and replace concrete that cannot be repaired and patched to Architect's approval.

B. Patching Mortar: Mix dry-pack patching mortar, consisting of one part portland cement to two and one-half parts fine aggregate passing a No. 16 (1.18-mm) sieve, using only enough water for handling and placing.

C. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.

1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch (13 mm) in any dimension to solid concrete. Limit cut depth to 3/4 inch (19 mm). Make edges of cuts perpendicular to concrete surface. Clean, dampen with water, and brush-coat holes and voids with bonding agent. Fill and compact with patching mortar before bonding agent has dried. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.
2. Repair defects on surfaces exposed to view by blending white portland cement and standard portland cement so that, when dry, patching mortar will match surrounding color. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.
3. Repair defects on concealed formed surfaces that affect concrete's durability and structural performance as determined by Architect.

D. Repairing Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.

1. Repair finished surfaces containing defects. Surface defects include spalls, popouts, honeycombs, rock pockets, crazing and cracks in excess of 0.01 inch (0.25 mm) wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.
2. After concrete has cured at least 14 days, correct high areas by grinding.
3. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete.
4. Correct other low areas scheduled to receive floor coverings with a repair underlayment. Prepare, mix, and apply repair underlayment and primer according to manufacturer's

written instructions to produce a smooth, uniform, plane, and level surface. Feather edges to match adjacent floor elevations.

5. Correct other low areas scheduled to remain exposed with a repair topping. Cut out low areas to ensure a minimum repair topping depth of 1/4 inch (6 mm) to match adjacent floor elevations. Prepare, mix, and apply repair topping and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.
6. Repair defective areas, except random cracks and single holes 1 inch (25 mm) or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least a 3/4-inch (19-mm) clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mixture as original concrete except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.
7. Repair random cracks and single holes 1 inch (25 mm) or less in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place patching mortar before bonding agent has dried. Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.

E. Perform structural repairs of concrete, subject to Architect's approval, using epoxy adhesive and patching mortar.

F. Repair materials and installation not specified above may be used, subject to Architect's approval.

3.16 FIELD QUALITY CONTROL

A. Testing and Inspecting: Owner will engage a special inspector and qualified testing and inspecting agency to perform field tests and inspections and prepare test reports.

B. Inspections:

1. Steel reinforcement placement.
2. Verification of use of required design mixture.
3. Concrete placement, including conveying and depositing.
4. Curing procedures and maintenance of curing temperature.

C. Concrete Tests: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:

1. Testing Frequency: Obtain one composite sample for each day's pour of each concrete mixture exceeding 5 cu. yd. (4 cu. m), but less than 25 cu. yd. (19 cu. m), plus one set for each additional 50 cu. yd. (38 cu. m) or fraction thereof.
2. Testing Frequency: Obtain at least one composite sample for each 100 cu. yd. (76 cu. m) or fraction thereof of each concrete mixture placed each day.

    a. When frequency of testing will provide fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.

3. Slump: ASTM C 143/C 143M; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change.

4. Air Content: ASTM C 231, pressure method, for normal-weight concrete; ASTM C 173/C 173M, volumetric method, for structural lightweight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
5. Concrete Temperature: ASTM C 1064/C 1064M; one test hourly when air temperature is 40 deg F (4.4 deg C) and below and when 80 deg F (27 deg C) and above, and one test for each composite sample.
6. Unit Weight: ASTM C 567, fresh unit weight of structural lightweight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
7. Compression Test Specimens: ASTM C 31/C 31M.

    a. Cast and laboratory cure two sets of two standard cylinder specimens for each composite sample.
    b. Cast and field cure two sets of two standard cylinder specimens for each composite sample.

8. Compressive-Strength Tests: ASTM C 39/C 39M; test one set of two laboratory-cured specimens at 7 days and one set of two specimens at 28 days.

    a. Test one set of two field-cured specimens at 7 days and one set of two specimens at 28 days.
    b. A compressive-strength test shall be the average compressive strength from a set of two specimens obtained from same composite sample and tested at age indicated.

9. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, Contractor shall evaluate operations and provide corrective procedures for protecting and curing in-place concrete.
10. Strength of each concrete mixture will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi (3.4 MPa).
11. Test results shall be reported in writing to Architect, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.
12. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.
13. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42/C 42M or by other methods as directed by Architect.
14. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
15. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.

D. Measure floor and slab flatness and levelness according to ASTM E 1155 (ASTM E 1155M) within 48 hours of finishing.

3.17 PROTECTION OF LIQUID FLOOR TREATMENTS

A. Protect liquid floor treatment from damage and wear during the remainder of construction period. Use protective methods and materials, including temporary covering, recommended in writing by liquid floor treatments installer.

END OF SECTION 033000

SECTION 033001 – SITE CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 DESCRIPTION

A. This Section specifies requirements for concrete cast-in-place on the site.

B. The work of includes cast-in-place concrete pavement, bases, foundations, structures and thrust blocks.

1.2 RELATED SECTIONS

A. Sections which directly relate to the work of this Section include:

1.3 REFERENCE STANDARDS

A. References herein are made in accordance with the following abbreviations and all work under this Section shall conform to the latest editions as applicable.

American Concrete Institute (ACI)

ACI 301 - Specifications for Structural Concrete for Building

ACI 305R - Hot Weather Concreting

ACI 306R - Cold Weather Concreting

ACI 316R - Recommendations for Construction of Concrete Pavements and Concrete Bases, American Society for Testing and Materials (ASTM)

ASTM 185 - Welded Wire Steel Fabric for Concrete Reinforcement

ASTM 615 - Deformed and Plain Billot Steel Bars for Concrete Reinforcement

ASTM C33 - Concrete Aggregates

ASTM C94 - Ready-Mixed Concrete

ASTM C143 - Slump of Portland Cement Concrete

ASTM C150 - Portland Cement

ASTM C171 - Sheet Materials for Curing Concrete

ASTM C231 - Air Content of Freshly Mixed Concrete by the Pressure Method

ASTM C260 - Air Entraining Admixtures for Concrete

ASTM C309 - Liquid Membrane-Forming Compounds for Curing Concrete

ASTM C494 - Chemical Admixtures for Concrete

ASTM C1116 - Standard Specifications for Fiber-Reinforced Concrete and Shortcrete.

Concrete Reinforcing Steel Institute (CRSI)

Manual of Standard Practice.

Americans with Disabilities Act and State Regulations

1.4 QUALITY ASSURANCE

A. Work and materials for construction of the cement concrete walks shall conform to ACI 316R. Other cast-in-place concrete shall conform to ACI 301.

B. Work, materials, and color of the wheelchair ramp paving shall conform to applicable sections of Americans with Disabilities Act (ADA) and State standards, whichever is more stringent.

C. Dimensions, locations, and details of equipment pads, anchors, supports, and similar features shown on the drawings are approximate. Manufacturer's approved shop Drawings of equipment to be supported, anchored, or contained thereby shall be consulted for exact location, size and details.

1.5 SUBMITTALS

A. Description of methods and sequence of placement for each type of specially-finished concrete, including description of methods and sequence of placement.

B. Manufacturer's product data for the following:

1. Form release agent.
2. Concrete coloring additive.
3. Preformed joint filler.
4. Concrete reinforcement specification data from manufacturer.
5. Stamp and Imprinting tools, manufacturers literature.

1.6 TESTING

A. The Owner may employ an independent testing laboratory to inspect and test concrete paving and other cast-in-place concrete work.

B. Testing of materials and installed work may occur at any time during progress of the work. Rejected materials and installed work shall be removed and replaced.

PART 2 - PRODUCTS

2.1 STEEL REINFORCEMENT

A. Steel reinforcing bars shall conform to ASTM A615, Grade 60, deformed.

1. Bars employed as dowels shall be hot-rolled plain rounds.

B. Steel wire: ASTM A82, plain cold drawn steel.

C. Welded wire fabric reinforcement shall conform to the applicable requirements of ASTM A185. Fabric reinforcement shall be furnished in flat sheets. Fabric reinforcement in rolls will not be permitted.

D. Supports for Reinforcement: Bolsters, chairs, and other devices for spacing, supporting, and fastening reinforcing bars, and welded wire fabric in place shall be wire bar-type supports complying with CRSI specifications.

1. For slabs-on-grade, use supports with sand plates or horizontal runners where base material will not support chair legs.
2. For exposed-to-view concrete surfaces where legs of supports are in contact with forms, provide supports with legs that are protected by plastic (CRSI, Class 1).

2.2 MIX DESIGN AND TESTING

A. Concrete mix design and testing shall comply with requirements of ACI.

B. Design mix to produce normal weight concrete consisting of Portland cement, aggregate, water-reducing admixture, air-entraining admixture, and water to produce following properties:

1. Compressive Strength: 4,500 psi, minimum at 28 days, unless otherwise indicated on Contract Documents.
2. Slump Range: 4-inches +/- 1-inch at time of placement
3. Air Entrainment: 4 to 7 percent
4. Have a maximum water cement ratio of 0.45 conforming to ACI 316R.
5. Be Air-entrained type conforming to ASTM C94. Air content by volume shall be tested in accordance with ASTM C260.
6. Use cement conforming to ASTM C150, Type I or II. Only one color of cement, all of the same manufacturer, shall be used for the work.
7. Use fine and coarse aggregates conforming to ASTM C33.
8. contain a water reducing agent to minimize cement and water content of the concrete mix at the specified slump. Water reducing agent shall conform to ASTM C494, Type A.
9. Contain no calcium chloride or admixtures containing calcium chloride shall be added to the concrete. No admixtures other than those specified shall be used in the concrete without the specific written permission of the Engineer in each case.

2.3 CONCRETE AGGREGATES

A. Provide in conformance with ASTM C33.

B. Fine aggregates in conformance with ASTM C33, part 6.

C. Coarse aggregates in conformance with ASTM C33, parts 9 thru 11 and tables 2 and 3, with the following Class designations:

1. 1S – For footings and foundations not exposed to the weather.
2. 4S – For pavements, driveways, curbs, walkways, sidewalks, and retaining walls, that are exposed to the weather.
3. 1N – For pavements, driveways, curbs, walkways, sidewalks, and retaining walls that are not exposed to the weather.

D. Exposed Aggregate for ADA curb ramps shall be selected, hard, durable, washed rounded stones free of deleterious reactivity to cement with graded sizes between ½ to ¾ inch diameter nominal sieves.

2.4 CURING MATERIALS FOR UNCOLORED CONCRETE

A. Curing shall be accomplished by the following methods:

1. Moist curing with burlap covering.
2. Curing paper, non-staining, fiber reinforced laminated Kraft bituminous product conforming to ASTM C171. Four mil polyethylene sheeting may be substituted for curing paper.
3. Curing compound, a resin-base, white pigmented compound conforming to ASTM C309, Type 2.

PART 3 - EXECUTION

3.1 PREPARATION OF SUBGRADE

A. The subgrade of areas to be paved shall be graded and compacted as specified in Section 312316 of these Specifications.

B. Excavation required in pavement subgrade shall be completed before fine grading and final compaction of subgrade are performed. Where excavation must be performed in completed subgrade, subbase, base, or pavement, subsequent backfill and compaction shall be performed as required by the Engineer and as specified in Section 310000, Earthwork.

C. Materials shall not be stored or stockpiled on subgrade.

D. Prepared subgrade will be observed by the Engineer. Subgrade shall be approved for installation of the gravel base course. Disturbance to subgrade caused by observation procedures shall be repaired.

3.2 BASE COURSE

A. Base course for concrete paving shall be pavement subbase course or gravel base materials specified in Section 312316 of these Specifications, as shown on the Drawings.

B. Width of base course shall extend beyond edge of the proposed pavement as shown on the drawings.

C. Material shall be placed in lifts no more than 6 inches thick, compacted measure. Each lift shall be separately compacted to specified density.

1. Material shall be placed adjacent to wall, manhole, catch basin, and other structures only after they have been set to required grade.
2. Rolling shall begin at sides and progress to center of crowned areas, and shall begin on low side and progress toward high side of sloped areas. Rolling shall continue until material does not creep or wave ahead of roller wheels.
3. Surface irregularities which exceed 1/2 inch as measured by means of a 10 foot long straightedge, shall be regraded and recompacted.

D. Base course shall be compacted at optimum moisture content to not less than 95 percent of maximum density as determined by ASTM D1557.

E. The base course shall be kept clean and uncontaminated. Less select materials shall not be permitted to become mixed with the base course material.

3.3 STEEL REINFORCEMENT

A. Before being placed in position, reinforcing steel shall be thoroughly cleaned of loose mill and rust scale, dirt, ice, and other foreign material which may reduce the bond between the concrete and reinforcing. Where there is delay in placing concrete after reinforcement is in place, bars shall be reinspected and cleaned when required.

B. Any bar showing cracks after bending shall be discarded.

C. Unless otherwise shown on the Drawings, reinforcing shall extend within 2 inches of form work and expansion joints. Reinforcing shall continue through control joints. Adjacent sheets of fabric reinforcing shall lap 6 inches.

D. After forms have been coated with form release agent, but before concrete is placed, reinforcing steel shall be securely wired in the required position and shall be maintained in that position until concrete is placed and compacted. Chair bars and supports shall be installed in a number and arrangement approved by the Engineer.

3.4 FORMS

A. General: Design, erect, support, brace, and maintain formwork to support vertical, lateral, static, and dynamic loads that might be applied until concrete structure can support such loads. Construct formwork so concrete members and structures are of correct size, shape, alignment, elevation, and position. Maintain formwork construction tolerances and surface irregularities complying with the following ACI 347 limits.

1. Provide Class A tolerances for concrete surfaces exposed to view.
2. Provide Class C tolerances for other concrete surfaces.

B. Construct forms to provide for openings, offsets, sinkages, keyways, recesses, moldings, chamfers, blocking, screeds, bulkheads, anchorages, and inserts, and other features required for the work. Use selected materials to obtain required finishes. Solidly butt joints and provide back-up at joints to prevent cement paste from leaking.

C. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Kerf wood inserts for forming keyways, reglets, recesses, and other features for easy removal.

D. Chamfer exposed corners and edges, using wood, metal, PVC, or rubber chamfer strips fabricated to produce uniform smooth lines and tight edge joints.

E. Thoroughly clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt or other debris just before placing concrete. Re-tighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.

3.5 INSTALLING EMBEDDED ITEMS

A. General: Set and build into formwork the anchorage devices and other embedded items required for work that is attached to, or supported by, cast-in-place concrete. Use setting drawings, diagrams, instructions, and directions provided by suppliers of items to be attached.

B. Forms for Slabs: Set edge forms, bulkheads, and intermediate screen strips for slabs to achieve required elevations and contours in finished surfaces. Provide and secure units to support screed strips using strike-off templates or compacting-type screeds.

3.6 PREPARING FORM SURFACES

A. Coat contact surfaces of forms with an approved, nonresidual, low-VOC form-coating compound before placing reinforcement.

3.7 CONCRETE PLACING

A. Equipment, methods of mixing and placing, and precautions to be observed as to weather, and condition of base shall meet the requirements of ACI 316R.

B. The Engineer shall be notified of scheduled concrete placement sufficiently in advance of start of operation to allow preliminary observation of the work, including subgrade, forms, and reinforcing steel.

C. Work shall not be performed during rainy weather or when temperature is less than 40°F (4.4°C).

D. Adjacent work shall be protected from stain and damage. Damaged and stained areas shall be replaced or repaired to equal their original conditions.

E. Existing concrete, earth, and other water-permeable material against which new concrete is to be placed shall be thoroughly damp when concrete is placed. There shall be no free water on surface.

F. Concrete which has set or partially set, before placing shall not be used. Retempering of concrete will not be permitted.

G. Concrete shall be thoroughly vibrated, or otherwise consolidated to secure a solid and homogeneous mass, thoroughly worked around reinforcement and into corners of forms.

H. When joining fresh concrete to concrete which has attained full set, latter shall be cleaned of foreign matter, and mortar laitance shall be removed by chipping and washing. Clean, roughened base surface shall be saturated with water, but shall have no free water on surface. A coat of 1:1 cement-sand grout, approximately 1/8 inch thick, shall be well scrubbed into the thoroughly dampened concrete base. New concrete shall be placed immediately, before grout has dried or set.

3.8 COLD WEATHER CONCRETING

A. Materials for concrete shall be heated when concrete is mixed, placed, or cured when the mean daily temperature is below 40°F or is expected to fall to below 40°F within 72 hours. The concrete, after placing, shall be protected by covering, heat, or both.

B. Details of handling and protecting of concrete during freezing weather shall be subject to the approval and direction of the Engineer. Procedures shall be in accordance with provisions of ACI 306R.

3.9 HOT WEATHER CONCRETING

A. Concrete just placed shall be protected from the direct rays of the sun and the forms and reinforcement just prior to placing shall be sprinkled with cold water. Every effort shall be made to minimize delays which will result in excessive mixing of the concrete after arrival on the site.

B. During periods of excessively hot weather (95°F., or above), ingredients in the concrete shall be cooled with cold mixing water to maintain the temperature of the concrete at permissible levels in accordance with the provisions of ACI 305. Any concrete with a temperature above 95°F., when ready for placement, will be rejected.

C. Temperature records shall be maintained throughout the period of hot weather giving air temperature, general weather conditions (calm, windy, clear, cloudy, etc.) and relative humidity. Records shall include checks on temperature of concrete as delivered and after placing in forms. Data should be correlated with the progress of the work so that conditions surrounding the construction of any part of the structure can be ascertained.

3.10 PROTECTION OF CONCRETE SURFACES

A. Concrete surfaces shall be protected from traffic or damage until surfaces have hardened sufficiently.

END OF SECTION 033001

SECTION 033543 - POLISHED CONCRETE FINISHING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Polished concrete finishing.
2. Concrete for polished concrete, including concrete materials, mixture design, placement procedures, initial finishing, and curing is specified in Section 033000 "Cast-in-Place Concrete."

1.3 PRE-INSTALLATION MEETINGS

A. Pre-installation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Polishing Schedule: Submit plan showing polished concrete surfaces and schedule of polishing operations for each area of polished concrete before start of polishing operations. Include locations of all joints, including construction joints.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Material Certificates: For each of the following, signed by manufacturers:

1. Repair materials.
2. Liquid floor treatments.

C. Sample Warranties: For special warranties.

D. Manufacturer’s Installation Instruction: Installation procedures and interface required with adjacent construction and its protection.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For each type of finishing system to include in maintenance manuals.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: Installer who is certified by manufacturer and experienced in performing work of this Section who has specialized in installation of work similar to that required for this project.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Store material in dry, enclosed area protected from exposure to moisture and temperatures below 50° F.

B. Keep containers closed and upright to prevent leakage.

C. Dispense special concrete finish material from factory numbered and sealed containers.

D. Maintain record of lot numbers.

1.9 FIELD CONDITIONS

A. Protect concrete slabs from staining prior to application of concrete finish system.

1.10 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer warrants to the Owner that the finishing system will remain water-repellant, dustproof, hardened, and abrasion-resistant within specified warranty period.

1. Warranty Period: Twenty (20) years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS (**PC**)

A. Basis-of-Design:

1. Vexcon Chemicals

B. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. ARDEX Americas
2. Euclid Chemical Company (The), an RPM company
3. H&C Decorative Concrete Products, a brand of Sherwin-Williams Co.
4. Substitutions: Under provisions of Section 012500 “Substitution Procedures”.

2.2 LIQUID FLOOR TREATMENTS

A. Penetrating Liquid Floor Treatments for Polished Concrete Finish: Clear, chemically reactive, waterborne solution of inorganic silicate or siliconate materials and proprietary components; odorless; that penetrates, hardens, and is suitable for polished concrete surfaces leaving no surface film.

1. Basis-of-Design: **Certi-Shine Clear**

B. Silicate Floor Repair Material: Liquid silicate material which fills and repairs concrete surface imperfections.

1. Basis-of-Design: **Certi-Shine Fusion**

C. Cleaning Solution: Eco-friendly degreaser and cleaner, concentrate pH must be slightly alkaline.

1. Basis-of-Design: **StarSeal EF Degreaser and Cleaner**

PART 3 - EXECUTION

3.1 EXAMINATION

A. Site Verification of Concrete Conditions:

1. Installer and manufacturer's representative will examine surfaces receiving concrete finish and polishing system.

a. Verify that surfaces conform to product manufacturer's requirements for substrate conditions.
b. Verify floor is free of curing membrane, bond-breaker, concrete laitance, and will absorb water per water absorbency test.

3.2 PREPARATION

A. Complete surface preparation per manufacturer’s written instructions.

B. Power sweep floor area, blowing out corners and column footings.

C. Initial grind should clean the concrete surface, removing all coatings, dirt, oil, and laitance.

D. If grinding does not remove oil spots, treat oil spots with emulsifier and oil absorber materials. Detail scrub with high pH detergent.

1. Basis-of-Design: **StarSeal EF Stripper**

E. Double scrub floor with automatic scrubber capable minimum of 80 to 120 pounds of head pressure, equipped with black stripping pads. Use proper dilution of high pH detergent. Scrub floor once without squeegee or vacuum. On second pass, remove water solution.

F. Power rinse surface removing all traces of soap residue.

G. Inspect the concrete surface.

H. Complete surface preparation per manufacturer’s written instructions.

I. Perform water absorbency test.

J. Repeat any steps as necessary to prepare for polishing.

3.3 POLISHING

A. Immediately following cleaning operation, install concrete polishing material(s) per manufacturer's instructions.

B. Apply polished concrete finish system to cured and prepared slabs.

1. Machine grind floor surfaces to receive polished finishes level and smooth.
2. Apply penetrating liquid floor treatment for polished concrete in polishing sequence and according to manufacturer's written instructions, allowing recommended drying time between successive coats.

3. Continue polishing with progressively finer-grit diamond polishing pads to gloss level required.
4. Control and dispose of waste products produced by grinding and polishing operations.
5. Neutralize and clean polished floor surfaces.

C. Perform polishing operation to the specified polish level.

1. Polish: Level 1: Matte finish, 100 grit.
2. Finishing Gloss Level Standard: Satin shine, equivalent to 60° film gloss of 30 when viewed at an angle.

3.4 PROTECTION

A. Protect finished surfaces from damage and soiling during other construction activities.

B. Without damaging completed work, provide protective cover.

END OF SECTION 033543

SECTION 034500 - PRECAST ARCHITECTURAL CONCRETE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Architectural precast concrete units.

1.3 DEFINITIONS

A. Design Reference Sample: Sample of approved architectural precast concrete color, finish, and texture, preapproved by Architect.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Design Mixtures: For each precast concrete mixture. Include compressive strength and water-absorption tests.

C. Shop Drawings:

1. Detail fabrication and installation of architectural precast concrete units.
2. Indicate locations, plans, elevations, dimensions, shapes, and cross sections of each unit.
3. Indicate joints, reveals, drips, chamfers, and extent and location of each surface finish.
4. Indicate details at building corners.
5. Indicate type, size, and length of welded connections by AWS standard symbols. Detail loose and cast-in hardware and connections.
6. Indicate locations, tolerances, and details of anchorage devices to be embedded in or attached to structure or other construction.
7. Indicate location of each architectural precast concrete unit by same identification mark placed on panel.
8. Indicate relationship of architectural precast concrete units to adjacent materials.

D. Samples: Design reference samples for initial verification of design intent, for each type of finish indicated on exposed surfaces of architectural precast concrete units, in sets of three (3), representative of finish, color, and texture variations expected; approximately 12 by 12 by 2 inches.

1. When other faces of precast concrete unit are exposed, include Samples illustrating workmanship, color, and texture of backup concrete as well as facing concrete.

1.5 INFORMATIONAL SUBMITTALS

A. Welding certificates.

B. Material Test Reports: For aggregates.

C. Source quality-control test reports.

D. Qualification Statements: For Installer and fabricator.

1.6 QUALITY ASSURANCE

A. Fabricator Qualifications: A firm that assumes responsibility for engineering architectural precast concrete units to comply with performance requirements. This responsibility includes preparation of Shop Drawings and comprehensive engineering analysis by a qualified professional engineer.

1. Quality-Control Standard: For manufacturing procedures and testing requirements, quality-control recommendations, and dimensional tolerances for types of units required, comply with PCI MNL 117 and PCI MNL 135.

B. Installer Qualifications: A precast concrete erector who has retained a "PCI-Certified Field Auditor" to conduct a field audit of a project in same category as this Project and who can produce an Erectors' Post-Audit Declaration.

C. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code - Steel"; and AWS D1.4, "Structural Welding Code - Reinforcing Steel."

1.7 COORDINATION

A. Furnish loose connection hardware and anchorage items to be embedded in or attached to other construction without delaying the Work. Provide locations, setting diagrams, templates, instructions, and directions, as required, for installation.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver architectural precast concrete units in such quantities and at such times to limit unloading units temporarily on the ground or other rehandling.

B. Support units during shipment on non-staining shock-absorbing material.

C. Store units with adequate dunnage and bracing and protect units to prevent contact with soil, to prevent staining, and to prevent cracking, distortion, warping or other physical damage.

D. Place stored units so identification marks are clearly visible, and units can be inspected.

E. Handle and transport units in a manner that avoids excessive stresses that cause cracking or damage.

F. Lift and support units only at designated points indicated on Shop Drawings.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Design Standards: Comply with ACI 318 and design recommendations of PCI MNL 120 applicable to types of architectural precast concrete units indicated.

B. Structural Performance: Provide architectural precast concrete units and connections capable of withstanding the following design loads within limits and under conditions indicated:

1. Loads: As indicated on Drawings and as required per Building Code.
2. Thermal Movements: Provide for in-plane thermal movements resulting from annual ambient temperature changes of 80 deg F (26 deg C).

2.2 PRECAST ARCHITECTURAL CONCRETE UNITS

A. Provide unit types as indicated on Drawings, including trim units.

B. Source Limitations: Obtain precast architectural concrete units from single fabricator.

2.3 MOLD MATERIALS

A. Molds: Rigid, dimensionally stable, non-absorptive material, warp and buckle free, that provides continuous and true precast concrete surfaces within fabrication tolerances indicated; nonreactive with concrete and suitable for producing required finishes.

B. Form-Release Agent: Commercially produced form-release agent that does not bond with, stain or adversely affect precast concrete surfaces and does not impair subsequent surface or joint treatments of precast concrete.

2.4 REINFORCING MATERIALS

A. Reinforcing Bars: ASTM A 615, Grade 60, deformed.

B. Supports: Suspend reinforcement from back of mold or use bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars in place according to PCI MNL 117.

2.5 CONCRETE MATERIALS

A. Portland Cement: ASTM C 150, Type I or Type III, gray, unless otherwise indicated.

1. For surfaces exposed to view in finished structure, use gray and white cement, of same type, brand, and mill source.

B. Normal-Weight Aggregates: Except as modified by PCI MNL 117, ASTM C 33, with coarse aggregates complying with Class 5S. Stockpile fine and coarse aggregates for each type of exposed finish from a single source (pit or quarry) for Project.

1. Face-Mixture-Coarse Aggregates: Selected, hard, and durable; free of material that reacts with cement or causes staining; to match selected finish sample.

a. Gradation: Uniformly graded.

2. Face-Mixture-Fine Aggregates: Selected, natural or manufactured sand compatible with coarse aggregate; to match approved finish sample.

C. Coloring Admixture: ASTM C 979, synthetic or natural mineral-oxide pigments or colored water-reducing admixtures, temperature stable, and nonfading.

1. Color as selected by Architect and Owner from manufacturer’s full range, to match existing.

D. Water: Potable; free from deleterious material that may affect color stability, setting, or strength of concrete and complying with chemical limits of PCI MNL 117.

E. Air-Entraining Admixture: ASTM C 260, certified by manufacturer to be compatible with other required admixtures.

2.6 MORTAR MATERIALS

A. Provide mortar materials that comply with Section 042613 “Masonry Veneer”.

2.7 ACCESSORIES

A. Precast Accessories: Provide clips, hangers, high-density plastic or steel shims, and other accessories required to install architectural precast concrete units.

2.8 CONCRETE MIXTURES

A. Prepare design mixtures for each type of precast concrete required.

1. Use a single design mixture for units with more than one (1) major face or edge exposed.
2. Where only one (1) face of unit is exposed use either a single design mixture or separate mixtures for face and backup.

B. Design mixtures may be prepared by a qualified independent testing agency or by qualified precast plant personnel at architectural precast concrete fabricator's option.

C. Limit water-soluble chloride ions to maximum percentage by weight of cement permitted by ACI 318 or PCI MNL 117 when tested according to ASTM C 1218.

D. Normal-Weight Concrete Mixtures: Proportion full-depth mixture by either laboratory trial batch or field test data methods according to ACI 211.1, with materials to be used on Project, to provide normal-weight concrete with the following properties:

1. Compressive Strength (Twenty-Eight (28) Days): 5000 psi minimum.
2. Maximum Water-Cementitious Materials Ratio: 0.45.

E. Water Absorption: Six percent (6%) by weight or fourteen percent (14%) by volume, tested according to ASTM C 642, except for boiling requirement.

F. Add air-entraining admixture at manufacturer's prescribed rate to result in concrete at point of placement having an air content complying with PCI MNL 117.

2.9 MORTAR MIXES

A. Comply with requirements in Section 042613 “Masonry Veneer” for mortar mixes.

2.10 MOLD FABRICATION

A. Molds: Accurately construct molds, mortar tight, of sufficient strength to withstand pressures due to concrete-placement operations and temperature changes. Coat contact surfaces of molds with release agent before reinforcement is placed. Avoid contamination of reinforcement by release agent.

B. Maintain molds to provide completed architectural precast concrete units of shapes, lines, and dimensions indicated, within fabrication tolerances specified.

1. Form joints are not permitted on faces exposed to view in the finished work.
2. Edge and Corner Treatment: Uniformly chamfered or as indicated in Drawings.

2.11 FABRICATION

A. Cast-in Anchors, Inserts, Plates, Angles, and Other Anchorage Hardware: Fabricate anchorage hardware with sufficient anchorage and embedment to comply with design requirements. Accurately position for attachment of loose hardware, and secure in place during precasting operations. Locate anchorage hardware where it does not affect position of main reinforcement or concrete placement.

B. Furnish loose hardware items including steel plates, clip angles, seat angles, anchors, dowels, cramps, hangers, and other hardware shapes for securing architectural precast concrete units to supporting and adjacent construction.

C. Reinforcement: Comply with recommendations in PCI MNL 117 for fabricating, placing, and supporting reinforcement.

1. Clean reinforcement of loose rust and mill scale, earth, and other materials that reduce or destroy the bond with concrete.
2. Accurately position, support, and secure reinforcement against displacement during concrete-placement and consolidation operations. Completely conceal support devices to prevent exposure on finished surfaces.
3. Place reinforcing steel to maintain at least ¾-inch minimum concrete cover. Increase cover requirements for reinforcing steel to 1½ inches when units are exposed to corrosive environment or severe exposure conditions. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position while placing concrete. Direct wire tie ends away from finished, exposed concrete surfaces.

D. Reinforce architectural precast concrete units to resist handling, transportation, and erection stresses and specified in-place loads.

E. Comply with requirements in PCI MNL 117 and requirements in this Section for measuring, mixing, transporting, and placing concrete. After concrete batching, no additional water may be added.

F. Place concrete in a continuous operation to prevent cold joints or planes of weakness from forming in precast concrete units.

G. Thoroughly consolidate placed concrete by internal and external vibration without dislocating or damaging reinforcement and built-in items, and minimize pour lines, honeycombing, or entrapped air voids on surfaces. Use equipment and procedures complying with PCI MNL 117.

H. Comply with PCI MNL 117 for hot- and cold-weather concrete placement.

I. Identify pickup points of architectural precast concrete units and orientation in structure with permanent markings, complying with markings indicated on Shop Drawings. Imprint or permanently mark casting date on each architectural precast concrete unit on a surface that does not show in finished structure.

J. Cure concrete, in accordance with PCI MNL 117, by moisture retention without heat or by accelerated heat curing using low-pressure live steam or radiant heat and moisture. Cure units until compressive strength is high enough to ensure that stripping does not have an effect on performance or appearance of final product.

K. Discard and replace architectural precast concrete units that do not comply with requirements, including structural, manufacturing tolerance, and appearance, unless repairs meet requirements in PCI MNL 117 and Architect's approval.

2.12 FABRICATION TOLERANCES

A. Fabricate architectural precast concrete units to shapes, lines, and dimensions indicated so each finished unit complies with PCI MNL 117 product tolerances as well as position tolerances for cast-in items.

2.13 FINISHES

A. Exposed faces shall be free of joint marks, grain, and other obvious defects. Corners, including false joints shall be uniform, straight, and sharp. Finish exposed-face surfaces of architectural precast concrete units to match approved design reference sample and as follows:

1. As-Cast Surface Finish: Provide surfaces to match approved sample for acceptable surface, air voids, sand streaks, and honeycomb.

B. Finish exposed top, bottom, and back surfaces of architectural precast concrete units to match face-surface finish.

C. Finish unexposed surfaces of architectural precast concrete units with as cast finish.

2.14 SOURCE QUALITY CONTROL

A. Quality-Control Testing: Test and inspect precast concrete according to PCI MNL 117 requirements.

B. Strength of precast concrete units is considered deficient if units fail to comply with ACI 318 requirements for concrete strength.

C. Testing: If there is evidence that strength of precast concrete units may be deficient or may not comply with ACI 318 requirements, precaster will employ an independent testing agency to obtain, prepare, and test cores drilled from hardened concrete to determine compressive strength according to ASTM C 42and ACI 318.

1. A minimum of three (3) representative cores shall be taken from units of suspect strength, from locations directed by Architect.
2. Test cores in an air-dry condition.
3. Strength of concrete for each series of three (3) cores is considered satisfactory if average compressive strength is equal to at least eighty-five percent (85%) of 28-day design compressive strength and no single core is less than seventy-five percent (75%) of 28-day design compressive strength.
4. Report test results in writing on same day that tests are performed, with copies to Architect, Contractor, and precast concrete fabricator. Test reports include the following:

a. Project identification name and number.
b. Date when tests were performed.
c. Name of precast concrete fabricator.
d. Name of concrete testing agency.
e. Identification letter, name, and type of precast concrete unit(s) represented by core tests; design compressive strength; type of break; compressive strength at breaks, corrected for length-diameter ratio; and direction of applied load to core in relation to horizontal plane of concrete as placed.

D. Patching: If core test results are satisfactory and precast concrete units comply with requirements, clean and dampen core holes and solidly fill with precast concrete mixture that has no coarse aggregate, and finish to match adjacent precast concrete surfaces.

E. Defective Units: Discard and replace recast architectural concrete units that do not comply with acceptability requirements in PCI MNL 117, including concrete strength, manufacturing tolerances, and color and texture range. Chipped, spalled, or cracked units may be repaired, subject to Architect's approval. Architect reserves the right to reject precast units that do not match approved samples. Replace unacceptable units with precast concrete units that comply with requirements.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 SETTING IN MORTAR

A. Set architectural precast concrete units as indicated on Drawings. Set units accurately in locations indicated, with edges and faces aligned according to established relationships and indicated tolerances.

1. Install anchors, supports, fasteners, and other attachments indicated or necessary to secure units in place.
2. Coordinate installation of units with installation of flashing specified in other Sections.

B. Wet joint surfaces thoroughly before applying mortar or setting in mortar.

C. Set units in full bed of mortar with full head joints unless otherwise indicated.

1. Set units with joints ¼- to 3/8-inch-wide unless otherwise indicated.
2. Build anchors and ties into mortar joints as units are set.
3. Fill dowel holes and anchor slots with mortar.
4. Build concealed flashing into mortar joints as units are set.
5. Keep joints at shelf angles open to receive sealant.

D. Rake out joints for pointing with mortar to depths of not less than ¾-inch. Rake joints to uniform depths with square bottoms and clean sides. Scrub faces of units to remove excess mortar as joints are raked.

E. Point mortar joints by placing and compacting mortar in layers not greater than 3/8-inch. Compact each layer thoroughly and allow it to become thumbprint hard before applying next layer.

F. Tool exposed joints when thumbprint hard. Use a smooth plastic jointer larger than joint thickness.

G. Provide sealant joints at head joints of copings and other horizontal surfaces; at expansion, control, and pressure-relieving joints; and at locations indicated.

1. Keep joints free of mortar and other rigid materials.
2. Build in compressible foam-plastic joint fillers where indicated.
3. Form joint of width indicated, but not less than 3/8-inch.
4. Prime precast surfaces to receive sealant and install compressible backer rod in joints before applying sealant unless otherwise indicated.
5. Prepare and apply sealant of type and at locations indicated to comply with applicable requirements in Section 079200 "Joint Sealants."

3.3 MECHANICALLY INSTALLING

A. Install clips, hangers, bearing pads, and other accessories required for connecting architectural precast concrete units to supporting members and backup materials.

B. Erect architectural precast concrete level, plumb, and square within specified allowable tolerances. Provide temporary supports and bracing as required to maintain position, stability, and alignment of units until permanent connections are completed.

1. Install temporary steel or plastic spacing shims as precast concrete units are being erected. Tack weld steel shims to each other to prevent shims from separating.
2. Maintain horizontal and vertical joint alignment and uniform joint width as erection progresses.
3. Remove projecting lifting devices and grout fill voids within recessed lifting devices flush with surface of adjacent precast surfaces when recess is exposed.
4. Unless otherwise indicated, maintain uniform joint widths of ¾-inch.

C. Connect architectural precast concrete units in position by bolting, welding, grouting, or as otherwise indicated on Shop Drawings. Remove temporary shims, wedges, and spacers as soon as practical after connecting and grouting are completed.

3.4 ERECTION TOLERANCES

A. Erect architectural precast concrete units level, plumb, square, and in alignment without exceeding the noncumulative erection tolerances of PCI MNL 117, Appendix I.

3.5 REPAIR

A. Repair architectural precast concrete units if permitted by Architect. Architect reserves the right to reject repaired units that do not comply with requirements.

B. Mix patching materials and repair units so cured patches blend with color, texture, and uniformity of adjacent exposed surfaces and show no apparent line of demarcation between original and repaired work, when viewed in typical daylight illumination from a distance of 20 feet.

C. Remove and replace damaged architectural precast concrete units when repairs do not comply with requirements.

3.6 CLEANING

A. Clean surfaces of precast concrete units exposed to view.

B. Clean mortar, plaster, fireproofing, weld slag, and other deleterious material from concrete surfaces and adjacent materials immediately.

C. Clean exposed surfaces of precast concrete units after erection and completion of joint treatment to remove weld marks, other markings, dirt, and stains.

1. Perform cleaning procedures, if necessary, in accordance with precast concrete fabricator's recommendations. Protect other work from staining or damage due to cleaning operations.
2. Do not use cleaning materials or processes that could change the appearance of exposed concrete finishes or damage adjacent materials.

END OF SECTION 034500

SECTION 034800 – PRECAST CONCRETE

PART 1 - GENERAL

1.1 REFERENCES:

A. Prestressed Concrete Institute MNL 117 "Manual for Quality Control for Plants and Production of Architectural Precast Concrete Products" - 3rd Edition, primarily Appendix J.

B. Prestressed Concrete Institute's "Architectural Precast Concrete Design Manual, 2nd Edition".

C. ASTM standards as stated herein.

1.2 SUMMARY

A. This is a general specification for precast architectural concrete intended for informational purposes only. Refer to structural engineer specifications and drawings for further information. All precast elements to be reviewed by project structural engineer and project landscape architect prior to installation. The specification refers to the following site elements:

1. Precast Concrete Stairs
2. Precast Concrete Curb
3. Precast Concrete Coping on Seatwall
4. Joint sealant

B. The Fabricator shall have a minimum of 5 years successful experience in fabrication of architectural precast concrete units, similar to units required for this project. Fabricator must be an APA (Architectural Precast Association) Certified Plant or a PCI (Prestressed/Precast Concrete Institute) certified Plant for category AT or A1 (Architectural Precast). Fabricator must adhere to procedures that are applicable to the manufacturing of Architectural Precast Concrete trim pieces as outlined in Appendix J of PCI MNL-117 (3rd Edition) and the PCI Design Manual (2nd Edition).

1. Fabricator requirements:

a. Proof of APA Plant Certification or proof of PCI Certification for category AT or A1.
b. Brochures or photos showing integrally colored precast from at least three previous projects that are of acceptable appearance in the opinion of the Architect. Names and locations of projects must be provided.
c. At least three test reports less than 12 months old showing that the 5000 psi compressive cylinder strength and absorption requirements (less than 5%) called for in this specification can be met. Tests must have been performed by a professional testing laboratory.
d. List of five successfully completed precast jobs at least five years old that include project name, location, General Contractor, and Architect.

2. Under no circumstances shall items labeled as precast concrete be cast in the field.
3. The setting contractor shall unload, store, protect, and install as covered by this Specification and shall provide and install all anchors and accessories for same. The setting contractor shall have a minimum of 3 years successful experience in erection of architectural precast concrete units similar to units required for this project.

1.3 HIGH PERFORMANCE BUILDING GENERAL REQUIREMENTS

A. Implement practices and procedures to meet the project's environmental goals, which include complying with Connecticut Standard Guidelines Compliance Manual for High Performance Buildings, September 2011 with additional mandatory building project requirements for schools. Specific project goals which may impact this and the other sections of this specification include: use of recycled-content materials; use of locally-manufactured materials; use of low-emitting materials; use of certified wood products; construction waste recycling; and the implementation of a construction indoor air quality management plan. Ensure that the requirements related to these goals, as defined in this Section and other Sections of the contract documents, are implemented to the fullest extent. Substitutions or other changes to the work shall not be allowed if such changes substantially compromise the stated High Performance Building criteria.

B. Comply with Connecticut Standard Guidelines Compliance Manual for High Performance Buildings, September 2011 with additional mandatory building project requirements for schools and the Department of Administrative Services / Office of School Construction Grants & Review High Performance School Construction Bulletin, June 2017.

1.4 SUBMITTALS

A. Fabricator information as listed above.

B. Shop Drawings: Detail fabrication and installation of architectural precast concrete units. Indicate locations, plans, elevations, dimensions, shapes, and cross sections of each unit type. Indicate joints, reveals, extent and location of each surface finish, and location of skateboard deterrents. All shop drawings are to be signed and sealed by a MA-licensed structural engineer.

1. Indicate finish surface.
2. Indicate units to receive furnishing.
3. Indicate locations, tolerances, and details of anchorage devices to be embedded in or attached to structure or other construction.
4. Include plans and elevations showing unit location and sequence of erection for special conditions. Indicate location of each architectural precast concrete unit on site.
5. Indicate relationship of architectural precast concrete units to adjacent grades, materials and elements.
6. Indicate locations and details of footings, also indicate all footings and footing types related to precast in plan. Include locations and details of anchors, and joint widths.
7. Design Modifications: If design modifications are proposed to meet performance requirements and field conditions, submit design calculations and Shop Drawings. Do not adversely affect the appearance, durability, or strength of units when modifying details or materials and maintain the general design concept.
8. Erection drawings indicating locations shown in relationship to the project baselines as indicated in Contract Documents, sequence of erection, field coordinated dimensions, field verified dimensions. All field measurements shall be shown on drawings annotating special elements.
9. Installation drawings for every type and at major interface areas indicating – all accessories including anchors, plates, grout, leveling devices, spacers, and shims. Drawings to show relationship of precast units to adjacent material and elements.

C. Color & Samples

1. Precast material for seat walls and tiered seating:

a. Minimum size - 6" x 6" x 2" to illustrate the quality, color, and surface finish texture.
b. Color: Light, based upon review of physical samples (or approved equal)

c. Texture: Smooth, dense, fine-grained texture achieved by acid etching to thoroughly remove all surface cement paste.
d. Refer to drawings for acceptable manufacturers.

2. Grout, Joint sealer and expansion joints Samples for Initial Selection: Color charts consisting of actual sections of grout showing manufacturer's full range of colors.

3. Grout, Joint sealer and expansion joints.
4. Samples for Verification: Showing color and texture of joint treatment.
5. Water repellant on precast concrete

D. Mockups: After sample approval but before production of architectural precast concrete units, construct full-sized mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Build mockups of each precast element indicated on Drawings. Mockups to include walls and complete with anchors, connections, flashings, sealer finishes and joint filler.
2. Build mockup of each curb type as indicated on Drawings. Mockups to include each curb color, texture, connections, sealer finishes and joint filler.
3. Approved mockups may become part of the completed Work if undamaged at time of Substantial Completion.
4. Approval of mockups does not constitute approval of deviations from the Contract Documents unless such deviations are specifically approved by Landscape Architect in writing.
5. Obtain Landscape Architect approval of mockup before starting fabrication.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer and fabricator.

B. Welding certificates.

C. Material Certificates: For the following items, signed by manufacturers:

1. Cementitious materials.
2. Reinforcing materials
3. Admixtures

D. Spacers and all inserts

E. Caulking and Silicon Sealer

F. Material Test Reports:

1. For aggregates.
2. Concrete mix test report, obtain approval from structural engineer before fabrication.

G. Source quality-control test reports.

H. Field quality-control test and special inspection reports.

I. Product data: For each type of product indicated. Retain quality control records and certificates of compliance for 5 years or period of warranty, whichever is greater.

1.6 DELIVERY, STORAGE, AND HANDLING.

A. Deliver precast concrete units to project site in such quantities and at such times to assure continuity of installation. Store units at project site to prevent cracking, distortion, warping,

staining, or other physical damage and so that markings are visible. Lift and support units only at designated lifting or supporting points as shown on final shop drawings.

PART 2 - PRODUCTS

2.1 FORMWORK

A. Provide forms and, where required, form-facing materials of metal, plastic, wood, or other acceptable material that is nonreactive with concrete and will produce required finish surfaces per the approved sample. Maintain form work to provide completed precast concrete trim units within specified fabrication tolerances.

2.2 CONCRETE MATERIALS

A. Portland Cement: ASTM C 150, Type I or Type III.

B. Coarse Aggregate: ASTM C 33, except for gradation.

C. Fine Aggregate: ASTM C 33, except for gradation

D. Pigments: ASTM C 979; Inorganic, nonfading, resistant to lime and other alkalis. Pigments not to exceed 10% of the cement weight.

E. Water: Drinkable, free from foreign materials in amounts harmful to concrete or cast in steel.

F. Air-Entraining Admixture: ASTM C 260.

G. Water-Reducing, Retarding, or Accelerating Admixtures: ASTM C 494, type as selected by Fabricator and containing not more than 0.1 percent chloride ions.

2.3 FABRICATION

A. Refer to fabricator for recommendations.

2.4 JOINT SEALER

A. Provide joint sealants, backing materials, primers, bond breakers, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint sealant manufacturer based on testing and field experience.

B. Colors and texture of Exposed Joint Sealants: As selected by Landscape Architect from manufacturer's full range of standard, special and custom colors for this characteristic.

C. Joint sealer for horizontal applications: Subject to compliance with ASTM C920, Type M, Grade P, Class 25 Use T, provide one of the following or approved equal:

1. Sikaflex-2CNS: Sika Corporation.
2. Sonolastic SL2 (slope grade); Sonneborn Building Products Div., ChemRex, Inc.
3. Vulkem 245/255: Tremco Inc.
4. Or approved equal.

D. Joint sealer for vertical applications: Subject to compliance with ASTM C920, Type M, Grade NS, Class 25 Use NT, provide one of the following or approved equal:

1. Sikaflex-2CNSTG: Sika Corporation.
2. Sonolastic NP2; Sonneborn Building Products Div., ChemRex, Inc.
3. Vulkem 227: Tremco Inc.
4. Or approved equal.

E. Joint sealer backer material: Provide joint-sealant backer materials that are closed cell, non-absorbent and non-staining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by joint sealant manufacturer based on field experience and laboratory testing.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Do not install any precast units that have any defects that exceed the acceptable PCI MNL-117 tolerances for dimensions and color if installation would result in unsatisfactory performance or appearance in the opinion of the Architect.

B. Install precast concrete members plumb, level, and in alignment in accordance with PCI MNL-117 erection tolerances and the contract documents. Provide temporary supports and bracing as required to maintain position, stability, and alignment as members are being permanently connected.

C. Protect the precast units from discoloration and staining when washing down the surrounding masonry by covering the precast units with plastic sheeting and/or by thoroughly soaking them with clear water to prevent dirty washdown water from being absorbed into them. If dirty washdown water gets on the precast, hose it off immediately with clear water.

D. Patching: The repair of chipped or damaged precast shall be done with materials and instructions furnished by the Fabricator. The precast shall show no obvious repairs or imperfections other than minimal color variations when viewed with the unaided eye under good typical day lighting at a 20 foot distance.

E. Cleaning: Before pointing and/or caulking, the face of all precast shall be scrubbed with a fiber brush, using mild detergent and water and shall then be thoroughly rinsed with clean running water. Any mortar on the face of the precast shall be removed. No acids or prepared cleaners shall be used without the approval of the precast Fabricator.

F. Sealing: Only exterior stair treads and other units that may come in contact with salt or other deicing compounds must be sealed with a penetrating sealer approved by the Architect. The sealer is to be applied in accordance with the sealer manufacturer's instructions after the units have been installed, cured, patched, and cleaned. Do not apply sealer before installation since it may prevent mortar, joint sealant and patches from adhering.

3.2 PERFORMANCE REQUIREMENTS

A. Applicable standards for inspection and quality control shall be Appendix J (Architectural Trim Requirements) in PCI MNL - 117 "Manual for Quality Control for Plants and Production of Architectural Precast Concrete Products" (3rd Edition) and PCI's "Architectural Precast Concrete Design Manual, 2nd Edition".

B. The Architectural Precast Concrete units shall show no obvious repairs or imperfections other than minimal color variations when viewed with the unaided eye at a 20-foot distance in good typical daylight illumination.

C. Any unacceptable precast units that cannot be repaired to the Architect's satisfaction in accordance with the aforementioned criteria are deemed unacceptable and are to be replaced by the Contractor.

END OF SECTION 034800

SECTION 035416 - HYDRAULIC CEMENT UNDERLAYMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes polymer-modified, self-leveling, hydraulic cement underlayment.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: Include plans indicating substrates, locations, and average depths of underlayment based on survey of substrate conditions.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Installer who is approved by manufacturer for application of underlayment products required for this Project.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store materials to comply with manufacturer's written instructions to prevent deterioration from moisture or other detrimental effects.

1.7 FIELD CONDITIONS

A. Environmental Limitations: Comply with manufacturer's written instructions for substrate temperature, ventilation, ambient temperature and humidity, and other conditions affecting underlayment performance.

1. Place hydraulic cement underlayments only when ambient temperature and temperature of substrates are between 50 and 80 deg F.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Resistance Ratings: Comply with ASTM E 119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Indicate design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency.

2.2 HYDRAULIC CEMENT UNDERLAYMENTS

A. Hydraulic Cement Underlayment: Polymer-modified, self-leveling, hydraulic cement product that can be applied in minimum uniform thickness of ¼-inch and that can be feathered at edges to match adjacent floor elevations.

1. Basis-of-Design:

a. Ardex Americas; **Ardex K 520**

2. Acceptable Manufacturers: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Euclid Chemical Company (The)
b. Koster Corporation
c. Mapei Corporation
d. Maxxon Corporation
e. USG Corporation
f. Substitutions: Under provisions of Section 012500 “Substitution Procedures”.

3. Cement Binder: ASTM C 150, Portland cement, or hydraulic or blended hydraulic cement as defined by ASTM C 219.
4. Compressive Strength: Not less than 6000 psi at twenty-eight (28) days when tested according to ASTM C 109.

B. Aggregate: Well-graded, washed gravel, 1/8- to ¼-inch; or coarse sand as recommended by underlayment manufacturer.

1. Provide aggregate when recommended in writing by underlayment manufacturer for underlayment thickness required.

C. Water: Potable and at a temperature of not more than 70 deg F.

D. Primer: Product of underlayment manufacturer recommended in writing for substrate, conditions, and application indicated.

E. Surface Sealer: Designed to reduce porosity as recommended by manufacturer for type of floor covering to be applied to underlayment.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for conditions affecting performance of the Work.

B. Proceed with application only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. General: Prepare and clean substrate according to manufacturer's written instructions.

1. Treat nonmoving substrate cracks according to manufacturer's written instructions to prevent cracks from telegraphing (reflecting) through underlayment.
2. Fill substrate voids to prevent underlayment from leaking.

B. Concrete Substrates: Mechanically remove, according to manufacturer's written instructions, laitance, glaze, efflorescence, curing compounds, form-release agents, dust, dirt, grease, oil, and other contaminants that might impair underlayment bond.

1. Moisture Testing: Perform anhydrous calcium chloride test, ASTM F 1869. Proceed with installation only after substrates do not exceed a maximum moisture-vapor-emission rate of 3 lb. of water/1000 sq. ft. in 24 hours.

C. Adhesion Tests: After substrate preparation, test substrate for adhesion with underlayment according to manufacturer's written instructions.

3.3 APPLICATION

A. General: Mix and apply underlayment components according to manufacturer's written instructions.

1. Close areas to traffic during underlayment application and for time period after application recommended in writing by manufacturer.
2. Coordinate application of components to provide optimum adhesion to substrate and between coats.
3. At substrate expansion, isolation, and other moving joints, allow joint of same width to continue through underlayment.

B. Apply primer over prepared substrate at manufacturer's recommended spreading rate.

C. Apply underlayment to produce uniform, level surface.

1. Apply a final layer without aggregate to product surface.
2. Feather edges to match adjacent floor elevations.

D. Cure underlayment according to manufacturer's written instructions. Prevent contamination during application and curing processes.

E. Do not install floor coverings over underlayment until after time period recommended in writing by underlayment manufacturer.

F. Apply surface sealer at rate recommended by manufacturer.

G. Remove and replace underlayment areas that evidence lack of bond with substrate, including areas that emit a "hollow" sound when tapped.

3.4 PROTECTION

A. Protect underlayment from concentrated and rolling loads for remainder of construction period.

END OF SECTION 035416

SECTION 040120.64 - MAINTENANCE OF UNIT MASONRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Repairing unit masonry, including replacing units.
2. Repointing joints with mortar.

B. Related Section:

1. Section 012100 “Allowances” for work of this Section included in allowances.
2. Section 012200 “Unit Prices” for work of this Section included in unit prices.

1.3 PRE-INSTALLATION MEETINGS

A. Pre-installation Conference: Conduct conference at Project site.

1. Review methods and procedures related to repointing brick masonry including, but not limited to, the following:

a. Materials, material application, sequencing, tolerances, and required clearances.
b. Coordination with building occupants.

1.4 SEQUENCING AND SCHEDULING

A. Work Sequence: Perform brick masonry repointing work in the following sequence, which includes work specified in this and other Sections:

1. Remove plant growth.
2. Inspect masonry for open mortar joints and permanently or temporarily point them before cleaning to prevent the intrusion of water and other cleaning materials into the wall.
3. Clean masonry.
4. Rake out mortar from joints surrounding masonry to be replaced and from joints adjacent to masonry repairs along joints.
5. Repair masonry, including replacing existing masonry with new masonry materials.
6. Rake out mortar from joints to be repointed.
7. Point mortar and sealant joints.
8. After repointing has been completed and cured, perform a final cleaning to remove residues from this work.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
2. Include recommendations for product application and use. Include test data substantiating that products comply with requirements.

B. Samples: For the following:

1. Pointing Mortar: Submit sets of mortar for pointing in the form of sample mortar strips, 6 inches long by ¼-inch-wide, set in aluminum or plastic channels.

   a. Have each set contain a close color range of at least three (3) Samples of different mixes of colored sands and cements that produce a mortar matching existing, cleaned mortar when cured and dry.
   b. Submit with precise measurements on ingredients, proportions, gradations, and source of colored sands from which each Sample was made.

2. Sand Type Used for Pointing Mortar: Minimum 8 oz. of each in plastic screw-top jars.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver packaged materials to Project site in manufacturer's original and unopened containers, labeled with manufacturer's name and type of products.

B. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.

C. Store hydrated lime in manufacturer's original and unopened containers. Discard lime if containers have been damaged or have been opened for more than two (2) days.

D. Store sand where grading and other required characteristics can be maintained and contamination avoided.

1.7 FIELD CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit repointing work to be performed according to product manufacturers' written instructions and specified requirements.

B. Temperature Limits, General: Repoint mortar joints only when air temperature is between 40 and 90 deg F (4 and 32 deg C) and is predicted to remain so for at least seven (7) days after completion of the Work unless otherwise indicated.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

A. Source Limitations: Obtain each type of material for repointing brick masonry (cement, sand, etc.) from single source with resources to provide materials of consistent quality in appearance and physical properties.

2.2 MASONRY MATERIALS

A. Brick: Match in-kind, as approved by Architect and Owner.

2.3 MORTAR MATERIALS

A. Portland Cement: ASTM C 150, Type I or Type II, except Type III may be used for cold-weather construction; white or gray, or both where required for color matching of mortar.

B. Hydrated Lime: ASTM C 207, Type S.

C. Mortar Sand: ASTM C 144.

1. Match size, texture, and gradation of existing mortar sand as closely as possible. Blend several sands if necessary, to achieve suitable match.
2. Color: Natural sand or ground marble, granite, or other sound stone of color necessary to produce required mortar color.

D. Mortar Pigments: ASTM C 979, compounded for use in mortar mixes, and having a record of satisfactory performance in masonry mortars.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Davis Colors; **True Tone Mortar Colors**
b. Lanxess Corporation; **Bayferrox Iron Oxide Pigments**
c. Solomon Colors, Inc.; **SGS Mortar Colors**
d. Substitutions: Under provisions of Section 012500 “Substitution Procedures”.

E. Water: Potable.

2.4 ACCESSORY MATERIALS

A. Masking Tape: Non-staining, non-absorbent material; compatible with mortar, joint primers, sealants, and surfaces adjacent to joints; and that easily comes off entirely, including adhesive.

B. Other Products: Select materials and methods of use based on the following:

1. Previous effectiveness in performing the work involved.
2. Minimal possibility of damaging exposed surfaces.
3. Consistency of each application.
4. Uniformity of the resulting overall appearance.
5. Do not use products or tools that could leave residue on surfaces.

2.5 MORTAR MIXES

A. Measurement and Mixing: Measure cementitious materials and sand in a dry condition by volume or equivalent weight. Do not measure by shovel; use known measure. Mix materials in a clean, mechanical batch mixer.

1. Mixing Pointing Mortar: Thoroughly mix cementitious materials and sand together before adding any water. Then mix again, adding only enough water to produce a damp, unworkable mix that retains its form when pressed into a ball. Maintain mortar in this dampened condition for 15 to 30 minutes. Add remaining water in small portions until mortar reaches desired consistency. Use mortar within 1 hour of final mixing; do not retemper or use partially hardened material.

B. Colored Mortar: Produce mortar of color required by using specified ingredients. Do not alter specified proportions without Architect's approval.

1. Mortar Pigments: Where mortar pigments are indicated, do not add pigment exceeding ten percent (10%) by weight of the cementitious or binder materials, except for carbon black which is limited to two percent (2%), unless otherwise demonstrated by a satisfactory history of performance.

C. Do not use admixtures in mortar unless otherwise indicated.

D. Mixes: Mix mortar materials in the following proportions:

1. Pointing Mortar by Property: ASTM C 270, Property Specification, Type N unless otherwise indicated; with cementitious material limited to Portland cement and lime. Add mortar pigments to produce mortar colors required.

PART 3 - EXECUTION

3.1 PROTECTION

A. Prevent mortar from staining face of surrounding masonry and other surfaces.

1. Cover sills, ledges, and other projecting items to protect them from mortar droppings.
2. Keep wall area wet below pointing work to discourage mortar from adhering.
3. Immediately remove mortar splatters in contact with exposed masonry and other surfaces.

3.2 BRICK REMOVAL AND REPLACEMENT

A. At locations indicated, remove bricks that are damaged, spalled, or deteriorated. Carefully demolish or remove entire units from joint to joint, without damaging surrounding masonry, in a manner that permits replacement with full-size units.

1. When removing single bricks, remove material from center of brick and work toward outside edges.

B. Support and protect remaining masonry that surrounds removal area. Maintain flashing, reinforcement, lintels, and adjoining construction in an undamaged condition.

C. Notify Architect of unforeseen detrimental conditions including voids, cracks, bulges, and loose units in existing masonry backup, rotted wood, rusted metal, and other deteriorated items.

D. Remove in an undamaged condition as many whole bricks as possible.

1. Remove mortar, loose particles, and soil from brick by cleaning with hand chisels, brushes, and water.
2. Remove sealants by cutting close to brick with utility knife and cleaning with solvents.
3. Store brick for reuse. Store off ground, on skids, and protected from weather.
4. Deliver cleaned brick not required for reuse to Owner unless otherwise indicated.

E. Clean bricks surrounding removal areas by removing mortar, dust, and loose particles in preparation for replacement.

F. Replace removed damaged brick with new brick matching existing brick, including size. Do not use broken units unless they can be cut to usable size.

G. Install replacement brick into bonding and coursing pattern of existing brick. If cutting is required, use a motor-driven saw designed to cut masonry with clean, sharp, unchipped edges.

1. Maintain joint width for replacement units to match existing joints.
2. Use setting buttons or shims to set units accurately spaced with uniform joints.

H. Lay replacement brick with completely filled bed, head, and collar joints. Butter ends with sufficient mortar to fill head joints and shove into place. Wet both replacement and surrounding bricks that have ASTM C 67 initial rates of absorption (suction) of more than 30 g/30 sq. in. per min. Use wetting methods that ensure that units are nearly saturated but surface is dry when laid.

1. Tool exposed mortar joints in repaired areas to match joints of surrounding existing brickwork.
2. When mortar is sufficiently hard to support units, remove shims and other devices interfering with pointing of joints.

3.3 MASONRY REPOINTING, GENERAL

A. Appearance Standard: Repointed surfaces are to have a uniform appearance as viewed from 20 feet away by Architect.

3.4 REPOINTING MASONRY

A. Rake out and repoint joints to the following extent:

1. Joints at locations of the following defects:

a. Holes and missing mortar.
b. Cracks that can be penetrated ¼-inch or more by a knife blade 0.027-inch-thick.
c. Cracks 1/8-inch or more in width and of any depth.
d. Hollow-sounding joints when tapped by metal object.
e. Eroded surfaces ¼-inch or more deep.
f. Deterioration to point that mortar can be easily removed by hand, without tools.
g. Joints filled with substances other than mortar.

B. Do not rake out and repoint joints where not required.

C. Rake out joints as follows:

1. Remove mortar from joints to depth of joint width plus 1/8-inch, but not less than ½-inch or not less than that required to expose sound, unweathered mortar. Do not remove unsound mortar more than 2 inches deep; consult Architect for direction.
2. Remove mortar from masonry surfaces within raked-out joints to provide reveals with square backs and to expose masonry for contact with pointing mortar. Brush, vacuum, or flush joints to remove dirt and loose debris.
3. Do not spall edges of masonry units or widen joints. Replace or patch damaged masonry units as directed by Architect.

a. Cut out mortar by hand with chisel and resilient mallet. Do not use power-operated grinders without Architect's written approval.

D. Notify Architect of unforeseen detrimental conditions including voids in mortar joints, cracks, loose masonry units, rotted wood, rusted metal, and other deteriorated items.

E. Pointing with Mortar:

1. Rinse joint surfaces with water to remove dust and mortar particles. Time rinsing application so, at time of pointing, joint surfaces are damp but free of standing water. If rinse water dries, dampen joint surfaces before pointing.
2. Apply pointing mortar first to areas where existing mortar was removed to depths greater than surrounding areas. Apply in layers not greater than 3/8-inch until a uniform depth is formed. Fully compact each layer and allow it to become thumbprint hard before applying next layer.
3. After deep areas have been filled to same depth as remaining joints, point joints by placing mortar in layers not greater than 3/8-inch. Fully compact each layer and allow to become thumbprint hard before applying next layer. Where existing masonry units have worn or rounded edges, slightly recess finished mortar surface below face of masonry to avoid widened joint faces. Take care not to spread mortar beyond joint edges onto exposed masonry surfaces or to featheredge the mortar.
4. When mortar is thumbprint hard, tool joints to match original appearance of joints. Remove excess mortar from edge of joint by brushing.
5. Cure mortar by maintaining in thoroughly damp condition for at least 72 consecutive hours, including weekends and holidays.
6. Hairline cracking within mortar or mortar separation at edge of a joint is unacceptable. Completely remove such mortar and repoint.

3.5 FINAL CLEANING

A. Clean adjacent non-masonry surfaces. Use detergent and soft brushes or cloths.

B. Clean mortar and debris from roof; remove debris from gutters and downspouts. Rinse off roof and flush gutters and downspouts.

C. Remove masking materials, leaving no residues that could trap dirt.

END OF SECTION 040120.64

SECTION 040140.62 - STONE REPOINTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Repointing joints with mortar.

1.3 DEFINITIONS

A. Low-Pressure Spray: 100 to 400 psi; 4 to 6 gpm.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.5 SEQUENCING AND SCHEDULING

A. Order sand and Portland cement for pointing mortar immediately after approval of Samples or mockups. Take delivery of and store at Project site enough quantity to complete Project.

B. Work Sequence: Perform stone repointing work in the following sequence, which includes work specified in this and other Sections:

1. Remove plant growth.
2. Inspect masonry for open mortar joints and permanently or temporarily point them before cleaning to prevent the intrusion of water and other cleaning materials into the wall.
3. Clean stone.
4. Rake out mortar from joints surrounding stone to be replaced and from joints adjacent to stone repairs along joints.
5. Rake out mortar from joints to be repointed.
6. Point mortar joints.
7. After repairs and repointing have been completed and cured, perform a final cleaning to remove residues from this work.

1.6 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
2. Include recommendations for product application and use.
3. Include test data substantiating that products comply with requirements.

B. Shop Drawings:

1. Include plans, elevations, sections, and locations of repointing work on the structure.
2. Show provisions for expansion joints or other sealant joints.

C. Samples: For the following:

1. Pointing Mortar: Submit sets of mortar for pointing in the form of sample mortar strips, 6 inches long by ½-inch-wide, set in aluminum or plastic channels.

a. Have each set contain a close color range of at least three (3) Samples of different mixes of colored sands and cements that produce a mortar matching the existing, cleaned mortar when cured and dry.
b. Submit with precise measurements on ingredients, proportions, gradations, and source of colored sands from which each Sample was made.

2. Sand Type Used for Pointing Mortar: Minimum 8 oz. of each in plastic screw-top jars.
3. Sealant materials.
4. Include similar Samples of accessories involving color selection.

1.7 INFORMATIONAL SUBMITTALS

A. Qualification Data: For stone repointing specialist including field supervisors and workers and testing service.

1.8 QUALITY ASSURANCE

A. Stone Repointing Specialist Qualifications: Engage an experienced stone repointing firm to perform work of this Section. Firm shall have completed work similar in material, design, and extent to that indicated for this Project with a record of successful in-service performance. Experience in only installing standard unit masonry or new stone masonry is insufficient experience for stone repointing work.

1. Field Supervision: Stone repointing specialist firms shall maintain experienced full-time supervisors on Project site during times that stone repointing work is in progress.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Deliver packaged materials to Project site in manufacturer's original and unopened containers, labeled with manufacturer's name and type of products.

B. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.

C. Store hydrated lime in manufacturer's original and unopened containers. Discard lime if containers have been damaged or have been opened for more than two (2) days.

D. Store sand where grading and other required characteristics can be maintained and contamination avoided.

1.10 FIELD CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit repointing work to be performed according to product manufacturers' written instructions and specified requirements.

B. Temperature Limits: Repoint mortar joints only when air temperature is between 40 and 90 deg F (4 and 32 deg C) and is predicted to remain so for at least seven (7) days after completion of the Work unless otherwise indicated.

C. Hot-Weather Requirements: Protect mortar-joint pointing when temperature and humidity conditions produce excessive evaporation of water from mortar materials. Provide artificial shade and wind breaks, and use cooled materials as required to minimize evaporation. Do not apply mortar to substrates with temperatures of 90 deg F (32 deg C) and above unless otherwise indicated.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Source Limitations: Obtain each type of material for stone repointing (cement, sand, etc.) from single source with resources to provide materials of consistent quality in appearance and physical properties.

2.2 MORTAR MATERIALS

A. Portland Cement: ASTM C150, Type I or Type II, except Type III may be used for cold-weather construction; white or gray, or both where required for color matching of mortar.

1. Provide cement containing not more than 0.60 percent total alkali when tested according to ASTM C114.

B. Hydrated Lime: ASTM C207, Type S.

C. Mortar Sand: ASTM C144.

1. Match size, texture, and gradation of existing mortar sand as closely as possible. Blend several sands if necessary to achieve suitable match.
2. Color: Natural sand or ground marble, granite, or other sound stone of color necessary to produce required mortar color.

D. Mortar Pigments: ASTM C 979, compounded for use in mortar mixes, and having a record of satisfactory performance in stone mortars.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Davis Colors; **True Tone Mortar Colors**
b. Lanxess Corporation; **Bayferrox Iron Oxide Pigments**
c. Solomon Colors, Inc.; **SGS Mortar Colors**
d. Substitutions: Under provisions of Section 012500 “Substitution Procedures”.

E. Water: Potable.

2.3 ACCESSORY MATERIALS

A. Masking Tape: Non-staining, non-absorbent material; compatible with mortar, joint primers, sealants, and surfaces adjacent to joints; and that easily comes off entirely, including adhesive.

B. Other Products: Select materials and methods of use based on the following:

1. Previous effectiveness in performing the work involved.
2. Minimal possibility of damaging exposed surfaces.
3. Consistency of each application.
4. Uniformity of the resulting overall appearance.
5. Do not use products or tools that could leave residue on surfaces.

2.4 MORTAR MIXES

A. Measurement and Mixing: Measure cementitious materials and sand in a dry condition by volume or equivalent weight. Do not measure by shovel; use known measure. Mix materials in a clean, mechanical batch mixer.

1. Mixing Pointing Mortar: Thoroughly mix cementitious materials and sand together before adding any water. Then mix again, adding only enough water to produce a damp, unworkable mix that retains its form when pressed into a ball. Maintain mortar in this dampened condition for 15 to 30 minutes. Add remaining water in small portions until mortar reaches desired consistency. Use mortar within one hour of final mixing; do not retemper or use partially hardened material.

B. Colored Mortar: Produce mortar of color required by using specified ingredients. Do not alter specified proportions without Architect's approval.

1. Mortar Pigments: Where mortar pigments are indicated, do not add pigment exceeding ten percent (10%) by weight of the cementitious or binder materials, except for carbon black which is limited to two percent (2%), unless otherwise demonstrated by a satisfactory history of performance.

C. Do not use admixtures in mortar unless otherwise indicated.

D. Mixes: Mix mortar materials in the following proportions:

1. Pointing Mortar by Property: ASTM C 270, Property Specification, Type N unless otherwise indicated; with cementitious material limited to Portland cement and lime. Add mortar pigments to produce mortar colors required.

PART 3 - EXECUTION

3.1 PROTECTION

A. Prevent mortar from staining face of surrounding stone and other surfaces.

1. Cover sills, ledges, and other projecting items to protect them from mortar droppings.

2. Keep wall area wet below pointing work to discourage mortar from adhering.
3. Immediately remove mortar splatters in contact with exposed stone and other surfaces.

3.2 STONE REPOINTING, GENERAL

A. Appearance Standard: Repointed surfaces are to have a uniform appearance as viewed from 20 feet away by Architect.

3.3 REPOINTING

A. Rake out and repoint joints to the following extent:

1. All joints in areas indicated.

B. Do not rake out and repoint joints where not required.

C. Rake out joints as follows:

1. Remove mortar from joints to depth of joint width plus 1/8-inch but not less than ½-inch and not less than that required to expose sound, unweathered mortar. Do not remove unsound mortar more than 2 inches deep; consult Architect for direction.
2. Remove mortar from stone surfaces within raked-out joints to provide reveals with square backs and to expose stone for contact with pointing mortar. Brush, vacuum, or flush joints to remove dirt and loose debris.
3. Do not spall edges of stone units or widen joints. Replace or patch damaged stone units as directed by Architect.

D. Notify Architect of unforeseen detrimental conditions including voids in mortar joints, cracks, loose stone, rotted wood, rusted metal, and other deteriorated items.

E. Pointing with Mortar:

1. Rinse joint surfaces with water to remove dust and mortar particles. Time rinsing application so, at time of pointing, joint surfaces are damp but free of standing water. If rinse water dries, dampen joint surfaces before pointing.
2. Apply pointing mortar first to areas where existing mortar was removed to depths greater than surrounding areas. Apply in layers not greater than 3/8-inch until a uniform depth is formed. Fully compact each layer, and allow it to become thumbprint hard before applying next layer.
3. After deep areas have been filled to same depth as remaining joints, point joints by placing mortar in layers not greater than 3/8-inch. Fully compact each layer and allow to become thumbprint hard before applying next layer. Where existing stone has worn or rounded edges, slightly recess finished mortar surface below face of stone to avoid widened joint faces. Take care not to spread mortar beyond joint edges onto exposed stone surfaces or to featheredge the mortar.
4. When mortar is thumbprint hard, tool joints to match original appearance of joints. Remove excess mortar from edge of joint by brushing.
5. Cure mortar by maintaining in thoroughly damp condition for at least 72 consecutive hours, including weekends and holidays.
6. Hairline cracking within mortar or mortar separation at edge of a joint is unacceptable. Completely remove such mortar and repoint.

F. Where repointing work precedes cleaning of existing stone, allow mortar to harden at least thirty (30) days before beginning cleaning work.

3.4 FINAL CLEANING

A. After mortar has fully hardened, thoroughly clean exposed stone surfaces of excess mortar and foreign matter; use wood scrapers, stiff-nylon or -fiber brushes, and clean water, applied by low-pressure spray.

1. Do not use metal scrapers or brushes.
2. Do not use acidic or alkaline cleaners.

B. Clean adjacent non-stone surfaces. Use detergent and soft brushes or cloths.

C. Remove masking materials, leaving no residues that could trap dirt.

END OF SECTION 040140.62

SECTION 042000 - UNIT MASONRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Clay face brick.
2. Mortar and grout.
3. Miscellaneous masonry accessories.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For the following:

1. Masonry Units: Show sizes, profiles, coursing, and locations of special shapes.

C. Samples: For each type and color of the following:

1. Clay face brick, in the form of straps of five (5) or more bricks.
2. Special brick shapes.
3. Pigmented mortar. Make Samples using same sand and mortar ingredients to be used on Project.
4. Accessories embedded in masonry.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For testing agency.

B. Material Certificates: For each type and size of the following:

1. Masonry units.

a. Include material test reports substantiating compliance with requirements.
b. For brick, include size-variation data verifying that actual range of sizes falls within specified tolerances.
c. For exposed brick, include test report for efflorescence according to ASTM C 67.

2. Cementitious materials. Include brand, type, and name of manufacturer.
3. Preblended, dry mortar mixes. Include description of type and proportions of ingredients.
4. Grout mixes. Include description of type and proportions of ingredients.

C. Mix Designs: For each type of mortar and grout. Include description of type and proportions of ingredients.

1. Include test reports for mortar mixes required to comply with property specification. Test according to ASTM C 109 for compressive strength, ASTM C 1506 for water retention, and ASTM C 91 for air content.
2. Include test reports, according to ASTM C 1019, for grout mixes required to comply with compressive strength requirement.

1.6 QUALITY ASSURANCE

A. Testing Agency Qualifications: Qualified according to ASTM C 1093 for testing indicated.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store masonry units on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied. If units become wet, do not install until they are dry.

B. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.

C. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.

D. Deliver preblended, dry mortar mix in moisture-resistant containers. Store preblended, dry mortar mix in delivery containers on elevated platforms in a dry location or in covered weatherproof dispensing silos.

E. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations for Masonry Units: Obtain exposed masonry units of a uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, from single source from single manufacturer for each product required.

B. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from single manufacturer for each cementitious component and from single source or producer for each aggregate.

2.2 UNIT MASONRY, GENERAL

A. Masonry Standard: Comply with ACI 530.1/ASCE 6/TMS 602, except as modified by requirements in the Contract Documents.

B. Defective Units: Referenced masonry unit standards may allow a certain percentage of units to contain chips, cracks, or other defects exceeding limits stated. Do not use units where such defects will be exposed in the completed Work.

2.3 BRICK

A. General: Provide shapes indicated and as follows, with exposed surfaces matching finish and color of exposed faces of adjacent units:

1. For ends of sills and caps and for similar applications that would otherwise expose unfinished brick surfaces, provide units without cores or frogs and with exposed surfaces finished.
2. Provide special shapes for applications where stretcher units cannot accommodate special conditions, including those at corners, movement joints, bond beams, sashes, and lintels.
3. Provide special shapes for applications requiring brick of size, form, color, and texture on exposed surfaces that cannot be produced by sawing.
4. Provide special shapes for applications where shapes produced by sawing would result in sawed surfaces being exposed to view.

B. Clay Face Brick: Facing brick complying with ASTM C 216.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. The Belden Brick Company, distributed by The Homer C. Godfrey Company
b. Glen-Gery Corporation, distributed by The Homer C. Godfrey Company
c. Mack Brick Company
d. Watsontown Brick
e. Substitutions: Under provisions of Section 012500 “Substitution Procedures”.

2. Grade: SW.
3. Type: FBS.
4. Initial Rate of Absorption: Less than 30 g/30 sq. in. per minute when tested per ASTM C 67.
5. Efflorescence: Provide brick that has been tested according to ASTM C 67 and is rated "not effloresced."
6. Size (Actual Dimensions): To match existing.
7. Application: Use where brick is exposed unless otherwise indicated.
8. Color and Texture: Brown veneer, to match existing brickwork exactly in color range, texture, and size, where exposed.

2.4 MORTAR AND GROUT MATERIALS

A. Portland Cement: ASTM C 150, Type I or II, except Type III may be used for cold-weather construction. Provide natural color or white cement as required to produce mortar color indicated.

1. Alkali content shall not be more than 0.1 percent when tested according to ASTM C114.

B. Hydrated Lime: ASTM C 207, Type S.

C. Mortar Pigments: Natural and synthetic iron oxides and chromium oxides, compounded for use in mortar mixes and complying with ASTM C 979. Use only pigments with a record of satisfactory performance in masonry mortar.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Davis Colors; **True Tone Mortar Colors**
b. Lanxess Corporation; **Bayferrox Iron Oxide Pigments**
c. Solomon Colors, Inc.; **SGS Mortar Colors**
d. Substitutions: Under provisions of Section 012500 “Substitution Procedures”.

D. Colored Cement Products: Packaged blend made from Portland cement and hydrated lime and mortar pigments, all complying with specified requirements, and containing no other ingredients.

1. Colored Portland Cement-Lime Mix:

a. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

1) Capital Materials Corporation; **Riverton Portland Cement Lime Custom Color**
2) Holcim (US) Inc.; **Rainbow Mortamix Custom Color Cement/Lime**
3) Lafarge North America Inc.; **Eaglebond Portland & Lime**
4) Lehigh Cement Company; **Lehigh Custom Color Portland/Lime Cement**
5) Substitutions: Under provisions of Section 012500 “Substitution Procedures”.

2. Formulate blend as required to produce color indicated or, if not indicated, as selected from manufacturer's standard colors.
3. Pigments shall not exceed ten percent (10%) of Portland cement by weight.

E. Aggregate for Mortar: ASTM C 144.

1. For mortar that is exposed to view, use washed aggregate consisting of natural sand or crushed stone.
2. For joints less than ¼-inch-thick, use aggregate graded with one hundred percent (100%) passing the No. 16 sieve.
3. White-Mortar Aggregates: Natural white sand or crushed white stone.

F. Aggregate for Grout: ASTM C 404.

G. Water: Potable.

2.5 MISCELLANEOUS MASONRY ACCESSORIES

A. Preformed Control-Joint Gaskets: Made from styrene-butadiene-rubber compound, complying with ASTM D 2000, Designation M2AA-805 or PVC, complying with ASTM D 2287, Type PVC-65406 and designed to fit standard sash block and to maintain lateral stability in masonry wall; size and configuration as indicated.

B. Bond-Breaker Strips: Asphalt-saturated felt complying with ASTM D 226, Type I (No. 15 asphalt felt).

2.6 MASONRY CLEANERS

A. Proprietary Acidic Cleaner: Manufacturer's standard-strength cleaner designed for removing mortar/grout stains, efflorescence, and other new construction stains from new masonry without discoloring or damaging masonry surfaces. Use product expressly approved for intended use by cleaner manufacturer and manufacturer of masonry units being cleaned.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. Diedrich Technologies, Inc.
    b. EaCo Chem, Inc.
    c. ProSoCo, Inc.
    d. Substitutions: Under provisions of Section 012500 “Substitution Procedures”.

2.7 MORTAR AND GROUT MIXES

A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures, unless otherwise indicated.

1. Do not use calcium chloride in mortar or grout.
2. Use Portland cement-lime mortar unless otherwise indicated.

B. Preblended, Dry Mortar Mix: Furnish dry mortar ingredients in form of a preblended mix. Measure quantities by weight to ensure accurate proportions, and thoroughly blend ingredients before delivering to Project site.

C. Mortar for Unit Masonry: Comply with ASTM C 270, Property Specification. Provide the following types of mortar for applications stated unless another type is indicated.

1. For exterior, above-grade, load-bearing and non-load-bearing walls and parapet walls; for interior load-bearing walls; for interior non-load-bearing partitions; and for other applications where another type is not indicated, use Type N.
2. For interior non-load-bearing partitions, Type O may be used instead of Type N.

D. Pigmented Mortar: Use colored cement product.

1. Application: Use pigmented mortar for exposed mortar joints with the following units:

    a. Face brick.

E. Grout for Unit Masonry: Comply with ASTM C 76.

1. Use grout of type indicated or, if not otherwise indicated, of type (fine or coarse) that will comply with Table 1.15.1 in ACI 530.1/ASCE 6/TMS 602 for dimensions of grout spaces and pour height.
2. Proportion grout in accordance with ASTM C 476, Table 1.
3. Provide grout with a slump of 8 to 11 inches as measured according to ASTM C 143.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

1. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of work.
2. Verify that substrates are free of substances that impair mortar bond.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

A. Thickness: Build cavity and composite walls and other masonry construction to full thickness shown. Build single-wythe walls to actual widths of masonry units, using units of widths indicated.

B. Build chases and recesses to accommodate items specified in this and other Sections.

C. Use full-size units without cutting if possible. If cutting is required to provide a continuous pattern or to fit adjoining construction, cut units with motor-driven saws; provide clean, sharp, unchipped edges. Allow units to dry before laying unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.

D. Select and arrange units for exposed unit masonry to produce a uniform blend of colors and textures. Mix units from several pallets or cubes as they are placed.

E. **Matching Existing Masonry: Match coursing, bonding, color, and texture of existing masonry and mortar where exposed.**

3.3 TOLERANCES

A. Dimensions and Locations of Elements:

1. For dimensions in cross section or elevation do not vary by more than plus ½-inch or minus ¼-inch.
2. For location of elements in plan do not vary from that indicated by more than plus or minus ½-inch.
3. For location of elements in elevation do not vary from that indicated by more than plus or minus ¼-inch in a story height or ½-inch total.

B. Lines and Levels:

1. For bed joints and top surfaces of bearing walls do not vary from level by more than ¼-inch in 10 feet, or ½-inch maximum.
2. For conspicuous horizontal lines, such as lintels, sills, parapets, and reveals, do not vary from level by more than 1/8-inch in 10 feet, ¼-inch in 20 feet, or ½-inch maximum.
3. For vertical lines and surfaces do not vary from plumb by more than ¼-inch in 10 feet, 3/8-inch in 20 feet, or ½-inch maximum.
4. For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than 1/8-inch in 10 feet, ¼-inch in 20 feet, or ½-inch maximum.
5. For lines and surfaces do not vary from straight by more than ¼-inch in 10 feet, 3/8-inch in 20 feet, or ½-inch maximum.
6. For vertical alignment of exposed head joints, do not vary from plumb by more than ¼-inch in 10 feet, or ½-inch maximum.
7. For faces of adjacent exposed masonry units, do not vary from flush alignment by more than 1/16-inch except due to warpage of masonry units within tolerances specified for warpage of units.

C. Joints:

1. For bed joints, do not vary from thickness indicated by more than plus or minus 1/8-inch, with a maximum thickness limited to ½-inch.

2. For exposed bed joints, do not vary from bed-joint thickness of adjacent courses by more than 1/8-inch.
3. For head and collar joints, do not vary from thickness indicated by more than plus 3/8-inch or minus ¼-inch.
4. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8-inch. Do not vary from adjacent bed-joint and head-joint thicknesses by more than 1/8-inch.
5. For exposed bed joints and head joints of stacked bond, do not vary from a straight line by more than 1/16-inch from one (1) masonry unit to the next.

3.4 LAYING MASONRY WALLS

A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns, and offsets. Avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other locations.

B. Bond Pattern for Exposed Masonry: Unless otherwise indicated, lay exposed masonry in running bond; do not use units with less than nominal 4-inch horizontal face dimensions at corners or jambs.

C. Stopping and Resuming Work: Stop work by racking back units in each course from those in course below; do not tooth. When resuming work, clean masonry surfaces that are to receive mortar, remove loose masonry units and mortar, and wet brick if required before laying fresh masonry.

D. Built-in Work: As construction progresses, build in items specified in this and other Sections. Fill in solidly with masonry around built-in items.

E. Fill space between steel frames and masonry solidly with mortar unless otherwise indicated.

F. Fill cores in hollow CMUs with grout 24 inches under bearing plates, beams, lintels, posts, and similar items unless otherwise indicated.

3.5 MORTAR BEDDING AND JOINTING

A. Lay CMUs and hollow brick as follows:

1. Bed face shells in mortar and with head joints of depth equal to bed joints.
2. Bed webs in mortar in grouted masonry.

B. Lay solid masonry units with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints and shove into place. Do not deeply furrow bed joints or slush head joints.

C. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness unless otherwise indicated.

D. Cut joints flush where indicated to receive waterproofing, cavity wall insulation, or air barriers unless otherwise indicated.

3.6 CONTROL AND EXPANSION JOINTS

A. General: Install control and expansion joint materials in unit masonry as masonry progresses. Do not allow materials to span control and expansion joints without provision to allow for in-plane wall or partition movement.

B. Form expansion joints in brick as follows:

1. Build flanges of factory-fabricated, expansion-joint units into masonry.
2. Build in compressible joint fillers where indicated.

3.7 LINTELS

A. Install steel lintels where indicated.

B. Provide minimum bearing of 8 inches at each jamb unless otherwise indicated.

3.8 FIELD QUALITY CONTROL

A. Testing and Inspecting: Owner will engage special inspectors to perform tests and inspections and prepare reports. Allow inspectors access to scaffolding and work areas as needed to perform tests and inspections. Retesting of materials that fail to comply with specified requirements shall be done at Contractor's expense.

B. Inspections: Special inspections according to Level B in TMS 402/ACI 530/ASCE 5.

1. Begin masonry construction only after inspectors have verified proportions of site-prepared mortar.
2. Place grout only after inspectors have verified compliance of grout spaces and of grades, sizes, and locations of reinforcement.
3. Place grout only after inspectors have verified proportions of site-prepared grout.

C. Testing Prior to Construction: One (1) set of tests.

D. Clay Masonry Unit Test: For each type of unit provided, according to ASTM C 67 for compressive strength.

E. Mortar Aggregate Ratio Test (Proportion Specification): For each mix provided, according to ASTM C 780.

F. Mortar Test (Property Specification): For each mix provided, according to ASTM C 780. Test mortar for mortar air content and compressive strength.

G. Grout Test (Compressive Strength): For each mix provided, according to ASTM C 1019.

3.9 REPAIRING, POINTING, AND CLEANING

A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Install new units to match adjoining units; install in fresh mortar, pointed to eliminate evidence of replacement.

B. Pointing: During the tooling of joints, enlarge voids and holes, except weep vents, and completely fill with mortar. Point up joints, including corners, openings, and adjacent construction, to provide a neat, uniform appearance. Prepare joints for sealant application, where indicated.

C. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.

D. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:

1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
2. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before proceeding with cleaning of masonry.
3. Protect adjacent stone and non-masonry surfaces from contact with cleaner by covering them with liquid strippable masking agent or polyethylene film and waterproof masking tape.
4. Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing surfaces thoroughly with clear water.
5. Clean masonry with a proprietary acidic cleaner applied according to manufacturer's written instructions.

3.10 MASONRY WASTE DISPOSAL

A. Salvageable Materials: Unless otherwise indicated, excess masonry materials are Contractor's property. At completion of unit masonry work, remove from Project site.

B. Excess Masonry Waste: Remove excess clean masonry waste that cannot be used as fill, as described above or recycled, and other masonry waste, and legally dispose of off Owner's property.

END OF SECTION 042000

SECTION 042300 - GLASS UNIT MASONRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Glass block set in mortar.

1.3 SEQUENCING AND SCHEDULING

A. Sequence and coordinate completion of glass unit masonry assemblies so sealants can be installed immediately after mortar has attained final set.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: Show fabrication and installation details for glass unit masonry, including vertical and horizontal coursing, anchors, reinforcement, and expansion strips.

C. Samples for Verification: Glass-block units.

D. Evaluation Reports: For post-installed anchors, from ICC-ES.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Store glass block in unopened cartons on elevated platforms, under cover, and in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied.

B. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.

C. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.

D. Store accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

1.6 FIELD CONDITIONS

A. Environmental Limitations: Proceed with installation of glass unit masonry assemblies only when ambient and material temperatures are 40 deg F (5 deg C) or higher.

1. Maintain temperature in installation areas at 40 deg F (5 deg C) or above for forty-eight (48) hours after installing.
2. Do not install sealants when ambient and substrate temperatures are outside limits permitted by sealant manufacturer or when joint substrates are wet.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations for Glass Block: Obtain glass block from single source from single manufacturer.

B. Source Limitations for Accessory Materials: Obtain each cementitious material, admixture and accessory component through single source from single manufacturer and each aggregate from single source or producer.

2.2 GLASS BLOCK

A. Hollow Glass Block: Hollow units made from transparent glass, with manufacturer's standard edge coating.

1. Basis of Design:

    a. Pittsburgh Corning Corporation

2. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

    a. Cincinnati Glass Block
    b. Glass Block Pro

3. Glass Color: As selected by Architect and Owner from manufacturer's full range to match adjacent glazing.
4. Pattern: To match existing.
5. Edge-Coating Color: As selected by Architect and Owner from manufacturer's full range.

    a. Provide one (1) color throughout for each pattern indicated.

6. Sizes: Manufacturer's standard sizes corresponding to nominal sizes indicated on Drawings.

2.3 MORTAR MATERIALS

A. Portland Cement: ASTM C 150, Type I or Type II. Provide natural color or white cement as required to produce mortar color indicated.

B. Hydrated Lime: ASTM C 207, Type S.

C. Mortar Pigments: Natural and synthetic iron oxides and chromium oxides, compounded for use in mortar mixes and complying with ASTM C 979. Use only pigments with a record of satisfactory performance in masonry mortar.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

    a. Davis Colors; **True Tone Mortar Colors**
    b. Lanxess Corporation; **Bayferrox Iron Oxide Pigments**
    c. Solomon Colors, Inc.; **SGS Mortar Colors**
    d. Substitutions: Under provisions of Section 012500 “Substitution Procedures”.

D. Colored Cement Product: Packaged blend made from Portland cement and hydrated lime and mortar pigments, all complying with specified requirements, and containing no other ingredients.

1. Colored Portland Cement-Lime Mix:

    a. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

        1) Capital Materials Corporation; **Riverton Portland Cement Lime Custom Color**
        2) Holcim (US) Inc.; **Rainbow Mortamix Custom Color Cement/Lime**
        3) Lafarge North America Inc.; **Eaglebond Portland & Lime**
        4) Lehigh Cement Company; **Lehigh Custom Color Portland/Lime Cement**
        5) Substitutions: Under provisions of Section 012500 “Substitution Procedures”.

2. Formulate blend as required to produce color indicated or, if not indicated, as selected from manufacturer's standard colors.
3. Pigments shall not exceed ten percent (10%) of Portland cement by weight.

E. Aggregate: ASTM C 144, with one hundred percent (100%) passing No. 8 sieve.

1. For joints narrower than ¼ inch, use aggregate graded with one hundred percent (100%) passing No. 16 sieve.
2. White Aggregates: Natural white sand or crushed white stone.

F. Water: Potable.

2.4 GLASS UNIT MASONRY ACCESSORIES

A. Plastic-Foam Expansion Strips: Polyethylene foam complying with requirements of glass-block manufacturer; 3/8 inch thick by wide.

B. Sealants: Manufacturer's standard elastomeric sealants of base polymer and characteristics indicated below that comply with applicable requirements in Section 079200 "Joint Sealants."

1. Silicone, non-staining, S, NS, 50, NT.
2. Sealants shall have a VOC content of 250 g/L or less.

C. Sealant Accessories: Provide sealant accessories, including primers, bond-breaker tape, and cylindrical sealant backing, that comply with applicable requirements in Section 079200 "Joint Sealants."

2.5 MORTAR MIXES

A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, or antifreeze compounds unless otherwise indicated.

1. Do not use calcium chloride in mortar.
2. Limit cementitious materials in mortar to Portland cement and lime.

B. Mortar for Glass Unit Masonry Assemblies: Comply with ASTM C 270, Proportion Specification for Type S mortar.

1. Combine and thoroughly mix cementitious materials, water, and aggregates in a mechanical batch mixer unless otherwise indicated. Mix mortar to produce a stiff but workable consistency that is drier than mortar for brick or concrete masonry. Discard mortar when it has reached initial set.

C. Pigmented Mortar: Use colored cement product.

1. Pigments shall not exceed ten percent (10%) of Portland cement by weight.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine sills, jambs, and heads surrounding glass unit masonry assemblies, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLING GLASS BLOCK WITH MORTAR

A. Apply a heavy coat of asphalt emulsion to sill and adhere expansion strips to jambs and heads with asphalt emulsion. Allow asphalt emulsion to dry before placing mortar. Trim expansion strips to width required to fit glass block and to full lengths of heads and jambs.

B. Set glass block with completely filled bed and head joints, with no furrowing, accurately spaced and coordinated with other construction. Maintain ¼-inch exposed joint widths unless otherwise indicated.

C. Use rubber mallet to tap units into position. Do not use steel tools, and do not allow units to come into contact with metal accessories and frames.

D. Use plastic spacers in mortar joints to produce uniform joint widths and to prevent mortar from being squeezed out of joints.

E. Keep expansion joints free of mortar.

F. Tool exposed joints slightly concave when mortar is thumbprint hard. Use a smooth plastic jointer larger than joint width.

G. Clean glass unit masonry assemblies as work progresses. Remove mortar fins and smears immediately, using a clean, wet sponge or a scrub brush with stiff fiber bristles. Do not use harsh cleaners, acids, abrasives, steel wool, or wire brushes when removing mortar or cleaning glass unit masonry assemblies.

H. Install sealant at jambs, heads, mullions, and other locations indicated. Prepare joints, including installation of primer and bond-breaker tape or cylindrical sealant backing, and apply elastomeric sealants to comply with requirements in Section 079200 "Joint Sealants."

I. Construction Tolerances: Set glass block to comply with the following tolerances:

1. Variation from Plumb: For vertical lines and surfaces, do not exceed ¼ inch in 10 feet, 3/8 inch in 20 feet, or ½ inch in 40 feet or more.
2. Variation from Level: For bed joints and other conspicuous lines, do not exceed 1/8 inch in 10 feet, ¼ inch in 20 feet, or ½ inch in 40 feet or more.
3. Variation of Location in Plan: For location of elements in plan, do not vary from that indicated by more than plus or minus ¼ inch.
4. Variation in Mortar-Joint Thickness: Do not vary from joint thickness indicated by more than plus or minus 1/16 inch.
5. For faces of adjacent exposed units, do not vary from flush alignment by more than 1/16 inch.

3.3 CLEANING

A. On surfaces adjacent to glass unit masonry assemblies, remove mortar, sealants, and other residue resulting from glass-block installation, in a manner approved by manufacturers of materials involved.

B. Remove excess sealants with commercial solvents according to sealant manufacturer's written instructions. Exercise care not to damage sealant in joints.

C. Perform final cleaning of glass unit masonry assemblies when surface is not exposed to direct sunlight. Start at top of panel using generous amounts of clean water. Remove water with clean, dry, soft cloths; change cloths frequently.

END OF SECTION 042300

SECTION 047200 - CAST STONE MASONRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Cast stone sills, lintels, etc.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. For cast stone units, include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

B. HPBS Submittals:

1. Product Certificates for Section 16a-38k-6(d)(10). For products and materials required to comply with requirements for regional materials indicating location and distance from Project of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include statement indicating cost for each regional material and the fraction by weight that is considered regional.

C. Shop Drawings: Show fabrication and installation details for cast stone units. Include dimensions, details of reinforcement and anchorages if any, and indication of finished faces.

1. Include building elevations showing layout of units and locations of joints and anchors.

D. Samples:

1. For each color and texture of cast stone required, 10 inches square in size.
2. For each trim shape required, 10 inches in length.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For manufacturer and testing agency.

B. Material Test Reports: For each mix required to produce cast stone, based on testing according to ASTM C 1364, including test for resistance to freezing and thawing.

1. Provide test reports based on testing within previous two (2) years.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: A qualified manufacturer of cast stone units similar to those indicated for this Project, that has sufficient production capacity to manufacture required units, and is a plant certified by the Cast Stone Institute.

B. Testing Agency Qualifications: Qualified according to ASTM E 329 for testing indicated.

C. Mockups: Furnish cast stone for installation in mockups specified in Section 042000 “Unit Masonry”.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Coordinate delivery of cast stone with unit masonry work to avoid delaying the Work and to minimize the need for on-site storage.

B. Pack, handle, and ship cast stone units in suitable packs or pallets.

1. Lift with wide-belt slings; do not use wire rope or ropes that might cause staining. Move cast stone units, if required, using dollies with wood supports.
2. Store cast stone units on wood skids or pallets with non-staining, waterproof covers, securely tied. Arrange to distribute weight evenly and to prevent damage to units. Ventilate under covers to prevent condensation.

1.7 PROJECT CONDITIONS

A. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Comply with cold-weather construction requirements in TMS 602/ACI 530.1/ASCE 6.

1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F and above and will remain so until cast stone has dried, but no fewer than seven (7) days after completing cleaning.

B. Hot-Weather Requirements: Comply with hot-weather construction requirements in TMS 602/ACI 530.1/ASCE 6.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations for Cast Stone: Obtain cast-stone units from single source from single manufacturer.

2.2 CAST STONE MATERIALS

A. General: Comply with ASTM C 1364.

B. Portland Cement: ASTM C 150, Type I or Type III, containing not more than 0.60 percent total alkali when tested according to ASTM C 114. Provide natural color or white cement as required to produce cast stone color indicated.

C. Coarse Aggregates: Granite, quartz, or limestone complying with ASTM C 33; gradation and colors as needed to produce required cast stone textures and colors.

D. Fine Aggregates: Natural sand or crushed stone complying with ASTM C 33, gradation and colors as needed to produce required cast stone textures and colors.

E. Color Pigment: ASTM C 979, synthetic mineral-oxide pigments or colored water-reducing admixtures; color stable, free of carbon black, nonfading, and resistant to lime and other alkalis.

F. Admixtures: Use only admixtures specified or approved in writing by Architect.

1. Do not use admixtures that contain more than 0.1 percent water-soluble chloride ions by mass of cementitious materials. Do not use admixtures containing calcium chloride.
2. Use only admixtures that are certified by manufacturer to be compatible with cement and other admixtures used.
3. Air-Entraining Admixture: ASTM C 260. Add to mixes for units exposed to the exterior at manufacturer's prescribed rate to result in an air content of four to six percent (4-6%), except do not add to zero-slump concrete mixes.
4. Water-Reducing Admixture: ASTM C 494, Type A.
5. Water-Reducing, Retarding Admixture: ASTM C 494, Type D.
6. Water-Reducing, Accelerating Admixture: ASTM C 494, Type E.

G. Reinforcement: Deformed steel bars complying with ASTM A 615, Grade 60. Use galvanized or epoxy-coated reinforcement when covered with less than 1½ inches of cast stone material.

1. Epoxy Coating: ASTM A 775.
2. Galvanized Coating: ASTM A 767.

H. Embedded Anchors and Other Inserts: Fabricated from stainless-steel complying with ASTM A 240, ASTM A 271, or ASTM A 666, Type 304.

2.3 CAST STONE UNITS

A. Manufacturers:

1. Continental Cast Stone East by Russell
2. Corinthian Cast Stone, Inc.
3. Sun Precast Company, Inc.
4. Substitutions: Under provisions of Section 012500 “Substitution Procedures”.

B. Regional Materials: Provide cast stone units that have been manufactured within five hundred (500) miles of Project site from aggregates and cement that have been extracted, harvested, or recovered, as well as manufactured, within five hundred (500) miles of Project site.

C. Cast Stone Units: Comply with ASTM C 1364.

1. Units shall be manufactured using either the vibrant dry tamp or wet-cast method.
2. Units shall be resistant to freezing and thawing as determined by laboratory testing according to ASTM C 666, Procedure A, as modified by ASTM C 1364.

D. Fabricate units with sharp arris and accurately reproduced details, with indicated texture on all exposed surfaces unless otherwise indicated.

1. Slope exposed horizontal surfaces 1:12 to drain unless otherwise indicated.
2. Provide raised fillets at backs of sills and at ends indicated to be built into jambs.
3. Provide drips on projecting elements unless otherwise indicated.

E. Fabrication Tolerances:

1. Variation in Cross Section: Do not vary from indicated dimensions by more than 1/8-inch.
2. Variation in Length: Do not vary from indicated dimensions by more than 1/360 of the length of unit or 1/8-inch, whichever is greater, but in no case by more than ¼-inch.
3. Warp, Bow, and Twist: Not to exceed 1/360 of the length of unit or 1/8-inch, whichever is greater.
4. Location of Grooves, False Joints, Holes, Anchorages, and Similar Features: Do not vary from indicated position by more than 1/8-inch on formed surfaces of units and 3/8-inch on unformed surfaces.

F. Cure units as follows:

1. Cure units in enclosed moist curing room at ninety-five to one hundred percent (95 to 100%) relative humidity and temperature of 100 deg F for 12 hours or 70 deg F for 16 hours.
2. Keep units damp and continue curing to comply with one of the following:

   a. No fewer than five (5) days at mean daily temperature of 70 deg F or above.
   b. No fewer than six (6) days at mean daily temperature of 60 deg F or above.
   c. No fewer than seven (7) days at mean daily temperature of 50 deg F or above.
   d. No fewer than eight (8) days at mean daily temperature of 45 deg F or above.

G. Acid etch units after curing to remove cement film from surfaces to be exposed to view.

H. Colors and Textures: As selected by Architect and Owner from manufacturer's entire range, to match existing.

2.4 ACCESSORIES

A. Anchors: Type and size indicated, fabricated from Type 304 stainless-steel complying with ASTM A 240, ASTM A 276, or ASTM A 666.

B. Dowels: ½-inch-diameter, round bars, fabricated from Type 304 stainless-steel complying with ASTM A 240, ASTM A 276, or ASTM A 666.

C. Proprietary Acidic Cleaner: Manufacturer's standard-strength cleaner designed for removing mortar/grout stains, efflorescence, and other new construction stains from new masonry without discoloring or damaging masonry surfaces. Use product expressly approved for intended use by cast-stone manufacturer and expressly approved by cleaner manufacturer for use on cast stone and adjacent masonry materials.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

   a. Diedrich Technologies, Inc.
   b. EaCo Chem, Inc.
   c. ProSoCo, Inc.
   d. Substitutions: Under provisions of Section 012500 “Substitution Procedures”.

2.5 MORTAR MIXES

A. Comply with requirements in Section 042000 “Unit Masonry” for mortar mixes.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 SETTING CAST STONE IN MORTAR

A. Install cast stone units to comply with requirements in Section 042000 “Unit Masonry”.

3.3 INSTALLATION TOLERANCES

A. Variation from Plumb: Do not exceed 1/8-inch in 10 feet, ¼-inch in 20 feet, or ½-inch maximum.

B. Variation from Level: Do not exceed 1/8-inch in 10 feet, ¼-inch in 20 feet, or ½-inch maximum.

C. Variation in Joint Width: Do not vary joint thickness more than 1/8-inch in 36 inches or one-fourth of nominal joint width, whichever is less.

D. Variation in Plane between Adjacent Surfaces (Lipping): Do not vary from flush alignment with adjacent units or adjacent surfaces indicated to be flush with units by more than 1/16-inch, except where variation is due to warpage of units within tolerances specified.

3.4 ADJUSTING AND CLEANING

A. Remove and replace stained and otherwise damaged units and units not matching approved Samples. Cast stone may be repaired if methods and results are approved by Architect.

B. Replace units in a manner that results in cast stone matching approved Samples, complying with other requirements, and showing no evidence of replacement.

C. In-Progress Cleaning: Clean cast stone as work progresses.

1. Remove mortar fins and smears before tooling joints.

END OF SECTION 047200

SECTION 051200 – STEEL FRAMING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Structural steel.
2. Grout.

B. Related Sections:

1. Division 01 Section "Quality Requirements" for independent testing agency procedures and administrative requirements.

2. Division 05 Section "Architecturally Exposed Structural Steel Framing" for additional requirements for architecturally exposed structural steel.

3. Division 05 Section "Steel Decking" for field installation of shear connectors through deck.

4. Division 05 Section "Metal Fabrications" for steel lintels and shelf angles not attached to structural-steel frame, miscellaneous steel fabrications and other metal items not defined as structural steel.

5. Division 05 Section "Metal Stairs."

1.3 DEFINITIONS

A. Structural Steel: Elements of structural-steel frame, as classified by AISC 303, "Code of Standard Practice for Steel Buildings and Bridges."

1.4 PERFORMANCE REQUIREMENTS

A. Connections: Provide details of simple shear connections required by the Contract Documents to be selected or completed by structural-steel fabricator, including comprehensive engineering design by a qualified professional engineer licensed in the State of Connecticut, to withstand loads indicated and comply with other information and restrictions indicated.

1. Select and complete connections using schematic details indicated and AISC 360.
2. Use ASD; data are given at service-load level.

B. Moment Connections: Type FR, fully restrained and designed by a qualified professional engineer licensed in the State of Connecticut.

C. Brace Frame Connections: Design for loading given on the drawings. Connections shall be designed by a qualified professional engineer licensed in the State of Connecticut.

1.5 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Show fabrication of structural-steel components.

1. Include details of cuts, connections, splices, camber, holes, and other pertinent data.

2. Include embedment drawings.

3. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld. Show backing bars that are to be removed and supplemental fillet welds where backing bars are to remain.

4. Indicate type, size, and length of bolts, distinguishing between shop and field bolts. Identify pretensioned and slip-critical high-strength bolted connections.

5. Identify members and connections of the seismic-load-resisting system.

6. For structural-steel connections indicated to comply with design loads, include structural design data signed and sealed by the qualified professional engineer responsible for their preparation.

7. Submit shop drawings of all members to be furnished. Detail drawings of the members and their connections shall follow standard practice as set forth in the AISC "Manual of Structural Steel Detailing" (Second Edition). In particular, welding shall be shown, using standard AWS welding symbols. Show on detail drawings the paint to be used.

8. Shop drawings will not be accepted for review by the Engineer unless there is substantial evidence that the General Contractor or Construction manager on the project has reviewed the submittal for compliance with the contract documents and has addressed questions to be responded to by the Contractor. All coordination items with other trades and submittals are to be performed and the submittal marked accordingly before submission. Failure to provide the above will result in the submittal being returned and not reviewed.

9. Contractor shall perform review and schedule shop drawing submittals to permit a minimum of 15 calendar days for review by the Engineer. Shop Drawings will be returned to the Architect for their required review and processing.

10. Shop drawings will not be reviewed unless accompanied by erection drawings which locates and identifies the members. Copies or reproductions of contract drawings will not be accepted or reviewed as shop drawings.

11. Shop drawings shall be submitted in the form of 1 reproducible plus 2 prints. Electronic submittals will be acceptable.

12. The following is the definitions for the Shop Drawing stamp disposition:

No Exceptions Taken - Re-submission is not required unless document is revised.

Make Corrections Noted - If checked, fabrication may be undertaken. Contractor is responsible for making noted corrections. Re-submission of record copies are required.

Revise and Resubmit - If checked, fabrication may not be undertaken. Resubmit corrected copies for final review, with all changes clouded.

Rejected - Resubmit for review.

Corrections or comments made on shop drawings during this review do not relieve the Contractor from compliance with the requirements of the project drawings and specifications. This check is only for the review of general conformance with the information given in the Contract Documents. The Contractor is responsible for confirming and correlating all quantities and dimensions, selecting fabrication processes, techniques and sequence of construction, coordinating his work with that of other trades, and performing his work in accordance with OSHA requirements and other sections of the Project Specifications.

C. Welding Procedure Specifications (WPSs) and Procedure Qualification Records (PQRs): Provide according to AWS D1.1/D1.1M, "Structural Welding Code - Steel," for each welded joint whether prequalified or qualified by testing, including the following:

1. Power source (constant current or constant voltage).
2. Electrode manufacturer and trade name, for demand critical welds.

D. Qualification Data: For qualified Installer and fabricator. Welding certificates.

E. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers, certifying that shop primers are compatible with topcoats.

F. Mill test reports for structural steel, including chemical and physical properties.

G. Product Test Reports: For the following:

1. Bolts, nuts, and washers including mechanical properties and chemical analysis.
2. Direct-tension indicators.
3. Tension-control, high-strength bolt-nut-washer assemblies.
4. Shear stud connectors.
5. Shop primers.
6. Nonshrink grout.

1.6 QUALITY ASSURANCE

A. Fabricator Qualifications: A qualified fabricator that participates in the AISC Quality Certification Program and is designated an AISC-Certified Plant, Category STD.

B. Installer Qualifications: A qualified installer who participates in the AISC Quality Certification Program and is designated an AISC-Certified Erector, Category ACSE.

C. Shop-Painting Applicators: Qualified according to AISC's Sophisticated Paint Endorsement P2.

D. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

1. Welders and welding operators performing work on bottom-flange, demand-critical welds shall pass the supplemental welder qualification testing, as required by AWS D1.8. FCAW-S and FCAW-G shall be considered separate processes for welding personnel qualification.

E. Comply with applicable provisions of the following specifications and documents:

1. AISC 303.

2. AISC 341 and AISC 341s1.
3. AISC 360.
4. RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store materials to permit easy access for inspection and identification. Keep steel members off ground and spaced by using pallets, dunnage, or other supports and spacers. Protect steel members and packaged materials from corrosion and deterioration.

1. Do not store materials on structure in a manner that might cause distortion, damage, or overload to members or supporting structures. Repair or replace damaged materials or structures as directed.

B. Store fasteners in a protected place in sealed containers with manufacturer's labels intact.

1. Fasteners may be repackaged provided Owner's testing and inspecting agency observes repackaging and seals containers.
2. Clean and relubricate bolts and nuts that become dry or rusty before use.
3. Comply with manufacturers' written recommendations for cleaning and lubricating ASTM F 1852 fasteners and for retesting fasteners after lubrication.

1.8 COORDINATION

A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' recommendations to ensure that shop primers and topcoats are compatible with one another.

B. Coordinate installation of anchorage items to be embedded in or attached to other construction without delaying the Work. Provide setting diagrams, sheet metal templates, instructions, and directions for installation.

C. Tolerances: Structural steel fabricator shall coordinate with the requirements for tolerances as required by the selected building finish systems, and to construct to those tolerances if they are stricter than the AISC standards.

PART 2 - PRODUCTS

2.1 STRUCTURAL-STEEL MATERIALS

A. Recycled Content of Steel Products: Provide products with an average recycled content of steel products so postconsumer recycled content plus one-half of preconsumer recycled content is not less than 35 percent.

B. W-Shapes: ASTM A 992.

C. Channels, Angles: ASTM A 36.

D. Plate and Bar: ASTM A 36.

E. Cold-Formed Hollow Structural Sections: ASTM A 500, Grade B, structural tubing.

F. Steel Pipe: ASTM A 53/A 53M, Type E or S, Grade B.
1. Finish: Black except where indicated to be galvanized.

G. Steel Castings: ASTM A 216/A 216M, Grade WCB with supplementary requirement S11.

H. Steel Forgings: ASTM A 668/A 668M.

I. Welding Electrodes: Comply with AWS requirements.

2.2 BOLTS, CONNECTORS, AND ANCHORS

A. High-Strength Bolts, Nuts, and Washers: ASTM A 325, Type 1, heavy-hex steel structural bolts; ASTM A 563, Grade C, heavy-hex carbon-steel nuts; and ASTM F 436 , Type 1, hardened carbon-steel washers; all with plain finish.

1. Direct-Tension Indicators: ASTM F 959, Type 325, compressible-washer type with plain finish.

B. High-Strength Bolts, Nuts, and Washers: ASTM A 490, Type 1, heavy-hex steel structural bolts or tension-control, bolt-nut-washer assemblies with splined ends; ASTM A 563, Grade DH, heavy-hex carbon-steel nuts; and ASTM F 436 (ASTM F 436M), Type 1, hardened carbon-steel washers with plain finish.

1. Direct-Tension Indicators: ASTM F 959, Type 490, compressible-washer type with plain finish.

C. Zinc-Coated High-Strength Bolts, Nuts, and Washers: ASTM A 325, Type 1, heavy-hex steel structural bolts; ASTM A 563, Grade DH heavy-hex carbon-steel nuts; and ASTM F 436 Type 1, hardened carbon-steel washers.

1. Finish: Hot-dip or mechanically deposited zinc coating.
2. Direct-Tension Indicators: ASTM F 959, Type 325 (ASTM F 959M, Type 8.8), compressible-washer type with mechanically deposited zinc coating finish.

D. Shear Connectors: ASTM A 108, Grades 1015 through 1020, headed-stud type, cold-finished carbon steel; AWS D1.1/D1.1M, Type B.

E. Unheaded Anchor Rods: ASTM F 1554, Grade 36

1. Configuration: Straight.
2. Nuts: ASTM A 563 heavy-hex carbon steel.
3. Plate Washers: ASTM A 36 carbon steel.
4. Washers: ASTM F 436, Type 1, hardened carbon steel.
5. Finish: Plain

F. Headed Anchor Rods: ASTM F 1554, Grade 36, straight.

1. Nuts: ASTM A 563 heavy-hex carbon steel.
2. Plate Washers: ASTM A 36 carbon steel.
3. Washers: ASTM F 436, Type 1, hardened carbon steel.
4. Finish: Plain or Hot-dip zinc coating, ASTM A 153/A 153M, Class C.

G. Threaded Rods: ASTM A 36.

1. Nuts: ASTM A 563 heavy-hex carbon steel.
2. Washers: ASTM A 36/A 36M carbon steel.
3. Finish: Plain.

H. Clevises and Turnbuckles: Made from cold-finished carbon steel bars, ASTM A 108, Grade 1035.

I. Eye Bolts and Nuts: Made from cold-finished carbon steel bars, ASTM A 108, Grade 1030.

2.3 PRIMER

A. Primer: Comply with Division 09 painting Sections and Division 09 Section "High-Performance Coatings."

B. Primer: Fabricator's standard lead- and chromate-free, nonasphaltic, rust-inhibiting primer complying with MPI#79 and compatible with topcoat.

C. Galvanizing Repair Paint: MPI#18, MPI#19, or SSPC-Paint 20.

2.4 GROUT

A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, nonmetallic aggregate grout, noncorrosive and nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

2.5 FABRICATION

A. Structural Steel: Fabricate and assemble in shop to greatest extent possible. Fabricate according to AISC's "Code of Standard Practice for Steel Buildings and Bridges" and AISC 360.

1. Camber structural-steel members where indicated.
2. Fabricate beams with rolling camber up.
3. Identify high-strength structural steel according to ASTM A 6/A 6M and maintain markings until structural steel has been erected.
4. Mark and match-mark materials for field assembly.
5. Complete structural-steel assemblies, including welding of units, before starting shop-priming operations.

B. Thermal Cutting: Perform thermal cutting by machine to greatest extent possible.

1. Plane thermally cut edges to be welded to comply with requirements in AWS D1.1/D1.1M.

C. Bolt Holes: Cut, drill, or punch standard bolt holes perpendicular to metal surfaces.

D. Finishing: Accurately finish ends of columns and other members transmitting bearing loads.

E. Cleaning: Clean and prepare steel surfaces that are to remain unpainted according to SSPC-SP 2, "Hand Tool Cleaning.

F. Shear Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Use automatic end welding of headed-stud shear connectors according to AWS D1.1/D1.1M and manufacturer's written instructions.

G. Steel Wall-Opening Framing: Select true and straight members for fabricating steel wall-opening framing to be attached to structural steel. Straighten as required to provide uniform, square, and true members in completed wall framing.

H. Welded Door Frames: Build up welded door frames attached to structural steel. Weld exposed joints continuously and grind smooth. Plug-weld fixed steel bar stops to frames. Secure removable stops to frames with countersunk machine screws, uniformly spaced not more than 10 inches (250 mm) o.c. unless otherwise indicated.

I. Holes: Provide holes required for securing other work to structural steel and for other work to pass through steel framing members..

1. Cut, drill, or punch holes perpendicular to steel surfaces. Do not thermally cut bolt holes or enlarge holes by burning.
2. Baseplate Holes: Cut, drill, mechanically thermal cut, or punch holes perpendicular to steel surfaces.
3. Weld threaded nuts to framing and other specialty items indicated to receive other work.

2.6 SHOP CONNECTIONS

A. High-Strength Bolts: Shop install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.

1. Joint Type: Slip critical.

B. Weld Connections: Comply with AWS D1.1/D1.1M and AWS D1.8/D1.8M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.

1. Assemble and weld built-up sections by methods that will maintain true alignment of axes without exceeding tolerances in AISC 303 for mill material.

2.7 SHOP PRIMING

A. Shop prime steel surfaces except the following:

1. Surfaces embedded in concrete or mortar. Extend priming of partially embedded members to a depth of 2 inches (50 mm).
2. Surfaces to be field welded.
3. Surfaces to be high-strength bolted with slip-critical connections.
4. Surfaces to receive sprayed fire-resistive materials (applied fireproofing).
5. Galvanized surfaces.

B. Surface Preparation: Clean surfaces to be painted. Remove loose rust and mill scale and spatter, slag, or flux deposits. Prepare surfaces according to the following specifications and standards:

1. SSPC-SP 2, "Hand Tool Cleaning."

C. Priming: Immediately after surface preparation, apply primer according to manufacturer's written instructions and at rate recommended by SSPC to provide a minimum dry film thickness of 1.5 mils (0.038 mm). Use priming methods that result in full coverage of joints, corners, edges, and exposed surfaces.

1. Stripe paint corners, crevices, bolts, welds, and sharp edges.
2. Apply two coats of shop paint to surfaces that are inaccessible after assembly or erection. Change color of second coat to distinguish it from first.

D. Painting: Prepare steel and apply a one-coat, nonasphaltic primer complying with SSPC-PS Guide 7.00, "Painting System Guide 7.00: Guide for Selecting One-Coat Shop Painting Systems," to provide a dry film thickness of not less than 1.5 mils (0.038 mm).

2.8 PREFABRICATED BUILDING COLUMNS

A. Prefabricated building columns consisting of load-bearing structural-steel members protected by concrete fireproofing encased in an outer non-load-bearing steel shell.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Black Rock Column, Inc.
b. Dean, George H., Inc.
c. Dean Lally L. P.; Fire-Trol Division.

B. Outer non-load bearing steel shell shall have zinc rich primed carbon steel shell at exterior columns on line 22.2. Coordinate with Architectural Details. All interior shell columns shall have primed finish.

2.9 GALVANIZING

A. Hot-Dip Galvanized Finish: Apply zinc coating by the hot-dip process to structural steel according to ASTM A 123/A 123M.

1. Fill vent and drain holes that will be exposed in the finished Work unless they will function as weep holes, by plugging with zinc solder and filing off smooth.
2. Galvanize lintels shelf angles and welded door frames attached to structural-steel frame and located in exterior walls.

2.10 SOURCE QUALITY CONTROL

A. Testing Agency: Owner will engage an independent testing and inspecting agency to perform shop tests and inspections and prepare test reports.

1. Provide testing agency with access to places where structural-steel work is being fabricated or produced to perform tests and inspections.

B. Correct deficiencies in Work that test reports and inspections indicate does not comply with the Contract Documents.

C. Bolted Connections: Shop-bolted connections will be inspected according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

D. Welded Connections: In addition to visual inspection, shop-welded connections will be tested and inspected according to AWS D1.1/D1.1M and the following inspection procedures, at testing agency's option:

1. Liquid Penetrant Inspection: ASTM E 165.
2. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration will not be accepted.
3. Ultrasonic Inspection: ASTM E 164.
4. Radiographic Inspection: ASTM E 94.

E. In addition to visual inspection, shop-welded shear connectors will be tested and inspected according to requirements in AWS D1.1/D1.1M for stud welding and as follows:

1. Bend tests will be performed if visual inspections reveal either a less-than-continuous 360-degree flash or welding repairs to any shear connector.
2. Tests will be conducted on additional shear connectors if weld fracture occurs on shear connectors already tested, according to requirements in AWS D1.1/D1.1M.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify, with steel Erector present, elevations of concrete- and masonry-bearing surfaces and locations of anchor rods, bearing plates, and other embedments for compliance with requirements.

1. Prepare a certified survey of bearing surfaces, anchor rods, bearing plates, and other embedments showing dimensions, locations, angles, and elevations.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Provide temporary shores, guys, braces, and other supports during erection to keep structural steel secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads. Remove temporary supports when permanent structural steel, connections, and bracing are in place unless otherwise indicated.

1. Do not remove temporary shoring supporting composite deck construction until cast-in-place concrete has attained its design compressive strength.

3.3 ERECTION

A. Set structural steel accurately in locations and to elevations indicated and according to AISC 303 and AISC 360.

B. Base Bearing and Leveling Plates: Clean concrete- and masonry-bearing surfaces of bond-reducing materials, and roughen surfaces prior to setting plates. Clean bottom surface of plates.

1. Set plates for structural members on wedges, shims, or setting nuts as required.
2. Weld plate washers to top of baseplate.
3. Snug-tighten anchor rods after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of plate before packing with grout.
4. Promptly pack grout solidly between bearing surfaces and plates so no voids remain. Neatly finish exposed surfaces; protect grout and allow to cure. Comply with manufacturer's written installation instructions for shrinkage-resistant grouts.

C. Maintain erection tolerances of structural steel within AISC's "Code of Standard Practice for Steel Buildings and Bridges." Level and plumb individual members of structure within specified AISC tolerances, unless stricter tolerances are otherwise required by finish building systems being provided on the project. Contractor is responsible to coordinate all construction tolerances, and to construct to the tolerances as required with all the selected building finish systems supported by or adjacent to the structural steel.

D. Align and adjust various members that form part of complete frame or structure before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that will be in permanent contact with members. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.

1. Level and plumb individual members of structure.
2. Make allowances for difference between temperature at time of erection and mean temperature when structure is completed and in service.

E. Splice members only where indicated.

F. Do not use thermal cutting during erection unless approved by Engineer. Finish thermally cut sections within smoothness limits in AWS D1.1/D1.1M.

G. Do not enlarge unfair holes in members by burning or using drift pins. Ream holes that must be enlarged to admit bolts.

H. Shear Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Use automatic end welding of headed-stud shear connectors according to AWS D1.1/D1.1M and manufacturer's written instructions.

3.4 FIELD CONNECTIONS

A. High-Strength Bolts: Install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.

1. Joint Type: Snug tightened or Slip critical.

B. Weld Connections: Comply with AWS D1.1/D1.1M and AWS D1.8/D1.8M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.

1. Comply with AISC 303 and AISC 360 for bearing, alignment, adequacy of temporary connections, and removal of paint on surfaces adjacent to field welds.
2. Remove backing bars or runoff tabs where indicated, back gouge, and grind steel smooth.
3. Assemble and weld built-up sections by methods that will maintain true alignment of axes without exceeding tolerances in AISC's "Code of Standard Practice for Steel Buildings and Bridges" for mill material.

3.5 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to inspect field welds and high-strength bolted connections.

B. Bolted Connections: Bolted connections will be inspected according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

C. Welded Connections: Field welds will be visually inspected according to AWS D1.1/D1.1M.

1. In addition to visual inspection, field welds will be tested and inspected according to AWS D1.1/D1.1M and the following inspection procedures, at testing agency's option:

a. Liquid Penetrant Inspection: ASTM E 165.

b. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration will not be accepted.
c. Ultrasonic Inspection: ASTM E 164.
d. Radiographic Inspection: ASTM E 94.

D. In addition to visual inspection, test and inspect field-welded shear connectors according to requirements in AWS D1.1/D1.1M for stud welding and as follows:

1. Perform bend tests if visual inspections reveal either a less-than-continuous 360-degree flash or welding repairs to any shear connector.
2. Conduct tests on additional shear connectors if weld fracture occurs on shear connectors already tested, according to requirements in AWS D1.1/D1.1M.

E. Correct deficiencies in Work that test reports and inspections indicate does not comply with the Contract Documents.

3.6 REPAIRS AND PROTECTION

A. Galvanized Surfaces: Clean areas where galvanizing is damaged or missing and repair galvanizing to comply with ASTM A 780.

B. Touchup Painting: Immediately after erection, clean exposed areas where primer is damaged or missing and paint with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.

1. Clean and prepare surfaces by SSPC-SP 2 hand-tool cleaning or SSPC-SP 3 power-tool cleaning.

C. Touchup Painting: Cleaning and touchup painting are specified in Division 09 painting Sections.

END OF SECTION 051200

SECTION 053100 - STEEL DECKING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.3 SUMMARY

A. This Section includes the following:

1. Roof deck.
2. Composite floor deck.

B. Related Sections include the following:
1. Division 05 Section "Structural Steel Framing" for shop- and field-welded shear connectors.
2. Division 05 Section "Metal Fabrications" for framing deck openings with miscellaneous steel shapes.

1.4 SUBMITTALS

A. Product Data: For each type of deck, accessory, and product indicated.

B. Shop Drawings: Show layout and types of deck panels, anchorage details, reinforcing channels, pans, cut deck openings, special jointing, accessories, and attachments to other construction.

1. Submit shop drawings of all members to be furnished. Detail drawings of the members and their connections shall follow standard practice as set forth in the AISC "Manual of Structural Steel Detailing" (Second Edition). In particular, welding shall be shown, using standard AWS welding symbols. Show on detail drawings the paint to be used.

2. Shop drawings will not be accepted for review by the Engineer unless there is substantial evidence that the General Contractor or Construction manager on the project has reviewed the submittal for compliance with the contract documents and has addressed questions to be responded to by the Contractor. All coordination items with other trades and submittals are to be performed and the submittal marked accordingly before submission. Failure to provide the above will result in the submittal being returned and not reviewed.

3. Contractor shall perform review and schedule shop drawing submittals to permit a minimum of 15 calendar days for review by the Engineer. Shop Drawings will be returned to the Architect for their required review and processing.

4. Shop drawings will not be reviewed unless accompanied by erection drawings which locates and identifies the members. Copies or reproductions of contract drawings will not be accepted or reviewed as shop drawings.

5. Shop drawings shall be submitted in the form of 1 reproducible plus 2 prints.

6. The following is the definitions for the Shop Drawing stamp disposition:

No Exceptions Taken - Re-submission is not required unless document is revised.

Make Corrections Noted - If checked, fabrication may be undertaken. Contractor is responsible for making noted corrections. Re-submission of record copies are required.

Revise and Resubmit - If checked, fabrication may not be undertaken. Resubmit corrected copies for final review, with all changes clouded.

Rejected - Resubmit for review.

Corrections or comments made on shop drawings during this review do not relieve the Contractor from compliance with the requirements of the project drawings and specifications. This check is only for the review of general conformance with the information given in the Contract Documents. The Contractor is responsible for confirming and correlating all quantities and dimensions, selecting fabrication processes, techniques and sequence of construction, coordinating his work with that of other trades, and performing his work in accordance with OSHA requirements and other sections of the Project Specifications.

C. Product Certificates: For each type of steel deck, signed by product manufacturer.

D. Welding certificates.

E. Field quality-control test and inspection reports.

F. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, indicating that each of the following complies with requirements:

1. Power-actuated mechanical fasteners.

G. Research/Evaluation Reports: For steel deck.

1.5 QUALITY ASSURANCE

A. Testing Agency Qualifications: An independent agency qualified according to ASTM E 329 for testing indicated.

B. Welding: Qualify procedures and personnel according to AWS D1.3, "Structural Welding Code - Sheet Steel."

C. AISI Specifications: Comply with calculated structural characteristics of steel deck according to AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members."

D. FMG Listing: Provide steel roof deck evaluated by FMG and listed in its "Approval Guide, Building Materials" for Class 1 fire rating and Class 1-90 windstorm ratings.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Protect steel deck from corrosion, deformation, and other damage during delivery, storage, and handling.

B. Stack steel deck on platforms or pallets and slope to provide drainage. Protect with a waterproof covering and ventilate to avoid condensation.

1. Protect and ventilate acoustical cellular roof deck with factory-installed insulation to maintain insulation free of moisture.

1.7 COORDINATION

A. Coordinate installation of sound-absorbing insulation strips in topside ribs of acoustical deck with roofing installation specified in Division 07 to ensure protection of insulation strips against damage from effects of weather and other causes.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Steel Deck:
   a. Canam Steel Corp.; The Canam Manac Group.
   b. Consolidated Systems, Inc.
   c. Epic Metals Corporation.
   d. New Millennium Building Systems, LLC.
   e. Nucor Corp.; Vulcraft Division.

2.2 ROOF DECK

A. Steel Roof Deck: Fabricate panels, without top-flange stiffening grooves, to comply with "SDI Specifications and Commentary for Steel Roof Deck," in SDI Publication No. 30, and with the following:

1. Galvanized Steel Sheet: ASTM A 653/A 653M, Structural Steel (SS), Grade , G60 zinc coating.
2. Deck Profile: As indicated.
3. Profile Depth: As indicated.
4. Design Uncoated-Steel Thickness: As indicated.
5. Span Condition: Triple span or more.
6. Side Laps: Overlapped or interlocking seam at Contractor's option.

2.3 COMPOSITE FLOOR DECK

A. Composite Steel Floor Deck: Fabricate panels, with integrally embossed or raised pattern ribs and interlocking side laps, to comply with "SDI Specifications and Commentary for Composite Steel Floor Deck," in SDI Publication No. 30, with the minimum section properties indicated, and with the following:
1. Galvanized Steel Sheet: ASTM A 653/A 653M, Structural Steel (SS), Grade 33 (230), G60 zinc coating.
2. Profile Depth: As indicated.
3. Design Uncoated-Steel Thickness: As indicated.
4. Span Condition: Triple span or more.

2.4 ACCESSORIES

A. General: Provide manufacturer's standard accessory materials for deck that comply with requirements indicated.

B. Mechanical Fasteners: Corrosion-resistant, low-velocity, power-actuated or pneumatically driven carbon-steel fasteners; or self-drilling, self-threading screws.

C. Side-Lap Fasteners: Corrosion-resistant, hexagonal washer head; self-drilling, carbon-steel screws, No. 10 (4.8-mm) minimum diameter.

D. Flexible Closure Strips: Vulcanized, closed-cell, synthetic rubber.

E. Miscellaneous Sheet Metal Deck Accessories: Steel sheet, minimum yield strength of 33,000 psi (230 MPa), not less than 0.0359-inch (0.91-mm) design uncoated thickness, of same material and finish as deck; of profile indicated or required for application.

F. Pour Stops and Girder Fillers: Steel sheet, minimum yield strength of 33,000 psi (230 MPa), of same material and finish as deck, and of thickness and profile recommended by SDI Publication No. 30 for overhang and slab depth.

G. Column Closures, End Closures, Z-Closures, and Cover Plates: Steel sheet, of same material, finish, and thickness as deck, unless otherwise indicated.

H. Recessed Sump Pans: Single-piece steel sheet, 0.0747 inch (1.90 mm) thick, of same material and finish as deck, with 3-inch- (76-mm-) wide flanges and [level] [sloped] recessed pans of 1-1/2-inch (38-mm) minimum depth. For drains, cut holes in the field.

I. Flat Sump Plate: Single-piece steel sheet, 0.0747 inch (1.90 mm) thick, of same material and finish as deck. For drains, cut holes in the field.

J. Galvanizing Repair Paint: SSPC-Paint 20 or DOD-P-21035, with dry film containing a minimum of 94 percent zinc dust by weight.

K. Repair Paint: Manufacturer's standard rust-inhibitive primer of same color as primer.

L. Acoustical elements shall be factory installed above the perforated holes in the bottom flat area between the dovetail-shaped ribs to provide NRC rating of 1.00. To facilitate field painting of the perforated surfaces, the sound absorbing elements shall be supported above the surface. Sound absorbing elements and spacers shall be furnished under the specification section for installation by the roofing contractor.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine supporting frame and field conditions for compliance with requirements for installation tolerances and other conditions affecting performance.

B. All components of the ER3.5A Acoustical Roof Deck Ceiling System shall be protected from significant damage during shipment and handling. If storage at the jobsite is required, bundles or packages of these materials shall be elevated above the ground, sloped to provide drainage, and protected from the elements with a ventilated waterproof covering.

3.2 INSTALLATION, GENERAL

A. Install deck panels and accessories according to applicable specifications and commentary in SDI Publication No. 30, manufacturer's written instructions, and requirements in this Section.

B. Install temporary shoring before placing deck panels, if required to meet deflection limitations.

C. Locate deck bundles to prevent overloading of supporting members.

D. Place deck panels on supporting frame and adjust to final position with ends accurately aligned and bearing on supporting frame before being permanently fastened. Do not stretch or contract side-lap interlocks.

1. Align cellular deck panels over full length of cell runs and align cells at ends of abutting panels.

E. Place deck panels flat and square and fasten to supporting frame without warp or deflection.

F. Cut and neatly fit deck panels and accessories around openings and other work projecting through or adjacent to deck.

G. Provide additional reinforcement and closure pieces at openings as required for strength, continuity of deck, and support of other work.

H. Comply with AWS requirements and procedures for manual shielded metal arc welding, appearance and quality of welds, and methods used for correcting welding work.

I. Mechanical fasteners may be used in lieu of welding to fasten deck. Locate mechanical fasteners and install according to deck manufacturer's written instructions.

3.3 ROOF-DECK INSTALLATION

A. Fasten roof-deck panels to steel supporting members by pneumatic fasteners, and as follows:

1. Fastener: HILTI X-ENP-19-L15 or equal.
2. Fastener Spacing: Fasteners edge and interior ribs of deck units with a minimum of two fasteners per deck unit at each support. Space fasteners as indicated on drawing S6-03.

B. Side-Lap and Perimeter Edge Fastening: Fasten side laps and perimeter edges of panels between supports, at intervals not exceeding the lesser of 1/2 of the span or 18 inches, and as follows:

1. Mechanically fasten with self-drilling, No. 10 diameter or larger, carbon-steel screws.

C. End Bearing: Install deck ends over supporting frame with a minimum end bearing of 1-1/2 inches (38 mm), with end joints as follows:

1. End Joints: Lapped 2 inches minimum

D. Roof Sump Pans and Sump Plates: Install over openings provided in roof deck and mechanically fasten flanges to top of deck. Space mechanical fasteners not more than 12 inches (305 mm) apart with at least one fastener at each corner.

1. Install reinforcing channels or zees in ribs to span between supports and mechanically fasten.

E. Miscellaneous Roof-Deck Accessories: Install ridge and valley plates, finish strips, end closures, and reinforcing channels according to deck manufacturer's written instructions. mechanically fasten to substrate to provide a complete deck installation.

1. Weld cover plates at changes in direction of roof-deck panels, unless otherwise indicated.

F. Flexible Closure Strips: Install flexible closure strips over partitions, walls, and where indicated. Install with adhesive according to manufacturer's written instructions to ensure complete closure.

G. Sound-Absorbing Insulation: Installation into topside ribs of deck as specified by manufacturer.

3.4 FLOOR-DECK INSTALLATION

A. Fasten floor-deck panels to steel supporting members by arc spot (puddle) welds of the surface diameter indicated and as follows:

1. Weld Diameter: 5/8 inch, nominal.
2. Weld Spacing: Weld edge ribs of panels at each support. Space additional welds an average of 12 inches (305 mm) apart, but not more than 18 inches (457 mm) apart.
3. Weld Spacing: Space and locate welds as indicated.
4. Weld Washers: Install weld washers at each weld location.

B. Side-Lap and Perimeter Edge Fastening: Fasten side laps and perimeter edges of panels between supports, at intervals not exceeding the lesser of half of the span or 36 inches (910 mm), and as follows:

1. Mechanically fasten with self-drilling, No. 10 diameter or larger, carbon-steel screws.
2. Mechanically clinch or button punch.
3. Fasten with a minimum of 1-1/2-inch long welds.

C. End Bearing: Install deck ends over supporting frame with a minimum end bearing of 1-1/2 inches, with end joints as follows:

1. End Joints: Lapped or butted at Contractor's option.

D. Pour Stops and Girder Fillers: Weld steel sheet pour stops and girder fillers to supporting structure according to SDI recommendations, unless otherwise indicated.

E. Floor-Deck Closures: Weld steel sheet column closures, cell closures, and Z-closures to deck, according to SDI recommendations, to provide tight-fitting closures at open ends of ribs and sides of deck.

F. Install piercing hanger tabs at 14 inches apart in both directions, within 9 inches of walls at ends, and not more than 12 inches from walls at sides, unless otherwise indicated.

3.5 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.

B. Field welds will be subject to inspection.

C. Testing agency will report inspection results promptly and in writing to Contractor and Architect.

D. Remove and replace work that does not comply with specified requirements.

E. Additional inspecting, at Contractor's expense, will be performed to determine compliance of corrected work with specified requirements.

3.7 REPAIRS AND PROTECTION

A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on both surfaces of deck with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.

B. Provide final protection and maintain conditions to ensure that steel deck is without damage or deterioration at time of Substantial Completion.

C. Construction loads that could damage the ER3.5A Acoustical Roof Deck such as heavy concentrated loads and impact loads shall be avoided. Planking shall be used in all high traffic areas.

D. Galvanized coatings that are significantly damaged shall be repaired. Appropriate galvanized repair paint shall be used, and the paint manufacturer’s application instructions shall be followed.

END OF SECTION 053100

SECTION 054000 - COLD-FORMED METAL FRAMING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 CT HIGH PERFORMANCE BUILDING REQUIREMENTS

A. Products containing materials with recycled content will be documented in accordance with the procedure outlined in the Project Documents.

B. Products containing materials manufactured and extracted, harvested or recovered within 500 miles will be documented in accordance with the procedure outlined in the Project Documents.

C. Metal fabrications (and/or steel/metal deck, steel tubing, framing, metal stairs, etc.) shall contain a minimum of 35% (combined) pre-consumer/post-consumer recycled content

1.3 SUMMARY

A. This Section includes the following:

1. Interior and exterior load-bearing wall framing.

2. Exterior non-load-bearing wall framing.

B. Related Sections include the following:

1. Division 09 Section "Non-Structural Metal Framing" for interior non-load-bearing, metal-stud framing and ceiling-suspension assemblies.
2. Division 09 Section "Gypsum Board Shaft Wall Assemblies" for interior non-load-bearing, metal-stud-framed, shaft-wall assemblies.

1.4 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide cold-formed metal framing capable of withstanding design loads within limits and under conditions indicated.

1. Design Loads: As follows:

a. Wind Loads: Per ASCE 7-16.

2. Deflection Limits: Design framing systems to withstand design loads without deflections greater than the following:

a. Exterior Load and Non-Load-Bearing Framing: Horizontal deflection of 1/600 of the wall height when backing up masonry veneer and 1/360 for all other exterior products.

3. Design framing systems to provide for movement of framing members without damage or overstressing, sheathing failure, connection failure, undue strain on fasteners and

anchors, or other detrimental effects when subject to a maximum ambient temperature change of 120 deg F.

4. Design framing system to maintain clearances at openings, to allow for construction tolerances, and to accommodate live load deflection of primary building structure as follows:

   a. Upward and downward movement of 1 inch.

B. Cold-Formed Steel Framing, General: Design according to AISI's "Standard for Cold-Formed Steel Framing - General Provisions."

1. Headers: Design according to AISI's "Standard for Cold-Formed Steel Framing - Header Design."
2. Design exterior non-load-bearing wall framing to accommodate horizontal deflection without regard for contribution of sheathing materials.

1.5 SUBMITTALS

A. Product Data: For each type of cold-formed metal framing product and accessory indicated.

B. Shop Drawings: Show layout, spacings, sizes, thickness, and types of cold-formed metal framing; fabrication; and fastening and anchorage details, including mechanical fasteners. Show reinforcing channels, opening framing, supplemental framing, strapping, bracing, bridging, splices, accessories, connection details, and attachment to adjoining work.

1. For cold-formed metal framing indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

C. Qualification Data: For professional engineer.

D. Product Test Reports: From a qualified testing agency, unless otherwise stated, indicating that each of the following complies with requirements, based on evaluation of comprehensive tests for current products:

1. Steel sheet.
2. Expansion anchors.
3. Power-actuated anchors.
4. Mechanical fasteners.
5. Vertical deflection clips.
6. Horizontal drift deflection clips
7. Miscellaneous structural clips and accessories.

E. Research/Evaluation Reports: For cold-formed metal framing.

F. The following is the definitions for the Shop Drawing stamp disposition:

No Exceptions Taken - Re-submission is not required unless document is revised.

Make Corrections Noted - If checked, fabrication may be undertaken. Contractor is responsible for making noted corrections. Re-submission of record copies are required.

Revise and Resubmit - If checked, fabrication may not be undertaken. Resubmit corrected copies for final review, with all changes clouded.

Rejected - Resubmit for review.

Corrections or comments made on shop drawings during this review do not relieve the Contractor from compliance with the requirements of the project drawings and specifications. This check is only for the review of general conformance with the information given in the Contract Documents. The Contractor is responsible for confirming and correlating all quantities and dimensions, selecting fabrication processes, techniques and sequence of construction, coordinating his work with that of other trades, and performing his work in accordance with OSHA requirements and other sections of the Project Specifications.

1.6 QUALITY ASSURANCE

A. Engineering Responsibility: Preparation of Shop Drawings, design calculations, and other structural data by a qualified professional engineer.

B. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of cold-formed metal framing that are similar to those indicated for this Project in material, design, and extent.

C. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, qualified according to ASTM E 329 to conduct the testing indicated.

D. Product Tests: Mill certificates or data from a qualified independent testing agency indicating steel sheet complies with requirements, including base-metal thickness, yield strength, tensile strength, total elongation, chemical requirements, and metallic-coating thickness.

E. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code--Steel," and AWS D1.3, "Structural Welding Code--Sheet Steel."

F. Fire-Test-Response Characteristics: Where indicated, provide cold-formed metal framing identical to that of assemblies tested for fire resistance per ASTM E 119 by a testing and inspecting agency acceptable to authorities having jurisdiction.

G. AISI Specifications and Standards: Comply with AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members" and its "Standard for Cold-Formed Steel Framing - General Provisions."

1. Comply with AISI's "Standard for Cold-Formed Steel Framing - Header Design."

1.7 DELIVERY, STORAGE, AND HANDLING

A. Protect cold-formed metal framing from corrosion, deformation, and other damage during delivery, storage, and handling.

B. Store cold-formed metal framing, protect with a waterproof covering, and ventilate to avoid condensation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering cold-formed metal framing that may be incorporated into the Work include, but are not limited to, the following:

B. Manufacturers: Subject to compliance with requirements, provide cold-formed metal framing by one of the following:

1. Clark Steel Framing.
2. Dietrich Metal Framing; a Worthington Industries Company.
3. Innovative Steel Systems.
4. MarinoWare; a division of Ware Industries.

2.2 MATERIALS

A. Recycled Content of Steel Products: Provide products with an average recycled content of steel products so postconsumer recycled content plus one-half of preconsumer recycled content is not less than 25 percent.

B. Steel Sheet: ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated, of grade and coating weight as follows:

1. Grade: As required by structural performance.
2. Coating: G60.

C. Steel Sheet for Vertical Deflection Clips: ASTM A 653/A 653M, structural steel, zinc coated, of grade and coating as follows:

1. Grade: As required by structural performance.
2. Coating: G60.

2.3 EXTERIOR NON-LOAD-BEARING WALL FRAMING

A. Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges, and as follows:

1. Minimum Base-Metal Thickness: 0.0428 inch.
2. Flange Width: 1-5/8 inches.

B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with unstiffened flanges, and as follows:

1. Minimum Base-Metal Thickness: Matching steel studs.
2. Flange Width: 1-1/4 inches.

C. Vertical Deflection Clips: Manufacturer's standard bypass or head clips, capable of accommodating upward and downward vertical displacement of primary structure through positive mechanical attachment to stud web.

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Dietrich Metal Framing; a Worthington Industries Company.
    b. MarinoWare, a division of Ware Industries.
    c. SCAFCO Corporation
    d. The Steel Network, Inc.

D. Single Deflection Track: Manufacturer's single, deep-leg, U-shaped steel track; unpunched, with unstiffened flanges, of web depth to contain studs while allowing free vertical movement, with flanges designed to support horizontal and lateral loads and transfer them to the primary structure, and as follows:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Minimum Base-Metal Thickness: 0.0428 inch.
3. Flange Width: Allow for vertical deflection of 1”.

E. Drift Clips: Manufacturer's standard bypass or head clips, capable of isolating wall stud from upward and downward vertical displacement and lateral drift of primary structure.

2.4 FRAMING ACCESSORIES

A. Fabricate steel-framing accessories from steel sheet, ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated, of same grade and coating weight used for framing members.

B. Provide accessories of manufacturer's standard thickness and configuration, unless otherwise indicated, as follows:

1. Supplementary framing.
2. Bracing, bridging, and solid blocking.
3. Web stiffeners.
4. Anchor clips.
5. End clips.
6. Foundation clips.
7. Gusset plates.
8. Stud kickers, knee braces, and girts.
9. Joist hangers and end closures.
10. Hole reinforcing plates.
11. Backer plates.

2.5 ANCHORS, CLIPS, AND FASTENERS

A. Steel Shapes and Clips: ASTM A 36/A 36M, zinc coated by hot-dip process according to ASTM A 123/A 123M.

B. Anchor Bolts: ASTM F 1554, Grade 36, threaded carbon-steel hex-headed bolts headless bolts, and carbon-steel nuts; and flat, hardened-steel washers; zinc coated C.

C. Expansion Anchors: Fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 5 times design load, as determined by testing per ASTM E 488 conducted by a qualified independent testing agency.

D. Power-Actuated Anchors: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 10 times design load, as determined by testing per ASTM E 1190 conducted by a qualified independent testing agency.

E. Mechanical Fasteners: ASTM C 1513, corrosion-resistant-coated, self-drilling, self-tapping steel drill screws.

1. Head Type: Low-profile head beneath sheathing, manufacturer's standard elsewhere.

F. Welding Electrodes: Comply with AWS standards.

2.6 MISCELLANEOUS MATERIALS

A. Shims: Load bearing, high-density multi-monomer plastic, non-leaching.

B. Sealer Gaskets: Closed-cell neoprene foam, 1/4-inch-thick, selected from manufacturer's standard widths to match width of bottom track or rim track members.

2.7 FABRICATION

A. Fabricate cold-formed metal framing and accessories plumb, square, and true to line, and with connections securely fastened, according to referenced AISI's specifications and standards, manufacturer's written instructions, and requirements in this Section.

1. Fabricate framing assemblies using jigs or templates.
2. Cut framing members by sawing or shearing; do not torch cut.
3. Fasten cold-formed metal framing members by welding, screw fastening, clinch fastening, or riveting as standard with fabricator. Wire tying of framing members is not permitted.

a. Comply with AWS D1.3 requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
b. Locate mechanical fasteners and install according to Shop Drawings, with screw penetrating joined members by not less than three exposed screw threads.

4. Fasten other materials to cold-formed metal framing by welding, bolting, or screw fastening, according to Shop Drawings.

B. Reinforce, stiffen, and brace framing assemblies to withstand handling, delivery, and erection stresses. Lift fabricated assemblies to prevent damage or permanent distortion.

C. Fabrication Tolerances: Fabricate assemblies level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet and as follows:

1. Spacing: Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.
2. Squareness: Fabricate each cold-formed metal framing assembly to a maximum out-of-square tolerance of 1/8 inch.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine supporting substrates and abutting structural framing for compliance with requirements for installation tolerances and other conditions affecting performance.

1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Install sealer gaskets to isolate the underside of wall bottom track or rim track and the top of foundation wall or slab at stud or joist locations.

3.3 INSTALLATION, GENERAL

A. Cold-formed metal framing may be shop or field fabricated for installation, or it may be field assembled.

B. Install cold-formed metal framing according to AISI's "Standard for Cold-Formed Steel Framing - General Provisions" and to manufacturer's written instructions unless more stringent requirements are indicated.

C. Install shop- or field-fabricated, cold-formed framing and securely anchor to supporting structure.

1. Screw, bolt, or weld wall panels at horizontal and vertical junctures to produce flush, even, true-to-line joints with maximum variation in plane and true position between fabricated panels not exceeding 1/16 inch.

D. Install cold-formed metal framing and accessories plumb, square, and true to line, and with connections securely fastened.

1. Cut framing members by sawing or shearing; do not torch cut.
2. Fasten cold-formed metal framing members by welding, screw fastening, clinch fastening, or riveting. Wire tying of framing members is not permitted.

a. Comply with AWS D1.3 requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
b. Locate mechanical fasteners and install according to Shop Drawings, and complying with requirements for spacing, edge distances, and screw penetration.

E. Install framing members in one-piece lengths unless splice connections are indicated for track or tension members.

F. Install temporary bracing and supports to secure framing and support loads comparable in intensity to those for which structure was designed. Maintain braces and supports in place, undisturbed, until entire integrated supporting structure has been completed and permanent connections to framing are secured.

G. Do not bridge building expansion and control joints with cold-formed metal framing. Independently frame both sides of joints.

H. Install insulation, specified in Division 07 Section "Thermal Insulation," in built-up exterior framing members, such as headers, sills, boxed joists, and multiple studs at openings, that are inaccessible on completion of framing work.

I. Fasten hole-reinforcing plate over web penetrations that exceed size of manufacturer's standard punched openings.

J. Erection Tolerances: Install cold-formed metal framing level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet and as follows:

1. Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.

3.4 EXTERIOR NON-LOAD-BEARING WALL INSTALLATION

A. Install continuous tracks sized to match studs. Align tracks accurately and securely anchor to supporting structure as indicated.

B. Fasten both flanges of studs to top and bottom track, unless otherwise indicated. Space studs as follows:

1. Stud Spacing: As indicated on the shop drawings.

C. Set studs plumb, except as needed for diagonal bracing or required for nonplumb walls or warped surfaces and similar requirements.

D. Isolate non-load-bearing steel framing from building structure to prevent transfer of vertical loads while providing lateral support.

1. Install single-leg deflection tracks and anchor to building structure.
2. Install double deep-leg deflection tracks and anchor outer track to building structure.
3. Connect vertical deflection clips to studs and anchor to building structure.
4. Connect drift clips to cold formed metal framing and anchor to building structure.

E. Install horizontal bridging in wall studs, spaced in rows indicated on Shop Drawings but not more than 48 inches apart. Fasten at each stud intersection.

1. Top Bridging for Single Deflection Track: Install row of horizontal bridging within 12 inches of single deflection track. Install a combination of flat, taut, steel sheet straps of width and thickness indicated and stud or stud-track solid blocking of width and thickness matching studs. Fasten flat straps to stud flanges and secure solid blocking to stud webs or flanges.

a. Install solid blocking at centers indicated on Shop Drawings.

2. Bridging: Combination of flat, taut, steel sheet straps of width and thickness indicated and stud-track solid blocking of width and thickness to match studs. Fasten flat straps to stud flanges and secure solid blocking to stud webs or flanges.
3. Bridging: Proprietary-bridging bars installed according to manufacturer's written instructions.

F. Install miscellaneous framing and connections, including stud kickers, web stiffeners, clip angles, continuous angles, anchors, fasteners, and stud girts, to provide a complete and stable wall-framing system.

3.5 FIELD QUALITY CONTROL

A. Testing: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.

B. Field and shop welds will be subject to testing and inspecting.

C. Testing agency will report test results promptly and in writing to Contractor and Architect.

D. Remove and replace work where test results indicate that it does not comply with specified requirements.

E. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.6 REPAIRS AND PROTECTION

A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on fabricated and installed cold-formed metal framing with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.

B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer that ensure that cold-formed metal framing is without damage or deterioration at time of Substantial Completion.

END OF SECTION 054000

SECTION 055000 - METAL FABRICATIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Steel framing and supports for mechanical and electrical equipment.
2. Steel framing and supports for applications where framing and supports are not specified in other Sections.
3. Shelf angles.

B. Products furnished, but not installed, under this Section include the following:

1. Loose steel lintels.
2. Anchor bolts, steel pipe sleeves, slotted-channel inserts, and wedge-type inserts indicated to be cast into concrete or built into unit masonry.

C. Related Requirements:

1. Section 042000 "Unit Masonry" for installing loose lintels, anchor bolts, and other items built into unit masonry.

1.3 COORDINATION

A. Coordinate installation of metal fabrications that are anchored to or that receive other work. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

1.4 ACTION SUBMITTALS

A. Product Data: For the following:

1. Fasteners.

B. Shop Drawings: Show fabrication and installation details. Include plans, elevations, sections, and details of metal fabrications and their connection. Show anchorage and accessory items.

C. Provide Shop Drawings for the following:

1. Steel framing and supports for mechanical and electrical equipment.
2. Steel framing and supports for applications where framing and supports are not specified in other Sections.
3. Shelf angles.
4. Loose steel lintels.

1.5 INFORMATIONAL SUBMITTALS

A. Welding certificates.

B. Research Reports: For post-installed anchors.

1.6 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel in accordance with the following:

1. AWS D1.1, "Structural Welding Code - Steel."

1.7 FIELD CONDITIONS

A. Field Measurements: Verify actual locations of walls, floor slabs, decks, and other construction contiguous with metal fabrications by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on exterior metal fabrications by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects.

1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

2.2 METALS

A. Metal Surfaces, General: Provide materials with smooth, flat surfaces unless otherwise indicated. For metal fabrications exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.

B. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of pre-consumer recycled content not less than twenty percent (20%).

C. Steel Plates, Shapes, and Bars: ASTM A 36.

2.3 FASTENERS

A. General: Unless otherwise indicated, provide Type 304 stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B633 or ASTM F 1941, Class Fe/Zn 5, at exterior walls. Select fasteners for type, grade, and class required.

B. Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A 307, Grade A; with hex nuts, ASTM A 563; and, where indicated, flat washers.

C. High-Strength Bolts, Nuts, and Washers: ASTM F 3125, Grade A325, Type 3, heavy-hex steel structural bolts; ASTM A 563, Grade DH3, heavy-hex carbon-steel nuts; and where indicated, flat washers.

D. Stainless-Steel Bolts and Nuts: Regular hexagon-head annealed stainless-steel bolts, ASTM F 593; with hex nuts, ASTM F 594; and, where indicated, flat washers; Alloy Group 1.

E. Anchor Bolts: ASTM F1554, Grade 36, of dimensions indicated; with nuts, ASTM A 563; and, where indicated, flat washers.

1. Hot-dip galvanize or provide mechanically deposited, zinc coating where item being fastened is indicated to be galvanized.

F. Anchors, General: Capable of sustaining, without failure, a load equal to six (6) times the load imposed when installed in unit masonry and four (4) times the load imposed when installed in concrete, as determined by testing in accordance with ASTM E 488, conducted by a qualified independent testing agency.

G. Post-Installed Anchors: Torque-controlled expansion anchors.

1. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5, unless otherwise indicated.
2. Material for Exterior Locations and Where Stainless-Steel Is Indicated: Alloy Group 1 stainless-steel bolts, ASTM F 593, and nuts, ASTM F 594.

2.4 MISCELLANEOUS MATERIALS

A. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.

2.5 FABRICATION, GENERAL

A. Shop Assembly: Preassemble items in the shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.

B. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32-inch unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.

C. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

D. Form exposed work with accurate angles and surfaces and straight edges.

E. Weld corners and seams continuously to comply with the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

F. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners or welds where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) fasteners unless otherwise indicated. Locate joints where least conspicuous.

G. Fabricate seams and other connections that are exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.

H. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.

I. Provide for anchorage of type indicated, coordinate with supporting structure. Space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.

J. Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded steel strap anchors, 1/8 by 1½ inches, with a minimum 6-inch embedment and 2-inch hook, not less than 8 inches from ends and corners of units and 24 inches o.c., unless otherwise indicated.

2.6 MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Provide steel framing and supports not specified in other Sections as needed to complete the Work.

B. Fabricate units from steel shapes, plates, and bars of welded construction unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction.

C. Galvanize and prime miscellaneous steel framing and supports where indicated.

2.7 SHELF ANGLES

A. Fabricate shelf angles from steel angles of sizes indicated and for attachment to concrete framing. Provide horizontally slotted holes to receive ¾-inch bolts, spaced not more than 6 inches from ends and 24 inches o.c., unless otherwise indicated.

1. Provide mitered and welded units at corners.
2. Provide open joints in shelf angles at expansion and control joints. Make open joint approximately 2 inches larger than expansion or control joint.

B. For cavity walls, provide vertical channel brackets to support angles from backup masonry and concrete.

C. Galvanize shelf angles located in exterior walls.

2.8 LOOSE STEEL LINTELS

A. Fabricate loose steel lintels from steel angles and shapes of size indicated for openings and recesses in masonry walls and partitions at locations indicated. Fabricate in single lengths for each opening unless otherwise indicated. Weld adjoining members together to form a single unit where indicated.

B. Size loose lintels to provide bearing length at each side of openings equal to 1/12 of clear span, but not less than 8 inches unless otherwise indicated.

C. Galvanize and prime loose steel lintels.

2.9 GENERAL FINISH REQUIREMENTS

A. Finish metal fabrications after assembly.

B. Finish exposed surfaces to remove tool and die marks and stretch lines, and to blend into surrounding surface.

2.10 STEEL AND IRON FINISHES

A. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A 153 for steel and iron hardware and with ASTM A 123 for other steel and iron products.

1. Do not quench or apply post galvanizing treatments that might interfere with paint adhesion.

B. Preparation for Shop Priming Galvanized Items: After galvanizing, thoroughly clean galvanized surfaces of grease, dirt, oil, flux, and other foreign matter, and treat with metallic phosphate process.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.

B. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.

C. Field Welding: Comply with the following requirements:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

D. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction. Provide threaded fasteners for use with concrete and masonry inserts, toggle bolts, through bolts, lag screws, wood screws, and other connectors.

E. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.

3.2 INSTALLATION OF MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Install framing and supports to comply with requirements of items being supported, including manufacturers' written instructions and requirements indicated on Shop Drawings.

3.3 REPAIRS

A. Touchup Painting:

1. Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Division 09 sections.

B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

END OF SECTION 055000

SECTION 055200 – METAL RAILINGS

PART 1- GENERAL

1.1 GENERAL

A. Section Includes:

1. Furnishing and installing steel pipe hand-railings at stairs.

1.2 REFERENCE STANDARDS

A. Reference herein to any technical society, organization, group or regulation are made in accordance with the following abbreviations and, unless otherwise noted or specified, all work under this Section shall conform to the latest edition as applicable.

B. Code of Federal Regulations (CFR).

1. 29 CFR 1926, Safety and Health Regulations for Construction.

C. American Society for Testing and Materials (ASTM).

1. ASTM A36 - Specification for Structural Steel.
2. ASTM A 53 - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
3. ASTM A53 - Specification for Pipe, Steel, Black and Hot-Dipped, Zinc Coated, Welded and Seamless.
4. ASTM A123 - Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
5. ASTM A143 - Recommended Practice for Safeguarding Against Embrittlement of Hot-Dip Galvanized Structural Steel Products and Procedure for Detecting Embrittlement.
6. ASTM A153 - Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
7. ASTM A269 - Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service.
8. ASTM A307 - Specification for Carbon Steel Bolts and Studs, 60,000 psi Tensile.
9. ASTM A384 Practice for Safeguarding Against Warpage and Distortion During Hot-Dip Galvanizing of Steel Assemblies.
10. ASTM A385 - Practice for Providing High-Quality Zinc Coatings (Hot-Dip).
11. ASTM A449 - Specification for Quenched and Tempered Steel Bolts and Studs.
12. ASTM A563 - Specification for Carbon and Alloy Steel Nuts.
13. ASTM A780 - Practice for Repair of Damaged Hot-Dip Galvanized Coatings.
14. ASTM D1640 - Standard Test Methods for Drying, Curing, or Film Formation of Organic Coatings at Room Temperature.
15. ASTM D2092 - Practices for Preparation of Zinc-Coated Galvanized Steel Surfaces for Paint.

D. National Association of Architectural Metal Manufacturers (NAAMM).

1. “Pipe Railing Manual, Including Round Tube"

E. Submittals

F. Shop Drawings

1. Submit shop drawings of metal handrails and railings, showing sizes, details of fabrication and construction, bends and radii, handrail brackets, locations of hardware, anchors, and accessories, and installation details. Shop Drawings shall be submitted to Engineer for approval prior to ordering materials.

2. Submit manufacturers' product data of railing system and railing components, handrails, and handrail brackets. Include corrosion-inhibitive shop coat painting system.

G. Product data for primer and paint demonstration compliance with these specifications.

1.3 HIGH PERFORMANCE BUILDING GENERAL REQUIREMENTS

A. Implement practices and procedures to meet the project's environmental goals, which include complying with Connecticut Standard Guidelines Compliance Manual for High Performance Buildings, September 2011 with additional mandatory building project requirements for schools. Specific project goals which may impact this and the other sections of this specification include: use of recycled-content materials; use of locally-manufactured materials; use of low-emitting materials; use of certified wood products; construction waste recycling; and the implementation of a construction indoor air quality management plan. Ensure that the requirements related to these goals, as defined in this Section and other Sections of the contract documents, are implemented to the fullest extent. Substitutions or other changes to the work shall not be allowed if such changes substantially compromise the stated High Performance Building criteria.

B. Comply with Connecticut Standard Guidelines Compliance Manual for High Performance Buildings, September 2011 with additional mandatory building project requirements for schools and the Department of Administrative Services / Office of School Construction Grants & Review High Performance School Construction Bulletin, June 2017.

1.4 QUALITY ASSURANCE

A. Use adequate numbers of skilled workmen who are trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and methods required for proper performance of the work in this Section.

1.5 DELIVERY, STORAGE AND HANDLING

A. Supply: Railing materials must be supplied in consistent quality in appearance and physical properties.

B. Materials shall be wrapped or otherwise packaged for shipment and storage as appropriate.

C. Store materials to avoid damage from moisture, abrasion, and other construction activities.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Stainless Steel Handrails: ASTM A 269, stainless steel tube: 316, welded ornamental tubing - (1.5 inches O.D. for handrail).

B. Stainless Steel Fittings: 316 stainless steel. Stainless steel fittings shall be used in all applications where stainless-steel railings are called-for.

C. Stainless Steel Finishes

1. Stainless steel pipe and tubing: #6 polish.

2. Machined stainless steel fittings: # 8 polish.

2.2 FABRICATION

A. Metal handrails and railings shall be fabricated by firms or shops experienced and skilled in the custom fabrication of architectural metal handrails and railings and shall meet the quality requirements of NAAMM's Pipe Railing Manual.

B. Bends in rails shall be precision-formed to a smooth continuous radius by skilled workers. Work quality and finish shall be true to detail.

C. Joints

1. Steel welded connections shall be made in accordance with applicable requirements of the AWS Structural Welding Code. Welding shall be performed in the shop unless otherwise indicated. Welded joints of handrails and railings shall be ground and dressed smooth to match adjacent surfaces and so that the shape and profile of the item welded is maintained.
2. All mitered and welded corners shall be ground smooth to match finish.
3. Butt joints shall have internal pipe sleeve or dowel.
4. Ends shall be closed with similar materials, welded and ground smooth.

D. Metal handrails and railings shall be prefabricated and preassembled in the factory or shop as far as practicable.

PART 3 - EXECUTION

3.1 GENERAL

A. Install metal handrails and railings as indicated and in accordance with the approved Shop Drawings, using workers skilled and experienced in the installation of the type of work involved. Conform with installation requirements of NAAMM's Pipe Railing Manual, as applicable.

B. Install metal handrails and railings with accessories furnished by the railing fabricator as required for complete and finished railing installations. The rail elements shall be erected to produce a smooth, continuous rail.

C. Installation of handrails and railings shall be in accordance with approved Shop Drawings, true and horizontal, perpendicular, or at the required angle, as the case may be, level and square, with angles and edges parallel with related lines of the building or structure.

3.2 GALVANIZING REPAIR

A. Galvanized surfaces which have become damaged from welding, handling, installation, or stripping, shall be repaired immediately after installation with galvanizing repair material, ASTM A780.

3.3 CLEANING AND PAINTING

A. Prior to site surface preparation and coating applications, remove, mask, or otherwise protect, finished work, hardware, hardware accessories, and other such items not to be coated.

B. Restore surfaces contaminated by coating materials, to original condition and repair damaged items.

C. Removal of coatings: All surfaces of metal handrails and railings to be re-coated shall be stripped using chemical or abrasive blast methods approved by Engineer.

D. All surfaces of metal handrails and railings to be re-coated shall be thoroughly cleaned and treated to assure maximum paint adherence, prior to application of the shop prime coat.

E. Rust-inhibitive metal primer shall be applied in accordance with manufacturer’s instructions.

F. Final coatings shall be applied in accordance with manufacturer's instructions.

G. After installation of new railings, exposed painted surfaces, field welds, and other abraded or damaged primed surfaces shall be prepared as required and touched up with an additional coat of the same primers for ferrous and galvanized surfaces as used for shop painting.

H. Lightly sand and feather out damaged surfaces so that paint touch-up becomes invisible.

END OF SECTION 055200

SECTION 055213 - PIPE AND TUBE RAILINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Steel railings.

1.3 ACTION SUBMITTALS

A. Product Data:

1. Fasteners.
2. Post-installed anchors.
3. Handrail brackets.
4. Metal finishes.

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

C. Samples: For each type of exposed finish required.

1. Sections of each distinctly different linear railing member, including handrails, top rails, posts, and balusters.
2. Fittings and brackets.

D. Third-Party Review Submittal: For railings, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For third-party review engineer and testing agency.

B. Welding certificates.

C. Product Test Reports: For tests on railings performed by a qualified testing agency, in accordance with ASTM E 894 and ASTM E 935.

D. Research Reports: For post-installed anchors, from ICC-ES or other qualified testing agency acceptable to authorities having jurisdiction.

1.5 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.1, "Structural Welding Code - Steel."

1.6 FIELD CONDITIONS

A. Field Measurements: Verify actual locations of walls and other construction contiguous with railings by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Third-Party Review: Engage a qualified professional engineer to review load calculations of the stair and railing assemblies, including attachment to building construction.

B. Structural Performance: Railings, including attachment to building construction, shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:

1. Handrails and Top Rails of Guards:

a. Uniform load of 50 lbf/ ft. applied in any direction.
b. Concentrated load of 200 lbf applied in any direction.
c. Uniform and concentrated loads need not be assumed to act concurrently.

C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.

1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C, material surfaces).

2.2 METALS, GENERAL

A. Metal Surfaces, General: Provide materials with smooth surfaces, without seam marks, roller marks, rolled trade names, stains, discolorations, or blemishes.

B. Brackets, Flanges, and Anchors: Cast or formed metal of same type of material and finish as supported rails unless otherwise indicated.

2.3 STEEL RAILINGS

A. Pipe: ASTM A 53, Type F or Type S, Grade A, Standard Weight (Schedule 40), unless another grade and weight are required by structural loads.

1. Provide galvanized finish for exterior installations and where indicated.

B. Plates, Shapes, and Bars: ASTM A 36.

2.4 FASTENERS

A. Fastener Materials:

1. Hot-Dip Galvanized Railings: Type 304 stainless-steel or hot-dip zinc-coated steel fasteners complying with ASTM A 153 or ASTM F 2329 for zinc coating.
2. Finish exposed fasteners to match appearance, including color and texture, of railings.

B. Fasteners for Anchoring Railings to Other Construction: Select fasteners of type, grade, and class required to produce connections suitable for anchoring railings to other types of construction indicated and capable of withstanding design loads.

C. Fasteners for Interconnecting Railing Components:

1. Provide concealed fasteners for interconnecting railing components and for attaching them to other work, unless exposed fasteners are unavoidable or are the standard fastening method for railings indicated.
2. Provide Phillips tamper-resistant flat-head machine screws for exposed fasteners unless otherwise indicated.

D. Post-Installed Anchors: Fastener systems with working capacity greater than or equal to the design load, according to an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC193 or ICC-ES AC308.

1. Material for Interior Locations: Carbon-steel components zinc-plated to comply with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5, unless otherwise indicated.

2.5 MISCELLANEOUS MATERIALS

A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.

1. For railings, provide type and alloy as recommended by producer of metal to be welded and as required for color match, strength, and compatibility in fabricated items.

B. Etching Cleaner for Galvanized Metal: Complying with MPI#25.

C. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.

2.6 FABRICATION

A. General: Fabricate railings to comply with requirements indicated for design, dimensions, member sizes and spacing, details, finish, and anchorage, but not less than that required to support structural loads.

B. Shop assemble railings to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations.

1. Clearly mark units for reassembly and coordinated installation.
2. Use connections that maintain structural value of joined pieces.

C. Cut, drill, and punch metals cleanly and accurately.

1. Remove burrs and ease edges to a radius of approximately 1/32-inch unless otherwise indicated.
2. Remove sharp or rough areas on exposed surfaces.

D. Form work true to line and level with accurate angles and surfaces.

E. Fabricate connections that are exposed to weather in a manner that excludes water.

1. Provide weep holes where water may accumulate.

2. Locate weep holes in inconspicuous locations.

F. Cut, reinforce, drill, and tap as indicated to receive finish hardware, screws, and similar items.

G. Connections: Fabricate railings with welded connections unless otherwise indicated.

H. Welded Connections: Cope components at connections to provide close fit, or use fittings designed for this purpose. Weld all around at connections, including at fittings.

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove flux immediately.
4. At exposed connections, finish exposed welds to comply with NOMMA's "Voluntary Joint Finish Standards" for Finish #1 welds; ornamental quality with no evidence of a welded joint.

I. Form Changes in Direction as Follows:

1. As detailed.

J. Bend members in jigs to produce uniform curvature for each configuration required. Maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of components.

K. Close exposed ends of railing members with prefabricated cap and end fittings of same metal and finish as railings.

L. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, flanges, miscellaneous fittings, and anchors to interconnect railing members to other work unless otherwise indicated.

2.7 STEEL AND IRON FINISHES

A. Galvanized Railings:

1. Hot-dip galvanize exterior steel railings, including hardware, after fabrication.
2. Comply with ASTM A 123 for hot-dip galvanized railings.
3. Comply with ASTM A 153 for hot-dip galvanized hardware.
4. Fill vent and drain holes that are exposed in the finished Work, unless indicated to remain as weep holes, by plugging with zinc solder and filing off smooth.

B. For galvanized railings, provide hot-dip galvanized fittings, brackets, fasteners, sleeves, and other ferrous components.

C. Preparing Galvanized Railings for Shop Priming: After galvanizing, thoroughly clean railings of grease, dirt, oil, flux, and other foreign matter, and treat with etching cleaner.

1. Comply with SSPC-SP 16.

D. Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with SSPC-SP 3, "Power Tool Cleaning."

E. Primer and Shop-Painted Finish: Comply with Division 09 sections.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Perform cutting, drilling, and fitting required for installing railings.

1. Fit exposed connections together to form tight, hairline joints.
2. Install railings level, plumb, square, true to line; without distortion, warp, or rack.
3. Set railings accurately in location, alignment, and elevation; measured from established lines and levels.
4. Do not weld, cut, or abrade surfaces of railing components that are coated or finished after fabrication and that are intended for field connection by mechanical or other means without further cutting or fitting.
5. Align rails so variations from level for horizontal members and variations from parallel with rake of steps and ramps for sloping members do not exceed ¼-inch in 12 feet.

B. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.

C. Adjust railings before anchoring to ensure matching alignment at abutting joints.

D. Fastening to In-Place Construction: Use anchorage devices and fasteners where necessary for securing railings and for properly transferring loads to in-place construction.

3.2 RAILING CONNECTIONS

A. Welded Connections: Use fully welded joints for permanently connecting railing components. Comply with requirements for welded connections in "Fabrication" Article whether welding is performed in the shop or in the field.

B. Expansion Joints: Install expansion joints at locations indicated but not farther apart than required to accommodate thermal movement. Provide slip-joint internal sleeve extending 2 inches beyond joint on either side, fasten internal sleeve securely to one side, and locate joint within 6 inches of post.

3.3 ANCHORING POSTS

A. Anchor posts to metal surfaces with oval flanges, angle type, or floor type as required by conditions, connected to posts and to metal supporting members as follows:

1. For steel railings, weld flanges to post and bolt to metal supporting surfaces.

3.4 ATTACHING RAILINGS

A. Attach handrails with brackets. Provide brackets with 1½-inch clearance from inside face of handrail and finished surface.

1. Use type of bracket with predrilled hole for exposed bolt anchorage.
2. Locate brackets as indicated or, if not indicated, at spacing required to support structural loads.

3.5 CLEANING

A. Clean by washing thoroughly with clean water and soap and rinsing with clean water.

B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas, and repair galvanizing to comply with ASTM A 780.

3.6 PROTECTION

A. Protect finishes of railings from damage during construction period with temporary protective coverings approved by railing manufacturer. Remove protective coverings at time of Substantial Completion.

B. Restore finishes damaged during installation and construction period, so no evidence remains of correction work. Return items that cannot be refinished in the field to the shop; make required alterations and refinish entire unit, or provide new units.

END OF SECTION 055213

SECTION 061000 - ROUGH CARPENTRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Rooftop equipment bases and support curbs.
2. Wood blocking and nailers.
3. Plywood backing panels.

B. Related Requirements:

1. Section 061600 "Sheathing" for sheathing, subflooring, and underlayment.

1.3 DEFINITIONS

A. Boards or Strips: Lumber of less than 2 inches nominal size in least dimension.

B. Exposed Framing: Framing not concealed by other construction.

C. Dimension Lumber: Lumber of 2 inches nominal or greater but less than 5 inches nominal in least dimension.

D. Lumber grading agencies, and the abbreviations used to reference them, include the following:

1. NeLMA: Northeastern Lumber Manufacturers' Association.
2. SPIB: The Southern Pine Inspection Bureau.
3. NLGA: National Lumber Grades Authority.
4. WWPA: Western Wood Products Association.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.

1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained.
2. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Include physical properties of treated materials based on testing by a qualified independent testing agency.
3. For fire-retardant treatments, include physical properties of treated lumber both before and after exposure to elevated temperatures, based on testing by a qualified independent testing agency according to ASTM D 5664.

4. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.
5. Include copies of warranties from chemical treatment manufacturers for each type of treatment.

1.5 INFORMATIONAL SUBMITTALS

A. Material Certificates: For dimension lumber specified to comply with minimum allowable unit stresses. Indicate species and grade selected for each use and design values approved by the ALSC Board of Review.

B. Evaluation Reports: For the following, from ICC-ES:

1. Wood-preservative-treated wood.
2. Fire-retardant-treated wood.
3. Power-driven fasteners.
4. Powder-actuated fasteners.
5. Post-installed anchors.
6. Expansion anchors.

1.6 QUALITY ASSURANCE

A. Testing Agency Qualifications: For testing agency providing classification marking for fire-retardant treated material, an inspection agency acceptable to authorities having jurisdiction that periodically performs inspections to verify that the material bearing the classification marking is representative of the material tested.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Stack wood products flat with spacers beneath and between each bundle to provide air circulation. Protect lumber from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 WOOD PRODUCTS, GENERAL

A. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, provide lumber that complies with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Provide lumber graded by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.

1. Factory mark each piece of lumber with grade stamp of grading agency.
2. Where nominal sizes are indicated, provide actual sizes required by DOC PS 20 for moisture content specified. Where actual sizes are indicated, they are minimum dressed sizes for dry lumber.

B. Maximum Moisture Content of Lumber: Nineteen percent (19%) unless otherwise indicated.

2.2 WOOD-PRESERVATIVE-TREATED LUMBER

A. Preservative Treatment by Pressure Process: AWPA U1; Use Category UC2 for interior construction not in contact with the ground, Use Category UC3b for exterior construction not in contact with the ground, and Use Category UC4a for items in contact with the ground.

1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.
2. For exposed items indicated to receive a stained or natural finish, use chemical formulations that do not require incising, contain colorants, bleed through, or otherwise adversely affect finishes.

B. Kiln-dry lumber after treatment to a maximum moisture content of nineteen percent (19%). Do not use material that is warped or that does not comply with requirements for untreated material.

C. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.

D. Application: Treat items indicated on Drawings, and the following:

1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
2. Wood sills, sleepers, blocking, furring, stripping and similar concealed members in contact with masonry or concrete.

2.3 FIRE-RETARDANT-TREATED MATERIALS

A. General: Where fire-retardant-treated materials are indicated, materials shall comply with requirements in this article, that are acceptable to authorities having jurisdiction, and with fire-test-response characteristics specified as determined by testing identical products per test method indicated by a qualified testing agency.

B. Fire-Retardant-Treated Lumber and Plywood by Pressure Process: Products with a flame spread index of 25 or less when tested according to ASTM E 84, and with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet beyond the centerline of the burners at any time during the test.

1. Treatment shall not promote corrosion of metal fasteners.
2. Treated materials shall comply with requirements specified above for fire-retardant-treated lumber and plywood by pressure process after being subjected to accelerated weathering according to ASTM D 2898. Use for all locations and where indicated.
3. Design Value Adjustment Factors: Treated lumber shall be tested according ASTM D 5664 and design value adjustment factors shall be calculated according to ASTM D 6841. For enclosed roof framing, framing in attic spaces, and where high temperature fire-retardant treatment is indicated, provide material with adjustment factors of not less than 0.85 modulus of elasticity and 0.75 for extreme fiber in bending for Project's climatological zone.

C. Kiln-dry lumber and plywood after treatment to a maximum moisture content of fifteen percent (15%).

D. Identify fire-retardant-treated wood with appropriate classification marking of qualified testing agency.

E. Application: Treat **all** rough carpentry unless otherwise indicated. Treat plywood backing panels.

2.4 MISCELLANEOUS LUMBER

A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:

1. Blocking.
2. Nailers.

B. Dimension Lumber Items: Standard, Stud, or No. 3 grade lumber of any of the following species:

1. Hem-fir (north); NLGA.
2. Hem-fir; WCLIB or WWPA.
3. Spruce-pine-fir (south); NeLMA, WCLIB, or WWPA.

C. For blocking not used for attachment of other construction, Utility, Stud, or No. 3 grade lumber of any species may be used provided that it is cut and selected to eliminate defects that will interfere with its attachment and purpose.

D. For blocking and nailers used for attachment of other construction, select and cut lumber to eliminate knots and other defects that will interfere with attachment of other work.

2.5 PLYWOOD BACKING PANELS

A. Equipment Backing Panels: DOC PS 1, Exposure 1, C-D Plugged, fire-retardant treated, in thickness indicated or, if not indicated, not less than ¾-inch nominal thickness.

2.6 FASTENERS

A. General: Fasteners shall be of size and type indicated and shall comply with requirements specified in this article for material and manufacture.

1. Where rough carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity, provide fasteners of Type 304 stainless-steel.

B. Nails, Brads, and Staples: ASTM F 1667.

C. Power-Driven Fasteners: NES NER-272.

D. Wood Screws: ASME B18.6.1.

E. Lag Bolts: ASME B18.2.1

F. Bolts: Steel bolts complying with ASTM A 307, Grade A; with ASTM A 563 hex nuts and, where indicated, flat washers.

G. Post-Installed Anchors: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC01 or ICC-ES AC193 as appropriate for the substrate.

1. Material: Stainless-steel with bolts and nuts complying with ASTM F 593 and ASTM F 594, Alloy Group 1 or 2.

H. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to six (6) times the load imposed when installed in unit masonry assemblies and equal to four (4) times the load imposed when installed in concrete as

determined by testing per ASTM E 488 conducted by a qualified independent testing and inspecting agency.

1. Material: Carbon-steel components, zinc plated to comply with ASTM B 633, Class Fe/Zn 5.

2.7 MISCELLANEOUS MATERIALS

A. Flexible Flashing: Composite, self-adhesive, flashing product consisting of a pliable, rubberized-asphalt compound, bonded to a high-density polyethylene film, aluminum foil, or spunbonded polyolefin to produce an overall thickness of not less than 0.025-inch.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry to other construction; scribe and cope as needed for accurate fit. Locate nailers, blocking, and similar supports to comply with requirements for attaching other construction.

B. Install plywood backing panels by fastening to studs; coordinate locations with utilities requiring backing panels. Install fire-retardant treated plywood backing panels with classification marking of testing agency exposed to view.

C. Do not splice structural members between supports unless otherwise indicated.

D. Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim.

1. Provide metal clips for fastening gypsum board or lath at corners and intersections where framing or blocking does not provide a surface for fastening edges of panels. Space clips not more than 16 inches o.c.

E. Sort and select lumber so that natural characteristics will not interfere with installation or with fastening other materials to lumber. Do not use materials with defects that interfere with function of member or pieces that are too small to use with minimum number of joints or optimum joint arrangement.

F. Comply with AWPA M4 for applying field treatment to cut surfaces of preservative-treated lumber.

1. Use inorganic boron for items that are continuously protected from liquid water.
2. Use copper naphthenate for items not continuously protected from liquid water.

G. Where wood-preservative-treated lumber is installed adjacent to metal decking, install continuous flexible flashing separator between wood and metal decking.

H. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:

1. NES NER-272 for power-driven fasteners.
2. Table 2304.9.1, "Fastening Schedule," in ICC's International Building Code (IBC).
3. ICC-ES evaluation report for fastener.

I. Use steel common nails unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood. Drive nails snug but do not countersink nail heads unless otherwise indicated.

3.2 WOOD BLOCKING AND NAILER INSTALLATION

A. Install where indicated and where required for attaching other work. Form to shapes indicated and cut as required for true line and level of attached work. Coordinate locations with other work involved.

B. Attach items to substrates to support applied loading. Recess bolts and nuts flush with surfaces unless otherwise indicated.

END OF SECTION 061000

SECTION 061600 - SHEATHING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Wall sheathing.
2. Roof sheathing.

B. Related Requirements:

1. Section 061000 "Rough Carpentry" for plywood backing panels.
2. Section 072726 "Fluid-Applied Membrane Air Barriers" for air and vapor barrier applied over wall sheathing.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.

1. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated plywood complies with requirements. Include physical properties of treated materials.
2. For fire-retardant treatments, include physical properties of treated plywood both before and after exposure to elevated temperatures, based on testing by a qualified independent testing agency according to ASTM D 5516.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Test Reports: For each air-barrier and water-resistant glass-mat gypsum sheathing assembly, indicating compliance with specified requirements, for tests performed by a qualified testing agency.

C. Evaluation Reports: For following products, from ICC-ES:

1. Fire-retardant-treated plywood.

1.5 QUALITY ASSURANCE

A. Testing Agency Qualifications:

1. For testing agency providing classification marking for fire-retardant-treated material, an inspection agency acceptable to authorities having jurisdiction that periodically performs

inspections to verify that the material bearing the classification marking is representative of the material tested.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Stack panels flat with spacers beneath and between each bundle to provide air circulation. Protect sheathing from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Resistance Ratings: As tested according to ASTM E 119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Fire-Resistance Ratings: Indicated by design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency.

2.2 WOOD PANEL PRODUCTS

A. Thickness: As needed to comply with requirements specified, but not less than thickness indicated.

B. Factory mark panels to indicate compliance with applicable standard.

2.3 FIRE-RETARDANT-TREATED PLYWOOD

A. General: Where fire-retardant-treated materials are indicated, use materials complying with requirements in this article that are acceptable to authorities having jurisdiction and with fire-test-response characteristics specified as determined by testing identical products per test method indicated by a qualified testing agency.

B. Fire-Retardant-Treated Plywood by Pressure Process: Products with a flame-spread index of 25 or less when tested according to ASTM E 84, and with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet beyond the centerline of the burners at any time during the test.

1. Use treatment that does not promote corrosion of metal fasteners.
2. Treated materials shall comply with requirements specified above for fire-retardant-treated plywood by pressure process after being subjected to accelerated weathering according to ASTM D 2898. Use for exterior locations and where indicated.
3. Design Value Adjustment Factors: Treated lumber plywood shall be tested according to ASTM D 5516 and design value adjustment factors shall be calculated according to ASTM D 6305. Span ratings after treatment shall be not less than span ratings specified. For roof sheathing and where high-temperature fire-retardant treatment is indicated, span ratings for temperatures up to 170 deg F shall be not less than span ratings specified.

C. Kiln-dry material after treatment to maximum moisture content of fifteen percent (15%). Do not use material that is warped or does not comply with requirements for untreated material.

D. Identify fire-retardant-treated plywood with appropriate classification marking of qualified testing agency.

E. Application: Treat **all** plywood unless otherwise indicated.

2.4 WALL SHEATHING

A. Plywood Sheathing: DOC PS 1, C-D Grade, Exposure 1 sheathing.

1. Nominal Thickness: Not less than ½-inch unless otherwise indicated.

B. Glass-Mat Gypsum Wall Sheathing: ASTM C 1177.

1. Basis-of-Design:

a. Georgia-Pacific Gypsum LLC; **DensGlass Sheathing**

2. Manufacturers:

a. Certainteed Corporation
b. National Gypsum Company
c. United States Gypsum Company
d. Substitutions: Under provisions of Section 012500 “Substitution Procedures”.

3. Type and Thickness: Regular, ½-inch-thick, unless otherwise indicated.
4. Size: 48 by 96 inches for vertical installation.

2.5 ROOF SHEATHING

A. Plywood Roof Sheathing: DOC PS 1, Exposure 1 sheathing.

1. Nominal Thickness: Not less than 5/8-inch unless otherwise indicated.

2.6 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.

1. For roof and wall sheathing, provide fasteners of Type 304 stainless-steel.

B. Nails, Brads, and Staples: ASTM F 1667.

C. Power-Driven Fasteners: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.

D. Screws for Fastening Wood Structural Panels to Cold-Formed Metal Framing Insulating Concrete Forms: ASTM C 954, except with wafer heads and reamer wings, length as recommended by screw manufacturer for material being fastened.

E. Screws for Fastening Gypsum Sheathing to Cold-Formed Metal Framing: Steel drill screws, in length recommended by sheathing manufacturer for thickness of sheathing to be attached.

1. For steel framing less than 0.0329-inch-thick, use screws that comply with ASTM C 1002.
2. For steel framing from 0.033- to 0.112-inch thick, use screws that comply with ASTM C 954.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Do not use materials with defects that impair quality of sheathing or pieces that are too small to use with minimum number of joints or optimum joint arrangement. Arrange joints so that pieces do not span between fewer than three (3) support members.

B. Cut panels at penetrations, edges, and other obstructions of work; fit tightly against abutting construction unless otherwise indicated.

C. Securely attach to substrate by fastening as indicated, complying with the following:

1. Table 2304.9.1, "Fastening Schedule," in the ICC's International Building Code.
2. ICC-ES evaluation report for fastener.

D. Coordinate roof and wall sheathing installation with flashing and joint-sealant installation so these materials are installed in sequence and manner that prevent exterior moisture from passing through completed assembly.

E. Do not bridge building expansion joints; cut and space edges of panels to match spacing of structural support elements.

F. Coordinate sheathing installation with installation of materials installed over sheathing so sheathing is not exposed to precipitation or left exposed at end of the workday when rain is forecast.

3.2 WOOD STRUCTURAL PANEL INSTALLATION

A. General: Comply with applicable recommendations in APA Form No. E30, "Engineered Wood Construction Guide," for types of structural-use panels and applications indicated.

B. Fastening Methods: Fasten panels as indicated below:

1. Roof and Wall Sheathing:

a. Screw to cold-formed metal framing.
b. Space panels 1/8-inch apart at edges and ends.

3.3 GYPSUM SHEATHING INSTALLATION

A. Comply with GA-253 and with manufacturer's written instructions.

1. Fasten gypsum sheathing to cold-formed metal framing with screws.
2. Install panels with a 3/8-inch gap where non-load-bearing construction abuts structural elements.
3. Install panels with a ¼-inch gap where they abut masonry or similar materials that might retain moisture, to prevent wicking.

B. Apply fasteners so heads bear tightly against face of sheathing, but do not cut into facing.

C. Vertical Installation: Install vertical edges centered over studs. Abut ends and edges with those of adjacent boards. Attach at perimeter and within field of panel to each stud.

1. Space fasteners approximately 8 inches o.c. and set back a minimum of 3/8 inch from edges and ends of panels.

END OF SECTION 061600

SECTION 062013 - EXTERIOR FINISH CARPENTRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Exterior wood trim, brackets, planks, sills, jambs, siding, façade, soffit, etc.
2. Lumber soffits.
3. Exterior wood stairs and railings, including decking.

B. Related Requirements:

1. Section 012100 “Allowances” for work of this Section included in allowances.
2. Section 012200 “Unit Prices” for work of this Section included in unit prices.
3. Section 061000 "Rough Carpentry" for furring, blocking, and other carpentry work not exposed to view.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product. Indicate component materials, dimensions, profiles, textures, and colors and include construction and application details.

1. Include data on products, including manufacturer’s specification product sheet.

B. Submit shop drawings for products indicating dimensions, adjacent construction, materials, thicknesses, fabrication details, required clearances, field jointing, tolerances, colors, finishes, methods of support, and anchorages.

C. Samples: For each type of product involving selection of colors, profiles, or textures.

1.4 INFORMATIONAL SUBMITTALS

A. Compliance Certificates:

1. For lumber that is not marked with grade stamp.

B. Sample Warranties: For manufacturer's warranties.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Stack lumber, plywood, and other panels flat with spacers between each bundle to provide air circulation.

1. Protect materials from weather by covering with waterproof sheeting, securely anchored.
2. Provide for air circulation around stacks and under coverings.

B. Store and handle in strict compliance with manufacturer's written instructions and recommendations.

1.6 FIELD CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecast weather conditions permit work to be performed and at least one (1) coat of specified finish can be applied without exposure to rain, snow, or dampness.

B. Do not install finish carpentry materials that are wet, moisture damaged, or mold damaged.

1. Indications that materials are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
2. Indications that materials are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

A. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, comply with applicable rules of any rules-writing agency certified by the American Lumber Standard Committee's (ALSC) Board of Review. Grade lumber by an agency certified by the ALSC's Board of Review to inspect and grade lumber under the rules indicated.

1. Factory mark each piece of lumber with grade stamp of inspection agency, indicating grade, species, moisture content at time of surfacing, and mill.
2. For exposed lumber, mark grade stamp on end or back of each piece or omit grade stamp and provide certificates of grade compliance issued by inspection agency.

B. Softwood Plywood: DOC PS 1, marine-grade.

C. Hardboard: ANSI A135.4.

2.2 EXTERIOR TRIM, PANELS, AND MOLDINGS

A. Lumber Trim for Painted Finish:

1. Species and Grade: Western red cedar, Grade A and Better; NLGA, WCLIB, or WWPA, but to match existing.
2. Maximum Moisture Content: Fifteen percent (15%) with at least eighty-five percent (85%) of shipment at twelve percent (12%) or less.
3. Finger Jointing: Not allowed.
4. Face Surface: Surfaced (smooth).

B. Moldings for Opaque Finish (Painted Finish): MMPA WM 4, P-grade wood moldings, made from kiln-dried stock to patterns included in MMPA's "WM/Series Softwood Molding Patterns."

1. Species: Western red cedar, but to match existing.
2. Finger Jointing: Not allowed.
3. Factory Priming: Factory coated on both faces and all edges, with exterior primer compatible with topcoats specified.

2.3 LUMBER SIDING

A. Provide kiln-dried lumber siding complying with DOC PS 20.

B. Species and Grade: Western red cedar; NLGA, WCLIB, or WWPA Clear VG (Vertical Grain) Heart.

C. Pattern:

1. Clapboard (bevel) siding, S1S2E, to match existing in all characteristics.
2. Shiplap siding, ½-inch lap, sized as indicated on Drawings.

2.4 LUMBER SOFFITS

A. Provide kiln-dried lumber siding complying with DOC PS 20.

B. Species and Grade: Western red cedar; NLGA, WCLIB, or WWPA Grade A, but to match existing.

C. Pattern: Board size and thickness, to match existing.

2.5 EXTERIOR STAIRS AND RAILINGS

A. Stair Treads and Decking:

1. 1-inch actual thickness radius-edged S4S boards, with one (1) face free of planer skip, machine burn, and torn or chipped grain; tongue & groove where indicated on Drawings.

a. Species: Ipe.
b. Grade Characteristics:

1) Sound; small pin knots, worm holes, and fixed knots allowed.
2) No decay, incipient decay, honeycomb, knot holes, shakes, splits, or wane.
3) No discoloration.

B. Stair Risers: Same as treads.

C. Railing Members: Radius-edged Ipe S4S boards, same grade as stair treads.

D. Balusters: 1-1/16-inch-square, radius-edged Ipe S4S boards, same grade as stair treads.

E. Newel Posts: 2¾-inch-square, radius-edged Ipe S4S boards, same grade as stair treads.

2.6 MISCELLANEOUS MATERIALS

A. Fasteners for Exterior Finish Carpentry: Provide nails or screws, in sufficient length to penetrate not less than 1½ inches into substrate. Staples, small brads, and wire nails are not acceptable.

1. For face-fastening siding, provide ringed-shank siding nails or hot-dip galvanized-steel siding nails unless otherwise indicated.
2. For applications not otherwise indicated, provide stainless-steel fasteners.

B. Wood Glue: Waterproof resorcinol glue recommended by manufacturer for exterior carpentry use.

C. Flashing: Comply with requirements in Section 076200 "Sheet Metal Flashing and Trim" for flashing materials installed in exterior finish carpentry.

D. Insect Screening for Soffit Vents: Stainless-steel, 18-by-18-inch mesh.

E. Sealants: Latex, complying with ASTM C 834 Type OP, Grade NF and with applicable requirements in Section 079200 "Joint Sealants," recommended by sealant manufacturer and manufacturer of substrates for intended application.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. BASF Building Systems; **Sonolac**
b. Bostik, Inc.; **Chem-Calk 600**
c. Pecora Corporation; **AC-20+**
d. Tremco Incorporated; **Tremflex 834**
e. Substitutions: Under provisions of Section 012500 “Substitution Procedures”.

2.7 FABRICATION

A. Back out or kerf backs of standing and running trim wider than 5 inches, except members with ends exposed in finished work.

B. Ease edges of lumber less than 1-inch in nominal thickness to 1/16-inch radius and edges of lumber 1 inch or more in nominal thickness to 1/8-inch radius.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance.

B. Examine finish carpentry materials before installation. Reject materials that are wet, moisture damaged, and mold damaged.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean substrates of projections and substances detrimental to application.

B. Prime lumber and moldings to be painted, including both faces and edges, unless factory primed.

1. Cut to required lengths and prime ends.
2. Comply with requirements in Section 099113 "Exterior Painting."

3.3 INSTALLATION, GENERAL

A. Do not use materials that are unsound, warped, improperly treated or finished, inadequately seasoned, or too small to fabricate with proper jointing arrangements.

1. Do not use manufactured units with defective surfaces, sizes, or patterns.

B. Install exterior finish carpentry level, plumb, true, and aligned with adjacent materials.

1. Use concealed shims where necessary for alignment.
2. Scribe and cut exterior finish carpentry to fit adjoining work.
3. Refinish and seal cuts as recommended by manufacturer.
4. Install to tolerance of 1/8-inch in 96 inches for level and plumb. Install adjoining exterior finish carpentry with 1/32-inch maximum offset for flush installation and 1/16-inch maximum offset for reveal installation.
5. Coordinate exterior finish carpentry with materials and systems in or adjacent to it.
6. Provide cutouts for mechanical and electrical items that penetrate exterior finish carpentry.

3.4 INSTALLATION OF TRIM AND MOLDINGS

A. Install flat-grain lumber with bark side exposed to weather.

B. Install trim with minimum number of joints practical, using full-length pieces from maximum lengths of lumber available. Do not use pieces less than 24 inches long except where necessary.

1. Use scarf joints for end-to-end joints.
2. Stagger end joints in adjacent and related members.

C. Fit exterior joints to exclude water.

1. Cope at returns and miter at corners to produce tight-fitting joints with full-surface contact throughout length of joint.
2. Plane backs of casings to provide uniform thickness across joints, where necessary for alignment.

D. Where face fastening is unavoidable, countersink fasteners, fill surface flush, and sand unless otherwise indicated.

3.5 INSTALLATION OF SIDING

A. Install siding to comply with manufacturer's written instructions.

B. Horizontal Lumber Siding:

1. Install courses lapped 1-inch over course below.

a. Nail at each stud.
b. Do not allow nails to penetrate more than one (1) thickness of siding.

2. Leave 1/8-inch gap at trim and corners unless otherwise recommended by manufacturer, and apply sealant.
3. Butt joints only over framing or blocking, nailing top and bottom on each side and staggering joints in subsequent courses.

C. Finish: Apply finish within two (2) weeks of installation.

3.6 STAIR AND RAILING INSTALLATION

A. Treads and Risers:

1. Install stair tread with crown side up (bark side down).
2. Secure treads and risers by gluing and nailing to carriages.

    a. Extend treads over carriages and finish with bullnose edge.

3. Countersink nail heads, fill flush, and sand filler.

B. Balusters:

1. Fit balusters to treads, glue, and nail in place.
2. Countersink nail heads, fill flush, and sand filler.
3. Let into railings and glue in place.

C. Newel Posts: Secure newel posts to stringers and risers with lag screws.

D. Railings: Fasten freestanding railings to newel posts with glue and countersunk-head wood screws or rail bolts.

E. For exposed work, arrange fasteners in straight rows parallel with edges of members, with fasteners evenly spaced and with adjacent rows staggered.

F. Install stairs with no more than 3/16-inch variation between adjacent treads and risers and with no more than 3/8-inch variation between largest and smallest treads and risers within each flight.

3.7 ADJUSTING

A. Replace exterior finish carpentry that is damaged or does not comply with requirements.

1. Exterior finish carpentry may be repaired or refinished if work complies with requirements and shows no evidence of repair or refinishing.

B. Adjust joinery for uniform appearance.

3.8 CLEANING

A. Clean exterior finish carpentry on exposed and semi-exposed surfaces.

B. Touch up factory-applied finishes to restore damaged or soiled areas.

3.9 PROTECTION

A. Protect installed products from damage from weather and other causes during construction.

B. Remove and replace finish carpentry materials that are wet, moisture damaged, and mold damaged.

1. Indications that materials are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
2. Indications that materials are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION 062013

SECTION 062023 - INTERIOR FINISH CARPENTRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Shelving.

B. Related Requirements:

1. Section 061000 "Rough Carpentry" for furring, blocking, and other carpentry work not exposed to view.
2. Section 099300 “Staining and Transparent Finishing” for staining and finishing of interior finish carpentry.

1.3 COORDINATION

A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to ensure that interior finish carpentry can be supported and installed as indicated.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product. Indicate component materials, dimensions, profiles, textures, and colors and include construction and application details.

B. Shop Drawings:

1. Include plans, elevations, sections, and attachment details.
2. Show large-scale details.
3. Show locations and sizes of furring, blocking, and hanging strips, including blocking and reinforcement concealed by construction and specified in other Sections.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For fabricator.

1.6 QUALITY ASSURANCE

A. Fabricator Qualifications: Shop that employs skilled workers who custom fabricate products similar to those required for this Project and whose products have a record of successful in-service performance.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Stack lumber, plywood, and other panels flat with spacers between each bundle to provide air circulation.

1. Protect materials from weather by covering with waterproof sheeting, securely anchored.
2. Provide for air circulation around stacks and under coverings.

B. Deliver interior finish carpentry materials only when environmental conditions meet requirements specified for installation areas. If interior finish carpentry materials must be stored in other than installation areas, store only where environmental conditions comply with requirements specified for installation areas.

1.8 FIELD CONDITIONS

A. Environmental Limitations: Do not deliver or install interior finish carpentry materials until building is enclosed and weatherproof, wet work in space is completed and nominally dry, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.

B. Do not install finish carpentry materials that are wet, moisture damaged, or mold damaged.

1. Indications that materials are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
2. Indications that materials are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

A. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, comply with applicable rules of any rules-writing agency certified by the American Lumber Standard Committee's (ALSC) Board of Review. Grade lumber by an agency certified by the ALSC's Board of Review to inspect and grade lumber under the rules indicated.

1. Factory mark each piece of lumber with grade stamp of grading agency.
2. For exposed lumber, mark grade stamp on end or back of each piece or omit grade stamp and provide certificates of grade compliance issued by inspection agency.

2.2 INTERIOR WOODWORK

A. Hardwood Lumber for Transparent Finish (Stain or Clear Finish):

1. Species and Grade: Select white maple; NHLA A Finish.
2. Maximum Moisture Content: Ten percent (10%).
3. Finger Jointing: Not allowed.
4. Gluing for Width: Not allowed.
5. Veneered Material: Allowed.
6. Face Surface: Surfaced (smooth).
7. Matching: Selected for compatible grain and color.

2.3 SHELVING AND CLOTHES RODS

A. Exposed Shelving: Made from the following material, ¾-inch-thick:

1. Wood boards as specified above for hardwood lumber trim for transparent finish.

B. Standards for Adjustable Shelf Brackets: BHMA A156.9, B04102; zinc-plated steel.

C. Adjustable Shelf Brackets: BHMA A156.9, B04112; zinc-plated steel.

2.4 MISCELLANEOUS MATERIALS

A. Fasteners for Interior Finish Carpentry: Nails, screws, and other anchoring devices of type, size, material, and finish required for application indicated to provide secure attachment, concealed where possible.

1. For applications not otherwise indicated, provide stainless-steel fasteners.

2.5 FABRICATION

A. Ease edges of lumber less than 1-inch in nominal thickness to 1/16-inch radius and edges of lumber 1-inch or more in nominal thickness to 1/8-inch radius.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance.

B. Examine finish carpentry materials before installation. Reject materials that are wet, moisture damaged, and mold damaged.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean substrates of projections and substances detrimental to application.

B. Before installing interior finish carpentry, condition materials to average prevailing humidity in installation areas for a minimum of 24 hours.

3.3 INSTALLATION, GENERAL

A. Do not use materials that are unsound, warped, improperly treated or finished, inadequately seasoned, too small to fabricate with proper jointing arrangements, or with defective surfaces, sizes, or patterns.

B. Install interior finish carpentry level, plumb, true, and aligned with adjacent materials.

1. Use concealed shims where necessary for alignment.
2. Scribe and cut interior finish carpentry to fit adjoining work. Refinish and seal cuts as recommended by manufacturer.

3. Where face fastening is unavoidable, countersink fasteners, fill surface flush, and sand unless otherwise indicated.
4. Install to tolerance of 1/8-inch in 96 inches for level and plumb. Install adjoining interior finish carpentry with 1/32-inch maximum offset for flush installation and 1/16-inch maximum offset for reveal installation.
5. Coordinate interior finish carpentry with materials and systems in or adjacent to it. Provide cutouts for mechanical and electrical items that penetrate interior finish carpentry.

3.4 INSTALLATION OF SHELVING AND CLOTHES RODS

A. Install standards for adjustable shelf brackets according to manufacturer's written instructions, spaced not more than 36 inches o.c. and within 6 inches of ends of shelves. Fasten to framing members, blocking, or metal backing, or use toggle bolts or hollow wall anchors.

B. Cut shelves to neatly fit openings with only enough gap to allow shelves to be removed and reinstalled.

1. Install shelves, fully seated on cleats, brackets, and supports.

3.5 ADJUSTING

A. Replace interior finish carpentry that is damaged or does not comply with requirements.

1. Interior finish carpentry may be repaired or refinished if work complies with requirements and shows no evidence of repair or refinishing.

B. Adjust joinery for uniform appearance.

3.6 CLEANING

A. Clean interior finish carpentry on exposed and semi-exposed surfaces.

B. Restore damaged or soiled areas and touch up factory-applied finishes, if any.

3.7 PROTECTION

A. Protect installed products from damage from weather and other causes during construction.

B. Remove and replace finish carpentry materials that are wet, moisture damaged, and mold damaged.

1. Indications that materials are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
2. Indications that materials are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION 062023

SECTION 064116 - PLASTIC-LAMINATE-CLAD ARCHITECTURAL CABINETS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Plastic-laminate-clad architectural cabinets and panels.
2. Wood furring, blocking, shims, and hanging strips for installing plastic-laminate-faced architectural cabinets unless concealed within other construction before cabinet installation.
3. Cabinetry and casework hardware and accessories.

B. Related Requirements:

1. Section 061000 "Rough Carpentry" for wood furring, blocking, shims, and hanging strips required for installing cabinets and concealed within other construction before cabinet installation.

1.3 COORDINATION

A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to support loads imposed by installed and fully loaded cabinets.

1.4 PRE-INSTALLATION MEETINGS

A. Pre-installation Conference: Conduct conference at Project site.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings:

1. Include plans, elevations, sections, and attachment details.
2. Show details full size.
3. Show locations and sizes of furring, blocking, and hanging strips, including concealed blocking and reinforcement specified in other Sections.
4. Show locations and sizes of cutouts and holes for items installed in plastic-laminate architectural cabinets.

C. Samples:

1. Plastic laminates, 12 by 12 inches, for each type, color, pattern, and surface finish required.

a. Provide one (1) sample applied to core material with specified edge material applied to one (1) edge.

2. Corner pieces as follows:

a. Cabinet-front frame joints between stiles and rails, as well as exposed end pieces, 18 inches high by 18 inches wide by 6 inches deep.
b. Miter joints for standing trim.

3. Exposed cabinet hardware and accessories, one (1) unit for each type and finish.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For fabricator.

B. Product Certificates: For the following:

1. Composite wood products.
2. High-pressure decorative laminate.
3. Adhesives.

1.7 QUALITY ASSURANCE

A. Fabricator Qualifications: Shop that employs skilled workers who custom fabricate products similar to those required for this Project and whose products have a record of successful in-service performance.

B. Installer Qualifications: Fabricator of products.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Do not deliver cabinets until painting and similar finish operations that might damage architectural cabinets have been completed in installation areas. Store cabinets in installation areas or in areas where environmental conditions comply with requirements specified in "Field Conditions" Article.

1.9 FIELD CONDITIONS

A. Environmental Limitations: Do not deliver or install cabinets until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature and relative humidity at levels planned for building occupants during the remainder of the construction period.

B. Field Measurements: Where cabinets are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication, and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1. Locate concealed framing, blocking, and reinforcements that support cabinets by field measurements before being enclosed/concealed by construction and indicate measurements on Shop Drawings.

C. Established Dimensions: Where cabinets are indicated to fit to other construction, establish dimensions for areas where cabinets are to fit. Provide allowance for trimming at site, and coordinate construction to ensure that actual dimensions correspond to established dimensions.

PART 2 - PRODUCTS

2.1 PLASTIC-LAMINATE-CLAD ARCHITECTURAL CABINETS

A. Quality Standard: Unless otherwise indicated, comply with the "Architectural Woodwork Standards" for grades of cabinets indicated for construction, finishes, installation, and other requirements.

B. Grade: **Custom**.

C. Type of Construction: Frameless.

D. Door and Drawer Front Interface Style: Reveal overlay.

1. Reveal Dimension: ½-inch, unless otherwise indicated.

E. High-Pressure Decorative Laminate: NEMA LD 3, grades as indicated or if not indicated, as required by woodwork quality standard.

1. Basis-of-Design:

a. Abet Laminati, Inc.
b. Arborite
c. Lamitech
d. Wilsonart International; Div. of Premark International, Inc.

2. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Formica Corporation
b. Lab Designs
c. Lamin-Art, Inc.
d. Nevamar, a division of Panolam Industries International, Inc.

3. Substitutions: Under provisions of Section 012500 “Substitution Procedures”.

F. Laminate Cladding for Exposed Surfaces:

1. Horizontal Surfaces: Grade HGS.
2. Vertical Surfaces: Grade HGS.
3. Edges: PVC edge banding, 0.12-inch-thick, matching laminate in color, pattern, and finish.
4. Pattern Direction: Vertically for drawer fronts, doors, and fixed panels.

G. Materials for Semi-Exposed Surfaces:

1. Surfaces Other Than Drawer Bodies: High-pressure decorative laminate, NEMA LD 3, Grade VGS.

a. Edges of Plastic-Laminate Shelves: PVC edge banding, 0.12-inch-thick, matching laminate in color, pattern, and finish.
b. For semi-exposed backs of panels with exposed plastic-laminate surfaces, provide surface of high-pressure decorative laminate, NEMA LD 3, Grade VGS.

2. Drawer Sides and Backs: Solid-hardwood lumber.
3. Drawer Bottoms: Hardwood plywood.

H. Concealed Backs of Panels with Exposed Plastic-Laminate Surfaces: High-pressure decorative laminate, NEMA LD 3, Grade BKL.

I. Drawer Construction: Fabricate with exposed fronts fastened to subfront with mounting screws from interior of body.

1. Join subfronts, backs, and sides with glued dovetail joints.

J. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces complying with the following requirements:

1. **PL**, as indicated in Section 090000 “Schedule of Finishes”.

2.2 WOOD MATERIALS

A. Wood Products: Provide materials that comply with requirements of referenced quality standard for each type of woodwork and quality grade specified unless otherwise indicated.

1. Wood Moisture Content: Five to ten percent (5-10%).

B. Composite Wood Products: Provide materials that comply with requirements of referenced quality standard for each type of architectural cabinet and quality grade specified unless otherwise indicated.

1. Medium-Density Fiberboard (MDF): ANSI A208.2, Grade 130.
2. Veneer-Faced Panel Products (Hardwood Plywood): HPVA HP-1, made with adhesive containing no urea formaldehyde.

2.3 CABINET HARDWARE AND ACCESSORIES

A. Frameless Concealed Hinges (European Type): ANSI/BHMA A156.9, B01602, 170 degrees of opening, self-closing.

B. Wire Pulls: Back mounted, solid metal, 4 inches long, 5/16-inch in diameter.

C. Catches: Roller catches, BHMA A156.9, B03071.

D. Shelf Rests (Pins): BHMA A156.9, B04013; metal.

E. Drawer Slides: BHMA A156.9.

1. Heavy-Duty (Grade 1HD-100 and Grade 1HD-200): Side mount.

a. Type: Full overtravel extension type.
b. Material: Zinc-plated-steel ball-bearing slides.
c. Motion Feature: Self-closing mechanism.

2. General-purpose drawers more than 3 inches high, but not more than 6 inches high and not more than 24 inches wide, provide Grade 1HD-100 with 75 lb. capacity.
3. File drawers more than 6 inches high or more than 24 inches wide, provide Grade 1HD-200 with 100 lb. capacity.

F. Door Locks: BHMA A156.11, E07121.

1. Sized for cabinet thickness on the active leaf as indicated in the documents, with two (2) keys master keyed all alike to keys of adjacent manufactured laboratory casework, with manufacturer's standard finger operated sash lock on the adjacent inactive leaf (in double door applications). For bidding purposes, the Contractor shall assume that one hundred percent (100%) of all cabinet operating door leaves or pairs of doors shall be locked.

G. Drawer Locks: BHMA A156.11, E07041.

1. Sized for drawer thickness, with two (2) keys master keyed all alike to keys of adjacent manufactured laboratory casework. For bidding purposes, the Contractor shall assume that one hundred percent (100%) of all drawers shall be locked.

H. Door and Drawer Silencers: BHMA A156.16, L03011.

I. Grommets for Cable Passage: 3-inch OD, surface mount, plastic cap with one (1) slot for wire passage.

1. Product: Subject to compliance with requirements, provide **XG3** by Doug Mockett & Company, Inc. or approved equal. Color as selected by Architect and Owner from manufacturer’s entire range.

J. Concealed Shelf Brackets: Medium-duty steel design, ¾-inch-tall backplate by length required for installation, ½-inch-diameter by 7-inch-long rod, and capable of carrying 30 lbs. per bracket.

1. Product: Subject to compliance with requirements, provide **Floating Shelf Bracket** by Sheppard Brackets or approved equal.

K. Exposed Hardware Finishes: For exposed hardware, provide finish that complies with BHMA A156.18 for BHMA finish number indicated.

1. Satin Nickel Plated: BHMA 619 for brass or bronze base; BHMA 646 for steel base.
2. Satin Stainless-Steel: BHMA 630.

L. For concealed hardware, provide manufacturer's standard finish that complies with product class requirements in BHMA A156.9.

2.4 MISCELLANEOUS MATERIALS

A. Furring, Blocking, Shims, and Hanging Strips: Softwood or hardwood lumber, kiln dried to less than fifteen percent (15%) moisture content.

B. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide metal expansion sleeves or expansion bolts for post-installed anchors. Use nonferrous-metal or hot-dip galvanized anchors and inserts at inside face of exterior walls and at floors.

C. Adhesives: Do not use adhesives that contain urea formaldehyde.

1. Adhesive for Bonding Plastic Laminate: Contact cement, water based.

a. Adhesive for Bonding Edges: Polyurethane hot-melt adhesive.

2.5 FABRICATION

A. Fabricate cabinets to dimensions, profiles, and details indicated.

B. Complete fabrication, including assembly and hardware application, to maximum extent possible before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.

1. Trial fit assemblies at fabrication shop that cannot be shipped completely assembled. Install dowels, screws, bolted connectors, and other fastening devices that can be removed after trial fitting. Verify that various parts fit as intended and check measurements of assemblies against field measurements before disassembling for shipment.

C. Shop-cut openings to maximum extent possible to receive hardware, appliances, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.

PART 3 - EXECUTION

3.1 PREPARATION

A. Before installation, condition cabinets to average humidity conditions in installation areas for not less than 72 hours.

3.2 INSTALLATION

A. Grade: Install cabinets to comply with quality standard grade of items to be installed.

B. Assemble cabinets and complete fabrication at Project site to the extent that it was not completed in the shop.

C. Anchor cabinets to anchors or blocking built in or directly attached to substrates. Secure with wafer-head cabinet installation screws.

1. Use filler matching finish of items being installed.

D. Install cabinets level, plumb, and true in line to a tolerance of 1/8-inch in 96 inches using concealed shims.

1. Scribe and cut cabinets to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.
2. Install without distortion so doors and drawers fit openings properly and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete installation of hardware and accessory items as indicated.
3. Fasten wall cabinets through back, near top and bottom, and at ends not more than 16 inches o.c. with No. 10 wafer-head screws sized for not less than 1½-inch penetration into wood framing, blocking, or hanging strips or No. 10 wafer-head sheet metal screws through metal backing or metal framing behind wall finish.

3.3 ADJUSTING AND CLEANING

A. Repair damaged and defective cabinets, where possible, to eliminate functional and visual defects. Where not possible to repair, replace woodwork. Adjust joinery for uniform appearance.

B. Clean, lubricate, and adjust hardware.

C. Clean cabinets on exposed and semi-exposed surfaces.

END OF SECTION 064116

SECTION 070150.19 - PREPARATION FOR REROOFING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Full tear-off of roof system at areas indicated on Drawings.
2. Removal of flashings and counterflashings.

B. Related Requirements:

1. Section 011000 "Summary of Work" for use of the premises and phasing requirements.
2. Section 015000 "Temporary Facilities and Controls" for temporary construction and environmental-protection measures for reroofing preparation.

1.3 DEFINITIONS

A. Roofing Terminology: Definitions in ASTM D 1079 and glossary of NRCA's "The NRCA Roofing and Waterproofing Manual" apply to work of this Section.

B. Full Roof Tear-Off: Removal of existing roofing system down to existing roof deck.

1.4 PRE-INSTALLATION MEETINGS

A. Preliminary Roofing Conference: Before starting removal work, conduct conference at Project site.

1. Meet with Owner; Architect; Owner's insurer if applicable; testing and inspecting agency representative; roofing system manufacturer's representative; roofing Installer, including project manager, superintendent, and foreman; and installers whose work interfaces with or affects reroofing, including installers of roof deck, roof accessories, and roof-mounted equipment.
2. Review methods and procedures related to roofing tear-off, including, but not limited to, the following:

a. Reroofing preparation, including roofing system manufacturer's written instructions.
b. Temporary protection requirements for existing roofing system components that are to remain.
c. Existing roof drains and roof drainage during each stage of reroofing, and roof-drain plugging and plug removal.
d. Construction schedule and availability of materials, Installer's personnel, equipment, and facilities needed to avoid delays.
e. Existing roof deck conditions requiring notification of Architect.
f. Existing roof deck removal procedures and Owner notifications.
g. Condition and acceptance of existing roof deck and base flashing substrate for reuse.

h. Structural loading limitations of roof deck during reroofing.
i. Base flashings, special roofing details, drainage, penetrations, equipment curbs, and condition of other construction that affect reroofing.
j. HVAC shutdown and sealing of air intakes.
k. Shutdown of fire-suppression, -protection, and -alarm and -detection systems.
l. Governing regulations and requirements for insurance and certificates if applicable.
m. Existing conditions that may require notification of Architect before proceeding.

B. Comply with additional requirements in Section 013100 “Project Management and Coordination”.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.6 INFORMATIONAL SUBMITTALS

A. Field Test Reports:

1. Fastener pull-out test report.

B. Photographs: Show existing conditions of adjoining construction and site improvements, including exterior and interior finish surfaces, that might be misconstrued as having been damaged by reroofing operations.

1. Submit before Work begins.

C. Landfill Records: Indicate receipt and acceptance of demolished roofing materials by a landfill facility licensed to accept them.

1.7 QUALITY ASSURANCE

A. Regulatory Requirements:

1. Comply with governing EPA notification regulations before beginning roofing removal.
2. Comply with hauling and disposal regulations of authorities having jurisdiction.

1.8 FIELD CONDITIONS

A. Existing Roofing System: EPDM.

B. Protect building to be reroofed, adjacent buildings, walkways, site improvements, exterior plantings, and landscaping from damage or soiling from reroofing operations.

C. Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities.

D. Conditions existing at time of inspection for bidding are maintained by Owner as far as practical.

E. Weather Limitations: Proceed with reroofing preparation only when existing and forecasted weather conditions permit Work to proceed without water entering existing roofing system or building.

1. Remove only as much roofing in one (1) day as can be made watertight in the same day.

F. Hazardous Materials: It is not expected that hazardous materials, such as asbestos-containing materials, will be encountered in the Work.

1. If materials suspected of containing hazardous materials are encountered, do not disturb; immediately notify Architect and Owner.

PART 2 - PRODUCTS

2.1 REPLACEMENT MATERIALS

A. Steel deck is specified in Section 053100 "Steel Decking."

B. Wood blocking, curbs, and nailers are specified in Section 061000 "Rough Carpentry."

2.2 AUXILIARY REROOFING MATERIALS

A. General: Use auxiliary reroofing preparation materials recommended by roofing system manufacturer for intended use and compatible with components of existing and new roofing system.

PART 3 - EXECUTION

3.1 PREPARATION

A. Seal or isolate windows that may be exposed to airborne substances created in removal of existing materials.

B. Shut off rooftop utilities and service piping before beginning the Work.

C. Test existing roof drains to verify that they are not blocked or restricted.

1. Immediately notify Architect of any blockages or restrictions.

D. Coordinate with Owner to shut down air-intake equipment in the vicinity of the Work.

1. Cover air-intake louvers before proceeding with reroofing work that could affect indoor air quality or activate smoke detectors in the ductwork.

E. During removal operations, have sufficient and suitable materials on-site to facilitate rapid installation of temporary protection in the event of unexpected rain.

F. Maintain roof drains in functioning condition to ensure roof drainage at end of each workday.

1. Prevent debris from entering or blocking roof drains and conductors.

a. Use roof-drain plugs specifically designed for this purpose.
b. Remove roof-drain plugs at end of each workday, when no work is taking place, or when rain is forecast.

2. If roof drains are temporarily blocked or unserviceable due to roofing system removal or partial installation of new roofing system, provide alternative drainage method to remove water and eliminate ponding.

a. Do not permit water to enter into or under existing roofing system components that are to remain.

3.2 ROOF TEAR-OFF

A. Notify Owner each day of extent of roof tear-off proposed for that day and obtain authorization to proceed.

B. Lower removed roofing materials to ground and onto lower roof levels, using dust-tight chutes or other acceptable means of removing materials from roof areas.

C. Full Roof Tear-Off: Where indicated on Drawings, remove existing roofing and other roofing system components down to the existing roof deck.

1. Remove substrate board, vapor retarder, underlayment, roof insulation and cover board.
2. Remove base flashings and counter flashings.
3. Remove perimeter edge flashing and gravel stops.
4. Remove flashings at pipes, curbs, mechanical equipment, and other penetrations.
5. Remove roof drains indicated on Drawings to be removed.
6. Remove wood blocking, curbs, and nailers.

7. Remove excess asphalt from steel deck.

a. A maximum of 15 lb./100 sq. ft. of asphalt is permitted to remain on steel decks.

8. Remove fasteners from deck.

3.3 DECK PREPARATION

A. Inspect deck after tear-off of roofing system.

B. If broken or loose fasteners that secure deck panels to one another or to structure are observed, or if deck appears or feels inadequately attached, immediately notify Architect.

1. Do not proceed with installation until directed by Architect.

C. If deck surface is unsuitable for receiving new roofing or if structural integrity of deck is suspect, immediately notify Architect.

1. Do not proceed with installation until directed by Architect.

D. Provide additional deck securement as recommended by manufacturer.

3.4 BASE FLASHING REMOVAL

A. Remove existing base flashings.

1. Clean substrates of contaminants, such as asphalt, sheet materials, dirt, and debris.

B. Do not damage metal counterflashings that are to remain.

1. Replace metal counterflashings damaged during removal with counterflashings specified in Section 076200 "Sheet Metal Flashing and Trim."

C. When directed by Architect, replace wood blocking, curbs, and nailers to comply with Section 061000 "Rough Carpentry."

3.5 FASTENER PULL-OUT TESTING

A. Retain independent testing and inspecting agency to conduct fastener pull-out tests according to Chapter 16 of the International Building Code and submit test report to Architect and roofing manufacturer before installing new roofing system.

1. Obtain Architect's and roofing manufacturer's approval to proceed with specified fastening pattern.

a. Architect and roofing manufacturer may furnish revised fastening pattern commensurate with pull-out test results.

3.6 DISPOSAL

A. Collect demolished materials and place in containers.

1. Promptly dispose of demolished materials.
2. Do not allow demolished materials to accumulate on-site.
3. Storage or sale of demolished items or materials on-site is not permitted.

B. Transport and legally dispose of demolished materials off Owner's property.

END OF SECTION 070150.19

SECTION 071113 - BITUMINOUS DAMPPROOFING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Cold-applied, emulsified-asphalt dampproofing.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated. Include recommendations for method of application, primer, number of coats, coverage, or thickness.

B. Material Certificates: For each product, signed by manufacturers.

1.4 PROJECT CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit dampproofing to be performed according to manufacturers' written instructions.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

A. Source Limitations: Obtain primary dampproofing materials and primers from single source from single manufacturer.

B. VOC Content: Products shall comply with VOC content limits of authorities having jurisdiction unless otherwise required.

2.2 COLD-APPLIED, EMULSIFIED-ASPHALT DAMPPROOFING

A. Manufacturers:

1. Henry Company
2. Karnak Corporation
3. Meadows, W. R., Inc.
4. Substitutions: Under provisions of Section 012500 “Substitution Procedures”.

B. Trowel Coats: ASTM D 1227, Type II, Class 1.

C. VOC Content: 0.30 lb./gallon or less.

2.3 MISCELLANEOUS MATERIALS

A. Emulsified-Asphalt Primer: ASTM D 1227, Type III, Class 1, except diluted with water as recommended by manufacturer.

B. Asphalt-Coated Glass Fabric: ASTM D 1668, Type I.

C. Patching Compound: Manufacturer's fibered mastic of type recommended by dampproofing manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for surface smoothness and other conditions affecting performance of work.

1. Proceed with dampproofing application only after substrate construction and penetrating work have been completed and unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Protection of Other Work: Mask or otherwise protect adjoining exposed surfaces from being stained, spotted, or coated with dampproofing. Prevent dampproofing materials from entering and clogging weep holes and drains.

B. Clean substrates of projections and substances detrimental to work; fill voids, seal joints, and apply bond breakers if any, as recommended by prime material manufacturer.

C. Apply patching compound for filling and patching tie holes, honeycombs, reveals, and other imperfections; cover with asphalt-coated glass fabric.

3.3 APPLICATION, GENERAL

A. Comply with manufacturer's written instructions for dampproofing application, cure time between coats, and drying time before backfilling unless more stringent requirements are indicated.

1. Apply dampproofing to provide continuous plane of protection.
2. Apply additional coats if recommended in writing by manufacturer or to achieve a smooth surface and uninterrupted coverage.

B. Where dampproofing footings and foundation walls, apply from finished-grade line to top of footing; extend over top of footing and down a minimum of 6 inches over outside face of footing.

1. Extend dampproofing 12 inches onto intersecting walls and footings, but do not extend onto surfaces exposed to view when Project is completed.
2. Install flashings and corner protection stripping at internal and external corners, changes in plane, construction joints, cracks, and where shown as "reinforced," by embedding an 8-inch-wide strip of asphalt-coated glass fabric in a heavy coat of dampproofing. Dampproofing coat for embedding fabric is in addition to other coats required.

3.4 COLD-APPLIED, EMULSIFIED-ASPHALT DAMPPROOFING

A. Concrete Foundations: Apply one (1) trowel coat at not less than 4 gallon/100 sq. ft.

3.5 CLEANING

A. Remove dampproofing materials from surfaces not intended to receive dampproofing.

END OF SECTION 071113

SECTION 071326 - SELF-ADHERING SHEET WATERPROOFING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Modified bituminous sheet waterproofing.

1.3 PRE-INSTALLATION MEETINGS

A. Pre-installation Conference: Conduct conference at Project site.

1. Review waterproofing requirements including surface preparation, substrate condition and pretreatment, minimum curing period, forecasted weather conditions, special details and sheet flashings, installation procedures, testing and inspection procedures, and protection and repairs.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, and tested physical and performance properties of waterproofing.
2. Include manufacturer's written instructions for evaluating, preparing, and treating substrate.

B. Shop Drawings: Show locations and extent of waterproofing and details of substrate joints and cracks, expansion joints, sheet flashings, penetrations, inside and outside corners, tie-ins with adjoining waterproofing, and other termination conditions.

C. Samples: For each exposed product and for each color and texture specified, including the following products:

1. 8-by-8-inch square of waterproofing and flashing sheet.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Field quality-control reports.

C. Sample Warranties: For special warranties.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by waterproofing manufacturer.

1.7 FIELD CONDITIONS

A. Environmental Limitations: Apply waterproofing within the range of ambient and substrate temperatures recommended in writing by waterproofing manufacturer. Do not apply waterproofing to a damp or wet substrate.

1. Do not apply waterproofing in snow, rain, fog, or mist.

B. Maintain adequate ventilation during preparation and application of waterproofing materials.

1.8 WARRANTY

A. Manufacturer's Warranty: Manufacturer agrees to furnish replacement waterproofing material for waterproofing that does not comply with requirements or that fails to remain watertight within specified warranty period.

1. Warranty Period: Five (5) years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

A. Source Limitations for Waterproofing System: Obtain waterproofing materials from single source from single manufacturer. Products of this Section must also be compatible with those in Sections 072713 “Modified Bituminous Sheet Air Barriers and 072726 “Fluid-Applied Membrane Air Barriers”.

2.2 MODIFIED BITUMINOUS SHEET WATERPROOFING

A. Modified Bituminous Sheet for Vertical Applications: Minimum 60-mil nominal thickness, self-adhering sheet consisting of 56 mils of rubberized asphalt laminated on one (1) side to a 4-mil-thick, polyethylene-film reinforcement, and with release liner on adhesive side.

1. Basis-of-Design:

a. GCP Applied Technologies, Inc.; **Bituthene 3000/Low Temperature**

2. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Carlisle Coatings & Waterproofing Inc
b. Meadows, W.R., Inc.
c. Tamko Building Products, Inc.
d. Substitutions: Under provisions of Section 012500 “Substitution Procedures”.

3. Physical Properties:

a. Tensile Strength, Membrane: 250 psi minimum; ASTM D 412, Die C, modified.

b. Ultimate Elongation: Three hundred percent (300%) minimum; ASTM D 412, Die C, modified.
c. Low-Temperature Flexibility: Pass at minus 20 degrees F (minus 29 degrees C); ASTM D 1970.
d. Crack Cycling: Unaffected after one hundred (100) cycles of 1/8-inch movement; ASTM C 836.
e. Puncture Resistance: 40 lbf minimum; ASTM E 154.
f. Water Absorption: 0.2 percent weight-gain maximum after 48-hour immersion at 70 degrees F (21 degrees C); ASTM D 570.
g. Water Vapor Permeance: 0.05 perms maximum; ASTM E 96, Water Method.

4. Sheet Strips: Self-adhering, rubberized-asphalt strips of same material and thickness as sheet waterproofing.

2.3 AUXILIARY MATERIALS

A. Furnish auxiliary materials recommended by waterproofing manufacturer for intended use and compatible with sheet waterproofing.

1. Furnish liquid-type auxiliary materials that comply with VOC limits of authorities having jurisdiction.

B. Primer: Liquid solvent-borne primer recommended for substrate by sheet-waterproofing material manufacturer.

C. Liquid Membrane: Elastomeric, two-component liquid, cold fluid applied, of trowel grade or low viscosity.

D. Substrate Patching Membrane: Low-viscosity, two-component, modified asphalt coating.

E. Termination Bars: Aluminum or rigid thermoplastic bars, approximately 1-by-1/8-inch, predrilled holes.

2.4 INSULATION DRAINAGE PANELS

A. Insulation: Comply with Section 072100 "Thermal Insulation."

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance of the waterproofing.

1. Verify that concrete has cured and aged for minimum time period recommended in writing by waterproofing manufacturer.
2. Verify that substrate is visibly dry and within the moisture limits recommended in writing by manufacturer. Test for capillary moisture by plastic sheet method according to ASTM D 4263.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean, prepare, and treat substrates according to manufacturer's written instructions. Provide clean, dust-free, and dry substrates for waterproofing application.

B. Mask off adjoining surfaces not receiving waterproofing to prevent spillage and overspray affecting other construction.

C. Remove grease, oil, bitumen, form-release agents, paints, curing compounds, and other penetrating contaminants or film-forming coatings from concrete.

D. Remove fins, ridges, mortar, and other projections and fill honeycomb, aggregate pockets, holes, and other voids.

E. Prepare, fill, prime, and treat joints and cracks in substrates. Remove dust and dirt from joints and cracks according to ASTM D 4258.

1. Install sheet strips of width according to manufacturer's written instructions and center over treated construction and contraction joints and cracks exceeding a width of 1/16-inch.

F. Corners: Prepare, prime, and treat inside and outside corners according to ASTM D 6135.

1. Install membrane strips centered over vertical inside corners. Install ¾-inch fillets of liquid membrane on horizontal inside corners and as follows:

a. At footing-to-wall intersections, extend liquid membrane in each direction from corner or install membrane strip centered over corner.

G. Prepare, treat, and seal vertical and horizontal surfaces at terminations and penetrations through waterproofing and at drains and protrusions according to ASTM D 6135.

3.3 MODIFIED BITUMINOUS SHEET-WATERPROOFING APPLICATION

A. Install modified bituminous sheets according to waterproofing manufacturer's written instructions and recommendations in ASTM D 6135.

B. Apply primer to substrates at required rate and allow it to dry. Limit priming to areas that will be covered by sheet waterproofing in same day. Reprime areas exposed for more than 24 hours.

C. Apply and firmly adhere sheets over area to receive waterproofing. Accurately align sheets and maintain uniform 2½-inch-minimum lap widths and end laps. Overlap and seal seams, and stagger end laps to ensure watertight installation.

1. When ambient and substrate temperatures range between 25 and 40 degrees F, install self-adhering, modified bituminous sheets produced for low-temperature application. Do not use low-temperature sheets if ambient or substrate temperature is higher than 60 degrees F.

D. Apply continuous sheets over already-installed sheet strips, bridging substrate cracks, construction, and contraction joints.

E. Seal edges of sheet-waterproofing terminations with mastic.

F. Install sheet-waterproofing and auxiliary materials to tie into adjacent waterproofing.

G. Repair tears, voids, and lapped seams in waterproofing not complying with requirements. Slit and flatten fishmouths and blisters. Patch with sheet waterproofing extending 6 inches beyond repaired areas in all directions.

3.4 FIELD QUALITY CONTROL

A. Engage a site representative qualified by waterproofing membrane manufacturer to inspect substrate conditions, surface preparation, membrane application, flashings, protection, and drainage components; and to furnish daily reports to Architect.

B. Prepare test and inspection reports.

3.5 PROTECTION, REPAIR, AND CLEANING

A. Do not permit foot or vehicular traffic on unprotected membrane.

B. Protect waterproofing from damage and wear during remainder of construction period.

C. Correct deficiencies in or remove waterproofing that does not comply with requirements; repair substrates, reapply waterproofing, and repair sheet flashings.

D. Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION 071326

SECTION 071416 - COLD FLUID-APPLIED WATERPROOFING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Latex-rubber waterproofing.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, and tested physical and performance properties of waterproofing.
2. Include manufacturer's written instructions for evaluating, preparing, and treating substrate.

B. Shop Drawings:

1. Show locations and extent of waterproofing.
2. Include details for substrate joints and cracks, sheet flashings, penetrations, inside and outside corners, tie-ins with adjoining waterproofing, and other termination conditions.

C. Samples: For each exposed product and for each color and texture specified.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Sample Warranties: For special warranties.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by waterproofing manufacturer.

B. Mockups: Build mockups to verify selections made under Sample submittals and to set quality standards for installation.

1. Build mockup for each typical waterproofing installation including accessories to demonstrate surface preparation, crack and joint treatments, inside and outside corner treatments, and protection.

    a. Size: 100 sq. ft. in area.
    b. Description: Each type of installation.

2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 FIELD CONDITIONS

A. Environmental Limitations: Apply waterproofing within the range of ambient and substrate temperatures recommended in writing by waterproofing manufacturer.

1. Do not apply waterproofing to a damp or wet substrate, when relative humidity exceeds eighty-five percent (85%), or when temperatures are less than 5 deg F (3 deg C) above dew point.
2. Do not apply waterproofing in snow, rain, fog or mist, or when such weather conditions are imminent during application and curing period.

B. Maintain adequate ventilation during application and curing of waterproofing materials.

1.8 WARRANTY

A. Manufacturer's Special Warranty: Manufacturer agrees to repair or replace waterproofing that fails in materials or workmanship within specified warranty period.

1. Warranty Period: Five (5) years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

A. Source Limitations for Waterproofing System: Obtain waterproofing materials from single source from single manufacturer.

2.2 RUBBER WATERPROOFING

A. Two-Component, Unreinforced, Rubber Waterproofing: ASTM C 836; coal-tar free.

1. Basis of Design:

    a. GCP Applied Technologies Inc.; **Procor**
    b. Substitutions: Under provisions of Section 012500 “Substitution Procedures”.

2. Hydrostatic-Head Resistance: 65 feet minimum; ASTM D 5385.

2.3 AUXILIARY MATERIALS

A. General: Provide auxiliary materials recommended in writing by waterproofing manufacturer for intended use and compatible with one another and with waterproofing.

1. Furnish liquid-type auxiliary materials that comply with VOC limits of authorities having jurisdiction.

B. Primer: Manufacturer's standard primer, sealer, or surface conditioner; factory-formulated acrylic latex, polyurethane, or epoxy.

C. Joint Sealant: Multicomponent polyurethane sealant, compatible with waterproofing; as specified in Section 079200 "Joint Sealants"; and as recommended by manufacturer for substrate and joint conditions.

1. Backer Rod: Closed-cell polyethylene foam.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.

1. Verify that concrete has cured and aged for minimum time period recommended in writing by waterproofing manufacturer.
2. Verify that substrate is visibly dry and within the moisture limits recommended in writing by manufacturer. Test for capillary moisture by plastic sheet method according to ASTM D 4263.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean, prepare, and treat substrates according to manufacturer's written instructions. Provide clean, dust-free, and dry substrates for waterproofing application.

B. Mask off adjoining surfaces not receiving waterproofing to prevent spillage and overspray affecting other construction.

C. Close off drains and other penetrations to prevent spillage and migration of waterproofing fluids.

D. Remove grease, oil, bitumen, form-release agents, paints, curing compounds, acid residues, and other penetrating contaminants or film-forming coatings from concrete.

E. Remove fins, ridges, and other projections, and fill honeycomb, aggregate pockets, holes, and other voids.

3.3 PREPARATION AT TERMINATIONS, PENETRATIONS, AND CORNERS

A. Prepare surfaces at terminations and penetrations through waterproofing and at expansion joints, drains, sleeves, and corners according to waterproofing manufacturer's written instructions and to recommendations in ASTM C 1471.

B. Apply waterproofing in two (2) separate applications, and embed a joint reinforcing strip in the first preparation coat when recommended by waterproofing manufacturer.

3.4 JOINT AND CRACK TREATMENT

A. Prepare, treat, rout, and fill joints and cracks in substrate according to waterproofing manufacturer's written instructions and to recommendations in ASTM C 1471. Before coating surfaces, remove dust and dirt from joints and cracks according to ASTM D 4258.

1. Comply with ASTM C 1193 for joint-sealant installation.
2. Apply bond breaker on sealant surface, beneath preparation strip.
3. Prime substrate along each side of joint and apply a single thickness of preparation strip at least 6 inches wide along each side of joint. Apply waterproofing in two (2) separate applications and embed a joint reinforcing strip in the first preparation coat.

3.5 WATERPROOFING APPLICATION

A. Apply waterproofing according to manufacturer's written instructions and to recommendations in ASTM C 1471.

B. Start installing waterproofing in presence of manufacturer's technical representative.

C. Apply primer over prepared substrate unless otherwise instructed in writing by waterproofing manufacturer.

D. Unreinforced Waterproofing Applications: Mix materials and apply waterproofing by spray, roller, notched squeegee, trowel, or other application method suitable to slope of substrate.

1. Apply one (1) or more coats of waterproofing to obtain a seamless membrane free of entrapped gases and pinholes, with a dry film thickness of 60 mils.
2. Apply waterproofing to prepared wall terminations and vertical surfaces.
3. Verify manufacturer's recommended wet film thickness of waterproofing every 100 sq. ft.

E. Cure waterproofing, taking care to prevent contamination and damage during application and curing.

3.6 PROTECTION

A. Protect waterproofing from damage and wear during remainder of construction period.

B. Correct deficiencies in or remove waterproofing that does not comply with requirements; repair substrates, reapply waterproofing, and repair sheet flashings.

C. Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended in writing by manufacturer of affected construction.

END OF SECTION 071416

SECTION 072100 - THERMAL INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Extruded polystyrene foam-plastic board insulation.
2. Glass-fiber blanket insulation.
3. Mineral-wool blanket insulation.

B. Related Requirements:

1. Section 075323 “Ethylene-Propylene-Diene-Monomer (EPDM) Roofing for insulation specified as part of roofing construction.
2. Section 092900 "Gypsum Board" for sound attenuation blanket used as acoustic insulation.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. HPBS Submittals:

1. Product Data for Section 16a-38k-6(d)(8): For products having recycled content, documentation indicating percentages by weight of postconsumer and pre-consumer recycled content. Include statement indicating cost for each product having recycled content.

C. Low-emitting product certification.

1.4 INFORMATIONAL SUBMITTALS

A. Product Test Reports: For each product, for tests performed by a qualified testing agency.

B. Evaluation Reports: For foam-plastic insulation, from ICC-ES.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Protect insulation materials from physical damage and from deterioration due to moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer's written instructions for handling, storing, and protecting during installation.

B. Protect foam-plastic board insulation as follows:

1. Do not expose to sunlight except to necessary extent for period of installation and concealment.

2. Protect against ignition at all times. Do not deliver foam-plastic board materials to Project site until just before installation time.
3. Quickly complete installation and concealment of foam-plastic board insulation in each area of construction.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Surface-Burning Characteristics: Maximum flame-spread and smoke-developed indexes less than Class A, 25 and 450 when tested in accordance with ASTM E 84.

B. Fire-Resistance Ratings: Comply with ASTM E119 or UL 263; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Indicate design designations from UL's "Fire Resistance Directory" or from listings of another qualified testing agency.

C. Fire Propagation Characteristics: Passes NFPA 285 testing as part of an approved assembly.

D. Labeling: Provide identification of mark indicating R-value of each piece of insulation 12 inches and wider in width.

2.2 EXTRUDED POLYSTYRENE FOAM-PLASTIC BOARD INSULATION

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. DiversiFoam Products
2. Dow Chemical Company (The)
3. Insulfoam
4. Owens Corning
5. Substitutions: Under provisions of Section 012500 “Substitution Procedures”.

B. Extruded Polystyrene Board Insulation: ASTM C 578, of type and minimum compressive strength indicated below; unfaced.

1. Type IV, 25 psi.
2. Type VI, 60 psi, underslab.

C. Extruded Polystyrene Board Insulation, Drainage Panels: ASTM C578, Type VI, 40-psi minimum compressive strength; unfaced; fabricated with shiplap or channel edges and with one (1) side having grooved drainage channels.

2.3 MINERAL-WOOL BLANKET INSULATION

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Johns Manville, a Berkshire Hathaway company
2. Rockwood International
3. Thermafiber, Inc., an Owens Corning company
4. Substitutions: Under provisions of Section 012500 “Substitution Procedures”.

B. Recycled Content of Insulation: Postconsumer recycled content plus one-half of pre-consumer recycled content not less than thirty-five percent (35%).

C. Mineral-Wool Blanket Insulation, Unfaced: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers; passing ASTM E 136 for combustion characteristics.

1. Flame-Spread Index: Not more than 25 when tested in accordance with ASTM E 84.
2. Smoke-Developed Index: Not more than 50 when tested in accordance with ASTM E 84.
3. Labeling: Provide identification of mark indicating R-value of each piece of insulation 12 inches and wider in width.

2.4 ACCESSORIES

A. Insulation for Miscellaneous Voids:

1. Glass-Fiber Insulation: ASTM C 764, Type II, loose fill; with maximum flame-spread and smoke-developed indexes of 5, per ASTM E 84.

B. Adhesive for Bonding Insulation: Product compatible with insulation and air and water barrier materials, and with demonstrated capability to bond insulation securely to substrates without damaging insulation and substrates.

PART 3 - EXECUTION

3.1 PREPARATION

A. Clean substrates of substances that are harmful to insulation, including removing projections capable of puncturing insulation or vapor retarders, or that interfere with insulation attachment.

3.2 INSTALLATION, GENERAL

A. Comply with insulation manufacturer's written instructions applicable to products and applications.

B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed to ice, rain, or snow at any time.

C. Install insulation with manufacturer's R-value label exposed after insulation is installed.

D. Extend insulation to envelop entire area to be insulated. Fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.

E. Provide sizes to fit applications and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units unless multiple layers are otherwise shown or required to make up total thickness or to achieve R-value.

3.3 INSTALLATION OF SLAB INSULATION

A. On horizontal surfaces, loosely lay insulation units according to manufacturer's written instructions. Stagger end joints and tightly abut insulation units.

1. If not otherwise indicated, extend insulation a minimum of 24 inches in from exterior walls.

3.4 INSTALLATION OF FOUNDATION WALL INSULATION

A. Butt panels together for tight fit.

B. Adhesive Installation: Install with adhesive or press into tacky waterproofing or dampproofing according to manufacturer's written instructions.

3.5 INSTALLATION OF CAVITY-WALL INSULATION

A. Foam-Plastic Board Insulation: Install pads of adhesive spaced approximately 24 inches o.c. both ways on inside face and as recommended by manufacturer.

1. Fit courses of insulation between wall ties and other obstructions, with edges butted tightly in both directions.
2. Press units firmly against inside substrates.

3.6 PROTECTION

A. Protect installed insulation from damage due to harmful weather exposures, physical abuse, and other causes.

B. Provide temporary coverings or enclosures where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

END OF SECTION 072100

SECTION 072713 - MODIFIED BITUMINOUS SHEET AIR BARRIERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes self-adhering (peel-and-stick), vapor-retarding, modified bituminous sheet air barriers.

1.3 DEFINITIONS

A. Air-Barrier Material: A primary element that provides a continuous barrier to the movement of air.

B. Air-Barrier Accessory: A transitional component of the air barrier that provides continuity.

C. Air-Barrier Assembly: The collection of air-barrier materials and accessory materials applied to an opaque wall, including joints and junctions to abutting construction, to control air movement through the wall.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include manufacturer's written instructions for evaluating, preparing, and treating substrate; technical data; and tested physical and performance properties of products.

B. Shop Drawings: For air-barrier assemblies.

1. Show locations and extent of air barrier materials, accessories, and assemblies specific to Project conditions.
2. Include details for substrate joints and cracks, counterflashing strips, penetrations, inside and outside corners, terminations, and tie-ins with adjoining construction.
3. Include details of interfaces with other materials that form part of air barrier.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Certificates: From air-barrier manufacturer, certifying compatibility of air barriers and accessory materials with Project materials that connect to or that come in contact with air barrier.

C. Product Test Reports: For each air-barrier assembly, for tests performed by a qualified testing agency.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Remove and replace liquid materials that cannot be applied within their stated shelf life.

B. Protect stored materials from direct sunlight.

1.8 FIELD CONDITIONS

A. Environmental Limitations: Apply air barrier within the range of ambient and substrate temperatures recommended by air-barrier manufacturer.

1. Protect substrates from environmental conditions that affect air-barrier performance.
2. Do not apply air barrier to a damp or wet substrate or during snow, rain, fog, or mist.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

A. Source Limitations: Obtain primary air-barrier materials and air-barrier accessories from single source from single manufacturer.

1. Products of this Section must also be compatible with those in Section 072726 “Fluid-Applied Membrane Air Barriers”.

2.2 PERFORMANCE REQUIREMENTS

A. Air-Barrier Performance: Air barrier assembly and seals with adjacent construction shall be capable of performing as a continuous air barrier. Air-barrier assemblies shall be capable of accommodating substrate movement and of sealing substrate expansion and control joints, construction material changes, penetrations, and transitions at perimeter conditions without deterioration and air leakage exceeding specified limits.

B. Air-Barrier Assembly Air Leakage: Maximum 0.04 cfm/sq. ft. of surface area at 1.57 lbf/sq. ft., when tested according to ASTM E 283 or ASTM E 2357.

C. VOC Content: 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24) and complying with VOC content limits of authorities having jurisdiction.

2.3 SELF-ADHERING SHEET AIR BARRIER

A. Modified Bituminous Sheet: 40-mil-thick, self-adhering sheet consisting of 36 mils of rubberized asphalt laminated to a 4-mil-thick, cross-laminated polyethylene film with release liner on adhesive side and formulated for application with primer that complies with VOC limits of authorities having jurisdiction.

1. Basis-of-Design:

a. GCP Applied Technologies, Inc.; **Perm-A-Barrier Wall Membrane**

2. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

    a. Carlisle Coatings & Waterproofing Inc.
    b. Meadows, W. R., Inc.
    c. Tremco Incorporated, an RPM company
    d. Substitutions: Under provisions of Section 012500 “Substitution Procedures”.

3. Physical and Performance Properties:

    a. Air Permeance: Maximum 0.004 cfm/sq. ft. of surface area at 1.57-lbf/sq. ft. pressure difference; ASTM E 2178.
    b. Tensile Strength: Minimum 400 psi; ASTM D 412, Die C.
    c. Ultimate Elongation: Minimum two hundred percent (200%); ASTM D 412, Die C.
    d. Puncture Resistance: Minimum 40 lbf; ASTM E 154.
    e. Water Absorption: Maximum 0.15 percent weight gain after 48-hour immersion at 70 deg F; ASTM D 570.
    f. Vapor Permeance: Maximum 0.05 perm; ASTM E 96, Water Method.

2.4 ACCESSORY MATERIALS

A. Requirement: Provide primers, transition strips, termination strips, joint sealants, counterflashing strips, flashing sheets and metal termination bars, termination mastic, substrate patching materials, adhesives, tapes, foam sealants, lap sealants, and other accessory materials that are recommended in writing by air-barrier manufacturer to produce a complete air-barrier assembly and that are compatible with primary air-barrier material and adjacent construction to which they may seal.

B. Primer: Liquid waterborne primer recommended for substrate by air-barrier material manufacturer.

C. Termination Mastic: Air-barrier manufacturer's standard cold fluid-applied elastomeric liquid; trowel grade.

D. Adhesive and Tape: Air-barrier manufacturer's standard adhesive and pressure-sensitive adhesive tape.

E. Modified Bituminous Transition Strip: Vapor retarding, 40 mils thick, smooth surfaced, self-adhering; consisting of 36 mils of rubberized asphalt laminated to a 4-mil-thick polyethylene film with release liner backing.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.

1. Verify that substrates are sound and free of oil, grease, dirt, excess mortar, or other contaminants.
2. Verify that substrates have cured and aged for minimum time recommended in writing by air-barrier manufacturer.
3. Verify that substrates are visibly dry and free of moisture. Test concrete substrates for capillary moisture by plastic sheet method according to ASTM D 4263.

4. Verify that masonry joints are flush and completely filled with mortar.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 SURFACE PREPARATION

A. Clean, prepare, treat, fill, and seal substrate and joints and cracks in substrate according to manufacturer's written instructions and details. Provide clean, dust-free, and dry substrate for air-barrier application.

B. Mask off adjoining surfaces not covered by air barrier to prevent spillage and overspray affecting other construction.

C. Remove excess mortar from masonry ties, shelf angles, and other obstructions.

D. At changes in substrate plane, apply sealant or termination mastic beads at sharp corners and edges to form a smooth transition from one (1) plane to another.

E. Cover gaps in substrate plane and form a smooth transition from one substrate plane to another with stainless-steel sheet mechanically fastened to structural framing to provide continuous support for air barrier.

3.3 INSTALLATION

A. Install materials according to air-barrier manufacturer's written instructions and details and according to recommendations in ASTM D 6135 to form a seal with adjacent construction and ensure continuity of air and water barrier.

1. When ambient and substrate temperatures range between 25 and 40 deg F install self-adhering, modified bituminous air-barrier sheet produced for low-temperature application. Do not install low-temperature sheet if ambient or substrate temperature is higher than 60 deg F.
2. Unless manufacturer recommends in writing against priming, apply primer to substrates at required rate and allow it to dry.

B. Prepare, treat, and seal vertical and horizontal surfaces at terminations and penetrations with termination mastic and according to ASTM D 6135.

C. Apply primer to substrates at required rate and allow it to dry. Limit priming to areas that will be covered by air-barrier sheet on same day. Reprime areas exposed for more than 24 hours.

D. Apply and firmly adhere air-barrier sheets over area to receive air barrier. Accurately align sheets and maintain uniform 2½-inch-minimum lap widths and end laps. Overlap and seal seams, and stagger end laps to ensure airtight installation.

1. Apply sheets in a shingled manner to shed water.
2. Roll sheets firmly to enhance adhesion to substrate.

E. Apply continuous air-barrier sheets over modified bituminous strips bridging substrate cracks, construction, and contraction joints.

F. Seal exposed edges of sheet at seams, cuts, penetrations, and terminations not concealed by metal counterflashings or ending in reglets with termination mastic.

G. Install air-barrier sheet and accessory materials to form a seal with adjacent construction and to maintain a continuous air barrier.

H. At end of each working day, seal top edge of air-barrier material to substrate with termination mastic.

I. Apply joint sealants forming part of air-barrier assembly within manufacturer's recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.

K. Fill gaps in miscellaneous penetrations of air-barrier membrane with foam sealant.

L. Repair punctures, voids, and deficient lapped seams in air barrier. Slit and flatten fishmouths and blisters. Patch with air-barrier sheet extending 6 inches beyond repaired areas in all directions.

M. Do not cover air barrier until it has been tested and inspected by Owner's testing agency.

N. Correct deficiencies in or remove air barrier that does not comply with requirements; repair substrates and reapply air-barrier components.

3.4 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Inspections: Air-barrier materials, accessories, and installation are subject to inspection for compliance with requirements.

C. Tests: As determined by testing agency from among the following tests:

1. Air-Leakage-Volume Testing: Air-barrier assemblies will be tested for air leakage according to ASTM E 783.
2. Adhesion Testing: Air-barrier assemblies will be tested for required adhesion to substrate according to ASTM D 4541 for each 600-sq. ft. of installed air barrier or part thereof.

D. Air barriers will be considered defective if they do not pass tests and inspections.

1. Apply additional air-barrier material, according to manufacturer's written instructions, where inspection results indicate insufficient thickness.
2. Remove and replace deficient air-barrier components for retesting as specified above.

E. Repair damage to air barriers caused by testing; follow manufacturer's written instructions.

F. Prepare test and inspection reports.

3.5 CLEANING AND PROTECTION

A. Protect air-barrier system from damage during application and remainder of construction period, according to manufacturer's written instructions.

1. Protect air barrier from exposure to UV light and harmful weather exposure as recommended in writing by manufacturer. If exposed to these conditions for longer than recommended, remove and replace air barrier or install additional, full-thickness, air-barrier application after repairing and preparing the overexposed membrane according to air-barrier manufacturer's written instructions.

2. Protect air barrier from contact with incompatible materials and sealants not approved by air-barrier manufacturer.

B. Clean spills, stains, and soiling from construction that would be exposed in the completed Work, using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION 072713

SECTION 072726 - FLUID-APPLIED MEMBRANE AIR BARRIERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Fluid-applied, vapor-permeable air barriers.

B. Related Requirements:

1. Section 061600 "Sheathing" for wall sheathings and wall sheathing joint-and-penetration treatments.

1.3 DEFINITIONS

A. Air-Barrier Material: A primary element that provides a continuous barrier to the movement of air.

B. Air-Barrier Accessory: A transitional component of the air barrier that provides continuity.

C. Air-Barrier Assembly: The collection of air-barrier materials and accessory materials applied to an opaque wall, including joints and junctions to abutting construction, to control air movement through the wall.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include manufacturer's written instructions for evaluating, preparing, and treating substrate; technical data; dry film thickness; and tested physical and performance properties of products.

B. Shop Drawings: For air-barrier assemblies.

1. Show locations and extent of air barrier materials, accessories, and assemblies specific to Project conditions.
2. Include details for substrate joints and cracks, counterflashing strips, penetrations, inside and outside corners, terminations, and tie-ins with adjoining construction.
3. Include details of interfaces with other materials that form part of air barrier.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Certificates: From air-barrier manufacturer, certifying compatibility of air barriers and accessory materials with Project materials that connect to or that come in contact with the barrier.

C. Product Test Reports: For each air-barrier assembly, for tests performed by a qualified testing agency.

D. Field quality-control reports.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to the jobsite in undamaged and clearly marked containers and/or wrapping indicating the name of the manufacturer and product.

B. Store materials as recommended by the manufacturer and conform to applicable safety regulatory agencies.

C. Protect stored materials from direct sunlight, open flame, or excessive heat.

D. Remove and replace liquid materials that cannot be applied within their stated shelf life.

1.8 FIELD CONDITIONS

A. Environmental Limitations: Apply air barrier within the range of ambient and substrate temperatures recommended by air-barrier manufacturer.

1. Protect substrates from environmental conditions that affect air-barrier performance.
2. Do not apply air barrier to a damp or wet substrate or during snow, rain, fog, or mist.

1.9 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace air and vapor barrier and accessories that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Five (5) years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Source Limitations: Obtain primary air-barrier materials and air-barrier accessories from single source from single manufacturer.

1. Products of this Section must also be compatible with those in Sections 072713 “Modified Bituminous Sheet Air Barriers” and 075423 “Thermoplastic Polyolefin (TPO) Roofing”.

B. VOC Content: 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24) and complying with VOC content limits of authorities having jurisdiction.

2.2 PERFORMANCE REQUIREMENTS

A. Air Barrier Performance: Air barrier assembly and seals with adjacent construction shall be capable of performing as a continuous air barrier. Air-barrier assemblies shall be capable of accommodating substrate movement and of sealing substrate expansion and control joints, construction material changes, penetrations, tie-ins to installed waterproofing, and transitions at perimeter conditions without deterioration and air leakage exceeding specified limits.

2.3 VAPOR PERMEABLE AIR BARRIERS

A. Vapor-Permeable Air Barrier: Synthetic polymer membrane.

1. Basis-of-Design:

a. Henry Company; **Air-Bloc 17MR**

2. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. GCP Applied Technologies, Inc.
b. Tremco, Inc.
c. Substitutions: Under provisions of Section 012500 “Substitution Procedures.

3. Physical and Performance Properties:

a. Air Permeance: Maximum 0.004 cfm/sq. ft. of surface area at 1.57-lbf/sq. ft. pressure difference; ASTM E 2178.
b. Vapor Permeance: Minimum 14 perms; ASTM E 96, Desiccant Method, Procedure A.
c. Ultimate Elongation: Minimum two hundred percent (2005); ASTM D 412, Die C.
d. UV Resistance: Can be exposed to sunlight for thirty (30) days according to manufacturer's written instructions.

2.4 ACCESSORY MATERIALS

A. General: Accessory materials recommended by air-barrier manufacturer to produce a complete air-barrier assembly and compatible with primary air-barrier material and adjacent construction to which they may seal.

B. Primer: Liquid waterborne primer recommended for substrate by air-barrier material manufacturer.

C. Joint Reinforcing Strip: Air-barrier manufacturer's glass-fiber-mesh tape.

D. Substrate-Patching Membrane: Manufacturer's standard trowel-grade substrate filler.

E. Adhesive and Tape: Air-barrier manufacturer's standard adhesive and pressure-sensitive adhesive tape.

F. Modified Bituminous Transition Strip: Vapor retarding, 40 mils thick, smooth surfaced, self-adhering; consisting of 36 mils of rubberized asphalt laminated to a 4-mil-thick polyethylene film with release liner backing.

G. Joint Sealant: ASTM C 920, single-component, neutral-curing silicone; Class 100/50 (low modulus), Grade NS, Use NT related to exposure, and, as applicable to joint substrates indicated, Use O. Comply with Section 079200 "Joint Sealants."

H. Termination Mastic: Air-barrier manufacturer's standard cold fluid-applied elastomeric liquid; trowel grade.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.

1. Verify that substrates are sound and free of oil, grease, dirt, excess mortar, or other contaminants.
2. Verify that concrete has cured and aged for minimum time recommended by air-barrier manufacturer.
3. Verify that substrates are visibly dry and free of moisture. Test concrete substrates for capillary moisture by plastic sheet method according to ASTM D 4263.
4. Verify that masonry joints are flush and completely filled with mortar.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 SURFACE PREPARATION

A. Clean, prepare, treat, fill, and seal substrate and joints and cracks in substrate according to manufacturer's written instructions and details. Provide clean, dust-free, and dry substrate for air-barrier application.

B. Mask off adjoining surfaces not covered by air barrier to prevent spillage and overspray affecting other construction.

C. Remove grease, oil, bitumen, form-release agents, paints, curing compounds, and other penetrating contaminants or film-forming coatings from concrete.

D. Remove fins, ridges, mortar, and other projections and fill honeycomb, aggregate pockets, holes, and other voids in concrete with substrate-patching membrane.

E. Remove excess mortar from masonry ties, shelf angles, and other obstructions.

F. At changes in substrate plane, apply sealant or termination mastic beads at sharp corners and edges to form a smooth transition from one plane to another.

3.3 JOINT TREATMENT

A. Concrete and Masonry: Prepare, treat, rout, and fill joints and cracks in substrate according to ASTM C 1193 and air-barrier manufacturer's written instructions. Remove dust and dirt from joints and cracks complying with ASTM D 4258 before coating surfaces.

1. Prime substrate and apply a single thickness of air-barrier manufacturer's recommended preparation coat extending a minimum of 3 inches along each side of joints and cracks. Apply a double thickness of fluid air-barrier material and embed a joint reinforcing strip in preparation coat.

B. Gypsum Sheathing: Fill joints greater than ¼-inch with sealant according to ASTM C 1193 and air-barrier manufacturer's written instructions. Apply first layer of fluid air-barrier material at joints. Tape joints with joint reinforcing strip after first layer is dry. Apply a second layer of fluid air-barrier material over joint reinforcing strip.

3.4 ACCESSORIES INSTALLATION

A. Install accessory materials according to air-barrier manufacturer's written instructions and details to form a seal with adjacent construction and ensure continuity of air and water barrier.

1. Coordinate the installation of air barrier with installation of roofing membrane and base flashing to ensure continuity of air barrier with roofing membrane.
2. Install transition strip on roofing membrane or base flashing so that a minimum of 3 inches of coverage is achieved over each substrate.
3. Unless manufacturer recommends in writing against priming, apply primer to substrates at required rate and allow it to dry. Limit priming to areas that will be covered by air-barrier material on same day. Reprime areas exposed for more than 24 hours.

B. Connect and seal exterior wall air-barrier material continuously to roofing-membrane air barrier, concrete below-grade structures, floor-to-floor construction, exterior glazing and window systems, glazed curtain-wall systems, storefront systems, exterior louvers, exterior door framing, and other construction used in exterior wall openings, using accessory materials.

C. At end of each working day, seal top edge of strips and transition strips to substrate with termination mastic.

D. Apply joint sealants forming part of air-barrier assembly within manufacturer's recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.

E. Wall Openings: Prime concealed, perimeter frame surfaces of windows, curtain walls, storefronts, and doors. Apply transition strip so that a minimum of 3 inches of coverage is achieved over each substrate. Maintain 3 inches of full contact over firm bearing to perimeter frames with not less than 1-inch of full contact.

1. Transition Strip: Roll firmly to enhance adhesion.

F. Seal strips and transition strips around masonry reinforcing or ties and penetrations with termination mastic.

G. Seal top of through-wall flashings to air barrier with an additional 6-inch-wide, transition strip.

H. Seal exposed edges of strips at seams, cuts, penetrations, and terminations not concealed by metal counterflashings or ending in reglets with termination mastic.

I. Repair punctures, voids, and deficient lapped seams in strips and transition strips. Slit and flatten fishmouths and blisters. Patch with transition strips extending 6 inches beyond repaired areas in strip direction.

3.5 AIR-BARRIER MATERIAL INSTALLATION

A. Apply air-barrier material to form a seal with strips and transition strips and to achieve a continuous air barrier according to air-barrier manufacturer's written instructions and details. Apply air-barrier material within manufacturer's recommended application temperature ranges.

1. Unless manufacturer recommends in writing against priming, apply primer to substrates at required rate and allow it to dry.
2. Limit priming to areas that will be covered by air-barrier material on same day. Reprime areas exposed for more than 24 hours.
3. Where multiple prime coats are needed to achieve required bond, allow adequate drying time between coats.

B. Air Barriers: Apply continuous unbroken air-barrier material to substrates according to the following thickness. Apply air-barrier material in full contact around protrusions such as masonry ties.

1. Vapor-Permeable Air Barrier: Total dry film thickness as recommended in writing by manufacturer to comply with performance requirements, but not less than 37 mils, applied in one (1) or more equal coats.

C. Do not cover air barrier until it has been tested and inspected by Owner's testing agency.

D. Correct deficiencies in or remove air barrier that does not comply with requirements; repair substrates and reapply air-barrier components.

3.6 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Inspections: Air-barrier materials, accessories, and installation are subject to inspection for compliance with requirements. Inspections may include the following:

1. Continuity of air-barrier system has been achieved throughout the building envelope with no gaps or holes.
2. Air-barrier dry film thickness.
3. Continuous structural support of air-barrier system has been provided.
4. Masonry and concrete surfaces are smooth, clean, and free of cavities, protrusions, and mortar droppings.
5. Site conditions for application temperature and dryness of substrates have been maintained.
6. Maximum exposure time of materials to UV deterioration has not been exceeded.
7. Surfaces have been primed, if applicable.
8. Laps in strips and transition strips have complied with minimum requirements and have been shingled in the correct direction (or mastic has been applied on exposed edges), with no fishmouths.
9. Termination mastic has been applied on cut edges.
10. Strips and transition strips have been firmly adhered to substrate.
11. Compatible materials have been used.
12. Transitions at changes in direction and structural support at gaps have been provided.
13. Connections between assemblies (air-barrier and sealants) have complied with requirements for cleanliness, surface preparation and priming, structural support, integrity, and continuity of seal.
14. All penetrations have been sealed.

C. Tests: As determined by Owner's testing agency from among the following tests:

1. Adhesion Testing: Air-barrier assemblies will be tested for minimum air-barrier adhesion of 30 lbf/sq. in. according to ASTM D 4541 for each 600 sq. ft. of installed air barrier or part thereof.

D. Air barriers will be considered defective if they do not pass tests and inspections.

1. Apply additional air-barrier material, according to manufacturer's written instructions, where inspection results indicate insufficient thickness.
2. Remove and replace deficient air-barrier components for retesting as specified above.

E. Repair damage to air barriers caused by testing; follow manufacturer's written instructions.

F. Prepare test and inspection reports.

3.7 CLEANING AND PROTECTION

A. Protect air-barrier system from damage during application and remainder of construction period, according to manufacturer's written instructions.

1. Protect air barrier from exposure to UV light and harmful weather exposure as recommended in writing by manufacturer. If exposed to these conditions for longer than recommended, remove and replace air barrier or install additional, full-thickness, air-barrier application after repairing and preparing the overexposed membrane according to air-barrier manufacturer's written instructions.
2. Protect air barrier from contact with incompatible materials and sealants not approved by air-barrier manufacturer.

B. Clean spills, stains, and soiling from construction that would be exposed in the completed work using cleaning agents and procedures recommended in writing by manufacturer of affected construction.

C. Remove masking materials after installation.

END OF SECTION 072726

SECTION 073113 - ASPHALT SHINGLES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Asphalt shingles.
2. Underlayment.
3. Metal flashing and trim.

B. Related Sections:

1. Section 061000 "Rough Carpentry" for wood blocking.
2. Section 076200 "Sheet Metal Flashing and Trim" for metal flashings.

1.3 DEFINITION

A. Roofing Terminology: See ASTM D 1079 and glossary of NRCA's "The NRCA Roofing and Waterproofing Manual" for definitions of terms related to roofing work in this Section.

1.4 PRE-INSTALLATION MEETINGS

A. Pre-installation Conference: Conduct conference at Project site.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Samples: For each exposed product and for each color and texture specified.

1. Asphalt Shingles: Full size.
2. Ridge and Hip Cap Shingles: Full size.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Installer.

B. Product Test Reports: For each type of asphalt shingle and underlayment product indicated, for tests performed by manufacturer and witnessed by a qualified testing agency.

C. Evaluation Reports: For synthetic underlayment, from ICC-ES or other testing and inspecting agency acceptable to authorities having jurisdiction, indicating that product is suitable for intended use under applicable building codes.

D. Sample Warranty: For manufacturer's warranty.

1.7 CLOSEOUT SUBMITTALS

A. Maintenance Data: For asphalt shingle to include in maintenance manuals.

1.8 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Asphalt Shingles: 100 sq. ft of each type, in unbroken bundles.

1.9 QUALITY ASSURANCE

A. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.

1.10 DELIVERY, STORAGE, AND HANDLING

A. Store roofing materials in a dry, well-ventilated location protected from weather, sunlight, and moisture according to manufacturer's written instructions.

B. Store underlayment rolls on end on pallets or other raised surfaces. Do not double stack rolls.

C. Protect unused roofing materials from weather, sunlight, and moisture when left overnight or when roofing work is not in progress.

D. Handle, store, and place roofing materials in a manner to prevent damage to roof deck or structural supporting members.

1.11 FIELD CONDITIONS

A. Environmental Limitations: Install self-adhering sheet underlayment within the range of ambient and substrate temperatures recommended by manufacturer.

1.12 WARRANTY

A. Manufacturer’s Warranty: Manufacturer agrees to repair or replace components of roof system that fail within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Manufacturing defects.
b. Structural failures including failure of asphalt shingles to self-seal after a reasonable time.

2. Warranty includes asphalt shingles, underlayment, fasteners, roofing accessories, metal flashings, and other components of roofing system for an edge-to-edge warranty.
3. Material Warranty Period: Minimum forty (40) years from date of Substantial Completion.
4. Workmanship Warranty Period: Twenty (20) years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Exterior Fire-Test Exposure: Provide asphalt shingles and related roofing materials identical to those of assemblies tested for Class A fire resistance according to ASTM E 108 or UL 790 by Underwriters Laboratories or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify products with appropriate markings of applicable testing agency.

2.2 GLASS-FIBER-REINFORCED ASPHALT SHINGLES

A. Multi-Tab-Strip Asphalt Shingles: ASTM D 3462, “Architectural Style”, UL Rating of A and Wind Resistance Label; glass-fiber reinforced, mineral-granule surfaced, and self-sealing.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. CertainTeed Corporation; **Landmark Premium**
b. GAF Materials Corporation; **Timberline Ultra HD**
c. Owens Corning; **Duration Premium**
d. Substitutions: Under provisions of Section 012500 “Substitution Procedures”.

2. Color and Blends: As selected by Architect and Owner from manufacturer's entire range.

B. Hip and Ridge Shingles: Manufacturer's standard units to match asphalt shingles.

2.3 UNDERLAYMENT MATERIALS

A. Self-Adhering Sheet Underlayment, Polyethylene Faced (Ice & Water Shield): ASTM D 1970, minimum of 40-mil-thick, slip-resisting, polyethylene-film-reinforced top surface laminated to SBS-modified asphalt adhesive, with release paper backing; cold applied.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. GCP Applied Technologies, Inc.
b. Johns Manville, a Berkshire Hathaway company
c. Owens Corning
d. Substitutions: Under provisions of Section 012500 “Substitution Procedures”.

2.4 ACCESSORIES

A. Asphalt Roofing Cement: ASTM D 4586, Type II, asbestos free.

B. Roofing Nails: ASTM F 1667; aluminum, stainless-steel, copper, or hot-dip galvanized-steel wire shingle nails, minimum 0.120-inch-diameter, barbed shank, sharp-pointed, with a minimum 3/8-inch-diameter flat head and of sufficient length to penetrate ¾-inch into solid wood decking or extend at least 1/8-inch through plywood sheathing.

1. Where nails are in contact with metal flashing, use nails made from same metal as flashing.

2.5 METAL FLASHING AND TRIM

A. General: Comply with requirements in Section 076200 "Sheet Metal Flashing and Trim."

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

1. Examine roof sheathing to verify that sheathing joints are supported by framing and blocking or metal clips and that installation is within flatness tolerances.
2. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and completely anchored; and that provision has been made for flashings and penetrations through asphalt shingles.

B. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 UNDERLAYMENT INSTALLATION

A. General: Comply with underlayment manufacturer's written installation instructions applicable to products and applications indicated unless more stringent requirements apply.

B. Self-Adhering Sheet Underlayment: Install, wrinkle free, on roof deck. Comply with low-temperature installation restrictions of underlayment manufacturer if applicable. Install lapped in direction that sheds water. Lap sides not less than 3½ inches. Lap ends not less than 6 inches staggered 24 inches between courses. Roll laps with roller. Cover underlayment within seven (7) days.

3.3 METAL FLASHING INSTALLATION

A. General: Install metal flashings and other sheet metal to comply with requirements in Section 076200 "Sheet Metal Flashing and Trim."

3.4 ASPHALT SHINGLE INSTALLATION

A. General: Install asphalt shingles according to manufacturer's written instructions and asphalt shingle recommendations in NRCA's "The NRCA Roofing and Waterproofing Manual."

B. Install starter strip along lowest roof edge, consisting of an asphalt shingle strip with tabs removed with self-sealing strip face up at roof edge.

1. Extend asphalt shingles ½-inch over fasciae at eaves and rakes.
2. Install starter strip along rake edge.

C. Install first and remaining courses of asphalt shingles stair-stepping diagonally across roof deck with manufacturer's recommended offset pattern at succeeding courses, maintaining uniform exposure.

D. Fasten asphalt shingle strips with a minimum of four (4) roofing nails located according to manufacturer's written instructions.

1. Where roof slope is less than 4:12, seal asphalt shingles with asphalt roofing cement spots.

E. Hip and Ridge Shingles: Maintain same exposure of cap shingles as roofing shingle exposure. Lap cap shingles at ridges to shed water away from direction of prevailing winds. Fasten with roofing nails of sufficient length to penetrate sheathing.

END OF SECTION 073113

SECTION 074293 - SOFFIT PANELS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Metal soffit panels.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of panel and accessory.

B. Shop Drawings:

1. Include fabrication and installation layouts of metal panels; details of edge conditions, joints, panel profiles, corners, anchorages, attachment system, trim, flashings, closures, and accessories; and special details.
2. Accessories: Include details of flashing, trim, and anchorage systems, at a scale of not less than 1½ inches per 12 inches.

C. Samples: For each type of exposed finish required, prepared on Samples of size indicated below:

1. Metal Panels: 12 inches long by actual panel width. Include fasteners, closures, and other metal panel accessories.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Test Reports: For each product, tests performed by a qualified testing agency.

C. Sample Warranties: For special warranties.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For metal panels to include in maintenance manuals.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver components, metal panels, and other manufactured items so as not to be damaged or deformed. Package metal panels for protection during transportation and handling.

B. Unload, store, and erect metal panels in a manner to prevent bending, warping, twisting, and surface damage.

C. Stack metal panels horizontally on platforms or pallets, covered with suitable weathertight and ventilated covering. Store metal panels to ensure dryness, with positive slope for drainage of water. Do not store metal panels in contact with other materials that might cause staining, denting, or other surface damage.

D. Retain strippable protective covering on metal panels during installation.

1.9 FIELD CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit assembly of metal panels to be performed according to manufacturers' written instructions and warranty requirements.

1.10 COORDINATION

A. Coordinate metal panel installation with rain drainage work, flashing, trim, construction of walls, and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

1.11 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of metal panel systems that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Structural failures including rupturing, cracking, or puncturing.
b. Deterioration of metals and other materials beyond normal weathering.

2. Warranty Period: Twenty (20) years from date of Substantial Completion.

B. Special Warranty on Panel Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal panels that show evidence of deterioration of factory-applied finishes within specified warranty period.

1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:

a. Color fading more than 5 Delta E units when tested according to ASTM D2244.
b. Chalking in excess of a No. 8 rating when tested according to ASTM D4214.
c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.

2. Finish Warranty Period: Thirty (30) years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide metal panel systems capable of withstanding the effects of the following loads, based on testing according to ASTM E 1592:

1. Wind and Other Design Loads: As indicated on Drawings, per Building Code, or as required by authorities having jurisdiction.
2. Deflection Limits: For wind loads, no greater than 1/180 of the span.

B. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

2.2 METAL SOFFIT PANELS

A. Provide metal soffit panels designed to be installed by lapping and interconnecting side edges of adjacent panels and mechanically attaching through panel to supports using concealed fasteners in side laps. Include accessories required for weathertight installation.

B. V-Groove-Profile Metal Soffit Panels: Perforated panels formed with vertical panel edges and a flat pan between panel edges; with a V-groove joint between panels.

1. Basis-of-Design:

a. ATAS International, Inc.; **Wind-Lok Soffit MPV120**

2. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Berridge Manufacturing Company
b. PAC-CLAD, Petersen Aluminum Corporation, a Carlisle company
c. Substitutions: Under provisions of Section 012500 “Substitution Procedures”.

3. Aluminum Sheet: Coil-coated sheet, ASTM B 209, alloy as standard with manufacturer, with temper as required to suit forming operations and structural performance required.

a. Thickness: 0.032-inch.
b. Surface: Smooth, flat finish; vented.
c. Exterior Finish: Two-coat fluoropolymer.
d. Color: As selected by Architect from manufacturer's entire range, to match existing.

4. Panel Coverage: 12 inches.
5. Panel Height: 0.375-inch.

2.3 MISCELLANEOUS MATERIALS

A. Miscellaneous Metal Subframing and Furring: ASTM C 645, cold-formed, metallic-coated steel sheet, ASTM A 653, G90 coating designation or ASTM A 792, Class AZ50 aluminum-zinc-alloy

coating designation unless otherwise indicated. Provide manufacturer's standard sections as required for support and alignment of metal panel system.

B. Panel Accessories: Provide components required for a complete, weathertight panel system including trim, clips, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal panels unless otherwise indicated.

1. Closure Strips: Closed-cell, expanded, cellular, rubber or crosslinked, polyolefin-foam or closed-cell laminated polyethylene; minimum 1-inch-thick, flexible closure strips; cut or pre-molded to match metal panel profile. Provide closure strips where indicated or necessary to ensure weathertight construction.

C. Flashing and Trim: Provide flashing and trim formed from same material as metal panels as required to seal against weather and to provide finished appearance. Finish flashing and trim with same finish system as adjacent metal panels.

D. Panel Fasteners: Self-tapping screws designed to withstand design loads. Provide exposed fasteners with heads matching color of metal panels by means of plastic caps or factory-applied coating. Provide EPDM or PVC sealing washers for exposed fasteners.

E. Panel Sealants: Provide sealant types recommended by manufacturer that are compatible with panel materials, are non-staining, and do not damage panel finish.

1. Sealant Tape: Pressure-sensitive, one hundred percent (100%) solids, gray polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, non-sag, non-toxic, non-staining tape ½-inch-wide and 1/8-inch-thick.
2. Joint Sealant: ASTM C 920; elastomeric polyurethane or silicone sealant; of type, grade, class, and use classifications required to seal joints in metal panels and remain weathertight; and as recommended in writing by metal panel manufacturer.
3. Butyl-Rubber-Based, Solvent-Release Sealant: ASTM C 1311.

2.4 FABRICATION

A. Fabricate and finish metal panels and accessories at the factory, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and with dimensional and structural requirements.

B. Provide panel profile, including major ribs and intermediate stiffening ribs, if any, for full length of panel.

C. Sheet Metal Flashing and Trim: Fabricate flashing and trim to comply with manufacturer's recommendations and recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of item indicated.

1. Form exposed sheet metal accessories that are without excessive oil canning, buckling, and tool marks and that are true to line and levels indicated, with exposed edges folded back to form hems.
2. Seams for Aluminum: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints for additional strength.
3. Sealed Joints: Form non-expansion, but movable, joints in metal to accommodate sealant and to comply with SMACNA standards.
4. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces of accessories exposed to view.

5. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal recommended in writing by metal panel manufacturer.

    a. Size: As recommended by SMACNA's "Architectural Sheet Metal Manual" or metal soffit panel manufacturer for application but not less than thickness of metal being secured.

2.5 FINISHES

A. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

B. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

C. Aluminum Panels and Accessories:

1. Two-Coat Fluoropolymer: AAMA 2605. Fluoropolymer finish containing not less than seventy percent (70%) polyvinylidene fluoride (PVDF) resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, metal panel supports, and other conditions affecting performance of the Work.
1. Examine framing to verify that girts, angles, channels, studs, and other structural panel support members and anchorage have been installed within alignment tolerances required by metal panel manufacturer.

B. Examine roughing-in for components and systems penetrating metal panels to verify actual locations of penetrations relative to seam locations of metal panels before installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Miscellaneous Supports: Install subframing, furring, and other miscellaneous panel support members and anchorages according to ASTM C 754 and metal panel manufacturer's written recommendations.

3.3 INSTALLATION

A. Install metal panels according to manufacturer's written instructions in orientation, sizes, and locations indicated. Install panels perpendicular to supports unless otherwise indicated. Anchor metal panels and other components of the Work securely in place, with provisions for thermal and structural movement.

1. Shim or otherwise plumb substrates receiving metal panels.
2. Flash and seal metal panels at perimeter of all openings. Fasten with self-tapping screws. Do not begin installation until air- or water-resistive barriers and flashings that will be concealed by metal panels are installed.
3. Install screw fasteners in predrilled holes.
4. Locate and space fastenings in uniform vertical and horizontal alignment.
5. Install flashing and trim as metal panel work proceeds.
6. Locate panel splices over, but not attached to, structural supports. Stagger panel splices and end laps to avoid a four-panel lap splice condition.
7. Provide weathertight escutcheons for pipe- and conduit-penetrating panels.

B. Fasteners:

1. Aluminum Panels: Use aluminum or stainless-steel fasteners for surfaces exposed to the exterior; use aluminum or galvanized-steel fasteners for surfaces exposed to the interior.

C. Metal Protection: Where dissimilar metals contact each other or corrosive substrates, protect against galvanic action as recommended in writing by metal panel manufacturer.

D. Lap-Seam Metal Panels: Fasten metal panels to supports with fasteners at each lapped joint at location and spacing recommended by manufacturer.

1. Apply panels and associated items true to line for neat and weathertight enclosure.
2. Provide metal-backed washers under heads of exposed fasteners bearing on weather side of metal panels.
3. Locate and space exposed fasteners in uniform vertical and horizontal alignment. Use proper tools to obtain controlled uniform compression for positive seal without rupture of washer.
4. Install screw fasteners with power tools having controlled torque adjusted to compress washer tightly without damage to washer, screw threads, or panels. Install screws in predrilled holes.

E. Accessory Installation: Install accessories with positive anchorage to building and weathertight mounting, and provide for thermal expansion. Coordinate installation with flashings and other components.

1. Install components required for a complete metal panel system including trim, corners, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items. Provide types indicated by metal panel manufacturer; or, if not indicated, provide types recommended by metal panel manufacturer.

F. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that are permanently watertight.

1. Install exposed flashing and trim that is without buckling, and tool marks, and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and to achieve waterproof performance.
2. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet with no joints allowed within 24 inches of corner or intersection. Where lapped expansion provisions cannot be used or would not be waterproof, form expansion joints of intermeshing hooked flanges, not less than 1-inch deep, filled with mastic sealant (concealed within joints).

3.4 CLEANING AND PROTECTION

A. Remove temporary protective coverings and strippable films, if any, as metal panels are installed unless otherwise indicated in manufacturer's written installation instructions. On completion of metal panel installation, clean finished surfaces as recommended by metal panel manufacturer. Maintain in a clean condition during construction.

B. After metal panel installation, clear weep holes and drainage channels of obstructions, dirt, and sealant.

C. Replace metal panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 074293

SECTION 075423 - THERMOPLASTIC-POLYOLEFIN (TPO) ROOFING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Adhered thermoplastic-polyolefin (TPO) roofing system.
2. Roof insulation.

B. Related Requirements:

1. Section 061000 "Rough Carpentry" for wood nailers, curbs, and blocking.
2. Section 076200 "Sheet Metal Flashing and Trim" for metal roof flashings and counterflashings.
3. Section 077129 "Manufactured Roof Expansion Joints" for proprietary manufactured roof expansion-joint assemblies.
4. Section 079200 "Joint Sealants" for joint sealants, joint fillers, and joint preparation.
5. Section 221423 "Storm Drainage Piping Specialties" for roof drains.

1.3 DEFINITIONS

A. Roofing Terminology: Definitions in ASTM D 1079 and glossary in NRCA's "The NRCA Roofing and Waterproofing Manual" apply to work of this Section.

1.4 PRE-INSTALLATION MEETINGS

A. Preliminary Roofing Conference: Conduct at Project site. **Refer to Section 070150.19 “Preparation for Reroofing” for additional items.**

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For roofing system. Include plans, elevations, sections, details, and attachments to other work, including:

1. Base flashings and membrane terminations.
2. Tapered insulation, including slopes.
3. Roof plan showing orientation of steel roof deck and orientation of roofing and fastening spacings and patterns for mechanically fastened roofing.
4. Insulation fastening patterns for corner, perimeter, and field-of-roof locations.

C. Samples: For the following products:

1. Sheet roofing and walkway pads, of color required.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer and manufacturer.

B. Manufacturer Certificates: Signed by roofing manufacturer certifying that roofing system complies with requirements specified in "Performance Requirements" Article.

1. Submit evidence of compliance with performance requirements.

C. Product Test Reports: For components of roofing system, tests performed by manufacturer and witnessed by a qualified testing agency.

D. Research/Evaluation Reports: For components of roofing system, from ICC-ES.

E. Field quality-control reports.

F. Sample Warranties: For manufacturer's special warranties.

1.7 CLOSEOUT SUBMITTALS

A. Maintenance Data: For roofing system to include in maintenance manuals.

1.8 QUALITY ASSURANCE

A. Manufacturer Qualifications: A qualified manufacturer that is UL listed for membrane roofing system identical to that used for this Project.

B. Installer Qualifications: A qualified firm that is approved, authorized, or licensed by roofing system manufacturer to install manufacturer's product and that is eligible to receive manufacturer's special warranty.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Deliver roofing materials to Project site in original containers with seals unbroken and labeled with manufacturer's name, product brand name and type, date of manufacture, approval or listing agency markings, and directions for storing and mixing with other components.

B. Store liquid materials in their original undamaged containers in a clean, dry, protected location and within the temperature range required by roofing system manufacturer. Protect stored liquid material from direct sunlight.

1. Discard and legally dispose of liquid material that cannot be applied within its stated shelf life.

C. Protect roof insulation materials from physical damage and from deterioration by sunlight, moisture, soiling, and other sources. Store in a dry location. Comply with insulation manufacturer's written instructions for handling, storing, and protecting during installation.

D. Handle and store roofing materials, and place equipment in a manner to avoid permanent deflection of deck.

1.10 FIELD CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit roofing system to be installed according to manufacturer's written instructions and warranty requirements.

1.11 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of roofing system that fail in materials or workmanship within specified warranty period.

1. Special warranty includes membrane roofing, base flashings, roof insulation, fasteners, cover boards, metal flashing, roofing accessories, roof drainage fabrications, and other components of roofing system for an edge-to-edge warranty.
2. Warranty Period: Twenty (20) years, non-prorated, no-dollar-limit, from date of Substantial Completion.

B. Provide self-adhesive emblems for each roof hatch, door, or access way, notifying the user of the roof condition, precautionary measures and other conditions of use or maintenance of the roofing membranes.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Carlisle SynTec Incorporated
2. Elevate, a division of Holcim Building Envelope
3. GAF
4. Johns Manville
5. Tremco, Inc.
6. Substitutions: Under provisions of Section 012500 “Substitution Procedures”.

B. Source Limitations: Obtain components including roof insulation and fasteners for roofing system from same manufacturer as membrane roofing or manufacturer approved by membrane roofing manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. General Performance: Installed roofing and base flashings shall withstand specified uplift pressures, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Roofing and base flashings shall remain watertight.

1. Accelerated Weathering: Roofing system shall withstand two thousand (2000) hours of exposure when tested according to ASTM G 152, ASTM G 154, or ASTM G 155.
2. Impact Resistance: Roofing system shall resist impact damage when tested according to ASTM D 3746 or ASTM D 4272.

B. Material Compatibility: Roofing materials shall be compatible with one another and adjacent materials under conditions of service and application required, as demonstrated by roofing manufacturer based on testing and field experience.

C. Roofing System Design: Tested by a qualified testing agency to resist the uplift requirements as indicated on the Drawings.

D. Solar Reflectance Index: Not less than 78 when calculated according to ASTM E 1980, based on testing identical products by a qualified testing agency.

E. Energy Star Listing: Roofing system shall be listed on the DOE's ENERGY STAR "Roof Products Qualified Product List" for low-slope roof products.

F. Exterior Fire-Test Exposure: ASTM E 108 or UL 790, Class C; for application and roof slopes indicated; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

G. Fire-Resistance Ratings: Comply with fire-resistance-rated assembly designs indicated. Identify products with appropriate markings of applicable testing agency.

2.3 TPO ROOFING

A. Fabric-Reinforced TPO Sheet: ASTM D 6878, internally fabric- or scrim-reinforced, uniform, flexible fabric-backed TPO sheet.

1. Thickness: 80 mils, nominal.
2. Exposed Face Color: White.

2.4 AUXILIARY ROOFING MATERIALS

A. General: Auxiliary materials recommended by roofing system manufacturer for intended use and compatible with roofing.

1. Liquid-type auxiliary materials shall comply with VOC limits of authorities having jurisdiction.
2. Adhesives and sealants that are not on the exterior side of weather barrier shall comply with the following limits for VOC content:

a. Multi-purpose Construction Adhesives: 70 g/L.
b. Single-Ply Roof Membrane Adhesives: 250 g/L.
c. Single-Ply Roof Membrane Sealants: 450 g/L.
d. Non-membrane Roof Sealants: 300 g/L.
e. Sealant Primers for Non-porous Substrates: 250 g/L.
f. Sealant Primers for Porous Substrates: 775 g/L.
g. Other Adhesives and Sealants: 250 g/L.

B. Sheet Flashing: Manufacturer's standard unreinforced TPO sheet flashing, 55 mils thick, minimum, of same color as TPO sheet.

C. Bonding Adhesive: Manufacturer's standard, water based.

D. Slip Sheet: Manufacturer's standard, of thickness required for application.

E. Metal Termination Bars: Manufacturer's standard, predrilled stainless-steel or aluminum bars, approximately 1 by 1/8-inch-thick; with anchors.

F. Miscellaneous Accessories: Provide pourable sealers, preformed cone and vent sheet flashings, preformed inside and outside corner sheet flashings, T-joint covers, lap sealants, termination reglets, compressible tubes and other accessories.

2.5 ROOF INSULATION

A. General: Preformed roof insulation boards manufactured or approved by TPO roofing manufacturer, selected from manufacturer's standard sizes suitable for application, of thicknesses indicated.

B. Polyisocyanurate Board Insulation: ASTM C 1289, Type II, Class 1, Grade 3, felt or glass-fiber mat facer on both major surfaces.

1. Compressive Strength: 25 psi.

C. Perlite Board Insulation: ASTM C 728, Type 1, rigid, mineral-aggregate thermal insulation board composed of expanded perlite, cellulosic fibers, binders, and waterproofing agents with top surface seal coated.

D. Tapered Insulation: Provide factory-tapered insulation boards.

1. Material: Match roof insulation.
2. Minimum Thickness: ¼-inch.
3. Slope:

a. Roof Field: ¼-inch per foot unless otherwise indicated on Drawings.
b. Saddles and Crickets: ½-inch per foot unless otherwise indicated on Drawings.

E. Provide preformed saddles, crickets, tapered edge strips, and other insulation shapes where indicated for sloping to drain. Fabricate to slopes indicated.

2.6 INSULATION ACCESSORIES

A. General: Roof insulation accessories recommended by insulation manufacturer for intended use and compatibility with roofing.

B. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Global 4470, designed for fastening roof insulation and cover boards to substrate, and acceptable to roofing system manufacturer.

C. Insulation Adhesive: Insulation manufacturer's recommended adhesive formulated to attach roof insulation to substrate or to another insulation layer as follows:

1. Full-spread, spray-applied, low-rise, two-component urethane adhesive.

D. Insulation Adhesive (at Metal Decks Exposed from Below): Two-component, polyurethane construction grade, low-rise expanding.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. OMG, Inc.; **OlyBond 500 Spot Shot**
b. Substitutions: Under provisions of Section 012500 “Substitution Procedures”.

E. Cover Board: ASTM C 1289, Type II, Class 4, Grade 2, polyisocyanurate board substrate with glass-fiber mat facer on both major surfaces.

2.7 WALKWAYS

A. Flexible Walkways: Factory-formed, non-porous, heavy-duty, slip-resisting, surface-textured walkway pads, approximately 3/16-inch-thick, and acceptable to roofing system manufacturer.

1. Size: Approximately 36 by 60 inches.
2. Color: Contrasting with roof membrane.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance of the Work:

1. Verify that roof openings and penetrations are in place, curbs are set and braced, and roof-drain bodies are securely clamped in place.
2. Verify that wood blocking, curbs, and nailers are securely anchored to roof deck at penetrations and terminations and that nailers match thicknesses of insulation.
3. Verify that surface plane flatness and fastening of steel roof deck complies with requirements in Section 053100 “Steel Decking”.
4. Verify that deck is securely fastened with no projecting fasteners and with no adjacent units in excess of 1/16-inch out of plane relative to adjoining deck.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean substrate of dust, debris, moisture, and other substances detrimental to roofing installation according to roofing system manufacturer's written instructions. Remove sharp projections.

B. Prevent materials from entering and clogging roof drains and conductors and from spilling or migrating onto surfaces of other construction. Remove roof-drain plugs when no work is taking place or when rain is forecast.

3.3 ROOFING INSTALLATION, GENERAL

A. Install roofing system according to roofing system manufacturer's written instructions.

B. Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of roofing system at the end of the workday or when rain is forecast. Remove and discard temporary seals before beginning work on adjoining roofing.

3.4 INSULATION INSTALLATION

A. Coordinate installing roofing system components so insulation is not exposed to precipitation or left exposed at the end of the workday.

B. Comply with roofing system and insulation manufacturer's written instructions for installing roof insulation.

C. Install tapered insulation under area of roofing to conform to slopes indicated.

D. Install insulation under area of roofing to achieve required thickness. Where overall insulation thickness is 2.7 inches or greater, install two (2) or more layers with joints of each succeeding layer staggered from joints of previous layer a minimum of 6 inches in each direction.

E. Trim surface of insulation where necessary at roof drains so completed surface is flush and does not restrict flow of water.

F. Install insulation with long joints of insulation in a continuous straight line with end joints staggered between rows, abutting edges and ends between boards. Fill gaps exceeding ¼-inch with insulation.

1. Cut and fit insulation within ¼-inch of nailers, projections, and penetrations.

G. Adhered Insulation (Metal Decks exposed from Below): Install each layer of insulation and adhere to substrate as follows:

1. Set each layer of insulation in a uniform coverage of full-spread insulation adhesive, firmly pressing and maintaining insulation in place.

H. Mechanically Fastened and Adhered Insulation (Metal Decks): Install each layer of insulation to deck using mechanical fasteners specifically designed and sized for fastening specified board-type roof insulation to deck type.

1. Fasten first layer of insulation to resist uplift pressure at corners, perimeter, and field of roof.
2. Set each subsequent layer of insulation in a uniform coverage of full-spread insulation adhesive, firmly pressing and maintaining insulation in place.

I. Install cover boards over insulation with long joints in continuous straight lines with end joints staggered between rows. Offset joints of insulation below a minimum of 6 inches in each direction. Loosely butt cover boards together and adhere to roof deck.

3.5 ADHERED ROOFING INSTALLATION

A. Adhere roofing over area to receive roofing according to roofing system manufacturer's written instructions. Unroll roofing and allow to relax before retaining.

B. Start installation of roofing in presence of roofing system manufacturer's technical personnel.

C. Accurately align roofing and maintain uniform side and end laps of minimum dimensions required by manufacturer. Stagger end laps.

D. Bonding Adhesive: Apply to substrate and underside of roofing at rate required by manufacturer and allow to partially dry before installing roofing. Do not apply to splice area of roofing.

E. In addition to adhering, mechanically fasten roofing securely at terminations, penetrations, and perimeter of roofing.

F. Apply roofing with side laps shingled with slope of roof deck where possible.

G. Seams: Clean seam areas, overlap roofing, and hot-air weld side and end laps of roofing and sheet flashings according to manufacturer's written instructions, to ensure a watertight seam installation.

1. Test lap edges with probe to verify seam weld continuity. Apply lap sealant to seal cut edges of sheet.
2. Verify field strength of seams a minimum of twice daily, and repair seam sample areas.
3. Repair tears, voids, and lapped seams in roofing that do not comply with requirements.

3.6 BASE FLASHING INSTALLATION

A. Install sheet flashings and preformed flashing accessories and adhere to substrates according to roofing system manufacturer's written instructions.

B. Apply bonding adhesive to substrate and underside of sheet flashing at required rate and allow to partially dry. Do not apply to seam area of flashing.

C. Flash penetrations and field-formed inside and outside corners with cured or uncured sheet flashing.

D. Clean seam areas, overlap, and firmly roll sheet flashings into the adhesive. Hot-air weld side and end laps to ensure a watertight seam installation.

E. Terminate and seal top of sheet flashings and mechanically anchor to substrate through termination bars, where indicated.

3.7 WALKWAY INSTALLATION

A. Flexible Walkways: Install walkway products in locations indicated. Heat weld to substrate or adhere walkway products to substrate with compatible adhesive according to roofing system manufacturer's written instructions.

3.8 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to inspect substrate conditions, surface preparation, membrane application, flashings, protection, and drainage components, and to furnish reports to Architect.

B. Final Roof Inspection: Arrange for roofing system manufacturer's technical personnel to inspect roofing installation on completion.

C. Repair or remove and replace components of roofing system where inspections indicate that they do not comply with specified requirements.

D. Additional testing and inspecting, at Contractor's expense, will be performed to determine if replaced or additional work complies with specified requirements.

3.9 PROTECTING AND CLEANING

A. Protect roofing system from damage and wear during remainder of construction period. When remaining construction does not affect or endanger roofing, inspect roofing for deterioration and damage, describing its nature and extent in a written report, with copies to Architect and Owner.

B. Correct deficiencies in or remove roofing system that does not comply with requirements, repair substrates, and repair or reinstall roofing system to a condition free of damage and deterioration at time of Substantial Completion and according to warranty requirements.

C. Clean overspray and spillage from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION 075423

SECTION 076200 - SHEET METAL FLASHING AND TRIM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Formed roof-drainage sheet metal fabrications.
2. Formed low-slope roof sheet metal fabrications.
3. Formed steep-slope roof sheet metal fabrications.
4. Formed brake metal.

B. Related Requirements:

1. Section 061000 "Rough Carpentry" for wood nailers, curbs, and blocking.
2. Section 077200 "Roof Accessories" for equipment supports, roof hatches, vents, and other manufactured roof accessory units.

1.3 COORDINATION

A. Coordinate sheet metal flashing and trim layout and seams with sizes and locations of penetrations to be flashed, and joints and seams in adjacent materials.

B. Coordinate sheet metal flashing and trim installation with adjoining roofing and wall materials, joints, and seams to provide leak-proof, secure, and non-corrosive installation.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each manufactured product and accessory.

B. Shop Drawings: For sheet metal flashing and trim.

1. Include plans, elevations, sections, and attachment details.
2. Detail fabrication and installation layouts, expansion-joint locations, and keyed details. Distinguish between shop- and field-assembled work.
3. Include identification of material, thickness, weight, and finish for each item and location in Project.
4. Include details for forming, including profiles, shapes, seams, and dimensions.
5. Include details for joining, supporting, and securing, including layout and spacing of fasteners, cleats, clips, and other attachments. Include pattern of seams.
6. Include details of termination points and assemblies.
7. Include details of roof-penetration flashing.
8. Include details of edge conditions, including eaves, ridges, valleys, rakes, crickets, and counterflashings as applicable.

9. Include details of special conditions.
10. Include details of connections to adjoining work.
11. Detail formed flashing and trim at scale of not less than 3 inches per 12 inches (1:5).

C. Samples: For each type of sheet metal and accessory indicated with factory-applied finishes.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For fabricator.

B. Product Test Reports: For each product, for tests performed by a qualified testing agency.

C. Sample Warranty: For special warranty.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For sheet metal flashing and trim, and its accessories, to include in maintenance manuals.

1.7 QUALITY ASSURANCE

A. Fabricator Qualifications: Employs skilled workers who custom fabricate sheet metal flashing and trim similar to that required for this Project and whose products have a record of successful in-service performance.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Do not store sheet metal flashing and trim materials in contact with other materials that might cause staining, denting, or other surface damage. Store sheet metal flashing and trim materials away from uncured concrete and masonry.

B. Protect strippable protective covering on sheet metal flashing and trim from exposure to sunlight and high humidity, except to extent necessary for period of sheet metal flashing and trim installation.

1.9 WARRANTY

A. Special Warranty on Finishes: Manufacturer agrees to repair finish or replace sheet metal flashing and trim that shows evidence of deterioration of factory-applied finishes within specified warranty period.

1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:

a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.

2. Finish Warranty Period: Twenty (20) years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Sheet metal flashing and trim assemblies, including cleats, anchors, and fasteners, are to withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Completed sheet metal flashing and trim are to not rattle, leak, or loosen, and are to remain watertight.

B. Sheet Metal Standard for Flashing and Trim: Comply with NRCA's "The NRCA Roofing Manual: Architectural Metal Flashing, Condensation and Air Leakage Control, and Reroofing" and SMACNA's "Architectural Sheet Metal Manual" requirements for dimensions and profiles shown unless more stringent requirements are indicated.

C. Wind Design Standard: Manufacture and install copings and roof edge flashings tested according to Chapter 16 of the International Building Code and capable of resisting the following design pressure:

1. Design Pressure: As indicated on Drawings and per Building Code, whichever is most stringent.

D. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes to prevent buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

2.2 SHEET METALS

A. General: Protect mechanical and other finishes on exposed surfaces from damage by applying strippable, temporary protective film before shipping.

B. Aluminum Sheet: ASTM B 209, alloy as standard with manufacturer for finish required, with temper as required to suit forming operations and performance required; with smooth, flat surface.

1. Exposed Coil-Coated Finish:

a. Two-Coat Fluoropolymer: AAMA 620. Fluoropolymer finish containing not less than seventy percent (70%) PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

2. Color: As selected by Architect and Owner from manufacturer's entire range.

C. Stainless-Steel Sheet: ASTM A 240 or ASTM A 666, Type 304, dead soft, fully annealed; with smooth, flat surface.

1. Finish: 2D (dull, cold rolled).

2.3 UNDERLAYMENT MATERIALS

A. Felt: ASTM D 226, Type II (No. 30), asphalt-saturated organic felt; non-perforated.

B. Slip Sheet: Rosin-sized building paper, 3 lb./100 sq. ft. minimum.

2.4 MISCELLANEOUS MATERIALS

A. General: Provide materials and types of fasteners, protective coatings, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation and as recommended by manufacturer of primary sheet metal unless otherwise indicated.

B. Fasteners: Wood screws, annular threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads and recommended by manufacturer of primary sheet metal.

1. General: Blind fasteners or self-drilling screws, gasketed, with hex-washer head.

a. Exposed Fasteners: Heads matching color of sheet metal using plastic caps or factory-applied coating. Provide metal-backed EPDM or PVC sealing washers under heads of exposed fasteners bearing on weather side of metal.
b. Blind Fasteners: High-strength aluminum or stainless-steel rivets suitable for metal being fastened.
c. Spikes and Ferrules: Same material as gutter; with spike with ferrule matching internal gutter width.

2. Fasteners for Aluminum Sheet: Aluminum or Series 300 stainless-steel.
3. Fasteners for Stainless-Steel Sheet: Series 300 stainless-steel.

C. Solder:

1. For Stainless-Steel: ASTM B 32, Grade Sn60, with acid flux of type recommended by stainless-steel sheet manufacturer.

D. Sealant Tape: Pressure-sensitive, one hundred percent (100%) solids, polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, non-sag, nontoxic, non-staining tape ½-inch-wide and 1/8-inch-thick.

E. Elastomeric Sealant: ASTM C 920, elastomeric polysulfide polymer sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.

F. Butyl Sealant: ASTM C 1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for hooked-type expansion joints with limited movement.

G. Bituminous Coating: Cold-applied asphalt emulsion according to ASTM D 1187.

H. Asphalt Roofing Cement: ASTM D 4586, asbestos free, of consistency required for application.

2.5 FABRICATION, GENERAL

A. General: Custom fabricate sheet metal flashing and trim to comply with details shown and recommendations in cited sheet metal standard that apply to design, dimensions, geometry, metal thickness, and other characteristics of item required. Fabricate sheet metal flashing and trim in shop to greatest extent possible.

1. Fabricate sheet metal flashing and trim in thickness or weight needed to comply with performance requirements, but not less than that specified for each application and metal.
2. Obtain field measurements for accurate fit before shop fabrication.
3. Form sheet metal flashing and trim to fit substrates without excessive oil canning, buckling, and tool marks; true to line, levels, and slopes; and with exposed edges folded back to form hems.
4. Conceal fasteners and expansion provisions where possible. Do not use exposed fasteners on faces exposed to view.

B. Fabrication Tolerances: Fabricate sheet metal flashing and trim that is capable of installation to a tolerance of ¼-inch in 20 feet on slope and location lines indicated on Drawings and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

C. Expansion Provisions: Form metal for thermal expansion of exposed flashing and trim.

1. Form expansion joints of intermeshing hooked flanges, not less than 1-inch-deep, filled with butyl sealant concealed within joints.
2. Use lapped expansion joints only where indicated on Drawings.

D. Sealant Joints: Where movable, non-expansion-type joints are required, form metal to provide for proper installation of elastomeric sealant according to cited sheet metal standard.

E. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal.

F. Fabricate cleats and attachment devices of sizes as recommended by cited sheet metal standard for application, but not less than thickness of metal being secured.

G. Seams: Fabricate non-moving seams with flat-lock seams. Tin edges to be seamed, form seams, and solder.

H. Seams (Aluminum): Fabricate non-moving seams with flat-lock seams. Form seams and seal with elastomeric sealant unless otherwise recommended by sealant manufacturer for intended use.

I. Do not use graphite pencils to mark metal surfaces.

2.6 ROOF-DRAINAGE SHEET METAL FABRICATIONS

A. Hanging Gutters: Fabricate to cross section required, complete with end pieces, outlet tubes, and other accessories as required. Fabricate in minimum 96-inch-long sections. Furnish flat-stock gutter brackets and twisted gutter spacers and straps fabricated from same metal as gutters, of size recommended by cited sheet metal standard but with thickness not less than twice the gutter thickness. Fabricate expansion joints, expansion-joint covers, and gutter accessories from same metal as gutters.

1. Gutter Profile: As indicated on Drawings, but to match existing.
2. Expansion Joints: Lap type.
3. Fabricate from the following materials:

a. Aluminum: 0.050-inch-thick.

B. Downspouts: Fabricate downspouts in rectangular profile and dimensions as indicated on Drawings to match existing adjacent building, complete with mitered elbows. Furnish with metal hangers from same material as downspouts and anchors. Shop fabricate elbows.

1. Fabricate from the following materials:

a. Aluminum: 0.040-inch-thick.

B. Gutter Diverter: Fabricate to dimensions and shape required and from the following materials:

1. Aluminum: 0.050-inch thick.

2.7 LOW-SLOPE ROOF SHEET METAL FABRICATIONS

A. Roof Caps, Fasciae, and Other Exposed Flashings: Fabricate in minimum 96-inch-long, but not exceeding 12-foot-long sections. Furnish with 6-inch-wide, joint cover plates.

1. Joint Style: Overlapped, 4 inches wide.
2. Fabricate from the following materials:

a. Aluminum: 0.050-inch-thick, unless otherwise indicated.

B. Base Flashing: Fabricate from the following materials:

1. Aluminum: 0.040-inch-thick.

C. Counterflashing: Shop fabricate interior and exterior corners. Fabricate from the following materials:

1. Aluminum: 0.032-inch-thick.

2.8 STEEP-SLOPE ROOF SHEET METAL FABRICATIONS

A. Valley Flashing: Fabricate from the following materials:

1. Aluminum: 0.032-inch-thick.

B. Drip Edges: Fabricate from the following materials:

1. Aluminum: 0.032-inch-thick.

C. Eave, Rake, Ridge, and Hip Flashing: Fabricate from the following materials:

1. Aluminum: 0.032-inch-thick, hemmed where indicated.

D. Roof-Penetration Flashing: Fabricate from the following materials:

1. Aluminum: 0.032-inch-thick.

E. Roof-to-Wall Transition (Step Flashing): Fabricate from the following materials:

1. Aluminum: 0.032-inch-thick.

2.9 MISCELLANEOUS SHEET METAL FABRICATIONS

A. Sill Flashing, Etc.: Fabricate from the following materials:

1. Aluminum: 0.063-inch-thick, unless otherwise noted, hemmed where indicated.

B. Drip Edges: Extend at least 3 inches into wall and ½-inch out from wall, with outer edge bent down 30 degrees and hemmed. Fabricate from the following materials:

1. Stainless Steel: 24-gauge-thick.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, substrate, and other conditions affecting performance of the Work.

1. Verify compliance with requirements for installation tolerances of substrates.
2. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 UNDERLAYMENT INSTALLATION

A. Felt Underlayment: Install felt underlayment, wrinkle free, using adhesive to minimize use of mechanical fasteners under sheet metal flashing and trim. Apply in shingle fashion to shed water, with lapped joints of not less than 2 inches.

B. Apply slip sheet, wrinkle free, directly on substrate before installing sheet metal flashing and trim.

3.3 INSTALLATION, GENERAL

A. General: Anchor sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement. Use fasteners, protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system.

1. Install sheet metal flashing and trim true to line, levels, and slopes. Provide uniform, neat seams with minimum exposure of solder, welds, and sealant.
2. Install sheet metal flashing and trim to fit substrates and to result in watertight performance. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.
3. Space cleats not more than 12 inches apart. Attach each cleat with at least two (2) fasteners. Bend tabs over fasteners.
4. Install exposed sheet metal flashing and trim with limited oil canning, and free of buckling and tool marks.
5. Torch cutting of sheet metal flashing and trim is not permitted.
6. Do not use graphite pencils to mark metal surfaces.

B. Metal Protection: Where dissimilar metals contact each other, or where metal contacts pressure-treated wood or other corrosive substrates, protect against galvanic action or corrosion by painting contact surfaces with bituminous coating or by other permanent separation as recommended by sheet metal manufacturer or cited sheet metal standard.

1. Coat concealed side of sheet metal flashing and trim with bituminous coating where flashing and trim contact wood, ferrous metal, or cementitious construction.
2. Underlayment: Where installing sheet metal flashing and trim directly on cementitious or wood substrates, install underlayment and cover with slip sheet.

C. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at maximum of 10 feet with no joints within 24 inches of corner or intersection.

1. Form expansion joints of intermeshing hooked flanges, not less than 1-inch-deep, filled with sealant concealed within joints.
2. Use lapped expansion joints only where indicated on Drawings.

D. Fasteners: Use fastener sizes that penetrate wood blocking or sheathing not less than 1¼ inches for nails and not less than ¾ inch for wood screws.

E. Conceal fasteners and expansion provisions where possible in exposed work and locate to minimize possibility of leakage. Cover and seal fasteners and anchors as required for a tight installation.

F. Seal joints as required for watertight construction.

1. Use sealant-filled joints unless otherwise indicated. Embed hooked flanges of joint members not less than 1-inch into sealant. Form joints to completely conceal sealant. When ambient temperature at time of installation is between 40 and 70 deg F, set joint members for fifty percent (50%) movement each way. Adjust setting proportionately for installation at higher ambient temperatures. Do not install sealant-type joints at temperatures below 40 deg F.
2. Prepare joints and apply sealants to comply with requirements in Section 079200 "Joint Sealants."

G. Soldered Joints: Clean surfaces to be soldered, removing oils and foreign matter. Pre-tin edges of sheets with solder to width of 1½ inches; however, reduce pre-tinning where pre-tinned surface would show in completed Work.

1. Do not solder aluminum sheet.
2. Do not use torches for soldering.
3. Heat surfaces to receive solder, and flow solder into joint. Fill joint completely. Completely remove flux and spatter from exposed surfaces.
4. Stainless-Steel Soldering: Tin edges of uncoated sheets, using solder for stainless steel and acid flux. Promptly remove acid flux residue from metal after tinning and soldering. Comply with solder manufacturer's recommended methods for cleaning and neutralization.

3.4 ROOF-DRAINAGE SYSTEM INSTALLATION

A. General: Install sheet metal roof-drainage items to produce complete roof-drainage system according to cited sheet metal standard unless otherwise indicated. Coordinate installation of roof perimeter flashing with installation of roof-drainage system.

B. Hanging Gutters: Join sections with soldered joints. Provide for thermal expansion. Attach gutters at eave or fascia to firmly anchor them in position. Provide end closures and seal watertight with sealant. Slope to downspouts.

1. Fasten gutter spacers to front and back of gutter.
2. Anchor and loosely lock back edge of gutter to continuous eave or apron flashing.
3. Anchor gutter with gutter brackets spaced not more than 24 inches apart to roof deck, unless otherwise indicated, and loosely lock to front gutter bead.
4. Install gutter with expansion joints at locations not exceeding 50 feet apart. Install expansion-joint caps.
5. Install gutter diverters on gutter edges at all roof valleys, minimum 8 inches tall with two (2) 14-inch-long legs. Increase height and leg length by 2 inches for valleys longer than 20 feet.

C. Downspouts: Join sections with 1½ inch telescoping joints.

1. Provide hangers with fasteners designed to hold downspouts securely to walls. Locate hangers at existing locations minimum, but at top and bottom and at approximately 60 inches o.c.
2. Connect downspouts to underground drainage system.

3.5 ROOF FLASHING INSTALLATION

A. General: Install sheet metal flashing and trim to comply with performance requirements and cited sheet metal standard. Provide concealed fasteners where possible, and set units true to line, levels, and slopes. Install work with laps, joints, and seams that are permanently watertight and weather resistant.

B. Cap, Fasciae, and Other Exposed Flashings: Anchor to resist uplift and outward forces according to recommendations in cited sheet metal standard unless otherwise indicated. Interlock bottom edge of roof edge flashing with continuous cleat anchored to substrate at staggered 3-inch centers.

C. Pipe or Post Counterflashing: Install counterflashing umbrella with close-fitting collar with top edge flared for elastomeric sealant, extending minimum of 4 inches over base flashing. Install stainless-steel draw band and tighten.

D. Counterflashing: Coordinate installation of counterflashing with installation of base flashing. Insert counterflashing in reglets or receivers and fit tightly to base flashing. Extend counterflashing 4 inches over base flashing. Lap counterflashing joints minimum of 4 inches and bed in sealant. Secure in waterproof manner by means of interlocking folded seam or blind rivets and sealant unless otherwise indicated.

E. Counterflashing: End counterflashing at termination bars as indicated on Drawings. Seal termination bar with sealant as specified in Section 079200 “Sealants”.

F. Roof-Penetration Flashing: Coordinate installation of roof-penetration flashing with installation of roofing and other items penetrating roof. Seal with elastomeric sealant and clamp flashing to pipes that penetrate roof.

3.6 ERECTION TOLERANCES

A. Installation Tolerances: Shim and align sheet metal flashing and trim within installed tolerance of ¼-inch in 20 feet on slope and location lines indicated on Drawings and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

3.7 CLEANING AND PROTECTION

A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.

B. Clean and neutralize flux materials. Clean off excess solder.

C. Clean off excess sealants.

D. Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed unless otherwise indicated in manufacturer's written installation instructions. On completion of sheet metal flashing and trim installation, remove unused materials and clean finished surfaces as recommended by sheet metal flashing and trim manufacturer. Maintain sheet metal flashing and trim in clean condition during construction.

E. Replace sheet metal flashing and trim that have been damaged or that have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 076200

SECTION 077100 - ROOF SPECIALTIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Roof-edge specialties.

B. Related Requirements:

1. Section 061000 "Rough Carpentry" for wood nailers, curbs, and blocking.
2. Section 076200 "Sheet Metal Flashing and Trim" for custom- and site-fabricated sheet metal flashing and trim.
3. Section 077200 "Roof Accessories" for set-on-type curbs, equipment supports, vents, and other manufactured roof accessory units.
4. Section 079200 "Joint Sealants" for field-applied sealants between roof specialties and adjacent materials.

1.3 PRE-INSTALLATION MEETING

A. Pre-installation Meeting: Conduct conference at Project site.

1. Meet with Owner, Architect, Owner's insurer if applicable, roofing-system testing and inspecting agency representative, roofing Installer, roofing-system manufacturer's representative, Installer, structural-support Installer, and installers whose work interfaces with or affects roof specialties, including installers of roofing materials and accessories.
2. Examine substrate conditions for compliance with requirements, including flatness and attachment to structural members.
3. Review special roof details, roof drainage, and condition of other construction that will affect roof specialties.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Shop Drawings: For roof specialties.

1. Include plans, elevations, expansion-joint locations, keyed details, and attachments to other work. Distinguish between plant- and field-assembled work.
2. Include details for expansion and contraction; locations of expansion joints, including direction of expansion and contraction.
3. Indicate profile and pattern of seams and layout of fasteners, cleats, clips, and other attachments.

4. Detail termination points and assemblies, including fixed points.
5. Include details of special conditions.

C. Samples: For each type of roof specialty and for each color and texture specified.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For manufacturer.

B. Product Test Reports: For roof-edge flashings, for tests performed by a qualified testing agency.

C. Sample Warranty: For manufacturer's special warranty.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For roofing specialties to include in maintenance manuals.

1.7 QUALITY ASSURANCE

A. Manufacturer Qualifications: A qualified manufacturer offering products meeting requirements that are tested to specified design pressure.

B. Source Limitations: Obtain roof specialties approved by manufacturer providing roofing-system warranty specified in Section 075423 “Thermoplastic Polyolefin (TPO) Roofing”.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Do not store roof specialties in contact with other materials that might cause staining, denting, or other surface damage. Store roof specialties away from uncured concrete and masonry.

B. Protect strippable protective covering on roof specialties from exposure to sunlight and high humidity, except to extent necessary for the period of roof-specialty installation.

1.9 FIELD CONDITIONS

A. Field Measurements: Verify profiles and tolerances of roof-specialty substrates by field measurements before fabrication and indicate measurements on Shop Drawings.

B. Coordination: Coordinate roof specialties with flashing, trim, and construction of parapets, roof deck, roof and wall panels, and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

1.10 WARRANTY

A. Roofing-System Warranty: Roof specialties are included in warranty provisions in Section 075423 “Thermoplastic Polyolefin (TPO) Roofing”.

B. Special Warranty on Painted Finishes: Manufacturer agrees to repair finish or replace roof specialties that show evidence of deterioration of factory-applied finishes within specified warranty period.

1. Fluoropolymer Finish: Deterioration includes, but is not limited to, the following:

a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.

c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.

2. Finish Warranty Period: Twenty (20) years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. General Performance: Roof specialties shall withstand exposure to weather and resist thermally induced movement without failure, rattling, leaking, or fastener disengagement due to defective manufacture, fabrication, installation, or other defects in construction.

B. Wind Design Standard: Manufacture and install copings and roof-edge specialties tested according to Chapter 16 of the International Building Code and capable of resisting the following design pressures:

1. Design Pressure: As indicated on Drawings and per Building Code, whichever is most stringent.

C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes to prevent buckling, opening of joints, hole elongation, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Provide clips that resist rotation and avoid shear stress as a result of thermal movements. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

2.2 ROOF-EDGE SPECIALTIES

A. Roof-Edge Fascia: Manufactured, two-piece, roof-edge fascia consisting of snap-on metal fascia cover in section lengths not exceeding 12 feet and a continuous metal receiver with integral drip-edge cleat to engage fascia cover and secure single-ply roof membrane. Provide matching corner units.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Elevate, a division of Holcim Building Envelope
b. Johns Manville
c. Perimeter Systems; a division of Southern Aluminum Finishing Company, Inc.
d. Substitutions: Under provisions of Section 012500 “Substitution Procedures”.

2. Formed Aluminum Sheet Fascia Covers: Aluminum sheet, minimum 0.063-inch-thick but thickness as required to meet performance requirements.

a. Surface: Smooth, flat finish.
b. Finish: Two-coat fluoropolymer.
c. Color: As selected by Architect and Owner from manufacturer's entire range, to match existing.

3. Corners: Factory mitered and continuously welded.
4. Splice Plates: Concealed, of same material, finish, and shape as fascia cover.
5. Receiver: Manufacturer's standard material and thickness.

B. Metal Copings: Manufactured coping system consisting of metal coping cap in section lengths not exceeding 12 feet, concealed anchorage; with corner units, end cap units, and concealed splice plates with finish matching coping caps.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Elevate, a division of Holcim Building Envelope
b. Johns Manville
c. Metal-Era, an MTL company
d. Perimeter Systems; a division of Southern Aluminum Finishing Company, Inc.
e. Substitutions: Under provisions of Section 012500 “Substitution Procedures”.

2. Formed Aluminum Sheet Coping Caps: Aluminum sheet, 0.063-inch-thick.

a. Surface: Smooth, flat finish.
b. Finish: Two-coat fluoropolymer.
c. Color: As selected by Architect and Owner from manufacturer's entire range, to match existing.

2.3 MATERIALS

A. Aluminum Sheet: ASTM B 209 alloy as standard with manufacturer for finish required, with temper to suit forming operations and performance required.

2.4 UNDERLAYMENT MATERIALS

A. Felt: ASTM D 226, Type II (No. 30), asphalt-saturated organic felt, non-perforated.

B. Slip Sheet: Rosin-sized building paper, 3-lb./100 sq. ft. minimum.

2.5 MISCELLANEOUS MATERIALS

A. Fasteners: Manufacturer's recommended fasteners, suitable for application and designed to meet performance requirements. Furnish the following unless otherwise indicated:

1. Exposed Penetrating Fasteners: Gasketed screws with hex washer heads matching color of sheet metal.
2. Fasteners for Aluminum: Aluminum or Series 300 stainless-steel.

B. Elastomeric Sealant: ASTM C 920, elastomeric polyurethane polymer sealant of type, grade, class, and use classifications required by roofing-specialty manufacturer for each application.

C. Butyl Sealant: ASTM C 1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for hooked-type joints with limited movement.

D. Bituminous Coating: Cold-applied asphalt emulsion complying with ASTM D 1187.

E. Asphalt Roofing Cement: ASTM D 4586, asbestos free, of consistency required for application.

2.6 FINISHES

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Noticeable variations in same piece are unacceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

D. Coil-Coated Aluminum Sheet Finishes:

1. High-Performance Organic Finish: Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

a. Two-Coat Fluoropolymer: AAMA 2605. Fluoropolymer finish containing not less than seventy percent (70%) PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
b. Concealed Surface Finish: Apply pretreatment and manufacturer's standard acrylic or polyester backer finish consisting of prime coat and wash coat with a minimum total dry film thickness of 0.5 mil.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions, and other conditions affecting performance of the Work.

B. Examine walls, roof edges, and parapets for suitable conditions for roof specialties.

C. Verify that substrate is sound, dry, smooth, clean, sloped for drainage where applicable, and securely anchored.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 UNDERLAYMENT INSTALLATION

A. Felt Underlayment: Install with adhesive for temporary anchorage to minimize use of mechanical fasteners under roof specialties. Apply in shingle fashion to shed water, with lapped joints of not less than 2 inches.

B. Slip Sheet: Install with tape or adhesive for temporary anchorage to minimize use of mechanical fasteners under roof specialties. Apply in shingle fashion to shed water, with lapped joints of not less than 2 inches.

3.3 INSTALLATION, GENERAL

A. General: Install roof specialties according to manufacturer's written instructions. Anchor roof specialties securely in place, with provisions for thermal and structural movement. Use fasteners, protective coatings, separators, underlayments, sealants, and other miscellaneous items as required to complete roof-specialty systems.

1. Install roof specialties level, plumb, true to line and elevation; with limited oil-canning and without warping, jogs in alignment, buckling, or tool marks.
2. Provide uniform, neat seams with minimum exposure of sealant.

3. Install roof specialties to fit substrates and to result in weathertight performance. Verify shapes and dimensions of surfaces to be covered before manufacture.
4. Torch cutting of roof specialties is not permitted.
5. Do not use graphite pencils to mark metal surfaces.

B. Metal Protection: Protect metals against galvanic action by separating dissimilar metals from contact with each other or with corrosive substrates by painting contact surfaces with bituminous coating or by other permanent separation as recommended by manufacturer.

1. Coat concealed side of uncoated aluminum roof specialties with bituminous coating where in contact with wood, ferrous metal, or cementitious construction.
2. Bed flanges in thick coat of asphalt roofing cement where required by manufacturers of roof specialties for waterproof performance.

C. Expansion Provisions: Allow for thermal expansion of exposed roof specialties.

1. Space movement joints at a maximum of 12 feet with no joints within 18 inches of corners or intersections unless otherwise indicated on Drawings.
2. When ambient temperature at time of installation is between 40 and 70 deg F, set joint members for fifty percent (50%) movement each way. Adjust setting proportionately for installation at higher ambient temperatures.

D. Fastener Sizes: Use fasteners of sizes that penetrate wood blocking or sheathing not less than 1¼ inches for nails and not less than ¾ inch for wood screws.

E. Seal concealed joints with butyl sealant as required by roofing-specialty manufacturer.

F. Seal joints as required for weathertight construction. Place sealant to be completely concealed in joint. Do not install sealants at temperatures below 40 deg F.

3.4 ROOF-EDGE SPECIALTIES INSTALLATION

A. Install cleats, cants, and other anchoring and attachment accessories and devices with concealed fasteners.

B. Anchor roof edgings with manufacturer's required devices, fasteners, and fastener spacing to meet performance requirements.

C. Anchor copings with manufacturer's required devices, fasteners, and fastener spacing to meet performance requirements.

1. Interlock face and back leg drip edges of snap-on coping cap into cleated anchor plates anchored to substrate at manufacturer's required spacing that meets performance requirements.

3.5 CLEANING AND PROTECTION

A. Clean off excess sealants.

B. Remove temporary protective coverings and strippable films as roof specialties are installed. On completion of installation, clean finished surfaces, including removing unused fasteners, metal filings, pop rivet stems, and pieces of flashing. Maintain roof specialties in a clean condition during construction.

C. Replace roof specialties that have been damaged or that cannot be successfully repaired by finish touchup or similar minor repair procedures.

END OF SECTION 077100

SECTION 077129 - MANUFACTURED ROOF EXPANSION JOINTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Compressible tube type roof expansion joints.

B. Related Requirements:

1. Section 061000 "Rough Carpentry" for wooden curbs or cants for mounting roof expansion joints.
2. Section 076200 "Sheet Metal Flashing and Trim" for shop- and field-fabricated sheet metal expansion-joint systems, flashing, and other sheet metal items.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For roof expansion joints.

1. Include plans, elevations, sections, and attachment details.
2. Include details of splices, intersections, transitions, fittings, method of field assembly, and location and size of each field splice.
3. Provide isometric drawings of intersections, terminations, and changes in joint direction or planes, depicting how components interconnect with each other and adjacent construction to allow movement and achieve waterproof continuity.

C. Samples: For each exposed product and for each color specified, 6 inches in size.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Test Reports: For each fire-barrier provided as part of a roof-expansion-joint assembly, for tests performed by a qualified testing agency.

C. Sample Warranties: For special warranties.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Installer of roofing membrane.

1.6 WARRANTY

A. Special Warranty: Manufacturer and Installer agree to repair or replace roof expansion joints and components that leak, deteriorate beyond normal weathering, or otherwise fail in materials or workmanship within specified warranty period.

1. Warranty Period: Two (2) years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. General: Roof expansion joints shall withstand exposure to weather, remain watertight, and resist the movements indicated without failure, rattling, leaking, or fastener disengagement due to defective manufacture, fabrication, installation, or other defects in construction.

B. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes to prevent buckling, opening of joints, hole elongation, overstressing of components, failure of joint seals, failure of connections, and other detrimental effects.

1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

C. Fire-Test-Response Characteristics: Provide fire-barrier assemblies with fire-test-response characteristics as determined by testing identical products, per test method indicated, by UL or another testing agency acceptable to authorities having jurisdiction. Assemblies shall be capable of anticipated movement while maintaining fire rating. Fire-barrier products shall bear classification marking of qualified testing agency.

2.2 COMPRESSIBLE TUBE-TYPE ROOF EXPANSION JOINTS

A. Source Limitations: Obtain roof expansion joints approved by roofing manufacturer and that are part of roofing membrane warranty.

B. Compressible Tube Roof Expansion Joint: Preformed, compressible, resilient, non-staining, non-waxing, non-extruding strips of closed-cell polyethylene foam, nonabsorbent to liquid water and gas, non-outgassing in unruptured state and of size, shape, and density to control sealant depth and otherwise contribute to producing optimum sealant performance.

1. Fire Barrier: Manufacturer's standard fire-resistive joint system with ratings determined per ASTM E 119 to resist spread of fire and to accommodate building thermal movements without impairing its ability to resist the passage of fire and hot gases.

a. Fire-Resistance Rating: Not less than 2 hours.

2.3 MATERIALS

A. Neoprene Membrane: Neoprene sheet recommended by EPDM manufacturer for resistance to hydrocarbons, non-aromatic solvents, grease, and oil; and as standard with roof-expansion-joint manufacturer for application.

B. Adhesives: As recommended by roof-expansion-joint manufacturer and with a VOC content of 70 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

C. Mineral-Fiber Blanket: ASTM C 665.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions, and other conditions affecting performance of the Work.

B. Examine roof-joint openings, inside surfaces of parapets, and expansion-control joint systems that interface with roof expansion joints, for suitable conditions where roof expansion joints will be installed.

C. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Comply with manufacturer's written instructions for handling and installing roof expansion joints.

1. Anchor roof expansion joints securely in place, with provisions for required movement. Use fasteners, protective coatings, sealants, and miscellaneous items as required to complete roof expansion joints.
2. Install roof expansion joints true to line and elevation; with limited oil-canning and without warping, jogs in alignment, buckling, or tool marks.
3. Provide for linear thermal expansion of roof expansion joint materials.
4. Provide uniform profile of roof expansion joint throughout its length; do not stretch or squeeze membranes.
5. Provide uniform, neat seams.
6. Install roof expansion joints to fit substrates and to result in watertight performance.
7. Torch cutting of roof expansion joints is not permitted.
8. Do not use graphite pencils to mark aluminum surfaces.

B. Splices: Splice roof expansion joints with materials provided by roof-expansion-joint manufacturer for this purpose, to provide continuous, uninterrupted, and waterproof joints.

C. Fire Barrier: Install fire barrier where indicated to provide continuous, uninterrupted fire resistance throughout length of roof expansion joint, including transitions and end joints.

3.3 PROTECTION

A. Protect roof expansion joints from foot traffic, displacement, or other damage.

B. Remove and replace roof expansion joints and components that become damaged by moisture or otherwise.

END OF SECTION 077129

SECTION 077200 - ROOF ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Roof hatches.
2. Pipe and duct supports.
3. Preformed flashing sleeves.

B. Related Sections:

1. Section 076200 "Sheet Metal Flashing and Trim" for shop- and field-formed metal flashing, roof-drainage systems, roof expansion-joint covers, and miscellaneous sheet metal trim and accessories.
2. Section 077100 "Roof Specialties" for manufactured fasciae and roof edge flashings.
3. Section 077129 "Manufactured Roof Expansion Joints" for manufactured roof expansion-joint covers.

1.3 COORDINATION

A. Coordinate layout and installation of roof accessories with roofing membrane and base flashing and interfacing and adjoining construction to provide a leakproof, weathertight, secure, and non-corrosive installation.

B. Coordinate dimensions with rough-in information or Shop Drawings of equipment to be supported.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of roof accessory.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Shop Drawings: For roof accessories.

1. Include plans, elevations, keyed details, and attachments to other work. Indicate dimensions, loadings, and special conditions. Distinguish between plant- and field-assembled work.

C. Samples: For each exposed product and for each color and texture specified, prepared on Samples of size to adequately show color.

1.5 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Roof plans, drawn to scale, and coordinating penetrations and roof-mounted items. Show the following:

1. Size and location of roof accessories specified in this Section.
2. Method of attaching roof accessories to roof or building structure.
3. Other roof-mounted items including mechanical and electrical equipment, ductwork, piping, and conduit.
4. Required clearances.

B. Sample Warranties: For manufacturer's special warranties.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For roof accessories to include in operation and maintenance manuals.

1.7 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace roof hatch that fails in materials or workmanship within specified warranty period.

1. Warranty Period: Five (5) years from date of Substantial Completion.

B. Special Warranty on Painted Finishes: Manufacturer's standard form in which manufacturer agrees to repair finishes or replace roof accessories that show evidence of deterioration of factory-applied finishes within specified warranty period.

1. Finish Warranty Period: Five (5) years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. General Performance: Roof accessories shall withstand exposure to weather and resist thermally induced movement without failure, rattling, leaking, or fastener disengagement due to defective manufacture, fabrication, installation, or other defects in construction.

2.2 ROOF HATCH

A. Roof Hatches: Metal roof-hatch units with thermally broken lids and insulated single-walled curbs, welded corner joints, continuous lid-to-curb counterflashing and weathertight perimeter gasketing, and integrally formed deck-mounting flange at perimeter bottom.

1. Basis-of-Design:

a. Bilco Company (The); **Type E-50TB**

2. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Milcor Inc.; Commercial Products Group of Hart & Cooley, Inc.

b. Precision Ladders, LLC
c. Substitutions: Under provisions of Section 012500 “Substitution Procedures”.

B. Type and Size: Single-leaf lid, sized to match existing.

C. Loads: Minimum 40-lbf/sq. ft. external live load and 20-lbf/sq. ft. internal uplift load.

D. Hatch Material: Aluminum sheet.

1. Thickness: 0.090-inch.
2. Finish: Mill.

E. Construction:

1. Insulation: 3-inch-thick, polyisocyanurate board.

a. R-Value: 20.3 according to ASTM C 1363.

2. Hatch Lid: Opaque, insulated, and double walled, with manufacturer's standard metal liner of same material and finish as outer metal lid.
3. On ribbed or fluted metal roofs, form flange at perimeter bottom to conform to roof profile.
4. Fabricate curbs to minimum height of 12 inches above roofing surface unless otherwise indicated.

F. Hardware: Spring operators, hold-open arm, galvanized steel spring latch with turn handles, stainless-steel butt- or pintle-type hinge system, and padlock hasps inside and outside.

G. Safety Railing System: Roof-hatch manufacturer's standard system including rails, clamps, fasteners, safety barrier at railing opening, and accessories required for a complete installation; attached to roof hatch and complying with 29 CFR 1910.23 requirements and authorities having jurisdiction.

1. Height: 42 inches above finished roof deck.
2. Posts and Rails: Galvanized-steel pipe, 1¼ inches in diameter or galvanized-steel tube, 1-5/8 inches in diameter.
3. Flat Bar: Galvanized steel, 2 inches high by 3/8-inch-thick.
4. Maximum Opening Size: System constructed to prevent passage of a sphere 21 inches in diameter.
5. Self-Latching Gate: Fabricated of same materials and rail spacing as safety railing system. Provide manufacturer's standard hinges and self-latching mechanism.
6. Post and Rail Tops and Ends: Weather resistant, closed or plugged with prefabricated end fittings.
7. Provide weep holes or another means to drain entrapped water in hollow sections of handrail and railing members.
8. Fabricate joints exposed to weather to be watertight.
9. Fasteners: Manufacturer's standard, finished to match railing system.
10. Finish: Manufacturer's standard baked enamel or powder coat.

a. Color: As selected by Architect and Owner from manufacturer's entire range.

2.3 PIPE AND DUCT SUPPORTS

A. Rubber Pipe Support Curbs: Provide manufacturer's standard low-profile rubber pipe support curbs.

1. Basis-of-Design Product:

    a. Advanced Support Products; **EcoCurb REC 9S**

2. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. MIFAB, Inc.
    b. Rugger Triangle Co. (The)
    c. Substitutions: Under provisions of Section 012500 “Substitution Procedures”.

B. Duct Supports: Internally reinforced metal duct supports capable of supporting superimposed live and dead loads, including equipment loads and other construction indicated on Drawings; with welded or mechanically fastened and sealed corner joints, and integrally formed deck-mounting flange at perimeter bottom.

1. Basis-of-Design Product:

    a. Miro Industries, Inc.; **6-DS**

2. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. Custom Solution Roof and Metal Products
    b. Roof Products, Inc.
    c. Substitutions: Under provisions of Section 012500 “Substitution Procedures”.

3. Size:

    a. Bases: 9 inches x 15¼ inches.
    b. Strut Assembly: Minimum 16-inch-wide support bar, width as required, with height adjustable from a minimum of 12 inches to a maximum of 36 inches in elevation above roof membrane.

4. Loads: Maximum load weight not to exceed 325 lbs. on each base.
5. Material: Polycarbonate plastic bases with zinc-coated (galvanized) steel struts and support bar. Finish and color per manufacturer’s standard.

2.4 PREFORMED FLASHING SLEEVES

A. Exhaust Vent Flashing: Double-walled metal flashing sleeve or boot, insulation filled, with integral deck flange, 12 inches high, with removable metal hood and slotted metal collar.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. Custom Solution Roof and Metal Products
    b. Thaler Metal USA Inc.
    c. Substitutions: Under provisions of Section 012500 “Substitution Procedures”.

2. Metal: Aluminum sheet, 0.063-inch-thick.
3. Diameter: As required.

4. Finish: Manufacturer's standard.

B. Vent Stack Flashing: Metal flashing sleeve, uninsulated, with integral deck flange.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Custom Solution Roof and Metal Products
b. Milcor Inc.; Commercial Products Group of Hart & Cooley, Inc.
c. Thaler Metal USA Inc.
d. Substitutions: Under provisions of Section 012500 “Substitution Procedures”.

2. Metal: Aluminum sheet, 0.063-inch-thick.
3. Height: 19 inches.
4. Diameter: As required.
5. Finish: Manufacturer's standard.

2.5 METAL MATERIALS

A. Aluminum Sheet: ASTM B 209, manufacturer's standard alloy for finish required, with temper to suit forming operations and performance required.

1. Mill Finish: As manufactured.

B. Galvanized-Steel Tube: ASTM A 500, round tube, hot-dip galvanized according to ASTM A 123.

C. Steel Pipe: ASTM A 53, galvanized.

2.6 MISCELLANEOUS MATERIALS

A. General: Provide materials and types of fasteners, protective coatings, sealants, and other miscellaneous items required by manufacturer for a complete installation.

B. Polyisocyanurate Board Insulation: ASTM C 1289, thickness and thermal resistivity as indicated.

C. Wood Nailers: Softwood lumber, pressure treated with waterborne preservatives for aboveground use, acceptable to authorities having jurisdiction, containing no arsenic or chromium, and complying with AWPA C2; not less than 1½ inches thick.

D. Bituminous Coating: Cold-applied asphalt emulsion complying with ASTM D 1187.

E. Underlayment:

1. Felt: ASTM D 226, Type II (No. 30), asphalt-saturated organic felt, non-perforated.
2. Polyethylene Sheet: 6-mil-thick polyethylene sheet complying with ASTM D 4397.
3. Slip Sheet: Building paper, 3-lb/100 sq. ft. minimum, rosin sized.

F. Fasteners: Roof accessory manufacturer's recommended fasteners suitable for application and metals being fastened. Match finish of exposed fasteners with finish of material being fastened. Provide non-removable fastener heads to exterior exposed fasteners. Furnish the following unless otherwise indicated:

1. Fasteners for Aluminum Sheet: Aluminum or Series 300 stainless-steel.

G. Gaskets: Manufacturer's standard tubular or fingered design of neoprene, EPDM, PVC, or silicone or a flat design of foam rubber, sponge neoprene, or cork.

H. Elastomeric Sealant: ASTM C 920, elastomeric polymer sealant as recommended by roof accessory manufacturer for installation indicated; low modulus; of type, grade, class, and use classifications required to seal joints and remain watertight.

I. Butyl Sealant: ASTM C 1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for expansion joints with limited movement.

J. Asphalt Roofing Cement: ASTM D 4586, asbestos free, of consistency required for application.

2.7 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

C. Baked-Enamel or Powder-Coat Finish: After cleaning and pretreating, apply manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat to a minimum dry film thickness of 2 mils.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions, and other conditions affecting performance of the Work.

B. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.

C. Verify dimensions of roof openings for roof accessories.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Install roof accessories according to manufacturer's written instructions.

1. Install roof accessories level, plumb, true to line and elevation, and without warping, jogs in alignment, excessive oil canning, buckling, or tool marks.
2. Anchor roof accessories securely in place so they are capable of resisting indicated loads.
3. Use fasteners, separators, sealants, and other miscellaneous items as required to complete installation of roof accessories and fit them to substrates.
4. Install roof accessories to resist exposure to weather without failing, rattling, leaking, or loosening of fasteners and seals.

B. Metal Protection: Protect metals against galvanic action by separating dissimilar metals from contact with each other or with corrosive substrates by painting contact surfaces with bituminous coating or by other permanent separation as recommended by manufacturer.

1. Coat concealed side of uncoated aluminum roof accessories with bituminous coating where in contact with wood, ferrous metal, or cementitious construction.
2. Underlayment: Where installing roof accessories directly on cementitious or wood substrates, install a course of felt underlayment and cover with a slip sheet, or install a course of polyethylene sheet.
3. Bed flanges in thick coat of asphalt roofing cement where required by manufacturers of roof accessories for waterproof performance.

C. Roof-Hatch and Accessories Installation:

1. Install roof hatch so top surface of hatch curb is level.
2. Verify that roof hatch operates properly. Clean, lubricate, and adjust operating mechanism and hardware.
3. Attach safety railing system to roof-hatch curb.

D. Duct Support Installation: Install supports so top surfaces are level with each other. All loose aggregate from an area of 2 inches larger than each base should be removed from the area directly beneath the duct support. Care should be taken to install each duct support so it supports a proportional and equal amount of weight at each duct support.

E. Preformed Flashing-Sleeve Installation: Secure flashing sleeve to roof membrane according to flashing-sleeve manufacturer's written instructions.

F. Seal joints with elastomeric or butyl sealant as required by roof accessory manufacturer.

3.3 REPAIR AND CLEANING

A. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing according to ASTM A 780.

B. Clean exposed surfaces according to manufacturer's written instructions.

C. Clean off excess sealants.

D. Replace roof accessories that have been damaged or that cannot be successfully repaired by finish touchup or similar minor repair procedures.

END OF SECTION 077200

SECTION 078413 - PENETRATION FIRESTOPPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Fireproof firestopping and firesafing materials and accessories.

1.3 PERFORMANCE REQUIREMENTS

A. Fireproofing Materials: ASTM E 119 and ASTM E 814 to achieve a fire rating as noted on Drawings.

B. Surface Burning: ASTM E 84 with a flame spread/fuel contributed/smoke developed rating of 5/0/0.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated provide characteristics, performance, and limitation criteria.

B. Manufacturer's Installation Instructions: Indicate preparation and installation instructions.

C. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

1.5 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing the products specified in this Section with minimum three (3) years documented experience.

B. Applicator: Company specializing in performing the work of this Section with minimum five (5) years documented experience.

1.6 REGULATORY REQUIREMENTS

A. Conform to applicable State Building code for fire resistance ratings and surface burning characteristics.

B. UL Classifications for these systems shall be (all two (2) hours or more):

1. Duct Penetrations: C-AJ-7027
2. Pipe Penetrations: C-AJ-1079
3. Cable Penetrations: C-AJ-1079
4. Conduit Penetrations: C-AJ-1079

1.7 ENVIRONMENTAL REQUIREMENTS

A. Do not apply materials when temperature of substrate material and ambient air is below 60 degrees F.

B. Maintain this minimum temperature before, during and for three (3) days after installation of materials.

C. Provide ventilation in areas to receive solvent cured materials.

1.8 SEQUENCING

A. Sequence Work to permit firestopping materials to be installed after adjacent and surrounding work is complete.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Thermal Ceramics; **Firemaster Putty, Bulk, and Blankets**

B. Tremco Incorporated; **Fyre-shield and Cerablanket FS Hilti, Inc.**

C. United States Gypsum; **Thermafiber Safing Insulation and FIRECODE compound**

D. Substitutions: Under provisions of Section 012500 “Substitution Procedures”.

2.2 MATERIALS

A. Firestopping Material: Single component silicone elastomeric compounds; conforming to the following:

1. Elongation & Shrinkage: Five percent (5%).
2. Tensile Strength: 300 psi.
3. Density: 8 lb./cu ft.
4. Surface Durability: 35 (Shore Hardness).
5. Durability and Longevity: Permanent.
6. Side Effects during Installation: Non-toxic.
7. Long Term Side Effects: None.

B. Primer: Type recommended by firestopping manufacturer for specific substrate surfaces.

C. Firesafing Blankets: ASTM C 665; 4 psf nominal density firesafing insulation.

D. Putty Pads: UL CLIV; acoustic, intumescent pad; 3.2mm thickness.

2.3 ACCESSORIES

A. Dam Material: Mineral fiber matting, permanent.

B. Retainers: Stainless clips to support mineral fiber matting

2.4 FINISHES

A. Color: Dark gray or manufacturer’s standard color.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Cleaning: Clean out openings immediately before installing penetration firestopping to comply with manufacturer's written instructions and with the following requirements:

1. Remove from surfaces of opening substrates and from penetrating items foreign materials that could interfere with adhesion of penetration firestopping.
2. Clean opening substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with penetration firestopping. Remove loose particles remaining from cleaning operation.
3. Remove laitance and form-release agents from concrete.

B. Install backing materials to arrest liquid material leakage.

3.3 INSTALLATION

A. General: Install penetration firestopping to comply with manufacturer's written installation instructions and published drawings for products and applications indicated.

B. Apply firestopping material to all wall and floor penetrations through rated assemblies. These penetrations include electrical conduit and raceways, plumbing and heating system penetrations, ducts, and other system chases.

C. Apply primer and materials in accordance with manufacturer's instructions.

D. Apply firestopping material in sufficient thickness to achieve rating to a density of fifty percent (50%) to uniform density and texture.

E. Install material at walls or partition openings which contain penetrating sleeves, piping, ductwork, conduit, and other items requiring firestopping.

F. Remove dam material after firestopping material has cured.

3.4 CLEANING AND PROTECTION

A. Clean off excess materials adjacent to openings as the Work progresses by methods and with cleaning materials that are approved in writing by penetration firestopping manufacturers and that do not damage materials in which openings occur.

B. Provide final protection and maintain conditions during and after installation that ensure that penetration firestopping is without damage or deterioration at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, immediately cut out and remove damaged or deteriorated penetration firestopping and install new materials to produce systems complying with specified requirements.

3.5 SCHEDULE

A. See Construction Documents for rating information and construction details and conditions.

B. Firesafe all penetrations through new and existing masonry and gypsum board construction in the project work areas, equal to the one (1) or two (2) hour rating of the appropriate spaces.

END OF SECTION 078413

SECTION 079200 - JOINT SEALANTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Silicone joint sealants.
2. Latex joint sealants.

1.3 ACTION SUBMITTALS

A. Product Data: For each joint-sealant product indicated.

B. Samples: Manufacturer's color charts consisting of strips of cured sealants showing the full range of colors available for each product exposed to view.

C. Joint-Sealant Schedule: Include the following information:

1. Joint-sealant application, joint location, and designation.
2. Joint-sealant manufacturer and product name.
3. Joint-sealant formulation.
4. Joint-sealant color.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Installer.

B. Product Certificates: For each kind of joint sealant and accessory, from manufacturer.

C. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, indicating that sealants comply with requirements.

D. Warranties: Sample of special warranties.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.

B. Source Limitations: Obtain each kind of joint sealant from single source from single manufacturer.

C. Product Testing: Test joint sealants using a qualified testing agency.

1. Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021 to conduct the testing indicated.

1.6 PROJECT CONDITIONS

A. Do not proceed with installation of joint sealants under the following conditions:

1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer or are below 40 deg F.
2. When joint substrates are wet.
3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
4. Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

1.7 WARRANTY

A. Special Installer's Warranty: Manufacturer's standard form in which Installer agrees to repair or replace joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.

1. Warranty Period: Two (2) years from date of Substantial Completion.

B. Special warranties specified in this article exclude deterioration or failure of joint sealants from the following:

1. Movement of the structure caused by structural settlement or errors attributable to design or construction resulting in stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression.
2. Disintegration of joint substrates from natural causes exceeding design specifications.
3. Mechanical damage caused by individuals, tools, or other outside agents.
4. Changes in sealant appearance caused by accumulation of dirt or other atmospheric contaminants.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer, based on testing and field experience.

B. VOC Content of Interior Sealants: Sealants and sealant primers used inside the weatherproofing system shall comply with the following:

1. Architectural sealants shall have a VOC content of 250 g/L or less.

C. Liquid-Applied Joint Sealants: Comply with ASTM C 920 and other requirements indicated for each liquid-applied joint sealant specified, including those referencing ASTM C 920 classifications for type, grade, class, and uses related to exposure and joint substrates.

D. Stain-Test-Response Characteristics: Where sealants are specified to be non-staining to porous substrates, provide products that have undergone testing according to ASTM C 1248 and have not stained porous joint substrates indicated for Project.

E. Colors of Exposed Joint Sealants: As selected by Architect and Owner from manufacturer's entire range, to match adjacent where required.

2.2 SILICONE JOINT SEALANTS

A. Silicone, Non-Staining: Non-Staining, single-component, non-sag, plus fifty percent (+50%) and minus fifty percent (-50%) movement capability, non-traffic-use, neutral-curing silicone joint sealant; ASTM C 920, Type S, Grade NS, Class 50, Use NT.

1. Products:

a. Dow Corning Corporation
b. Master Bond, Inc.
c. Pecora Corporation
d. Tremco Incorporated
e. Substitutions: Under provisions of Section 012500 “Substitution Procedures”.

B. Mildew-Resistant, Single-Component, Non-sag, Neutral-Curing Silicone Joint Sealant: ASTM C 920, Type S, Grade NS, Class 25, for Use NT.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Pecora Corporation; **898**
b. Substitutions: Under provisions of Section 012500 “Substitution Procedures”.

2.3 LATEX JOINT SEALANTS

A. Latex Joint Sealant: Acrylic latex or siliconized acrylic latex, ASTM C 834, Type OP, Grade NF.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. BASF Building Systems; **Sonolac**
b. Bostik, Inc.; **Chem-Calk 600**
c. Pecora Corporation; **AC-20+**
d. Tremco Incorporated; **Tremflex 834**
e. Substitutions: Under provisions of Section 012500 “Substitution Procedures”.

2.4 JOINT SEALANT BACKING

A. General: Provide sealant backings of material that are non-staining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.

B. Cylindrical Sealant Backings: ASTM C 1330, Type B (bi-cellular material with a surface skin), and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.

C. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint. Provide self-adhesive tape where applicable.

2.5 MISCELLANEOUS MATERIALS

A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.

B. Cleaners for Non-porous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.

C. Masking Tape: Non-staining, non-absorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint-sealant performance.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions and the following requirements:

1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
2. Clean porous joint substrate surfaces by brushing, grinding, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air. Porous joint substrates include the following:

    a. Concrete.
    b. Masonry.

3. Remove laitance and form-release agents from concrete.
4. Clean nonporous joint substrate surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants. Nonporous joint substrates include the following:

    a. Metal.
    b. Glass.
    c. Porcelain enamel.
    d. Glazed surfaces of ceramic tile.

B. Joint Priming: Prime joint substrates where recommended by joint-sealant manufacturer or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.

C. Masking Tape: Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or

by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.3 INSTALLATION OF JOINT SEALANTS

A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.

B. Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.

C. Install sealant backings of kind indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.

1. Do not leave gaps between ends of sealant backings.
2. Do not stretch, twist, puncture, or tear sealant backings.
3. Remove absorbent sealant backings that have become wet before sealant application and replace them with dry materials.

D. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.

E. Install sealants using proven techniques that comply with the following and at the same time backings are installed:

1. Place sealants so they directly contact and fully wet joint substrates.
2. Completely fill recesses in each joint configuration.
3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.

F. Tooling of Non-Sag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified in subparagraphs below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.

1. Remove excess sealant from surfaces adjacent to joints.
2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
3. Provide concave joint profile per Figure 8A in ASTM C 1193, unless otherwise indicated.
4. Provide flush joint profile where indicated per Figure 8B in ASTM C 1193.
5. Provide recessed joint configuration of recess depth and at locations indicated per Figure 8C in ASTM C 1193.

    a. Use masking tape to protect surfaces adjacent to recessed tooled joints.

3.4 CLEANING

A. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

3.5 PROTECTION

A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work.

3.6 JOINT-SEALANT SCHEDULE

A. Joint-Sealant Application: Exterior joints in vertical surfaces and horizontal non-traffic surfaces.

1. Joint Locations:

a. Control and expansion joints in unit masonry.
b. Joints between metal panels.
c. Joints between different materials.
d. Perimeter joints between materials and frames of doors, windows, and louvers.
e. Other Joints as indicated.

2. Joint Sealant: Silicone, non-staining, S, NS, 50, NT.

B. Joint-Sealant Application: Interior joints in vertical surfaces and horizontal non-traffic surfaces.

1. Joint Locations:

a. Control and expansion joints on exposed interior surfaces of exterior walls.
b. Perimeter joints of exterior openings where indicated.
c. Vertical joints on exposed surfaces of interior unit masonry and concrete walls and partitions.
d. Perimeter joints between interior wall surfaces and frames of interior doors, windows, and louvers.
e. Other joints as indicated.

2. Joint Sealant: Latex.

C. Joint-Sealant Application: Mildew-resistant interior joints in vertical surfaces and horizontal non-traffic surfaces.

1. Joint Sealant Location:

a. Joints between plumbing fixtures and adjoining walls, floors, and counters.
b. Other Joints as indicated.

2. Joint Sealant: Mildew resistant, single component, non-sag, neutral curing, silicone.

END OF SECTION 079200

SECTION 079500 - EXPANSION CONTROL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Interior and exterior expansion control systems.

B. Related Requirements:

1. Section 077129 "Manufactured Roof Expansion Joints" for factory-fabricated roof expansion control.
2. Section 079200 "Joint Sealants" for liquid-applied joint sealants and for elastomeric sealants without metal frames.

1.3 ACTION SUBMITTALS

A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for expansion joint cover assemblies.

B. Shop Drawings: For each expansion control system specified.

1. Include plans, elevations, sections, details, splices, block-out requirement, attachments to other work, and line diagrams showing entire route of each expansion joint.
2. Where expansion control systems change planes, provide isometric or clearly detailed drawing depicting how components interconnect.

C. Samples: For each exposed expansion control system and for each color and texture specified, full width by 6 inches long in size.

1.4 INFORMATIONAL SUBMITTALS

A. Product Test Reports: For each fire barrier provided as part of an expansion control system, for tests performed by a qualified testing agency.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

A. General: Provide expansion control systems of design, basic profile, materials, and operation indicated. Provide units with capability to accommodate variations in adjacent surfaces.

1. Furnish units in longest practicable lengths to minimize field splicing.

2. Include factory-fabricated closure materials and transition pieces, T-joints, corners, curbs, cross-connections, and other accessories as required to provide continuous expansion control systems.

B. Coordination: Coordinate installation of exterior wall and soffit expansion control systems with roof expansion control systems to ensure that wall transitions are watertight.

C. Source Limitations: Obtain expansion control systems from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Expansion control systems shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

B. Fire-Resistance Ratings: Provide expansion control systems with fire barriers identical to those of systems tested for fire resistance according to UL 2079 or ASTM E 1966 by a qualified testing agency.

2.3 EXPANSION CONTROL SYSTEMS

A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated or a comparable product by one (1) of the following:

1. MM Systems Corporation

B. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Construction Specialties, Inc.
2. JointMaster/InPro Corporation
3. Substitutions: Under provisions of Section 012500 “Substitution Procedures”.

C. Interior:

1. Floor-to-Floor

a. **SP-2-2**

2. Wall-to-Wall/Wall Corner:

a. **KX-200**
b. **VSWL-200**

3. Wall-to-Ceiling/Ceiling-to-Ceiling:

a. **FSX-200**
b. **VSGL-200**

D. Exterior:

1. Wall-to-Wall/Wall Corner:

a. **VSS-200 Exterior**

2.4 MATERIALS

A. Aluminum: ASTM B 221, Alloy 6063-T5 for extrusions; ASTM B 209, Alloy 6061-T6 for sheet and plate.

1. Apply manufacturer's standard protective coating on aluminum surfaces to be placed in contact with cementitious materials.

B. Elastomeric Seals: ASTM E 1783; preformed elastomeric membranes or extrusions.

1. Color: As selected by Architect and Owner from manufacturer’s entire range, to match adjacent.

C. Fire Barriers: Any material or material combination, when fire tested after cycling, designated to resist the passage of flame and hot gases through a movement joint and to comply with performance criteria for required fire-resistance rating.

2.5 ALUMINUM FINISHES

A. Clear Anodic Finish: AAMA 611, AA-M12C22A41, Class I, 0.018-mm or thicker.

2.6 ACCESSORIES

A. Manufacturer's standard (or stainless-steel for exterior) attachment devices. Include anchors, clips, fasteners, set screws, spacers, and other accessories compatible with material in contact, as indicated or required for complete installations.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine surfaces where expansion control systems will be installed for installation tolerances and other conditions affecting performance of work.

B. Notify Architect where discrepancies occur that will affect proper expansion joint cover assembly installation and performance.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Prepare substrates according to expansion control system manufacturer's written instructions.

3.3 INSTALLATION

A. Comply with manufacturer's written instructions for storing, handling, and installing expansion control systems and materials unless more stringent requirements are indicated.

B. Metal Frames: Perform cutting, drilling, and fitting required to install expansion control systems.

1. Install in true alignment and proper relationship to joints and adjoining finished surfaces measured from established lines and levels.
2. Adjust for differences between actual structural gap and nominal design gap due to ambient temperature at time of installation.

3. Cut and fit ends to accommodate thermal expansion and contraction of metal without buckling of frames.
4. Install frames in continuous contact with adjacent surfaces.

    a. Shimming is not permitted.

5. Locate anchors at interval recommended by manufacturer, but not less than 3 inches from each end and not more than 24 inches o.c.

C. Elastomeric Seals: Install elastomeric seals and membranes to comply with manufacturer's written instructions. Install with minimum number of end joints.

1. Provide in continuous lengths for straight sections.
2. Seal transitions. Vulcanize or heat-weld field-spliced joints as recommended by manufacturer.
3. Mechanically lock seals into frames or adhere to frames with adhesive or pressure-sensitive tape as recommended by manufacturer.

D. Install with hairline mitered corners where expansion control systems change direction or abut other materials.

E. Terminate exposed ends of expansion control systems with field- or factory-fabricated termination devices.

F. Fire-Resistance-Rated Assemblies: Coordinate installation of expansion control system materials and associated work so complete assemblies comply with assembly performance requirements.

1. Fire Barriers: Install fire barriers to provide continuous, uninterrupted fire resistance throughout length of joint, including transitions and field splices.

3.4 PROTECTION

A. Do not remove protective covering until finish work in adjacent areas is complete. When protective covering is removed, clean exposed metal surfaces to comply with manufacturer's written instructions.

B. Protect the installation from damage by work of other Sections.

END OF SECTION 079500

SECTION 081213 - HOLLOW METAL FRAMES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes hollow-metal frames.

B. Related Requirements:

1. Section 081416 "Flush Wood Doors" for wood doors installed in hollow-metal frames.
2. Section 087100 "Door Hardware" for door hardware for hollow-metal doors.

1.3 DEFINITIONS

A. Minimum Thickness: Minimum thickness of base metal without coatings according to NAAMM-HMMA 803 or SDI A250.8.

1.4 COORDINATION

A. Coordinate anchorage installation for hollow-metal frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.

B. Coordinate requirements for installation of door hardware.

1.5 PRE-INSTALLATION MEETINGS

A. Pre-installation Conference: Conduct conference at Project site.

1.6 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions and finishes.

B. Shop Drawings: Include the following:

1. Elevations of each frame type.
2. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
3. Locations of reinforcement and preparations for hardware.
4. Details of each different wall opening condition.
5. Details of anchorages, joints, field splices, and connections.
6. Details of accessories.

C. Samples: Prepare Samples approximately 12 by 12 inches to demonstrate compliance with requirements for quality of materials and construction. Show profile, corner joint, floor and wall anchors, and silencers.

D. Product Schedule: For hollow-metal frames, prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Drawings. Coordinate with final Door Hardware Schedule.

1.7 INFORMATIONAL SUBMITTALS

A. Product Test Reports: For each type of frame assembly, for tests performed by a qualified testing agency.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver hollow-metal work palletized, packaged, or crated to provide protection during transit and Project-site storage. Do not use non-vented plastic.

1. Provide additional protection to prevent damage to factory-finished units.

B. Deliver welded frames with two (2) removable spreader bars across bottom of frames, tack welded to jambs and mullions.

C. Store hollow-metal frames vertically under cover at Project site with head up. Place on minimum 4-inch-high wood blocking. Provide minimum ¼-inch space between each unit to permit air circulation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design:

1. Steelcraft; an Allegion company

B. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Ceco Door Products; an ASSA ABLOY Group company
2. Curries Company; an ASSA ABLOY Group company
3. Substitutions: Under provisions of Section 012500 “Substitution Procedures”.

C. Source Limitations: Obtain hollow-metal frames from single source from single manufacturer.

2.2 STANDARD STEEL FRAMES

A. Construct interior frames to comply with the standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.

B. Interior Frames: SDI A250.8, Level 3.

1. Physical Performance: Level A according to SDI A250.4.
2. Materials: Uncoated steel sheet, minimum thickness of 16-gauge.
3. Construction: Full profile welded.
4. Exposed Finish: Prime.

C. Exterior Frames: SDI A250.8.

1. Materials: Metallic-coated steel sheet, minimum thickness of 14-gauge, with minimum A40 coating.
2. Construction: Full profile welded.
3. Exposed Finish: Prime.

2.3 FRAME ANCHORS

A. Jamb Anchors:

1. Type: Anchors of minimum size and type required by applicable door and frame standard, and suitable for performance level indicated.
2. Quantity: Minimum of three (3) anchors per jamb, with one (1) additional anchor for frames with no floor anchor. Provide one (1) additional anchor for each 24 inches of frame height above 7 feet.
3. Post-installed Expansion Anchor: Minimum 3/8-inch-diameter bolts with expansion shields or inserts, with manufacturer's standard pipe spacer.

B. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor:

2.4 MATERIALS

A. Cold-Rolled Steel Sheet: ASTM A 1008, Commercial Steel (CS), Type B; suitable for exposed applications.

B. Metallic-Coated Steel Sheet: ASTM A 653, Commercial Steel (CS), Type B.

C. Frame Anchors: ASTM A 879, Commercial Steel (CS), 04Z coating designation; mill phosphatized.

1. For anchors built into exterior walls, steel sheet complying with ASTM A 1008 or ASTM A 1011; hot-dip galvanized according to ASTM A 153, Class B.

D. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A 153.

E. Power-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hollow-metal frames of type indicated.

F. Grout: ASTM C 476, except with a maximum slump of 4 inches, as measured according to ASTM C 143.

G. Mineral-Fiber Insulation: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers manufactured from slag or rock wool with 6- to 12-lb/cu. ft. density; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively; passing ASTM E 136 for combustion characteristics.

H. Bituminous Coating: Cold-applied asphalt mastic, compounded for 15-mil dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

2.5 FABRICATION

A. Fabricate hollow-metal frames to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for metal thickness. Where practical,

fit and assemble units in manufacturer's plant. To ensure proper assembly at Project site, clearly identify work that cannot be permanently factory assembled before shipment.

B. Hollow-Metal Frames: Fabricate in one (1) piece except where handling and shipping limitations require multiple sections. Where frames are fabricated in sections, provide alignment plates or angles at each joint, fabricated of metal of same or greater thickness as frames.

1. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.
2. Grout Guards: Weld guards to frame at back of hardware mortises in frames to be grouted.
3. Floor Anchors: Weld anchors to bottoms of jambs with at least four (4) spot welds per anchor; however, for slip-on drywall frames, provide anchor clips or countersunk holes at bottoms of jambs.
4. Door Silencers: Except on weather-stripped frames, drill stops to receive door silencers as follows. Keep holes clear during construction.

a. Single-Door Frames: Drill stop in strike jamb to receive three (3) door silencers.

C. Hardware Preparation: Factory prepare hollow-metal frames to receive templated mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to SDI A250.6, the Door Hardware Schedule, and templates.

1. Reinforce frames to receive non-templated, mortised, and surface-mounted hardware.
2. Comply with BHMA A156.115 for preparation of hollow-metal frames for hardware.

2.6 STEEL FINISHES

A. Prime Finish: Clean, pretreat, and apply manufacturer's standard primer.

1. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with SDI A250.10; recommended by primer manufacturer for substrate; compatible with substrate and field-applied coatings despite prolonged exposure.

2.7 ACCESSORIES

A. Grout Guards: Formed from same material as frames, not less than 0.016-inch-thick.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine roughing-in for embedded and built-in anchors to verify actual locations before frame installation.

C. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Remove welded-in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces.

B. Drill and tap frames to receive non-templated, mortised, and surface-mounted hardware.

3.3 INSTALLATION

A. General: Install hollow-metal frames plumb, rigid, properly aligned, and securely fastened in place. Comply with approved Shop Drawings and with manufacturer's written instructions. Comply with SDI A250.11.

B. Set frames accurately in position; plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces without damage to completed Work.

1. Where frames are fabricated in sections, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces. Touch-up finishes.
2. Install door silencers in frames before grouting.
3. Remove temporary braces necessary for installation only after frames have been properly set and secured.
4. Field apply bituminous coating to backs of frames that will be filled with grout containing anti-freezing agents.

C. Floor Anchors: Secure with post-installed expansion anchors.

1. Floor anchors may be set with power-actuated fasteners instead of post-installed expansion anchors if so indicated and approved on Shop Drawings.

D. Solidly pack mineral-fiber insulation inside frames.

E. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with grout or mortar.

F. In-Place Concrete or Masonry Construction: Secure frames in place with post-installed expansion anchors. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.

G. Installation Tolerances: Adjust hollow-metal frames to the following tolerances:

1. Squareness: Plus or minus 1/16-inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
2. Alignment: Plus or minus 1/16-inch, measured at jambs on a horizontal line parallel to plane of wall.
3. Twist: Plus or minus 1/16-inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
4. Plumbness: Plus or minus 1/16-inch, measured at jambs at floor.

3.4 CLEANING AND TOUCH-UP

A. Remove grout and other bonding material from hollow-metal work immediately after installation.

B. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying, rust-inhibitive primer.

END OF SECTION 081213

SECTION 081416 - FLUSH WOOD DOORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Solid-core doors with wood-veneer faces.
2. Factory finishing flush wood doors.
3. Factory fitting flush wood doors to frames and factory machining for hardware.

B. Related Requirements:

1. Section 088000 "Glazing" for glass view panels in flush wood doors.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of door. Include details of core and edge construction and trim for openings. Include factory-finishing specifications.

B. Shop Drawings: Indicate location, size, and hand of each door; elevation of each kind of door; construction details not covered in Product Data; and the following:

1. Door schedule indicating door location, type, size, fire protection rating, and swing.
2. Door elevations, dimensions, locations of hardware, lite and louver cutouts, and glazing thicknesses.
3. Dimensions and locations of blocking for hardware attachment.
4. Dimensions and locations of mortises and holes for hardware.
5. Clearances and undercuts.
6. Requirements for veneer matching.
7. Doors to be factory finished and application requirements.

C. Samples:

1. Corner sections of doors, approximately 8 by 10 inches, with door faces and edges representing actual materials to be used.

a. Provide Samples for each species of veneer and solid lumber required.
b. Finish veneer-faced door Samples with same materials proposed for factory-finished doors.

2. Frames for light openings, 6 inches long, for each material, type, and finish required.

1.4 INFORMATIONAL SUBMITTALS

A. Sample Warranty: For special warranty.

1.5 CLOSEOUT SUBMITTALS

A. Special warranties.

B. Record Documents: For fire-rated doors, list of door numbers and applicable room name and number to which door accesses.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Comply with requirements of referenced standard and manufacturer's written instructions.

B. Package doors individually in plastic bags or cardboard cartons.

C. Mark each door on top and bottom rail with opening number used on Shop Drawings.

1.7 FIELD CONDITIONS

A. Environmental Limitations: Do not deliver or install doors until spaces are enclosed and weathertight, wet work in spaces is complete and dry, and HVAC system is operating and maintaining temperature and relative humidity at levels designed for building occupants for the remainder of construction period.

1.8 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace doors that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Delamination of veneer.
b. Warping (bow, cup, or twist) more than ¼-inch in a 42-by-84-inch section.
c. Telegraphing of core construction in face veneers exceeding 0.01-inch in a 3-inch span.

2. Warranty shall also include installation and finishing that may be required due to repair or replacement of defective doors.
3. Warranty Period for Solid-Core Interior Doors: Life of installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design:

1. VT Industries, Inc.

B. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Manhattan Door Corp.
2. Masonite Architectural Company
3. Substitutions: Under provisions of Section 012500 “Substitution Procedures”.

C. Source Limitations: Obtain flush wood doors from single manufacturer.

2.2 FLUSH WOOD DOORS, GENERAL

A. Quality Standard: In addition to requirements specified, comply with AWI's "Architectural Woodwork Standards."

B. Certified Wood: Flush wood doors shall be certified as "FSC Pure" or "FSC Mixed Credit" according to FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship," and to FSC STD-40-004, "FSC Standard for Chain of Custody Certification."

C. Low-Emitting Materials: Fabricate doors with adhesives and composite wood products that do not contain urea formaldehyde.

2.3 VENEER-FACED DOORS FOR TRANSPARENT FINISH

A. Interior Solid-Core Doors:

1. Grade: **Premium**, with Grade AA faces.
2. Faces: Single-ply wood veneer not less than 1/50-inch-thick.

a. Species: Red oak.
b. Cut: Quarter sliced.
c. Match between Veneer Leaves: Book match.
d. Assembly of Veneer Leaves on Door Faces: Balance match.
e. Pair and Set Match: Provide for doors hung in same opening or separated only by mullions.
f. Room Match: Match door faces within each separate room or area of building. Corridor-door faces do not need to match where they are separated by 10 feet or more.

3. Exposed Vertical and Top Edges: Same species as faces - edge Type A.
4. Core for Non-Fire-Rated Doors: ANSI A208.1, Grade LD-2 particleboard.

a. Blocking: Provide wood blocking in particleboard-core doors as follows:

1) 5-inch top-rail blocking, in doors indicated to have closers.
2) 5-inch bottom-rail blocking, in doors indicated to have kick, mop, or armor plates.
3) 5-inch mid-rail blocking, in doors indicated to have exit devices.

b. Provide doors with glued-wood-stave cores instead of particleboard cores for doors scheduled to receive exit devices in Section 087100 "Door Hardware."

5. Construction: Five (5) or seven (7) plies, hot-pressed bonded (vertical and horizontal edging is bonded to core), with entire unit abrasive planed before veneering.

2.4 LIGHT FRAMES AND LOUVERS

A. Wood Beads for Light Openings in Wood Doors: Provide manufacturer's standard wood beads unless otherwise indicated.

1. Wood Species: Same species as door faces.
2. Profile: Manufacturer's standard shape.

2.5 FABRICATION

A. Factory fit doors to suit frame-opening sizes indicated.

1. Comply with clearance requirements of referenced quality standard for fitting unless otherwise indicated.
2. Comply with NFPA 80 requirements for fire-rated doors.

B. Factory machine doors for hardware that is not surface applied.

1. Locate hardware to comply with DHI-WDHS-3.
2. Comply with final hardware schedules, door frame Shop Drawings, ANSI/BHMA-156.115-W, and hardware templates.
3. Coordinate with hardware mortises in metal frames to verify dimensions and alignment before factory machining.
4. For doors scheduled to receive electrified locksets, provide factory-installed raceway and wiring to accommodate specified hardware.

C. Openings: Factory cut and trim openings through doors.

1. Light Openings: Trim openings with moldings of material and profile indicated.
2. Glazing: Factory install glazing in doors indicated to be factory finished. Comply with applicable requirements in Section 088000 "Glazing."

2.6 FACTORY FINISHING

A. Comply with referenced quality standard for factory finishing.

1. Complete fabrication, including fitting doors for openings and machining for hardware that is not surface applied, before finishing.
2. Finish faces, all four (4) edges, edges of cutouts, and mortises.
3. Stains and fillers may be omitted on bottom edges, edges of cutouts and mortises.

B. Factory finish doors.

C. Transparent Finish:

1. Grade: **Premium**.
2. Finish: AWI's "Architectural Woodwork Standards" System 5, conversion varnish or System 11, catalyzed polyurethane.
3. Staining: As selected by Architect and Owner from manufacturer's entire range.
4. Effect: Filled finish.
5. Sheen: Satin.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine doors and installed door frames, with Installer present, before hanging doors.

1. Verify that installed frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with level heads and plumb jambs.
2. Reject doors with defects.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Hardware: For installation, see Section 087100 "Door Hardware."

B. Install doors to comply with manufacturer's written instructions and referenced quality standard, and as indicated.

C. Factory-Fitted Doors: Align in frames for uniform clearance at each edge.

D. Factory-Finished Doors: Restore finish before installation if fitting or machining is required at Project site.

3.3 ADJUSTING

A. Operation: Rehang or replace doors that do not swing or operate freely.

B. Finished Doors: Replace doors that are damaged or that do not comply with requirements. Doors may be repaired or refinished if Work complies with requirements and shows no evidence of repair or refinishing.

END OF SECTION 081416

SECTION 083113 - ACCESS DOORS AND FRAMES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Access doors and frames.

B. Related Requirements:

1. Section 233300 "Air Duct Accessories" for heating and air-conditioning duct access doors.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, materials, individual components and profiles, and finishes.

B. Samples: For each type of access door and frame and for each finish specified, complete assembly minimum 6 by 6 inches in size.

C. Product Schedule: For access door and frame schedule.

PART 2 - PRODUCTS

2.1 ACCESS DOORS AND FRAMES

A. Basis-of-Design Product:

1. J. L. Industries, Inc.; Div. of Activar Construction Products Group

B. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following

1. Babcock-Davis
2. Larsen's Manufacturing Company
3. Milcor Inc.
4. Substitutions: Under provisions of Section 012500 “Substitution Procedures”.

C. Source Limitations: Obtain each type of access door and frame from single source from single manufacturer.

D. Flush Access Doors with Exposed Flanges:

1. Basis-of-Design Product: **Model TM**
2. Description: Face of door flush with frame, with exposed flange and concealed hinge.
3. Locations: Wall and ceiling.
4. Uncoated Steel Sheet for Door: Nominal 0.060-inch, 16-gauge.

    a. Finish: Factory prime.

5. Frame Material: Same material, thickness, and finish as door.
6. Latch and Lock: Cam latch, key operated.

2.2 MATERIALS

A. Steel Plates, Shapes, and Bars: ASTM A 36.

B. Steel Sheet: Uncoated or electrolytic zinc coated, ASTM A 879, with cold-rolled steel sheet substrate complying with ASTM A 1008, Commercial Steel (CS), exposed.

C. Frame Anchors: Same type as door face.

D. Inserts, Bolts, and Anchor Fasteners: Hot-dip galvanized steel according to ASTM A 153 or ASTM F 2329.

2.3 FABRICATION

A. General: Provide access door and frame assemblies manufactured as integral units ready for installation.

B. Metal Surfaces: For metal surfaces exposed to view in the completed Work, provide materials with smooth, flat surfaces without blemishes. Do not use materials with exposed pitting, seam marks, roller marks, rolled trade names, or roughness.

C. Doors and Frames: Grind exposed welds smooth and flush with adjacent surfaces. Furnish mounting holes, attachment devices and fasteners of type required to secure access doors to types of supports indicated.

D. Latching and Lock Hardware:

1. Quantity: Furnish number of latches and locks required to hold doors tightly closed.
2. Keys: Furnish two (2) keys per lock and key all locks alike.

2.4 FINISHES

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

D. Painted Finishes: Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.

1. Factory Primed: Apply manufacturer's standard, lead- and chromate-free, universal primer immediately after surface preparation and pretreatment.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Comply with manufacturer's written instructions for installing access doors and frames.

3.3 ADJUSTING

A. Adjust doors and hardware, after installation, for proper operation.

END OF SECTION 083113

SECTION 084113 - ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Exterior storefront framing.
2. Exterior and interior manual-swing entrance doors.

1.3 PRE-INSTALLATION MEETINGS

A. Pre-installation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Shop Drawings: For aluminum-framed entrances and storefronts. Include plans, elevations, sections, full-size details, and attachments to other work.

1. Include details of provisions for assembly expansion and contraction and for draining moisture occurring within the assembly to the exterior.
2. Include full-size isometric details of each vertical-to-horizontal intersection of aluminum-framed entrances and storefronts, showing the following:

a. Joinery, including concealed welds.
b. Anchorage.
c. Expansion provisions.
d. Glazing.
e. Flashing and drainage.

3. Show connection to and continuity with adjacent thermal, weather, air, and vapor barriers.

C. Schedules: For aluminum-framed entrances, door hardware **must** be submitted with Section 087100 “Door Hardware”.

D. Samples: For units with factory-applied color finishes.

E. Delegated-Design Submittal: For aluminum-framed entrances and storefronts indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Energy Performance Certificates: For aluminum-framed entrances and storefronts, accessories, and components, from manufacturer.

1. Basis for Certification: NFRC-certified energy performance values for each aluminum-framed entrance and storefront.

C. Product Test Reports: For aluminum-framed entrances and storefronts, for tests performed by a qualified testing agency.

D. Sample Warranties: For special warranties.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For aluminum-framed entrances and storefronts to include in maintenance manuals.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

B. Product Options: Information on Drawings and in Specifications establishes requirements for aesthetic effects and performance characteristics of assemblies. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction.

1. Do not change intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If changes are proposed, submit comprehensive explanatory data to Architect for review.

1.8 MOCKUPS

A. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.

1. Build mockup of typical wall area as shown on Drawings. Mockup to include storefront, masonry, and rainscreen system at a minimum.
2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.9 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of aluminum-framed entrances and storefronts that do not comply with requirements or that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Structural failures including, but not limited to, excessive deflection.
b. Noise or vibration created by wind and thermal and structural movements.
c. Deterioration of metals and other materials beyond normal weathering.
d. Water penetration through fixed glazing and framing areas.
e. Failure of operating components.

2. Warranty Period: Two (2) years from date of Substantial Completion.

B. Special Finish Warranty: Standard form in which manufacturer agrees to repair finishes or replace aluminum that shows evidence of deterioration of factory-applied finishes within specified warranty period.

1. Deterioration includes, but is not limited to, the following:

a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.

2. Warranty Period: Twenty (20) years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Product:

1. Kawneer North America; **Trifab VersaGlaze 451T Framing Systems, 500T Insulpour Thermal Entrances**

B. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. EFCO Corporation
2. Oldcastle BuildingEnvelope
3. TRACO
4. YKK AP America Inc.
5. Substitutions: Under provisions of Section 012500 “Substitution Procedures”.

C. Source Limitations: Obtain all components of aluminum-framed entrance and storefront system, including framing, venting windows, and accessories, from single manufacturer. Section 084413 “Glazed Aluminum Curtain Walls” must also be from this same, single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design aluminum-framed entrances and storefronts.

B. General Performance: Comply with performance requirements specified, as determined by testing of aluminum-framed entrances and storefronts representing those indicated for this Project without failure due to defective manufacture, fabrication, installation, or other defects in construction.

1. Aluminum-framed entrances and storefronts shall withstand movements of supporting structure including, but not limited to, story drift, twist, column shortening, long-term creep, and deflection from uniformly distributed and concentrated live loads.
2. Failure also includes the following:

    a. Thermal stresses transferring to building structure.
    b. Glass breakage.
    c. Noise or vibration created by wind and thermal and structural movements.
    d. Loosening or weakening of fasteners, attachments, and other components.
    e. Failure of operating units.

C. Structural Loads:

1. Wind and other Design Loads: As indicated on Drawings and per Building Code, whichever is most stringent.

D. Deflection of Framing Members: At design wind pressure, as follows:

1. Deflection Normal to Wall Plane: Limited to 1/175 of clear span for spans of up to 13 feet 6 inches and to 1/240 of clear span plus ¼-inch for spans greater than 13 feet 6 inches.
2. Deflection Parallel to Glazing Plane: Limited to amount not exceeding that which reduces glazing bite to less than seventy-five percent (<75%) of design dimension and that which reduces edge clearance between framing members and glazing or other fixed components to less than 1/8-inch.

E. Structural: Test according to ASTM E 330 as follows:

1. When tested at positive and negative wind-load design pressures, storefront assemblies, including entrance doors, do not evidence deflection exceeding specified limits.
2. When tested at one hundred fifty percent (150%) of positive and negative wind-load design pressures, storefront assemblies, including entrance doors and anchorage, do not evidence material failures, structural distress, or permanent deformation of main framing members exceeding 0.2 percent of span.
3. Test Durations: As required by design wind velocity, but not less than ten (10) seconds.

F. Water Penetration under Static Pressure: Test according to ASTM E 331 as follows:

1. No evidence of water penetration through fixed glazing and framing areas, including entrance doors, when tested according to a minimum static-air-pressure differential of twenty percent (20%) of positive wind-load design pressure, but not less than 10 lbf/sq. ft.

G. Energy Performance: Certified and labeled by manufacturer for energy performance as follows:

1. Thermal Transmittance (U-factor):

    a. Fixed Glazing and Framing Areas: U-factor for the system of not more than 0.32 Btu/sq. ft. x h x deg F as determined according to NFRC 100.
    b. Entrance Doors: U-factor of not more than 0.52 Btu/sq. ft. x h x deg F as determined according to NFRC 100.

2. Solar Heat-Gain Coefficient (SHGC):

    a. Fixed Glazing and Framing Areas: SHGC for the system of not more than 0.34 as determined according to NFRC 200.

b. Entrance Doors: SHGC of not more than 0.40 as determined according to NFRC 200.

3. Air Leakage:

a. Fixed Glazing and Framing Areas: Air leakage for the system of not more than 0.06 cfm/sq. ft. at a static-air-pressure differential of 6.24 lbf/sq. ft when tested according to ASTM E 283.
b. Entrance Doors: Air leakage of not more than 1.0 cfm/sq. ft. at a static-air-pressure differential of 1.57 lbf/sq. ft.

4. Condensation Resistance Factor (CRF):

a. Fixed Glazing and Framing Areas: CRF for the system of not less than 68 as determined according to AAMA 1503.
b. Entrance Doors: CRF of not less than 45 as determined according to AAMA 1503.

H. Thermal Movements: Allow for thermal movements resulting from ambient and surface temperature changes:

1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

2.3 FRAMING

A. Framing Members: Manufacturer's extruded- or formed-aluminum framing members of thickness required and reinforced as required to support imposed loads.

1. Construction: Thermally broken.
2. Glazing System: Retained mechanically with gaskets on four (4) sides.
3. Glazing Plane: Center.
4. Finish: High-performance organic finish.
5. Fabrication Method: Field-fabricated stick system.

B. Backer Plates: Manufacturer's standard, continuous backer plates for framing members, if not integral, where framing abuts adjacent construction.

C. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with non-staining, nonferrous shims for aligning system components.

1. Provide internal steel reinforcement where required to meet code.

D. Materials:

1. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.

a. Sheet and Plate: ASTM B 209.
b. Extruded Bars, Rods, Profiles, and Tubes: ASTM B 221.
c. Structural Profiles: ASTM B 308.

2. Steel Reinforcement:

a. Structural Shapes, Plates, and Bars: ASTM A 36.
b. Cold-Rolled Sheet and Strip: ASTM A 1008.
c. Hot-Rolled Sheet and Strip: ASTM A 1011.

3. Steel Reinforcement Primer: Manufacturer's standard zinc-rich, corrosion-resistant primer complying with SSPC-PS Guide No. 12.00; applied immediately after surface preparation and pretreatment. Select surface preparation methods in accordance with recommendations in SSPC-SP COM and prepare surfaces in accordance with applicable SSPC standard.

2.4 ENTRANCE DOOR SYSTEMS

A. Entrance Doors: Manufacturer's standard glazed entrance doors for manual-swing operation.

1. Door Construction: 2¼-inch overall thickness, with minimum 0.125-inch-thick, extruded-aluminum tubular rail and stile members. Mechanically fasten corners with reinforcing brackets that are deeply penetrated and fillet welded or that incorporate concealed tie rods.

a. Provide internal steel reinforcement where required to meet code.

2. Door Design: Wide stile; 5-inch nominal width.
3. Glazing Stops and Gaskets: Square, snap-on, extruded-aluminum stops and preformed gaskets.

a. Provide non-removable glazing stops on outside of door.

2.5 ENTRANCE DOOR HARDWARE

A. Entrance Door Hardware: Hardware not specified in this section is specified in Section 087100 "Door Hardware."

B. Weather Stripping: Manufacturer's standard replaceable components.

1. Compression Type: Made of ASTM D 2000, molded neoprene, or ASTM D 2287, molded PVC.
2. Sliding Type: AAMA 701/702, made of wool, polypropylene, or nylon woven pile with nylon-fabric or aluminum-strip backing.

2.6 GLAZING

A. Glazing: Comply with Section 088000 "Glazing."

2.7 ACCESSORIES

A. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, non-staining, nonbleeding fasteners and accessories compatible with adjacent materials.

1. Use self-locking devices where fasteners are subject to loosening or turning out from thermal and structural movements, wind loads, or vibration.
2. Reinforce members as required to receive fastener threads.

B. Anchors: Three-way adjustable anchors with minimum adjustment of 1-inch that accommodate fabrication and installation tolerances in material and finish compatible with adjoining materials and recommended by manufacturer.

1. Concrete and Masonry Inserts: Hot-dip galvanized cast-iron, malleable-iron, or steel inserts complying with ASTM A 123 or ASTM A 153 requirements.

C. Concealed Flashing: Manufacturer's standard corrosion-resistant, non-staining, nonbleeding flashing compatible with adjacent materials.

D. Bituminous Paint: Cold-applied asphalt-mastic paint complying with SSPC-Paint 12 requirements except containing no asbestos, formulated for 30-mil thickness per coat.

2.8 FABRICATION

A. Form or extrude aluminum shapes before finishing.

B. Weld in concealed locations to greatest extent possible to minimize distortion or discoloration of finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.

C. Fabricate components that, when assembled, have the following characteristics:

1. Profiles that are sharp, straight, and free of defects or deformations.
2. Accurately fitted joints with ends coped or mitered.
3. Physical and thermal isolation of glazing from framing members.
4. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.
5. Provisions for field replacement of glazing from interior or exterior for vision glass, spandrel glazing, or metal panels.
6. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.

D. Mechanically Glazed Framing Members: Fabricate for flush glazing without projecting stops.

E. Storefront Framing: Fabricate components for assembly using screw-spline system.

F. Entrance Door Frames: Reinforce as required to support loads imposed by door operation and for installing entrance door hardware.

1. At exterior doors and where indicated, provide compression weather stripping at fixed stops.
2. At interior doors, provide silencers at stops to prevent metal-to-metal contact. Install three (3) silencers on strike jamb of single-door frames and two (2) silencers on head of frames for pairs of doors.

G. Entrance Doors: Reinforce doors as required for installing entrance door hardware.

1. At pairs of exterior doors, provide sliding-type weather stripping retained in adjustable strip and mortised into door edge.
2. At exterior doors, provide weather sweeps applied to door bottoms.

H. Entrance Door Hardware Installation: Factory install entrance door hardware to the greatest extent possible. Cut, drill, and tap for factory-installed entrance door hardware before applying finishes.

I. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.

2.9 ALUMINUM FINISHES

A. High-Performance Organic Finish: Two-coat fluoropolymer finish complying with AAMA 2605 and containing not less than seventy percent (70%) PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

1. Color and Gloss: As selected by Architect and Owner from manufacturer's entire range.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General:

1. Comply with manufacturer's written instructions.
2. Do not install damaged components.
3. Fit joints to produce hairline joints free of burrs and distortion.
4. Rigidly secure non-movement joints.
5. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration and to prevent impeding movement of moving joints.
6. Seal perimeter and other joints watertight unless otherwise indicated.

B. Metal Protection:

1. Where aluminum is in contact with dissimilar metals, protect against galvanic action by painting contact surfaces with materials recommended by manufacturer for this purpose or by installing nonconductive spacers.
2. Where aluminum is in contact with concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.

C. Set continuous sill members and flashing in full sealant bed as specified in Section 079200 "Joint Sealants" to produce weathertight installation.

D. Install components plumb and true in alignment with established lines and grades.

E. Install glazing as specified in Section 088000 "Glazing."

F. Entrance Doors: Install doors to produce smooth operation and tight fit at contact points.

1. Install to produce weathertight enclosure and tight fit at weather stripping.
2. Field-Installed Entrance Door Hardware: Install surface-mounted entrance door hardware according to entrance door hardware manufacturers' written instructions using concealed fasteners to greatest extent possible.

3.3 ERECTION TOLERANCES

A. Erection Tolerances: Install aluminum-framed entrances and storefronts to comply with the following maximum tolerances:

1. Plumb: 1/8-inch in 10 feet; ¼-inch in 40 feet.
2. Level: 1/8-inch in 20 feet; ¼-inch in 40 feet.
3. Alignment:

    a. Where surfaces abut in line or are separated by reveal or protruding element up to ½ inch wide, limit offset from true alignment to 1/16-inch.
    b. Where surfaces are separated by reveal or protruding element from ½- to 1-inch-wide, limit offset from true alignment to 1/8-inch.
    c. Where surfaces are separated by reveal or protruding element of 1-inch-wide or more, limit offset from true alignment to ¼-inch.

4. Location: Limit variation from plane to 1/8- inch in 12 feet; ½-inch over total length.

END OF SECTION 084113

SECTION 084333.13 - SECURITY ENTRANCES AND STOREFRONTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Security storefront framing.
2. Security manual-swing entrance doors.

1.3 PRE-INSTALLATION MEETINGS

A. Pre-installation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

B. HPBS Submittals:

1. Product Data for Section 16a-38k-5(d): For glazing sealants used inside the weatherproofing system, documentation including printed statement of VOC content.

C. Shop Drawings: For security entrances and storefronts. Include plans, elevations, sections, full-size details, and attachments to other work.

1. Include details of provisions for assembly expansion and contraction.
2. Include full-size isometric details of each vertical-to-horizontal intersection of security entrances and storefronts, showing the following:

a. Joinery, including concealed welds.
b. Anchorage.
c. Expansion provisions.
d. Glazing.
e. Details of deal tray.

3. Show connection to and continuity with adjacent thermal, weather, air, and vapor barriers.

D. Samples: For units with factory-applied color finishes.

E. Delegated-Design Submittal: For security entrances and storefronts indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Energy Performance Certificates: For security entrances and storefronts, accessories, and components, from manufacturer.

1. Basis for Certification: NFRC-certified energy performance values for each security entrance and storefront.

C. Product Test Reports: For security entrances and storefronts, for tests performed by a qualified testing agency.

D. Sample Warranties: For special warranties.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For security entrances and storefronts to include in maintenance manuals.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

B. Product Options: Information on Drawings and in Specifications establishes requirements for aesthetic effects and performance characteristics of assemblies. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction.

1. Do not change intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If changes are proposed, submit comprehensive explanatory data to Architect for review.

1.8 MOCKUPS

A. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.

1. Build mockup of typical wall area as shown on Drawings.
2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
3. Accepted mockup may remain as portion of final work.

1.9 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of security entrances and storefronts that do not comply with requirements or that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Structural failures including, but not limited to, excessive deflection.
b. Noise or vibration created by wind and thermal and structural movements.
c. Deterioration of metals and other materials beyond normal weathering.

d. Failure of operating components.

2. Warranty Period: One (1) year from date of Substantial Completion.

B. Special Finish Warranty: Standard form in which manufacturer agrees to repair finishes or replace aluminum that shows evidence of deterioration of factory-applied finishes within specified warranty period.

1. Deterioration includes, but is not limited to, the following:

a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.

2. Warranty Period: Ten (10) years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design security entrances and storefronts.

B. General Performance: Comply with performance requirements specified, as determined by testing of security entrances and storefronts representing those indicated for this Project without failure due to defective manufacture, fabrication, installation, or other defects in construction.

1. Security entrances and storefronts shall withstand movements of supporting structure including, but not limited to, story drift, twist, column shortening, long-term creep, and deflection from uniformly distributed and concentrated live loads.
2. Failure also includes the following:

a. Thermal stresses transferring to building structure.
b. Glass breakage.
c. Noise or vibration created by wind and thermal and structural movements.
d. Loosening or weakening of fasteners, attachments, and other components.
e. Failure of operating units.

C. Structural Loads:

1. Wind and other Design Loads: As indicated on Drawings and per Building Code, whichever is most stringent.

D. Deflection of Framing Members: At design wind pressure, as follows:

1. Deflection Normal to Wall Plane: Limited to edge of glass in a direction perpendicular to glass plane not exceeding 1/175 of the glass edge length for each individual glazing lite or an amount that restricts edge deflection of individual glazing lites to ¾-inch, whichever is less.
2. Deflection Parallel to Glazing Plane: Limited to 1/100 of clear span or ¾-inch, whichever is smaller.

E. Structural: Test according to ASTM E 330 as follows:

1. When tested at positive and negative wind-load design pressures, assemblies do not evidence deflection exceeding specified limits.
2. When tested at one hundred fifty percent (150%) of positive and negative wind-load design pressures, assemblies, including anchorage, do not evidence material failures, structural distress, or permanent deformation of main framing members exceeding 0.2 percent of span.
3. Test Durations: As required by design wind velocity, but not less than 10 seconds.

F. Air Infiltration: Test according to ASTM E 283 for infiltration as follows:

1. Fixed Framing and Glass Area:

a. Maximum air leakage of 0.06 cfm/sq. ft. at a static-air-pressure differential of 6.24 lbf/sq. ft.

2. Entrance Doors:

a. Pair of Doors: Maximum air leakage of 1.0 cfm/sq. ft. at a static-air-pressure differential of 1.57 lbf/sq. ft.
b. Single Doors: Maximum air leakage of 0.5 cfm/sq. ft. at a static-air-pressure differential of 6.24 lbf/sq. ft.

G. Energy Performance: Certify and label energy performance according to NFRC as follows:

1. Thermal Transmittance (U-factor): Fixed glazing and framing areas shall have U-factor of not more than 0.33 Btu/sq. ft. x h x deg F as determined according to NFRC 100.
2. Solar Heat Gain Coefficient: Fixed glazing and framing areas shall have a solar heat gain coefficient of no greater than 0.34 as determined according to NFRC 200.

H. Ballistics Resistance, UL 752: Listed and labeled as **Level 4** when tested according to UL 752.

I. Thermal Movements: Allow for thermal movements resulting from ambient and surface temperature changes:

1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

2.2 MANUFACTURERS

A. Basis-of-Design Product:

1. Action Bullet Resistant Corporation; **BR 450-4 Framing/Doors**

B. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Insulgard Security Products
2. Total Security Solutions
3. Substitutions: Under provisions of Section 012500 “Substitution Procedures”.

C. Source Limitations: Obtain all components of security entrance and storefront system, including framing and accessories, from single manufacturer.

2.3 FRAMING

A. Framing Members: Manufacturer's extruded- or formed-aluminum framing members of thickness required and reinforced as required to support imposed loads.

1. Glazing System: Retained mechanically with gaskets on four (4) sides.
2. Glazing Plane: Front.
3. Finish: High-performance organic finish.
4. Fabrication Method: Factory-fabricated system.

B. Backer Plates: Manufacturer's standard, continuous backer plates for framing members, if not integral, where framing abuts adjacent construction.

C. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with non-staining, non-ferrous shims for aligning system components.

1. Provide internal steel reinforcement where required to meet code and performance requirements.

D. Materials:

1. Aluminum: 6005-T5 alloy and temper.

a. Sheet and Plate: ASTM B 209.
b. Extruded Bars, Rods, Profiles, and Tubes: ASTM B 221.

2. Steel Reinforcement: Manufacturer's standard zinc-rich, corrosion-resistant primer complying with SSPC-PS Guide No. 12.00; applied immediately after surface preparation and pretreatment. Select surface preparation methods according to recommendations in SSPC-SP COM and prepare surfaces according to applicable SSPC standard.

a. Structural Shapes, Plates, and Bars: ASTM A 36.
b. Seamless Structural Tubing: ASTM A 500.

2.4 ENTRANCE DOOR SYSTEMS

A. Entrance Doors: Manufacturer's standard glazed entrance doors for manual-swing operation.

1. Door Construction: 2-7/16-inch overall thickness with a 3/8-inch minimum wall thickness. Mechanically fasten corners with reinforcing brackets that are deeply penetrated and fillet welded or that incorporate concealed tie rods.
2. Door Design: Wide stile; minimum 5-inch nominal width.
3. Glazing Stops and Gaskets: Square, snap-on, extruded-aluminum stops and preformed gaskets.

a. Provide non-removable glazing stops on outside of door.

2.5 ENTRANCE DOOR HARDWARE

A. Entrance Door Hardware: Comply with Section 087100 "Door Hardware."

2.6 GLAZING

A. Glazing: Comply with Section 088000 "Glazing."

2.7 ACCESSORIES

A. Recessed, Non-Ricochet Deal Trays: Formed from stainless-steel; fabricated with recessed bullet trap to ricochet bullets away from secure side, with exposed flanges for recessed installation into horizontal surface, and with sliding stainless-steel cover.

1. Clear Opening Size: 12 inches wide by 8 inches deep by 1¾ inches high.
2. Bullet Trap Location: Secure side.
3. Ballistics Resistance: Same as security window.
4. Listed and labeled as bullet resisting according to UL 752.

B. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, non-staining, non-bleeding fasteners and accessories compatible with adjacent materials.

1. Use self-locking devices where fasteners are subject to loosening or turning out from thermal and structural movements, wind loads, or vibration.
2. Reinforce members as required to receive fastener threads.

C. Anchors: Three-way adjustable anchors with minimum adjustment of 1-inch that accommodate fabrication and installation tolerances in material and finish compatible with adjoining materials and recommended by manufacturer.

1. Concrete and Masonry Inserts: Hot-dip galvanized cast-iron, malleable-iron, or steel inserts complying with ASTM A 123 or ASTM A 153 requirements.

D. Concealed Flashing: Manufacturer's standard corrosion-resistant, non-staining, non-bleeding flashing compatible with adjacent materials.

E. Bituminous Paint: Cold-applied asphalt-mastic paint complying with SSPC-Paint 12 requirements except containing no asbestos, formulated for 30-mil thickness per coat.

2.8 FABRICATION

A. Form or extrude aluminum shapes before finishing.

B. Weld in concealed locations to greatest extent possible to minimize distortion or discoloration of finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.

C. Fabricate components that, when assembled, have the following characteristics:

1. Profiles that are sharp, straight, and free of defects or deformations.
2. Accurately fitted joints with ends coped or mitered.
3. Physical and thermal isolation of glazing from framing members.
4. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.
5. Provisions for field replacement of glazing from interior for vision glass and exterior for spandrel glazing or metal panels.
6. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.

D. Mechanically Glazed Framing Members: Fabricate for flush glazing without projecting stops.

E. Entrance Door Frames: Reinforce as required to support loads imposed by door operation and for installing entrance door hardware.

1. At interior doors, provide silencers at stops to prevent metal-to-metal contact. Install three (3) silencers on strike jamb of single-door frames and two (2) silencers on head of frames for pairs of doors.

F. Entrance Doors: Reinforce doors as required for installing entrance door hardware.

G. Entrance Door Hardware Installation: Factory install entrance door hardware to the greatest extent possible. Cut, drill, and tap for factory-installed entrance door hardware before applying finishes.

H. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.

2.9 ALUMINUM FINISHES

A. High-Performance Organic Finish: Two-coat fluoropolymer finish complying with AAMA 2605 and containing not less than seventy percent (70%) PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

1. Color and Gloss: As selected by Architect and Owner from manufacturer's full range.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General:

1. Comply with manufacturer's written instructions.
2. Do not install damaged components.
3. Fit joints to produce hairline joints free of burrs and distortion.
4. Rigidly secure non-movement joints.
5. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration and to prevent impeding movement of moving joints.
6. Seal perimeter and other joints watertight unless otherwise indicated.

B. Metal Protection:

1. Where aluminum is in contact with dissimilar metals, protect against galvanic action by painting contact surfaces with materials recommended by manufacturer for this purpose or by installing nonconductive spacers.
2. Where aluminum is in contact with concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.

C. Set continuous sill members and flashing in full sealant bed as specified in Section 079200 "Joint Sealants" to produce weathertight installation.

D. Install components plumb and true in alignment with established lines and grades.

E. Install glazing as specified in Section 088000 "Glazing."

F. Entrance Doors: Install doors to produce smooth operation and tight fit at contact points.

1. Field-Installed Entrance Door Hardware: Install surface-mounted entrance door hardware according to entrance door hardware manufacturers' written instructions using concealed fasteners to greatest extent possible.

3.3 ERECTION TOLERANCES

A. Erection Tolerances: Install security entrances and storefronts to comply with the following maximum tolerances:

1. Plumb: 1/8-inch in 10 feet; ¼-inch in 40 feet.
2. Level: 1/8-inch in 20 feet; ¼-inch in 40 feet.
3. Alignment:

a. Where surfaces abut in line or are separated by reveal or protruding element up to ½ inch wide, limit offset from true alignment to 1/16-inch.
b. Where surfaces are separated by reveal or protruding element from ½- to 1-inch-wide, limit offset from true alignment to 1/8-inch.
c. Where surfaces are separated by reveal or protruding element of 1-inch-wide or more, limit offset from true alignment to ¼-inch.

4. Location: Limit variation from plane to 1/8-inch in 12 feet; ½-inch over total length.

END OF SECTION 084333.13

SECTION 084413 - GLAZED ALUMINUM CURTAIN WALLS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes conventionally glazed aluminum curtain walls installed as unit-and-mullion assemblies.

1.3 PRE-INSTALLATION MEETINGS

A. Pre-installation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

B. HPBS Submittals:

1. Product Data for Section 16a-38k-5(d): For glazing sealants used inside the weatherproofing system, documentation including printed statement of VOC content.

C. Shop Drawings: For glazed aluminum curtain walls. Include plans, elevations, sections, full-size details, and attachments to other work.

1. Include details of provisions for assembly expansion and contraction and for draining moisture occurring within the assembly to the exterior.
2. Include full-size isometric details of each vertical-to-horizontal intersection of glazed aluminum curtain walls, showing the following:

a. Joinery, including concealed welds.
b. Anchorage.
c. Expansion provisions.
d. Glazing.
e. Flashing and drainage.

3. Show connection to and continuity with adjacent thermal, weather, air, and vapor barriers.

D. Samples: For units with factory-applied color finishes.

E. Delegated-Design Submittal: For glazed aluminum curtain walls indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Energy Performance Certificates: For glazed aluminum curtain walls, accessories, and components from manufacturer.

1. Basis for Certification: NFRC-certified energy performance values for each glazed aluminum curtain wall.

C. Product Test Reports: For glazed aluminum curtain walls, for tests performed by manufacturer and witnessed by a qualified testing agency.

D. Sample Warranties: For special warranties.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For glazed aluminum curtain walls to include in maintenance manuals.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

B. Product Options: Information on Drawings and in Specifications establishes requirements for aesthetic effects and performance characteristics of assemblies. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction.

1. Do not change intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If changes are proposed, submit comprehensive explanatory data to Architect for review.

1.8 MOCKUPS

A. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.

1. Build mockup of typical wall area as shown on Drawings. Mockup to include curtain wall and masonry, at a minimum.
2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.9 WARRANTY

A. Special Assembly Warranty: Manufacturer agrees to repair or replace components of glazed aluminum curtain wall that do not comply with requirements or that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Structural failures including, but not limited to, excessive deflection.

b. Noise or vibration created by wind and thermal and structural movements.
c. Deterioration of metals and other materials beyond normal weathering.
d. Water penetration through fixed glazing and framing areas.

2. Warranty Period: Two (2) years from date of Substantial Completion.

B. Special Finish Warranty: Standard form in which manufacturer agrees to repair finishes or replace aluminum that shows evidence of deterioration of factory-applied finishes within specified warranty period.

1. Deterioration includes, but is not limited to, the following:

a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.

2. Warranty Period: Twenty (20) years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Product:

1. Kawneer North America; **1600 Wall System 1 Curtain Wall**

B. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. EFCO Corporation
2. Oldcastle BuildingEnvelope
3. TRACO
4. YKK AP America Inc.
5. Substitutions: Under provisions of Section 012500 “Substitution Procedures”.

C. Source Limitations: Obtain all components of curtain wall system, including framing, venting windows, entrances, and sun control from single manufacturer. Sections 084113 “Aluminum-Framed Entrances and Storefronts” and 085113 “Aluminum Windows” must also be from this same, single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design glazed aluminum curtain walls.

B. General Performance: Comply with performance requirements specified, as determined by testing of glazed aluminum curtain walls representing those indicated for this Project without failure due to defective manufacture, fabrication, installation, or other defects in construction.

1. Glazed aluminum curtain walls shall withstand movements of supporting structure including, but not limited to, story drift, twist, column shortening, long-term creep, and deflection from uniformly distributed and concentrated live loads.
2. Failure also includes the following:

a. Thermal stresses transferring to building structure.
b. Glass breakage.
c. Noise or vibration created by wind and thermal and structural movements.
d. Loosening or weakening of fasteners, attachments, and other components.

C. Structural Loads:

1. Wind and other Design Loads: As indicated on Drawings and per Building Code, whichever is most stringent.

D. Deflection of Framing Members: At design wind pressure, as follows:

1. Deflection Normal to Wall Plane: Limited to edge of glass in a direction perpendicular to glass plane not exceeding L/175 of the glass edge length for each individual glazing lite or an amount that restricts edge deflection of individual glazing lites to ¾-inch, whichever is less.
2. Deflection Parallel to Glazing Plane: Limited to L/360 of clear span or 1/8-inch, whichever is smaller.

E. Structural: Test according to ASTM E 330 as follows:

1. When tested at positive and negative wind-load design pressures, assemblies do not evidence deflection exceeding specified limits.
2. When tested at one hundred fifty percent (150%) of positive and negative wind-load design pressures, assemblies, including anchorage, do not evidence material failures, structural distress, or permanent deformation of main framing members exceeding 0.2 percent of span.
3. Test Durations: As required by design wind velocity, but not less than 10 seconds.

F. Air Infiltration: Test according to ASTM E 283 for infiltration as follows:

1. Fixed Framing and Glass Area:

a. Maximum air leakage of 0.06 cfm/sq. ft. at a static-air-pressure differential of 6.24 lbf/sq. ft.

G. Water Penetration under Static Pressure: Test according to ASTM E 331 as follows:

1. No evidence of water penetration through fixed glazing and framing areas when tested according to a minimum static-air-pressure differential of twenty percent (20%) of positive wind-load design pressure, but not less than 12 lbf/sq. ft.

H. Seismic Performance: Glazed aluminum curtain walls shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

I. Energy Performance: Certify and label energy performance according to NFRC as follows:

1. Thermal Transmittance (U-factor): Fixed glazing and framing areas shall have U-factor of not more than 0.39 Btu/sq. ft. x h x deg F as determined according to NFRC 100.
2. Solar Heat Gain Coefficient: Fixed glazing and framing areas shall have a solar heat gain coefficient of no greater than 0.34 as determined according to NFRC 200.
3. Condensation Resistance: Fixed glazing and framing areas shall have an NFRC-certified condensation resistance rating of no less than 15 as determined according to NFRC 500.

J. Blast Resistance:

1. Hazard Rating: **Very Low Hazard** per ASTM F 1642.
2. Design of framing, connections, doors, and glazing shall be based on the following design criteria as described in the ANTITERRORISM STANDARDS FOR BUILDINGS, 9 February 2012, and subsequent revisions:

   a. Standoff Distance of 90 ft.
   b. Applicable Explosive Weight of Type I.

3. Window manufacturer shall provide, with their bid/quote, a “Blast Narrative” describing which design method of the UFC 4-010-01 was utilized to show product compliance to the performance specification in 2.a. and .b. above.

K. Thermal Movements: Allow for thermal movements resulting from ambient and surface temperature changes:

1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

2.3 FRAMING

A. Framing Members: Manufacturer's extruded- or formed-aluminum framing members of thickness required and reinforced as required to support imposed loads.

1. Construction: Thermally broken.
2. Glazing System: Retained mechanically with gaskets on four (4) sides.
3. Glazing Plane: Front.
4. Finish: High-performance organic finish.
5. Fabrication Method: Factory-fabricated unit and mullion system.

B. Pressure Caps: Manufacturer's standard aluminum components that mechanically retain glazing.

1. Include snap-on aluminum trim that conceals fasteners.

C. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with non-staining, nonferrous shims for aligning system components.

1. Provide internal steel reinforcement where required to meet code and blast resistance.

D. Materials:

1. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.

   a. Sheet and Plate: ASTM B 209.
   b. Extruded Bars, Rods, Profiles, and Tubes: ASTM B 221.
   c. Extruded Structural Pipe and Tubes: ASTM B 429.
   d. Structural Profiles: ASTM B 308.

2. Steel Reinforcement: Manufacturer's standard zinc-rich, corrosion-resistant primer complying with SSPC-PS Guide No. 12.00; applied immediately after surface preparation and pretreatment. Select surface preparation methods according to recommendations in SSPC-SP COM and prepare surfaces according to applicable SSPC standard.

   a. Structural Shapes, Plates, and Bars: ASTM A 36.
   b. Cold-Rolled Sheet and Strip: ASTM A 1008.

c. Hot-Rolled Sheet and Strip: ASTM A 1011.

2.4 INSULATED SPANDREL PANELS

A. Insulated Spandrel Panels: Laminated, metal-faced flat panels with no deviations in plane exceeding 0.8 percent of panel dimension in width or length.

1. Overall Panel Thickness: 1-inch.
2. Exterior Skin: Aluminum.

a. Thickness: Manufacturer's standard for finish and texture indicated.
b. Finish: Match framing system.
c. Texture: Smooth.
d. Backing Sheet: 0.125-inch-thick, corrugated, high-density polyethylene.

3. Interior Skin: Aluminum.

a. Thickness: Manufacturer's standard for finish and texture indicated.
b. Finish: Matching storefront framing.
c. Texture: Smooth.
d. Backing Sheet: 0.125-inch-thick, corrugated, high-density polyethylene.

4. Thermal Insulation Core: Manufacturer's standard rigid, closed-cell, polyisocyanurate board.

a. Provide internal steel reinforcement where required to meet code and blast resistance.

B. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Flame-Spread Index: 25 or less.
2. Smoke-Developed Index: 450 or less.

2.5 ENTRANCES

A. Entrances: Comply with Section 084113 "Aluminum-Framed Entrances and Storefronts."

2.6 GLAZING

A. Glazing: Comply with Section 088000 "Glazing."

B. Glazing Gaskets: Manufacturer's standard sealed-corner pressure-glazing system of black, resilient elastomeric glazing gaskets, setting blocks, and shims or spacers.

C. Glazing Sealants: As recommended by manufacturer.

2.7 ACCESSORIES

A. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, non-staining, nonbleeding fasteners and accessories compatible with adjacent materials.

1. Use self-locking devices where fasteners are subject to loosening or turning out from thermal and structural movements, wind loads, or vibration.
2. Reinforce members as required to receive fastener threads.

3. Use exposed fasteners with countersunk Phillips screw heads, fabricated from 300 series stainless-steel.

B. Anchors: Three-way adjustable anchors with minimum adjustment of 1-inch that accommodate fabrication and installation tolerances in material and finish compatible with adjoining materials and recommended by manufacturer.

1. Concrete and Masonry Inserts: Hot-dip galvanized cast-iron, malleable-iron, or steel inserts complying with ASTM A 123 or ASTM A 153 requirements.

C. Concealed Flashing: Manufacturer's standard corrosion-resistant, non-staining, nonbleeding flashing compatible with adjacent materials.

D. Bituminous Paint: Cold-applied asphalt-mastic paint complying with SSPC-Paint 12 requirements except containing no asbestos, formulated for 30-mil thickness per coat.

2.8 FABRICATION

A. Form or extrude aluminum shapes before finishing.

B. Weld in concealed locations to greatest extent possible to minimize distortion or discoloration of finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.

C. Fabricate components that, when assembled, have the following characteristics:

1. Profiles that are sharp, straight, and free of defects or deformations.
2. Accurately fitted joints with ends coped or mitered.
3. Physical and thermal isolation of glazing from framing members.
4. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.
5. Provisions for field replacement of glazing from exterior.
6. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.

D. Fabricate components to resist water penetration as follows:

1. Internal guttering system or other means to drain water passing joints, condensation occurring within framing members, and moisture migrating within glazed aluminum curtain wall to exterior.

E. Factory-Assembled Frame Units:

1. Rigidly secure nonmovement joints.
2. Preparation includes, but is not limited to, cleaning and priming surfaces.
3. Seal joints watertight unless otherwise indicated.
4. Install glazing to comply with requirements in Section 088000 "Glazing."

F. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.

2.9 ALUMINUM FINISHES

A. High-Performance Organic Finish: Two-coat fluoropolymer finish complying with AAMA 2605 and containing not less than seventy percent (70%) PVDF resin by weight in color coat.

Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

1. Color and Gloss: As selected by Architect and Owner from manufacturer's full range, to match existing.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General:

1. Comply with manufacturer's written instructions.
2. Do not install damaged components.
3. Fit joints to produce hairline joints free of burrs and distortion.
4. Rigidly secure nonmovement joints.
5. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration and to prevent impeding movement of moving joints.
6. Where welding is required, weld components in concealed locations to minimize distortion or discoloration of finish. Protect glazing surfaces from welding.
7. Seal joints watertight unless otherwise indicated.

B. Metal Protection:

1. Where aluminum is in contact with dissimilar metals, protect against galvanic action by painting contact surfaces with primer, applying sealant or tape, or installing nonconductive spacers as recommended by manufacturer for this purpose.
2. Where aluminum is in contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.

C. Install components to drain water passing joints, condensation occurring within framing members, and moisture migrating within glazed aluminum curtain wall to exterior.

D. Install components plumb and true in alignment with established lines and grades.

3.3 ERECTION TOLERANCES

A. Erection Tolerances: Install glazed aluminum curtain walls to comply with the following maximum tolerances:

1. Plumb: 1/8-inch in 10 feet; ¼-inch in 40 feet.
2. Level: 1/8-inch in 20 feet; ¼-inch in 40 feet.
3. Alignment:

a. Where surfaces abut in line or are separated by reveal or protruding element up to ½-inch-wide, limit offset from true alignment to 1/16-inch.

b. Where surfaces are separated by reveal or protruding element from ½- to 1-inch-wide, limit offset from true alignment to 1/8-inch.
c. Where surfaces are separated by reveal or protruding element of 1-inch-wide or more, limit offset from true alignment to ¼-inch.

4. Location: Limit variation from plane to 1/8-inch in 12 feet; ½-inch over total length.

END OF SECTION 084413

SECTION 085113 - ALUMINUM WINDOWS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes aluminum windows for exterior locations.

B. Related Requirements:

1. Section 012300 “Alternates” for work of this Section relating to alternates.
2. Section 084113 "Aluminum-Framed Entrances and Storefronts" for coordinating finish among aluminum fenestration units.

1.3 PRE-INSTALLATION MEETINGS

A. Pre-installation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, glazing and fabrication methods, dimensions of individual components and profiles, hardware, and finishes for aluminum windows.

B. Shop Drawings: For aluminum windows.

1. Include plans, elevations, sections, hardware, accessories, insect screens, operational clearances, and details of installation, including anchor, flashing, and sealant installation.

C. Samples: For each exposed product and for each color specified, 2 by 4 inches in size.

D. Product Schedule: For aluminum windows. Use same designations indicated on Drawings.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For manufacturer and Installer.

B. Product Test Reports: For each type of aluminum window, for tests performed by a qualified testing agency.

C. Sample Warranties: For manufacturer's warranties.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: A manufacturer capable of fabricating aluminum windows that meet or exceed performance requirements indicated and of documenting this performance by test reports, and calculations.

B. Installer Qualifications: An installer acceptable to aluminum window manufacturer for installation of units required for this Project.

1.7 WARRANTY

A. Manufacturer's Warranty: Manufacturer agrees to repair or replace aluminum windows that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Failure to meet performance requirements.
b. Structural failures including excessive deflection, water leakage, condensation, and air infiltration.
c. Faulty operation of movable sash and hardware.
d. Deterioration of materials and finishes beyond normal weathering.
e. Failure of insulating glass.

2. Warranty Period:

a. Window: Two (2) years from date of Substantial Completion.
b. Glazing Units: Five (5) years from date of Substantial Completion.
c. Aluminum Finish: Twenty (20) years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Product:

1. Kawneer North America; **TR-9100 Series**

B. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. EFCO Corporation
2. Oldcastle BuildingEnvelope
3. TRACO
4. YKK AP America Inc.
5. Substitutions: Under provisions of Section 012500 “Substitution Procedures”.

C. Source Limitations: Obtain all components of aluminum windows from single manufacturer. Sections 084113 “Aluminum-Framed Entrances and Storefronts” and 084413 “Glazed Aluminum Curtain Walls” must also be from this same, single manufacturer.

2.2 WINDOW PERFORMANCE REQUIREMENTS

A. Product Standard: Comply with AAMA/WDMA/CSA 101/I.S.2/A440 for definitions and minimum standards of performance, materials, components, accessories, and fabrication unless more stringent requirements are indicated.

B. Performance Class and Grade: AAMA/WDMA/CSA 101/I.S.2/A440 as follows:

1. Minimum Performance Class: AW.
2. Minimum Performance Grade: 80.

C. Air Infiltration: Maximum rate not more than indicated when tested according to ASTM E 283.

1. Maximum Rate: 0.1 cfm/sq. ft. of area at an inward test pressure of 6.24 lbf/sq. ft.

D. Water Resistance: No water leakage as defined in AAMA/WDMA referenced test methods at a water test pressure equaling that indicated, when tested according to ASTM E 331/E 547.

E. Thermal Transmittance: NFRC 100 maximum whole-window U-factor of 0.43 Btu/sq. ft. x h x deg F.

F. Condensation-Resistance Factor (CRF): Provide aluminum windows tested for thermal performance according to AAMA 1503, showing a minimum CRF of 66 .

G. Blast Resistance:

1. Hazard Rating: **Very Low Hazard** per ASTM F 1642.
2. Design of framing, connections, doors, and glazing shall be based on the following design criteria as described in the ANTITERRORISM STANDARDS FOR BUILDINGS, 9 February 2012, and subsequent revisions:

a. Standoff Distance of 90 ft.
b. Applicable Explosive Weight of Type I.

3. Window manufacturer shall provide, with their bid/quote, a “Blast Narrative” describing which design method of the UFC 4-010-01 was utilized to show product compliance to the performance specification in 2.a. and .b. above.

H. Thermal Movements: Provide aluminum windows, including anchorage, that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change: 120 deg F, ambient; 180 deg F material surfaces.

2.3 ALUMINUM WINDOWS

A. Operating Types: Provide the following operating types in locations indicated on Drawings:

1. Single hung.

B. Frames and Sashes: Aluminum extrusions complying with AAMA/WDMA/CSA 101/I.S.2/A440.

1. Thermally Improved Construction: Fabricate frames, sashes, and muntins with an integral, concealed, low-conductance thermal barrier located between exterior materials and window members exposed on interior side in a manner that eliminates direct metal-to-metal contact.

C. Insulating-Glass Units: Comply with Section 088000 "Glazing."

D. Glazing System: Manufacturer's standard factory-glazing system that produces weathertight seal.

E. Hardware, General: Provide manufacturer's standard hardware fabricated from aluminum, stainless-steel, carbon steel complying with AAMA 907, or other corrosion-resistant material compatible with adjacent materials; designed to smoothly operate, tightly close, and securely lock windows, and sized to accommodate sash weight and dimensions.

1. Exposed Hardware Color and Finish: As selected by Architect and Owner from manufacturer's entire range.

F. Hung Window Hardware:

1. Counterbalancing Mechanism: Complying with AAMA 902, concealed, of size and capacity to hold sash stationary at any open position.
2. Locks and Latches: Allow unobstructed movement of the sash across adjacent sash in direction indicated and operated from the inside only.
3. Tilt Latch: Releasing latch allows sash to pivot about horizontal axis to facilitate cleaning exterior surfaces from the interior.

G. Weather Stripping: Provide full-perimeter weather stripping for each operable sash unless otherwise indicated.

H. Fasteners: Noncorrosive and compatible with window members, trim, hardware, anchors, and other components.

1. Exposed Fasteners: Do not use exposed fasteners to the greatest extent possible. For application of hardware, use fasteners that match finish hardware being fastened.

2.4 ACCESSORIES

A. Subsills: Thermally broken, extruded aluminum subsills in configurations indicated on Drawings.

B. Interior and Panning Trim: Extruded-aluminum profiles in sizes and configurations indicated on Drawings.

C. Receptor System: Two-piece, snap-together, thermally broken, extruded-aluminum receptor system that anchors windows in place.

2.5 INSECT SCREENS

A. General: Fabricate insect screens to integrate with window frame. Provide screen for each operable exterior sash. Screen wickets are not permitted.

1. Type and Location: Full, inside for outswing sashes.

B. Aluminum Frames: Manufacturer's standard aluminum alloy complying with SMA 1004 or SMA 1201. Fabricate frames with mitered or coped joints or corner extrusions, concealed fasteners, and removable PVC spline/anchor concealing edge of frame.

1. Tubular Framing Sections and Cross Braces: Roll formed from aluminum sheet.
2. Color: To match aluminum window frame.

C. Aluminum Wire Fabric: 18-by-16 mesh of 0.011-inch-diameter, coated aluminum wire.

1. Wire-Fabric Finish: As selected by Architect and Owner from manufacturer’s entire range.

2.6 FABRICATION

A. Framing Members, General: Fabricate components that, when assembled, have the following characteristics:

1. Profiles that are sharp, straight, and free of defects or deformations.
2. Accurately fit joints; make joints flush, hairline and weatherproof.
3. Means to drain water passing joints, condensation within framing members, and moisture migrating within the system to exterior.
4. Physical and thermal isolation of glazing from framing members.
5. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.
6. Provisions for field replacement of glazing.
7. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.

B. Window Frame Joinery: Screw-spline, factory sealed frame and vent corner joints.

C. Fabricate aluminum windows in sizes indicated. Include a complete system for assembling components and anchoring windows.

D. Glaze aluminum windows in the factory and fabricate so that windows are re-glazable without dismantling sash or framing.

E. Weather strip each operable sash to provide weathertight installation.

F. Weep Holes: Provide weep holes and internal passages to conduct infiltrating water to exterior.

G. Provide water-shed members above side-hinged sashes and similar lines of natural water penetration.

H. Complete fabrication, assembly, finishing, hardware application, and other work in the factory to greatest extent possible. Disassemble components only as necessary for shipment and installation.

2.7 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM's "Metal Finishes Manual" for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.8 ALUMINUM FINISHES

A. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.

B. High-Performance Organic Finish: Two-coat fluoropolymer finish complying with AAMA 2605 and containing not less than seventy percent (70%) PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

1. Color and Gloss: As selected by Architect and Owner from manufacturer’s entire range, to match adjacent framing.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine openings, substrates, structural support, anchorage, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Verify rough opening dimensions, levelness of sill plate, and operational clearances.

C. Examine wall flashings, vapor retarders, water and weather barriers, and other built-in components to ensure weathertight window installation.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Comply with manufacturer's written instructions for installing windows, hardware, accessories, and other components. For installation procedures and requirements not addressed in manufacturer's written instructions, comply with installation requirements in ASTM E 2112.

B. Install windows level, plumb, square, true to line, without distortion or impeding thermal movement, anchored securely in place to structural support, and in proper relation to wall flashing and other adjacent construction.

C. Set sill members in bed of sealant or with gaskets, as indicated, for weather tight construction.

D. Install windows and components to drain condensation, water penetrating joints, and moisture migrating within windows to the exterior.

E. Separate aluminum and other corrodible surfaces from sources of corrosion or electrolytic action at points of contact with other materials.

3.3 ADJUSTING, CLEANING, AND PROTECTION

A. Adjust operating sashes and hardware for a tight fit at contact points and weather stripping for smooth operation and weathertight closure.

1. Lubricate hardware and moving parts.

B. Clean exposed surfaces immediately after installing windows. Avoid damaging protective coatings and finishes. Remove excess sealants, glazing materials, dirt, and other substances.

1. Keep protective films and coverings in place until final cleaning.

C. Clean glass immediately after installing windows. Comply with manufacturer's written recommendations for final cleaning and maintenance. Remove non-permanent labels, and clean surfaces.

D. Remove and replace glass that has been broken, chipped, cracked, abraded, or damaged during construction period.

E. Protect window surfaces from contact with contaminating substances resulting from construction operations. If contaminating substances do contact window surfaces, remove contaminants immediately according to manufacturer's written instructions.

END OF SECTION 085113

SECTION 085653 - SECURITY WINDOWS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Fixed, transaction security windows.

1.3 COORDINATION

A. Coordinate installation of anchorages for security windows. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in adjacent construction. Deliver such items to Project site in time for installation.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, weights and finishes for window units.

B. Shop Drawings: For security windows.

1. Include plans, elevations, sections, and attachment details.
2. Full-size section details of framing members, including internal armoring, reinforcement, and stiffeners.
3. Glazing details.
4. Details of deal tray and speaking aperture.

C. Samples: For frame members with factory-applied color finishes.

D. Cutaway Sample: Corner of security window, made from 12-inch lengths of full-size components, and showing details of the following:

1. Joinery.
2. Anchorage.
3. Glazing.

E. Delegated-Design Submittal: For security windows indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer and testing agency.

B. Welding certificates.

C. Product Test Reports: For each type of security window and accessory indicated as ballistics resistant, for tests performed by a qualified testing agency.

D. Examination reports documenting inspections of substrates, areas, and conditions.

E. Anchor inspection reports documenting inspections of built-in and cast-in anchors.

F. Field quality-control reports documenting inspections of installed products.

1. Field quality-control certification signed by Contractor.

G. Sample Warranty: For special warranty.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: An authorized representative who is trained and approved by manufacturer for installation of units required for this Project.

B. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.2, "Structural Welding Code - Aluminum."
3. AWS D1.6, "Structural Welding Code - Stainless Steel."

1.8 DELIVERY, STORAGE, AND HANDLING

A. Pack security windows in wood crates for shipment. Crate glazing separate from frames unless factory glazed.

B. Label security window packaging with drawing designation.

C. Store crated security windows on raised blocks to prevent moisture damage.

1.9 FIELD CONDITIONS

A. Field Measurements: Verify actual dimensions of openings by field measurements before fabrication.

1.10 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace security windows that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

    a. Structural failures including deflections exceeding ¼-inch.
    b. Failure of welds.
    c. Deterioration of metals, metal finishes, and other materials beyond normal weathering and use.

2. Warranty Period: One (1) year from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Attack Resistance: Provide units identical to those tested for compliance with requirements indicated, and as follows:

1. Ballistics Resistance: Listed and labeled as **Level 3** when tested according to UL 752.

2.3 FIXED, TRANSACTION SECURITY WINDOWS

A. Provide fixed, transaction security windows with operable sash or ventilator capable of allowing transfer of currency and documents.

1. Basis-of-Design:

    a. North American Bullet Proof, **Shotgard ® Series Bullet-Resistant EXTW-A**
    b. Substitutions: Under provisions of Section 012500 “Substitution Procedures”.

B. Configuration: One (1) fixed-glazed panel.

C. Framing: Fabricate perimeter framing, mullions, and glazing stops from aluminum as follows:

1. Profile: Manufacturer's standard, with minimum face dimension indicated.

    a. Minimum Face Dimension: 2 inches.

2. Depth: Manufacturer's standard.

D. Head and Jamb Framing: Designed for sealant glazing.

E. Channel-Frame Sill: Formed from aluminum and designed for sealant glazing.

F. Glazing and Glazing Materials: **GL-7**; comply with requirements in Section 088000 “Glazing”.

G. Glazing Meeting Edges: Polished glazing.

H. Materials:

1. Stainless-Steel Sheet, Strip, Plate, and Flat Bars: ASTM A666 or ASTM A 240, austenitic stainless steel, Type 304.

2. Aluminum Extrusions: ASTM B 221. Provide alloy and temper recommended by manufacturer for strength, corrosion resistance, and application of required finish, but not less than 22,000-psi ultimate tensile strength.
3. Aluminum Sheet and Plate: ASTM B 209.

2.4 FABRICATION

A. General: Fabricate security windows to provide a complete system for assembly of components and anchorage of window units.

1. Provide units that are reglazable from the secure side without dismantling the attack side of framing.
2. Prepare security windows for field glazing unless preglazing at the factory is indicated.

B. Framing: Miter or cope corners the full depth of framing; weld and dress smooth.

1. Fabricate framing with manufacturer's standard, internal opaque armoring in thicknesses required for security windows to comply with ballistics-resistance performance indicated.

C. Glazing Stops: Finish glazing stops to match security window framing.

1. Attack-Side (Exterior) Glazing Stops: Welded or integral to framing.
2. Secure-Side (Interior) Glazing Stops: Removable, coordinated with glazing indicated.

D. Welding: Weld components to comply with referenced AWS standard. To greatest extent possible, weld before finishing and in concealed locations to minimize distortion or discoloration of finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.

E. Metal Protection: Separate dissimilar metals to protect against galvanic action by painting contact surfaces with primer or by applying sealant or tape recommended by manufacturer for this purpose.

F. Factory-cut openings in glazing for speaking apertures.

2.5 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM/NOMMA 500 for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.6 ALUMINUM FINISHES

A. High-Performance Organic Finish: Two-coat fluoropolymer finish complying with AAMA 2605 and containing not less than seventy percent (70%) PVDF resin by weight in color

coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

1. Color and Gloss: As selected by Architect and Owner from manufacturer's full range, to match adjacent framing.

2.7 STAINLESS-STEEL FINISHES

A. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.

B. Polished Finishes: Grind and polish surfaces to produce uniform finish, free of cross scratches.

1. Run grain of directional finishes with long dimension of each piece.
2. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.
3. Directional Satin Finish: No. 4.

2.8 ACCESSORIES

A. Recessed, Non-Ricochet Deal Trays: Formed from stainless-steel; fabricated with recessed bullet trap to ricochet bullets away from secure side, with exposed flanges for recessed installation into horizontal surface, and with sliding stainless-steel cover.

1. Clear Opening Size: 12 inches wide by 8 inches deep by 1¾ inches high.
2. Bullet Trap Location: Secure side.
3. Ballistics Resistance: Same as security window.
4. Listed and labeled as bullet resisting according to UL 752.

B. Speaking Apertures: Fabricate from stainless-steel, designed to allow passage of speech at normal speaking volume without distortion.

1. Shape: Circular.
2. Ballistics Resistance: Same as security window.
3. Listed and labeled as bullet resisting according to UL 752.

C. Concealed Bolts: ASTM A 307, Grade A unless otherwise indicated.

D. Embedded Plate Anchors: Fabricated from mild steel shapes and plates, minimum 3/16-inch-thick; with minimum ½-inch-diameter, headed studs welded to back of plate.

E. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.

F. Miscellaneous Glazing Materials: Provide material, size, and shape complying with requirements of glass manufacturers and with a proven record of compatibility with surfaces contacted in installation.

1. Cleaners, Primers, and Sealers: Type recommended by sealant or gasket manufacturer.
2. Setting Blocks: Elastomeric material with a Shore A durometer hardness of 85, plus or minus 5.

3. Spacers: Elastomeric blocks or continuous extrusions with a Shore A durometer hardness required by glass manufacturer to maintain glass lites in place for installation indicated.
4. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).

G. Anchors, Clips, and Window Accessories: Stainless-steel; hot-dip, zinc-coated steel or iron, complying with ASTM B 633; provide sufficient strength to withstand design pressures indicated.

H. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.

I. Sealants: For sealants required within fabricated security windows, provide type recommended by manufacturer for joint size and movement. Sealant shall remain permanently elastic, non-shrinking, and nonmigrating.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of security windows.

B. Examine roughing-in for embedded and built-in anchors to verify actual locations of security window connections before security window installation.

C. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of security windows.

D. Inspect built-in and cast-in anchor installations, before installing security windows, to verify that anchor installations comply with requirements. Prepare inspection reports.

1. Remove and replace anchors where inspections indicate that they do not comply with specified requirements. Reinspect after repairs or replacements are made.
2. Perform additional inspections to determine compliance of replaced or additional work. Prepare anchor inspection reports.

E. For factory-installed glazing materials whose orientation (secure or attack side) is critical for performance, verify installation orientation.

F. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Coordination: Furnish layouts for cast-in-place anchors, clips, and other security window anchors whose installation is specified in other Sections.

1. Furnish cast-in-place anchors and similar devices to other trades for installation well in advance of time needed for coordinating other work.

3.3 INSTALLATION

A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing security windows to in-place construction. Include threaded fasteners for inserts, security fasteners, and other connectors.

1. Install an attached or integral flange to secure side of security windows extending over rough-in opening gap so that gap has same ballistics-resistance performance as security window.

B. Glazed Framing: Provide sealant-glazed framing. Comply with installation requirements in Section 088000 “Glazing”.

C. Removable Glazing Stops and Trim: Fasten components with security fasteners.

D. Fasteners: Install security windows using fasteners recommended by manufacturer with head style appropriate for installation requirements, strength, and finish of adjacent materials. Provide stainless-steel fasteners in stainless-steel materials.

E. Sealants: Comply with requirements in Section 079200 "Joint Sealants" for installing sealants, fillers, and gaskets.

1. Set continuous sill members and flashing in a full sealant bed to provide weathertight construction unless otherwise indicated.
2. Seal frame perimeter with sealant to provide weathertight construction unless otherwise indicated.

F. Metal Protection: Where dissimilar metals will contact each other, protect against galvanic action by painting contact surfaces with primer or by applying sealant or tape recommended in writing by manufacturer for this purpose. Where aluminum will contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.

3.4 FIELD QUALITY CONTROL

A. Inspect installed products to verify compliance with requirements. Prepare inspection reports and indicate compliance with and deviations from the Contract Documents.

B. Perform additional inspections to determine compliance of replaced or additional work. Prepare inspection reports.

C. Prepare field quality-control certification that states installed products and their installation comply with requirements in the Contract Documents.

3.5 ADJUSTING

A. Remove and replace defective work, including security windows that are warped, bowed, or otherwise unacceptable.

3.6 CLEANING AND PROTECTION

A. Clean surfaces promptly after installation of security windows. Take care to avoid damaging the finish. Remove excess glazing and sealant compounds, dirt, and other substances.

B. Provide temporary protection to ensure that security windows are without damage at time of Substantial Completion.

END OF SECTION 085653

SECTION 087100 - DOOR HARDWARE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes commercial door hardware for the following:

1. Swinging doors.
2. Other doors to the extent indicated.

B. Door hardware includes, but is not necessarily limited to, the following:

1. Mechanical door hardware.
2. Electromechanical door hardware.
3. Automatic operators.
4. Cylinders specified for doors in other sections.

C. Related Sections:

1. Section 081213 “Hollow Metal Frames”.
2. Section 081416 “Flush Wood Doors”.
3. Section 084113 “Aluminum-Framed Entrances and Storefronts”.
4. Section 084333.13 “Security Entrances and Storefronts”.

D. Codes and References: Comply with the version year adopted by the Authority Having Jurisdiction.

1. ANSI A117.1 - Accessible and Usable Buildings and Facilities.
2. ICC/IBC - International Building Code.
3. NFPA 70 - National Electrical Code.
4. NFPA 80 - Fire Doors and Windows.
5. NFPA 101 - Life Safety Code.
6. NFPA 105 - Installation of Smoke Door Assemblies.
7. UL/ULC and CSA C22.2 - Standards for Automatic Door Operators Used on Fire and Smoke Barrier Doors and Systems of Doors.
8. State Building Codes, Local Amendments.

E. Standards: All hardware specified herein shall comply with the following industry standards as applicable. Any undated reference to a standard shall be interpreted as referring to the latest edition of that standard:

1. ANSI/BHMA Certified Product Standards - A156 Series.
2. UL10C - Positive Pressure Fire Tests of Door Assemblies.
3. ANSI/UL 294 - Access Control System Units.
4. UL 305 - Panic Hardware.

1.3 SUBMITTALS

A. Product Data: Manufacturer's product data sheets including installation details, material descriptions, dimensions of individual components and profiles, operational descriptions and finishes.

B. Door Hardware Schedule: Prepared by or under the supervision of supplier, detailing, fabrication and assembly of door hardware, as well as procedures and diagrams. Coordinate the final Door Hardware Schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.

1. Format: Comply with scheduling sequence and vertical format in DHI's "Sequence and Format for the Hardware Schedule."
2. Organization: Organize the Door Hardware Schedule into door hardware sets indicating complete designations of every item required for each door or opening. Organize door hardware sets in same order as in the Door Hardware Sets at the end of Part 3. Submittals that do not follow the same format and order as the Door Hardware Sets will be rejected and subject to resubmission.
3. Content: Include the following information:

    a. Type, style, function, size, label, hand, and finish of each door hardware item.
    b. Manufacturer of each item.
    c. Fastenings and other pertinent information.
    d. Location of door hardware set, cross-referenced to Drawings, both on floor plans and in door and frame schedule.
    e. Explanation of abbreviations, symbols, and codes contained in schedule.
    f. Mounting locations for door hardware.
    g. Door and frame sizes and materials.
    h. Warranty information for each product.

4. Submittal Sequence: Submit the final Door Hardware Schedule at earliest possible date, particularly where approval of the Door Hardware Schedule must precede fabrication of other work that is critical in the Project construction schedule. Include Product Data, Samples, Shop Drawings of other work affected by door hardware, and other information essential to the coordinated review of the Door Hardware Schedule.

C. Shop Drawings: Details of electrified access control hardware indicating the following:

1. Wiring Diagrams: Upon receipt of approved schedules, submit detailed system wiring diagrams for power, signaling, monitoring, communication, and control of the access control system electrified hardware. Differentiate between manufacturer-installed and field-installed wiring. Include the following:

    a. Elevation diagram of each unique access controlled opening showing location and interconnection of major system components with respect to their placement in the respective door openings.
    b. Complete (risers, point-to-point) access control system block wiring diagrams.
    c. Wiring instructions for each electronic component scheduled herein.

2. Electrical Coordination: Coordinate with related sections the voltages and wiring details required at electrically controlled and operated hardware openings.

D. Keying Schedule: After a keying meeting with the owner has taken place prepare a separate keying schedule detailing final instructions. Submit the keying schedule in electronic format. Include keying system explanation, door numbers, key set symbols, hardware set numbers and special

instructions. Owner must approve submitted keying schedule prior to the ordering of permanent cylinders/cores.

E. Informational Submittals:

1. Product Test Reports: Indicating compliance with cycle testing requirements, based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified independent testing agency.

1.4 CLOSEOUT SUBMITTALS

A. Operating and Maintenance Manuals: Provide manufacturers operating and maintenance manuals for each item comprising the complete door hardware installation in quantity as required in Division 01, Closeout Procedures.

B. Project Record Documents: Provide record documentation of as-built door hardware sets in digital format (.pdf, .docx, .xlsx, .csv) and as required in Division 01, Project Record Documents.

1.5 QUALITY ASSURANCE

A. Manufacturers Qualifications: Engage qualified manufacturers with a minimum 5 years of documented experience in producing hardware and equipment similar to that indicated for this Project and that have a proven record of successful in-service performance.

B. Certified Products: Where specified, products must maintain a current listing in the Builders Hardware Manufacturers Association (BHMA) Certified Products Directory (CPD).

C. Installer Qualifications: A minimum 3 years documented experience installing both standard and electrified door hardware similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.

D. Door Hardware Supplier Qualifications: Experienced commercial door hardware distributors with a minimum 5 years documented experience supplying both mechanical and electromechanical hardware installations comparable in material, design, and extent to that indicated for this Project. Supplier recognized as a factory direct distributor by the manufacturers of the primary materials with a warehousing facility in Project's vicinity. Supplier to have on staff a certified Architectural Hardware Consultant (AHC) available during the course of the Work to consult with Contractor, Architect, and Owner concerning both standard and electromechanical door hardware and keying.

E. Source Limitations: Obtain each type and variety of door hardware specified in this section from a single source unless otherwise indicated.

1. Electrified modifications or enhancements made to a source manufacturer's product line by a secondary or third party source will not be accepted.
2. Provide electromechanical door hardware from the same manufacturer as mechanical door hardware, unless otherwise indicated.

F. Each unit to bear third party permanent label indicating compliance with the referenced testing standards.

G. Keying Conference: Conduct conference to comply with requirements in Division 01 Section "Project Meetings." Keying conference to incorporate the following criteria into the final keying schedule document:

1. Function of building, purpose of each area and degree of security required.
2. Plans for existing and future key system expansion.
3. Requirements for key control storage and software.
4. Installation of permanent keys, cylinder cores and software.
5. Address and requirements for delivery of keys.

H. Pre-Submittal Conference: Conduct coordination conference in compliance with requirements in Division 01 Section "Project Meetings" with attendance by representatives of Supplier(s), Installer(s), and Contractor(s) to review proper methods and the procedures for receiving, handling, and installing door hardware.

1. Prior to installation of door hardware, conduct a project specific training meeting to instruct the installing contractors' personnel on the proper installation and adjustment of their respective products. Product training to be attended by installers of door hardware (including electromechanical hardware) for aluminum, hollow metal and wood doors. Training will include the use of installation manuals, hardware schedules, templates and physical product samples as required.
2. Inspect and discuss electrical roughing-in, power supply connections, and other preparatory work performed by other trades.
3. Review sequence of operation narratives for each unique access controlled opening.
4. Review and finalize construction schedule and verify availability of materials.
5. Review the required inspecting, testing, commissioning, and demonstration procedures

I. At completion of installation, provide written documentation that components were applied according to manufacturer's instructions and recommendations and according to approved schedule.

1.6 DELIVERY, STORAGE AND HANDLING

A. Inventory door hardware on receipt and provide secure lock-up and shelving for door hardware delivered to Project site. Do not store electronic access control hardware, software or accessories at Project site without prior authorization.

B. Tag each item or package separately with identification related to the final Door Hardware Schedule, and include basic installation instructions with each item or package.

C. Deliver, as applicable, permanent keys, cylinders, cores, access control credentials, software and related accessories directly to Owner via registered mail or overnight package service. Instructions for delivery to the Owner shall be established at the "Keying Conference".

1.7 COORDINATION

A. Templates: Obtain and distribute to the parties involved templates for doors, frames, and other work specified to be factory prepared for installing standard and electrified hardware. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing hardware to comply with indicated requirements.

B. Door Hardware and Electrical Connections: Coordinate the layout and installation of scheduled electrified door hardware and related access control equipment with required connections to source power junction boxes, low voltage power supplies, detection and monitoring hardware, and fire and detection alarm systems.

C. Door and Frame Preparation: Doors and corresponding frames are to be prepared, reinforced and pre-wired (if applicable) to receive the installation of the specified electrified, monitoring, signaling and access control system hardware without additional in-field modifications.

1.8 WARRANTY

A. General Warranty: Reference Division 01, General Requirements. Special warranties specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

B. Warranty Period: Written warranty, executed by manufacturer(s), agreeing to repair or replace components of standard and electrified door hardware that fails in materials or workmanship within specified warranty period after final acceptance by the Owner. Failures include, but are not limited to, the following:

1. Structural failures including excessive deflection, cracking, or breakage.
2. Faulty operation of the hardware.
3. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
4. Electrical component defects and failures within the systems operation.

C. Warranty Period: Unless otherwise indicated, warranty shall be one year from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 BUTT HINGES

A. Hinges: ANSI/BHMA A156.1 butt hinges with number of hinge knuckles and other options as specified in the Door Hardware Sets.

1. Quantity: Provide the following hinge quantity:

a. Two Hinges: For doors with heights up to 60 inches.
b. Three Hinges: For doors with heights 61 to 90 inches.
c. Four Hinges: For doors with heights 91 to 120 inches.
d. For doors with heights more than 120 inches, provide 4 hinges, plus 1 hinge for every 30 inches of door height greater than 120 inches.

2. Hinge Size: Provide the following, unless otherwise indicated, with hinge widths sized for door thickness and clearances required:

a. Widths up to 3’0”: 4-1/2” heavy weight.
b. Sizes from 3’1” to 4’0”: 5” heavy weight.

3. Hinge Weight and Base Material: Unless otherwise indicated, provide the following:

a. Exterior Doors: Heavy weight, non-ferrous, ball bearing or oil impregnated bearing hinges unless Hardware Sets indicate standard weight.
b. Interior Doors: Standard weight, steel, ball bearing or oil impregnated bearing hinges unless Hardware Sets indicate heavy weight.

4. Hinge Options: Comply with the following:

a. Non-removable Pins: With the exception of electric through wire hinges, provide set screw in hinge barrel that, when tightened into a groove in hinge pin, prevents removal of pin while door is closed; for the all out-swinging lockable doors.

5. Manufacturers:

a. Hager Companies (HA) - BB Series, 5-knuckle.
b. McKinney (MK) - TA/T4A Series, 5-knuckle.
c. dormakaba BEST (ST) - F/FBB Series, 5-knuckle.

2.2 CONTINUOUS HINGES

A. Continuous Geared Hinges: ANSI/BHMA A156.26 Grade 1-600 continuous geared hinge. with minimum 0.120-inch thick extruded 6063-T6 aluminum alloy hinge leaves and a minimum overall width of 4 inches. Hinges are non-handed, reversible and fabricated to template screw locations. Factory trim hinges to suit door height and prepare for electrical cut-outs. Provide custom screw pattern where required by aluminum door manufacturer.

1. Where specified, provide modular continuous geared hinges that ship in two or three pieces and form a single continuous hinge upon installation.
2. Manufacturers:.

a. Hager Companies (HA).
b. Select.
c. Pemko (PE).

B. Pin and Barrel Continuous Hinges: ANSI/BHMA A156.26 Grade 1-600 pin and barrel continuous hinges with minimum 14 gauge Type 304 stainless steel hinge leaves, concealed stainless pin, and twin self-lubricated nylon bearings at each knuckle separation. Factory trim hinges to suit door height and prepare for electrical cut-outs.

1. Manufacturers:

a. Hager Companies (HA).
b. Markar Products; ASSA ABLOY Architectural Door Accessories (MR).
c. Pemko (PE).

2.3 POWER TRANSFER DEVICES

A. Concealed Quick Connect Electric Power Transfers: Provide concealed wiring pathway housing mortised into the door and frame for low voltage electrified door hardware. Furnish with Molex™ standardized plug connectors and sufficient number of concealed wires (up to 12) to accommodate the electrified functions specified in the Door Hardware Sets. Connectors plug directly to through-door wiring harnesses for connection to electric locking devices and power supplies. Wire nut connections are not acceptable.

1. Manufacturers:

a. Pemko (PE) - EL-CEPT Series.
b. Securitron (SU) - EL-CEPT Series.
c. dormakaba BEST (ST) EPT-12C Series.

B. Electric Door Wire Harnesses: Provide electric/data transfer wiring harnesses with standardized plug connectors to accommodate up to twelve (12) wires. Connectors plug directly to through-door

wiring harnesses for connection to electric locking devices and power supplies. Provide sufficient number and type of concealed wires to accommodate electric function of specified hardware. Provide a connector for through-door electronic locking devices and from hinge to junction box above the opening. Wire nut connections are not acceptable. Determine the length required for each electrified hardware component for the door type, size and construction, minimum of two per electrified opening.

1. Provide one each of the following tools as part of the base bid contract:

    a. McKinney (MK) - Electrical Connecting Kit: QC-R001.
    b. McKinney (MK) - Connector Hand Tool: QC-R003.

2. Manufacturers:

    a. Hager Companies (HA) - Quick Connect.
    b. McKinney (MK) - QC-C Series.
    c. dormakaba BEST (ST) - WH Series.

2.4 DOOR OPERATING TRIM

A. Flush Bolts and Surface Bolts: Provide products conforming to ANSI/BHMA A156.3 and A156.16, Grade 1.

1. Flush bolts to be furnished with top rod of sufficient length to allow bolt retraction device location approximately six feet from the floor.
2. Furnish dust proof strikes for bottom bolts.
3. Surface bolts to be minimum 8” in length and U.L. listed for labeled fire doors and U.L. listed for windstorm components where applicable.
4. Provide related accessories (mounting brackets, strikes, coordinators, etc.) as required for appropriate installation and operation.
5. Manufacturers:

    a. Door Controls International (DC).
    b. Rockwood (RO).
    c. Trimco (TC).

B. Coordinators: ANSI/BHMA A156.3 door coordinators consisting of active-leaf, hold-open lever and inactive-leaf release trigger. Model as indicated in hardware sets.

1. Manufacturers:

    a. Door Controls International (DC).
    b. Rockwood (RO).
    c. Trimco (TC).

C. Door Push Plates and Pulls: ANSI/BHMA A156.6 door pushes and pull units of type and design specified in the Hardware Sets. Coordinate and provide proper width and height as required where conflicting hardware dictates.

1. Push/Pull Plates: Minimum .050 inch thick, size as indicated in hardware sets, with beveled edges, secured with exposed screws unless otherwise indicated.
2. Door Pull and Push Bar Design: Size, shape, and material as indicated in the hardware sets. Minimum clearance of 2 1/2-inches from face of door unless otherwise indicated.

3. Offset Pull Design: Size, shape, and material as indicated in the hardware sets. Minimum clearance of 2 1/2-inches from face of door and offset of 90 degrees unless otherwise indicated.
4. Pulls, where applicable, shall be provided with a 10” clearance from the finished floor on the push side to accommodate wheelchair accessibility.
5. Fasteners: Provide manufacturer's designated fastener type as indicated in Hardware Sets. When through-bolt fasteners are in the same location as a push plate, countersink the fasteners flush with the door face allowing the push plate to sit flat against the door.
6. Manufacturers:

    a. Hiawatha, Inc. (HI).
    b. Rockwood (RO).
    c. Trimco (TC).

2.5 CYLINDERS AND KEYING

A. General: Cylinder manufacturer to have minimum (10) years experience designing secured master key systems and have on record a published security keying system policy.

B. Cylinder Types: Original manufacturer cylinders able to supply the following cylinder formats and types:

1. Threaded mortise cylinders with rings and cams to suit hardware application.
2. Rim cylinders with back plate, flat-type vertical or horizontal tailpiece, and raised trim ring.
3. Bored or cylindrical lock cylinders with tailpieces as required to suit locks.
4. Tubular deadlocks and other auxiliary locks.
5. Mortise and rim cylinder collars to be solid and recessed to allow the cylinder face to be flush and be free spinning with matching finishes.
6. Keyway: Match Facility Standard.

C. Small Format Interchangeable Cores: Provide small format interchangeable cores (SFIC) as specified, core insert, removable by use of a special key; usable with other manufacturers' cylinders.

D. Provide a keyed core for every locking device on this project, both new and existing locks. Provide re-keying and new keys for all existing locks not indicated to receive a new core.

E. Patented Cylinders: ANSI/BHMA A156.5, Grade 1 Certified Products Directory (CPD) listed cylinders employing a utility patented and restricted keyway requiring the use of a patented key. Cylinders are to be protected from unauthorized manufacture and distribution by manufacturer’s United States patents.

1. Patented key systems shall not be established with products that have an expired patent. Expired systems shall only be specified and supplied to support existing systems.
2. Manufacturers:

    a. Medeco (MC) - X4.
    b. No Substitution.

F. Keying System: Each type of lock and cylinders to be factory keyed.

1. Supplier shall conduct a "Keying Conference" to define and document keying system instructions and requirements.

2. Furnish factory cut, nickel-silver large bow permanently inscribed with a visual key control number as directed by Owner.
3. Existing System: Field verify and key cylinders to match Owner's existing system.

G. Key Quantity: Provide the following minimum number of keys:

1. Change Keys per Cylinder: Two (2)
2. Master Keys (per Master Key Level/Group): Five (5).
3. Construction Keys (where required): Ten (10).
4. Construction Control Keys (where required): Two (2).
5. Permanent Control Keys (where required): Two (2).

H. Construction Keying: Provide construction master keyed cylinders.

I. Construction Keying: Provide temporary keyed construction cores.

J. Key Registration List (Bitting List):

1. Provide keying transcript list to Owner's representative in the proper format for importing into key control software.
2. Provide transcript list in writing or electronic file as directed by the Owner.

2.6 KEY CONTROL

A. Key Control Cabinet: Provide a key control system including envelopes, labels, and tags with self-locking key clips, receipt forms, 3-way visible card index, temporary markers, permanent markers, and standard metal cabinet. Key control cabinet shall have expansion capacity of 150% of the number of locks required for the project.

1. Manufacturers:

a. Lund Equipment (LU).
b. MMF Industries (MM).
c. Telkee (TK).

2.7 CYLINDRICAL LOCKS AND LATCHING DEVICES

A. Cylindrical Locksets, Grade 1 (Heavy Duty): ANSI/BHMA A156.2, Series 4000, Operational Grade 1 Certified Products Directory (CPD) listed cylindrical locksets. Listed manufacturers shall meet all functions and features as specified herein.

1. Provide locksets with functions and features as follows:

a. Meets ANSI/BHMA A156.41 for single motion egress.
b. Provide knurling on all levers leading to hazardous areas.
c. Meets UL and CUL Standard 10C Positive Pressure, Fire Test of Door Assemblies with levers that meet A117.1 Accessibility Code.
d. Exceeds ANSI/BHMA A156.2 requirements by 2.6 times for 3,100 in-lb. abusive locked lever torque with no entry while maintaining egress.
e. Exceeds ANSI/BHMA A156.2 requirements by 8 times for 1,600 lbs. offset lever pull with no entry for protection against attacks.
f. Exceeds ANSI/BHMA A156.3 requirements by 2 times for latch retraction with 100 lb. preload while maintaining operation in warped doors.

g. Exceeds ANSI/BHMA A156.3 requirements by 20 times for no access with minimum 100 vertical impacts for protection against vandalism attempts.
h. Independent return springs allow lock to exceed ANSI/BHMA A156.2 Grade 1 cycle requirements without lever sag.
i. Status indicators inside, outside, or on both sides of doors as specified with high visibility red/green or red/white icons to display locked or unlocked state in the rose.
j. Ten-year limited warranty for mechanical functions.

2. Manufacturers:

a. Sargent Manufacturing (SA) - 10X Line.
b. No Substitution.

2.8 DEADLOCKS AND LATCHES

A. Mortise Deadlocks, Small Case: ANSI/BHMA A156.36, Grade 1, small case mortise type deadlocks constructed of heavy gauge wrought corrosion resistant steel. Steel or stainless steel bolts with a 1" throw and hardened steel roller pins. Deadlocks to be products of the same source manufacturer and keyway as other specified locksets.

1. Manufacturers:

a. Sargent Manufacturing (SA) - 4870 Series.
b. No Substitution.

2.9 LOCK AND LATCH STRIKES

A. Strikes: Provide manufacturer's standard strike with strike box for each latch or lock bolt, with curved lip extended to protect frame, finished to match door hardware set, unless otherwise indicated, and as follows:

1. Flat-Lip Strikes: For locks with three-piece antifriction latchbolts, as recommended by manufacturer.
2. Extra-Long-Lip Strikes: For locks used on frames with applied wood casing trim.
3. Aluminum-Frame Strike Box: Provide manufacturer's special strike box fabricated for aluminum framing.
4. Short-lipped strikes: For locks at double doors.

B. Standards: Comply with the following:

1. Strikes for Mortise Locks and Latches: BHMA A156.13.
2. Strikes for Bored Locks and Latches: BHMA A156.2.
3. Strikes for Auxiliary Deadlocks: BHMA A156.36.
4. Dustproof Strikes: BHMA A156.16.

2.10 ELECTRIC STRIKES

A. Standard Electric Strikes: Electric strikes conforming to ANSI/BHMA A156.31, Grade 1, for use on non-rated or fire rated openings. Strikes shall be of stainless steel construction tested to a minimum of 1500 pounds of static strength and 70 foot-pounds of dynamic strength with a minimum endurance of 1 million operating cycles. Provide strikes with 12 or 24 VDC capability, fail-secure unless otherwise specified. Where specified provide latchbolt and latchbolt strike monitoring indicating both the position of the latchbolt and locked condition of the strike.

1. Manufacturers:

    a. Folger Adam (FO) - 700 Series.
    b. HES (HS) - 1500/1600 Series.
    c. Locknetics (LO) - MDS100 Series.

B. Provide electric strikes with in-line power controller and surge suppressor by the same manufacturer as the strike with the combined products having a five year warranty.

2.11 CONVENTIONAL EXIT DEVICES

A. General Requirements: All exit devices specified herein shall meet or exceed the following criteria:

1. Exit devices shall have a five-year warranty.
2. At doors not requiring a fire rating, provide devices complying with NFPA 101 and listed and labeled for "Panic Hardware" according to UL305. Provide proper fasteners as required by manufacturer including sex nuts and bolts at openings specified in the Hardware Sets.
3. Where exit devices are required on fire rated doors, provide devices complying with NFPA 80 and with UL labeling indicating "Fire Exit Hardware". Provide devices with the proper fasteners for installation as tested and listed by UL. Consult manufacturer’s catalog and template book for specific requirements.
4. Except on fire rated doors, provide exit devices with keyed cylinder dogging device to hold the pushbar and latch in a retracted position.
5. Devices must fit flat against the door face with no gap that permits unauthorized dogging of the push bar. The addition of filler strips is required in any case where the door light extends behind the device as in a full glass configuration.
6. Flush End Caps: Provide flush end caps made of architectural metal in the same finish as the devices as in the Hardware Sets. Plastic end caps will not be acceptable.
7. Lever Operating Trim: Where exit devices require lever trim, furnish manufacturer's heavy duty escutcheon trim with threaded studs for thru-bolts.

    a. Lock Trim Design: As indicated in Hardware Sets, provide finishes and designs to match that of the specified locksets.
    b. Where function of exit device requires a cylinder, provide a cylinder (Rim or Mortise) as specified in Hardware Sets.

8. Vertical Rod Exit Devices: Where surface or concealed vertical rod exit devices are used at interior openings, provide as less bottom rod (LBR) unless otherwise indicated. Provide dust proof strikes where thermal pins are required to project into the floor.
9. Narrow Stile Applications: At doors constructed with narrow stiles, or as specified in Hardware Sets, provide devices designed for maximum 2” wide stiles.
10. Dummy Push Bar: Nonfunctioning push bar matching functional push bar.
11. Rail Sizing: Provide exit device rails factory sized for proper door width application.
12. Through Bolt Installation: For exit devices and trim as indicated in Door Hardware Sets.

B. Conventional Push Rail Exit Devices (Heavy Duty): ANSI/BHMA A156.3, Grade 1 Certified Products Directory (CPD) listed exit devices. Listed manufacturers shall meet all functions and features as specified herein.

1. Provide exit devices with functions and features as follows:

    a. Where required by code, provide knurling or abrasive coating on all levers leading to hazardous areas.
    b. Meets UL and CUL Standard 10C Positive Pressure, Fire Test of Door Assemblies with levers that meet A117.1 Accessibility Code.

c. Five-year limited warranty for mechanical features.

2. Manufacturers:

a. Sargent Manufacturing (SA) - 80 Series.
b. No Substitution.

C. Steel Removable Mullions: ANSI/BHMA A156.3 steel removable mullions with options for fire rating, locking, through-wire electrification and hurricane compliance as specified.

1. Provide mullions with functions and features as follows:

a. Provide keyed removable feature where specified in the Hardware Sets.
b. Provide stabilizers and mounting brackets as required.

2. Manufacturers:

a. Same as exit device manufacturer.

2.12 DOOR CLOSERS

A. All door closers specified herein shall meet or exceed the following criteria:

1. General: Door closers to be from one manufacturer, matching in design and style, with the same type door preparations and templates regardless of application or spring size. Closers to be non-handed with full sized covers.
2. Standards: Closers to comply with UL-10C for Positive Pressure Fire Test and be U.L. listed for use of fire rated doors.
3. Cycle Testing: Provide closers which have surpassed 15 million cycles.
4. Size of Units: Comply with manufacturer's written recommendations for sizing of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Where closers are indicated for doors required to be accessible to the Americans with Disabilities Act, provide units complying with ANSI ICC/A117.1.
5. Closer Arms: Provide heavy duty, forged steel closer arms unless otherwise indicated in Hardware Sets.
6. Closers shall not be installed on exterior or corridor side of doors; where possible install closers on door for optimum aesthetics.
7. Closer Accessories: Provide door closer accessories including custom templates, special mounting brackets, spacers and drop plates as required for proper installation. Provide through-bolt and security type fasteners as specified in the hardware sets.

B. Door Closers, Surface Mounted (Large Body Cast Iron): ANSI/BHMA A156.4, Grade 1 Certified Products Directory (CPD) listed surface mounted, heavy duty door closers with complete spring power adjustment, sizes 1 thru 6; and fully operational adjustable according to door size, frequency of use, and opening force. Closers to be rack and pinion type, one piece cast iron body construction, with adjustable backcheck and separate non-critical valves for closing sweep and latch speed control.

1. Large body cast iron surface mounted door closers shall have a 30-year warranty.
2. Manufacturers:

a. Sargent Manufacturing (SA) - 281 Series.
b. No Substitution.

C. Door Closers, Surface Mounted (Heavy Duty): ANSI/BHMA A156.4, Grade 1 Certified Products Directory (CPD) listed surface mounted, heavy duty door closers with complete spring power adjustment, sizes 1 thru 6; and fully operational adjustable according to door size, frequency of use, and opening force. Closers to be rack and pinion type, one piece cast iron or aluminum alloy body construction, with adjustable backcheck and separate non-critical valves for closing sweep and latch speed control. Provide non-handed units standard.

1. Heavy duty surface mounted door closers shall have a 30-year warranty.

2. Manufacturers:

   a. Sargent Manufacturing (SA) - 351 Series.
   b. No Substitution.

D. Door Closers, Surface Mounted (Cam Action): ANSI/BHMA 156.4, Grade 1 Certified Products Directory (CPD) listed surface mounted, high efficiency door closers with complete spring power adjustment, sizes 1 thru 6; and fully operational adjustable according to door size, frequency of use, and opening force. Closers to be of the cam and roller design, one piece cast aluminum silicon alloy body with adjustable backcheck and independently controlled valves for closing sweep and latch speed.

1. Manufacturers:

   a. Sargent Manufacturing (SA) - 422 Series.
   b. No Substitution.

2.13 ELECTROHYDRAULIC DOOR OPERATORS

A. Electrohydraulic Door Operators (High Traffic): Provide ANSI/BHMA A156.19 Certified Products Directory (CPD) listed low energy operators that meet ANSI/BHMA A156.4 requirements and are UL listed for use on fire rated doors and UL10C certified that comply with requirements for the Americans with Disabilities Act (ADA). Operators shall be verified by GreenCircle to offer energy savings of 19% when compared to similar products to accommodate openings up 250 pounds and 48” wide.

1. Provide operators with features as follows:

   a. Non-handed with push and pull side mounting.
   b. Operates as mechanical surface closer during close cycles, when door is opened manually or if power is off.
   c. Activation by push button, hands-free or radio frequency devices.
   d. On board electronics to collect usage and cycle count data to facilitate preventative maintenance/diagnostics.
   e. Two-year limited warranty.
   f. Wi-Fi interface where the operator is a secure, password protected WiFi hot spot with no connection to building’s IT required.
      1) Simple setup with no app required.
      2) View status and make adjustments without removing the cover.
      3) Built-in logic to support single use restroom applications with no external relay boards, logic modules, position switches required.
   g. Mounting backplate to simplify and speed up installation.

2. Operators shall have the following functionality:

a. Adjustable Hold Open: Amount of time a door will stay in the full open position after an activation.
b. Blow Open for Smoke Ventilation: Door opens when signal is received from alarm system allowing air or smoke to flow through opening. Door will stay open until signal from alarm system is stopped.
c. Infinite Hold Open: Door will hold open at set position until power is turned off.
d. Obstruction Detection: Door closes if it hits an obstruction while opening; door will reverse to open position if it hits an obstruction while closing. Door will stop once it hits an obstruction and will rest against the obstruction until removed.
e. Open Delay: Delays operator opening for locking hardware.
f. Overload Safety Shut-Off: After two minutes of receiving a door activation signal, inverter times out and door closes to prevent motor/inverter damage.
g. Presence Detector Input: Input for external sensor to detect presence at door open or close position only.
h. Push & Go: As the door is manually opened, the operator "senses" movement and opens door to the full-open position.
i. Selector Mode Switch: Off disables the signal inputs unless Blow Open is activated, on activates the signal inputs, hold open activates the unit (unless Blow Closed is activated) to the hold open position.
j. Vestibule Delay: When the wall switch is pressed, first door in vestibule will open. Second door will open once vestibule door delay has expired. Delay is adjustable.

3. Manufacturers:

a. Norton Rixson (NO) - 6000 Series.

2.14 SURFACE MOUNTED CLOSER HOLDERS

A. Electromagnetic Door Holders: ANSI A156.15 electromagnetic door holder/releases with a minimum 20 to 40 pounds holding power and single coil construction able to accommodate.12VDC, 24VAC, 24VDC and 120VAC. Coils to be independently wound, employing an integral fuse and armatures to include a positive release button.

1. Manufacturers:

a. Norton Rixson (RF) - 980/990 Series.
b. Sargent Manufacturing (SA) - 1560 Series.

2.15 ARCHITECTURAL TRIM

A. Door Protective Trim

1. General: Door protective trim units to be of type and design as specified below or in the Hardware Sets.
2. Size: Fabricate protection plates (kick, armor, or mop) not more than 2" less than door width (LDW) on stop side of single doors and 1” LDW on stop side of pairs of doors, and not more than 1" less than door width on pull side. Coordinate and provide proper width and height as required where conflicting hardware dictates. Height to be as specified in the Hardware Sets.
3. Where plates are applied to fire rated doors with the top of the plate more than 16” above the bottom of the door, provide plates complying with NFPA 80. Consult manufacturer’s catalog and template book for specific requirements for size and applications.
4. Protection Plates: ANSI/BHMA A156.6 protection plates (kick, armor, or mop), fabricated from the following:

a. Stainless Steel: 300 grade, 050-inch thick.

5. Options and fasteners: Provide manufacturer's designated fastener type as specified in the Hardware Sets. Provide countersunk screw holes.
6. Manufacturers:

a. Burns Manufacturing (BU).
b. Rockwood (RO).
c. Trimco (TC).

2.16 DOOR STOPS AND HOLDERS

A. General: Door stops and holders to be of type and design as specified below or in the Hardware Sets.

B. Door Stops and Bumpers: ANSI/BHMA A156.16, Grade 1 door stops and wall bumpers. Provide wall bumpers, either convex or concave types with anchorage as indicated, unless floor or other types of door stops are specified in Hardware Sets. Do not mount floor stops where they will impede traffic. Where floor or wall bumpers are not appropriate, provide overhead type stops and holders.

1. Manufacturers:

a. Burns Manufacturing (BU).
b. Rockwood (RO).
c. Trimco (TC).

C. Overhead Door Stops and Holders: ANSI/BHMA A156.8, Grade 1 Certified Products Directory (CPD) listed overhead stops and holders to be surface or concealed types as indicated in Hardware Sets. Track, slide, arm and jamb bracket to be constructed of extruded bronze and shock absorber spring of heavy tempered steel. Provide non-handed design with mounting brackets as required for proper operation and function.

1. Manufacturers:

a. Norton Rixson (RF).
b. Rockwood (RO).
c. Sargent Manufacturing (SA).

2.17 ARCHITECTURAL SEALS

A. General: Thresholds, weatherstripping, and gasket seals to be of type and design as specified below or in the Hardware Sets. Provide continuous weatherstrip gasketing on exterior doors and provide smoke, light, or sound gasketing on interior doors where indicated. At exterior applications provide non-corrosive fasteners and elsewhere where indicated.

B. Smoke Labeled Gasketing: Assemblies complying with NFPA 105 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for smoke control ratings indicated, based on testing according to UL 1784.

1. Provide smoke labeled perimeter gasketing at all smoke labeled openings.

C. Fire Labeled Gasketing: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to UL-10C.

1. Provide intumescent seals as indicated to meet UL10C Standard for Positive Pressure Fire Tests of Door Assemblies, and NFPA 252, Standard Methods of Fire Tests of Door Assemblies.

D. Sound-Rated Gasketing: Assemblies that are listed and labeled by a testing and inspecting agency, for sound ratings indicated.

E. Replaceable Seal Strips: Provide only those units where resilient or flexible seal strips are easily replaceable and readily available from stocks maintained by manufacturer.

F. Manufacturers:

1. National Guard Products (NG).
2. Pemko (PE).
3. Reese Enterprises, Inc. (RE).

2.18 ELECTRONIC ACCESSORIES

A. Key Switches: Key switches furnished standard with stainless steel single gang face plate with a 12/24VDC bi-color LED indicator. Integral backing bracket permits integration with any 1 1/4" or 1 1/2" mortise type cylinder. Key switches available as momentary or maintained action and in narrow face plate options.

1. Manufacturers:

a. Alarm Controls (AK) - MCK Series.
b. Securitron (SU) - MK Series.

B. Intelligent Switching Power Supplies: Provide power supplies with single, dual or multi-voltage configurations at 12 and/or 24VDC. Power Supply shall have battery backup function with an integrated battery charging circuit. The power supply shall have a standard, integrated Fire Alarm Interface (FAI). The power supply shall provide capability for secondary voltage, power distribution, direct lock control and network monitoring through add on modules. The power supply shall be expandable up to 16 individually protected outputs. Output modules shall provide individually protected, continuous outputs and/or individually protected, relay controlled outputs. Network modules shall provide remote monitoring functions such as status reporting, fault reporting and information logging.

1. Provide the least number of units, at the appropriate amperage level, sufficient to exceed the required total draw for the specified electrified hardware and access control equipment.
2. Manufacturers:

a. Securitron (SU) - AQL Series.
b. Altronix (AS) - Maximal 11F.

2.19 FABRICATION

A. Fasteners: Provide door hardware manufactured to comply with published templates generally prepared for machine, wood, and sheet metal screws. Provide screws according to manufacturers recognized installation standards for application intended.

2.20 FINISHES

A. Standard: Designations used in the Hardware Sets and elsewhere indicate hardware finishes complying with ANSI/BHMA A156.18, including coordination with traditional U.S. finishes indicated by certain manufacturers for their products.

B. Provide quality of finish, including thickness of plating or coating (if any), composition, hardness, and other qualities complying with manufacturer's standards, but in no case less than specified by referenced standards for the applicable units of hardware

C. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine scheduled openings, with Installer present, for compliance with requirements for installation tolerances, labeled fire door assembly construction, wall and floor construction, and other conditions affecting performance.

B. Notify architect of any discrepancies or conflicts between the door schedule, door types, drawings and scheduled hardware. Proceed only after such discrepancies or conflicts have been resolved in writing.

3.2 PREPARATION

A. Hollow Metal Doors and Frames: Comply with ANSI/DHI A115 series.

B. Wood Doors: Comply with ANSI/DHI A115-W series.

3.3 INSTALLATION

A. Install each item of mechanical and electromechanical hardware and access control equipment to comply with manufacturer's written instructions and according to specifications.

1. Installers are to be trained and certified by the manufacturer on the proper installation and adjustment of fire, life safety, and security products including: hanging devices; locking devices; closing devices; and seals.

B. Mounting Heights: Mount door hardware units at heights indicated in following applicable publications, unless specifically indicated or required to comply with governing regulations:

1. Standard Steel Doors and Frames: DHI's "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."
2. DHI TDH-007-20: Installation Guide for Doors and Hardware.

3. Where indicated to comply with accessibility requirements, comply with ANSI A117.1 "Accessibility Guidelines for Buildings and Facilities."
4. Provide blocking in drywall partitions where wall stops or other wall mounted hardware is located.

C. Retrofitting: Install door hardware to comply with manufacturer's published templates and written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work specified in Division 9 Sections. Do not install surface-mounted items until finishes have been completed on substrates involved.

D. Push Plates and Door Pulls: When through-bolt fasteners are in the same location as a push plate, countersink the fasteners flush with the door face allowing the push plate to sit flat against the door.

E. Thresholds: Set thresholds for exterior and acoustical doors in full bed of sealant complying with requirements specified in Division 7 Section "Joint Sealants."

F. Storage: Provide a secure lock up for hardware delivered to the project but not yet installed. Control the handling and installation of hardware items so that the completion of the work will not be delayed by hardware losses before and after installation.

3.4 FIELD QUALITY CONTROL

A. Field Inspection (Punch Report): Reference Division 01 Sections “Closeout Procedures”. Produce project punch report for each installed door opening indicating compliance with approved submittals and verification hardware is properly installed, operating and adjusted. Include list of items to be completed and corrected, indicating the reasons or deficiencies causing the Work to be incomplete or rejected.

1. Organization of List: Include separate Door Opening and Deficiencies and Corrective Action Lists organized by Mark, Opening Remarks and Comments, and related Opening Images and Video Recordings.

3.5 ADJUSTING

A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.

3.6 CLEANING AND PROTECTION

A. Protect all hardware stored on construction site in a covered and dry place. Protect exposed hardware installed on doors during the construction phase. Install any and all hardware at the latest possible time frame.

B. Clean adjacent surfaces soiled by door hardware installation.

C. Clean operating items as necessary to restore proper finish. Provide final protection and maintain conditions that ensure door hardware is without damage or deterioration at time of owner occupancy.

3.7 DEMONSTRATION

A. Instruct Owner's maintenance personnel to adjust, operate, and maintain mechanical and electromechanical door hardware.

3.8 DOOR HARDWARE SETS

A. The hardware sets represent the design intent and direction of the owner and architect. They are a guideline only and should not be considered a detailed hardware schedule. Discrepancies, conflicting hardware and missing items should be brought to the attention of the architect with corrections made prior to the bidding process. Omitted items not included in a hardware set should be scheduled with the appropriate additional hardware required for proper application and functionality.

1. Quantities listed are for each pair of doors, or for each single door.
2. The supplier is responsible for handing and sizing all products.
3. Where multiple options for a piece of hardware are given in a single line item, the supplier shall provide the appropriate application for the opening.
4. At existing openings with new hardware the supplier shall field inspect existing conditions prior to the submittal stage to verify the specified hardware will work as required. Provide alternate solutions and proposals as needed.

B. Manufacturer's Abbreviations:
1. MK - McKinney
2. MR - Markar
3. PE - Pemko
4. SU - Securitron
5. RO - Rockwood
6. SA - SARGENT
7. MC - Medeco
8. HS - HES
9. RF - Rixson
10. NO - Norton

Hardware Sets

Set: 1.0
Description: Exterior Main Entry Pair - Blast Resistant - Card Access; Auto; 2 Pulls

2	Continuous Hinge	FM3500 EL-CEPTx32D Security Studs	630	MR
1	Mullion (heavy duty fixed)	12-HD980	PC	SA
1	Rim Exit Device, NL,EL,RX,LX,CD	16 53 55 56 72 8804 862	US32D	SA
1	Rim Exit Device, NL,EL,RX,LX,CD	16 53 55 56 72 8810 862	US32D	SA
3	Medeco X4 SFIC Core	7-Pin VKC keys/CKC cores GMK	26	MC
1	Surf Overhead Stop	9-X36	630	RF
1	Surface Closer (specialty app)	281 PD10	EN	SA
1	Automatic Opener	6061 / 6071	689	NO
2	Kick Plate	K1050 12" CSK BEV	US32D	RO
2	Astragal	305CN		PE
1	Gasketing	2891AS TKSP x 290AS TKSP		PE
1	Mullion Gasketing	5110BL		PE
2	Sweep	315CN TKSP		PE
1	Threshold (coord w/ details)	1716AK Frost Guard FHSL14SS-2		PE
2	Door Contact (recessed)	195-12 DPDT UL George Risk Industries		
2	Door Wiring Harness	QC-Cxxx (jamb to device)		MK

2	Frame Wiring Harness	QC-CxxxP (jamb to J-box)	MK
2	Door Switch	671	NO
1	Power Supply	AQL4-R8E1	SU
1	Remote Release Switch	By Others	
1	Card Reader	By Others	
1	Wiring Diagram	Elevation; Point-to-Point	SA

Notes: Coordinate with Blast/Ballistic door manufacturer (typ). Coordinate hardware with door size, thickness and weight. Mount operator on left leaf, card reader and actuator on right side.
Operation: Doors are normally closed and secured. Valid card at reader (or signal from remote switch where shown) retracts latches for momentary or extended access, then enables outside actuator. Inside actuator retracts latch, then auto opens door. Monitoring by door position switches. During a loss of power the door will default to secure. Free egress at all times. Lock status will not change when the fire detection/suppression systems are activated. Depressing pushrail will activate request to exit switch for appropriate monitor by EAC systems. Outside key override.

Set: 2.0
Description: Vestibule Main Entry Pair - Level 3 Bullet Resistant - Card Access; Auto; 2 Pulls

2	Continuous Hinge	FM3500 EL-CEPTx32D Security Studs	630	MR
1	Mullion (heavy duty fixed)	12-HD980	PC	SA
1	Rim Exit Device, NL,EL,RX,LX,CD	16 53 55 56 72 8804 862	US32D	SA
1	Rim Exit Device, NL,EL,RX,LX,CD	16 53 55 56 72 8810 862	US32D	SA
3	Medeco X4 SFIC Core	7-Pin VKC keys/CKC cores GMK	26	MC
1	Surf Overhead Stop	9-X36	630	RF
1	Surface Closer (specialty app)	281 PD10	EN	SA
1	Automatic Opener	6061 / 6071	689	NO
2	Kick Plate	K1050 12" CSK BEV	US32D	RO
2	Astragal	305CN		PE
1	Gasketing	2891AS TKSP x 290AS TKSP		PE
1	Mullion Gasketing	5110BL		PE
2	Sweep	315CN TKSP		PE
1	Threshold (coord w/ details)	1716AK Frost Guard FHSL14SS-2		PE
2	Door Contact (recessed)	195-12 DPDT UL George Risk Industries		
2	Door Wiring Harness	QC-Cxxx (jamb to device)		MK
2	Frame Wiring Harness	QC-CxxxP (jamb to J-box)		MK
2	Door Switch	671		NO
1	Power Supply	AQL4-R8E1		SU
1	Remote Release Switch	By Others		
1	Card Reader	By Others		
1	Wiring Diagram	Elevation; Point-to-Point		SA

Notes: Coordinate with Blast/Ballistic door manufacturer (typ). Hardware shown is to be used as a placeholder until a manufacturer has been selected. Coordinate hardware with door size, thickness and weight. Mount operator on left leaf, card reader and actuator on right side.
Operation: Doors are normally closed and secured. Valid card at reader (or signal from remote switch where shown) retracts latches for momentary or extended access, then enables outside actuator. Inside actuator retracts latch, then auto opens door. Monitoring by door position switches. During a loss of power the door will default to secure. Free egress at all times. Lock status will not change when the fire detection/suppression systems are activated. Depressing pushrail will activate request to exit switch for appropriate monitor by EAC systems. Outside key override.

Set: 3.0
Description: Exterior Alum Pair - Card Access; Auto

2	Continuous Hinge	CFM-SLF-HD1-M EL-CEPTx32D	PE

1	Key Removable Mullion	L980S (12- if fire rated)	PC	SA
1	Rim Exit Device, NL,EL,RX,LX,CD	16 53 55 56 72 8804 862	US32D	SA
1	Rim Exit Device, EO,RX,CD	16 55 8810 EO	US32D	SA
4	Medeco X4 SFIC Core	7-Pin VKC keys/CKC cores GMK	26	MC
1	Mullion Cylinder	72 980C1	US26D	SA
2	Conc Overhead Stop	1-X36	630	RF
1	Surface Closer (delayed action)	DA 351 O; P10 (or to suit conditions)	EN	SA
1	Automatic Opener	6061 / 6071	689	NO
1	Mullion Gasketing	5110BL		PE
2	Sweep	3452CNB TKSP		PE
1	Threshold (coord w/ details)	2010APK FG Pemkote FHSL14SS		PE
2	Door Contact (recessed)	195-12 DPDT UL George Risk Industries		
2	Door Wiring Harness	QC-Cxxx (jamb to device)		MK
2	Frame Wiring Harness	QC-CxxxP (jamb to J-box)		MK
2	Door Switch	671		NO
1	Power Supply	AQL4-R8E1		SU
1	Card Reader	By Others		
1	Wiring Diagram	Elevation; Point-to-Point		SA
1	Weather / Perimeter Seals	Supplied with door/frame assembly		

Notes: Mount operator on left leaf, card reader and actuator on right side.

Operation: Doors are normally closed and secured. Valid card at reader (or signal from remote switch where shown) retracts latches for momentary access, then enables outside actuator. Inside actuator retracts latch, then auto opens door. Monitoring by door position switches. During a loss of power the door will default to secure. Free egress at all times. Lock status will not change when the fire detection/suppression systems are activated. Depressing pushrail will activate request to exit switch for appropriate monitor by EAC systems. Outside key override.

Set: 4.0
Description: Exterior Alum Pair - Card Access

2	Continuous Hinge	CFM-SLF-HD1-M EL-CEPTx32D		PE
1	Key Removable Mullion	L980S (12- if fire rated)	PC	SA
1	Rim Exit Device, NL,EL,RX,LX,CD	16 53 55 56 72 8804 862	US32D	SA
1	Rim Exit Device, EO,RX,CD	16 55 8810 EO	US32D	SA
4	Medeco X4 SFIC Core	7-Pin VKC keys/CKC cores GMK	26	MC
1	Mullion Cylinder	72 980C1	US26D	SA
2	Conc Overhead Stop	1-X36	630	RF
2	Surface Closer (delayed action)	DA 351 O; P10 (or to suit conditions)	EN	SA
1	Mullion Gasketing	5110BL		PE
2	Sweep	3452CNB TKSP		PE
1	Threshold (coord w/ details)	2010APK FG Pemkote FHSL14SS		PE
2	Door Contact (recessed)	195-12 DPDT UL George Risk Industries		
2	Door Wiring Harness	QC-Cxxx (jamb to device)		MK
2	Frame Wiring Harness	QC-CxxxP (jamb to J-box)		MK
1	Power Supply	AQL4-R8E1		SU
1	Card Reader	By Others		
1	Wiring Diagram	Elevation; Point-to-Point		SA
1	Weather / Perimeter Seals	Supplied with door/frame assembly		

Operation: Doors are normally closed and locked. Valid card at reader retracts latch for momentary access. Monitoring by door position switches. During a loss of power the door will default to secure. Free egress at all times. Lock status will not change when the fire detection / suppression systems are activated. Depressing pushrail will activate request to exit switch for appropriate monitor by EAC systems. Outside key override.

Set: 5.0
Description: Exterior Alum Single - Classroom - Auto

1	Continuous Hinge	CFM-SLF-HD1-M Series		PE
1	Rim Exit Device, NL,CD	72 16 8804 862	US32D	SA
1	Mortise Cylinder	72 42 x CAM	US32D	SA
3	Medeco X4 SFIC Core	7-Pin VKC keys/CKC cores GMK	26	MC
1	Conc Overhead Stop	1-X36	630	RF
1	Automatic Opener	6061 / 6071	689	NO
1	Sweep	3452CNB TKSP		PE
1	Threshold (coord w/ details)	2010APK FG Pemkote FHSL14SS		PE
1	Door Contact (recessed)	195-12 DPDT UL George Risk Industries		
2	Door Switch	671		NO
1	Keyswitch	MKA		SU
1	Wiring Diagram	Elevation; Point-to-Point		SA
1	Weather / Perimeter Seals	Supplied with door/frame assembly		

Notes: Exit device must be dogged manually for auto operator to function. Key switch turns operator on/off.

Set: 5.1
Description: Exterior Alum Single - Card Access

1	Continuous Hinge	CFM-SLF-HD1-M EL-CEPTx32D		PE
1	Rim Exit Device, NL,EL,RX,LX,CD	16 53 55 56 72 8804 862	US32D	SA
2	Medeco X4 SFIC Core	7-Pin VKC keys/CKC cores GMK	26	MC
1	Conc Overhead Stop	1-X36	630	RF
1	Surface Closer (delayed action)	DA 351 O; P10 (or to suit conditions)	EN	SA
1	Sweep	3452CNB TKSP		PE
1	Threshold (coord w/ details)	2010APK FG Pemkote FHSL14SS		PE
1	Door Contact (recessed)	195-12 DPDT UL George Risk Industries		
1	Door Wiring Harness	QC-Cxxx (jamb to device)		MK
1	Frame Wiring Harness	QC-CxxxP (jamb to J-box)		MK
1	Power Supply	AQL4-R8E1		SU
1	Card Reader	By Others		
1	Wiring Diagram	Elevation; Point-to-Point		SA
1	Weather / Perimeter Seals	Supplied with door/frame assembly		

Operation: Doors are normally closed and locked. Valid card at reader retracts latch for momentary access. Monitoring by door position switches. During a loss of power the door will default to secure. Free egress at all times. Lock status will not change when the fire detection / suppression systems are activated. Depressing pushrail will activate request to exit switch for appropriate monitor by EAC systems. Outside key override.

Set: 6.0
Description: Exterior Alum Pair

2	Continuous Hinge	CFM-SLF-HD1-M Series		PE
1	Key Removable Mullion	L980S (12- if fire rated)	PC	SA
1	Rim Exit Device, NL,CD	72 16 8804 862	US32D	SA
1	Rim Exit Device, Exit Only, CD	72 16 8810 EO	US32D	SA
4	Medeco X4 SFIC Core	7-Pin VKC keys/CKC cores GMK	26	MC
1	Mullion Cylinder	72 980C1	US26D	SA
2	Conc Overhead Stop	1-X36	630	RF
2	Surface Closer (delayed action)	DA 351 O; P10 (or to suit conditions)	EN	SA
1	Mullion Gasketing	5110BL		PE
2	Sweep	3452CNB TKSP		PE

1	Threshold (coord w/ details)	2010APK FG Pemkote FHSL14SS		PE
2	Door Contact (recessed)	195-12 DPDT UL George Risk Industries		
1	Weather / Perimeter Seals	Supplied with door/frame assembly		

Set: 7.0
Description: Alum Interior Pair - Push-Pull

2	Continuous Hinge	CFM-SLF-HD1-M Series		PE
2	Fixed Push Rail	8893	US32D	SA
2	Pull	862	US32D	SA
2	Conc Overhead Stop	1-X36	630	RF
2	Surface Closer (delayed action)	DA 351 O; P10 (or to suit conditions)	EN	SA
1	Threshold (coord w/ details)	2716AK FHSL14SS		PE
1	Weather / Perimeter Seals	Supplied with door/frame assembly		

Set: 7.1
Description: Vestibule Alum Pair - Card Access; Auto

2	Continuous Hinge	CFM-SLF-HD1-M EL-CEPTx32D		PE
1	Key Removable Mullion	L980S (12- if fire rated)	PC	SA
1	Rim Exit Device, NL,EL,RX,LX,CD	16 53 55 56 72 8804 862	US32D	SA
1	Rim Exit Device, EO,RX,CD	16 55 8810 EO	US32D	SA
4	Medeco X4 SFIC Core	7-Pin VKC keys/CKC cores GMK	26	MC
1	Mullion Cylinder	72 980C1	US26D	SA
2	Conc Overhead Stop	1-X36	630	RF
1	Surface Closer (delayed action)	DA 351 O; P10 (or to suit conditions)	EN	SA
1	Automatic Opener	6061 / 6071	689	NO
1	Mullion Gasketing	5110BL		PE
2	Sweep	3452CNB TKSP		PE
1	Threshold (coord w/ details)	2716AK FHSL14SS		PE
2	Door Contact (recessed)	195-12 DPDT UL George Risk Industries		
2	Door Wiring Harness	QC-Cxxx (jamb to device)		MK
2	Frame Wiring Harness	QC-CxxxP (jamb to J-box)		MK
2	Door Switch	671		NO
1	Power Supply	AQL4-R8E1		SU
1	Card Reader	By Others		
1	Wiring Diagram	Elevation; Point-to-Point		SA
1	Weather / Perimeter Seals	Supplied with door/frame assembly		

Notes: Mount operator on left leaf, card reader and actuator on right side.

Operation: Doors are normally closed and secured. Valid card at reader (or signal from remote switch where shown) retracts latches for momentary access, then enables outside actuator. Inside actuator retracts latch, then auto opens door. Monitoring by door position switches. During a loss of power the door will default to secure. Free egress at all times. Lock status will not change when the fire detection/suppression systems are activated. Depressing pushrail will activate request to exit switch for appropriate monitor by EAC systems. Outside key override.

Set: 8.0
Description: Exterior Alum Pair - Courtyard - Auto

2	Continuous Hinge	CFM-SLF-HD1-M Series		PE
1	Key Removable Mullion	L980S (12- if fire rated)	PC	SA
2	Rim Exit Device, Classroom, Weather	WH-CPC 16 72 8813 ETL NC-E35	US32D	SA
1	Mortise Cylinder	72 42 x CAM	US32D	SA
6	Medeco X4 SFIC Core	7-Pin VKC keys/CKC cores GMK	26	MC

1	Mullion Cylinder	72 980C1	US26D	SA
2	Conc Overhead Stop	6-X36	630	RF
1	Surface Closer (cam,track,pull)	422 CTB2	EN	SA
1	Automatic Opener	6011	689	NO
2	Sweep	315CN TKSP		PE
1	Threshold (coord w/ details)	1716AK Frost Guard FHSL14SS-2		PE
2	Door Switch	671		NO
1	Keyswitch	MKA		SU
1	Wiring Diagram	Elevation; Point-to-Point		SA
1	Weather / Perimeter Seals	Supplied with door/frame assembly		

Notes: Exit devices must be dogged manually for auto operator to function. Key switch turns operator on/off. Coordinate concealed overhead stops with track-style closer and operator during submittal stage. Concealed stops may need to be changed to surface Rixson 9 Series and mounted on push side.

Set: 9.0
Description: Exterior Alum Pair - Courtyard

2	Continuous Hinge	CFM-SLF-HD1-M Series		PE
1	Key Removable Mullion	L980S (12- if fire rated)	PC	SA
2	Rim Exit Device, Classroom, Weather	WH-CPC 16 72 8813 ETL NC-E35	US32D	SA
1	Mortise Cylinder	72 42 x CAM	US32D	SA
5	Medeco X4 SFIC Core	7-Pin VKC keys/CKC cores GMK	26	MC
1	Mullion Cylinder	72 980C1	US26D	SA
2	Conc Overhead Stop	6-X36	630	RF
2	Surface Closer (cam,track,pull)	422 CTB2	EN	SA
2	Sweep	315CN TKSP		PE
1	Threshold (coord w/ details)	1716AK Frost Guard FHSL14SS-2		PE
1	Weather / Perimeter Seals	Supplied with door/frame assembly		

Notes: Coordinate concealed overhead stops with track-style closers during submittal stage. Concealed stops may need to be changed to surface Rixson 9 Series and mounted on push side.

Set: 10.0
Description: Building Services; Storage Pair (> 100 SF)

6	Hinge, Full Mortise, Hvy Wt	T4A3786	US26D	MK
1	Dust Proof Strike	570	US26	RO
1	Flush Bolts (self-latching)	2845; 2945	US26D	RO
1	Storeroom Lock	72 10XG04 LL	US26D	SA
1	Medeco X4 SFIC Core	7-Pin VKC keys/CKC cores GMK	26	MC
1	Coordinator	1700	Black	RO
2	Surface Closer (delayed action)	DA 351 O; P10 (or to suit conditions)	EN	SA
2	Kick Plate	K1050 12" CSK BEV	US32D	RO
2	Door Stop	401; 441CU; overhead as required	US26D	RO
1	Meeting Edge Seal	S772BL		PE
1	Astragal	357SP TKSP		PE
1	Head & Jamb Gasketing	S88BL		PE

Set: 11.0
Description: Building Services; Storage

3	Hinge, Full Mortise, Hvy Wt	T4A3786	US26D	MK
1	Storeroom Lock	72 10XG04 LL	US26D	SA
1	Medeco X4 SFIC Core	7-Pin VKC keys/CKC cores GMK	26	MC
1	Surface Closer (delayed action)	DA 351 O; P10 (or to suit conditions)	EN	SA

1	Kick Plate	K1050 12" CSK BEV	US32D	RO
1	Door Stop	401; 441CU; overhead as required	US26D	RO
1	Head & Jamb Gasketing	S88BL		PE

Set: 12.0
Description: Electrical / Generator - Panic

3	Hinge, Full Mortise, Hvy Wt	T4A3786	US26D	MK
1	Rim Exit Device, Storeroom	12 72 8804 ETL	US32D	SA
1	Medeco X4 SFIC Core	7-Pin VKC keys/CKC cores GMK	26	MC
1	Surface Closer (delayed action)	DA 351 O; P10 (or to suit conditions)	EN	SA
1	Kick Plate	K1050 12" CSK BEV	US32D	RO
1	Door Stop	401; 441CU; overhead as required	US26D	RO
1	Head & Jamb Gasketing	S88BL		PE

Set: 13.0
Description: Electrical Pair - Panic

6	Hinge, Full Mortise, Hvy Wt	T4A3786	US26D	MK
1	Key Removable Mullion	L980S (12- if fire rated)	PC	SA
1	Rim Exit Device, Exit Only	LD (12-if rated) 8810 EO	US32D	SA
1	Rim Exit Device, Storeroom	12 72 8804 ETL	US32D	SA
2	Medeco X4 SFIC Core	7-Pin VKC keys/CKC cores GMK	26	MC
1	Mullion Cylinder	72 980C1	US26D	SA
2	Surface Closer (delayed action)	DA 351 O; P10 (or to suit conditions)	EN	SA
2	Kick Plate	K1050 12" CSK BEV	US32D	RO
2	Door Stop	401; 441CU; overhead as required	US26D	RO
1	Meeting Edge Seal	S772BL		PE
1	Head & Jamb Gasketing	S88BL		PE
1	Mullion Gasketing	5110BL		PE

Set: 14.0
Description: Isolation

3	Hinge, Full Mortise, Hvy Wt	T4A3786	US26D	MK
1	Passage Latch	10XU15 LL	US26D	SA
1	Surface Closer (delayed action)	DA 351 O; P10 (or to suit conditions)	EN	SA
1	Kick Plate	K1050 12" CSK BEV	US32D	RO
1	Door Stop	401; 441CU; overhead as required	US26D	RO
1	Head & Jamb Gasketing	S88BL		PE

Set: 15.0
Description: Conference Pair WD x AL

6	Hinge, Full Mortise, Hvy Wt	T4A3786	US26D	MK
1	Dust Proof Strike	570	US26	RO
1	Flush Bolts (self-latching)	2845; 2945	US26D	RO
1	Classroom Lock	72 10XG37 LL	US26D	SA
1	Half Dummy Trim	10XU93 LL	US26D	SA
1	Medeco X4 SFIC Core	7-Pin VKC keys/CKC cores GMK	26	MC
2	Surface Closer (delayed action)	DA 351 O; P10 (or to suit conditions)	EN	SA
2	Kick Plate	K1050 12" CSK BEV	US32D	RO
2	Door Stop	401; 441CU; overhead as required	US26D	RO
1	Meeting Edge Seal	S772BL		PE
1	Weather / Perimeter Seals	Supplied with door/frame assembly		

Notes: Provide coat hook for office doors.

Set: 16.0
Description: Office; Conference

3	Hinge, Full Mortise, Hvy Wt	T4A3786	US26D	MK
1	Classroom Lock	72 10XG37 LL	US26D	SA
1	Medeco X4 SFIC Core	7-Pin VKC keys/CKC cores GMK	26	MC
1	Surface Closer (delayed action)	DA 351 O; P10 (or to suit conditions)	EN	SA
1	Kick Plate	K1050 12" CSK BEV	US32D	RO
1	Door Stop	401; 441CU; overhead as required	US26D	RO
1	Head & Jamb Gasketing	S88BL		PE
1	Coat Hook	RM802	US32D	RO

Notes: Provide coat hook for office doors.

Set: 17.0
Description: Main Office / Reception

3	Hinge, Full Mortise, Hvy Wt	T4A3786	US26D	MK
1	Classroom Security Lock	72 10XG38 LL	US26D	SA
2	Medeco X4 SFIC Core	7-Pin VKC keys/CKC cores GMK	26	MC
1	Surface Closer (delayed action)	DA 351 O; P10 (or to suit conditions)	EN	SA
1	Kick Plate	K1050 12" CSK BEV	US32D	RO
1	Door Stop	401; 441CU; overhead as required	US26D	RO
1	Head & Jamb Gasketing	S88BL		PE

Set: 18.0
Description: Work Room; Mail

3	Hinge, Full Mortise, Hvy Wt	T4A3786	US26D	MK
1	Classroom Lock	72 10XG37 LL	US26D	SA
1	Surface Closer (delayed action)	DA 351 O; P10 (or to suit conditions)	EN	SA
1	Kick Plate	K1050 12" CSK BEV	US32D	RO
1	Door Stop	401; 441CU; overhead as required	US26D	RO
3	Silencer	608-RKW		RO

Set: 19.0
Description: Single Use Restroom

3	Hinge, Full Mortise, Hvy Wt	T4A3786	US26D	MK
1	Privacy Indicator Lockset	10XU65 VSLL V33	US26D	SA
1	Surface Closer (delayed action)	DA 351 O; P10 (or to suit conditions)	EN	SA
1	Kick Plate	K1050 12" CSK BEV	US32D	RO
1	Door Stop	401; 441CU; overhead as required	US26D	RO
1	Head & Jamb Gasketing	S88BL		PE

Notes: Provide passage function at kindergarten and Pre-K toilet rooms. Provide finger guards at kindergarten and Pre-K areas (MK1A/MK1B fingersafe USA).

Set: 20.0
Description: Multi-Person Restroom

3	Hinge, Full Mortise, Hvy Wt	T4A3786	US26D	MK
1	Public Toilet Deadlock	72 4878	US26D	SA
2	Medeco X4 SFIC Core	7-Pin VKC keys/CKC cores GMK	26	MC

1	Push Pull (prep for deadbolt)	110x73C/73CL	US32D-MS	RO
1	Surface Closer (delayed action)	DA 351 O; P10 (or to suit conditions)	EN	SA
1	Kick Plate	K1050 12" CSK BEV	US32D	RO
1	Mop Plate	K1050 4" CSK BEV	US32D	RO
1	Door Stop	401; 441CU; overhead as required	US26D	RO
3	Silencer	608-RKW		RO

Notes: Provide finger guards at kindergarten and Pre-K areas (MK1A/MK1B fingersafe USA).

Set: 21.0
Description: Classroom (Student / Staff Areas)

3	Hinge, Full Mortise, Hvy Wt	T4A3786	US26D	MK
1	Classroom Security Lock	72 10XG38 LL	US26D	SA
2	Medeco X4 SFIC Core	7-Pin VKC keys/CKC cores GMK	26	MC
1	Surface Closer (delayed action)	DA 351 O; P10 (or to suit conditions)	EN	SA
1	Kick Plate	K1050 12" CSK BEV	US32D	RO
1	Door Stop	401; 441CU; overhead as required	US26D	RO
1	Head & Jamb Gasketing	S88BL		PE

Notes: Provide finger guards at kindergarten and Pre-K areas (MK1A/MK1B fingersafe USA).

Set: 22.0
Description: Band/Orchestra

3	Hinge, Full Mortise, Hvy Wt	T4A3786	US26D	MK
1	Classroom Security Lock	72 10XG38 LL	US26D	SA
2	Medeco X4 SFIC Core	7-Pin VKC keys/CKC cores GMK	26	MC
1	Surface Closer (delayed action)	DA 351 O; P10 (or to suit conditions)	EN	SA
1	Kick Plate	K1050 12" CSK BEV	US32D	RO
1	Door Stop	401; 441CU; overhead as required	US26D	RO
1	Head & Jamb Gasketing	S88BL		PE
1	Door Bottom	434ARL		PE

Notes: Provide finger guards at kindergarten and Pre-K areas (MK1A/MK1B fingersafe USA).

Set: 23.0
Description: Classroom Storage

3	Hinge, Full Mortise, Hvy Wt	T4A3786	US26D	MK
1	Classroom Lock	72 10XG37 LL	US26D	SA
1	Surface Closer (delayed action)	DA 351 O; P10 (or to suit conditions)	EN	SA
1	Kick Plate	K1050 12" CSK BEV	US32D	RO
1	Door Stop	401; 441CU; overhead as required	US26D	RO
1	Head & Jamb Gasketing	S88BL		PE

Notes: Provide finger guards at kindergarten and Pre-K areas (MK1A/MK1B fingersafe USA).

Set: 24.0
Description: Lift at Stage

3	Hinge, Full Mortise, Hvy Wt	T4A3786	US26D	MK
1	Communicating Storeroom Lock	72 10XG07 LL	US26D	SA
1	Medeco X4 SFIC Core	7-Pin VKC keys/CKC cores GMK	26	MC
1	Electric Strike	1500C-LM	630	HS
1	SMART Pac Bridge Rectifier	2005M3		HS

1	Surface Closer (delayed action)	DA 351 O; P10 (or to suit conditions)	EN	SA
1	Kick Plate	K1050 12" CSK BEV	US32D	RO
1	Door Stop	401; 441CU; overhead as required	US26D	RO
1	Head & Jamb Gasketing	S88BL		PE
1	Door Contact (recessed)	195-12 DPDT UL George Risk Industries		
1	Frame Wiring Harness	QC-CxxxP (jamb to J-box)		MK
1	Power Supply	AQL4-R8E1		SU
1	Wiring Diagram	Elevation; Point-to-Point		SA

Notes: Coordinate all hardware with Lift Mfr.
Operation: Door is normally closed and locked. Electric strike will unlock when signaled by lift, upon signal from fire alarm or by signal from emergency button within the lift. If fire rated, electric strike must be fail-secure and therefore, will not unlock upon signal from fire alarm. Inside face of door has no projecting hardware. Outside to have lever trim and key override.

Set: 25.0
Description: Assembly Single

1	Continuous Hinge	CFM-SLF-HD1-M Series		PE
1	Rim Exit Device, Intruder	72 LD(12-if rated) 49 8816 ETL	US32D	SA
2	Medeco X4 SFIC Core	7-Pin VKC keys/CKC cores GMK	26	MC
1	Surface Closer (delayed action)	DA 351 O; P10 (or to suit conditions)	EN	SA
1	Kick Plate	K1050 12" CSK BEV	US32D	RO
1	Door Stop	401; 441CU; overhead as required	US26D	RO
1	Head & Jamb Gasketing	S88BL		PE

Set: 26.0
Description: Assembly Pair - Hold Open

2	Continuous Hinge	CFM-SLF-HD1-M Series		PE
1	Key Removable Mullion	L980S (12- if fire rated)	PC	SA
2	Rim Exit Device, Intruder	72 LD(12-if rated) 49 8816 ETL	US32D	SA
5	Medeco X4 SFIC Core	7-Pin VKC keys/CKC cores GMK	26	MC
1	Mullion Cylinder	72 980C1	US26D	SA
2	Surface Closer (delayed action)	DA 351 O; P10 (or to suit conditions)	EN	SA
2	Kick Plate	K1050 12" CSK BEV	US32D	RO
2	Electromagnetic Holder	998M (or to suit conditions)	689	RF
1	Meeting Edge Seal	S772BL		PE
1	Head & Jamb Gasketing	S88BL		PE
1	Mullion Gasketing	5110BL		PE

Notes: Interface with building fire alarm system to release door(s) from hold open. Review mullion used with hold open with code official as mullion poses a safety hazard. Vertical rod exit devices are not available with double-cylinder intruder function.

Set: 27.0
Description: Assembly Unequal Pair - Hold Open

2	Continuous Hinge	CFM-SLF-HD1-M Series		PE
1	Dust Proof Strike	570	US26	RO
1	Flush Bolts (self-latching)	2845; 2945	US26D	RO
1	Mortise Exit Device, Intruder	12 72 8916 ETL	US32D	SA
1	Medeco X4 SFIC Core	7-Pin VKC keys/CKC cores GMK	26	MC
1	Coordinator	2600 Series (brackets/filler)	Black	RO
2	Surface Closer (delayed action)	DA 351 O; P10 (or to suit conditions)	EN	SA
2	Kick Plate	K1050 12" CSK BEV	US32D	RO

2	Electromagnetic Holder	998M (or to suit conditions)	689	RF
1	Meeting Edge Seal	S772BL		PE
1	Astragal	357SP TKSP		PE
1	Head & Jamb Gasketing	S88BL		PE
1	Mullion Gasketing	5110BL		PE

Notes: Interface with building fire alarm system to release door(s) from hold open. Coordinate closer with inactive door width.

Set: 28.0
Description: Stair; Corridor Pair

2	Continuous Hinge	CFM-SLF-HD1-M Series		PE
2	Surface Vert Rod Exit, Passage	12 NB8715 ETL	US32D	SA
2	Surface Closer (delayed action)	DA 351 O; P10 (or to suit conditions)	EN	SA
2	Kick Plate	K1050 12" CSK BEV	US32D	RO
2	Door Stop	401; 441CU; overhead as required	US26D	RO
1	Meeting Edge Seal	S772BL		PE
1	Head & Jamb Gasketing	S88BL		PE

Set: 29.0
Description: Stair; Corridor Pair - Hold Open

2	Continuous Hinge	CFM-SLF-HD1-M Series		PE
2	Surface Vert Rod Exit, Passage	12 NB8715 ETL	US32D	SA
2	Surface Closer (delayed action)	DA 351 O; P10 (or to suit conditions)	EN	SA
2	Kick Plate	K1050 12" CSK BEV	US32D	RO
2	Electromagnetic Holder	998M (or to suit conditions)	689	RF
1	Meeting Edge Seal	S772BL		PE
1	Head & Jamb Gasketing	S88BL		PE

Notes: Interface with building fire alarm system to release door(s) from hold open.
Operation: Upper-level stair doors that need to be lockable for lock-down will need to be fail-safe, tied to the fire alarm to meet re-entry provisions of the code. Otherwise, special approval will be needed from the code official.

Set: 30.0
Description: Stair; Corridor Pair - Hold Open; Lockable

2	Continuous Hinge	CFM-SLF-HD1-M Series		PE
2	Surface Vert Rod Exit, Classroom	12 72 NB8713 ETL	US32D	SA
2	Medeco X4 SFIC Core	7-Pin VKC keys/CKC cores GMK	26	MC
2	Surface Closer (delayed action)	DA 351 O; P10 (or to suit conditions)	EN	SA
2	Kick Plate	K1050 12" CSK BEV	US32D	RO
2	Electromagnetic Holder	998M (or to suit conditions)	689	RF
1	Meeting Edge Seal	S772BL		PE
1	Head & Jamb Gasketing	S88BL		PE

Notes: Interface with building fire alarm system to release door(s) from hold open.

Set: 31.0
Description: Existing Exterior Door with Card Access and Auto Operator?

1	Medeco X4 SFIC Core	7-Pin VKC keys/CKC cores GMK	26	MC

Notes: All hardware existing to remain.

Set: 32.0
Description: Existing Door - New Lock and Keyed Core (VIF)

1	Storeroom Lock	72 10XG04 LL	US26D	SA
1	Medeco X4 SFIC Core	7-Pin VKC keys/CKC cores GMK	26	MC

Notes: Match existing lock function.

Set: 33.0
Description: Existing Door, Frame and Hardware - Re-key ALL Existing Locks as required

1	Rekey all existing locks on this project	On-site as required

Set: 34.0
Description: Existing Door - New Keyed Core (VIF)

1	Medeco X4 SFIC Core	7-Pin VKC keys/CKC cores GMK	26	MC

Set: 35.0
Description: Existing Exterior Single (VIF) - New Hardware

1	Continuous Hinge	CFM-SLF-HD1-M Series		PE
1	Storeroom Lock	72 10XG04 LL	US26D	SA
1	Medeco X4 SFIC Core	7-Pin VKC keys/CKC cores GMK	26	MC
1	Surf Overhead Stop	9-X36	630	RF
1	Surface Closer (delayed action)	DA 351 O; P10 (or to suit conditions)	EN	SA
1	Kick Plate	K1050 12" CSK BEV	US32D	RO
1	Gasketing	2891AS TKSP x 290AS TKSP		PE
1	Sweep	3452CNB TKSP		PE
1	Threshold (coord w/ details)	2010APK FG Pemkote FHSL14SS		PE
1	Door Contact (recessed)	195-12 DPDT UL George Risk Industries		

Set: 36.0
Description: Existing Exterior Alum Pair (VIF) - New Hardware; Card Access

2	Continuous Hinge	CFM-SLF-HD1-M EL-CEPTx32D		PE
1	Key Removable Mullion	L980S (12- if fire rated)	PC	SA
1	Rim Exit Device, NL,EL,RX,LX,CD	16 53 55 56 72 8804 862	US32D	SA
1	Rim Exit Device, EO,RX,CD	16 55 8810 EO	US32D	SA
4	Medeco X4 SFIC Core	7-Pin VKC keys/CKC cores GMK	26	MC
1	Mullion Cylinder	72 980C1	US26D	SA
2	Surf Overhead Stop	9-X36	630	RF
2	Surface Closer (delayed action)	DA 351 O; P10 (or to suit conditions)	EN	SA
1	Mullion Gasketing	5110BL		PE
2	Sweep	3452CNB TKSP		PE
1	Threshold (coord w/ details)	2010APK FG Pemkote FHSL14SS		PE
2	Door Contact (recessed)	195-12 DPDT UL George Risk Industries		
2	Door Wiring Harness	QC-Cxxx (jamb to device)		MK
2	Frame Wiring Harness	QC-CxxxP (jamb to J-box)		MK
1	Power Supply	AQL4-R8E1		SU
1	Card Reader	By Others		
1	Wiring Diagram	Elevation; Point-to-Point		SA
1	Weather / Perimeter Seals	Supplied with door/frame assembly		

Notes:
Operation: Doors are normally closed and locked. Valid card at reader retracts latch for momentary

access. Monitoring by door position switches. During a loss of power the door will default to secure. Free egress at all times. Lock status will not change when the fire detection/suppression systems are activated. Depressing pushrail will activate request to exit switch for appropriate monitor by EAC systems. Outside key override.

Set: 37.0
Description: Existing Vestibule Pair (VIF) - New Hardware; Push-Pull

2	Continuous Hinge	CFM-SLF-HD1-M Series		PE
2	Fixed Push Rail	8893	US32D	SA
2	Pull	862	US32D	SA
2	Surf Overhead Stop	9-X36	630	RF
2	Surface Closer (delayed action)	DA 351 O; P10 (or to suit conditions)	EN	SA
2	Kick Plate	K1050 12" CSK BEV	US32D	RO
1	Threshold (coord w/ details)	2716AK FHSL14SS		PE

Set: 38.0
Description: Existing Pair Media Center (VIF)

2	Continuous Hinge	CFM-SLF-HD1-M Series		PE
1	Key Removable Mullion	L980S (12- if fire rated)	PC	SA
2	Rim Exit Device, Intruder	72 LD(12-if rated) 49 8816 ETL	US32D	SA
5	Medeco X4 SFIC Core	7-Pin VKC keys/CKC cores GMK	26	MC
1	Mullion Cylinder	72 980C1	US26D	SA
2	Surface Closer (delayed action)	DA 351 O; P10 (or to suit conditions)	EN	SA
2	Kick Plate	K1050 12" CSK BEV	US32D	RO
2	Door Stop	401; 441CU; overhead as required	US26D	RO
1	Meeting Edge Seal	S772BL		PE
1	Head & Jamb Gasketing	S88BL		PE
1	Mullion Gasketing	5110BL		PE

END OF SECTION 087100

SECTION 088000 - GLAZING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes:

1. Glass for doors, frames, entrances, windows, storefront framing, and glazed curtain walls.
2. Glazing sealants and accessories.

1.3 DEFINITIONS

A. Glass Manufacturers: Firms that produce primary glass, fabricated glass, or both, as defined in referenced glazing publications.

B. Glass Thicknesses: Indicated by thickness designations according to ASTM C 1036.

C. IBC: International Building Code.

D. Interspace: Space between lites of an insulating-glass unit.

1.4 COORDINATION

A. Coordinate glazing channel dimensions to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. HPBS Submittals:

1. Product Data for Section 16a-38k-5(d): For glazing sealants used inside the weatherproofing system, documentation including printed statement of VOC content.

C. Glass Samples: For each type of glass product other than clear monolithic vision glass; 12 inches square.

D. Glazing Accessory Samples: For gaskets and sealants, in 12-inch lengths. Install sealant Samples between two (2) strips of material representative in color of the adjoining framing system.

E. Glazing Schedule: List glass types and thicknesses for each size opening and location. Use same designations indicated on Drawings.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For installers, glass testing agency and sealant testing agency.

B. Product Test Reports: For tinted glass, coated glass, insulating glass, glazing sealants, and glazing gaskets.

1. For glazing sealants, provide test reports based on testing current sealant formulations within previous 36-month period.

C. Pre-construction adhesion and compatibility test report.

D. Sample Warranties: For special warranties.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who employs glass installers for this Project who are certified under the National Glass Association's Certified Glass Installer Program.

B. Glass Testing Agency Qualifications: A qualified independent testing agency accredited according to the NFRC CAP 1 Certification Agency Program.

C. Sealant Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021 to conduct the testing indicated.

D. Mockups: Build mockups to demonstrate aesthetic effects and to set quality standards for materials and execution.

1. Install glazing in mockups specified in Sections 084113 “Aluminum-Framed Entrances and Storefronts” and 084413 “Glazed Aluminum Curtain Walls” to match glazing systems required for Project, including glazing methods.

1.8 PRE-CONSTRUCTION TESTING

A. Pre-construction Adhesion and Compatibility Testing: Test each glass product, tape sealant, gasket, glazing accessory, and glass-framing member for adhesion to and compatibility with elastomeric glazing sealants.

1. Testing is not required if data are submitted based on previous testing of current sealant products and glazing materials matching those submitted.
2. Use ASTM C 1087 to determine whether priming and other specific joint-preparation techniques are required to obtain rapid, optimum adhesion of glazing sealants to glass, tape sealants, gaskets, and glazing channel substrates.
3. Test no fewer than eight (8) Samples of each type of material, including joint substrates, shims, sealant backings, secondary seals, and miscellaneous materials.
4. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.
5. For materials failing tests, submit sealant manufacturer's written instructions for corrective measures including the use of specially formulated primers.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Protect glazing materials according to manufacturer's written instructions. Prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.

B. Comply with insulating-glass manufacturer's written recommendations for venting and sealing units to avoid hermetic seal ruptures due to altitude change.

1.10 FIELD CONDITIONS

A. Environmental Limitations: Do not proceed with glazing when ambient and substrate temperature conditions are outside limits permitted by glazing material manufacturers and when glazing channel substrates are wet from rain, frost, condensation, or other causes.

1. Do not install glazing sealants when ambient and substrate temperature conditions are outside limits permitted by sealant manufacturer or below 40 deg F.

1.11 WARRANTY

A. Manufacturer's Special Warranty for Coated-Glass Products: Manufacturer agrees to replace coated-glass units that deteriorate within specified warranty period. Deterioration of coated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning coated glass contrary to manufacturer's written instructions. Defects include peeling, cracking, and other indications of deterioration in coating.

1. Warranty Period: Ten (10) years from date of Substantial Completion.

B. Manufacturer's Special Warranty on Laminated Glass: Manufacturer agrees to replace laminated-glass units that deteriorate within specified warranty period. Deterioration of laminated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning laminated glass contrary to manufacturer's written instructions. Defects include edge separation, delamination materially obstructing vision through glass, and blemishes exceeding those allowed by referenced laminated-glass standard.

1. Warranty Period: Ten (10) years from date of Substantial Completion.

C. Manufacturer's Special Warranty on Insulating Glass: Manufacturer agrees to replace insulating-glass units that deteriorate within specified warranty period. Deterioration of insulating glass is defined as failure of hermetic seal under normal use that is not attributed to glass breakage or to maintaining and cleaning insulating glass contrary to manufacturer's written instructions. Evidence of failure is the obstruction of vision by dust, moisture, or film on interior surfaces of glass.

1. Warranty Period: Ten (10) years from date of Substantial Completion.

D. Manufacturer's Special Warranty on Film Overlay: Manufacturer agrees to replace film overlays that deteriorate within specified warranty period. Deterioration of film overlay is defined as cracking, crazing, peeling, blistering, bubbling, delaminating from glass, and discoloration.

1. Warranty Period: Ten (10) years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Cardinal Glass Industries

2. DuPont™ Building Innovations
3. Oldcastle BuildingEnvelope
4. PPG Industries, Inc.
5. Viracon, Inc.
6. Substitutions: Under provisions of Section 012500 “Substitution Procedures”.

B. Source Limitations for Glass: Obtain from single source from single manufacturer for each glass type.

1. Obtain tinted glass from single source from single manufacturer.

C. Source Limitations for Glazing Accessories: Obtain from single source from single manufacturer for each product and installation method.

2.2 PERFORMANCE REQUIREMENTS

A. General: Installed glazing systems shall withstand normal thermal movement and wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to the following: defective manufacture, fabrication, or installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.

B. Structural Performance: Glazing shall withstand the following design loads within limits and under conditions indicated determined according to the IBC and ASTM E 1300.

1. Design Wind Pressures: As indicated on Drawings and per Building Code, whichever is most stringent.
2. Maximum Lateral Deflection: For glass supported on all four (4) edges, limit center-of-glass deflection at design wind pressure to not more than 1/50 times the short-side length or 1-inch, whichever is less.
3. Differential Shading: Design glass to resist thermal stresses induced by differential shading within individual glass lites.

C. Safety Glazing: Where safety glazing is indicated, provide glazing that complies with 16 CFR 1201, Category II.

D. Thermal and Optical Performance Properties: Provide glass with performance properties specified, as indicated in manufacturer's published test data, based on procedures indicated below:

1. For monolithic-glass lites, properties are based on units with lites of thickness indicated.
2. For laminated-glass lites, properties are based on products of construction indicated.
3. For insulating-glass units, properties are based on units of thickness indicated for overall unit and for each lite.
4. U-Factors: Center-of-glazing values, according to NFRC 100 and based on LBL's WINDOW 5.2 computer program, expressed as Btu/sq. ft. x h x deg F.
5. Solar Heat-Gain Coefficient and Visible Transmittance: Center-of-glazing values, according to NFRC 200 and based on LBL's WINDOW 5.2 computer program.
6. Visible Reflectance: Center-of-glazing values, according to NFRC 300.

2.3 GLASS PRODUCTS, GENERAL

A. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below unless more stringent requirements are indicated. Refer to these publications for glazing terms not otherwise defined in this Section or in referenced standards.

1. GANA Publications: GANA's "Laminated Glazing Reference Manual" and GANA's "Glazing Manual."
2. IGMA Publication for Insulating Glass: SIGMA TM-3000, "North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial and Residential Use."

B. Safety Glazing Labeling: Where safety glazing is indicated, permanently mark glazing with certification label of the SGCC or another certification agency acceptable to authorities having jurisdiction. Label shall indicate manufacturer's name, type of glass, thickness, and safety glazing standard with which glass complies.

C. Insulating-Glass Certification Program: Permanently marked either on spacers or on at least one (1) component lite of units with appropriate certification label of IGCC.

D. Thickness: Where glass thickness is indicated, it is a minimum. Provide glass that complies with performance requirements and is not less than the thickness indicated.

E. Strength: Where float glass is indicated, provide annealed float glass, Kind HS heat-treated float glass, or Kind FT heat-treated float glass. Where heat-strengthened glass is indicated, provide Kind HS heat-treated float glass or Kind FT heat-treated float glass. Where fully tempered glass is indicated, provide Kind FT heat-treated float glass.

2.4 GLASS PRODUCTS

A. Clear Annealed Float Glass: ASTM C 1036, Type I, Class 1 (clear), Quality-Q3.

B. Tinted Annealed Float Glass: ASTM C 1036, Type I, Class 2 (tinted), Quality-Q3.

1. Color: As selected by Architect and Owner from manufacturer's entire range.

C. Fully Tempered Float Glass: ASTM C 1048, Kind FT (fully tempered), Condition A (uncoated) unless otherwise indicated, Type I, Class 1 (clear) or Class 2 (tinted) as indicated, Quality-Q3.

1. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed unless otherwise indicated.

D. Heat-Strengthened Float Glass: ASTM C 1048, Kind HS (heat strengthened), Type I, Condition A (uncoated) unless otherwise indicated, Type I, Class 1 (clear) or Class 2 (tinted) as indicated, Quality-Q3.

1. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed unless otherwise indicated.
2. For uncoated glass, comply with requirements for Condition A.
3. For coated vision glass, comply with requirements for Condition C (other coated glass).

E. Patterned Glass: ASTM C 1036, Type II, Class 1 (clear), Form 3; Quality-Q6, Finish F2 (patterned both sides), Pattern P1 (linear).

F. Ceramic-Coated Spandrel Glass: ASTM C 1048, Condition B, Type I, Quality-Q3.

1. Glass: Tinted float.
2. Ceramic Coating Color: As selected by Architect and Owner from manufacturer's entire range.

G. Film Overlay: Micro-layered polyester, dimensionally stable film, with durable acrylic abrasion resistant coating over one (1) surface and pressure-sensitive, clear adhesive back for adhering to glass and releasable protective backing.

2. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Gila Film Products, an Eastman Chemical company
b. Llumar, an Eastman Chemical company
c. Madico
d. Substitutions: Under provisions of Section 012500 “Substitution Procedures”.

2.5 LAMINATED GLASS

A. Laminated Glass: ASTM C 1172. Use materials that have a proven record of no tendency to bubble, discolor, or lose physical and mechanical properties after fabrication and installation.

1. Construction: Laminate glass with polyvinyl butyl interlayer to comply with interlayer manufacturer's written recommendations.
2. Interlayer Thickness: Provide thickness not less than that indicated and as needed to comply with requirements.
3. Interlayer Color: Clear unless otherwise indicated.

2.6 INSULATING GLASS

A. Insulating-Glass Units: Factory-assembled units consisting of sealed lites of glass separated by a dehydrated interspace, qualified according to ASTM E 2190.

1. Sealing System: Dual seal, with polyisobutylene and silicone primary and secondary.
2. Perimeter Spacer: Manufacturer's standard spacer material and construction.

2.7 FIRE-RESISTANCE-RATED GLAZING

A. Fire-Resistance-Rated Glazing: Listed and labeled by a testing agency acceptable to authorities having jurisdiction, for fire-resistance ratings indicated, based on testing according to ASTM E 119 or UL 263.

B. Fire-Resistance-Rated Glazing Labeling: Permanently mark fire-protection-rated glazing with certification label of a testing agency acceptable to authorities having jurisdiction. Label shall indicate manufacturer's name, test standard, that the glazing is approved for use in walls, and the fire-resistance rating in minutes.

C. Laminated Glass with Intumescent Interlayers: Laminated glass made from multiple plies of uncoated, clear float glass; with intumescent interlayers; complying with testing requirements in 16 CFR 1201 for Category II materials.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. AGC (distributed by McGrory Glass); **Pyrobel**
b. Pilkington Group Limited (distributed by Technical Glass Products); **PyroStop**
c. Vetrotech Saint-Gobain – Fire-Rated Glass & Systems; **Contraflam**
d. Substitutions: Under provisions of Section 012500 “Substitution Procedures”.

2.8 GLAZING GASKETS

A. Dense Compression Gaskets: Molded or extruded gaskets of profile and hardness required to maintain watertight seal, made from one (1) of the following:

1. EPDM complying with ASTM C 864.
2. Silicone complying with ASTM C 1115.
3. Thermoplastic polyolefin rubber complying with ASTM C 1115.

B. Soft Compression Gaskets: Extruded or molded, closed-cell, integral-skinned EPDM, silicone or thermoplastic polyolefin rubber gaskets complying with ASTM C 509, Type II, black; of profile and hardness required to maintain watertight seal.

1. Application: Use where soft compression gaskets will be compressed by inserting dense compression gaskets on opposite side of glazing or pressure applied by means of pressure-glazing stops on opposite side of glazing.

C. Lock-Strip Gaskets: Neoprene extrusions in size and shape indicated, fabricated into frames with molded corner units and zipper lock-strips, complying with ASTM C 542, black.

2.9 GLAZING SEALANTS

A. General:

1. Compatibility: Compatible with one another and with other materials they will contact, including glass products, seals of insulating-glass units, and glazing channel substrates, under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.
2. Suitability: Comply with sealant and glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation.
3. Sealants used inside the weatherproofing system, shall have a VOC content of not more than 250 g/L when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
4. Colors of Exposed Glazing Sealants: As selected by Architect and Owner from manufacturer's full range, to match adjacent.

B. Glazing Sealant: Neutral-curing silicone glazing sealant complying with ASTM C 920, Type S, Grade NS, Class 100/50, Use NT.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Dow Corning Corporation; **790**
b. Pecora Corporation; **890**
c. Tremco Incorporated; **Spectrem 1**
d. Substitutions: Under provisions of Section 012500 “Substitution Procedures”.

C. Glazing Sealants for Fire-Rated Glazing Products: Products that are approved by testing agencies that listed and labeled fire-resistant glazing products with which they are used for applications and fire-protection ratings indicated.

2.10 GLAZING TAPES

A. Back-Bedding Mastic Glazing Tapes: Preformed, butyl-based, one hundred percent (100%) solids elastomeric tape; non-staining and non-migrating in contact with nonporous surfaces;

with or without spacer rod as recommended in writing by tape and glass manufacturers for application indicated; and complying with ASTM C 1281 and AAMA 800 for products indicated below:

1. AAMA 806.3 tape, for glazing applications in which tape is subject to continuous pressure.

2.11 MISCELLANEOUS GLAZING MATERIALS

A. General: Provide products of material, size, and shape complying with referenced glazing standard, with requirements of manufacturers of glass and other glazing materials for application indicated, and with a proven record of compatibility with surfaces contacted in installation.

B. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.

C. Setting Blocks: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.

D. Spacers: Elastomeric blocks or continuous extrusions of hardness required by glass manufacturer to maintain glass lites in place for installation indicated.

E. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).

F. Cylindrical Glazing Sealant Backing: ASTM C 1330, Type O (open-cell material), of size and density to control glazing sealant depth and otherwise produce optimum glazing sealant performance.

G. Perimeter Insulation for Fire-Resistive Glazing: Product that is approved by testing agency that listed and labeled fire-resistant glazing product with which it is used for application and fire-protection rating indicated.

2.12 FABRICATION

A. Fabricate glazing units in sizes required to fit openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing publications, to comply with system performance requirements.

1. Allow for thermal movements from ambient and surface temperature changes acting on glass framing members and glazing components.

a. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

B. Clean-cut or flat-grind vertical edges of butt-glazed monolithic lites to produce square edges with slight chamfers at junctions of edges and faces.

C. Grind smooth and polish exposed glass edges and corners.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine framing, glazing channels, and stops, with Installer present, for compliance with the following:

1. Manufacturing and installation tolerances, including those for size, squareness, and offsets at corners.
2. Presence and functioning of weep systems.
3. Minimum required face and edge clearances.
4. Effective sealing between joints of glass-framing members.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings not firmly bonded to substrates.

B. Examine glazing units to locate exterior and interior surfaces. Label or mark units as needed so that exterior and interior surfaces are readily identifiable. Do not use materials that leave visible marks in the completed work.

3.3 GLAZING, GENERAL

A. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.

B. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass includes glass with edge damage or other imperfections that, when installed, could weaken glass, impair performance, or impair appearance.

C. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction testing.

D. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.

E. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.

F. Provide spacers for glass lites where length plus width is larger than 50 inches.

1. Locate spacers directly opposite each other on both inside and outside faces of glass. Install correct size and spacing to preserve required face clearances, unless gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and to comply with system performance requirements.
2. Provide 1/8-inch minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.

G. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.

H. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.

I. Set glass lites with proper orientation so that coatings face exterior or interior as specified.

J. Where wedge-shaped gaskets are driven into one side of channel to pressurize sealant or gasket on opposite side, provide adequate anchorage so gasket cannot walk out when installation is subjected to movement.

K. Square cut wedge-shaped gaskets at corners and install gaskets in a manner recommended by gasket manufacturer to prevent corners from pulling away; seal corner joints and butt joints with sealant recommended by gasket manufacturer.

3.4 TAPE GLAZING

A. Position tapes on fixed stops so that, when compressed by glass, their exposed edges are flush with or protrude slightly above sightline of stops.

B. Install tapes continuously, but not necessarily in one (1) continuous length. Do not stretch tapes to make them fit opening.

C. Cover vertical framing joints by applying tapes to heads and sills first and then to jambs. Cover horizontal framing joints by applying tapes to jambs and then to heads and sills.

D. Place joints in tapes at corners of opening with adjoining lengths butted together, not lapped. Seal joints in tapes with compatible sealant approved by tape manufacturer.

E. Do not remove release paper from tape until right before each glazing unit is installed.

F. Apply heel bead of elastomeric sealant.

G. Center glass lites in openings on setting blocks and press firmly against tape by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings.

H. Apply cap bead of elastomeric sealant over exposed edge of tape.

3.5 GASKET GLAZING (DRY)

A. Cut compression gaskets to lengths recommended by gasket manufacturer to fit openings exactly, with allowance for stretch during installation.

B. Insert soft compression gasket between glass and frame or fixed stop so it is securely in place with joints miter cut and bonded together at corners.

C. Installation with Drive-in Wedge Gaskets: Center glass lites in openings on setting blocks and press firmly against soft compression gasket by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.

D. Installation with Pressure-Glazing Stops: Center glass lites in openings on setting blocks and press firmly against soft compression gasket. Install dense compression gaskets and pressure-glazing stops, applying pressure uniformly to compression gaskets. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.

E. Install gaskets so they protrude past face of glazing stops.

3.6 SEALANT GLAZING (WET)

A. Install continuous spacers, or spacers combined with cylindrical sealant backing, between glass lites and glazing stops to maintain glass face clearances and to prevent sealant from extruding into glass channel and blocking weep systems until sealants cure. Secure spacers or spacers and backings in place and in position to control depth of installed sealant relative to edge clearance for optimum sealant performance.

B. Force sealants into glazing channels to eliminate voids and to ensure complete wetting or bond of sealant to glass and channel surfaces.

C. Tool exposed surfaces of sealants to provide a substantial wash away from glass.

3.7 FILM INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Apply squarely aligned to glass edges, uniformly smooth, and free from tears, air bubbles, wrinkles, and rough edges, in single sheet completely overlaying the back face of clean glass, according to manufacturer's written instructions, including surface preparation and application temperature limitations.

3.8 CLEANING AND PROTECTION

A. Immediately after installation remove non-permanent labels and clean surfaces.

B. Protect glass from contact with contaminating substances resulting from construction operations. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for buildup of dirt, scum, alkaline deposits, or stains.

1. If, despite such protection, contaminating substances do come into contact with glass, remove substances immediately as recommended in writing by glass manufacturer. Remove and replace glass that cannot be cleaned without damage to coatings.

C. Remove and replace glass that is damaged during construction period.

D. Wash glass on both exposed surfaces not more than four (4) days before date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended in writing by glass manufacturer.

3.9 FILM SCHEDULE

A. Glass Type **GL-0**: Decorative film overlay.

1. Thickness: 8 mils.

3.10 MONOLITHIC-GLASS SCHEDULE

A. Glass Type **GL-1**: Clear float glass.

1. Thickness: ¼-inch.

B. Glass Type **GL-2**: Clear fully tempered float glass.

1. Thickness: ¼-inch.
2. Safety glazing required.

C. Glass Type **GL-3**: Frosted, fully tempered float glass.

1. Thickness: ¼-inch.
2. Provide safety glazing labeling.

D. Glass Type **GL-4**: Patterned, fully tempered float glass.

1. Thickness: ¼ inch.
2. Provide safety glazing labeling.

3.11 LAMINATED GLASS SCHEDULE

A. Glass Type **GL-5**: Clear laminated glass with two (2) plies of fully tempered float glass.

1. Minimum Thickness of Each Glass Ply: ¼-inch.
2. Interlayer Thickness: 0.090-inch.
3. Safety glazing required.

B. Glass Type **GL-7**: Clear laminated glass.

1. Ballistic Resistance: **Level 4** according to UL 752.
2. Maximum Overall Unit Thickness: 1-inch.
3. Provide safety glazing labeling.

C. Glass Type **GL-22**: Not used.

3.12 INSULATING-GLASS SCHEDULE

A. Glass Type **GL-9**: Not used.

B. Glass Type **GL-10**: Not used.

C. Glass Type **GL-11**: Not used.

D. Glass Type **GL-12**: Not used.

E. Glass Type **GL-13**: Low-e-coated, tempered, tinted insulating glass.

1. Overall Unit Thickness: 1-inch.
2. Thickness of Each Glass Lite: ¼-inch.
3. Outdoor Lite: Tinted, fully tempered float glass.
4. Interspace Content: Argon.
5. Indoor Lite: Clear, fully tempered float glass.
6. Low-E Coating: Pyrolytic on third surface.

7. Safety glazing required.

F. Glass Type **GL-14**: Not used.

G. Glass Type **GL-15**: Not used.

H. Glass Type **GL-16**: Not used.

I. Glass Type **GL-18**: Not used.

J. Glass Type **GL-20**: Not used.

K. Glass Type **GL-25**: Not used.

L. Glass Type **GL-26**: Not used.

M. Glass Type **GL-32**: Not used.

N. Glass Type **GL-36**: Not used.

O. Glass Type **GL-42**: Not used.

P. Glass Type **GL-43**: Not used.

3.13 INSULATING-LAMINATED-GLASS TYPES

A. Glass Type **GL-17**: Low-e-coated, tinted, insulating laminated glass.

1. Overall Unit Thickness: Minimum 1-inch.
2. Thickness of Outdoor Lite: ¼-inch.
3. Outdoor Lite: Tinted, fully tempered float glass.
4. Interspace Content: Argon.
5. Indoor Lite: Clear laminated glass with two (2) plies of heat-strengthened float glass.

    a. Thickness of Each Glass Ply: Minimum 1/8-inch.
    b. Interlayer Thickness: 0.090-inch.

6. Low-E Coating: Pyrolytic on second surface.
7. Safety glazing required.

B. Glass Type **GL-19**: Not used.

C. Glass Type **GL-21**: Not used.

D. Glass Type **GL-23**: Low-e-coated, tinted, insulating laminated glass.

1. Blast Resistance:

    a. Hazard Rating: **Very low hazard** according to ASTM F 1642.

2. Interspace Content: Argon.
3. Tinted Glass Location: Outer ply of outdoor lite.
4. Coating Location: Fourth surface.
5. Provide safety glazing labeling.

E. Glass Type **GL-27**: Not used.

F. Glass Type **GL-28**: Low-e-coated, tinted, insulating laminated glass.

1. Ballistic Resistance: **Level 4** according to UL 752.
2. Interspace Content: Argon.
3. Tinted Glass Location: Outer ply of outdoor lite.
4. Coating Location: Fourth surface.
5. Provide safety glazing labeling.

G. Glass Type **GL-29**: Not used.

H. Glass Type **GL-30**: Not used.

I. Glass Type **GL-31**: Not used.

J. Glass Type **GL-41**: Not used.

3.14 FIRE-RESISTANCE-RATED GLAZING TYPES

A. Glass Type **GL-6**: Fire-rated glazing with 450 deg F temperature rise limitation; laminated glass with intumescent interlayers.

B. Glass Type **GL-8**: Not used.

C. Glass Type **GL-24**: Not used.

D. Glass Type **GL-33**: Not used.

END OF SECTION 088000

SECTION 088300 - MIRRORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes the following types of silvered flat glass mirrors:

1. Tempered glass mirrors qualifying as safety glazing.

B. Related Sections:

1. Section 102800 "Toilet, Bath, and Laundry Accessories" for metal-framed mirrors.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Mirrors. Include description of materials and process used to produce each type of silvered flat glass mirror specified that indicates sources of glass, glass coating components, edge sealer, and quality-control provisions.

B. Shop Drawings: Include mirror elevations, edge details, mirror hardware, and attachment details.

C. Samples: For each type of the following products:

1. Mirrors: 12 inches square, including edge treatment on two (2) adjoining edges.
2. Mirror Trim: 12 inches long.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Sample Warranty: For special warranty.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For mirrors to include in maintenance manuals.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who employs glass installers for this Project who are certified under the National Glass Association's Certified Glass Installer Program.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Protect mirrors according to mirror manufacturer's written instructions and as needed to prevent damage to mirrors from moisture, condensation, temperature changes, direct exposure to sun, or other causes.

B. Comply with mirror manufacturer's written instructions for shipping, storing, and handling mirrors as needed to prevent deterioration of silvering, damage to edges, and abrasion of glass surfaces and applied coatings. Store indoors.

1.8 FIELD CONDITIONS

A. Environmental Limitations: Do not install mirrors until ambient temperature and humidity conditions are maintained at levels indicated for final occupancy.

1.9 WARRANTY

A. Special Warranty: Manufacturer agrees to replace mirrors that deteriorate within specified warranty period. Deterioration of mirrors is defined as defects developed from normal use that are not attributed to mirror breakage or to maintaining and cleaning mirrors contrary to manufacturer's written instructions. Defects include discoloration, black spots, and clouding of the silver film.

1. Warranty Period: One (1) year from date of manufacture.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Donisi Mirror Company
2. Gardner Glass, Inc.
3. Lenoir Mirror Company
4. Virginia Mirror Company, Inc
5. Substitutions: Under provisions of Section 012500 “Substitution Procedures”.

B. Source Limitations for Mirrors: Obtain mirrors from single source from single manufacturer.

C. Source Limitations for Mirror Accessories: Obtain mirror glazing accessories from single source.

2.2 SILVERED FLAT GLASS MIRRORS

A. Mirrors, General: ASTM C 1503.

B. Tempered Clear Glass: Mirror Glazing Quality, for blemish requirements; and comply with ASTM C 1048 for Kind FT, Condition A, tempered float glass before silver coating is applied; clear.

1. Nominal Thickness: 3/8-inch.

C. Safety Glazing Products: For tempered mirrors, provide products that comply with 16 CFR 1201, Category II.

2.3 MISCELLANEOUS MATERIALS

A. Setting Blocks: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.

B. Edge Sealer: Coating compatible with glass coating and approved by mirror manufacturer for use in protecting against silver deterioration at mirrored glass edges.

C. Mirror Mastic: An adhesive setting compound, asbestos-free, produced specifically for setting mirrors and certified by both mirror and mastic manufacturer as compatible with glass coating and substrates on which mirrors will be installed.

1. Adhesive shall have a VOC content of not more than 70 g/L when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.4 MIRROR HARDWARE

A. Aluminum J-Channels: Aluminum extrusions with a return deep enough to produce a glazing channel to accommodate mirrors of thickness indicated and in lengths required to cover edges of each mirror in a single piece.

1. Bottom and Side Trim: J-channels formed with front leg and back leg not less than 3/8- and 7/8-inch in height, respectively, and a thickness of not less than 0.04-inch.

a. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

1) Laurence, C. R. Co., Inc.; **CRL Standard "J" Channel**
2) Sommer & Maca Industries, Inc.; **Aluminum Shallow Nose "J" Molding Lower Bar**
3) Substitutions: Under provisions of Section 012500 “Substitution Procedures”.

2. Top Trim: J-channels formed with front leg and back leg not less than 5/8- and 1-inch in height, respectively, and a thickness of not less than 0.04-inch.

a. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

1) Laurence, C. R. Co., Inc.; **CRL Deep "J" Channel**
2) Sommer & Maca Industries, Inc.; **Aluminum Deep Nose "J" Molding Upper Bar**
3) Substitutions: Under provisions of Section 012500 “Substitution Procedures”.

3. Finish: Clear bright anodized.

B. Fasteners: Fabricated of same basic metal and alloy as fastened metal and matching it in finished color and texture where fasteners are exposed.

C. Anchors and Inserts: Provide devices as required for mirror hardware installation. Provide toothed or lead-shield expansion-bolt devices for drilled-in-place anchors. Provide galvanized anchors and inserts for applications on inside face of exterior walls and where indicated.

2.5 FABRICATION

A. Fabricate mirrors in the shop to greatest extent possible.

B. Fabricate cutouts for notches and holes in mirrors without marring visible surfaces. Locate and size cutouts so they fit closely around penetrations in mirrors.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, over which mirrors are to be mounted, with Installer present, for compliance with installation tolerances, substrate preparation, and other conditions affecting performance of the Work.

B. Verify compatibility with and suitability of substrates, including compatibility of mirror mastic with existing finishes or primers.

C. Proceed with installation only after unsatisfactory conditions have been corrected and surfaces are dry.

3.2 PREPARATION

A. Comply with mastic manufacturer's written installation instructions for preparation of substrates, including coating substrates with mastic manufacturer's special bond coating where applicable.

3.3 INSTALLATION

A. General: Install mirrors to comply with mirror manufacturer's written instructions and with referenced GANA publications. Mount mirrors accurately in place in a manner that avoids distorting reflected images.

1. GANA Publications: "Glazing Manual" and "Mirrors, Handle with Extreme Care: Tips for the Professional on the Care and Handling of Mirrors."

B. Provide a minimum air space of 1/8-inch between back of mirrors and mounting surface for air circulation between back of mirrors and face of mounting surface.

C. Install mirrors with mastic and mirror hardware. Attach mirror hardware securely to mounting surfaces with mechanical fasteners installed with anchors or inserts as applicable. Install fasteners so heads do not impose point loads on backs of mirrors.

1. Aluminum J-Channels: Provide setting blocks 1/8-inch-thick by 4 inches long at quarter points. To prevent trapping water, provide, between setting blocks, two (2) slotted weeps not less than ¼-inch-wide by 3/8-inch-long at bottom channel.
2. Install mastic as follows:

a. Apply barrier coat to mirror backing where approved in writing by manufacturers of mirrors and backing material.
b. Apply mastic to comply with mastic manufacturer's written instructions for coverage and to allow air circulation between back of mirrors and face of mounting surface.
c. After mastic is applied, align mirrors and press into place while maintaining a minimum air space of 1/8-inch between back of mirrors and mounting surface.

3.4 CLEANING AND PROTECTION

A. Protect mirrors from breakage and contaminating substances resulting from construction operations.

B. Do not permit edges of mirrors to be exposed to standing water.

C. Maintain environmental conditions that prevent mirrors from being exposed to moisture from condensation or other sources for continuous periods of time.

D. Clean exposed surface of mirrors not more than four (4) days before date scheduled for inspections that establish date of Substantial Completion. Clean mirrors as recommended in writing by mirror manufacturer.

END OF SECTION 088300

SECTION 089000 - LOUVERS AND VENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Fixed, extruded-aluminum louvers.

1.3 DEFINITIONS

A. Louver Terminology: Definitions of terms for metal louvers contained in AMCA 501 apply to this Section unless otherwise defined in this Section or in referenced standards.

B. Horizontal Louver: Louver with horizontal blades; i.e., the axes of the blades are horizontal.

C. Drainable-Blade Louver: Louver with blades having gutters that collect water and drain it to channels in jambs and mullions, which carry it to bottom of unit and away from opening.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. For louvers specified to bear AMCA seal, include printed catalog pages showing specified models with appropriate AMCA Certified Ratings Seals.

B. Shop Drawings: For louvers and accessories. Include plans, elevations, sections, details, and attachments to other work. Show frame profiles and blade profiles, angles, and spacing.

1. Show weep paths, gaskets, flashing, sealant, and other means of preventing water intrusion.
2. Show mullion profiles and locations.

C. Samples: For each type of metal finish required.

1.5 INFORMATIONAL SUBMITTALS

A. Sample Warranties: For manufacturer's special warranties.

1.6 QUALITY ASSURANCE

A. Welding: Qualify procedures and personnel according to the following:

1. AWS D1.2, "Structural Welding Code - Aluminum."

1.7 FIELD CONDITIONS

A. Field Measurements: Verify actual dimensions of openings by field measurements before fabrication.

1.8 WARRANTY

A. Special Finish Warranty, Factory-Applied Finishes: Standard form in which manufacturer agrees to repair finishes or replace aluminum that shows evidence of deterioration of baked enamel, powder coat, or organic finishes within specified warranty period.

1. Deterioration includes, but is not limited to, the following:

a. Color fading more than 5 Delta E units when tested in accordance with ASTM D2244.
b. Chalking in excess of a No. 8 rating when tested in accordance with ASTM D4214.
c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.

2. Warranty Period: Twenty (20) years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain fixed louvers and vents from single source from a single manufacturer where indicated to be of same type, design, or factory-applied color finish.

2.2 PERFORMANCE REQUIREMENTS

A. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.

1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

B. SMACNA Standard: Comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" for fabrication, construction details, and installation procedures.

2.3 FIXED EXTRUDED-ALUMINUM LOUVERS

A. Horizontal, Drainable-Blade Louver:

1. Basis-of-Design Product:

a. Ruskin Company; **ELF375DX**

2. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Airolite Company, LLC (The)
b. Arrow United Industries; a division of Mestek, Inc.
c. Greenheck Fan Corporation
d. Substitutions: Under provisions of Section 012500 “Substitution Procedures”.

3. Louver Depth: 4 inches.
4. Frame and Blade Nominal Thickness: Not less than 0.081-inch.
5. Blade Angle: 37.5 degrees.
6. Mullion Type: Fully recessed.
7. Louver Performance Ratings: AMCA Certified.
8. AMCA Seal: Mark units with AMCA Certified Ratings Seal.

2.4 LOUVER SCREENS

A. General: Provide screen at each exterior louver.

1. Screen Location for Fixed Louvers: Interior face.
2. Screening Type: Bird screening.

B. Secure screen frames to louver frames with stainless-steel machine screws, spaced a maximum of 6 inches from each corner and at 12 inches o.c.

C. Louver Screen Frames: Fabricate with mitered corners to louver sizes indicated.

1. Metal: Same kind and form of metal as indicated for louver to which screens are attached. Reinforce extruded-aluminum screen frames at corners with clips.
2. Finish: Same finish as louver frames to which louver screens are attached.
3. Type: Rewirable frames with a driven spline or insert.

D. Louver Screening for Aluminum Louvers:

1. Bird Screening: Aluminum, 5/8-inch- square mesh, 0.040-inch wire.

2.5 MATERIALS

A. Aluminum Extrusions: ASTM B 221, Alloy 6063-T5.

B. Aluminum Sheet: ASTM B 209, Alloy 3003 or 5005 with temper as required for forming, or as otherwise recommended by metal producer for required finish.

C. Fasteners: Use types and sizes to suit unit installation conditions.

1. Use Phillips flat-head tamper-resistant screws for exposed fasteners unless otherwise indicated.
2. For fastening aluminum, use aluminum or 300 series stainless-steel fasteners.
3. For color-finished louvers, use fasteners with heads that match color of louvers.

D. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.

2.6 FABRICATION

A. Assemble louvers in factory to minimize field splicing and assembly. Disassemble units as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.

B. Vertical Assemblies: Where height of louver units exceeds fabrication and handling limitations, fabricate units to permit field-bolted assembly with close-fitting joints in jambs and mullions, reinforced with splice plates.

1. Continuous Vertical Assemblies: Fabricate units without interrupting blade-spacing pattern unless horizontal mullions are indicated.

C. Maintain equal louver blade spacing to produce uniform appearance.

D. Fabricate frames, including integral sills, to fit in openings of sizes indicated, with allowances made for fabrication and installation tolerances, adjoining material tolerances, and perimeter sealant joints.

1. Frame Type: Channel or flange unless otherwise indicated.

E. Include supports, anchorages, and accessories required for complete assembly.

F. Provide vertical mullions of type and at spacings indicated, but not more than is recommended by manufacturer, or 72 inches o.c., whichever is less.

1. Fully Recessed Mullions: Where indicated, provide mullions fully recessed behind louver blades. Where length of louver exceeds fabrication and handling limitations, fabricate with close-fitting blade splices designed to permit expansion and contraction.
2. Exterior Corners: Prefabricated corner units with mitered and welded blades and with semi-recessed mullions at corners.

G. Provide subsills made of same material as louvers for recessed louvers.

H. Join frame members to each other and to fixed louver blades with fillet welds, threaded fasteners, or both, as standard with louver manufacturer unless otherwise indicated or size of louver assembly makes bolted connections between frame members necessary.

2.7 ALUMINUM FINISHES

A. High-Performance Organic Finish, Two-Coat PVDF: Fluoropolymer finish complying with AAMA 2605 and containing not less than seventy percent (70%) PVDF resin by weight in color coat.

1. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
2. Color and Gloss: As selected by Architect and Owner from manufacturer's entire range.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and openings, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Coordinate setting drawings, diagrams, templates, instructions, and directions for installation of anchorages that are to be embedded in concrete or masonry construction. Coordinate delivery of such items to Project site.

3.3 INSTALLATION

A. Locate and place louvers and vents level, plumb, and at indicated alignment with adjacent work.

B. Use concealed anchorages where possible. Provide brass or lead washers fitted to screws where required to protect metal surfaces and to make a weathertight connection.

C. Form closely fitted joints with exposed connections accurately located and secured.

D. Provide perimeter reveals and openings of uniform width for sealants and joint fillers, as indicated.

E. Repair finishes damaged by cutting, welding, soldering, and grinding. Restore finishes so no evidence remains of corrective work. Return items that cannot be refinished in the field to the factory, make required alterations, and refinish entire unit or provide new units.

F. Protect unpainted galvanized- and nonferrous-metal surfaces that are in contact with concrete, masonry, or dissimilar metals from corrosion and galvanic action by applying a heavy coating of bituminous paint or by separating surfaces with waterproof gaskets or nonmetallic flashing.

G. Install concealed gaskets, flashings, joint fillers, and insulation as louver installation progresses, where weathertight louver joints are required. Comply with Section 079200 "Joint Sealants" for sealants applied during louver installation.

3.4 ADJUSTING AND CLEANING

A. Clean exposed louver and vent surfaces that are not protected by temporary covering, to remove fingerprints and soil during construction period. Do not let soil accumulate during construction period.

B. Before final inspection, clean exposed surfaces with water and a mild soap or detergent not harmful to finishes. Thoroughly rinse surfaces and dry.

C. Restore louvers and vents damaged during installation and construction, so no evidence remains of corrective work. If results of restoration are unsuccessful, as determined by Architect, remove damaged units and replace with new units.

1. Touch up minor abrasions in finishes with air-dried coating that matches color and gloss of, and is compatible with, factory-applied finish coating.

END OF SECTION 089000

FLOORS:

CPT-1

Item:	Carpet Tile
Manufacturer:	Mannington
Style:	Everywear Plus
Color:	Bluegrass 4409
Size:	24” x 24”
Pile Thickness:	0.126”
Installation:	Monolithic
Location:	Refer to Finish Plan & Finish Schedule
Notes:	Approx. Lead Time is 5 Weeks; Refer to Section 096813
Local Rep:	Jeremy Wright, 203.818.9848

PC-1

Item:	Polished Concrete
Finish:	Matte
Location:	Refer to Floor Pattern Plan & Finish Schedule
Notes:	Refer to Section 033543

PFT-1

Item:	Porcelain Floor Tile
Manufacturer:	Daltile
Style:	Volume 1.0
Color:	Naval VL67
Size:	12” x 24”
Thickness:	5/16"
Location:	Refer to Finish Plan & Finish Schedule
Notes:	Refer to Section 093000
Local Rep:	Cleo Galanos 203.233.8585

PFT-2

Item:	Porcelain Floor Tile
Manufacturer:	Daltile
Style:	Keystones
Color:	Elemental Tan Speckle D175
Size:	2” x 2” (12” x 24” Sheet)
Thickness:	1/4"
Location:	Refer to Finish Plan & Finish Schedule
Notes:	Refer to Section 093000
Local Rep:	Cleo Galanos 203.233.8585

RFT-1

Item:	Rubber Floor Tile
Manufacturer:	Flexco Floors
Style:	IMO Rubber Flooring Tiles
Color:	FlexTones 014 Medium Gray
Pattern:	Radial II (RGT)
Size:	18” x 18”
Thickness:	1/8”
Installation:	Monolithic
Location:	Stair Landings; Refer to Finish Plan & Finish Schedule
Notes:	Refer to Section 096519
Local Rep:	Carrie Bartucca 860.305.2599

RST-1

Item:	Rubber Stair Tread
Manufacturer:	Flexco Floors
Style:	Heavy Duty One-Piece Tread with Riser 1975 with Visually Impaired Contrast
Color:	FlexTones 014 Medium Gray
Finish:	Hammered
Gauge:	13/64” at Nose
Location:	Stairs; Refer to Finish Plan & Finish Schedule
Notes:	Refer to Section 096513
Local Rep:	Carrie Bartucca 860.305.2599

SC-1

Item:	Sealed Concrete
Location:	Refer to Floor Pattern Plan & Finish Schedule
Notes:	Refer to Section 099123

SF-1

Item:	Resilient Sheet Flooring
Manufacturer:	Mohawk Group
Style:	Medella Hues C2062
Color:	H5350 Indigo Mid
Roll Size:	6’-7”W x up to 98.4’L
Thickness:	2.0 mm
Location:	Refer to Finish Plan & Finish Schedule
Notes:	DCOF 0.53 Wet, 0.73 Dry; Heat Weld; Refer to Section 096516
Local Rep:	John Talio 901.953.5368

SF-2

Item:	Resilient Sheet Flooring
Manufacturer:	Mohawk Group
Style:	Medella Fleck C2061
Color:	84970 Sandstone
Roll Size:	6’-7”W x up to 98.4’L
Thickness:	2.0 mm
Location:	Refer to Finish Plan & Finish Schedule
Notes:	DCOF 0.53 Wet, 0.73 Dry; Heat Weld; Refer to Section 096516
Local Rep:	John Talio 901.953.5368

SF-3

Item:	Resilient Sheet Flooring
Manufacturer:	Mohawk Group
Style:	Medella Hues C2062
Color:	H5432 Regatta
Roll Size:	6’-7”W x up to 98.4’L
Thickness:	2.0 mm
Location:	Refer to Finish Plan & Finish Schedule
Notes:	DCOF 0.53 Wet, 0.73 Dry; Heat Weld; Refer to Section 096516
Local Rep:	John Talio 901.953.5368

VCT-1

Item:	Vinyl Composite Tile
Manufacturer:	Armstrong
Style:	Imperial Texture
Color:	51839 Fortress White
Size:	12” x 12”

Thickness: 1/8”
Location: Refer to Finish Plan & Finish Schedule
Notes: Refer to Section 096519
Local Rep: Jared Mallet 203.868.7811

WOM-1

Item: Broadloom Walk-Off Material
Manufacturer: Signature
Style: Trellis Entryway System
Color: 1411 Natural
Size: 6’-7” or 13’-2”
Thickness: 0.47”
Location: Refer to Finish Plan & Finish Schedule
Notes: Refer to Section 124813
Local Rep: Adam Pelkofsky 845.337.0918

BASE:

CWB-1

Item: Ceramic Wall Base w/Flat Top
Manufacturer: Daltile
Style: Color Wheel Linear
Shape: Flat Top Cove Base A34C1MOD
Size: 4” x 12”
Finish: Arctic White 0190
Location: Cove Base at CWT-1
Notes: Refer to Section 096513
Local Rep: Cleo Galanos 203.233.8585

PWB-1

Item: Porcelain Wall Base w/Flat Top
Manufacturer: Daltile
Style: 2x2 Build-up Cove Base MB5A
Color: Elemental Tan Speckle D175
Location: Cove Base at PFT-2 When CWT or FRP Above
Notes: Refer to Section 096513
Local Rep: Cleo Galanos 203.233.8585

PWB-2

Item: Porcelain Wall Base w/Bullnose Top
Manufacturer: Daltile
Style: 2x2 Build-up Cove Base MB5B
Color: Elemental Tan Speckle D175
Location: Cove Base at PFT-2 when Wall Painted
Notes: Refer to Section 096513
Local Rep: Cleo Galanos 203.233.8585

RB-1

Item: Rubber Wall Base
Manufacturer: Tarkett/Johnsonite
Style: Duracove Roll
Color: 40 Black
Size: 4”H
Thickness: 1/8”
Location: Wall Base
Notes: Refer to Section 096513
Local Rep: Carrie Bartucca 860.305.2599

RB-2

Item:	Rubber Wall Base
Manufacturer:	Tarkett/Johnsonite
Style:	Duracove Roll
Color:	84 Blue Jeans
Size:	4”H
Thickness:	1/8”
Location:	Wall Base
Notes:	Refer to Section 096513
Local Rep:	Carrie Bartucca 860.305.2599

RB-3

Item:	Rubber Wall Base
Manufacturer:	Tarkett/Johnsonite
Style:	Duracove Roll
Color:	TA8 Welsh Castle CB
Size:	4”H
Thickness:	1/8”
Location:	Wall Base
Notes:	Refer to Section 096513
Local Rep:	Carrie Bartucca 860.305.2599

WALLS:

CWT-1

Item:	Ceramic Wall Tile
Manufacturer:	Daltile
Style:	Color Wheel Linear
Color:	Arctic White 0190
Size:	8” x 24”
Thickness:	5/16"
Location:	Refer to Finish Plan & Finish Schedule
Notes:	Refer to Section 093000
Local Rep:	Cleo Galanos 203.233.8585

CWT-2

Item:	Ceramic Wall Tile
Manufacturer:	Daltile
Style:	Miramo
Color:	Aqua MR47 Glossy
Size:	2” x 8”
Thickness:	1/4"
Location:	Refer to Finish Plan & Finish Schedule
Notes:	Refer to Section 093000
Local Rep:	Cleo Galanos 203.233.8585

CWT-3

Item:	Ceramic Wall Tile
Manufacturer:	Daltile
Style:	Color Wheel Linear
Color:	Almond Matte
Size:	4” x 12”
Thickness:	5/16"
Location:	Refer to Finish Plan & Finish Schedule
Notes:	Non-Stocked Size, Made-To-Order w/Colormatch Program; 8-10 Week Lead Time; Refer to Section 093000
Local Rep:	Cleo Galanos 203.233.8585

FRP-1

Item:	Fiberglass Reinforced Wall Panel
Manufacturer:	Crane Composites
Style:	Glasbord
Color:	White Smooth Finish
Size:	4’ x 8’ x 3/32” thick
Location:	Refer to Finish Plan & Finish Schedule
Notes:	W/Surfaseal Film Finish; All Required Accessory Pieces In Finish To Match Panels; Refer to Section 097720
Local Rep:	John Beck 704.830.8653

WC-1

Item:	Wall Covering
Manufacturer:	Wolf-Gordon
Style:	Wink Magnetic
Content:	100% Polyethylene Face on Cloth Backing
Finish:	Gloss Sheen UV Coating
Size:	48” W
Location:	Refer to Finish Plan & Elevations
Notes:	PFC/PFOA/PFOS, Phthalates Free; Refer to Section 101146
Local Rep:	Lisa Spencer 845.641.1081

COATINGS:

EP-1

Item:	Epoxy Trim Paint
Manufacturer:	Sherwin Williams
Color:	SW 9150 Endless Sea
Finish:	Semi-Gloss
Location:	Refer to Finish Plan & Finish Schedule
Notes:	Refer to Section 099600
Local Rep:	Jodi Campbell 585.278.7244

EP-2

Item:	Epoxy Wall Paint
Manufacturer:	Sherwin Williams
Color:	SW 7006 Extra White
Finish:	Satin/Eg-shel
Location:	Refer to Finish Plan & Finish Schedule
Notes:	Refer to Section 099600
Local Rep:	Jodi Campbell 585.278.7244

EP-3

Item:	Epoxy Trim Paint
Manufacturer:	Sherwin Williams
Color:	SW 6993 Black of Night
Finish:	Semi-Gloss
Location:	Refer to Finish Plan & Finish Schedule
Notes:	Refer to Section 099600
Local Rep:	Jodi Campbell 585.278.7244

EP-4

Item:	Epoxy Trim Paint
Manufacturer:	Sherwin Williams
Color:	SW 9109 Natural Linen
Finish:	Satin/Eg-shel
Location:	Refer to Finish Plan & Finish Schedule

Notes:	Refer to Section 099600
Local Rep:	Jodi Campbell 585.278.7244

PT-1

Item:	Ceiling Paint
Manufacturer:	Sherwin Williams
Color:	SW 7006 Extra White
Finish:	Flat
Location:	Refer to RCP and Finish Schedule
Notes:	Refer to Section 099123
Local Rep:	Jodi Campbell 585.278.7244

PT-2

Item:	Trim Paint
Manufacturer:	Sherwin Williams
Color:	SW 9150 Endless Sea
Finish:	Semi-Gloss
Location:	Refer to Finish Plan & Finish Schedule
Notes:	Refer to Section 099123
Local Rep:	Jodi Campbell 585.278.7244

PT-3

Item:	Wall Paint
Manufacturer:	Sherwin Williams
Color:	SW 0053 Porcelain
Finish:	Satin/Eg-shel
Location:	Refer to Finish Plan & Finish Schedule
Notes:	Refer to Section 099123
Local Rep:	Jodi Campbell 585.278.7244

PT-4

Item:	Paint
Manufacturer:	Sherwin Williams
Color:	SW 9146 Faded Flaxflower
Location:	Refer to Finish Plan & Finish Schedule
Notes:	Acoustical Deck at Kindergarten; Refer to Section 099123
Local Rep:	Jodi Campbell 585.278.7244

PT-5

Item:	Wall Paint
Manufacturer:	Sherwin Williams
Color:	SW 0054 Twilight Gray
Finish:	Satin/Eg-shel
Location:	Refer to Finish Plan & Finish Schedule
Notes:	Refer to Section 099123
Local Rep:	Jodi Campbell 585.278.7244

PT-6

Item:	Wall Paint
Manufacturer:	Sherwin Williams
Color:	SW 0052 Pearl Gray
Finish:	Satin/Eg-shel
Location:	Refer to Finish Plan & Finish Schedule
Notes:	Refer to Section 099123
Local Rep:	Jodi Campbell 585.278.7244

PT-7

Item:	Trim Paint
Manufacturer:	Sherwin Williams
Color:	SW 0037 Morris Room Grey
Finish:	Semi-Gloss
Location:	Refer to Finish Plan & Finish Schedule
Notes:	Refer to Section 099123
Local Rep:	Jodi Campbell 585.278.7244

PT-8

Item:	Accent Paint
Manufacturer:	Sherwin Williams
Color:	SW 9020 Rayo de Sol
Finish:	Semi-Gloss
Location:	Refer to Finish Plan & Finish Schedule
Notes:	Refer to Section 099123
Local Rep:	Jodi Campbell 585.278.7244

PT-9

Item:	Trim Paint
Manufacturer:	Sherwin Williams
Color:	SW 6076 Turkish Coffee
Finish:	Semi-Gloss
Location:	Refer to Finish Plan & Finish Schedule
Notes:	Refer to Section 099123
Local Rep:	Jodi Campbell 585.278.7244

CASEWORK:

PL-1

Item:	Plastic Laminate
Manufacturer:	Wilsonart
Color:	Jean Y0849-60
Finish:	Matte Texture
Location:	Vertical Surfaces at Classroom Casework
Notes:	Refer to Sections 064116
Local Rep:	Michelle Gould-Bernstein 215.359.8512

PL-2

Item:	Plastic Laminate
Manufacturer:	Wilsonart
Color:	Daintree 8235K-05
Finish:	Timbergrain Finish, AEON Scratch Resistance
Location:	Vertical Surfaces at Staff Casework
Notes:	Refer to Sections 064116
Local Rep:	Michelle Gould-Bernstein 215.359.8512

SS-1

Item:	Solid Surface
Manufacturer:	TRINSEO/Aristech Surfaces LLC
Color:	Cozumel 8575
Location:	Horizontal Surfaces at Classroom Casework
Notes:	Refer to Section 123661.16
Local Rep:	Jennifer Gill 781.573.8139

QTZ-1

Item:	Quartz

Manufacturer: Corian
Color: Snow White
Location: Horizontal Surfaces at Staff Casework; Refer to Interior Elevations
Notes: Refer to Section 123661.19
Local Rep: Stacey Smith 617.777.3759

WDM-1
Item: Stained Wood Millwork
Species: Match Door Species
Finish: Match Door Finish
Notes: Benches at Corridor C108B & K Classrooms; Refer to Section

CEILINGS:
ACC-1
Item: Acoustic Ceiling Cloud
Manufacturer: Armstrong
Style: Axiom Classic 6" (Straight)/Ultima High NRC
Color: White
Edge Thickness: 6"H
Locations: Kindergarten; Refer to RCP
Notes: Refer to Projectworks Drawing Package; Square Lay-In; Prelude 15/16"; Refer to Section 095113
Local Rep: Julie Wilson 959.236.4351

ACC-2
Item: Acoustic Ceiling Cloud
Manufacturer: Kirei
Style: HyperFly
Color: 003 Sunshine (Previously 108)
Size: Large 47.4"D x 7.2"H
Core Thickness: 12mm
Locations: Kindergarten; Refer to RCP
Notes: Refer to Section 098436
Local Rep: Michele Silva 201.463.4494

ACT-1
Item: Acoustic Ceiling Tile
Manufacturer: Armstrong
Style: Ultima
Color: White
Size: 2' x 2'
NRC Rating: 0.75
Location: Refer to RCP & Finish Schedule
Notes: Square Lay-In; Prelude 15/16"; Refer to Section 095113
Local Rep: Julie Wilson 959.236.4351

ACT-2
Item: Acoustic Ceiling Tile
Manufacturer: Armstrong
Style: Ultima Health Zone
Color: White
Size: 2' x 2'
NRC Rating: **0**.80
Location: Refer to RCP & Finish Schedule
Notes: Square Lay-In; Prelude 15/16"; Refer to Section 095113
Local Rep: Julie Wilson 959.236.4351

ACT-3

Item:	Acoustic Ceiling Tile
Manufacturer:	Armstrong
Style:	Ultima High NRC
Color:	White
Size:	2’ x 2’
NRC Rating:	**0**.85
Location:	Refer to RCP & Finish Schedule
Notes:	Square Lay-In; Prelude 15/16”; Refer to Section 095113
Local Rep:	Julie Wilson 959.236.4351

SAS-1

Item:	Sound Absorbing Spray
Manufacturer:	International Cellulose Corporation
Style:	SonaSpray “fc”
Color:	White
Thickness:	.5”
NRC Rating:	**0**.65
Location:	Refer to RCP & Finish Schedule
Notes:	Refer to Section 098129

MISCELLANEOUS:

AWP-1

Item:	Acoustic Wall Panel
Manufacturer:	Owens-Corning Conwed Designscape
Style:	Respond A Series A100
Fabric:	Guilford of Maine FR701 2100
Color:	Quartz 380
Size:	Width Varies x 2’-0”H; Refer to Elevations
Core Thickness:	2”
Locations:	Atrium Lobby; Refer to Finish Schedule
Notes:	Refer to Section 098433
Local Rep:	Architectural Design Resources 781.837.4700

BB-1

Item:	Tac-Wall Wallcovering
Manufacturer:	Koroseal
Color:	Sandalwood (87)
Location:	Atrium Lobby
Notes:	Railroaded; Aluminum J-Cap Trim at Exposed Edges; Refer to Section 101100
Local Rep:	Cal Raymond 413.313.1346

BB-2

Item:	Tac-Wall Wallcovering
Manufacturer:	Koroseal
Color:	Pewter (62)
Location:	Atrium Lobby
Notes:	Railroaded; Aluminum J-Cap Trim at Exposed Edges; Refer to Section 101100
Local Rep:	Cal Raymond 413.313.1346

BB-3

Item:	Tac-Wall Wallcovering
Manufacturer:	Koroseal
Color:	Deep Sea (14)

Location:	Atrium Lobby
Notes:	Railroaded; Aluminum J-Cap Trim at Exposed Edges; Refer to Section 101100
Local Rep:	Cal Raymond 413.313.1346

BB-4

Item:	Tac-Wall Wallcovering
Manufacturer:	Koroseal
Color:	Harbor (06)
Location:	Kindergarten Classrooms
Notes:	Railroaded; Aluminum J-Cap Trim at Exposed Edges; Refer to Section 101100
Local Rep:	Cal Raymond 413.313.1346

PC-1

Item:	Privacy/Cubicle Curtain
Manufacturer:	Inpro Corporation
Track System:	Whisper Cube Cubicle Track
Track Color:	White
Curtain:	Shield by Panaz; Array Stone
Accessories:	Spring Clips, Pop Out Carrier, End Cap as Required
Location:	Infirmary
Notes:	36” Mesh Top; Fabric Railroaded; NFPA 701; Refer to Section 102123
Local Rep:	Ellen O’Brien 978.873.3096

RP-1

Item:	Resin Panel
Manufacturer:	3-Form
Material:	Varia
Color:	Loch
Thickness:	3/8"
Hardware System:	Iltuo I-shaped Half Wall System w/Anodized Aluminum Top Cap
Location:	2nd Floor Atrium Overlook
Notes:	Anchored To Floor; Coordinate w/Railing System; Refer to Section
Local Rep:	Nicole Doran 303.309.1049

TB-1

Item:	Tack Board
Manufacturer:	Forbo
Color:	Oyster Shell (2206)
Size:	Refer to Elevations
Location:	Refer to Drawings
Notes:	Aluminum-Framed; Refer to Section 101100
Local Rep:	Cal Raymond 413.313.1346

TS-1

Item:	Tack Strip
Manufacturer:	Forbo
Color:	Oyster Shell (2206)
Size:	6’
Location:	Refer to Drawings; See Wall Board Schedule
Notes:	Refer to Section 101100
Local Rep:	Chris Riley 860.830.9341

WB-1

Item:	White Board
Color:	White
Size:	Refer to Elevations
Location:	Refer to Drawings
Notes:	Magnetic Porcelain; Refer to Section 101100

WINDOW TREATMENTS

WF-1

Item:	Window Film
Manufacturer:	3M
Style:	SH2MAMM Frost/Matte Milky Milky
Light Transmission:	21%
Location:	Toilet Rooms w/Exterior Windows; Refer to Finish Schedule
Notes:	Refer to Section 088000

WS-1

Item:	Roller Shades
Manufacturer:	Rollease Acmeda Contract
Light Filtering Fabric:	Ambient Renew
Black Out Fabric:	Mesa Blackout
Control Type:	Manual Clutch Operator
Notes:	Heat-Seamed Hem Bar/Fascia Valance w/End Caps; All Rooms w/Exterior Windows EXCEPT Lobbies, Vestibules, Corridors, & Toilet Rooms W/Obscured Glass, PVC FREE MATERIAL ONLY; Refer to Section 122413

WS-2

Item:	Roller Shades
Manufacturer:	Rollease Acmeda Contract
Black Out Fabric:	Mesa Blackout
Control Type:	Manual Clutch Operator
Notes:	Heat-Seamed Hem Bar/Fascia Valance w/End Caps; All Rooms w/Exterior Windows EXCEPT Lobbies, Vestibules, Corridors, & Toilet Rooms w/Obscured Glass, PVC FREE MATERIAL ONLY; Refer to Section 122413

END OF SECTION 090000

SECTION 092216 - NON-STRUCTURAL METAL FRAMING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Non-load-bearing steel framing for interior partitions.
2. Suspension systems for interior ceilings and soffits.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated, according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.

2.2 FRAMING SYSTEMS

A. Framing Members, General: Comply with ASTM C 754 for conditions indicated.

1. Steel Sheet Components: Comply with ASTM C 645 requirements for metal unless otherwise indicated.
2. Protective Coating: ASTM A 653, G60, hot-dip galvanized unless otherwise indicated.

B. Studs and Tracks: ASTM C 645.

1. Steel Studs and Tracks:

a. Minimum Base-Metal Thickness: 20-gauge, unless noted otherwise.
b. Depth: As indicated on Drawings.

C. Slip-Type Head Joints: Where indicated, provide the following:

1. Deflection Track: Steel sheet top track manufactured to prevent cracking of finishes applied to interior partition framing resulting from deflection of structure above; in thickness not less than indicated for studs and in width to accommodate depth of studs.

a. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

1) ClarkDietrich; **MaxTrak Slotted Deflection Track**
2) MarinoWare; **Slotted Track**
3) MBA Building Supplies; **Slotted Deflecto Track**
4) Substitutions: Under provisions of Section 012500 “Substitution Procedures”.

D. Flat Strap and Backing Plate: Steel sheet for blocking and bracing in length and width indicated.

1. Minimum Base-Metal Thickness: 0.018-inch.

2.3 SUSPENSION SYSTEMS

A. Tie Wire: ASTM A 641, Class 1 zinc coating, soft temper, 0.062-inch-diameter wire, or double strand of 0.048-inch-diameter wire.

B. Wire Hangers: ASTM A 641, Class 1 zinc coating, soft temper, 0.16 -inch in diameter.

C. Carrying Channels (Main Runners): Cold-rolled, commercial-steel sheet with a base-metal thickness of 0.053-inch and minimum ½-inch-wide flanges.

1. Depth: As required per manufacturer.

2.4 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that comply with referenced installation standards.

1. Fasteners for Metal Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.

B. Isolation Strip at Exterior Walls: Provide one (1) of the following:

1. Asphalt-Saturated Organic Felt: ASTM D 226, Type I (No. 15 asphalt felt), non-perforated.
2. Foam Gasket: Adhesive-backed, closed-cell vinyl foam strips that allow fastener penetration without foam displacement, 1/8-inch-thick, in width to suit steel stud size.

C. Rigid Connections: Universal framing clip to attach and support rigid framing conditions including shear, tension, and two-axis loading.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Dietrich Metal Framing; **Uni-Clip**
b. Substitutions: Under provisions of Section 012500 “Substitution Procedures”.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames, cast-in anchors, and structural framing, for compliance with requirements and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Suspended Assemblies: Coordinate installation of suspension systems with installation of overhead structure to ensure that inserts and other provisions for anchorages to building structure have been installed to receive hangers at spacing required to support the Work and that hangers will develop their full strength.

3.3 INSTALLATION, GENERAL

A. Installation Standard: ASTM C 754.

1. Gypsum Board Assemblies: Also comply with requirements in ASTM C 840 that apply to framing installation.

B. Install framing and accessories plumb, square, and true to line, with connections securely fastened.

C. Install supplementary framing, and blocking to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction.

D. Install bracing at terminations in assemblies.

E. Do not bridge building control and expansion joints with non-load-bearing steel framing members. Frame both sides of joints independently.

3.4 INSTALLING FRAMED ASSEMBLIES

A. Install framing system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.

B. Where studs are installed directly against exterior masonry walls or dissimilar metals at exterior walls, install isolation strip between studs and exterior wall.

C. Install studs so flanges within framing system point in same direction.

D. Install tracks at floors and overhead supports. Extend framing full height to structural supports or substrates above suspended ceilings except where partitions are indicated to terminate at suspended ceilings. Continue framing around ducts penetrating partitions above ceiling.

1. Slip-Type Head Joints: Where framing extends to overhead structural supports, install to produce joints at tops of framing systems that prevent axial loading of finished assemblies.
2. Door Openings: Screw vertical studs at jambs to jamb anchor clips on door frames.

a. Install two (2) studs at each jamb unless otherwise indicated.
b. Extend jamb studs through suspended ceilings and attach to underside of overhead structure.

3. Other Framed Openings: Frame openings other than door openings the same as required for door openings unless otherwise indicated. Install framing below sills of openings to match framing required above door heads.
4. Sound-Rated Partitions: Install framing to comply with sound-rated assembly indicated.

E. Installation Tolerance: Install each framing member so fastening surfaces vary not more than 1/8-inch from the plane formed by faces of adjacent framing.

3.5 INSTALLING CEILING SUSPENSION SYSTEMS

A. Install suspension system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.

B. Isolate suspension systems from building structure where they abut or are penetrated by building structure to prevent transfer of loading imposed by structural movement.

C. Suspend hangers from building structure as follows:

1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or suspension system.

    a. Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.

2. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with locations of hangers required to support standard suspension system members, install supplemental suspension members and hangers in the form of trapezes or equivalent devices.

    a. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced installation standards.

3. Wire Hangers: Secure by looping and wire tying, either directly to structures or to inserts, eye screws, or other devices and fasteners that are secure and appropriate for substrate, and in a manner that will not cause hangers to deteriorate or otherwise fail.
4. Do not connect or suspend steel framing from ducts, pipes, or conduit.

D. Seismic Bracing: Sway-brace suspension systems with hangers used for support.

E. Installation Tolerances: Install suspension systems that are level to within 1/8 inch in 12 feet measured lengthwise on each member that will receive finishes and transversely between parallel members that will receive finishes.

END OF SECTION 092216

SECTION 092513.13 - ACRYLIC PLASTER FINISH

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Exterior horizontal and nonvertical plasterwork (stucco).

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: Show locations and installation of control and expansion joints, including plans, elevations, sections, details of components, and attachments to other work.

C. Samples: For each type of factory-prepared finish coat and for each color and texture specified.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Contractor shall be qualified to perform the work specified by reason of experience. Contractor shall have at least five (5) years of experience in commercial textured finish application and shall have completed at least three (3) projects of similar size and complexity. Contractor shall provide proof before commencement of work that he/she will maintain and supervise a qualified crew of applicators through the duration of the work. When requested Contractor shall provide a list of the last three (3) comparable jobs including the name, location, and start and finish dates for the work.

B. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.

1. Build mockups for each substrate and finish texture indicated, including accessories.

a. Size: 100 sq. ft. in surface area.

2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver products in original packaging, labeled with product identification, manufacturer, and batch number.

B. Store materials inside under cover and keep them dry and protected against damage from weather, moisture, direct sunlight, surface contamination, corrosion, construction traffic, and other causes.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design:

1. Sto Corp.; **StoQuik Gold Finish System**

B. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Dryvit Systems, Inc.
2. Omega Products International
3. Senergy, a brand of Master Builders Solutions
4. Substitutions: Under provisions of Section 012500 “Substitution Procedures”.

C. Source Limitations: Obtain accessories from single source from single manufacturer.

2.2 MATERIALS

A. Acrylic-Based Finish Coatings: Factory-mixed acrylic-emulsion coating systems formulated with colorfast mineral pigments and fine aggregates; for use over cement base coats. Include manufacturer's recommended primers and sealing topcoats for acrylic-based finishes.

1. Color: As selected by Architect and Owner from manufacturer’s entire range.

B. Primer: Acrylic-based sanded primer, complying with SCAQMD Rule 1113 for primers.

C. Base Coat: One (1) component polymer modified Portland cement high-build base coat.

D. Surface Reinforcement: Nominal 4½ oz./sq. yd. glass fiber reinforcing mesh. Mesh to be treated for compatibility with all other components.

E. Sheathing: Gypsum as specified in Section 061600 “Sheathing”.

2.3 ACCESSORIES

A. General: Comply with ASTM C 1063, and coordinate depth of trim and accessories with thicknesses required.

B. Plastic Accessories: Manufactured from high-impact PVC per ASTM D 1784 with perforated flanges.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Protect adjacent work from soiling, spattering, moisture deterioration, and other harmful effects caused by finishing.

B. Substrate must be clean, dry, and free of surface contamination, shall not have planar irregularities in excess of 1/16-inch, and shall be free of voids, cracks, and other surface defects.

3.3 INSTALLATION, GENERAL

A. Install finish system in accordance with manufacturer’s written recommendations and instructions.

B. Install accessories as required, including control joints at intervals as required by the substrate manufacturer.

C. Base Coat/Reinforcement: Install nominal 1/8-inch base coat by trowel to the substrate. Work horizontally or vertically in strips of 40 inches, and immediately embed the reinforcement into the wet base coat by troweling from the center to the edge of the reinforcement. Overlap reinforcement not less than 2½ inches at seams and feather. Double wrap all inside and outside corners with minimum 8-inch overlap in each direction (except where accessories are used at outside corners). Avoid wrinkles in the reinforcement and fully embed so that it cannot be seen through the base coat when it is dry. Re-skim with additional base coat if visible. Do not install base coat and reinforcement onto solid (unperforated) portions of accessories.

D. Primer: When the base coat application is dry, apply the primer by brush or roller to the entire base coat surface.

E. Acrylic-Based Finish Coatings: Apply coating system, including primers, finish coats, and sealing topcoats, according to manufacturer's written instructions.

3.4 CLEANING AND PROTECTION

A. Remove temporary protection and enclosure of other work after finishing is complete.

B. Provide protection of installed materials from water infiltration into or behind them during and after construction.

C. Provide protection of installed materials from dust, dirt, precipitation, freezing and continuous high humidity until they are fully dry.

D. Seal penetrations through the finished surface with backer rod and sealant or other appropriate means.

END OF SECTION 092513.13

SECTION 092900 - GYPSUM BOARD

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Interior gypsum board.

B. Related Requirements:

1. Section 092216 "Non-Structural Metal Framing" for non-structural framing and suspension systems that support gypsum board panels.
2. Section 093000 " Tiling" for cementitious backer units installed as substrates for ceramic tile.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Samples: For the following products:

1. Trim Accessories: Full-size Sample in 12-inch-long length for each trim accessory indicated.

1.4 DELIVERY, STORAGE AND HANDLING

A. Store materials inside under cover and keep them dry and protected against weather, condensation, direct sunlight, construction traffic, and other potential causes of damage. Stack panels flat and supported on risers on a flat platform to prevent sagging.

1.5 FIELD CONDITIONS

A. Environmental Limitations: Comply with ASTM C 840 requirements or gypsum board manufacturer's written recommendations, whichever are more stringent.

B. Do not install paper-faced gypsum panels until installation areas are enclosed and conditioned.

C. Do not install panels that are wet, those that are moisture damaged, and those that are mold damaged.

1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.

2.2 GYPSUM BOARD, GENERAL

A. Recycled Content of Gypsum Panel Products: Postconsumer recycled content plus one-half of pre-consumer recycled content not less than thirty-five percent (35%).

B. Regional Materials: Gypsum panel products shall be manufactured within one hundred (100) miles of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within one hundred (100) miles of Project site.

C. Size: Provide maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.

2.3 INTERIOR GYPSUM BOARD

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Georgia-Pacific Gypsum LLC
2. National Gypsum Company
3. USG Corporation
4. Substitutions: Under provisions of Section 012500 “Substitution Procedures”.

B. Abuse-Resistant Gypsum Board: ASTM C 1629.

1. Core: As indicated on Drawings.
2. Surface Abrasion: Meets or exceeds Level 3 requirements.
3. Surface Indentation: Meets or exceeds Level 1 requirements.
4. Single-Drop Soft-Body Impact: Meets or exceeds Level 1 requirements.
5. Long Edges: Tapered.
6. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.

2.4 TRIM ACCESSORIES

A. Interior Trim: ASTM C 1047.

1. Material: Galvanized or aluminum-coated steel sheet or rolled zinc.
2. Shapes:

a. Cornerbead.
b. Bullnose bead.
c. LC-Bead: J-shaped; exposed long flange receives joint compound.
d. L-Bead: L-shaped; exposed long flange receives joint compound.
e. U-Bead: J-shaped; exposed short flange does not receive joint compound.
f. Expansion (control) joint.

2.5 JOINT TREATMENT MATERIALS

A. General: Comply with ASTM C 475.

B. Joint Tape:

1. Interior Gypsum Board: Paper.

C. Joint Compound for Interior Gypsum Board: For each coat use formulation that is compatible with other compounds applied on previous or for successive coats.

1. Prefilling: At open joints, rounded or beveled panel edges, and damaged surface areas, use setting-type taping compound.
2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use drying-type, all-purpose compound.
3. Fill Coat: For second coat, use drying-type, all-purpose compound.
4. Finish Coat: For third coat, use drying-type, all-purpose compound.
5. Skim Coat: For final coat of Level 5 finish, use drying-type, all-purpose compound.

2.6 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written recommendations.

B. Steel Drill Screws: ASTM C 1002, unless otherwise indicated.

1. Use screws complying with ASTM C 954 for fastening panels to steel members from 0.033- to 0.112-inch-thick.

C. Sound Attenuation Blankets: ASTM C 665, Type I (blankets without membrane facing) produced by combining thermosetting resins with mineral fibers manufactured from glass, slag wool, or rock wool.

1. Recycled Content of Blankets: Postconsumer recycled content plus one-half of pre-consumer recycled content not less than twenty-five percent (25%).

D. Acoustical Joint Sealant: Manufacturer's standard non-sag, paintable, non-staining latex sealant complying with ASTM C 834. Product effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Pecora Corporation; **AC-20 FTR**
b. Specified Technologies, Inc.; **Smoke N Sound Acoustical Sealant**
c. USG Corporation; **SHEETROCK Acoustical Sealant**
d. Substitutions: Under provisions of Section 012500 “Substitution Procedures”.

2. Acoustical joint sealant shall have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

E. Thermal Insulation: As specified in Section 072100 "Thermal Insulation."

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and substrates including welded hollow-metal frames and framing, with Installer present, for compliance with requirements and other conditions affecting performance.

B. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 APPLYING AND FINISHING PANELS, GENERAL

A. Comply with ASTM C 840.

B. Install ceiling panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one (1) framing member.

C. Install panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1/16-inch of open space between panels. Do not force into place.

D. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.

E. Form control and expansion joints with space between edges of adjoining gypsum panels.

F. Cover both faces of support framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases braced internally.

1. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. in area.
2. Fit gypsum panels around ducts, pipes, and conduits.
3. Where partitions intersect structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by structural members; allow ¼- to 3/8-inch-wide joints to install sealant.

G. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments, except floors. Provide ¼- to ½-inch-wide spaces at these locations and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.

H. Attachment to Steel Framing: Attach panels so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.

I. STC-Rated Assemblies: Seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C 919 and with manufacturer's written recommendations for locating edge trim and closing off sound-flanking paths around or through assemblies, including sealing partitions above acoustical ceilings.

J. Install sound attenuation blankets before installing gypsum panels unless blankets and boards are readily installed after panels have been installed on one (1) side.

3.3 APPLYING INTERIOR GYPSUM BOARD

A. Install interior gypsum board where indicated on Drawings.

B. Single-Layer Application:

1. On ceilings, apply gypsum panels before wall/partition board application to greatest extent possible and at right angles to framing unless otherwise indicated.
2. On partitions/walls, apply gypsum panels in most economical direction, with ends and edges occurring over firm bearing unless otherwise indicated or required by fire-resistance-rated assembly, and minimize end joints.

a. Stagger abutting end joints not less than one (1) framing member in alternate courses of panels.

3. Fastening Methods: Apply gypsum panels to supports with steel drill screws.

3.4 INSTALLING TRIM ACCESSORIES

A. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.

B. Control Joints: Install control joints according to ASTM C 840 and in specific locations approved by Architect for visual effect.

C. Interior Trim: Install in the following locations:

1. Cornerbead: Use at outside corners, unless otherwise indicated.
2. Bullnose Bead: Use at outside corners.
3. LC-Bead: Use at exposed panel edges.
4. L-Bead: Use where indicated.
5. U-Bead: Use at exposed panel edges.

3.5 FINISHING GYPSUM BOARD

A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.

B. Prefill open joints, rounded or beveled edges, and damaged surface areas.

C. Apply joint tape over gypsum board joints, except for trim products specifically indicated as not intended to receive tape.

D. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C 840:

1. Level 4: At panel surfaces that will be exposed to view, receiving wallcoverings and flat and non-flat paints.

a. Primer and its application to surfaces are specified in Division 09 Sections.

3.6 PROTECTION

A. Protect adjacent surfaces from drywall compound and promptly remove from floors and other non-drywall surfaces. Repair surfaces stained, marred, or otherwise damaged during drywall application.

B. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.

C. Remove and replace panels that are wet, moisture damaged, and mold damaged.

1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION 092900

SECTION 093000 - TILING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Ceramic mosaic tile.
2. Porcelain tile.
3. Glazed wall tile.
4. Stone thresholds.
5. Tile backing panels.
6. Crack isolation membrane.

B. Related Sections:

1. Section 079200 "Joint Sealants" for sealing of expansion, contraction, control, and isolation joints in tile surfaces.

1.3 DEFINITIONS

A. General: Definitions in the ANSI A108 series of tile installation standards and in ANSI A137.1 apply to Work of this Section unless otherwise specified.

B. ANSI A108 Series: ANSI A108.01, ANSI A108.02, ANSI A108.1A, ANSI A108.1B, ANSI A108.1C, ANSI A108.4, ANSI A108.5, ANSI A108.6, ANSI A108.8, ANSI A108.9, ANSI A108.10, ANSI A108.11, ANSI A108.12, ANSI A108.13, ANSI A108.14, ANSI A108.15, ANSI A108.16, and ANSI A108.17, which are contained in its "Specifications for Installation of Ceramic Tile."

1.4 PRE-INSTALLATION MEETINGS

A. Pre-installation Conference: Conduct conference at Project site.

1. Review requirements in ANSI A108.01 for substrates and for preparation by other trades.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: Show locations of each type of tile and tile pattern. Show widths, details, and locations of expansion, contraction, control, and isolation joints in tile substrates and finished tile surfaces.

C. Samples:

1. Full-size units of each type and composition of tile and for each color and finish required.
2. Full-size units of each type of trim and accessory for each color and finish required.
3. Stone thresholds in 6-inch lengths.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Test Reports: For tile-setting and -grouting products.

1.7 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match and are from same production runs as products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Tile and Trim Units: Furnish quantity of full-size units equal to three percent (3%) of amount installed for each type, composition, color, pattern, and size indicated.
2. Grout: Furnish quantity of grout equal to three percent (3%) of amount installed for each type, composition, and color indicated.

1.8 QUALITY ASSURANCE

A. Installer Qualifications:

1. Installer employs installers recognized by the U.S. Department of Labor as Journeyman Tile Layers.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use. Comply with requirements in ANSI A137.1 for labeling tile packages.

B. Store tile and cementitious materials on elevated platforms, under cover, and in a dry location.

C. Store aggregates where grading and other required characteristics can be maintained and contamination can be avoided.

D. Store liquid materials in unopened containers and protected from freezing.

1.10 FIELD CONDITIONS

A. Environmental Limitations: Do not install tile until construction in spaces is complete and ambient temperature and humidity conditions are maintained at the levels indicated in referenced standards and manufacturer's written instructions.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations for Tile: Obtain tile of each type and color or finish from single source or producer.

1. Obtain tile of each type and color or finish from same production run and of consistent quality in appearance and physical properties for each contiguous area.

B. Source Limitations for Setting and Grouting Materials: Obtain ingredients of a uniform quality for each mortar, adhesive, and grout component from single manufacturer and each aggregate from single source or producer.

1. Obtain setting and grouting materials, except for unmodified Portland cement and aggregate, from single manufacturer.
2. Obtain crack isolation membrane, except for sheet products, from manufacturer of setting and grouting materials.

C. Source Limitations for Other Products: Obtain each of the following products specified in this Section from a single manufacturer for each product:

1. Stone thresholds.
2. Crack isolation membrane.

2.2 PRODUCTS, GENERAL

A. ANSI Tile Standard: Provide tile that complies with Standard grade requirements for types, compositions, and other characteristics indicated.

1. Ceramic: ANSI A137.1.

B. ANSI Standards for Tile Installation Materials: Provide materials complying with ANSI A108.02, ANSI standards referenced in other Part 2 articles, ANSI standards referenced by TCNA installation methods specified in tile installation schedules, and other requirements specified.

C. Factory Blending: For tile exhibiting color variations within ranges, blend tile in factory and package so tile units taken from one (1) package show same range in colors as those taken from other packages and match approved Samples.

D. Mounting: For factory-mounted tile, provide back- or edge-mounted tile assemblies as standard with manufacturer unless otherwise indicated.

2.3 TILE PRODUCTS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. American Olean; a division of Dal-Tile International, Inc.
2. Creative Materials Corp.
3. Crossville, Inc.
4. Daltile; a division of Dal-Tile International, Inc.
5. Mosa
6. New Jersey Tile & Stone, a member of the Olympia Tile Group
7. Substitutions: Under provisions of Section 012500 “Substitution Procedures”.

B. Tile Type (**PFT-2**): Factory-mounted unglazed ceramic mosaic tile.

1. Basis-of-Design Product:

a. Daltile, a division of Dal-Tile International, Inc.; **Keystones**

2. Composition: Porcelain.
3. Face: Plain with cushion edges.
4. Surface: Slip-resistant, with abrasive admixture.

    a. Dynamic Coefficient of Friction (Wet): Not less than 0.42 0.50.

5. Size, Thickness, and Tile Color and Pattern, and Grout Color: As indicated in Section 090000 “Schedule of Finishes”.
6. Trim Units: Coordinated with sizes and coursing of adjoining flat tile where applicable and matching characteristics of adjoining flat tile. Provide shapes as follows, selected from manufacturer's standard shapes:

    a. Base (**PWB**): Size as indicated in Section 090000 “Schedule of Finishes”.
    b. External Corners: Surface bullnose, module size same as adjoining flat tile.
    c. Internal Corners: Field-butted square corners. For coved base, use angle pieces designed to fit with stretcher shapes.

C. Tile Type (**PFT-1**): Unglazed porcelain floor tile.

1. Basis-of-Design Product:

    b. Daltile; a division of Dal-Tile International, Inc.; **Volume 1.0**

2. Certification: Porcelain tile certified by the Porcelain Tile Certification Agency.
3. Face: Plain with square or cushion edges.
4. Dynamic Coefficient of Friction: ASTM C 1028.

    a. Wet: Not less than 0.42.

5. Size, Thickness, Tile Color and Pattern: As indicated in Section 090000 “Schedule of Finishes”.

D. Tile Type (**CWT**): Glazed wall tile.

1. Basis-of-Design Product:

    a. Daltile; Division of Dal-Tile International, Inc.; **Color Wheel Collection – Classic Linear, Miramo**

2. Composition: Ceramic.
3. Face: Plain with cushion edges.
4. Size, Thickness, and Tile Color and Pattern: As indicated in Section 090000 “Schedule of Finishes”.
5. Trim Units: Coordinated with sizes and coursing of adjoining flat tile where applicable and matching characteristics of adjoining flat tile. Provide shapes as follows, selected from manufacturer's standard shapes:

    a. Base Cove (**CWB**): Cove, module size same as adjoining flat tile, unless indicated otherwise.
    a. External Corners for Thin-Set Mortar Installations: Surface bullnose, same size as adjoining flat tile.
    b. Internal Corners: Field-butted square corners. For coved base and cap use angle pieces designed to fit with stretcher shapes.

2.4 THRESHOLDS

A. General: Fabricate to sizes and profiles indicated or required to provide transition between adjacent floor finishes.

1. Bevel edges at 1:2 slope, with lower edge of bevel aligned with or up to 1/16-inch above adjacent floor surface. Finish bevel to match top surface of threshold. Limit height of threshold to ½-inch or less above adjacent floor surface.

B. Marble Thresholds: ASTM C 503, with a minimum abrasion resistance of 10 per ASTM C 1353 or ASTM C 241 and with honed finish.

1. Description: Uniform, fine- to medium-grained stone in color as selected by Architect and Owner.

2.5 TILE BACKING PANELS

A. Cementitious Backer Units: ANSI A118.9 or ASTM C 1325, Type A, in maximum lengths available to minimize end-to-end butt joints.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Custom Building Products; **Wonderboard Lite**
b. James Hardie Industries; **HardieBacker**
c. USG Corporation; **DUROCK Cement Board**
d. Substitutions: Under provisions of Section 012500 “Substitution Procedures”.

2. Thickness: To match adjacent gypsum board.

2.6 CRACK ISOLATION MEMBRANE

A. General: Manufacturer's standard product that complies with ANSI A118.12 for standard performance and is recommended by the manufacturer for the application indicated. Include reinforcement and accessories recommended by manufacturer.

B. Chlorinated Polyethylene Sheet: Non-plasticized, chlorinated polyethylene faced on both sides with nonwoven polyester fabric; 0.030-inch nominal thickness.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Noble Company (The); **Nobleseal CIS**
b. Substitutions: Under provisions of Section 012500 “Substitution Procedures”.

2.7 SETTING MATERIALS

A. Latex-Portland Cement Mortar (Thin Set): ANSI A118.4; white unless otherwise indicated.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Bostik, Inc.
b. Custom Building Products

c. Laticrete International, Inc.
d. MAPEI Corporation
e. Substitutions: Under provisions of Section 012500 “Substitution Procedures”.

2. Provide prepackaged, dry-mortar mix containing dry, redispersible, vinyl acetate or acrylic additive to which only water must be added at Project site.
3. For wall applications, provide mortar that complies with requirements for non-sagging mortar in addition to the other requirements in ANSI A118.4.

2.8 GROUT MATERIALS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Bostik, Inc.
2. Custom Building Products
3. Laticrete International, Inc.
4. MAPEI Corporation
5. Substitutions: Under provisions of Section 012500 “Substitution Procedures”.

B. Water-Cleanable Epoxy Grout: ANSI A118.3.

1. Provide product capable of withstanding continuous and intermittent exposure to temperatures of up to 140 deg F and 212 deg F, respectively, and certified by manufacturer for intended use.
2. Colors: As selected by Architect and Owner from manufacturer’s entire range.

2.9 MISCELLANEOUS MATERIALS

A. Trowelable Underlayments and Patching Compounds: Latex-modified, Portland cement-based formulation provided or approved by manufacturer of tile-setting materials for installations indicated.

B. Tile Cleaner: A neutral cleaner capable of removing soil and residue without harming tile and grout surfaces, specifically approved for materials and installations indicated by tile and grout manufacturers.

C. Grout Sealer: Manufacturer's standard silicone product for sealing grout joints and that does not change color or appearance of grout.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Bostik, Inc.; **CeramaSeal Grout & Tile Sealer**
b. Custom Building Products; **Surfaceguard Sealer**
c. MAPEI Corporation; **KER003, Silicone Spray Sealer for Cementitious Tile Grout**
d. Substitutions: Under provisions of Section 012500 “Substitution Procedures”.

2.10 MIXING MORTARS AND GROUT

A. Mix mortars and grouts to comply with referenced standards and mortar and grout manufacturers' written instructions.

B. Add materials, water, and additives in accurate proportions.

C. Obtain and use type of mixing equipment, mixer speeds, mixing containers, mixing time, and other procedures to produce mortars and grouts of uniform quality with optimum performance characteristics for installations indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions where tile will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of installed tile.

1. Verify that substrates for setting tile are firm, dry, clean, free of coatings that are incompatible with tile-setting materials including curing compounds and other substances that contain soap, wax, oil, or silicone; and comply with flatness tolerances required by ANSI A108.01 for installations indicated.
2. Verify that concrete substrates for tile floors installed with thin-set mortar comply with surface finish requirements in ANSI A108.01 for installations indicated.

    a. Verify that surfaces that received a steel trowel finish have been mechanically scarified.
    b. Verify that protrusions, bumps, and ridges have been removed by sanding or grinding.

3. Verify that installation of grounds, anchors, recessed frames, electrical and mechanical units of work, and similar items located in or behind tile has been completed.
4. Verify that joints and cracks in tile substrates are coordinated with tile joint locations; if not coordinated, adjust joint locations in consultation with Architect.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Fill cracks, holes, and depressions in concrete substrates for tile floors installed with thin-set mortar with trowelable leveling and patching compound specifically recommended by tile-setting material manufacturer.

B. Blending: For tile exhibiting color variations, verify that tile has been factory blended and packaged so tile units taken from one (1) package show same range of colors as those taken from other packages and match approved Samples. If not factory blended, either return to manufacturer or blend tiles at Project site before installing.

3.3 TILE INSTALLATION

A. Comply with TCNA's "Handbook for Ceramic, Glass, and Stone Tile Installation" for TCNA installation methods specified in tile installation schedules. Comply with parts of the ANSI A108 Series "Specifications for Installation of Ceramic Tile" that are referenced in TCNA installation methods, specified in tile installation schedules, and apply to types of setting and grouting materials used.

B. Extend tile work into recesses and under or behind equipment and fixtures to form complete covering without interruptions unless otherwise indicated. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.

C. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish, or built-in items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap tile.

D. Provide manufacturer's standard trim shapes where necessary to eliminate exposed tile edges.

E. Where accent tile differs in thickness from field tile, vary setting-bed thickness so that tiles are flush.

F. Jointing Pattern: Lay tile in grid pattern unless otherwise indicated. Lay out tile work and center tile fields in both directions in each space or on each wall area. Lay out tile work to minimize the use of pieces that are less than half of a tile. Provide uniform joint widths unless otherwise indicated.

1. For tile mounted in sheets, make joints between tile sheets same width as joints within tile sheets so joints between sheets are not apparent in finished work.
2. Where adjoining tiles on floor, base, walls, or trim are specified or indicated to be same size, align joints.

G. Joint Widths: Unless otherwise indicated, install tile with the following joint widths:

1. Ceramic Mosaic Tile: . 1/8-inch.
2. Floor Tile: 1/8-inch.
3. Glazed Wall Tile: 1/8-inch.

H. Lay out tile wainscots to dimensions indicated or to next full tile beyond dimensions indicated.

I. Expansion Joints: Provide expansion joints and other sealant-filled joints, including control, contraction, and isolation joints, where indicated. Form joints during installation of setting materials, mortar beds, and tile. Do not saw-cut joints after installing tiles.

1. Where joints occur in concrete substrates, locate joints in tile surfaces directly above them.

J. Stone Thresholds: Install stone thresholds in same type of setting bed as adjacent floor unless otherwise indicated.

1. Do not extend crack isolation membrane under thresholds set in latex-Portland cement mortar. Fill joints between such thresholds and adjoining tile set on crack isolation membrane with elastomeric sealant.

K. Grout Sealer: Apply grout sealer to grout joints according to grout-sealer manufacturer's written instructions. As soon as grout sealer has penetrated grout joints, remove excess sealer and sealer from tile faces by wiping with soft cloth.

3.4 TILE BACKING PANEL INSTALLATION

A. Install panels and treat joints according to ANSI A108.11 and manufacturer's written instructions for type of application indicated. Use latex-Portland cement mortar for bonding material unless otherwise directed in manufacturer's written instructions.

3.5 CRACK ISOLATION MEMBRANE INSTALLATION

A. Install crack isolation membrane to comply with ANSI A108.17 and manufacturer's written instructions to produce membrane of uniform thickness and bonded securely to substrate.

B. Allow crack isolation membrane to cure before installing tile or setting materials over it.

3.6 CLEANING AND PROTECTING

A. Remove and replace tile that is damaged or that does not match adjoining tile. Provide new matching units, installed as specified and in a manner to eliminate evidence of replacement.

B. Cleaning: On completion of placement and grouting, clean all tile surfaces so they are free of foreign matter.

1. Remove grout residue from tile as soon as possible.
2. Clean grout smears and haze from tile according to tile and grout manufacturer's written instructions but no sooner than ten (10) days after installation. Use only cleaners recommended by tile and grout manufacturers and only after determining that cleaners are safe to use by testing on samples of tile and other surfaces to be cleaned. Protect metal surfaces and plumbing fixtures from effects of cleaning. Flush surfaces with clean water before and after cleaning.

C. Protect installed tile work with Kraft paper or other heavy covering during construction period to prevent staining, damage, and wear. If recommended by tile manufacturer, apply coat of neutral protective cleaner to completed tile walls and floors.

D. Prohibit foot and wheel traffic from tiled floors for at least seven (7) days after grouting is completed.

E. Before final inspection, remove protective coverings and rinse neutral protective cleaner from tile surfaces.

3.7 INTERIOR CERAMIC TILE INSTALLATION SCHEDULE

A. Interior Floor Installations, Concrete Subfloor:

1. Ceramic Tile Installation (**PFT**): TCNA F125A; thin-set mortar on crack isolation membrane.

a. Thin-Set Mortar: Latex-Portland cement mortar.
b. Grout: Water-cleanable epoxy grout.

B. Interior Wall Installations, Masonry or Concrete:

1. Ceramic Tile Installation (**CWT**): TCNA W202; thin-set mortar.

a. Thin-Set Mortar: Latex-Portland cement mortar.
b. Grout: Water-cleanable epoxy grout.

C. Interior Wall Installations, Wood or Metal Studs or Furring:

1. Ceramic Tile Installation (**CWT, PFT**): TCNA W244C or TCNA W244F; thin-set mortar on cementitious backer units or fiber-cement backer board.

a. Thin-Set Mortar: Latex-Portland cement mortar.
b. Grout: Water-cleanable epoxy grout.

END OF SECTION 093000

SECTION 095113 - ACOUSTICAL PANEL CEILINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes acoustical panels and exposed suspension systems for ceilings.

B. Products furnished, but not installed under this Section, include anchors, clips, and other ceiling attachment devices to be cast in concrete.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Samples: For each exposed product and for each color and texture specified, 6 inches in size.

1.4 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Suspended ceiling components.
2. Structural members to which suspension systems will be attached.
3. Size and location of initial access modules for acoustical panels.
4. Items penetrating finished ceiling including the following:

    a. Lighting fixtures.
    b. Air outlets and inlets.
    c. Speakers.
    d. Sprinklers.
    e. Access panels.
    f. Perimeter moldings.

B. Product Test Reports: For each acoustical panel ceiling, for tests performed by a qualified testing agency.

C. Evaluation Reports: For each acoustical panel ceiling suspension system and anchor and fastener type, from ICC-ES.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For finishes to include in maintenance manuals.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Acoustical Ceiling Panels: Full-size panels equal to two percent (2%) of each type of quantity installed.
2. Suspension-System Components: Quantity of each exposed component equal to two percent (2%) of quantity installed.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver acoustical panels, suspension-system components, and accessories to Project site in original, unopened packages and store them in a fully enclosed, conditioned space where they will be protected against damage from moisture, humidity, temperature extremes, direct sunlight, surface contamination, and other causes.

B. Before installing acoustical panels, permit them to reach room temperature and a stabilized moisture content.

C. Handle acoustical panels carefully to avoid chipping edges or damaging units in any way.

1.8 FIELD CONDITIONS

A. Environmental Limitations: Do not install acoustical panel ceilings until spaces are enclosed and weatherproof, wet work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

1. Pressurized Plenums: Operate ventilation system for not less than 48 hours before beginning acoustical panel ceiling installation.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Acoustical ceiling shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

B. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Flame-Spread Index: Comply with ASTM E 1264 for Class A materials.
2. Smoke-Developed Index: 50 or less.

2.2 ACOUSTICAL PANELS, GENERAL

A. Source Limitations:

1. Acoustical Ceiling Panel: Obtain each type from single source from single manufacturer.
2. Suspension System: Obtain each type from single source from single manufacturer.

B. Acoustical Panel Standard: Provide manufacturer's standard panels of configuration indicated that comply with ASTM E 1264 classifications as designated by types, patterns, acoustical ratings, and light reflectances unless otherwise indicated.

1. Mounting Method for Measuring NRC: Type E-400; plenum mounting in which face of test specimen is 15¾ inches away from test surface according to ASTM E 795.

C. Acoustical Panel Colors and Patterns: Match appearance characteristics indicated for each product type.

1. Where appearance characteristics of acoustical panels are indicated by referencing pattern designations in ASTM E 1264 and not manufacturers' proprietary product designations, provide products selected by Architect from each manufacturer's full range that comply with requirements indicated for type, pattern, color, light reflectance, acoustical performance, edge detail, and size.

2.3 ACOUSTICAL PANEL MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Armstrong World Industries, Inc.
2. CertainTeed Corp.
3. Decoustics
4. Frasch!, a Catalyst Acoustics Group company
5. USG Interiors, Inc.; Subsidiary of USG Corporation
6. Substitutions: Under provisions of Section 012500 “Substitution Procedures”.

2.4 ACOUSTICAL PANELS

A. Basis-of-Design Product (**ACT-3, ACC-1**):

1. Armstrong World Industries, Inc.; **Ultima High NRC**
2. Classification: Provide panels complying with ASTM E 1264 for type, form, and pattern as follows:

a. Type and Form: Type IV, mineral base with membrane-faced overlay; Form 2, water felted; with vinyl overlay on face, back, and sealed edges.
b. Pattern: E (lightly textured).

3. LR: Not less than 0.87.
4. NRC: Not less than 0.80.
5. Thickness: 7/8-inch.
6. Color, Edge/Joint Detail, and Modular Size: As indicated in Section 090000 “Schedule of Finishes”.
7. Recycled Content: Post-consumer recycled content plus one-half of pre-consumer recycled content not less than forty-three percent (43%).

B. Basis-of-Design Product (**ACT-1**):

1. Armstrong World Industries, Inc.; **Ultima**
2. Classification: Provide panels complying with ASTM E 1264 for type, form, and pattern as follows:

a. Type and Form: Type IV, mineral base with membrane-faced overlay; Form 2, water felted; with vinyl overlay on face, back, and sealed edges.
b. Pattern: E (lightly textured).

3. LR: Not less than 0.88.
4. NRC: Not less than 0.75.
5. Thickness: ¾-inch.

6. Color, Edge/Joint Detail, and Modular Size: As indicated in Section 090000 “Schedule of Finishes”.
7. Recycled Content: Post-consumer recycled content plus one-half of pre-consumer recycled content not less than fifty percent (50%).

C. Basis-of-Design Product (**ACT-2**):

1. Armstrong World Industries, Inc.; **Ultima Health Zone**
2. Classification: Provide panels complying with ASTM E 1264 for type, form, and pattern as follows:

   a. Type and Form: Type IV, mineral base with membrane-faced overlay; Form 2, water felted; with vinyl overlay on face, back, and sealed edges.
   b. Pattern: E (lightly textured).

3. LR: Not less than 0.86.
4. NRC: Not less than 0.70.
5. CAC: Not less than 38.
6. Thickness: ¾-inch.
7. Color, Modular Size, and Edge/Joint Detail: As indicated in Section 090000 “Schedule of Finishes”.
8. Recycled Content: Post-consumer recycled content plus one-half of pre-consumer recycled content not less than fifty percent (50%).

D. Broad Spectrum Antimicrobial Fungicide and Bactericide Treatment: Provide acoustical panels treated with manufacturer's standard antimicrobial formulation that inhibits fungus, mold, mildew, and gram-positive and gram-negative bacteria and showing no mold, mildew, or bacterial growth when tested according to ASTM D 3273 and evaluated according to ASTM D 3274 or ASTM G 21.

2.5 METAL SUSPENSION SYSTEM

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Armstrong World Industries, Inc.
2. CertainTeed Corp.
3. Decoustics
4. USG Interiors, Inc.; Subsidiary of USG Corporation
5. Substitutions: Under provisions of Section 012500 “Substitution Procedures”.

B. Metal Suspension-System Standard: Provide manufacturer's standard direct-hung metal suspension systems of types, structural classifications, and finishes indicated that comply with applicable requirements in ASTM C 635.

1. High-Humidity Finish: Comply with ASTM C 635 requirements for "Coating Classification for Severe Environment Performance" where high-humidity finishes are indicated.

C. Recycled Content: Post-consumer recycled content plus one-half of pre-consumer recycled content not less than twenty-five percent (25%).

D. Wide-Face, Double-Web, Hot-Dip Galvanized, Steel Suspension System: Main and cross runners roll formed from cold-rolled steel sheet; hot-dip galvanized according to ASTM A 653; with prefinished, cold-rolled, 15/16-inch-wide flanges.

1. Basis-of-Design Product:

   a. Armstrong World Industries, Inc.; **Prelude XL 15/16-Inch Exposed Tee System**

2. Structural Classification: Heavy-duty system.
3. Face Design: Flat, flush.
4. Finish: Painted white.

2.6 ACCESSORIES

A. Attachment Devices: Size for five (5) times the design load indicated in ASTM C 635, Table 1, "Direct Hung," unless otherwise indicated. Comply with seismic design requirements.

1. Provide manufacturer's standard fasteners and hooks.

B. Wire Hangers, Braces, and Ties: Provide wires as follows:

1. Zinc-Coated, Carbon-Steel Wire: ASTM A 641, Class 1 zinc coating, soft temper.
2. Size: Select wire diameter so its stress at three (3) times hanger design load (ASTM C 635, Table 1, "Direct Hung") will be less than yield stress of wire, but provide not less than 0.106-inch-diameter wire.

C. Seismic Clips: Manufacturer's standard seismic clips designed and spaced to secure acoustical panels in place.

D. Seismic Stabilizer Bars: Manufacturer's standard perimeter stabilizers designed to accommodate seismic forces.

E. Seismic Struts: Manufacturer's standard compression struts designed to accommodate seismic forces.

2.7 METAL EDGE MOLDINGS AND TRIM

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Armstrong World Industries, Inc.
2. CertainTeed Corp.
3. USG Interiors, Inc.; Subsidiary of USG Corporation
4. Substitutions: Under provisions of Division 01 Section "Substitution Procedures".

B. Recycled Content: Post-consumer recycled content plus one-half of pre-consumer recycled content not less than thirty percent (30%) for moldings.

C. Roll-Formed, Sheet-Metal Edge Moldings: Type and profile indicated or, if not indicated, manufacturer's standard moldings for edges and penetrations that comply with seismic design requirements; formed from sheet metal of same material, finish, and color as that used for exposed flanges of suspension-system runners.

1. Provide manufacturer's standard edge moldings that fit acoustical panel edge details and suspension systems indicated and that match width and configuration of exposed runners unless otherwise indicated.
2. For circular penetrations of ceiling, provide edge moldings fabricated to diameter required to fit penetration exactly.

D. Extruded-Aluminum Edge Trim: Where indicated, provide manufacturer's extruded-aluminum edge trim of profile indicated or referenced by manufacturer's designations, including splice plates, corner pieces, and attachment and other clips, complying with seismic design requirements and the following:

1. Basis-of-Design Product:

a. Armstrong World Industries, Inc.; **Axiom – Classic**

2. Baked-Enamel or Powder-Coat Finish: Minimum dry film thickness of 1.5 mils. Comply with ASTM C 635 and coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.

2.8 ACOUSTICAL SEALANT

A. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

1. Acoustical Sealant for Exposed and Concealed Joints:

a. Pecora Corporation; **AC-20 FTR Acoustical and Insulation Sealant**
b. USG Corporation; **SHEETROCK Acoustical Sealant**
c. Substitutions: Under provisions of Section 012500 “Substitution Procedures”.

B. Acoustical Sealant: Manufacturer's standard sealant complying with ASTM C 834 and effective in reducing airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.

1. Exposed and Concealed Joints: Non-sag, paintable, non-staining latex sealant.
2. Acoustical sealant shall have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, including structural framing to which acoustical panel ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage and with requirements for installation tolerances and other conditions affecting performance of acoustical panel ceilings.

B. Examine acoustical panels before installation. Reject acoustical panels that are wet, moisture damaged, or mold damaged.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Measure each ceiling area and establish layout of acoustical panels to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width panels at borders and comply with layout shown on reflected ceiling plans.

3.3 INSTALLATION

A. General: Install acoustical panel ceilings to comply with ASTM C 636 and seismic design requirements indicated, according to manufacturer's written instructions and CISCA's "Ceiling Systems Handbook."

B. Suspend ceiling hangers from building's structural members and as follows:

1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structure or of ceiling suspension system.
2. Splay hangers only where required to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
3. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with location of hangers at spacings required to support standard suspension-system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices.
4. Secure wire hangers to ceiling-suspension members and to supports above with a minimum of three (3) tight turns. Connect hangers directly either to structures or to inserts, eye screws, or other devices that are secure and appropriate for substrate and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
5. When steel framing does not permit installation of hanger wires at spacing required, install carrying channels or other supplemental support for attachment of hanger wires.
6. Do not attach hangers to roof deck. Attach hangers to structural members.
7. Space hangers not more than 48 inches o.c. along each member supported directly from hangers unless otherwise indicated; provide hangers not more than 8 inches from ends of each member.
8. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards and publications.

C. Secure bracing wires to ceiling suspension members and to supports with a minimum of four (4) tight turns. Suspend bracing from building's structural members as required for hangers, without attaching to permanent metal forms, steel deck, or steel deck tabs. Fasten bracing wires into concrete with cast-in-place or post-installed anchors.

D. Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical panels.

1. Apply acoustical sealant in a continuous ribbon concealed on back of vertical legs of moldings before they are installed.
2. Screw attach moldings to substrate at intervals not more than 16 inches o.c. and not more than 3 inches from ends, leveling with ceiling suspension system to a tolerance of 1/8-inch in 12 feet. Miter corners accurately and connect securely.
3. Do not use exposed fasteners, including pop rivets, on moldings and trim.

E. Install suspension-system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.

F. Install acoustical panels with undamaged edges and fit accurately into suspension-system runners and edge moldings. Scribe and cut panels at borders and penetrations to provide precise fit.

1. For square-edged panels, install panels with edges fully hidden from view by flanges of suspension-system runners and moldings.

2. Paint cut edges of panel remaining exposed after installation; match color of exposed panel surfaces using coating recommended in writing for this purpose by acoustical panel manufacturer.
3. Protect lighting fixtures and air ducts to comply with requirements indicated for fire-resistance-rated assembly.

3.4 CLEANING

A. Clean exposed surfaces of acoustical panel ceilings, including trim, edge moldings, and suspension-system members. Comply with manufacturer's written instructions for cleaning and touchup of minor finish damage. Remove and replace ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION 095113

SECTION 096513 - RESILIENT BASE AND ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Resilient base.
2. Resilient stair accessories.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Samples: For each exposed product and for each color and texture specified, not less than 12 inches long.

C. Product Schedule: For resilient base and accessory products. Use same designations indicated on Drawings.

1.4 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Furnish not less than 10 linear feet for every 500 linear feet or fraction thereof, of each type, color, pattern, and size of resilient product installed.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Store resilient products and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F or more than 90 deg F.

1.6 FIELD CONDITIONS

A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F or more than 95 deg F, in spaces to receive resilient products during the following time periods:

1. 48 hours before installation.
2. During installation.
3. 48 hours after installation.

B. After installation and until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F or more than 95 deg F.

C. Install resilient products after other finishing operations, including painting, have been completed.

1.7 WARRANTY

A. Provide manufacturer's written limited warranties against defects in materials and against premature wear prior to warranty expiration for the materials as follows:

1. Resilient Base: Two (2) years.
2. Resilient Stair Accessories: Five (5) years.

PART 2 - PRODUCTS

2.1 REGULATORY REQUIREMENTS

A. Conform to Class I rating with a flame spread of 0 to 25 in accordance with the requirements of Class A material in accordance with ASTM E 84. Rubber products shall be Class I, 0.45 watts/sq. cm in accordance with ASTM E 648 and NFPA 255.

2.2 THERMOPLASTIC-RUBBER BASE

A. Basis-of-Design:

1. Johnsonite; A Tarkett Company; **Duracove**

B. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Burke Mercer Flooring Products, Division of Burke Industries Inc.
2. Flexco Corporation
3. Mannington Mills, Inc.
4. Roppe Corporation, USA
5. Substitutions: Under provisions of Section 012500 “Substitution Procedures”.

C. Product Standard: ASTM F 1861, Type TP (rubber, thermoplastic).

1. Group: I (solid, homogeneous).
2. Style: B, Cove.

D. Lengths: Coils in manufacturer's standard length.

E. Outside and Inside Corners: Preformed.

F. Thickness, Height, and Colors: **RB**, as indicated in Section 090000 “Schedule of Finishes”.

2.3 RUBBER STAIR ACCESSORIES

A. Fire-Test-Response Characteristics: As determined by testing identical products according to ASTM E 648 or NFPA 253 by a qualified testing agency.

1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.

B. Basis-of-Design:

1. Flexco; **Heavy Duty One-Piece Tread w/Riser**

C. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. American Biltrite
2. Burke Mercer Flooring Products, Division of Burke Industries Inc.
3. Johnsonite; a Tarkett company
4. Mannington Mills, Inc.
5. Nora Systems, Inc.
6. Roppe Corporation, USA.
7. Substitutions: Under provisions of Section 012500 “Substitution Procedures”.

D. Stair Treads: ASTM F 2169.

1. Type: TS (rubber, vulcanized thermoset).
2. Class: 2 (pattern; embossed, grooved, or ribbed).
3. Group: 1 (embedded abrasive strips).
4. Nosing Style: Square.
5. Nosing Height: 2 inches.
6. Thickness: 0.2 inch and tapered to back edge.
7. Size: Lengths and depths to fit each stair tread in one (1) piece.
8. Integral Risers: Smooth, flat; in height that fully covers substrate.

E. Landing Tile: **RFT**, produced by same manufacturer as treads and recommended by manufacturer for installation with treads.

F. Locations: Provide rubber stair accessories in areas indicated and where required.

G. Thickness, Color, and Texture: **RST**, as indicated in Section 090000 “Schedule of Finishes”.

2.4 INSTALLATION MATERIALS

A. Trowelable Leveling and Patching Compounds: Latex-modified, Portland cement based or blended hydraulic-cement-based formulation provided or approved by resilient-product manufacturer for applications indicated.

B. Adhesives: Water-resistant type recommended by resilient-product manufacturer for resilient products and substrate conditions indicated.

1. Adhesives shall have a VOC content of 50 g/L or less except that adhesive for rubber stair treads shall have a VOC content of 60 g/L or less.

C. Stair-Tread Nose Filler: Two-part epoxy compound recommended by resilient stair-tread manufacturer to fill nosing substrates that do not conform to tread contours.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resilient products.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

1. Installation of resilient products indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient products.

B. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.

C. Do not install resilient products until they are the same temperature as the space where they are to be installed.

1. At least 48 hours in advance of installation, move resilient products and installation materials into spaces where they will be installed.

D. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient products.

3.3 RESILIENT BASE INSTALLATION

A. Comply with manufacturer's written instructions for installing resilient base.

B. Apply resilient base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.

C. Install resilient base in lengths as long as practical without gaps at seams and with tops of adjacent pieces aligned.

D. Tightly adhere resilient base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.

E. Do not stretch resilient base during installation.

F. On masonry surfaces or other similar irregular substrates, fill voids along top edge of resilient base with manufacturer's recommended adhesive filler material.

G. Preformed Corners: Install preformed corners before installing straight pieces.

3.4 RESILIENT ACCESSORY INSTALLATION

A. Comply with manufacturer's written instructions for installing resilient accessories.

B. Resilient Stair Accessories:

1. Use stair-tread-nose filler to fill nosing substrates that do not conform to tread contours.
2. Tightly adhere to substrates throughout length of each piece.

3.5 CLEANING AND PROTECTION

A. Comply with manufacturer's written instructions for cleaning and protecting resilient products.

B. Perform the following operations immediately after completing resilient-product installation:

1. Remove adhesive and other blemishes from exposed surfaces.

C. Protect resilient products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.

D. Cover resilient products subject to wear and foot traffic until Substantial Completion.

END OF SECTION 096513

SECTION 096516 - RESILIENT SHEET FLOORING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Unbacked vinyl sheet flooring.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. HPBS Submittals:

1. Product Data for Section 16a-38k-5(d): For installation adhesive, documentation including printed statement of VOC content.

C. Shop Drawings: For each type of resilient sheet flooring.

1. Include sheet flooring layouts, locations of seams, edges, columns, doorways, enclosing partitions, built-in furniture, cabinets, and cutouts.
2. Show details of special patterns.

D. Samples: For each exposed product and for each color, texture, and pattern specified in manufacturer's standard size, but not less than 6-by-9-inch sections.

1. For heat-welding bead, manufacturer's standard-size Samples, but not less than 9 inches long, of each color required.

E. Welded-Seam Samples: For seamless-installation technique indicated and for each resilient sheet flooring product, color, and pattern required; with seam running lengthwise and in center of 6-by-9-inch Sample applied to a rigid backing and prepared by Installer for this Project.

F. Product Schedule: For resilient sheet flooring. Use same designations indicated on Drawings.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For each type of resilient sheet flooring to include in maintenance manuals.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Resilient Sheet Flooring: Furnish not less than 10 linear feet for every 500 linear feet or fraction thereof, in roll form and in full roll width for each type, color, and pattern of flooring installed.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are competent in techniques required by manufacturer for resilient sheet flooring installation and seaming method indicated.

1. Engage an installer who employs workers for this Project who are trained or certified by resilient sheet flooring manufacturer for installation techniques required.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Store resilient sheet flooring and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F or more than 90 deg F. Store rolls upright.

1.9 FIELD CONDITIONS

A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F or more than 85 deg F, in spaces to receive resilient sheet flooring during the following time periods:

1. 48 hours before installation.
2. During installation.
3. 48 hours after installation.

B. After installation and until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F or more than 95 deg F.

C. Close spaces to traffic during resilient sheet flooring installation.

D. Close spaces to traffic for 48 hours after resilient sheet flooring installation.

E. Install resilient sheet flooring after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Test-Response Characteristics: For resilient sheet flooring, as determined by testing identical products according to ASTM E 648 or NFPA 253 by a qualified testing agency.

1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.

2.2 UNBACKED VINYL SHEET FLOORING

A. Basis-of-Design:

1. Mohawk Group; **Medella Hues, Medella Fleck**

B. Products: Subject to compliance with requirement, available products that may be incorporated into the Work include, but are not limited to, the following:

1. Armstrong World Industries, Inc.
2. Forbo Industries, Inc.
3. Johnsonite; a Tarkett company
4. Mannington Mills, Inc.
5. Substitutions: Under provisions of Section 012500 “Substitution Procedures”.

C. Product Standard: ASTM F 1913.

D. Wearing Surface: Smooth.

1. Slip resistant with a Coefficient of Friction of 0.6 or greater on level surface (dry).

E. Seamless-Installation Method: Heat welded.

F. Thickness, Sheet Width, Colors, and Patterns: **SF**, as indicated in Section 090000 “Schedule of Finishes”.

2.3 INSTALLATION MATERIALS

A. Trowelable Leveling and Patching Compounds: Latex-modified, Portland cement based or blended hydraulic-cement-based formulation provided or approved by resilient sheet flooring manufacturer for applications indicated.

B. Adhesives: Water-resistant type recommended by flooring and adhesive manufacturers to suit resilient sheet flooring and substrate conditions indicated.

1. Adhesives shall have a VOC content of 60 g/L or less.

C. Seamless-Installation Accessories:

1. Heat-Welding Bead: Manufacturer's solid-strand product for heat welding seams.

a. Color: Match flooring.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resilient sheet flooring.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Prepare substrates according to resilient sheet flooring manufacturer's written instructions to ensure adhesion of resilient sheet flooring.

B. Concrete Substrates: Prepare according to ASTM F 710.

1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by resilient sheet flooring manufacturer. Do not use solvents.
3. Alkalinity and Adhesion Testing: Perform tests recommended by resilient sheet flooring manufacturer. Proceed with installation only after substrate alkalinity falls within range on pH scale recommended by manufacturer in writing, but not less than 5 or more than 9 pH.
4. Moisture Testing: Perform tests so that each test area does not exceed 1000 sq. ft., and perform no fewer than three (3) tests in each installation area and with test areas evenly spaced in installation areas.

    a. Relative Humidity Test: Using in-situ probes, ASTM F 2170. Proceed with installation only after substrates have a maximum relative humidity level measurement per manufacturer’s written recommendations.

C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate. Expect and include in the Base Bid the requirement to apply and machine level at least three (3) coats of leveler in all spaces.

D. Do not install resilient sheet flooring until materials are the same temperature as space where they are to be installed.

1. At least 48 hours in advance of installation, move flooring and installation materials into spaces where they will be installed.

E. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient sheet flooring.

3.3 RESILIENT SHEET FLOORING INSTALLATION

A. Comply with manufacturer's written instructions for installing resilient sheet flooring.

B. Unroll resilient sheet flooring and allow it to stabilize before cutting and fitting.

C. Lay out resilient sheet flooring as follows:

1. Maintain uniformity of flooring direction.
2. Minimize number of seams; place seams in inconspicuous and low-traffic areas, at least 6 inches away from parallel joints in flooring substrates.
3. Match edges of flooring for color shading at seams.
4. Avoid cross seams.

D. Scribe and cut resilient sheet flooring to butt neatly and tightly to vertical surfaces and permanent fixtures including built-in furniture, cabinets, pipes, outlets, and door frames.

E. Extend resilient sheet flooring into toe spaces, door reveals, closets, and similar openings.

F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on resilient sheet flooring as marked on substrates. Use chalk or other nonpermanent marking device.

G. Adhere resilient sheet flooring to substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.

H. Seamless Installation:

1. Heat-Welded Seams: Comply with ASTM F 1516. Rout joints and heat weld with welding bead to fuse sections permanently into a seamless flooring installation. Prepare, weld, and finish seams to produce surfaces flush with adjoining flooring surfaces.

3.4 CLEANING AND PROTECTION

A. Comply with manufacturer's written instructions for cleaning and protecting resilient sheet flooring.

B. Perform the following operations immediately after completing resilient sheet flooring installation:

1. Remove adhesive and other blemishes from surfaces.
2. Sweep and vacuum surfaces thoroughly.
3. Damp-mop surfaces to remove marks and soil.

C. Protect resilient sheet flooring from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.

D. Cover resilient sheet flooring until Substantial Completion.

END OF SECTION 096516

SECTION 096519 - RESILIENT TILE FLOORING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Vinyl composition floor tile.
2. Rubber floor tile.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. HPBS Submittals:

1. Product Data for Section 16a-38k-6(d)(8): For products having recycled content, documentation indicating percentages by weight of postconsumer and pre-consumer recycled content. Include statement indicating cost for each product having recycled content.
2. Product Data for Section 16a-38k-5(d): For adhesives, sealants and chemical-bonding compounds, documentation including printed statement of VOC content.

C. Shop Drawings: For each type of floor tile.

1. Include floor tile layouts, edges, columns, doorways, enclosing partitions, built-in furniture, cabinets, and cutouts.
2. Show details of special patterns.

D. Samples: Full-size units of each color and pattern of floor tile required.

E. Product Schedule: For floor tile. Use same designations indicated on Drawings.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For each type of floor tile to include in maintenance manuals.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Floor Tile: Furnish one (1) box for every fifty (50) boxes or fraction thereof, of each type, color, and pattern of floor tile installed.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are competent in techniques required by manufacturer for floor tile installation and seaming method indicated.

1. Engage an installer who employs workers for this Project who are trained or certified by floor tile manufacturer for installation techniques required.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Store floor tile and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F or more than 90 deg F. Store floor tiles on flat surfaces.

1.9 FIELD CONDITIONS

A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F or more than 95 deg F, in spaces to receive floor tile during the following time periods:

1. 48 hours before installation.
2. During installation.
3. 48 hours after installation.

B. After installation and until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F or more than 95 deg F.

C. Close spaces to traffic during floor tile installation.

D. Close spaces to traffic for 48 hours after floor tile installation.

E. Install floor tile after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Test-Response Characteristics: For resilient floor tile, as determined by testing identical products according to ASTM E 648 or NFPA 253 by a qualified testing agency.

1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.

2.2 VINYL COMPOSITION FLOOR TILE

A. Basis-of-Design:

1. Armstrong World Industries, Inc; **Standard EXCELON Imperial Texture**

B. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

1. Mannington Mills, Inc.

2. Tarkett, Inc.
3. Substitutions: Under provision of Section 012500 “Substitution Procedures”.

C. Tile Standard: ASTM F 1066, Class 1, solid-color tile.

D. Wearing Surface: Smooth.

1. Slip resistant with a Coefficient of Friction of 0.6 on level surface (dry).

E. Thickness, Size, Colors, and Patterns: **VCT**, as indicated in Section 090000 “Schedule of Finishes”.

2.3 RUBBER FLOOR TILE

A. Basis-of-Design:

1. Flexco; **IMO Rubber Flooring**

B. Products: Subject to compliance with requirement, available products that may be incorporated into the Work include, but are not limited to, the following;

1. American Biltrite
2. Johnsonite; a Tarkett company
3. Mannington Mills, Inc.
4. Nora Rubber Flooring, Freudenberg Building Systems, Inc
5. Substitutions: Under provisions of Section 012500 “Substitution Procedures”.

C. Tile Standard: ASTM F 1344, Class I-B, homogeneous rubber tile, through mottled.

D. Hardness: Not less than 82 as required by ASTM F 1344, measured using Shore, Type A durometer per ASTM D 2240.

E. Wearing Surface: Textured.

1. Slip resistant with a Coefficient of Friction equal to or greater than 0.50 on level surface (dry).

F. Thickness, Size, Colors and Patterns: **RFT**, as indicated in Section 090000 “Schedule of Finishes”.

2.4 INSTALLATION MATERIALS

A. Trowelable Leveling and Patching Compounds: Latex-modified, Portland cement based or blended hydraulic-cement-based formulation provided or approved by floor tile manufacturer for applications indicated.

B. Adhesives: Water-resistant type recommended by floor tile and adhesive manufacturers to suit floor tile and substrate conditions indicated.

C. Floor Polish: Provide protective, liquid floor-polish products recommended by floor tile manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of floor tile.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Prepare substrates according to floor tile manufacturer's written instructions to ensure adhesion of resilient products.

B. Concrete Substrates: Prepare according to ASTM F 710.

1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by floor tile manufacturer. Do not use solvents.
3. Alkalinity and Adhesion Testing: Perform tests recommended by floor tile manufacturer. Proceed with installation only after substrate alkalinity falls within range on pH scale recommended by manufacturer in writing, but not less than 7 or more than 10 pH.
4. Moisture Testing: Proceed with installation only after substrates pass testing according to floor tile manufacturer's written recommendations, but not less stringent than the following:

a. Perform anhydrous calcium chloride test according to ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of that indicated in manufacturer’s written recommendations.
b. Perform relative humidity test using in situ probes according to ASTM F 2170. Proceed with installation only after substrates have a maximum relative humidity level per manufacturer’s written recommendations.

C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate. Expect and include in the Base Bid the requirement to apply and machine level at least three (3) coats of leveler in all spaces.

D. Do not install floor tiles until they are the same temperature as the space where they are to be installed.

1. At least 48 hours in advance of installation, move resilient floor tile and installation materials into spaces where they will be installed.

E. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient floor tile.

3.3 FLOOR TILE INSTALLATION

A. Comply with manufacturer's written instructions for installing floor tile.

B. Lay out floor tiles from center marks established with principal walls, discounting minor offsets, so tiles at opposite edges of room are of equal width. Adjust as necessary to avoid using cut widths that equal less than one-half tile at perimeter.

1. Lay tiles in pattern of colors and sizes indicated.
2. Lay tiles with grain running in one (1) direction.

C. Match floor tiles for color and pattern by selecting tiles from cartons in the same sequence as manufactured and packaged, if so numbered. Discard broken, cracked, chipped, or deformed tiles.

D. Scribe, cut, and fit floor tiles to butt neatly and tightly to vertical surfaces and permanent fixtures including built-in furniture, cabinets, pipes, outlets, and door frames.

E. Extend floor tiles into toe spaces, door reveals, closets, and similar openings. Extend floor tiles to center of door openings.

F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on floor tiles as marked on substrates. Use chalk or other nonpermanent marking device.

G. Adhere floor tiles to flooring substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.

3.4 CLEANING AND PROTECTION

A. Comply with manufacturer's written instructions for cleaning and protecting floor tile.

B. Perform the following operations immediately after completing floor tile installation:

1. Remove adhesive and other blemishes from exposed surfaces.
2. Sweep and vacuum surfaces thoroughly.
3. Damp-mop surfaces to remove marks and soil.

C. Protect floor tile from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.

D. Floor Polish: Remove soil, adhesive, and blemishes from polyester resin composition floor tile surfaces before applying liquid floor polish.

1. Apply number of coats recommended by the manufacturer.

E. Cover floor tile until Substantial Completion.

END OF SECTION 096519

SECTION 096813 - TILE CARPETING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes modular carpet tile.

B. Related Requirements:

1. Section 096513 "Resilient Base and Accessories" for resilient wall base and accessories installed with carpet tile.

1.3 PRE-INSTALLATION MEETINGS

A. Pre-installation Conference: Conduct conference at Project site.

1. Review methods and procedures related to carpet tile installation including, but not limited to, the following:

a. Review delivery, storage, and handling procedures.
b. Review ambient conditions and ventilation procedures.
c. Review subfloor preparation procedures.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include manufacturer's written data on physical characteristics, durability, and fade resistance.
2. Include installation recommendations for each type of substrate.

B. HPBS Submittals:

1. Product Data for Section 16a-38k-5(d):

a. For carpet tile, documentation indicating compliance with testing and product requirements of CRI's "Green Label Plus" program.
b. For installation adhesive, documentation including printed statement of VOC content.

2. Product Data for Section 16a-38k-6(d)(8): For products having recycled content, documentation indicating percentages by weight of postconsumer and pre-consumer recycled content. Include statement indicating cost for each product having recycled content.

C. Shop Drawings: For carpet tile installation, plans showing the following:

1. Columns, doorways, enclosing walls or partitions, built-in cabinets, and locations where cutouts are required in carpet tiles.
2. Carpet tile type, color, and dye lot.
3. Type of subfloor.
4. Type of installation.
5. Pattern of installation.
6. Pattern type, location, and direction.
7. Pile direction.
8. Type, color, and location of insets and borders.
9. Type, color, and location of edge, transition, and other accessory strips.
10. Transition details to other flooring materials.

D. Samples: For each of the following products and for each color and texture required. Label each Sample with manufacturer's name, material description, color, pattern, and designation indicated on Drawings and in schedules.

1. Carpet Tile: Full-size Sample.
2. Exposed Edge, Transition, and Other Accessory Stripping: 12-inch-long Samples.

E. Product Schedule: For carpet tile. Use same designations indicated on Drawings.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Test Reports: For carpet tile, for tests performed by a qualified testing agency.

C. Sample Warranty: For special warranty.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For carpet tiles to include in maintenance manuals. Include the following:

1. Methods for maintaining carpet tile, including cleaning and stain-removal products and procedures and manufacturer's recommended maintenance schedule.
2. Precautions for cleaning materials and methods that could be detrimental to carpet tile.

1.7 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Carpet Tile: Full-size units equal to five percent (5%) of amount installed for each type indicated, but not less than 10 sq. yd.

1.8 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who is certified by the International Certified Floorcovering Installers Association at the Commercial II certification level.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Comply with CRI's "CRI Carpet Installation Standard."

1.10 FIELD CONDITIONS

A. Comply with CRI's "CRI Carpet Installation Standard" for temperature, humidity, and ventilation limitations.

B. Environmental Limitations: Do not deliver or install carpet tiles until spaces are enclosed and weathertight, wet work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at occupancy levels during the remainder of the construction period.

1.11 WARRANTY

A. Special Warranty for Carpet Tiles: Manufacturer agrees to repair or replace components of carpet tile installation that fail in materials or workmanship within specified warranty period.

1. Warranty does not include deterioration or failure of carpet tile due to unusual traffic, failure of substrate, vandalism, or abuse.
2. Failures include, but are not limited to, more than ten percent (10%) edge raveling, snags, runs, dimensional stability, excess static discharge, loss of tuft bind strength, loss of face fiber, and delamination.
3. Warranty Period: Limited lifetime.

PART 2 - PRODUCTS

2.1 CARPET TILE MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. FLOR
2. Forbo Flooring Systems
3. Interface, Inc.
4. J&J Flooring Group, LLC
5. Mannington Commercial
6. Mohawk Group
7. Patcraft
8. Shaw Contract Group
9. Substitutions: Under provisions of Section 012500 “Substitution Procedures”.

2.2 CARPET TILE

A. Basis-of-Design Product:

1. Mannington Commercial; **Everywear Plus**
2. Material Characteristics: **CPT**, as indicated in Section 090000 “Schedule of Finishes”.

a. Fiber Content: One hundred percent (100%) nylon 6.
b. Construction: Non-patterned loop.

3. Applied Treatments:

a. Soil-Resistance Treatment: Manufacturer's standard treatment.

2.3 INSTALLATION ACCESSORIES

A. Trowelable Leveling and Patching Compounds: Latex-modified, hydraulic-cement-based formulation provided or recommended by carpet tile manufacturer.

B. Adhesives: Water-resistant, mildew-resistant, non-staining, pressure-sensitive type to suit products and subfloor conditions indicated, that complies with flammability requirements for installed carpet tile and is recommended by carpet tile manufacturer for releasable installation.

1. Adhesives shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for maximum moisture content, alkalinity range, installation tolerances, and other conditions affecting carpet tile performance.

B. Examine carpet tile for type, color, pattern, and potential defects.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. General: Comply with CRI's "Carpet Installation Standards" and with carpet tile manufacturer's written installation instructions for preparing substrates indicated to receive carpet tile.

B. Use trowelable leveling and patching compounds, according to manufacturer's written instructions, to fill cracks, holes, depressions, and protrusions in substrates. Fill or level cracks, holes, and depressions 1/8-inch-wide or wider, and protrusions more than 1/32-inch unless more stringent requirements are required by manufacturer's written instructions. Expect and include in the Base Bid the requirement to apply and machine level at least three (3) coats of leveler in all spaces.

C. Substrates: Remove coatings, including curing compounds, and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, without using solvents. Use mechanical methods recommended in writing by adhesive and carpet tile manufacturers.

D. Broom and vacuum clean substrates to be covered immediately before installing carpet tile.

3.3 INSTALLATION

A. General: Comply with CRI's "CRI Carpet Installation Standard," Section 18, "Modular Carpet" and with carpet tile manufacturer's written installation instructions.

B. Installation Method: As indicated in Section 090000 “Schedule of Finishes” and as recommended in writing by carpet tile manufacturer.

C. Maintain dye lot integrity. Do not mix dye lots in same area.

D. Maintain pile-direction patterns recommended in writing by carpet tile manufacturer.

E. Cut and fit carpet tile to butt tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings. Bind or seal cut edges as recommended by carpet tile manufacturer.

F. Extend carpet tile into toe spaces, door reveals, closets, open-bottomed obstructions, removable flanges, alcoves, and similar openings.

G. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on finish flooring as marked on subfloor. Use nonpermanent, non-staining marking device.

H. Install pattern parallel to walls and borders.

3.4 CLEANING AND PROTECTION

A. Perform the following operations immediately after installing carpet tile:

1. Remove excess adhesive, seam sealer, and other surface blemishes using cleaner recommended by carpet tile manufacturer.
2. Remove yarns that protrude from carpet tile surface.
3. Vacuum carpet tile using commercial machine with face-beater element.

B. Protect installed carpet tile to comply with CRI's "Carpet Installation Standard," Section 20, "Protecting Indoor Installations."

C. Protect carpet tile against damage from construction operations and placement of equipment and fixtures during the remainder of construction period. Use protection methods indicated or recommended in writing by carpet tile manufacturer.

END OF SECTION 096813

SECTION 098433 - SOUND-ABSORBING WALL UNITS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes shop-fabricated panel units tested for acoustical performance, including:

1. Sound-absorbing wall panels.

1.3 DEFINITIONS

A. NRC: Noise Reduction Coefficient.

1.4 PRE-INSTALLATION MEETINGS

A. Pre-installation Conference: Conduct conference at Project site.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include fabric facing, panel edge, core material, and mounting indicated.

B. HPBS Submittals:

1. Product Data for Section 16a-38k-6(d)(8): For products having recycled content, documentation indicating percentages by weight of postconsumer and pre-consumer recycled content. Include statement indicating cost for each product having recycled content.
2. Product Certificates for Section 16a-38k-6(d)(10): For products and materials required to comply with requirements for regionally manufactured materials. Include statement indicating cost, location of manufacturer, and distance to Project for each regionally manufactured material.

C. Shop Drawings: For unit assembly and installation.

1. Include plans, elevations, sections, and mounting devices and details.
2. Include details at panel head, base, joints, and corners; and details at ceiling, floor base, and wall intersections. Indicate panel edge and core materials.
3. Include details at cutouts and penetrations for other work.
4. Include elevations showing panel sizes.

D. Samples: For the following products:

1. Fabric: Full-width by approximately 36-inch-long Sample, but not smaller than required to show complete pattern repeat, from dye lot to be used for the Work, and with specified treatments applied. Mark top and face of fabric.

2. Mounting Devices: Full-size Samples.

1.6 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Elevations and other details, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Electrical outlets, switches, and thermostats.
2. Items penetrating or covered by sound-absorbing units including the following:

a. Lighting fixtures.
b. Air outlets and inlets.
c. Speakers.
d. Alarms.
e. Sprinklers.
f. Access panels.

3. Show operation of hinged and sliding components covered by or adjacent to units.

B. Warranty: Sample of special warranty.

1.7 CLOSEOUT SUBMITTALS

A. Maintenance Data: For sound-absorbing units to include in maintenance manuals. Include manufacturers' written cleaning and stain-removal recommendations.

1.8 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials from same production run that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Sound-Absorbing Wall Units: Full-size units equal to five percent (5%) of amount installed, but no fewer than five (5) units, minimum of one (1) of each color and size.
2. Mounting Devices: Full-size units equal to five percent (5%) of amount installed, but no fewer than five (5) devices.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Comply with fabric and unit manufacturers' written instructions for minimum and maximum temperature and humidity requirements for shipment, storage, and handling.

B. Deliver materials and units in unopened bundles and store in a temperature-controlled dry place with adequate air circulation.

1.10 PROJECT CONDITIONS

A. Environmental Limitations: Do not install units until spaces are enclosed and weathertight, wet work in spaces is complete and dry, work at and above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

B. Lighting: Do not install sound-absorbing units until a permanent level of lighting is provided on surfaces to receive the units.

C. Air-Quality Limitations: Protect units from exposure to airborne odors, such as tobacco smoke, and install units under conditions free from odor contamination of ambient air.

D. Field Measurements: Verify locations of sound-absorbing wall units and actual dimensions of openings and penetrations by field measurements before fabrication.

1.11 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace units and components that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to the following:

a. Acoustical performance.
b. Fabric sagging, distorting, or releasing from panel edge.
c. Warping of core.

2. Warranty Period: Manufacturer’s standard, but minimum of one (1) year from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Acoustical Panel Systems (APS, Inc.)
2. Acoustical Solutions, Inc.
3. Armstrong World Industries, Inc.
4. Conwed, a division of Owens Corning
5. Decoustics Limited; a CertainTeed Ceilings company
6. Sound Management Group LLC
7. Surface Materials
8. Substitutions: Under provisions of Section 012500 “Substitution Procedures”.

2.2 PERFORMANCE REQUIREMENTS

A. Fire-Test-Response Characteristics: Units shall comply with "Surface-Burning Characteristics" or "Fire Growth Contribution" Subparagraph below, or both, as determined by testing identical products by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:

1. Surface-Burning Characteristics: Comply with ASTM E 84 or UL 723; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

a. Flame-Spread Index: 25 or less.
b. Smoke-Developed Index: 450 or less.

2. Fire Growth Contribution: Comply with acceptance criteria of local code and authorities having jurisdiction when tested according to NFPA 265 Method B Protocol or NFPA 286.

2.3 SOUND-ABSORBING WALL UNITS

A. Sound-Absorbing Wall Panel: Manufacturer's standard panel construction consisting of facing material stretched over front face of edge-framed core and bonded or attached to edges and back of frame.

1. Basis-of-Design Product:

   a. Conwed, a division of Owens Corning; **Respond A Series**

2. Mounting: Back mounted with manufacturer's standard metal clips or bar hangers, secured to substrate.
3. Core: Glass-fiber board.
4. Edge Construction: Manufacturer's standard chemically hardened core with no frame.
5. Edge Profile: Square.
6. Corner Detail in Elevation: Square with continuous edge profile indicated.
7. Acoustical Performance: Sound absorption NRC of not less than 0.80 according to ASTM C 423 for Type A mounting according to ASTM E 795.
8. Facing Material, Panel Thickness, Width, Height, and Color: **AWP**, as indicated in Section 090000 “Schedule of Finishes”.

2.4 MATERIALS

A. General:

1. Minimum Recycled Content: Postconsumer recycled content plus one-half of pre-consumer recycled content not less than fifty-three (53%) by weight.
2. Regional Materials: Sound-absorbing wall units shall be manufactured within five hundred (500) miles of Project site.

B. Core Materials:

1. Glass-Fiber Board: ASTM C 612; of type standard with manufacturer; nominal density of 6 to 7 lb./cu. ft., unfaced, and dimensionally stable, molded rigid board; and with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively.

C. Mounting Devices:

1. Metal Clips or Bar Hangers: Manufacturer's standard two-part metal "Z" clips, with one part of each clip mechanically attached to back of unit and the other part to substrate, designed to permit unit removal.

2.5 FABRICATION

A. Standard Construction: Use manufacturer's standard construction unless otherwise indicated; with facing material applied to all faces of dimensionally stable core; and with rigid edges to reinforce panel perimeter against warpage and damage.

B. Edge Hardening: For glass-fiber board cores, chemically harden core edges and areas of core where mounting devices are attached.

C. Facing Material: Apply fabric facing fully covering visible surfaces of unit; with material stretched straight, on the grain, tight, square, and free from puckers, ripples, wrinkles, sags, blisters, seams, adhesive, or other visible distortions or foreign matter.

1. Square Corners: Tailor corners.
2. Radius and Other Non-Square Corners: Attach facing material so there are no seams or gathering of material.

D. Dimensional Tolerances of Finished Units: Plus or minus 1/16-inch for the following:

1. Thickness.
2. Edge straightness.
3. Overall length and width.
4. Squareness from corner to corner.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine fabric, fabricated units, substrates, areas, and conditions, for compliance with requirements, installation tolerances, and other conditions affecting unit performance.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install units in locations indicated on Drawings. Unless otherwise indicated, install units with vertical surfaces and edges plumb, top edges level and in alignment with other units, faces flush, and scribed to fit adjoining work accurately at borders and at penetrations.

B. Comply with manufacturer's written instructions for installation of units using type of mounting devices indicated. Mount units securely to supporting substrate.

C. Align and level fabric pattern and grain among adjacent units.

3.3 INSTALLATION TOLERANCES

A. Variation from Plumb and Level: Plus or minus 1/16-inch.

B. Variation of Panel Joints from Hairline: Not more than 1/16-inch-wide.

3.4 CLEANING

A. Clip loose threads; remove pills and extraneous materials.

B. Clean panels on completion of installation to remove dust and other foreign materials according to manufacturer's written instructions.

END OF SECTION 098433

SECTION 098436 - SOUND-ABSORBING CEILING UNITS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes shop-fabricated, acoustical panel units tested for acoustical performance, including the following:

1. Sound-absorbing ceiling units.

1.3 DEFINITIONS

A. NRC: Noise Reduction Coefficient.

1.4 PRE-INSTALLATION MEETINGS

A. Pre-installation Conference: Conduct conference at Project site.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include panel edge, core material, fire-resistive characteristics, finishes, and mounting indicated.

B. HPBS Submittals:

1. Product Data for Section 16a-38k-6(d)(8): For products having recycled content, documentation indicating percentages by weight of postconsumer and pre-consumer recycled content. Include statement indicating cost for each product having recycled content.

C. Shop Drawings: For unit assembly and installation.

1. Include reflected ceiling plans, elevations, sections, and mounting devices and details.

D. Samples: For the following products:

1. Assembled Panels: Approximately 24 by 24 inches, including mounting methods.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Manufacturer and Installer.

B. Coordination Drawings: Reflected ceiling plans and other details, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Electrical outlets.
2. Suspended ceiling components above ceiling units.
3. Structural members to which suspension devices will be attached.
4. Items penetrating or covered by units including the following:

    a. Lighting fixtures.
    b. Air outlets and inlets.
    c. Speakers.
    d. Alarms.
    e. Sprinklers.
    f. Access panels.

5. Show operation of hinged and sliding components covered by or adjacent to units.

C. Product Certificates: For each type of unit.

D. Sample Warranty: For manufacturer's special warranty.

1.7 CLOSEOUT SUBMITTALS

A. Maintenance Data: For each type of unit to include in maintenance manuals. Include manufacturer's written cleaning and stain-removal instructions.

1.8 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Mounting Devices: Full-size units equal to five percent (5%) of amount installed, but no fewer than five (5) devices.

1.9 QUALITY ASSURANCE

A. Manufacturer's Qualifications: Firm with not less than five (5) years' experience in manufacturing of products similar in complexity to those required for this Project.

B. Installer's Qualifications: Firm with not less than five (5) years' experience in installation of products similar in complexity to those required for this Project, including specific requirements indicated.

1. Successfully completed not less than five (5) comparable scale projects.

1.10 DELIVERY, STORAGE, AND HANDLING

A. Comply with unit manufacturers' written instructions for minimum and maximum temperature and humidity requirements for shipment, storage, and handling.

B. Deliver materials and units in unopened bundles and store in a temperature-controlled dry place with adequate air circulation.

1.11 FIELD CONDITIONS

A. Environmental Limitations: Do not install units until spaces are enclosed and weathertight, wet-work in spaces is complete and dry, work at and above ceilings is complete, and ambient

temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

B. Field Measurements: Verify unit locations and actual dimensions of openings and penetrations by field measurements before fabrication and indicate them on Shop Drawings.

1.12 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace units and components that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Acoustical performance.

2. Warranty Period: Three (3) years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Acoustical Solutions, Inc.
2. Arktura, LLC
3. Armstrong World Industries, Inc.
4. Kirei Usa
5. Substitutions: Under provisions of Section 012500 “Substitution Procedures”.

B. Source Limitations: Obtain each type of ceiling unit specified from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. Fire-Test-Response Characteristics: Units shall comply with "Surface-Burning Characteristics" or "Fire Growth Contribution" Subparagraph below, or both, as determined by testing identical products by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:

1. Surface-Burning Characteristics: Comply with ASTM E84 or UL 723; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

a. Flame-Spread Index: 25 or less.
b. Smoke-Developed Index: 450 or less.

2. Fire Growth Contribution: Comply with acceptance criteria of local code and authorities having jurisdiction when tested according to NFPA 286.

2.3 SOUND-ABSORBING CEILING UNITS

A. Sound-Absorbing Cloud: Manufacturer's standard panel construction consisting of one hundred percent (100%) PET plastic.

1. Basis-of-Design Product:

    a. Kirei USA; **Hyperfly Clouds**

3. Mounting: Top-edge mounted with manufacturer's standard suspension system with stiffening top-support angle, secured to substrate.
4. Edge Profile: . Manufacturer’s standard.
5. Acoustical Performance: Sound absorption NRC of 0.40 according to ASTM C 423.
6. Panel Thickness, Width, Height, and Color: **ACC-2**, as indicated in Section 090000 “Schedule of Finishes”.

2.4 MATERIALS

A. Core Materials: Manufacturer's standard.

B. Mounting Devices:

1. Concealed on back or top edge of unit, recommended by manufacturer to support weight of unit.

    a. 1/16-inch aircraft cable.

2. Manufacturer’s standard screw for substrate.

2.5 FABRICATION

A. Standard Construction: Use manufacturer's standard construction unless otherwise indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine fabricated units, substrates, areas, and conditions for compliance with requirements, installation tolerances, and other conditions affecting unit performance.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install units in locations indicated. Unless otherwise indicated, install units with edges in alignment with walls and other units, faces flush, and scribed to fit adjoining work accurately at borders and at penetrations.

B. Comply with manufacturer's written instructions for installation of units using type of mounting devices indicated. Mount units securely to supporting substrate.

3.3 INSTALLATION TOLERANCES

A. Variation from Alignment with Surfaces: Plus or minus 1/16-inch in 48 inches, non-cumulative.

B. Variation from Level or Slope: Plus or minus 1/16-inch.

3.4 CLEANING

A. Clean panels on completion of installation to remove dust and other foreign materials according to manufacturer's written instructions.

B. Remove and reinstall improperly installed material.

C. Remove damaged or discolored material, or material that cannot be properly cleaned, and install new material.

END OF SECTION 098436

SECTION 099113 - EXTERIOR PAINTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes surface preparation and the application of paint systems on the following exterior substrates:

1. Steel and iron.
2. Galvanized metal.

1.3 DEFINITIONS

A. Gloss Level 5: 35 to 70 units at 60 degrees, according to ASTM D 523.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product. Include preparation requirements and application instructions.

B. Samples: For each type of paint system and each color and gloss of topcoat.

1. Submit Samples on rigid backing, 8 inches square.
2. Step coats on Samples to show each coat required for system.
3. Label each coat of each Sample.
4. Label each Sample for location and application area.

C. Product List: For each product indicated, include the following:

1. Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules.
2. Printout of current "MPI Approved Products List" for each product category specified, with the proposed product highlighted.
3. VOC content.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Paint: Five percent, (5%) but not less than 1 gal. of each material and color applied.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F.

1. Maintain containers in clean condition, free of foreign materials and residue.
2. Remove rags and waste from storage areas daily.

1.7 FIELD CONDITIONS

A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F.

B. Do not apply paints in snow, rain, fog, or mist; when relative humidity exceeds eighty-five percent (85%); at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Behr Process Corporation
2. Benjamin Moore & Co.
3. Duron, Inc.
4. ICI Paints
5. PPG Architectural Finishes, Inc.
6. Sherwin-Williams Company (The)
7. Substitutions: Under provisions of Section 012500 “Substitution Procedures”.

2.2 PAINT, GENERAL

A. MPI Standards: Provide products that comply with MPI standards indicated and that are listed in its "MPI Approved Products List."

B. Material Compatibility:

1. Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
2. For each coat in a paint system, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.

C. VOC Content: Provide materials that comply with VOC limits of authorities having jurisdiction.

D. Colors: As selected by Architect and Owner from manufacturer’s entire range.

2.3 SOURCE QUALITY CONTROL

A. Testing of Paint Materials: Owner reserves the right to invoke the following procedure:

1. Owner will engage the services of a qualified testing agency to sample paint materials. Contractor will be notified in advance and may be present when samples are taken. If paint materials have already been delivered to Project site, samples may be taken at Project site. Samples will be identified, sealed, and certified by testing agency.
2. Testing agency will perform tests for compliance with product requirements.

3. Owner may direct Contractor to stop applying paints if test results show materials being used do not comply with product requirements. Contractor shall remove noncomplying paint materials from Project site, pay for testing, and repaint surfaces painted with rejected materials. Contractor will be required to remove rejected materials from previously painted surfaces if, on repainting with complying materials, the two (2) paints are incompatible.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

B. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.

C. Proceed with coating application only after unsatisfactory conditions have been corrected.

1. Application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Comply with manufacturer's written instructions and recommendations in "MPI Manual" applicable to substrates and paint systems indicated.

B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.

1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection.

C. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.

1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce paint systems indicated.

D. Steel Substrates: Remove rust, loose mill scale, and shop primer if any. Clean using methods recommended in writing by paint manufacturer but not less than the following:

1. SSPC-SP 3.

E. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints.

3.3 APPLICATION

A. Apply paints according to manufacturer's written instructions and recommendations in "MPI Manual."

1. Use applicators and techniques suited for paint and substrate indicated.

2. Paint surfaces behind movable items same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed items with prime coat only.
3. Paint both sides and edges of exterior doors and entire exposed surface of exterior door frames.
4. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
5. Primers specified in painting schedules may be omitted on items that are factory primed or factory finished if acceptable to topcoat manufacturers.

B. Tint undercoats same color as topcoat but tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Provide sufficient difference in shade of undercoats to distinguish each separate coat.

C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.

D. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

E. Painting Fire Suppression, Plumbing, HVAC, Electrical, Communication, and Electronic Safety and Security Work:

1. Paint the following work where exposed to view, unless factory-finished:

a. Equipment, including panelboards and switch gear.
b. Uninsulated metal piping.
c. Pipe hangers and supports.
d. Metal conduit.
e. Tanks that do not have factory-applied final finishes.

3.4 FIELD QUALITY CONTROL

A. Dry Film Thickness Testing: Owner may engage the services of a qualified testing and inspecting agency to inspect and test paint for dry film thickness.

1. Contractor shall touch up and restore painted surfaces damaged by testing.
2. If test results show that dry film thickness of applied paint does not comply with paint manufacturer's written recommendations, Contractor shall pay for testing and apply additional coats as needed to provide dry film thickness that complies with paint manufacturer's written recommendations.

3.5 CLEANING AND PROTECTION

A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.

B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.

D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.6 EXTERIOR PAINTING SCHEDULE

A. Steel and Iron Substrates:

1. Water-Based Light Industrial Coating System:

a. Prime Coat: Primer, zinc rich, inorganic, **MPI #19**.
b. Intermediate Coat: Light industrial coating, exterior, water based, matching topcoat.
c. Topcoat: Light industrial coating, exterior, water based, semi-gloss (Gloss Level 5), **MPI #163**.

B. Galvanized-Metal Substrates:

1. Water-Based Light Industrial Coating System:

a. Prime Coat: Primer, galvanized, water based**, MPI #134**.
b. Intermediate Coat: Light industrial coating, exterior, water based, matching topcoat.
c. Topcoat: Light industrial coating, exterior, water based, semi-gloss (Gloss Level 5), **MPI #163**.

END OF SECTION 099113

SECTION 099123 - INTERIOR PAINTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes surface preparation and the application of paint systems on the following interior substrates:

1. Concrete.
2. Concrete masonry units (CMU).
3. Steel and iron.
4. Galvanized metal.
5. Gypsum board.

B. Related Requirements:

1. Section 099113 "Exterior Painting" for surface preparation and the application of paint systems on exterior substrates.
2. Section 099600 "High-Performance Coatings" for high-performance and special-use coatings.

1.3 DEFINITIONS

A. Gloss Level 1: Not more than 5 units at 60 degrees and 10 units at 85 degrees, according to ASTM D 523.

B. Gloss Level 3: 10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523.

C. Gloss Level 5: 35 to 70 units at 60 degrees, according to ASTM D 523.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product. Include preparation requirements and application instructions.

1. Include Printout of current "MPI Approved Products List" for each product category specified, with the proposed product highlighted.
2. Indicate VOC content.

B. Samples: For each type of paint system and in each color and gloss of topcoat.

1. Submit Samples on rigid backing, 8 inches square.
2. Apply coats on Samples to show each coat required for system.
3. Label each coat of each Sample.
4. Label each Sample for location and application area.

C. Product List: Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules. Include color designations.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Paint: Five percent (5%), but not less than 1 gal. of each material and color applied.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F.

1. Maintain containers in clean condition, free of foreign materials and residue.
2. Remove rags and waste from storage areas daily.

1.7 FIELD CONDITIONS

A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F.

B. Do not apply paints when relative humidity exceeds eighty-five percent (85%); at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design:

1. Benjamin Moore & Co.
2. Sherwin-Williams Company (The)

B. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. ICI Paints
2. Substitutions: Under provisions of Section 012500 “Substitution Procedures”.

2.2 PAINT, GENERAL

A. MPI Standards: Provide products that comply with MPI standards indicated and that are listed in its "MPI Approved Products List."

B. Material Compatibility:

1. Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
2. For each coat in a paint system, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.

C. VOC Content: Products shall comply with VOC limits of authorities having jurisdiction and, for interior paints and coatings applied at Project site, the following VOC limits, exclusive of colorants added to a tint base, when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

1. Flat Paints and Coatings: 50 g/L.
2. Non-Flat Paints and Coatings: 150 g/L.
3. Primers, Sealers, and Undercoaters: 200 g/L.
4. Anti-corrosive and Anti-rust Paints Applied to Ferrous Metals: 250 g/L.
5. Zinc-Rich Industrial Maintenance Primers: 340 g/L.
6. Floor Coatings: 100 g/L.

D. Colors: As selected by Architect and Owner from manufacturer's entire range if not specified as **PT** or **SC** in Section 090000 "Schedule of Finishes".

2.3 SOURCE QUALITY CONTROL

A. Testing of Paint Materials: Owner reserves the right to invoke the following procedure:

1. Owner will engage the services of a qualified testing agency to sample paint materials. Contractor will be notified in advance and may be present when samples are taken. If paint materials have already been delivered to Project site, samples may be taken at Project site. Samples will be identified, sealed, and certified by testing agency.
2. Testing agency will perform tests for compliance with product requirements.
3. Owner may direct Contractor to stop applying coatings if test results show materials being used do not comply with product requirements. Contractor shall remove noncomplying paint materials from Project site, pay for testing, and repaint surfaces painted with rejected materials. Contractor will be required to remove rejected materials from previously painted surfaces if, on repainting with complying materials, the two (2) paints are incompatible.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:

1. Concrete: Twelve percent (12%).
2. Masonry (Clay and CMUs): Twelve percent (12%).
3. Gypsum Board: Twelve percent (12%).

C. Gypsum Board Substrates: Verify that finishing compound is sanded smooth.

D. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.

E. Proceed with coating application only after unsatisfactory conditions have been corrected.

1. Application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Comply with manufacturer's written instructions and recommendations in "MPI Manual" applicable to substrates indicated.

B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.

1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.

C. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.

1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce paint systems indicated.

D. Concrete Substrates: Remove release agents, curing compounds, efflorescence, and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces to be painted exceeds that permitted in manufacturer's written instructions.

E. Masonry Substrates: Remove efflorescence and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces or mortar joints exceeds that permitted in manufacturer's written instructions.

F. Steel Substrates: Remove rust, loose mill scale, and shop primer, if any. Clean using methods recommended in writing by paint manufacturer but not less than the following:

1. SSPC-SP 3, "Power Tool Cleaning."

G. Shop-Primed Steel Substrates: Clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material as used for shop priming to comply with SSPC-PA 1 for touching up shop-primed surfaces.

H. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints.

3.3 APPLICATION

A. Apply paints according to manufacturer's written instructions and to recommendations in "MPI Manual."

1. Use applicators and techniques suited for paint and substrate indicated.
2. Paint surfaces behind movable equipment and furniture same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
3. Paint front and backsides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.
4. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
5. Primers specified in painting schedules may be omitted on items that are factory primed or factory finished if acceptable to topcoat manufacturers.

B. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Tint undercoats to match color of topcoat, but provide sufficient difference in shade of undercoats to distinguish each separate coat.

C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.

D. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

E. Painting Fire Suppression, Plumbing, HVAC, Electrical, Communication, and Electronic Safety and Security Work:

1. Paint the following work where exposed in equipment rooms, unless factory-finished:

   a. Equipment, including panelboards.
   b. Uninsulated metal piping.
   c. Pipe hangers and supports.
   d. Metal conduit.
   e. Tanks that do not have factory-applied final finishes.
   f. Duct, equipment, and pipe insulation having cotton or canvas insulation covering or other paintable jacket material.

2. Paint the following work where exposed in occupied spaces, unless factory-finished:

   a. Equipment, including panelboards.
   b. Uninsulated metal piping.
   c. Pipe hangers and supports.
   d. Metal conduit.
   e. Duct, equipment, and pipe insulation having cotton or canvas insulation covering or other paintable jacket material.
   f. Other items as directed by Architect.

3. Paint portions of internal surfaces of metal ducts, without liner, behind air inlets and outlets that are visible from occupied spaces.

3.4 FIELD QUALITY CONTROL

A. Dry Film Thickness Testing: Owner may engage the services of a qualified testing and inspecting agency to inspect and test paint for dry film thickness.

1. Contractor shall touch up and restore painted surfaces damaged by testing.
2. If test results show that dry film thickness of applied paint does not comply with paint manufacturer's written recommendations, Contractor shall pay for testing and apply additional coats as needed to provide dry film thickness that complies with paint manufacturer's written recommendations.

3.5 CLEANING AND PROTECTION

A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.

B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.

D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.6 INTERIOR PAINTING SCHEDULE

A. Concrete Substrates, Traffic Surfaces:

1. Water-Based Concrete Floor Sealer System:

a. First Coat: Sealer, water based, for concrete floors, matching topcoat.
b. Topcoat: Sealer, water based, for concrete floors, **MPI #99**.

B. CMU Substrates:

1. Institutional Low-Odor/VOC Latex System:

a. Block Filler: Block filler, latex, interior/exterior, **MPI #4**.
b. Intermediate Coat: Latex, interior, institutional low odor/VOC, matching topcoat.
c. Topcoat: Latex, interior, institutional low odor/VOC, eggshell (Gloss Level 3), **MPI #145**.

C. Steel Substrates:

1. Institutional Low-Odor/VOC Latex System:

a. Prime Coat: Primer, rust-inhibitive, water based, **MPI #107**.
b. Intermediate Coat: Latex, interior, institutional low odor/VOC, matching topcoat.
c. Topcoat: Latex, interior, institutional low odor/VOC, semi-gloss (Gloss Level 5), **MPI #148**.

D. Galvanized-Metal Substrates:

1. Institutional Low-Odor/VOC Latex System:

a. Prime Coat: Primer, galvanized, water based, **MPI #134**.
b. Intermediate Coat: Latex, interior, institutional low odor/VOC, matching topcoat.
c. Topcoat: Latex, interior, institutional low odor/VOC, flat (Gloss Level 1), **MPI #143**.
d. Topcoat: Latex, interior, institutional low odor/VOC, semi-gloss (Gloss Level 5), **MPI #148**.

E. Gypsum Board Substrates:

1. Institutional Low-Odor/VOC Latex System:

a. Prime Coat: Primer sealer, interior, institutional low odor/VOC, **MPI #149**.
b. Intermediate Coat: Latex, interior, institutional low odor/VOC, matching topcoat.
c. Topcoat: Latex, interior, institutional low odor/VOC, flat (Gloss Level 1), **MPI #143**, at ceilings.
d. Topcoat: Latex, interior, institutional low odor/VOC, eggshell, (Gloss Level 3), **MPI #145**.

END OF SECTION 099123

SECTION 099600 - HIGH-PERFORMANCE COATINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes surface preparation and the application of high-performance coating systems on the following substrates:

1. Interior Substrates:

a. Concrete masonry units (CMUs).
b. Steel.
c. Gypsum board.

B. Related Requirements:

1. Section 099113 "Exterior Painting" for general field painting.
2. Section 099123 "Interior Painting" for general field painting.

1.3 DEFINITIONS

A. Gloss Level 1: Not more than 5 units at 60 degrees and 10 units at 85 degrees, according to ASTM D 523.

B. Gloss Level 3: 10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523.

C. Gloss Level 5: 35 to 70 units at 60 degrees, according to ASTM D 523.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product. Include preparation requirements and application instructions.

1. Include printout of current "MPI Approved Products List" for each product category specified, with the proposed product highlighted.
2. Indicate VOC content.

B. Samples: For each type of coating system and in each color and gloss of topcoat indicated.

1. Submit Samples on rigid backing, 8 inches square.
2. Apply coats on Samples to show each coat required for system.
3. Label each coat of each Sample.
4. Label each Sample for location and application area.

C. Product List: Cross-reference to coating system and locations of application areas. Use same designations indicated on Drawings and in schedules. Include color designations.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Coatings: Five percent (5%), but not less than 1 gallon of each material and color applied.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F.

1. Maintain containers in clean condition, free of foreign materials and residue.
2. Remove rags and waste from storage areas daily.

1.7 FIELD CONDITIONS

A. Apply coatings only when temperature of surfaces to be coated and ambient air temperatures are between 50 and 95 deg F.

B. Do not apply coatings when relative humidity exceeds eighty-five percent (85%); at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.

C. Do not apply exterior coatings in snow, rain, fog, or mist.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design:

1. Sherwin-Williams Company (The)

B. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Behr Process Corporation
2. Benjamin Moore & Co.
3. ICI Paints
4. Sumter Coatings, Inc.
5. Substitutions: Under provisions of Section 012500 “Substitution Procedures”.

2.2 HIGH-PERFORMANCE COATINGS, GENERAL

A. MPI Standards: Provide products that comply with MPI standards indicated and are listed in "MPI Approved Products List."

B. Material Compatibility:

1. Materials for use within each coating system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.

2. For each coat in a coating system, provide products recommended in writing by manufacturers of topcoat for use in coating system and on substrate indicated.
3. Products shall be of same manufacturer for each coat in a coating system.

C. VOC Content: Products shall comply with VOC limits of authorities having jurisdiction and, for interior coatings applied at Project site, the following VOC limits, exclusive of colorants added to a tint base:

1. Non-Flat Paints and Coatings: 150 g/L.
2. Primers, Sealers, and Undercoaters: 200 g/L.
3. Anti-Corrosive and Anti-Rust Paints Applied to Ferrous Metals: 250 g/L.
4. Zinc-Rich Industrial Maintenance Primers: 340 g/L.
5. Pretreatment Wash Primers: 420 g/L.

D. Colors: **EP**, as indicated in Section 090000 “Schedule of Finishes”.

2.3 SOURCE QUALITY CONTROL

A. Testing of Coating Materials: Owner reserves the right to invoke the following procedure:

1. Owner will engage the services of a qualified testing agency to sample coating materials. Contractor will be notified in advance and may be present when samples are taken. If coating materials have already been delivered to Project site, samples may be taken at Project site. Samples will be identified, sealed, and certified by testing agency.
2. Testing agency will perform tests for compliance with product requirements.
3. Owner may direct Contractor to stop applying coatings if test results show materials being used do not comply with product requirements. Contractor shall remove noncomplying coating materials from Project site, pay for testing, and recoat surfaces coated with rejected materials. Contractor will be required to remove rejected materials from previously coated surfaces if, on recoating with complying materials, the two (2) coatings are incompatible.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:

1. Masonry (Clay and CMUs): Twelve percent (12%).
2. Gypsum Board: Twelve percent (12%).

C. Gypsum Board Substrates: Verify that finishing compound is sanded smooth.

D. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.

E. Proceed with coating application only after unsatisfactory conditions have been corrected.

1. Application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates and coating systems indicated.

B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.

1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection.

C. Clean substrates of substances that could impair bond of coatings, including dust, dirt, oil, grease, and incompatible paints and encapsulants.

1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce coating systems indicated.

D. Steel Substrates: Remove rust, loose mill scale, and shop primer if any. Clean using methods recommended in writing by paint manufacturer.

E. Shop-Primed Steel Substrates: Clean field welds, bolted connections, and areas where shop paint is abraded. Paint exposed areas with the same material as used for shop priming to comply with SSPC-PA 1 for touching up shop-primed surfaces.

3.3 APPLICATION

A. Apply high-performance coatings according to manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual."

1. Use applicators and techniques suited for coating and substrate indicated.
2. Coat surfaces behind movable equipment and furniture same as similar exposed surfaces. Before final installation, coat surfaces behind permanently fixed equipment or furniture with prime coat only.
3. Coat back sides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.
4. Do not apply coatings over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.

B. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of the same material are to be applied. Tint undercoats to match color of finish coat, but provide sufficient difference in shade of undercoats to distinguish each separate coat.

C. If undercoats or other conditions show through final coat, apply additional coats until cured film has a uniform coating finish, color, and appearance.

D. Apply coatings to produce surface films without cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections. Produce sharp glass lines and color breaks.

3.4 FIELD QUALITY CONTROL

A. Dry Film Thickness Testing: Owner may engage the services of a qualified testing and inspecting agency to inspect and test coatings for dry film thickness.

1. Contractor shall touch up and restore coated surfaces damaged by testing.
2. If test results show that dry film thickness of applied coating does not comply with coating manufacturer's written recommendations, Contractor shall pay for testing and apply additional coats as needed to provide dry film thickness that complies with coating manufacturer's written recommendations.

3.5 CLEANING AND PROTECTION

A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.

B. After completing coating application, clean spattered surfaces. Remove spattered coatings by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

C. Protect work of other trades against damage from coating operation. Correct damage to work of other trades by cleaning, repairing, replacing, and recoating, as approved by Architect, and leave in an undamaged condition.

D. At completion of construction activities of other trades, touch up and restore damaged or defaced coated surfaces.

3.6 INTERIOR HIGH-PERFORMANCE COATING SCHEDULE

A. Steel Substrates:

1. Epoxy System, **MPI INT 5.1L**:

a. Prime Coat: Primer, epoxy, anti-corrosive, for metal, **MPI #101**.
b. Intermediate Coat: Epoxy, matching topcoat.
c. Topcoat: Epoxy, semi-gloss (Gloss Level 5), **MPI #77**.

B. Gypsum BoardSubstrates:

1. Epoxy System, **MPI INT 9.2E**:

a. Prime Coat: Primer sealer, latex, interior, **MPI #50**.
b. Intermediate Coat: Epoxy, matching topcoat.
c. Topcoat: Epoxy, interior, flat (Gloss Level 1), **MPI #77**, at ceilings.
d. Topcoat: Epoxy, interior, eggshell (Gloss Level 3), **MPI #77**.

END OF SECTION 099600

SECTION 101100 - VISUAL DISPLAY UNITS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Markerboards.
2. Tackboards.
3. Tack surfaces.
4. Display rails.

B. Related Requirements:

1. Section 101146 "Visual Display Fabrics" for visual display wall coverings intended for use with dry-erase markers.

1.3 DEFINITIONS

A. Tackboard: Framed or unframed, tackable, visual display board assembly.

B. Visual Display Board Assembly: Visual display surface that is factory fabricated into composite panel form, either with or without a perimeter frame; includes chalkboards, markerboards, and tackboards.

C. Visual Display Surface: Surfaces that are used to convey information visually, including surfaces of chalkboards, markerboards, tackboards, and surfacing materials that are not fabricated into composite panel form but are applied directly to walls.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, finishes, and accessories for visual display units.

B. HPBS Submittals:

1. Product Data for Section 16a-38k-5(d): For adhesives, documentation including printed statement of VOC content.
2. Product Data for Section 16a-38k-6(d)(8): For products having recycled content, documentation indicating percentages by weight of postconsumer and pre-consumer recycled content. Include statement indicating costs for each product having recycled content.

C. Shop Drawings: For visual display units.

1. Include plans, elevations, sections, details, and attachments to other work.
2. Show locations of panel joints.
3. Include sections of typical trim members.

D. Samples: For each type of visual display unit indicated, for units with factory-applied color finishes, and as follows:

1. Actual sections of porcelain-enamel face sheet and tackboard assembly surface.
2. Include accessory Samples to verify color selected.

E. Product Schedule: For visual display units. Use same designations indicated on Drawings.

1.5 INFORMATIONAL SUBMITTALS

A. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for surface-burning characteristics of fabrics.

B. Sample Warranties: For special warranties.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For visual display units to include in maintenance manuals.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver factory-fabricated visual display units completely assembled in one (1) piece. If dimensions exceed maximum manufactured unit size, or if unit size is impracticable to ship in one (1) piece, provide two (2) or more pieces with joints in locations indicated on approved Shop Drawings.

B. Store visual display surfaces vertically with packing materials between each unit.

1.8 FIELD CONDITIONS

A. Environmental Limitations: Do not deliver or install visual display surfaces until spaces are enclosed and weathertight, wet work in spaces is complete and dry, work above ceilings is complete, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

1.9 WARRANTY

A. Special Warranty for Porcelain-Enamel Face Sheets: Manufacturer agrees to repair or replace porcelain-enamel face sheets that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Surfaces lose original writing and erasing qualities.
b. Surfaces exhibit crazing, cracking, or flaking.

2. Warranty Period: Life of the building.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain each type of visual display unit from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Flame-Spread Index: 25 or less.
2. Smoke-Developed Index: 50 or less.

2.3 MARKERBOARD ASSEMBLIES

A. Porcelain-Enamel Markerboards: Balanced, high-pressure, factory-laminated markerboard assembly of three-ply construction consisting of moisture-barrier backing, core material, and 0.021-inch-thick, porcelain-enamel face sheet with high or low-gloss finish.

1. Basis-of-Design:

a. Claridge Products and Equipment, Inc.; **LCS Deluxe Series 3**

2. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. AARCO Products, Inc.
b. ADP Lemco, Inc.
c. Substitutions: Under provisions of Section 012500 “Substitution Procedures”.

3. MDF Core: 7/16-inch-thick; with manufacturer's standard moisture-barrier backing.
4. Laminating Adhesive: Manufacturer's standard, moisture-resistant thermoplastic type.

2.4 TACKBOARD PANELS

A. Plastic-Impregnated-Cork Tackboard Surface: ¼-inch-thick, plastic-impregnated cork factory laminated to ¼-inch-thick hardboard backing.

1. Basis-of-Design:

a. Forbo Flooring Systems; **Bulletin Board**

2. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. AARCO Products, Inc.
b. Claridge Products and Equipment, Inc.
c. Substitutions: Under provisions of Section 012500 “Substitution Procedures”.

2.5 MARKERBOARD AND TACKBOARD ACCESSORIES

A. Aluminum Frames and Trim: Fabricated from not less than 0.062-inch-thick, extruded aluminum; of size and shape indicated on Drawings.

1. Factory-Applied Trim: Manufacturer's standard.

B. Chalktray: Manufacturer's standard, continuous.

1. Box Type: Extruded aluminum with slanted front, grooved tray, and cast-aluminum end closures.

C. Display Rail: Manufacturer's standard, extruded-aluminum display rail with plastic-impregnated-cork insert, and end stops, designed to hold accessories.

1. Size: 1-inch high by full length of visual display unit.
2. Map Hooks: Two (2) map hooks for every 48 inches of display rail or fraction thereof.
3. Flag Holder: One (1) for each room.
4. Tackboard Insert Color: To match **TS-1**, as indicated in Section 090000 “Schedule of Finishes”.
5. Aluminum Color: Match finish of visual display assembly trim.

2.6 TACK SURFACES

A. Plastic-Impregnated-Cork Tackboard Surface: ¼-inch-thick, plastic-impregnated cork on natural burlap backing.

1. Basis-of-Design:

a. Koroseal Interior Products; **Tac-Wall**

2. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Forbo Flooring Systems
b. Substitutions: Under provisions of Section 012500 “Substitution Procedures”.

2.7 DISPLAY RAILS

A. Basis-of-Design:

1. Forbo Flooring Systems; **Bulletin Board**

B. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. AARCO Products, Inc.
2. Claridge Products and Equipment, Inc.
3. Substitutions: Under provisions of Section 012500 “Substitution Procedures”.

C. Aluminum Display Rail: Manufacturer's standard, extruded-aluminum display rail with plastic-impregnated-cork tackable insert, designed to hold accessories.

1. Aluminum Finish: Clear anodic finish.

D. Tackable Insert Color and Size: **TS-1**, as indicated in Section 090000 “Schedule of Finishes”.

E. End Stops: Aluminum.

2.8 MATERIALS, GENERAL

A. Porcelain-Enamel Face Sheet: Manufacturer's standard steel sheet with porcelain-enamel coating fused to steel; uncoated thickness indicated.

1. Matte Finish: Low reflective; chalk wipes clean with dry cloth or standard eraser.
2. Recycled Content: Postconsumer recycled content plus one-half of pre-consumer recycled content not less than thirty percent (30%).

B. Plastic-Impregnated-Cork Sheet: Seamless, homogeneous, self-sealing sheet consisting of granulated cork, linseed oil, resin binders, and dry pigments that are mixed and calendared onto fabric backing; with washable vinyl finish and integral color throughout with surface-burning characteristics indicated.

C. MDF: ANSI A208.2, Grade 130.

D. Hardboard: ANSI A135.4, tempered.

E. Extruded Aluminum: ASTM B 221, Alloy 6063.

2.9 FABRICATION

A. Porcelain-Enamel Visual Display Assemblies: Laminate porcelain-enamel face sheet and backing sheet to core material under heat and pressure with manufacturer's standard flexible, waterproof adhesive.

B. Visual Display Boards: Factory assemble visual display boards unless otherwise indicated.

1. Where factory-applied trim is indicated, trim shall be assembled and attached to visual display boards at manufacturer's factory before shipment.

C. Factory-Assembled Visual Display Units: Coordinate factory-assembled units with trim and accessories indicated. Join parts with a neat, precision fit.

1. Make joints only where total length exceeds maximum manufactured length. Fabricate with minimum number of joints, balanced around center of board, as acceptable to Architect.
2. Provide manufacturer's standard vertical-joint spline system between abutting sections of markerboards.
3. Provide manufacturer's standard mullion trim at joints between markerboards and tackboards of combination units.
4. Where size of visual display boards or other conditions require support in addition to normal trim, provide structural supports or modify trim as indicated or as selected by Architect from manufacturer's standard structural support accessories to suit conditions indicated.

D. Aluminum Frames and Trim: Fabricate units straight and of single lengths, keeping joints to a minimum. Miter corners to a neat, hairline closure.

1. Where factory-applied trim is indicated, trim shall be assembled and attached to visual display units at manufacturer's factory before shipment.

2.10 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.11 ALUMINUM FINISHES

A. Clear Anodic Finish: AAMA 611, AA-M12C22A31, Class II, 0.010-mm or thicker.

2.12 VISUAL DISPLAY SCHEDULE

A. Visual Display Board: Factory assembled.

1. Markerboard: Porcelain-enamel markerboard assembly.

a. Color: **WB**, as indicated in Section 090000 “Schedule of Finishes”.

2. Corners: Square.
3. Size and Mounting Height: As indicated on Drawings.
4. Mounting: Wall.
5. Factory-Applied Aluminum Trim: Manufacturer's standard with clear anodic finish.
6. Accessories:

a. Chalktray: Box type.
b. Display rail.
c. Flag holder.

B. Visual Display Board: Factory assembled.

1. Tackboard: Plastic-impregnated-cork tackboard assembly.

a. Color: **TB**, as indicated in Section 090000 “Schedule of Finishes”.

2. Corners: Square.
3. Size and Mounting Height: As indicated on Drawings.
4. Mounting: Wall.
5. Edges: Concealed by trim.

a. Factory-Applied Aluminum Trim: Manufacturer's standard style, with clear anodic finish.

C. Visual Display Surface:

1. Tack Board: Plastic-impregnated-cork.

a. Color: **BB** , as indicated in Section 090000 “Schedule of Finishes”.

2. Corners: Square.

3. Size and Mounting Height: As indicated on Drawings.
4. Mounting: Wall.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for installation tolerances, surface conditions of wall, and other conditions affecting performance of the Work.

B. Examine walls and partitions for proper preparation and backing for visual display surfaces.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Comply with manufacturer's written instructions for surface preparation.

B. Clean substrates of substances, such as dirt, mold, and mildew, that could impair the performance of and affect the smooth, finished surfaces of visual display boards.

C. Prepare surfaces to achieve a smooth, dry, clean surface free of flaking, unsound coatings, cracks, defects, projections, depressions, and substances that will impair bond between visual display surfaces and wall surfaces.

3.3 INSTALLATION

A. General: Install visual display surfaces in locations and at mounting heights indicated on Drawings. Keep perimeter lines straight, level, and plumb. Provide grounds, clips, backing materials, adhesives, brackets, anchors, trim, and accessories necessary for complete installation.

B. Factory-Fabricated Visual Display Board Assemblies: Attach concealed clips, hangers, and grounds to wall surfaces and to visual display boards with fasteners at not more than 16 inches o.c. Secure both top and bottom of boards to walls.

C. Display Rails: Install rails at mounting heights indicated on Drawings. Attach to wall surface with fasteners at not more than 16 inches o.c.

3.4 CLEANING AND PROTECTION

A. Clean visual display units in accordance with manufacturer's written instructions. Attach one (1) removable cleaning instructions label to visual display unit in each room.

B. Touch up factory-applied finishes to restore damaged or soiled areas.

C. Cover and protect visual display surfaces after installation and cleaning.

END OF SECTION 101100

SECTION 101146 - VISUAL DISPLAY FABRICS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes dry-erase wall coverings.

B. Related Requirements:

1. Section 101100 "Visual Display Units" for manufactured visual display units, including markerboards.

1.3 PRE-INSTALLATION MEETINGS

A. Pre-installation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of dry-erase wall covering. Include data on physical characteristics, durability, and flame-resistance characteristics.

B. Shop Drawings: Show location and extent. Indicate seams and termination points.

C. Samples: Full width by 36-inch-long section of dry-erase wall covering.

D. Product Schedule: For dry-erase wall coverings. Use same designations indicated on Drawings.

1.5 INFORMATIONAL SUBMITTALS

A. Product Test Reports: For surface-burning characteristics of each type of dry-erase wall covering, for tests performed by a qualified testing agency.

B. Sample Warranties: For special warranties.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For dry-erase wall coverings to include in maintenance manuals.

1.7 FIELD CONDITIONS

A. Environmental Limitations: Do not deliver or install dry-erase wall coverings until spaces are enclosed and weathertight, wet-work in spaces is complete and dry, work above ceilings is complete, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

1.8 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace visual display fabric that fails in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Cracking, chipping, or peeling.
b. Permanent staining, yellowing, or fading when used with appropriate dry erase markers.

2. Warranty Period: Ten (10) years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Flame-Spread Index: 55 or less.
2. Smoke-Developed Index: 90 or less.

2.2 DRY-ERASE WALL COVERINGS

A. Magnetic Dry-Erase Wall Covering: Intended for use with dry-erase markers and magnetic aids as well as a project surface and consisting of moderate-gloss plastic film bonded to ferrous-powdered fabric backing.

1. Basis-of-Design:

a. Wolf-Gordon, Inc.; **Wink Complete**

2. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Koroseal Interior Products, LLC
b. Write Walls
c. Substitutions: Under provisions of Section 012500 “Substitution Procedures”.

3. Color: **WC**, as indicated in Section 090000 “Schedule of Finishes”.

B. Adhesives for Field Application: Strippable, mildew-resistant, non-staining adhesive for use with dry-erase wall coverings and for substrate application as recommended in writing by dry-erase wall covering manufacturer.

C. Primer/Sealer: Mildew-resistant primer/sealer as recommended in writing by dry-erase wall covering manufacturer for intended substrate.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for installation tolerances, surface conditions of wall, moisture content, and other conditions affecting performance of the Work.

B. Examine walls and partitions for proper preparation for dry-erase wall covering.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Comply with manufacturer's written instructions for surface preparation.

B. Clean substrates of substances, including dirt, mold, and mildew, that could impair the bond of dry-erase wall coverings or affect the smooth, finished surfaces of dry-erase wall coverings.

C. Prepare surfaces to achieve a smooth, dry, clean surface free of flaking, unsound coatings, cracks, defects, projections, and depressions.

D. Prepare substrates indicated to receive dry-erase wall covering as required by manufacturer's written instructions to achieve a smooth, dry, clean, structurally sound surface that is uniform in color.

1. Moisture Content: Maximum of four percent (4%) when tested with an electronic moisture meter.
2. Gypsum Board: Prime with primer as recommended in writing by primer/sealer manufacturer and wall-covering manufacturer.

3.3 INSTALLATION

A. Dry-Erase Wall Covering: Comply with dry-erase wall-covering manufacturers' written installation instructions.

1. Install seams horizontal and level, with lowest seam 24 inches above finished floor. Railroad fabric (reverse roll direction) to ensure color matching.
2. Double cut seams, with no gaps or overlaps. Remove air bubbles, wrinkles, blisters, and other defects.
3. After installation, clean dry-erase wall covering in accordance with manufacturer's written instructions. Remove excess adhesive at finished seams, perimeter edges, and adjacent surfaces.

3.4 CLEANING AND PROTECTION

A. Remove excess adhesive at finished seams, perimeter edges, and adjacent surfaces.

B. Clean dry-erase wall covering in accordance with manufacturer's written instructions. Attach one removable cleaning instructions label to dry-erase wall covering in each room.

C. Reinstall hardware and hardware accessories, electrical plates and covers, light fixture trims, and similar items.

END OF SECTION 101146

SECTION 101400 - SIGNAGE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Panel signs.
2. Field-applied, vinyl-character signs.

B. Related Sections include the following:

1. Section 015000 "Temporary Facilities and Controls" for temporary information and directional signs.
2. Section 220553 "Identification for Plumbing Piping and Equipment" for labels, tags, and nameplates for plumbing systems and equipment.
3. Section 230553 "Identification for HVAC Piping and Equipment" for labels, tags, and nameplates for HVAC systems and equipment.
4. Section 260553 "Identification for Electrical Systems" for labels, tags, and nameplates for electrical equipment.
5. Section 265119 “LED Interior Lighting” for illuminated Exit signs.
6. Section 265219 "Emergency and Exit Lighting" for illuminated Exit signs.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: For panel signs.

1. Include fabrication and installation details and attachments to other work.
2. Show sign mounting heights, locations of supplementary supports to be provided by other installers, and accessories.
3. Show message list, typestyles, graphic elements, including raised characters and Braille, and layout for each sign.

C. Samples: Manufacturer's color charts consisting of actual units or sections of units showing the full range of colors available for the following:

1. Acrylic Sheet: Full-size Sample for each color required.
2. Field-Applied, Vinyl-Character Signs: Full-size Sample of characters on glass.

D. Sign Schedule: Use same designations indicated on Drawings or as listed in special schedule.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For manufacturer.

B. Sample Warranty: For special warranty.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For signs to include in maintenance manuals.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: Shop that employs skilled workers who custom-fabricate products similar to those required for this Project and whose products have a record of successful in-service performance.

1.7 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of signs that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Deterioration of finishes beyond normal weathering.
b. Deterioration of embedded graphic image
c. Separation or delamination of sheet material and components.

2. Warranty Period: Five (5) years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Thermal Movements: For exterior signs, allow for thermal movements from ambient and surface temperature changes.

1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

B. Accessibility Standard: Comply with applicable provisions in the ABA standards of the Federal agency having jurisdiction and ICC/ANSI A117.1.

C. Source Limitations for Signs: Obtain each sign type indicated from one (1) source from a single manufacturer.

2.2 PANEL SIGNS

A. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

1. ASE, Inc.
2. Best Sign Systems, Inc.
3. Intelligent Signage, Inc.
4. Seton Identification Products
5. Substitutions: Under provisions of Section 012500 “Substitution Procedures”.

B. Interior Panel Signs: Provide smooth sign panel surfaces constructed to remain flat under installed conditions within a tolerance of plus or minus 1/16-inch measured diagonally from corner to corner.

C. Interior Signs: Provide matte finish plaques in sizes to accommodate the message indicated in the Signage Schedule on the Door Schedule and the Signage Details drawing in the Construction Documents. Fabricate of thermoformed acrylic plastic conforming to ASTM D 709, Type NDP minimum 1/8-inch. Provide with square corners.

1. Graphics Application:

a. Raised Letters: Minimum 1/32-inch-thick acrylic message letters. These shall comply with Section 703.2.3 (not italic, oblique, script or decorative) and 703.2.5 (1-inch character height) of the ICC/ANSI A117.1 Code.
b. Pictogram: Each sign shall be provided with an international symbol of accessibility per Section 4.30.7 (Figure 43 a and b) of the Americans with Disabilities Act. The raised image pictogram shall have a field height of 6 inches minimum. Text and braille shall NOT be located in the pictogram field.
c. Messages:

1) Typeface: Helvetica Medium, with accompanying Grade 2 Braille message.
2) Type Size: 1-inch large and small case, with width, height and stroke complying with the requirements of Section 703.2.6 (maximum stroke width fifteen percent (15%) of the height of each letter at the top surface of the character and thirty percent (30%) maximum of the height of each letter at the base, Section 703.2.7 (character spacing 1/8-inch minimum and four (4) times the tactile character stroke width maximum), and Section 703.2.8 (spacing between lines shall be between one hundred thirty-five percent (135%) and one hundred seventy percent (170%) of the tactile character height) of the ICC/ANSI A117.1 Code.
3) Background Color: In color selected by Architect and Owner from manufacturer's entire range. Message Color: In contrasting color of background.

2.3 FIELD-APPLIED, VINYL-CHARACTER SIGNS

A. Field-Applied, Vinyl-Character Sign: Characters die cut from 3- to 3.5-mil-thick, weather-resistant vinyl film with release liner on the back and carrier film on the front for on-site alignment and application.

1. Basis-of-Design:

a. Wolf Gordon

2. Manufacturers: Subject to compliance with requirements, available products by one (1) of the following:

a. Apco Graphics
b. FDC Graphic Films
c. LG Hausys America
d. Substitutions: Under provisions of Section 012500 “Substitution Procedures”.

3. Size: As indicated on Drawings.
4. Substrate: As indicated on Drawings.

2.4 MATERIALS

A. Acrylic Sheet: ASTM D 4802, Category A-1 (cell-cast sheet), Type UVA (UV absorbing).

B. Vinyl Film: UV-resistant vinyl film of nominal thickness indicated, with pressure-sensitive, permanent adhesive on back; die cut to form characters or images as indicated on Drawings and suitable for exterior applications.

2.5 ACCESSORIES

A. Adhesive: As recommended by sign manufacturer.

1. Adhesive shall have a VOC content of 70 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.6 FABRICATION

A. General: Provide manufacturer's standard sign assemblies according to requirements indicated.

1. Preassemble signs in the shop to greatest extent possible. Disassemble signs and assemblies only as necessary for shipping and handling limitations. Clearly mark units for reassembly and installation; apply markings in locations concealed from view after final assembly.
2. Mill joints to tight, hairline fit. Form assemblies and joints exposed to weather to exclude water penetration and retention.
3. Provide rabbets, lugs, and tabs necessary to assemble components and to attach to existing work. Drill and tap for required fasteners. Use concealed fasteners where possible; use exposed fasteners that match sign finish.

2.7 GENERAL FINISH REQUIREMENTS

A. Appearance of Finished Work: Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.8 ACRYLIC SHEET FINISHES

A. Colored Coatings for Acrylic Sheet: For copy and background colors, provide colored coatings, including inks, dyes, and paints, that are recommended by acrylic manufacturers for optimum adherence to acrylic surface and that are UV and water resistant for five (5) years for application intended.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.

B. Verify that sign-support surfaces are within tolerances to accommodate signs without gaps or irregularities between backs of signs and support surfaces unless otherwise indicated.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Install signs using mounting methods indicated and according to manufacturer's written instructions.

1. Install signs level, plumb, true to line, and at locations and heights indicated, with sign surfaces free of distortion and other defects in appearance.
2. Install signs so they do not protrude or obstruct according to the accessibility standard.
3. Before installation, verify that sign surfaces are clean and free of materials or debris that would impair installation.

B. Accessible Signage: Install in locations on walls as indicated on Drawings and according to the accessibility standard.

1. Interior Wall Signs: Install signs on walls adjacent to latch side of door where applicable. Where not indicated or possible, such as double doors, install signs on nearest adjacent walls. Locate to allow approach within 3 inches of sign without encountering protruding objects or standing within swing of door.

C. Mounting Methods:

1. Silicone-Adhesive Mounting: Clean bond-breaking materials from substrate surface and remove loose debris. Apply linear beads or spots of adhesive symmetrically to back of sign and of suitable quantity to support weight of sign after cure without slippage. Keep adhesive away from edges to prevent adhesive extrusion as sign is applied and to prevent visibility of cured adhesive at sign edges. Place sign in position and push to engage adhesive. Temporarily support sign in position until adhesive fully sets.

D. Field-Applied, Vinyl-Character Signs: Clean and dry substrate. Align sign characters in final position before removing release liner. Remove release liner in stages and apply and firmly press characters into final position. Press from the middle outward to obtain good bond without blisters or fishmouths. Remove carrier film without disturbing applied vinyl film.

E. Signs Mounted on Glass: Provide opaque sheet matching sign material and finish onto opposite side of glass to conceal back of sign and two-face tape.

3.3 ADJUSTING AND CLEANING

A. Remove and replace damaged or deformed signs and signs that do not comply with specified requirements. Replace signs with damaged or deteriorated finishes or components that cannot be successfully repaired by finish touchup or similar minor repair procedures.

B. Remove temporary protective coverings and strippable films as signs are installed.

C. On completion of installation, clean exposed surfaces of signs according to manufacturer's written instructions and touch up minor nicks and abrasions in finish. Maintain signs in a clean condition during construction and protect from damage until acceptance by Owner.

END OF SECTION 101400

SECTION 101419 - DIMENSIONAL LETTER SIGNAGE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Cast dimensional characters.
2. Cutout dimensional characters.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For signs.

1. Include fabrication and installation details and attachments to other work.
2. Show sign mounting heights, locations of supplementary supports to be provided by other installers, and accessories.
3. Show message list, typestyles, graphic elements, and layout for each sign at least half size.

C. Samples: For each type of sign assembly showing all components and with the required finish(es), in manufacturer's standard size unless otherwise indicated and as follows:

1. Dimensional Characters: Full-size Sample of each type of dimensional character.
2. Exposed Accessories: Full-size Sample of each accessory type.

D. Product Schedule: For dimensional letter signs. Use same designations indicated on Drawings or specified.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For manufacturer.

B. Sample Warranty: For special warranty.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For signs to include in maintenance manuals.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer of products.

1.7 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of signs that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Deterioration of finishes beyond normal weathering.
b. Separation or delamination of sheet materials and components.

2. Warranty Period: Five (5) years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Thermal Movements: For exterior fabricated channel dimensional characters, allow for thermal movements from ambient and surface temperature changes.

1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

2.2 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Alphabet Signs, Inc.
2. ASI Sign Systems, Inc.
3. Gemini Incorporated
4. Impact Signs, Inc.
5. PHOTOMETALS, a division of PMA Industries
6. Seton Identification Products
7. Woodland Manufacturing, LLC
8. Substitution Procedures: Under provisions of Section 012500 “Substitution Procedures”.

2.3 DIMENSIONAL CHARACTERS

A. Cast Characters: Characters with uniform faces, sharp corners, and precisely formed lines and profiles, and as follows:

1. Character Material: Cast aluminum.
2. Character Height: As indicated on Drawings.
3. Thickness: Manufacturer's standard for size of character.
4. Finishes:

a. Integral Aluminum Finish (Exterior): Clear anodized.

5. Mounting: Projecting studs.
6. Typeface: As indicated on Drawings.

B. Cutout Characters: Characters with uniform faces; square-cut, smooth, eased edges; precisely formed lines and profiles; and as follows:

1. Character Material: Sheet or plate aluminum.

2. Character Height: As indicated on Drawings.
3. Thickness: Manufacturer's standard for size of character.
4. Finishes:

    a. Integral Aluminum Finish (Exterior): Clear anodized.
    a. Baked-Enamel or Powder-Coat Finish (Interior): Manufacturer's standard, in color as selected by Architect from manufacturer's entire range.

5. Mounting: Projecting studs (interior), ¼-inch-thick aluminum bottom rail (exterior).
6. Typeface: As indicated on Drawings.

2.4 DIMENSIONAL CHARACTER MATERIALS

A. Aluminum Castings: ASTM B 26, alloy and temper recommended by sign manufacturer for casting process used and for type of use and finish indicated.

B. Aluminum Sheet and Plate: ASTM B 209, alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated.

2.5 ACCESSORIES

A. Fasteners and Anchors: Manufacturer's standard as required for secure anchorage of signage, non-corrosive and compatible with each material joined, and complying with the following:

1. Use concealed fasteners and anchors unless indicated to be exposed.
2. For exterior exposure, furnish stainless-steel devices unless otherwise indicated.
3. Sign Mounting Fasteners:

    a. Projecting Studs: Threaded studs with sleeve spacer, welded or brazed to back of sign material, screwed into back of sign assembly, or screwed into tapped lugs cast integrally into back of cast sign material, unless otherwise indicated.

B. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.

2.6 FABRICATION

A. General: Provide manufacturer's standard sign assemblies according to requirements indicated.

1. Pre-assemble signs and assemblies in the shop to greatest extent possible. Disassemble signs and assemblies only as necessary for shipping and handling limitations. Clearly mark units for reassembly and installation; apply markings in locations concealed from view after final assembly.
2. Mill joints to a tight, hairline fit. Form assemblies and joints exposed to weather to resist water penetration and retention.
3. Comply with AWS for recommended practices in welding and brazing. Provide welds and brazes behind finished surfaces without distorting or discoloring exposed side. Clean exposed welded and brazed connections of flux, and dress exposed and contact surfaces.
4. Conceal connections if possible; otherwise, locate connections where they are inconspicuous.
5. Internally brace dimensional characters for stability, to meet structural performance loading without oil-canning or other surface deformation, and for securing fasteners.
6. Provide rebates, lugs, and brackets necessary to assemble components and to attach to existing work. Drill and tap for required fasteners. Use concealed fasteners where possible; use exposed fasteners that match sign finish.

7. Castings: Fabricate castings free of warp, cracks, blowholes, pits, scale, sand holes, and other defects that impair appearance or strength. Grind, wire brush, sandblast, and buff castings to remove seams, gate marks, casting flash, and other casting marks before finishing.

2.7 GENERAL FINISH REQUIREMENTS

A. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

C. Organic, Anodic, and Chemically Produced Finishes: Apply to formed metal after fabrication but before applying contrasting polished finishes on raised features unless otherwise indicated.

2.8 ALUMINUM FINISHES

A. Clear Anodic Finish: AAMA 611, Class I, 0.018 mm or thicker.

B. Baked-Enamel or Powder-Coat Finish: AAMA 2603 except with a minimum dry film thickness of 1.5 mils. Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance.

B. Verify that sign-support surfaces are within tolerances to accommodate signs without gaps or irregularities between backs of signs and support surfaces unless otherwise indicated.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION OF DIMENSIONAL CHARACTERS

A. General: Install signs using mounting methods indicated and according to manufacturer's written instructions.

1. Install signs level, plumb, true to line, and at locations and heights indicated, with sign surfaces free of distortion and other defects in appearance.
2. Before installation, verify that sign surfaces are clean and free of materials or debris that would impair installation.
3. Corrosion Protection: Coat concealed surfaces of exterior aluminum in contact with grout, concrete, masonry, wood, or dissimilar metals, with a heavy coat of bituminous paint.

B. Mounting Methods:

1. Projecting Studs: Using a template, drill holes in substrate aligning with studs on back of sign. Remove loose debris from hole and substrate surface.

a. Masonry Substrates: Fill holes with adhesive. Leave recess space in hole for displaced adhesive. Place spacers on studs, place sign in position, and push until spacers are pinched between sign and substrate, embedding the stud ends in holes. Temporarily support sign in position until adhesive fully sets.
b. Thin or Hollow Surfaces: Place spacers on studs, place sign in position with spacers pinched between sign and substrate, install washers and nuts on stud ends projecting through opposite side of surface, and tighten.

3.3 ADJUSTING AND CLEANING

A. Remove and replace damaged or deformed characters and signs that do not comply with specified requirements. Replace characters with damaged or deteriorated finishes or components that cannot be successfully repaired by finish touchup or similar minor repair procedures.

B. Remove temporary protective coverings and strippable films as signs are installed.

C. On completion of installation, clean exposed surfaces of signs according to manufacturer's written instructions and touch up minor nicks and abrasions in finish. Maintain signs in a clean condition during construction and protect from damage until acceptance by Owner.

END OF SECTION 101419

SECTION 102113.19 - PLASTIC TOILET COMPARTMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Solid-plastic toilet compartments.

B. Related Requirements:

1. Section 102800 "Toilet, Bath, and Laundry Accessories" for accessories mounted on toilet compartments.

1.3 COORDINATION

A. Coordinate requirements for blocking, reinforcing, and other supports concealed within wall to ensure that toilet compartments can be supported and installed as indicated.

1.4 ACTION SUBMITTALS

A. Product Data:

1. Solid-plastic toilet compartments:

a. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for toilet compartments.

B. Shop Drawings: For toilet compartments.

1. Include plans, elevations, sections, details, and attachment details.
2. Show locations of cutouts for compartment-mounted toilet accessories.
3. Show locations of centerlines of toilet fixtures.
4. Show locations of floor drains.
5. Show overhead support or bracing locations.

C. Samples: Manufacturer's standard color sheets, showing full range of available colors for each type of toilet compartment.

1. Include Samples of hardware and accessories involving material and color selection.

D. Product Schedule: For toilet compartments, prepared by or under the supervision of supplier, detailing location and selected colors for toilet compartment material.

E. Delegated Design Submittals: For grab bars mounted on toilet compartment panels, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1. Include structural design calculations indicating compliance with specified structural-performance requirements.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For toilet compartments.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Extra Stock Materials: Furnish extra materials to Owner that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Door Hinges: One (1) hinge with associated fasteners.
2. Latch and Keeper: One (1) latch and keeper with associated fasteners.
3. Door Bumper: One (1) bumper with associated fasteners.
4. Door Pull: One (1) door pull with associated fasteners.
5. Fasteners: Ten (10) fasteners of each size and type.

1.7 FIELD CONDITIONS

A. Field Measurements: Verify actual locations of toilet fixtures, walls, columns, ceilings, and other construction contiguous with toilet compartments by field measurements, and coordinate before fabrication.

1.8 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of compartments that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Deterioration of finishes beyond normal weathering.
b. Separation or delamination of materials and components.

2. Warranty Period: Fifteen (15) years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

A. Obtain plastic toilet compartments from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. Recycled Content: Postconsumer recycled content plus one-half of pre-consumer recycled content not less than ten percent (10%).

B. Fire Performance: Tested in accordance with, and pass the acceptance criteria of, NFPA 286.

C. Structural Performance: Where grab bars are mounted on toilet compartments, design panels to comply with the following requirements:

1. Panels are able to withstand a concentrated load on grab bar of at least 250 lbf applied at any direction and at any point, without deformation of panel.

D. Regulatory Requirements: Comply with applicable provisions in ICC A117.1 for toilet compartments designated as accessible.

2.3 SOLID-PLASTIC TOILET COMPARTMENTS

A. Basis-of-Design Product:

1. Scranton Products; **Hiny Hiders**

B. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Accurate Partitions Corp.; an ASI Group Company
2. Metpar Corporation
3. PSiSC Columbia Partitions, a division of CSiSC
4. Substitutions: Under provisions of Section 012500 “Substitution Procedures”.

C. Toilet-Enclosure Style: Overhead braced.

D. Door, Panel, and Pilaster Construction: Solid, high-density polyethylene (HDPE) material, not less than 1-inch-thick, seamless, with eased edges, and with homogenous color and pattern throughout thickness of material.

1. Heat-Sink Strip: Manufacturer's standard continuous, extruded-aluminum or stainless-steel strip fastened to exposed bottom edges of solid-plastic components to hinder malicious combustion.
2. Color and Pattern: **TP**, as indicated in Section 090000 “Schedule of Finishes”.

E. Pilaster Shoes and Sleeves (Caps): Manufacturer's standard design; stainless-steel.

F. Brackets (Fittings):

1. Stirrup Type: Heavy-duty ear or U-brackets; stainless-steel.

2.4 HARDWARE AND ACCESSORIES

A. Hardware and Accessories, Heavy-Duty: Manufacturer's heavy-duty institutional operating hardware and accessories.

1. Hinges: Manufacturer's minimum 0.062-inch-thick stainless-steel self-closing, continuous, cam type that swings to a closed or partially open position, allowing emergency access by lifting door. Mount with through-bolts.
2. Latch and Keeper: Manufacturer's heavy-duty surface-mounted cast-stainless-steel latch unit designed to resist damage due to slamming, with combination rubber-faced door strike and keeper, and with provision for emergency access. Provide units that comply with regulatory requirements for accessibility at toilet enclosures designated as accessible. Mount with through-bolts.
3. Coat Hook: Manufacturer's heavy-duty combination cast-stainless-steel hook and rubber-tipped bumper, sized to prevent in-swinging door from hitting compartment-mounted accessories. Mount with through-bolts.
4. Door Bumper: Manufacturer's heavy-duty rubber-tipped cast-stainless-steel bumper at out-swinging doors. Mount with through-bolts.
5. Door Pull: Manufacturer's heavy-duty cast-stainless-steel pull at out-swinging doors that complies with regulatory requirements for accessibility. Provide units on both sides of doors at compartments designated as accessible. Mount with through-bolts.

B. Overhead Bracing: Manufacturer's standard continuous, extruded-aluminum head rail with anti-grip profile and in manufacturer's standard finish.

C. Anchorages and Fasteners: Manufacturer's standard exposed fasteners of stainless-steel, finished to match the items they are securing, with theft-resistant-type heads. Provide barrel bolts for through-bolt applications. For concealed anchors, use stainless-steel, hot-dip galvanized-steel, or other rust-resistant, protective-coated steel compatible with related materials.

2.5 MATERIALS

A. Aluminum Castings: ASTM B 26.

B. Aluminum Extrusions: ASTM B 221.

C. Stainless-Steel Sheet: ASTM A 666, Type 304, stretcher-leveled standard of flatness.

D. Stainless-Steel Castings: ASTM A 743.

2.6 FABRICATION

A. Fabricate toilet compartment components to sizes indicated. Coordinate requirements and provide cutouts for through-partition toilet accessories where required for attachment of toilet accessories.

B. Overhead-Braced Units: Provide manufacturer's standard corrosion-resistant supports, leveling mechanism, and anchors at pilasters and walls to suit floor and wall conditions. Provide shoes at pilasters to conceal supports and leveling mechanism.

C. Door Size and Swings: Unless otherwise indicated, provide 24-inch-wide, in-swinging doors for standard toilet enclosures and 36-inch-wide, out-swinging doors with a minimum 32-inch-wide, clear opening for toilet enclosures designated as accessible.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions, with Installer present, for compliance with requirements for fastening, support, alignment, operating clearances, and other conditions affecting performance of the Work.

1. Confirm location and adequacy of blocking and supports required for installation.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Comply with manufacturer's written installation instructions. Install units rigid, straight, level, and plumb. Secure units in position with manufacturer's recommended anchoring devices.

1. Maximum Clearances:

a. Pilasters and Panels or Screens: ½-inch.
b. Panels or Screens and Walls: 1-inch.

2. Stirrup Brackets: Secure panels or screens to walls and to pilasters with no fewer than three (3) brackets attached at midpoint and near top and bottom of panel.

   a. Locate wall brackets so holes for wall anchors occur in masonry or tile joints.
   b. Align brackets at pilasters with brackets at walls.

B. Overhead-Braced Units: Secure pilasters to floor and level, plumb, and tighten. Set pilasters with anchors penetrating not less than 1¾ inches into structural floor unless otherwise indicated in manufacturer's written instructions. Secure continuous head rail to each pilaster with no fewer than two (2) fasteners. Hang doors to align tops of doors with tops of panels and adjust so tops of doors are parallel with overhead brace when doors are in closed position.

   1. All escutcheon seams to not be visible from the outside of the stall.

3.3 ADJUSTING

A. Hardware Adjustment: Adjust and lubricate hardware in accordance with hardware manufacturer's written instructions for proper operation. Set hinges on in-swinging doors to hold doors open approximately 30 degrees from closed position when unlatched, unless the compartment is designated as accessible, where the doors are to return to fully closed position. Set hinges on out-swinging doors to return doors to fully closed position.

END OF SECTION 102113.19

SECTION 102123 - CUBICLE CURTAINS AND TRACK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Cubicle-curtain support systems.
2. Cubicle curtains.

B. Related Requirements:

1. Section 061000 "Rough Carpentry" for supplementary wood framing and blocking for mounting items requiring anchorage.
2. Section 092216 "Non-Structural Metal Framing" for supplementary metal framing and blocking for mounting items requiring anchorage.

1.3 ACTION SUBMITTALS

A. Product Data: For each product.

1. For each type of curtain fabric indicated, include durability, laundry temperature limits, fade resistance, applied curtain treatments, and fire-test-response characteristics.

B. Shop Drawings: For curtains and tracks.

1. Show layout and types of cubicles, sizes of curtains, number of carriers, anchorage details, and conditions requiring accessories. Indicate dimensions taken from field measurements.
2. Include details on blocking above ceiling.

C. Samples: For each type of product required, prepared on Samples of size indicated below.

1. Curtain Fabric: Not less than 10 inches square and showing complete pattern repeat, from dye lot used for the Work, with specified treatments applied. Mark top and face of material.
2. Mesh Top: Not less than 10 inches square.
3. Curtain Track: Not less than 10 inches long.
4. Curtain Carrier: Full-size unit.

D. Product Schedule: For curtains and tracks. Use same designations indicated on Drawings.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For curtains, tracks, and hardware to include in operation and maintenance manuals.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Curtain Carriers and Track End Caps: Full-size units equal to three percent (3%) of amount installed for each size indicated, but no fewer than ten (10) units.
2. Curtains: Full-size units equal to ten percent (10%) of amount installed for each size indicated, but no fewer than two (2) units.

1.6 WARRANTY

A. Special Warranty: Manufacturer's standard limited lifetime warranty in which manufacturer agrees to repair or replace components of cubicle curtain and track that fail in materials or workmanship.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Cubicle Curtains: Provide curtain fabrics with the following characteristics:

1. Laundering: Launderable to a water temperature of not less than 160 deg. F.
2. Flame Resistance: Provide fabrics identical to those that have passed NFPA 701 when tested by a qualified testing agency acceptable to authorities having jurisdiction.

a. Identify fabrics with appropriate markings of a qualified testing agency.

2.2 CUBICLE-CURTAIN SUPPORT SYSTEMS

A. Basis-of-Design:

1. InPro Corporation; **Whisper Cube**

B. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Cubicle Curtain Factory, Inc.
2. General Cubicle Company, Inc.
3. Substitutions: Under provisions of Section 012500 “Substitution Procedures”.

C. PVC Curtain Track: Not less than 1¼ inches wide by 15/16-inch-high.

1. Curved Track: Factory-fabricated, 12-inch-radius bends.

D. Curtain-Track Mounting: Surface. **PC**, as indicated in Section 090000 “Schedule of Finishes” for locations.

E. Curtain-Track Accessories: Fabricate splices, end caps, connectors, end stops, coupling and joining sleeves, wall flanges, brackets, ceiling clips, and other accessories from same material and with same finish as track.

1. Suspended Track Support: Not less than 5/8-inch-square tube.
2. End Stop: Removable with carrier hook.

F. Breakaway Curtain Carriers: One-piece nylon breakaway curtain carriers designed to allow curtains to detach from tracks with a pulling force of no more than 5 lbf.

G. Exposed Fasteners: Stainless-steel.

H. Concealed Fasteners: Hot-dip galvanized.

2.3 CUBICLE CURTAINS

A. Basis-of-Design:

1. InPro Corporation; **Shield by Panaz**

B. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Cubicle Curtain Factory, Inc.
2. General Cubicle Company, Inc.
3. Substitutions: Under provisions of Section 012500 “Substitution Procedures”.

C. Fabric: Curtain manufacturer's standard, one hundred percent (100%) polyester, inherently and permanently flame resistant, stain resistant, and antimicrobial.

1. Material, Pattern and Color: **PC**, as indicated in Section 090000 “Schedule of Finishes”.

D. Curtain Grommets: Two-piece, rolled-edge, rustproof, nickel-plated brass; spaced not more than 6 inches o.c.; machined into top hem.

E. Mesh Top: No. 50 nylon mesh.

F. Curtain Tieback: Nickel-plated brass chain; one (1) at each curtain termination.

2.4 CURTAIN FABRICATION

A. Continuous Curtain Panels:

1. Width: Equal to track length from which curtain is hung plus ten percent (10%) added fullness, but not less than 12 inches added fullness.
2. Length: Equal to floor-to-ceiling height minus 18 inches from finished ceiling at top, and minus distance above the finished floor of 12 inches.
3. Mesh Top: Top hem of mesh not less than 1-inch and not more than 1½ inches wide, triple thickness, reinforced with integral web, and double lockstitched. Double lockstitch bottom of mesh directly to ½-inch triple thickness, top hem of curtain fabric.
4. Bottom Hem: Not less than 1-inch and not more than 1½ inches wide, double thickness and double lock stitched.
5. Side Hems: Not less than ½-inch and not more than 1¼ inches wide, with double turned edges, and single lock stitched.
6. Vertical Seams: Not less than ½-inch-wide, double turned and double stitched.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, and other conditions affecting performance of work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install tracks level and plumb, according to manufacturer's written instructions.

B. For tracks of up to 20 feet in length, provide track fabricated from single, continuous length.

1. Curtain Track Mounting: Surface.

C. Surface-Track Mounting: Fasten tracks to ceilings at intervals recommended by manufacturer. Fasten tracks to structure at each splice and tangent point of each corner. Center fasteners in track to ensure unencumbered carrier operation. Attach track to ceiling as follows:

1. Attach track to suspended ceiling grid with manufacturer's proprietary clip.

D. Track Accessories: Install splices, end caps, connectors, end stops, coupling and joining sleeves, and other accessories as required for a secure and operational installation.

E. Curtain Carriers: Provide curtain carriers adequate for 6-inch spacing along full length of curtain plus an additional carrier.

F. Cubicle Curtains: Hang curtains on each curtain track. Secure with curtain tieback.

END OF SECTION 102123

SECTION 102600 - WALL AND DOOR PROTECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Impact-resistant wall coverings.

B. Related Requirements:

1. Section 087100 "Door Hardware" for metal armor, kick, mop, and push plates.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, impact strength, dimensions of individual components and profiles, and finishes.

B. Shop Drawings: For each type of wall protection showing locations and extent.

1. Include plans, elevations, sections, and attachment details.

C. Samples: For each type of exposed finish on the following products, prepared on Samples of size indicated below.

1. Impact-Resistant Wall Covering: 6 by 6 inches square.

1.4 INFORMATIONAL SUBMITTALS

A. Qualifications: For Installer and Manufacturer.

B. Material Certificates: For each type of exposed material.

C. Sample Warranty: For special warranty.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For each type of wall protection product to include in maintenance manuals.

1. Include recommended methods and frequency of maintenance for maintaining best condition under anticipated traffic and use conditions. Include precautions against using cleaning materials and methods that may be detrimental to finishes and performance.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Mounting and Accessory Components: Amounts proportional to the quantities of extra materials. Package mounting and accessory components with each extra material.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: Engage an installer who has no less than three (3) years' experience in installation of systems similar in complexity to those required for this project.

B. Manufacturer's Qualifications: Not less than five (5) years' experience in the production of specified products and a record of successful in-service performance.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Store wall protection in original undamaged packages and containers inside well-ventilated area protected from weather, moisture, soiling, extreme temperatures, and humidity.

1. Maintain room temperature within storage area at not less than 65 deg F during the period materials are stored.
2. Keep materials out of direct sunlight.
3. Store wall protection components for a minimum of 24 hours, or until plastic material attains a minimum room temperature of 65 deg F.

a. Store wall coverings in a horizontal position.

4. Do not install if relative humidity is greater than eighty percent (80%)

1.9 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of wall protection units that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Structural failures including detachment of components from each other or from the substrates, delamination, and permanent deformation beyond normal use.
b. Deterioration of metals, metal finishes, plastics, and other materials beyond normal use.

2. Warranty Period:

a. Impact-Resistant Wall Coverings: Minimum one (1) year from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Altro USA
2. Commercial Corner Guards
3. Construction Specialties, Inc.
4. Crane Composites, Inc.
5. IPC Door and Wall Protection Systems; Division of InPro Corporation
6. Korogard Wall Protection Systems; a division of RJF International Corporation
7. Level Digital Wallcoverngs
8. Marlite, Inc., a division of Nudo Products, Inc.
9. Pawling Corporation
10. Tarkett North America
11. Substitutions: Under provisions of Section 012500 “Substitution Procedures”.

B. Source Limitations: Obtain wall and door protection products of each type from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. Surface Burning Characteristics: Comply with ASTM E 84 or UL 723; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Flame-Spread Index: 25 or less.
2. Smoke-Developed Index: 450 or less.

B. Regulatory Requirements: Comply with applicable provisions in ICC A117.1.

2.3 IMPACT-RESISTANT WALL COVERINGS

A. Impact-Resistant Sheet Wall Covering: Fabricated from pre-finished polyester glass reinforced plastic sheets.

1. Basis-of-Design: Crane Composites, Inc.; **GLASBORD-FSI w/Surfaseal**
2. Height: Full wall, unless otherwise indicated.
3. Trim and Joint Moldings: Extruded rigid plastic that matches sheet wall covering color.
4. Mounting: Adhesive.
5. Size, Sheet Thickness, Color, and Texture: **FRP**, as indicated in Section 090000 “Schedule of Finishes”.

2.4 MATERIALS

A. Plastic Materials: Chemical- and stain-resistant, fiberglass reinforced thermosetting polyester panel sheets complying with ASTM D 5319, thickness as indicated. Resistant to rot, corrosion, staining, denting, peeling, and splintering. Coated with sanitary sealer with water-based coatings and controlled, low-temperature inline curing.

B. Adhesive: As recommended by protection product manufacturer and with a VOC content of 70 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

C. Sealants: As recommended by protection product manufacturer and as specified in Section 079200 “Joint Sealants”.

2.5 FABRICATION

A. Fabricate wall protection according to requirements indicated for design, performance, dimensions, and member sizes, including thicknesses of components.

B. Factory Assembly: Assemble components in factory to greatest extent possible to minimize field assembly. Disassemble only as necessary for shipping and handling.

C. Quality: Fabricate components with uniformly tight seams and joints and with exposed edges rolled. Provide surfaces free of wrinkles, chips, dents, uneven coloration, and other imperfections. Fabricate members and fittings to produce flush, smooth, and rigid hairline joints.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and wall areas, with Installer present, for compliance with requirements for installation tolerances, fire rating, and other conditions affecting performance of work.

B. Examine walls to which wall protection will be attached for blocking, grounds, and other solid backing that have been installed in the locations required for secure attachment of support fasteners.

1. For wall protection attached with adhesive, verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Complete finishing operations, including painting, before installing wall protection.

B. Before installation, clean substrate to remove dust, debris, and loose particles.

C. Allow wall protection and adhesive to precondition for a minimum of 24 hours at a temperature between 65 deg F and 75 deg F before installation.

3.3 INSTALLATION

A. Installation Quality: Install wall protection according to manufacturer's written instructions, level, plumb, and true to line without distortions. Do not use materials with chips, cracks, voids, stains, or other defects that might be visible in the finished Work.

B. Mounting Heights: Install wall protection in locations and at mounting heights indicatedon Drawings.

C. Accessories: Provide splices, mounting hardware, anchors, trim, joint moldings, and other accessories required for a complete installation.

1. Provide anchoring devices and suitable locations to withstand imposed loads.
2. Where splices occur in horizontal runs of more than 20 feet, splice aluminum retainers and plastic covers at different locations along the run, but no closer than 12 inches apart.
3. Adjust end and top caps as required to ensure tight seams.

D. Impact-Resistant Wall Covering: Install top and edge moldings, corners, and divider bars as required for a complete installation.

3.4 CLEANING

A. Immediately after completion of installation, clean in accordance with manufacturer's instructions.

B. Remove excess adhesive using methods and materials recommended in writing by manufacturer.

END OF SECTION 102600

SECTION 102800 - TOILET, BATH, AND LAUNDRY ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Public-use washroom accessories.
2. Childcare accessories.

B. Related Sections:

1. Section 061000 “Rough Carpentry” for blocking coordination.
2. Section 088300 "Mirrors" for frameless mirrors.

1.3 COORDINATION

A. Coordinate accessory locations with other work to prevent interference with clearances required for access by people with disabilities, and for proper installation, adjustment, operation, cleaning, and servicing of accessories.

B. Deliver inserts and anchoring devices set into concrete or masonry as required to prevent delaying the Work.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
2. Include anchoring and mounting requirements, including requirements for cutouts in other work and substrate preparation.
3. Include electrical characteristics.

B. Samples: Full size, for each exposed product and for each finish specified.

1. Approved full-size Samples will be returned and may be used in the Work.

C. Product Schedule: Indicating types, quantities, sizes, and installation locations by room of each accessory required.

1. Identify locations using room designations indicated.

1.5 INFORMATIONAL SUBMITTALS

A. Sample Warranty: For manufacturer’s special warranties.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For accessories to include in maintenance manuals.

1.7 WARRANTY

A. Manufacturer’s Special Warranty for Mirrors: Manufacturer agrees to repair or replace mirrors that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, visible silver spoilage defects.
2. Warranty Period: Fifteen (15) years from date of Substantial Completion.

B. Manufacturer's Special Warranty for Hand Dryers: Manufacturer agrees to repair or replace hand dryers that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Limited, ten (10) years from date of Substantial Completion.

C. Manufacturer’s Special Warranty for Childcare Accessories: Manufacturer agrees to repair or replace childcare accessories that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Five (5) years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 OWNER-FURNISHED MATERIALS

A. Owner-Furnished Materials:

1. Toilet tissue (roll) dispenser.
2. Paper towel (roll) dispenser:
3. Soap dispenser.
4. Vendor.

B. Materials are to be provided by Owner but installed by Contractor.

2.2 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. A & J Washroom Accessories, Inc.
2. American Specialties, Inc.
3. Bobrick Washroom Equipment, Inc.
4. Bradley Corporation
5. Diaper Deck & Company, Inc.
6. Georgia-Pacific Consumer Products
7. Koala Kare Products; a division of Bobrick Washroom Equipment, Inc.
8. World Dryer Corporation
9. Substitutions: Under provisions of Section 012500 “Substitution Procedures”.

2.3 PERFORMANCE REQUIREMENTS

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Structural Performance: Design accessories and fasteners to comply with the following requirements:

1. Grab Bars: Installed units are able to resist 250-lbf concentrated load applied in any direction and at any point.

2.4 PUBLIC-USE WASHROOM ACCESSORIES

B. Paper Towel (Folded) Dispenser:

1. Basis-of-Design Product: **Bobrick #B-2621** (above Cabinetry)
2. Mounting: Surface mounted.
3. Minimum Capacity: 400 C-fold or 525 multi-fold towels and 200 C-fold or 275 multi-fold towels.
4. Material and Finish: Stainless-steel, No. 4 finish (satin).
5. Lockset: Tumbler type.
6. Refill Indicators: Pierced slots at sides or front.

C. Grab Bar:

1. Basis-of-Design Product: **Bobrick #B-6806.99x18, x24, x36 and x42**
2. Mounting: Flanges with concealed fasteners.
3. Material: Stainless-steel, 0.05-inch-thick.

a. Finish: Smooth, No. 4 finish (satin) on ends and slip-resistant texture in grip area.

4. Outside Diameter: 1½ inches.
5. Configuration and Length: As indicated in the Drawings.

D. Sanitary-Napkin Disposal Unit:

1. Basis-of-Design Product: **Bobrick #B-270**
2. Mounting: Surface mounted.
3. Door or Cover: Self-closing, disposal-opening cover.
4. Receptacle: Removable.
5. Material and Finish: Stainless-steel, No. 4 finish (satin).
6. Locations: Female gang restrooms only, unless otherwise noted.

E. Mirror Unit:

1. Basis-of-Design Product: **Bobrick #B-290-1836**
2. Frame: Stainless-steel angle, 0.05-inch-thick.

a. Corners: Manufacturer's standard.

3. Size: 18x36.
4. Hangers: Manufacturer’s standard rigid, tamper- and theft-resistant installation.

F. Hook:

1. Basis-of-Design Product: **Bobrick #B-76717**
2. Description: Single-prong unit.
3. Mounting: Concealed.
4. Material and Finish: Stainless-steel, No. 4 finish (satin).
5. Location: On back of single use restroom doors.

G. Adjustable-Height Adult Changing Station:

1. Basis-of-Design Product: **Koala #KB3000-AHL**
2. Description: Height-adjustable horizontal unit that is electrically operated with wired hand control and with safety rail and receiver tray.

    a. Engineered to support minimum of 500 lb. static load when opened.

3. Mounting: Surface mounted, foldable by pneumatic shock-absorbing mechanism.
4. Electrical Characteristics: Manufacturer's standard actuator and control system, with integrated 24 V dc transformer, powered by single 110 V electrical receptacle.
5. Material and Finish: Stainless steel, ASTM A 480 No. 4 finish (satin), with PVC mattress.

2.5 CHILDCARE ACCESSORIES

A. Diaper-Changing Station:

1. Basis-of-Design Product: **Koala #KB310-SSRE**
2. Description: Horizontal unit that opens by folding down from stored position and with child-protection strap.

    a. Engineered to support minimum of 200-lb. static load when opened.

3. Mounting: Semi-recessed, with unit projecting not more than 1-inch from wall when closed.
4. Operation: By pneumatic shock-absorbing mechanism.
5. Material and Finish: Stainless-steel, ASTM A480 No. 4 finish (satin), exterior shell with rounded plastic corners; HDPE interior in manufacturer's standard color.
6. Liner Dispenser: Provide built-in [**separate, locking**] dispenser for disposable sanitary liners.

2.6 MATERIALS

A. Stainless-Steel: ASTM A 240 or ASTM A 666, Type 304, 0.031-inch minimum nominal thickness unless otherwise indicated.

B. Steel Sheet: ASTM A 1008, Designation CS (cold rolled, commercial steel), 0.036-inch-minimum nominal thickness.

C. Galvanized-Steel Mounting Devices: ASTM A 153, hot-dip galvanized after fabrication.

D. Fasteners: Screws, bolts, and other devices of same material as accessory unit, unless otherwise recommended by manufacturer or specified in this Section, and tamper-and-theft resistant where exposed, and of galvanized steel where concealed.

E. Mirrors: ASTM C 1503, Mirror Glazing Quality, clear-glass mirrors, nominal ¼-inch-thick.

F. ABS Plastic: Acrylonitrile-butadiene-styrene resin formulation.

2.7 FABRICATION

A. General: Fabricate units with tight seams and joints, and exposed edges rolled. Hang doors and access panels with full-length, continuous hinges. Equip units for concealed anchorage and with corrosion-resistant backing plates.

B. Keys: Provide universal keys for internal access to accessories for servicing and resupplying. Provide minimum of six (6) keys to Owner's representative.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install accessories in accordance with manufacturers' written instructions, using fasteners appropriate to substrate indicated and recommended by unit manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated.

1. Remove temporary labels and protective coatings.

B. Grab Bars: Install to comply with specified structural-performance requirements.

3.2 ADJUSTING AND CLEANING

A. Adjust accessories for unencumbered, smooth operation. Replace damaged or defective items.

B. Clean and polish exposed surfaces according to manufacturer's written recommendations.

END OF SECTION 102800

SECTION 104300 - EMERGENCY AID SPECIALTIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes:

1. Automated external defibrillator (AED).
2. Automated external defibrillator (AED) cabinet.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For automated external defibrillator cabinets.

1. Include plans, elevations, sections, details, and attachments to other work.

C. Product Schedule: For automated external defibrillator cabinets. Coordinate final automated external defibrillator cabinet schedule with number and type of automated external defibrillators to ensure proper fit and function. Use same designations indicated on Drawings.

1.4 INFORMATIONAL SUBMITTALS

A. Warranty: Sample of special warranty.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For automated external defibrillators and automated external defibrillator cabinets to include in maintenance manuals.

1.6 COORDINATION

A. Coordinate size of automated external defibrillator cabinets to ensure that type and capacity of automated external defibrillators indicated are accommodated.

B. Coordinate sizes and locations of automated external defibrillator cabinets with wall depths.

1.7 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace automated external defibrillators that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Eight (8) years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers that may be incorporated into the Work include, but are not limited to, the following:

1. Automated External Defibrillator (AED):

a. HeartSine
b. J. L. Industries, Inc., a division of Activar Construction Products Group
c. Philips
d. Physio-Control

2. Automated External Defibrillator (AED) Cabinets:

a. J. L. Industries, Inc., a division of Activar Construction Products Group
b. Modern Metal Products
c. Safety Technology, Inc.

B. Substitutions: Under provisions of Section 012500 “Substitution Procedures”.

2.2 AUTOMATED EXTERNAL DEFIBRILLATOR (AED)

A. Automated External Defibrillator: Portable automated external defibrillator capable of automatically diagnosing life-threatening cardiac arrhythmias, suitable for use on adult or pediatric patients. Lid release, on/off button operation. Type, size, and capacity for each cabinet indicated.

1. Basis-of-Design:

a. J. L. Industries, Inc., **LIFEPAK CR2 Defibrillator LP-CR2-WIFI AUTO**

2. Storage Case: Manufacturer's standard.
3. Battery Capacity: 13 hours.
4. Standby Life: 6 years.

2.3 MOUNTABLE – AUTOMATED EXTERNAL DEFIBRILLATOR CABINET

A. Automated External Defibrillator (AED) Cabinet Type: Mountable AED cabinet of suitable type, size, and capacity for automated external defibrillator.

1. Basis-of-Design:

a. J. L. Industries, Inc., **1416 LIFESTART SERIES**

B. AED Cabinet Construction: Cold-rolled steel sheet, flush doors with 5/8-inch doorstop attached by continuous hinge, and equipped with zinc-plated pull and roller catch.

C. Cabinet Construction: Non-rated.

D. Semi-Recessed Cabinet: One-piece combination trim and perimeter door frame overlapping surrounding wall surface, with exposed trim face and wall return at outer edge (backbend).

1. Rolled-Edge Trim: 2½-inch backbend depth.

E. Cabinet Trim Material: Same material and finish as door.

F. Door Material: Steel sheet.

G. Door Style: Full glazing.

H. Door Glazing: Acrylic sheet.

I. Door Hardware: Manufacturer's standard door-operating hardware of proper type for cabinet type, trim style, and door material and style indicated.

J. Accessories:

1. Identification: Manufacturer's standard graphics and lettering complying with authorities having jurisdiction for letter style, size, spacing, and location.
2. Alarm: Alarm that actuates when fire-protection cabinet door is opened and that is powered by batteries.

K. Materials:

1. Cold-Rolled Steel: ASTM A 1008, Commercial Steel (CS), Type B.

a. Finish: Baked enamel or powder coat, complying with AAMA 2603.
b. Color: As selected by Architect and Owner from manufacturer’s entire range.

2. Transparent Acrylic Sheet: ASTM D 4802, Category A-1 (cell-cast sheet), ¼-inch-thick mm thick, with Finish 1 (smooth or polished).

a. Color: Clear.

2.4 FABRICATION

A. Cabinets: Provide manufacturer's standard box (tub) with trim, frame, door, and hardware to suit cabinet type, trim style, and door style indicated.

1. Weld joints and grind smooth.
2. Miter corners and grind smooth.
3. Provide factory-drilled mounting holes.
4. Prepare doors and frames to receive locks.

B. Cabinet Doors: Fabricate doors according to manufacturer's standards, from materials indicated and coordinated with cabinet types and trim styles.

1. Fabricate door frames with tubular stiles and rails and hollow-metal design, minimum ½-inch thick.
2. Fabricate door frames of one-piece construction with edges flanged.
3. Miter and weld perimeter door frames and grind smooth.

C. Cabinet Trim: Fabricate cabinet trim in one (1) piece with corners mitered, welded, and ground smooth.

2.5 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM's AMP 500, "Metal Finishes Manual for Architectural and Metal Products," for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces of fire-protection cabinets from damage by applying a strippable, temporary protective covering before shipping.

C. Finish fire-protection cabinets after assembly.

D. Appearance of Finished Work: Noticeable variations in same piece are unacceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine walls and partitions for suitable framing depth and blocking where semi-recessed cabinets will be installed.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Prepare recesses for semi-recessed automated external defibrillator cabinets as required by type and size of cabinet and trim style.

3.3 INSTALLATION

A. General: Install automated external defibrillator cabinets in locations and at mounting heights indicated or, if not indicated, at heights acceptable to authorities having jurisdiction.

B. Automated External Defibrillator Cabinets: Fasten cabinets to structure, square and plumb.

1. Fasten mounting brackets to inside surface of automated external defibrillator cabinets, square and plumb.

3.4 ADJUSTING AND CLEANING

A. Remove temporary protective coverings and strippable films, if any, as automated external defibrillator cabinets are installed unless otherwise indicated in manufacturer's written installation instructions.

B. Adjust automated external defibrillator cabinet doors to operate easily without binding. Verify that integral locking devices operate properly.

C. On completion of automated external defibrillator cabinet installation, clean interior and exterior surfaces as recommended by manufacturer.

D. Touch up marred finishes or replace automated external defibrillator cabinets that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by automated external defibrillator cabinet manufacturer.

E. Replace automated external defibrillator cabinets that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 104300

SECTION 104413 - FIRE PROTECTION CABINETS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Fire-protection cabinets for the following:

a. Portable fire extinguishers.

B. Related Requirements:

1. Section 104416 "Fire Extinguishers" for portable, hand-carried fire extinguishers accommodated by fire-protection cabinets.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Show door hardware, cabinet type, trim style, and panel style. Include roughing-in dimensions and details showing recessed-, semi-recessed-, or surface-mounting method and relationships of box and trim to surrounding construction.

B. Shop Drawings: For fire-protection cabinets.

1. Include plans, elevations, sections, details, and attachments to other work.

C. Samples: For each type of exposed finish required.

D. Product Schedule: For fire-protection cabinets. Indicate whether recessed, semi-recessed, or surface mounted. Coordinate final fire-protection cabinet schedule with fire-extinguisher schedule to ensure proper fit and function. Use same designations indicated on Drawings.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For fire-protection cabinets to include in maintenance manuals.

1.5 COORDINATION

A. Coordinate size of fire-protection cabinets to ensure that type and capacity of fire extinguishers indicated are accommodated.

B. Coordinate sizes and locations of fire-protection cabinets with wall depths.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers that may be incorporated into the Work include, but are not limited to, the following:

1. J. L. Industries, Inc., a division of Activar Construction Products Group
2. Larsen's Manufacturing Company
3. Substitutions: Under provisions of Section 012500 “Substitution Procedures”.

B. Source Limitations: Obtain fire-protection cabinets, accessories, and fire extinguishers from single source from single manufacturer.

2.2 FIRE-PROTECTION CABINET

A. Cabinet Type: Suitable for fire extinguisher.

1. Basis-of-Design:

a. J. L. Industries, Inc., **Ambassador 1017**

B. Cabinet Construction: Non-rated.

C. Cabinet Material: Cold-rolled steel sheet.

D. Semi-Recessed Cabinet: One-piece combination trim and perimeter door frame overlapping surrounding wall surface with exposed trim face and wall return at outer edge (backbend).

1. Rolled-Edge Trim: 3-inch backbend depth.

E. Cabinet Trim Material: Same material and finish as door.

F. Door Material: Steel sheet.

G. Door Style: Vertical duo panel with frame.

H. Door Glazing: Acrylic sheet.

I. Door Hardware: Manufacturer's standard door-operating hardware of proper type for cabinet type, trim style, and door material and style indicated.

1. Provide projecting door pull and friction latch.
2. Provide continuous hinge, of same material and finish as trim, permitting door to open 180 degrees.

J. Accessories:

1. Mounting Bracket: Manufacturer's standard steel, designed to secure fire extinguisher to fire-protection cabinet, of sizes required for types and capacities of fire extinguishers indicated, with plated or baked-enamel finish.
2. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location. Locate as directed by Architect.

a. Identify fire extinguisher in fire-protection cabinet with the words "FIRE EXTINGUISHER."

1) Location: Applied to cabinet door.
2) Application Process: Pressure-sensitive vinyl letters.
3) Lettering Color: In contrasting color.
4) Orientation: Vertical.

3. Alarm: Manufacturer's standard alarm that actuates when fire-protection cabinet door is opened and that is powered by batteries.

K. Materials:

1. Cold-Rolled Steel: ASTM A 1008, Commercial Steel (CS), Type B.

a. Finish: Baked enamel or powder coat, complying with AAMA 2603.
b. Color: As selected by Architect and Owner from manufacturer's entire range.

2. Transparent Acrylic Sheet: ASTM D 4802, Category A-1 (cell-cast sheet), ¼-inch-thick mm thick, with Finish 1 (smooth or polished).

a. Color: Clear.

2.3 FABRICATION

A. Fire-Protection Cabinets: Provide manufacturer's standard box (tub) with trim, frame, door, and hardware to suit cabinet type, trim style, and door style indicated.

1. Weld joints and grind smooth.
2. Miter corners and grind smooth.
3. Provide factory-drilled mounting holes.
4. Prepare doors and frames to receive locks.

B. Cabinet Doors: Fabricate doors according to manufacturer's standards, from materials indicated and coordinated with cabinet types and trim styles.

1. Fabricate door frames with tubular stiles and rails and hollow-metal design, minimum ½-inch thick.
2. Fabricate door frames of one-piece construction with edges flanged.
3. Miter and weld perimeter door frames and grind smooth.

C. Cabinet Trim: Fabricate cabinet trim in one (1) piece with corners mitered, welded, and ground smooth.

2.4 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM's AMP 500, "Metal Finishes Manual for Architectural and Metal Products," for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces of fire-protection cabinets from damage by applying a strippable, temporary protective covering before shipping.

C. Finish fire-protection cabinets after assembly.

D. Appearance of Finished Work: Noticeable variations in same piece are unacceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine walls and partitions for suitable framing depth and blocking where semi-recessed cabinets will be installed.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Prepare recesses for semi-recessed fire-protection cabinets as required by type and size of cabinet and trim style.

3.3 INSTALLATION

A. General: Install fire-protection cabinets in locations and at mounting heights indicated or, if not indicated, at heights acceptable to authorities having jurisdiction.

B. Fire-Protection Cabinets: Fasten cabinets to structure, square and plumb.

1. Fasten mounting brackets to inside surface of fire-protection cabinets, square and plumb.

C. Identification:

1. Apply vinyl lettering at locations indicated.

3.4 ADJUSTING AND CLEANING

A. Remove temporary protective coverings and strippable films, if any, as fire-protection cabinets are installed unless otherwise indicated in manufacturer's written installation instructions.

B. Adjust fire-protection cabinet doors to operate easily without binding. Verify that integral locking devices operate properly.

C. On completion of fire-protection cabinet installation, clean interior and exterior surfaces as recommended by manufacturer.

D. Touch up marred finishes or replace fire-protection cabinets that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by fire-protection cabinet and mounting bracket manufacturers.

E. Replace fire-protection cabinets that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 104413

SECTION 104416 - FIRE EXTINGUISHERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes portable, hand-carried fire extinguishers.

B. Related Requirements:

1. Section 104413 "Fire Protection Cabinets."

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include rating and classification, material descriptions, dimensions of individual components and profiles, and finishes for fire extinguisher.

1.4 INFORMATIONAL SUBMITTALS

A. Warranty: Sample of special warranty.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For fire extinguishers to include in maintenance manuals.

1.6 COORDINATION

A. Coordinate type and capacity of fire extinguishers with fire-protection cabinets to ensure fit and function.

1.7 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace fire extinguishers that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Failure of hydrostatic test according to NFPA 10.
b. Faulty operation of valves or release levers.

2. Warranty Period: Six (6) years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. NFPA Compliance: Fabricate and label fire extinguishers to comply with NFPA 10, "Portable Fire Extinguishers."

B. Fire Extinguishers: Listed and labeled for type, rating, and classification by an independent testing agency acceptable to authorities having jurisdiction.

1. Provide fire extinguishers approved, listed, and labeled by FMG.

2.2 PORTABLE, HAND-CARRIED FIRE EXTINGUISHERS

A. Fire Extinguishers: Type, size, and capacity for each fire-protection cabinet indicated.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. J. L. Industries, Inc.; a division of Activar Construction Products Group; **Cosmic 10E**
b. Larsen's Manufacturing Company; **MP10**
c. Substitutions: Under provisions of Section 012500 “Substitution Procedures”.

2. Source Limitations: Obtain fire extinguishers, fire-protection cabinets, and accessories, from single source from single manufacturer.
3. Valves: Manufacturer's standard.
4. Handles and Levers: Manufacturer's standard.
5. Instruction Labels: Include pictorial marking system complying with NFPA 10, Appendix B.

B. Multi-purpose Dry-Chemical Type in Steel Container: UL-rated 4-A:80-B:C, 10-lb nominal capacity, with monoammonium phosphate-based dry chemical in enameled-steel container.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine fire extinguishers for proper charging and tagging.

1. Remove and replace damaged, defective, or undercharged fire extinguishers.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Install fire extinguishers in locations indicated and in compliance with requirements of authorities having jurisdiction.

END OF SECTION 104416

SECTION 105113 - METAL LOCKERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Welded corridor lockers.
2. Locker benches.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of metal locker.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of metal locker and bench.

B. HPBS Submittals:

1. Product Data for Section 16a-38k-6(d)(8): For products having recycled content, documentation indicating percentages by weight of postconsumer and pre-consumer recycled content. Include statement indicating cost for each product having recycled content.

C. Shop Drawings: For metal lockers.

1. Include plans, elevations, sections, and attachments details.
2. Show locker trim and accessories.
3. Include locker identification system and numbering sequence.

D. Samples: For each color specified, in manufacturer's standard size.

E. Product Schedule: For lockers.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Sample Warranty: For special warranty.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For adjusting, repairing, and replacing locker doors and latching mechanisms to include in maintenance manuals.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Full-size units of the following metal locker hardware items equal to ten percent (10%) of amount installed for each type and finish installed, but no fewer than five (5) units:

a. Identification plates.
b. Hooks.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Do not deliver metal lockers until spaces to receive them are clean, dry, and ready for their installation.

1.8 FIELD CONDITIONS

A. Field Measurements: Verify actual dimensions of recessed openings by field measurements before fabrication.

1.9 COORDINATION

A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of work specified in other Sections to ensure that metal lockers can be supported and installed as indicated.

1.10 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of metal lockers that fail in materials or workmanship, excluding finish, within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Structural failures.
b. Faulty operation of latches and other door hardware.

2. Damage from deliberate destruction and vandalism is excluded.
3. Warranty Period for Welded Metal Lockers: Ten (10) years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain each type of metal lockers and accessories from single source from single locker manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. Accessibility Standard: For lockers and locker benches indicated to be accessible, comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines and ICC A117.1.

2.3 WELDED CORRIDOR LOCKERS

A. Basis-of-Design Product:

1. Penco Products, Inc; **Welded Gen2**

B. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

1. Lyon Workspace Products, LLC
2. Republic Storage Systems Company
3. Substitutions: Under provisions of Section 012500 “Substitution Procedures”.

C. Doors: One-piece; fabricated from 14-gauge nominal-thickness steel sheet; formed into channel shape with double bend at vertical edges and with right-angle single bend at horizontal edges.

1. Reinforcement: Manufacturer's standard reinforcing angles, channels, or stiffeners for doors more than 15 inches wide; welded to inner face of doors.
2. Door Style: Vented panel as follows:

a. Louvered Vents: No fewer than six (6) louver openings at top and bottom for single-tier, three (3) louver openings at top and bottom for double-tier and two (2) louver openings at top and bottom for triple- and 4-tier lockers.

D. Body: Assembled by welding body components together. Fabricate from unperforated steel sheet with thicknesses as follows:

1. Tops, Bottoms, and Sides: 16-gauge nominal thickness.
2. Backs: 18-gauge nominal thickness.

E. Frames: Channel formed; fabricated from 16-gauge nominal-thickness steel sheet; lapped and factory welded at corners; with top and bottom main frames factory welded into vertical main frames. Form continuous, integral, full-height door strikes on vertical main frames.

F. Hinges: Welded to door and attached to door frame with no fewer than two (2) factory-installed rivets per hinge that are completely concealed and tamper resistant when door is closed; fabricated to swing 180 degrees; self-closing.

1. Continuous Hinges: Manufacturer's standard, steel, full height.

G. Recessed Door Handle and Latch: Stainless-steel cup with integral door pull, recessed so locking device does not protrude beyond door face; pry and vandal resistant.

1. Multipoint Latching: Finger-lift latch control designed for use with built-in combination locks or padlocks; positive automatic latching and pre-locking.

a. Latch Hooks: Equip doors 48 inches and higher with three (3) latch hooks and doors less than 48 inches high with two (2) latch hooks; fabricated from 0.120-inch nominal-thickness steel sheet; welded to full-height door strikes; with resilient silencer on each latch hook.
b. Latching Mechanism: Manufacturer's standard, rattle-free latching mechanism and moving components isolated to prevent metal-to-metal contact, and incorporating a pre-locking device that allows locker door to be locked while door is open and then closed without unlocking or damaging lock or latching mechanism.

H. Identification Plates: Manufacturer's standard, etched, embossed, or stamped aluminum plates, with numbers and letters at least 3/8-inch-high.

I. Hooks: Manufacturer's standard ball-pointed type, aluminum or steel; zinc plated.

J. Continuous Zee Base: Fabricated from, 0.075-inch nominal-thickness steel sheet.

1. Height: 4 inches.

K. Continuous Sloping Tops: Fabricated from 0.048-inch nominal-thickness steel sheet, with a pitch of approximately 20 degrees.

1. Closures: Vertical-end type.
2. Sloping-top corner fillers, mitered.

L. Finished End Panels: Fabricated from 16-gauge nominal-thickness steel sheet to cover unused penetrations and fasteners, except for perimeter fasteners, at exposed ends of non-recessed metal lockers; finished to match lockers.

M. Materials:

1. Cold-Rolled Steel Sheet: ASTM A 1008, Commercial Steel (CS), Type B, suitable for exposed applications.
2. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of pre-consumer recycled content not less than twenty-five percent (25%).

N. Finish: Baked enamel or powder coat.

1. Color: As selected by Architect and Owner from manufacturer's full range.

2.4 LOCKER BENCHES

A. Basis-of-Design Product:

1. Wisconsin Bench Manufacturing

B. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Robinson Steel Company
2. Substitutions: Under provisions of Section 012500 “Substitution Procedures”.

C. Provide bench units with overall assembly height of 17¼ inches.

D. Bench Tops: Manufacturer's standard one-piece units, with rounded corners and edges.

1. Size: Minimum 20 inches wide by 1¼ inches thick.
2. Laminated clear hardwood with one (1) coat of clear sealer on all surfaces and one (1) coat of clear lacquer on top and sides.
3. Provide with slip resistant surface.

E. Backrests: Manufacturer's standard one-piece units, with rounded corners and edges.

1. Size: Minimum 20-inch-wide backs where accessible benches are indicated.

2. Laminated clear hardwood with one (1) coat of clear sealer on all surfaces and one (1) coat of clear lacquer on top and sides.

F. Fixed Pedestals: Manufacturer's standard supports, with predrilled fastener holes for attaching bench top and anchoring to floor, complete with fasteners and anchors, and as follows:

1. Tubular Steel: 1½-inch-diameter steel tubing threaded on both ends, with standard pipe flange at top and bell-shaped cast-iron base; with baked-enamel or powder-coat finish; anchored with exposed fasteners.

a. Color: As selected by Architect and Owner from manufacturer's full range.

G. Materials:

1. Steel Tube: ASTM A 500, cold rolled.

2.5 FABRICATION

A. Fabricate metal lockers square, rigid, without warp, and with metal faces flat and free of dents or distortion. Make exposed metal edges safe to touch and free of sharp edges and burrs.

1. Form body panels, doors, shelves, and accessories from one-piece steel sheet unless otherwise indicated.
2. Provide fasteners, filler plates, supports, clips, and closures as required for complete installation.

B. Fabricate each metal locker with an individual door and frame; individual top, bottom, and back; and common intermediate uprights separating compartments. Factory weld frame members of each metal locker together to form a rigid, one-piece assembly.

C. Equipment: Provide each locker with an identification plate and the following equipment:

1. Single-Tier Units: Shelf, one (1) double-prong ceiling hook, and two (2) single-prong wall hooks.

D. Welded Construction: Factory preassemble metal lockers by welding all joints, seams, and connections; with no bolts, nuts, screws, or rivets used in assembly of main locker groups. Factory weld main locker groups into one-piece structures. Grind exposed welds smooth and flush.

E. Accessible Lockers: Fabricate as follows:

1. Locate compartment bottom minimum of 15 inches above the floor or an extra shelf placed 15 inches above the floor for unobstructed forward and side reach.
2. Where hooks, coat rods, or additional shelves are provided, locate no higher than 48 inches above the floor.
3. Operation of the recessed hasp latch will not require pinching or twisting actions on the part of the user.
4. Handicapped symbol attached to door.

F. Continuous Zee Base: Fabricated in lengths as long as practical to enclose base and base ends; finished to match lockers.

G. Continuous Sloping Tops: Fabricated in lengths as long as practical, without visible fasteners at splice locations; finished to match lockers.

1. Sloping-top corner fillers, mitered.

H. Finished End Panels: Fabricated to conceal unused penetrations and fasteners, except for perimeter fasteners, at exposed ends of non-recessed metal lockers; finished to match lockers.

2.6 ACCESSORIES

A. Fasteners: Zinc- or nickel-plated steel, slotless-type, exposed bolt heads; with self-locking nuts or lock washers for nuts on moving parts.

B. Anchors: Material, type, and size required for secure anchorage to each substrate.

1. Provide toothed-steel or lead expansion sleeves for drilled-in-place anchors.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine walls, floors, and support bases, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install lockers level, plumb, and true; shim as required, using concealed shims.

1. Anchor locker runs at ends and at intervals recommended by manufacturer, but not more than 36 inches o.c. Using concealed fasteners, install anchors through backup reinforcing plates, channels, or blocking as required to prevent metal distortion.
2. Anchor single rows of metal lockers to walls near top of lockers and to floor.

B. Welded Lockers: Connect groups together with manufacturer’s standard fasteners, with no exposed fasteners on face frames.

C. Equipment:

1. Attach hooks with at least two (2) fasteners.
2. Identification Plates: Identify metal lockers with identification indicated on Drawings.

a. Attach plates to each locker door, near top, centered, with at least two (2) aluminum rivets.

D. Trim: Fit exposed connections of trim, fillers, and closures accurately together to form tight, hairline joints, with concealed fasteners and splice plates.

1. Attach sloping-top units to metal lockers, with closures at exposed ends.

2. Attach finished end panels using fasteners only at perimeter to conceal exposed ends of non-recessed metal lockers.

E. Fixed Locker Benches: Provide no fewer than two (2) pedestals or brackets for each bench, uniformly spaced not more than 72 inches apart. Securely fasten tops of pedestals or brackets to undersides of bench tops, and anchor bases to wall.

3.3 ADJUSTING

A. Clean, lubricate, and adjust hardware. Adjust doors and latches to operate easily without binding.

3.4 PROTECTION

A. Protect metal lockers from damage, abuse, dust, dirt, stain, or paint. Do not permit use during construction.

B. Touch up marred finishes or replace metal lockers that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by locker manufacturer.

END OF SECTION 105113

SECTION 113100 - RESIDENTIAL APPLIANCES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Cooking appliances.
2. Refrigeration appliances.

1.3 PRE-INSTALLATION MEETINGS

A. Pre-installation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include installation details, material descriptions, dimensions of individual components, and finishes for each appliance.
2. Include rated capacities, operating characteristics, electrical characteristics, and furnished accessories.

B. Samples: For each exposed product and for each color and texture specified, in manufacturer's standard size.

C. Product Schedule: For appliances. Use same designations indicated on Drawings.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For manufacturer.

B. Product Certificates: For each type of appliance.

C. Field quality-control reports.

D. Sample Warranties: For manufacturers' special warranties.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For each residential appliance to include in operation and maintenance manuals.

1.7 WARRANTY

A. Special Warranties: Manufacturer agrees to repair or replace residential appliances or components that fail in materials or workmanship within specified warranty period except as qualified below:

1. Warranty Period: One (1) year from date of Substantial Completion.

B. Microwave Oven: Limited warranty including parts and labor for first year and parts thereafter for on-site service.

1. Warranty Period: Three (3) years from date of Substantial Completion.

C. Refrigerator/Freezer, Sealed System: Limited warranty, including parts and labor for first year, and parts thereafter, for on-site service on the product.

1. Warranty Period for Compressor: Five (5) years, parts only, from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. AccuCold (AC)
2. Accurex (AX)
3. Amana (A)
4. Bosch (B)
5. Broan-NuTone, LLC (BN)
6. Bunn (BU)
7. Electrolux Home Products (E)
8. Follett (F)
9. General Electric Company (GE)
10. Keurig Dr. Pepper, Inc. (K)
11. LG Electronics (LG)
12. Maytag; a division of Whirlpool Corporation (M)
13. Sears Brands LLC (Kenmore)
14. Summit Appliance Division (S)
15. U-Line (U)
16. Whirlpool Corporation (W)
17. Substitutions: Under provisions of Section 012500 “Substitution Procedures” unless otherwise indicated.

2.2 PERFORMANCE REQUIREMENTS

A. Electrical Appliances: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Accessibility: Where residential appliances are indicated to comply with accessibility requirements, comply with applicable provisions in the ABA standards of the Federal agency having jurisdiction and ICC A117.1.

2.3 MICROWAVE OVENS

A. Microwave Oven:

1. Basis-of-Design Product: **GE #PES7227SLSS**
2. Mounting: Countertop.
3. Type: Conventional.
4. Dimensions:

    a. Width: 24 inches.
    b. Depth: 18-½ inches.
    c. Height: 13½ inches.

5. Capacity: 2.2 cu. ft.
6. Oven Door: Door with observation window and pushbutton latch release.
7. Microwave Power Rating: 1100 W.
8. Electric Power Supply: 120 V, 60 Hz, 1 phase, 15 A.
9. Controls: Digital panel controls and timer display.
10. Other Features: Turntable and sensor cooking.
11. Material: Stainless-steel.

2.4 COFFEE MAKERS

A. Coffee Maker:

1. Basis-of-Design Product: **BU #CWTF-15-1**
2. Description: Single funnel.

    a. Type: Electric heated.
    b. Controls: Rocker switches.
    c. Accessories:

        1) Warmers: One (1).
        2) Hot water faucet.
        3) Servers: Minimum one (1) each of black and orange handles.
        4) Fittings, hoses, and brackets for connection to water line.

3. Electrical Service: 120V, 15A, 1-phase, 60Hz, 2-wire.
4. Finish: Stainless-steel.

2.5 REFRIGERATOR/FREEZERS

A. Refrigerator/Freezer: Two-door refrigerator with one (1) refrigerator and one (1) freezer drawers on bottom and complying with AHAM HRF-1.

1. Basis-of-Design Product: **GE #PVD28BYNFS**
2. Type: Freestanding.
3. Dimensions:

    a. Width: 35-5/8 inches.
    b. Depth: 36¾ inches.
    c. Height: 69-7/8 inches.

4. Storage Capacity:

a. Refrigeration Compartment Volume: 19.34 cu. ft.
b. Convertible Drawer Volume: 3.61 cu. ft.
c. Freezer Volume: 8.55 cu. ft.
d. Shelf Area: Four (4) adjustable shelves half-width, one (1) fixed full-width.

5. General Features:

a. Door Configuration: Overlay.
b. Dispenser in door for ice and cold water.
c. Built-in water-filtration system.
d. Separate touch-pad temperature controls for each compartment.
e. Self-leveling legs.
f. Door alarm.

6. Refrigerator Features:

a. Interior light in refrigeration compartment.
b. Compartment Storage: Two (2) drawers with adjustable controls.
c. Door Storage: Modular compartments with gallon-milk-container storage.

7. Convertible Drawer Features: One (1) compartment configured as pull-out drawer.

a. Removable bid caddy/divider.
b. Removable drawer liner.

8. Freezer Features: One (1) freezer compartment configured as pull-out drawer.

a. Automatic defrost.
b. Interior light in freezer compartment.
c. Spill-proof freezer floor.
d. Two (2) baskets and one (1) drawer.
e. Automatic icemaker.

9. ENERGY STAR: Provide appliances that qualify for the EPA/DOE ENERGY STAR product-labeling program.
10. Appliance Color/Finish: Stainless-steel.

2.6 GENERAL FINISH REQUIREMENTS

A. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, power connections, and other conditions affecting installation and performance of residential appliances.

B. Examine roughing-in for piping systems to verify actual locations of piping connections before appliance installation.

C. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install appliances according to manufacturer's written instructions.

B. Freestanding Equipment: Place units in final locations after finishes have been completed in each area. Verify that clearances are adequate to properly operate equipment.

3.3 FIELD QUALITY CONTROL

A. Perform the following tests and inspections with the assistance of a factory-authorized service representative:

1. Perform visual, mechanical, and electrical inspection and testing for each appliance according to manufacturers' written recommendations. Certify compliance with each manufacturer's appliance-performance parameters.
2. Leak Test: After installation, test for leaks. Repair leaks and retest until no leaks exist.
3. Operational Test: After installation, start units to confirm proper operation.
4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and components.

B. An appliance will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports.

3.4 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain residential appliances.

END OF SECTION 113100

SECTION 115213 - PROJECTION SCREENS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Electrically operated, front-projection screens and controls.

B. Related Requirements:

1. Section 055000 "Metal Fabrications" for metal support framing for front-projection screens.
2. Section 061000 "Rough Carpentry" for wood backing for screen installation.

1.3 DEFINITIONS

A. Gain: Ratio of light reflected from viewing surface material to that reflected perpendicularly from a magnesium carbonate surface as determined in accordance with SMPTE RP 94.

B. Half-Gain Angle: The angle, measured from the axis of the viewing surface to the most central position on a perpendicular plane through the horizontal centerline of the viewing surface, where the gain is half of the peak gain.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: Show layouts and types of front-projection screens. Include the following:

1. Drop heights.
2. For end-mounted motors, location of screen centerline relative to ends of screen case.
3. Anchorage details, including connection to supporting structure for suspended units.
4. Details of juncture of exposed surfaces with adjacent finishes.
5. For electrically operated units, wiring diagrams and location of wiring connections.
6. Accessories.

C. Samples: For each type of exposed finish and for each color and finish specified, in manufacturer's standard sizes.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For front-projection screens to include in maintenance manuals.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Environmental Limitations: Do not deliver front-projection screens until spaces are enclosed and weathertight, wet work in installation spaces is complete and dry, and temporary or permanent HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

B. Store front-projection screens in manufacturer's protective packaging and according to manufacturer's written instructions.

1.7 COORDINATION

A. Coordinate layout and installation of front-projection screens with adjacent construction, including ceiling suspension systems, light fixtures, HVAC system components, fire-suppression system, and partitions.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations for Projection Screens: Obtain front-projection screens from single manufacturer. Obtain viewing surfaces and accessories, including mounting hardware, from screen manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. Viewing-Surface and Masking Materials:

1. Mildew-Resistance Rating: Zero or 1 when tested in accordance with ASTM G21.
2. Flame Resistance: Passes NFPA 701.
3. Flame-Spread Index: Not greater than 75 when tested in accordance with ASTM E84.

2.4 ELECTRICALLY OPERATED, FRONT-PROJECTION SCREENS

A. General Requirements: Manufacturer's standard units consisting of case, screen, motor, controls, mounting accessories, and other components necessary for a complete installation.

1. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
2. Screen Mounting: Top edge securely anchored to rigid metal roller and bottom edge formed into a pocket holding a metal rod with ends of rod protected by plastic caps.

B. Surface-Mounted, Metal-Encased, Electrically Operated Screens: Motor-in-roller units designed and fabricated for surface mounting on wall or ceiling, fabricated from formed-steel sheet or from aluminum extrusions; with manufacturer’s standard finish and matching end caps.

1. Basis of Design:

a. Legrand North America, LLC (Legrand AV); **Da-Lite Cosmopolitan**

2. Available Manufacturers:

a. Bretford, Inc.

b. Draper, Inc.
c. Substitutions: Under provisions of Section 012500 “Substitution Procedures”.

3. Motor in Roller: Instant-reversing motor of size and capacity recommended in writing by screen manufacturer; with permanently lubricated ball bearings, automatic thermal-overload protection, preset limit switches to automatically stop screen in up and down positions, and positive-stop action to prevent coasting. Mount motor inside roller with vibration isolators to reduce noise transmission.
4. Controls: Remote, key-operated, three-position control switch installed in recessed device box with flush cover plate matching other electrical device cover plates in room where switch is installed.

a. Provide with one (1) control switch.
b. Provide power supply for low-voltage systems if required.
a. Provide locking cover plates for switches.
b. Provide key-operated, power-supply switch.

5. Surface-Mounting Configuration: Mounted directly to wall or ceiling, as indicated on Drawings, with concealed mounting.
6. Screen-Case Color: As selected by Architect and Owner from manufacturer's entire range.
7. Free-Hanging, Matte Viewing Surface: White, 1.0 minimum peak gain and 60-degree minimum half-gain angle.

a. Edge Treatment: Manufacturer's standard masking borders.

8. Size of Viewing Surface: As indicated in schedule on Drawings.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install front-projection screens at locations indicated on Drawings to comply with manufacturer's written instructions.

B. Install front-projection screens with screen cases in position and in relation to adjoining construction indicated. Securely anchor to supporting substrate in a manner that produces a smoothly operating screen that, when lowered, has flat view surface and plumb vertical edges.

1. Install low-voltage controls according to NFPA 70 and complying with manufacturer's written instructions.

a. Wiring Method: Install wiring in raceway except in accessible ceiling spaces and in gypsum board partitions where unenclosed wiring method may be used. Use UL-listed plenum cable in environmental air spaces, including plenum ceilings. Conceal raceway and cables except in unfinished spaces.

2. Test electrically operated units to verify that screen controls, limit switches, closures, and other operating components are in optimum functioning condition.

END OF SECTION 115213

SECTION 116800 – PLAY EQUIPMENT

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Playground equipment and accessories.

1.2 RELATED SECTIONS

A. Section 03 30 01 – Site Cast-in-Place Concrete

B. Section 31 08 00 – Earthwork

1.3 SCOPE

A. Furnish labor, material, and equipment necessary to provide and install the play equipment as shown on the drawings and as specified herein.

1.4 REFERENCES

A. ASTM F1487-17 - Standard Consumer Safety Performance Specification for Playground Equipment for Public Use.

B. ASTM F2373 – Standard Consumer Safety Performance for Public Use Play Equipment for Children 6 months through 23 Months.

C. ASTM F3101-15 – Standard Specification for Unsupervised Public Use Outdoor Fitness Equipment.

D. 2010 ADA Standard for Accessible Design.

E. U. S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines for Buildings and Facilities.

F. ICC A117.1 for playground equipment designated as accessible.

G. CPSC Technical Safety Guidelines for Public Playgrounds.

H. IPEMA (International Play Equipment Manufacturers Association) Certification.

I. Certified Playground Safety Inspector (CPSI).

J. FSC Certified Wood – Forest Stewardship Council.

1.5 HIGH PERFORMANCE BUILDING GENERAL REQUIREMENTS

A. Implement practices and procedures to meet the project's environmental goals, which include complying with Connecticut Standard Guidelines Compliance Manual for High Performance Buildings, September 2011 with additional mandatory building project requirements for schools. Specific project goals which may impact this and the other sections of this specification include: use of recycled-content materials; use of locally-manufactured materials; use of low-emitting materials; use of certified wood products; construction waste recycling; and the implementation of a construction indoor air quality management plan. Ensure that the requirements related to these goals, as defined in this Section and other Sections of the contract documents, are implemented to the fullest extent. Substitutions or other changes to the work shall not be allowed if such changes substantially compromise the stated High Performance Building criteria.

B. Comply with Connecticut Standard Guidelines Compliance Manual for High Performance Buildings, September 2011 with additional mandatory building project requirements for schools and the Department of Administrative Services / Office of School Construction Grants & Review High Performance School Construction Bulletin, June 2017.

1.6 SUBMITTALS

A. Submit under provisions of Section 01 30 00 - Administrative Requirements.

B. Layout: Upon request, provide layout drawing showing equipment size and locations, required safety zones, signage locations, age range for each area.

C. Product Data: Upon request, provide product data for each selected equipment item.

D. Selection Samples: Upon request, provide samples for each finish product specified, two complete sets of color chips representing manufacturer's full range of available colors and patterns for each material utilized in specified play items.

E. Installation Documentation: All shipments shall include a packet of order-specific, step-by-step instructions for assembly of each component, including equipment assembly diagrams, estimated hours for assembly, footing dimensions, concrete quantity for direct bury components, fall height information, and area required information.

F. LEED: Upon request, provide recycled material data and FSC wood certification (if applicable) for selected products.

G. Warranty documentation: Upon request, provide warranty documentation.

H. Maintenance Manual: Provide maintenance literature for all installed equipment.

1.7 QUALITY ASSURANCE

A. Manufacturer's representative and/or designer to be Certified Playground Safety Inspector (CPSI).

B. Manufacturer Qualifications: Minimum 5-year experience manufacturing similar products.

C. All play structures shall be certified and validated to be in conformance with the ASTM F1487 Standard.

D. In US, all play structures to be in conformance with ASTM F2373.

E. In US, all fitness structures to be in conformance with ASTM F3101-15.

F. To the best of manufacturer's belief and knowledge play structures to conform to the U.S. Consumer Products Safety Commission (CPSC) Guidelines – “Public Playground Safety Handbook” (CGS Section 21a-12a).

G. All playground equipment to be certified by IPEMA.

H. Accessibility:

1. Unless otherwise noted, all play structures are to be accessible according to the 2010 ADA Standard for Accessible Design.
2. Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines for Buildings and Facilities and ICC A117.1 for playground equipment designated as accessible.
3. Manufacturer’s equipment shall integrate play opportunities for all abilities within the same play equipment items and locations, rather than provide separate ADA-specific play items and areas.
4. Designer to confirm paths, ramps, gates, parking, restrooms (if any), and water fountains (if any), serving playground meet accessibility codes and guidelines.
5. Upon request, manufacturer to provide play components listing with product literature for each structure to verify ADA compliance of overall design.

I. Designer to confirm planned playground surfacing meets above standards based on critical fall heights of equipment items.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store products in manufacturer's unopened packaging bearing the brand name and manufacturer's identification until ready for installation.

B. Packaging: Components shall be individually wrapped or bulk wrapped to provide protection during shipment. Small parts and hardware packages will be placed in crates for shipment. The components and crates are then shrink-wrapped to skids (pallets) to ensure secure shipping.

C. Handling: Handle materials to avoid damage.

D. Protect products from damage and theft during construction.

1.9 PROJECT CONDITIONS

A. Confirm environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's recommended limits.

1.10 SEQUENCING

A. Ensure that products of this section are supplied to affected trades in time to prevent interruption of construction progress.

B. Coordinate site preparation, surfacing installation and other related work.

1.11 WARRANTY

The playground equipment manufacturer shall warrant that all play structures and/ or equipment sold will conform in kind and in quality to the specifications manual for the products identified in the Acknowledgment of Order and will be free of defects in manufacturing and material.

PART 1 - PRODUCTS

1.1 MANUFACTURERS

A. Acceptable Manufacturer and basis of design:

1. GameTime, 150 PlayCore Drive SR, Fort Payne, AL 35967; www.gametime.com

2. Landscape Structures, 601 7th Street, South Delano, MN 55328; www.playlsi.com

3. Kompan, 605 West Howard Lane, Suite 101, Austin, TX 78753; www.kompan.com/en/us

B. Manufacturers to be ISO 9001 certified.

C. Manufacturer's standard products to be IPEMA certified.

1.2 MATERIALS & COMPONENTS

A. Material: All materials shall be structurally sound and suitable for safe play. Durability shall be ensured on all steel parts using time-tested coatings such as zinc plating, galvanizing, ProShield finish, TenderTuff coating, etc. Colors shall be finalized with user group during submittal process.

B. Fasteners: Primary fasteners shall be socketed and pinned tamperproof in design, stainless-steel (SST) per ASTM F 879 unless otherwise indicated (see specific product installation/specifications). All primary fasteners shall include a locking patch type material that will meet the minimum torque requirements of IFI-125. Manufacturer to provide special tools for pinned tamperproof fasteners.

C. Installation Documentation: All shipments shall include a notebook or packet of order-specific, step by-step instructions for assembly of each component, including equipment assembly diagrams, estimated hours for assembly, footing dimensions, concrete quantity for direct bury components, fall height information, area required information and detailed material specifications.

D. Packing List: All shipments shall include a packing list for each skid/container, specifying the part numbers and quantities on each skid or within each container.

E. Packaging: All components shall be individually wrapped or bulk wrapped and placed on skids (pallets) then shrink wrapped to provide protection during shipment. Small parts and hardware packages will be placed in crates for shipment. Other components shall be individually wrapped or bulk wrapped to provide protection during shipment.

F. Maintenance Kit: An order-specific maintenance kit shall be provided for each structure order. The kit will include a notebook or packet with a second set of installation documents and order-specific maintenance documentation with recommendations on how often to inspect, what to look for and what to do to keep the equipment in like-new condition. The kit also includes touch-up primer, appropriate color touch-up paint, sandpaper, appropriate color touch-up PVC and additional installation tools for the tamperproof fasteners.

PART 2 - EXECUTION

2.1 EXAMINATION

A. Verify correct location for installation of equipment. Confirm acceptable subgrade preparation, drainage, fencing, any other condition required for proper installation and performance of equipment.

B. Confirm any previous equipment, surfacing, or fencing to be removed has been removed, holes filled and compacted.

C. Do not begin installation until site has been properly prepared. If substrate preparation is the responsibility of another installer, notify them of unsatisfactory preparation before proceeding.

D. Verify locations of any existing utilities through site to avoid conflicts with footers or fall zones.

E. Identify any possible obstructions lying within required equipment safety fall zones.

2.2 PREPARATION

A. Per drawings and specifications. Level site to between 1% and 2% slope unless otherwise noted. Excavate site as needed to accommodate thickness of subbase (if any), cushioning, and surfacing materials and achieve desired final surface elevation in relation to surrounding grade.

B. Lay out equipment locations and fall zones on site and verify fall zones are free and clear with no trees, existing equipment, or other obstructions.

C. Verify equipment delivered to site is correct, undamaged, and complete prior to starting assembly or installation. Verify all hardware and accessories are present prior to starting installation. Contact manufacturer’s representative to replace missing or damaged items.

D. Review manufacturer’s installation instructions, included with each item, and contact manufacturer with any questions.

E. If damage to existing equipment is discovered, notify owner. Contractor is not responsible for compliance of existing equipment or surfacing to remain.

2.3 INSTALLATION

A. Install all playground equipment as shown on drawings and per manufacturer’s instructions, approves submittals, and in proper relationship with adjacent construction.

B. Contact manufacturer with installation questions to prevent damage to equipment.

C. Protect construction area from trespassers with orange plastic construction fencing or similar until installation and final safety inspections are complete.

D. Align all posts vertically and decks level. All equipment shall be securely anchored and in proper working order.

E. Coordinate final elevation of playground equipment with finished elevation of any playground safety surfacing for area.

F. Touch up any scratched surfaces with paint provided by manufacturer.

2.4 INSPECTION

A. Manufacturer’s representative to inspect completed installation for safety and relevant standard compliance prior to use. Notify installer of any items to be corrected. All corrections to be made prior to use.

2.5 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION 116800

SECTION 122413 - ROLLER WINDOW SHADES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Manually operated roller shades with single rollers.
2. Manually operated, double-roller shades.

B. Related Requirements:

1. Section 061000 "Rough Carpentry" for wood blocking and grounds for mounting roller shades and accessories.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include styles, material descriptions, construction details, dimensions of individual components and profiles, features, finishes, and operating instructions for roller shades.

B. Shop Drawings: Show fabrication and installation details for roller shades, including shadeband materials, their orientation to rollers, and their seam and batten locations.

C. Samples: For each exposed product and for each color and texture specified, 10 inches long.

D. Product Schedule: For roller shades. Use same designations indicated on Drawings.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Certificates: For each type of shadeband material.

C. Product Test Reports: For each type of shadeband material, for tests performed by manufacturer and witnessed by a qualified testing agency.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For roller shades to include in maintenance manuals.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Roller Shades: Full-size units equal to five percent (5%) of quantity installed for each size, color, and shadeband material indicated, but no fewer than two (2) units.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: Fabricator of products.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver roller shades in factory packages, marked with manufacturer, product name, and location of installation using same designations indicated on Drawings.

1.9 FIELD CONDITIONS

A. Environmental Limitations: Do not install roller shades until construction and finish work in spaces, including painting, is complete and dry and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

B. Field Measurements: Where roller shades are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings. Allow clearances for operating hardware of operable glazed units through entire operating range. Notify Architect of installation conditions that vary from Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Product:

1. Rollease Acmeda; **Contract Series**

B. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Draper, Inc.
2. Hunter Douglas
3. MechoShade Systems, Inc.
4. OEM Shades Inc.
5. SWF Contract
6. Substitutions: Under provisions of Section 012500 “Substitution Procedures”.

C. Source Limitations: Obtain roller shades from single source from single manufacturer.

2.2 MANUALLY OPERATED SHADES WITH SINGLE ROLLERS

A. Chain-and-Clutch Operating Mechanisms: With continuous-loop bead chain and clutch that stops shade movement when bead chain is released; permanently adjusted and lubricated.

1. Bead Chains: Stainless-steel.

a. Loop Length: Full length of roller shade.
b. Limit Stops: Provide upper and lower ball stops.

c. Chain-Retainer Type: Chain tensioner, sill mounted.

2. Spring Lift-Assist Mechanisms: Manufacturer's standard for balancing roller-shade weight and lifting heavy roller shades.

a. Provide for shadebands that weigh more than 10 lb. or for shades as recommended by manufacturer, whichever criteria are more stringent.

B. Rollers: Corrosion-resistant steel or extruded-aluminum tubes of diameters and wall thicknesses required to accommodate operating mechanisms and weights and widths of shadebands indicated without deflection. Provide with permanently lubricated drive-end assemblies and idle-end assemblies designed to facilitate removal of shadebands for service.

1. Roller Drive-End Location: Right side of inside face of shade.
2. Direction of Shadeband Roll: Regular, from back (exterior face) of roller.
3. Shadeband-to-Roller Attachment: Manufacturer's standard method.

C. Mounting Hardware: Brackets or endcaps, corrosion resistant and compatible with roller assembly, operating mechanism, installation accessories, and mounting location and conditions indicated.

D. Shadebands:

1. Shadeband Material: Light-blocking fabric.
2. Shadeband Bottom (Hem) Bar: Steel or extruded aluminum.

a. Type: Enclosed in sealed pocket of shadeband material.

E. Installation Accessories:

1. Exposed Headbox: Rectangular, extruded-aluminum enclosure including front fascia, top and back covers, endcaps, and removable bottom closure.

a. Height: Manufacturer's standard height required to enclose roller and shadeband assembly when shade is fully open, but not less than 4 inches.

2. Endcap Covers: To cover exposed endcaps.
3. Installation Accessories Color and Finish: As selected by Architect and Owner from manufacturer's entire range.

2.3 MANUALLY OPERATED, DOUBLE-ROLLER SHADES

A. Chain-and-Clutch Operating Mechanisms: With continuous-loop bead chain and clutch that stops shade movement when bead chain is released; permanently adjusted and lubricated.

1. Bead Chains: Stainless-steel.

a. Loop Length: Full length of roller shade.
b. Limit Stops: Provide upper and lower ball stops.
c. Chain-Retainer Type: Chain tensioner, sill mounted.

2. Spring Lift-Assist Mechanisms: Manufacturer's standard for balancing roller-shade weight and lifting heavy roller shades.

a. Provide for shadebands that weigh more than 10 lb. or for shades as recommended by manufacturer, whichever criteria are more stringent.

B. Rollers: Corrosion-resistant steel or extruded-aluminum tubes of diameters and wall thicknesses required to accommodate operating mechanisms and weights and widths of shadebands indicated without deflection. Provide with permanently lubricated drive-end assemblies and idle-end assemblies designed to facilitate removal of shadebands for service.

1. Double-Roller Mounting Configuration: Offset, outside roller over and inside roller under.
2. Inside Roller:

a. Drive-End Location: Right side of inside face of shade.
b. Direction of Shadeband Roll: Regular, from back (exterior face) of roller.

3. Outside Roller:

a. Drive-End Location: Right side of inside face of shade.
b. Direction of Shadeband Roll: Regular, from back (exterior face) of roller.

4. Shadeband-to-Roller Attachment: Manufacturer's standard method.

C. Mounting Hardware: Brackets or endcaps, corrosion resistant and compatible with roller mounting configuration, roller assemblies, operating mechanism, installation accessories, and installation locations and conditions indicated.

D. Inside Shadebands:

1. Shadeband Material: Light-filtering fabric.
2. Shadeband Bottom (Hem) Bar: Steel or extruded aluminum.

a. Type: Enclosed in sealed pocket of shadeband material.

E. Outside Shadebands:

1. Shadeband Material: Light-blocking fabric.
2. Shadeband Bottom (Hem) Bar: Steel or extruded aluminum.

a. Type: Enclosed in sealed pocket of shadeband material.

F. Installation Accessories:

1. Exposed Headbox: Rectangular, extruded-aluminum enclosure including front fascia, top and back covers, endcaps, and removable bottom closure.

a. Height: Manufacturer's standard height required to enclose roller and shadeband assembly when shade is fully open, but not less than 4 inches.

2. Endcap Covers: To cover exposed endcaps.
3. Installation Accessories Color and Finish: As selected by Architect and Owner from manufacturer's entire range.

2.4 SHADEBAND MATERIALS

A. Shadeband Material Flame-Resistance Rating: Comply with NFPA 701. Testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

B. Light-Blocking Fabric: Opaque fabric, stain and fade resistant.

1. Basis-of-Design Product: **Mesa Blackout**
2. Source: Roller-shade manufacturer.
3. Type: Polyester with acrylic backing, PVC-free.
4. Roll Width: Per manufacturer.
5. Orientation on Shadeband: Up the bolt.
6. Color: **WS**, as indicated in Section 090000 “Schedule of Finishes”.

C. Light-Filtering Fabric: Woven fabric, stain and fade resistant.

1. Basis-of-Design Product: **Ambient Renew**
2. Source: Roller-shade manufacturer.
3. Type: Recycled and virgin polyester, PVC-free.
4. Weave: Basketweave.
5. Roll Width: Per manufacturer.
6. Orientation on Shadeband: Up the bolt.
7. Openness Factor: Five percent (5%).
8. Color: **WS**, as indicated in Section 090000 “Schedule of Finishes”.

2.5 ROLLER-SHADE FABRICATION

A. Product Safety Standard: Fabricate roller shades to comply with WCMA A 100.1, including requirements for flexible, chain-loop devices; lead content of components; and warning labels.

B. Unit Sizes: Fabricate units in sizes to fill window and other openings as follows, measured at 74 deg F:

1. Outside of Jamb Installation: Width and length as indicated, with terminations between shades of end-to-end installations at centerlines of mullion or other defined vertical separations between openings.

C. Shadeband Fabrication: Fabricate shadebands without battens or seams to extent possible except as follows:

1. Vertical Shades: Where width-to-length ratio of shadeband is equal to or greater than 1:4, provide battens and seams at uniform spacings along shadeband length to ensure shadeband tracking and alignment through its full range of movement without distortion of the material.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, operational clearances, and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 ROLLER-SHADE INSTALLATION

A. Install roller shades level, plumb, and aligned with adjacent units according to manufacturer's written instructions.

1. Opaque Shadebands: Located so shadeband is not closer than 2 inches to interior face of glass. Allow clearances for window operation hardware.

B. Roller Shade Locations: As indicated on Drawings.

3.3 ADJUSTING

A. Adjust and balance roller shades to operate smoothly, easily, safely, and free from binding or malfunction throughout entire operational range.

3.4 CLEANING AND PROTECTION

A. Clean roller-shade surfaces after installation, according to manufacturer's written instructions.

B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that roller shades are without damage or deterioration at time of Substantial Completion.

C. Replace damaged roller shades that cannot be repaired, in a manner approved by Architect, before time of Substantial Completion.

END OF SECTION 122413

PROJECT MANUAL

TOWN OF GREENWICH
CONNECTICUT

ADDITIONS & ALTERATION

OLD GREENWICH SCHOOL
285 SOUND BEACH AVENUE
OLD GREENWICH, CT 06870

STATE PROJECT #057-____
S/P+A PROJECT #22.382

VOLUME 3 OF 4
(Section 123661.16 – Section 262416)

DD Submission: January 19, 2024
95%CD Submission: August 29, 2024

Architects | Engineers | Interiors
Silver Petrucelli + Associates, Inc.
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Town Officials

Building Inspector	Fire Marshal
Sanitation/Health Inspector	ADA/504 Coordinator

ADDITIONS & ALTERATION

OLD GREENWICH SCHOOL
285 SOUND BEACH AVENUE
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STATE PROJECT #057-____ __

S/P+A PROJECT #22.382

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PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Solid surface material countertops.
2. Solid surface material backsplashes.
3. Solid surface material end splashes.

B. Related Requirements:

1. Section 224216.16 "Commercial Sinks" for sinks and plumbing fittings.

1.3 ACTION SUBMITTALS

A. Product Data: For solid surfacing materials.

B. HPBS Submittals:

1. Product Data for Sections 16a-38k-6(d)(8): For products having recycled content, documentation indicating percentages by weight of postconsumer and pre-consumer recycled content. Include statement indicating cost for each product having recycled content.

C. Shop Drawings: Show materials, finishes, edge and backsplash profiles, and methods of joining, and cutouts for plumbing fixtures.

1. Show locations and details of joints.
2. Show direction of directional pattern, if any.

D. Samples: For the following products:

1. Solid surfacing material, 6 inches square.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For fabricator.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For solid surface materials to include in maintenance manuals. Include Product Data for care products used or recommended by Installer and names, addresses, and telephone numbers of local sources for products.

1.6 QUALITY ASSURANCE

A. Fabricator Qualifications: Shop that employs skilled workers who custom-fabricate solid surface materials similar to that required for this Project, and whose products have a record of successful in-service performance.

B. Installer Qualifications: Fabricator.

1.7 FIELD CONDITIONS

A. Field Measurements: Verify dimensions by field measurements before fabrication is complete.

1.8 COORDINATION

A. Coordinate locations of utilities that will penetrate countertops or backsplashes.

PART 2 - PRODUCTS

2.1 SOLID SURFACE MATERIALS

A. Solid Surface Material: Homogeneous-filled plastic resin complying with ICPA SS-1.

1. Basis-of-Design Product:

a. Avonite Surfaces by Aristech Surfaces LLC

2. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. E. I. du Pont de Nemours and Company
b. Formica Corporation
c. LG Chemical, Ltd.
d. Wilsonart International
e. Substitutions: Under provisions of Section 012500 “Substitution Procedures”.

3. Type: Provide Standard type unless Special Purpose type is indicated.
4. Colors and Patterns: **SS**, as indicated in Section 090000 “Schedule of Finishes”.

B. Medium-Density Fiberboard: ANSI A208.2, Grade 130, made for wet environments.

2.2 FABRICATION

A. Fabricate according to solid surface material manufacturer's written instructions and to the AWI/AWMAC/WI's "Architectural Woodwork Standards."

1. Grade: **Custom**.

B. Configuration:

1. Front: As indicated on Drawings.
2. Backsplash: Straight, slightly eased at corner.
3. End/Side Splash: Matching backsplash.

C. Countertops: ½-inch-thick, solid surface material with front edge built up with same material.

D. Splashes: ½-inch-thick, solid surface material.

E. Fabricate tops with shop-applied edges unless otherwise indicated. Comply with solid surface material manufacturer's written instructions for adhesives, sealers, fabrication, and finishing.

1. Fabricate with loose back and end splashes for field assembly.

F. Joints: Fabricate countertops without joints.

G. Cutouts and Holes:

1. Counter-Mounted Plumbing Fixtures: Prepare countertops in shop for field cutting openings for counter-mounted fixtures. Mark tops for cutouts and drill holes at corners of cutout locations. Make corner holes of largest radius practical.
2. Fittings: Drill countertops in shop for plumbing fittings and similar items.

2.3 INSTALLATION MATERIALS

A. Adhesive: Product recommended by solid surface material manufacturer.

1. Adhesives shall not contain urea formaldehyde.

B. Sealant: Comply with applicable requirements in Section 079200 "Joint Sealants."

C. Countertop Brackets: Heavy-duty, folded steel design with ¾ inch by 1½ inch notching system and two (2) conduit holes. Provide size required for installation.

1. Product: Subject to compliance with requirements, provide **EH-1824** by Rakks, Inc. or approved equal.

2.4 ACCESSORIES

A. Grommets: Refer to Section 064116 “Plastic-Laminate-Faced Architectural Cabinets”.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates to receive solid surface material countertops and conditions under which material will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install countertops level to a tolerance of 1/8-inch in 8 feet, ¼-inch maximum. Do not exceed 1/64-inch difference between planes of adjacent units.

B. Fasten subtops to base units by screwing through subtops into cornerblocks of base units. Shim as needed to align subtops in a level plane.

C. Secure countertops to subtops with adhesive according to solid surface material manufacturer's written instructions. Align adjacent surfaces and, using adhesive in color to match countertop, form seams to comply with manufacturer's written instructions. Carefully dress joints smooth, remove surface scratches, and clean entire surface.

D. Install splashes by adhering to wall and countertops with adhesive. Mask areas of countertops and splashes adjacent to joints to prevent adhesive smears.

E. Complete cutouts not finished in shop. Mask areas of countertops adjacent to cutouts to prevent damage while cutting. Make cutouts to accurately fit items to be installed, and at right angles to finished surfaces unless beveling is required for clearance. Ease edges slightly to prevent snipping.

1. Seal edges of cutouts in subtops by saturating with varnish.

F. Apply sealant to gaps at walls; comply with Section 079200 "Joint Sealants."

END OF SECTION 123661.16

SECTION 123661.19 - QUARTZ AGGLOMERATE COUNTERTOPS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Quartz agglomerate countertops.
2. Quartz agglomerate backsplashes.
3. Quartz agglomerate end splashes.

B. Related Requirements:

1. Section 224216.16 "Commercial Sinks" for sinks and plumbing fittings.

1.3 COORDINATION

A. Coordinate locations of utilities that will penetrate countertops or backsplashes.

1.4 ACTION SUBMITTALS

A. Product Data: For countertop materials.

B. Shop Drawings: For countertops. Show materials, finishes, edge and backsplash profiles, methods of joining, and cutouts for plumbing fixtures.

1. Show locations and details of joints.
2. Show direction of directional pattern, if any.

C. Samples: For the following products:

1. Countertop material, 6 inches square.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For fabricator.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For quartz agglomerate countertops to include in maintenance manuals. Include Product Data for care products used or recommended by Installer and names, addresses, and telephone numbers of local sources for products.

1.7 QUALITY ASSURANCE

A. Fabricator Qualifications: Shop that employs skilled workers who custom-fabricate countertops similar to that required for this Project, and whose products have a record of successful in-service performance.

B. Installer Qualifications: Fabricator of countertops.

1.8 FIELD CONDITIONS

A. Field Measurements: Verify dimensions of countertops by field measurements before countertop fabrication is complete.

PART 2 - PRODUCTS

2.1 QUARTZ AGGLOMERATE COUNTERTOP MATERIALS

A. Quartz Agglomerate: Solid sheets consisting of quartz aggregates bound together with a matrix of filled plastic resin and complying with ICPA SS-1, except for composition.

1. Basis-of-Design:

a. E. I. du Pont de Nemours and Company; **Corian Quartz**

2. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. LG Chemical, Ltd.
b. Wilsonart International
c. Substitutions: Under provisions of Section 012500 “Substitution Procedures”.

3. Colors and Patterns: **QTZ**, as indicated in Section 090000 “Schedule of Finishes”.

B. Medium-Density Fiberboard: ANSI A208.2, Grade 130, made for wet environments.

2.2 COUNTERTOP FABRICATION

A. Fabricate countertops according to quartz agglomerate manufacturer's written instructions and the AWI/AWMAC/WI's "Architectural Woodwork Standards."

1. Grade: **Custom**.

B. Configuration:

1. Front: As indicated on Drawings.
2. Backsplash: Straight, slightly eased at corner.
3. End/Side Splash: Matching backsplash.

C. Countertops: ½-inch-thick, quartz agglomerate with front edge built up with same material.

D. Splashes: ½-inch-thick, quartz agglomerate.

E. Fabricate tops with shop-applied edges unless otherwise indicated. Comply with quartz agglomerate manufacturer's written instructions for adhesives, sealers, fabrication, and finishing.

1. Fabricate with loose back and end splashes for field assembly.

F. Joints: Fabricate countertops without joints.

G. Cutouts and Holes:

1. Counter-Mounted Plumbing Fixtures: Prepare countertops in shop for field cutting openings for counter-mounted fixtures. Mark tops for cutouts and drill holes at corners of cutout locations. Make corner holes of largest radius practical.
2. Fittings: Drill countertops in shop for plumbing fittings, undercounter soap dispensers, and similar items.

2.3 INSTALLATION MATERIALS

A. Adhesive: Product recommended by quartz agglomerate manufacturer. Adhesives shall not contain urea formaldehyde.

B. Sealant for Countertops: Comply with applicable requirements in Section 079200 "Joint Sealants."

C. Countertop Brackets: Heavy-duty, folded steel design with ¾ inch by 1½ inch notching system and two (2) conduit holes. Provide size required for installation.

1. Product: Subject to compliance with requirements, provide **EH-1824** by Rakks, Inc. or approved equal.

2.4 ACCESSORIES

A. Grommets: Refer to Section 064116 “Plastic-Laminate-Faced Architectural Cabinets”.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates to receive quartz agglomerate countertops and conditions under which countertops will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of countertops.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install countertops level to a tolerance of 1/8-inch in 8 feet, ¼-inch maximum. Do not exceed 1/64-inch difference between planes of adjacent units.

B. Fasten countertops by screwing through corner blocks of base units into underside of countertop. Predrill holes for screws as recommended by manufacturer. Align adjacent surfaces and, using adhesive in color to match countertop, form seams to comply with quartz agglomerate manufacturer's written instructions. Carefully dress joints smooth, remove surface scratches, and clean entire surface.

C. Install splashes by adhering to wall and countertops with adhesive. Mask areas of countertops and splashes adjacent to joints to prevent adhesive smears.

D. Complete cutouts not finished in shop. Mask areas of countertops adjacent to cutouts to prevent damage while cutting. Make cutouts to accurately fit items to be installed, and at right angles to finished surfaces unless beveling is required for clearance. Ease edges slightly to prevent snipping.

1. Seal edges of cutouts in subtops by saturating with varnish.

E. Apply sealant to gaps at walls; comply with Section 079200 "Joint Sealants."

END OF SECTION 123661.19

SECTION 124813 - ENTRANCE FLOOR MATS AND FRAMES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Resilient entrance mats.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for floor mats.

B. Samples: For the following products, in manufacturer's standard sizes:

1. Floor Mat: Assembled sections of floor mat.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance Data: For floor mats to include in maintenance manuals.

1.5 WARRANTY

A. Special Warranty for Entrance Mats: Manufacturer agrees to repair or replace entrance mats that fail in materials or workmanship within specified warranty period.

1. Warranty does not include deterioration or failure of carpet tile due to unusual traffic, failure of substrate, vandalism, or abuse.
2. Failures include, but are not limited to, more than ten percent (10%) edge raveling, snags, runs, dimensional stability, excess static discharge, loss of tuft bind strength, loss of face fiber, and delamination.
3. Warranty Period: One (1) year, limited.

PART 2 - PRODUCTS

2.1 ENTRANCE FLOOR MATS AND FRAMES, GENERAL

A. Accessibility Standard: Comply with applicable provisions in the ICC A117.1.

B. Physical properties of the entrance matting shall conform to the following minimums:

1. Surface Flammability: ASTM D 2859 – Pass.
2. Smoke Density: ASTM E 662 – Pass.

2.2 RESILIENT ENTRANCE MATS

A. Basis-of-Design Product:

1. Signature Flooring; **Trellis Entryway**

B. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Matter Surfaces, Inc.
2. Mohawk Carpet, LLC
3. Pawling Corporation; Architectural Products Division
4. Substitutions: Under provisions of Section 012500 “Substitution Procedures”.

C. Carpet-Type Mats: One hundred percent (100%) solution-dyed UV stabilized polypropylene carpet with non-staining vinyl backing.

1. Thickness, Size, and Color: **WOM**, as indicated in Section 090000 “Schedule of Finishes”.

D. Performance Characteristics: As follows:

1. Electrostatic Propensity: Less than 2 kV according to AATCC 134.

E. Adhesives: Water-resistant, mildew-resistant, non-staining, pressure-sensitive type to suit products and subfloor conditions indicated, that complies with flammability requirements for installed entrance mat and is recommended by entrance mat manufacturer for releasable installation.

1. Adhesives shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and floor conditions for compliance with requirements for location, sizes, and other conditions affecting installation of floor mats.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install units to comply with manufacturer's written instructions; coordinate with entrance locations and traffic patterns.

1. Installation Method: Glue down; install with full-spread, releasable, pressure-sensitive adhesive.

3.3 PROTECTION

A. Perform the following operations immediately after installing entrance mat:

1. Remove excess adhesive and other surface blemishes using cleaner recommended by entrance mat manufacturer.
2. Remove yarns that protrude from carpet surface.
3. Vacuum carpet using commercial machine with face-beater element.

B. Protect entrance mat against damage from construction operations and placement of equipment and fixtures during the remainder of construction period. Use protection methods indicated or recommended in writing by entrance mat manufacturer.

END OF SECTION 124813

SECTION 142123.16 - MACHINE ROOM-LESS ELECTRIC TRACTION PASSENGER ELEVATORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Machine-room-less electric traction passenger elevators.

B. Related Requirements:

1. Section 033000 "Cast-in-Place Concrete" for setting sleeves, inserts, and anchoring devices in concrete.
2. Section 042000 "Unit Masonry" for setting sleeves, inserts, and anchoring devices in masonry and for grouting elevator entrance frames installed in masonry walls.
3. Section 051200 "Structural Steel Framing" for the following:

    a. Attachment plates, angle brackets, and other preparation of structural steel for fastening guide-rail brackets.
    b. Hoist beams.
    c. Structural-steel shapes for subsills.

4. Section 055000 "Metal Fabrications" for the following:

    a. Attachment plates and angle brackets for supporting guide-rail brackets.
    b. Hoist beams.
    c. Structural-steel shapes for subsills.
    d. Pit ladders.

5. Section 096519 “Resilient Tile Flooring” for finish flooring in elevator cars.
6. Section 271000 “Structured Cabling” for twisted pair cable for telephone service for elevators.
7. Section 283111 “Digital, Addressable Fire Alarm System” for smoke detectors in elevator lobbies to initiate emergency recall operation, for heat detectors in shafts to disconnect power from elevator equipment before or on sprinkler activation, and for connection to elevator controllers.

1.3 DEFINITIONS

A. Definitions in ASME A17.1/CSA B44 apply to work of this Section.

B. Service Elevator: A passenger elevator that is also used to carry freight.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include capacities, sizes, performances, operations, safety features, finishes, and similar information.
2. Include Product Data for car enclosures, hoistway entrances, and operation, control, and signal systems.

B. Shop Drawings:

1. Include plans, elevations, sections, and large-scale details indicating service at each landing, coordination with building structure, relationships with other construction, and locations of equipment.
2. Include large-scale layout of car-control station and standby power operation control panel.
3. Indicate maximum dynamic and static loads imposed on building structure at points of support, and maximum and average power demands.
4. Shop Drawings must be approved by State Bureau of Elevators, OSBI, and Connecticut Department of Administrative Services (DAS) Construction Services and state elevator permit issued prior to installation. State inspections and certificate is required prior to placing in service.

C. Samples: For exposed car, hoistway door and frame, and signal equipment finishes; 3-inch-square Samples of sheet materials; and 4-inch lengths of running trim members.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Seismic Qualification Certificates: For elevator equipment, accessories, and components, from manufacturer.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

C. Manufacturer Certificates: Signed by elevator manufacturer certifying that hoistway and pit layout and dimensions, as indicated on Drawings, and electrical service including standby power generator, as shown and specified, are adequate for elevator system being provided.

D. Sample Warranty: For special warranty.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For elevators to include in emergency, operation, and maintenance manuals.

1. Submit manufacturer's or Installer's standard operation and maintenance manual, according to ASME A17.1/CSA B44 including diagnostic and repair information available to manufacturer's and Installer's maintenance personnel.

B. Inspection and Acceptance Certificates and Operating Permits: As required by authorities having jurisdiction for normal, unrestricted elevator use.

C. Continuing Maintenance Proposal: Submit a continuing maintenance proposal from Installer to Owner, in the form of a standard one-year maintenance agreement, starting on date initial maintenance service is concluded. State services, obligations, conditions, and terms for agreement period and for future renewal options.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: Elevator manufacturer or an authorized representative who is trained and approved by manufacturer.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle materials, components, and equipment in manufacturer's protective packaging. Store materials, components, and equipment off ground, under cover, and in a dry location.

1.9 COORDINATION

A. Coordinate installation of inserts, sleeves, block outs, elevator equipment with integral anchors, and other items that are embedded in concrete or masonry for elevator equipment. Furnish templates, inserts, sleeves, elevator equipment with integral anchors, and installation instructions and deliver to Project site in time for installation.

B. Coordinate locations and dimensions of work specified in other Sections that relates to electric traction elevators including pit ladders; sumps and floor drains in pits; entrance subsills; electrical service; and electrical outlets, lights, and switches in hoistways and pits.

1.10 WARRANTY

A. Manufacturer's Special Warranty: Manufacturer agrees to repair, restore, or replace elevator work that fails in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, operation or control system failure, including excessive malfunctions; performances below specified ratings; excessive wear; unusual deterioration or aging of materials or finishes; unsafe conditions; need for excessive maintenance; abnormal noise or vibration; and similar unusual, unexpected, and unsatisfactory conditions.
2. Warranty Period: One (1) year from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Product:

1. KONE Americas; **MonoSpace 300 DX**

B. Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Otis Elevator Co.
2. Schindler Elevator Corp.
3. TK Elevator
4. Substitutions: Under provisions of Section 012500 “Substitution Procedures”.

C. Source Limitations: Obtain elevators from single manufacturer.

1. Major elevator components, including driving machines, controllers, signal fixtures, door operators, car frames, cars, and entrances, shall be manufactured by single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. Regulatory Requirements: Comply with ASME A17.1/CSA B44.

B. Accessibility Requirements: Comply with requirements for accessible elevators in the United States Access Board's ADA-ABA Accessibility Guidelines and with ICC A117.1.

C. Seismic Performance: Elevator system shall withstand the effects of earthquake motions determined according to ASCE/SEI 7 and shall comply with elevator seismic requirements in ASME A17.1/CSA B44.

1. The term "withstand" means "the system will remain in place without separation of any parts when subjected to the seismic forces specified.
2. Project Seismic Design Category: As indicated in Structural Drawings.
3. Elevator Component Importance Factor: 1.0.
4. Design earthquake spectral response acceleration short period (Sds) for Project is as indicated in Structural Drawings.
5. Provide earthquake equipment required by ASME A17.1/CSA B44.
6. Provide seismic switch required by ASCE/SEI 7.

2.3 ELEVATORS

A. Elevator System, General: Manufacturer's standard elevator systems. Unless otherwise indicated, manufacturer's standard components shall be used, as included in standard elevator systems and as required for complete system.

B. Elevator Description:

1. Rated Load: .
2. Freight Loading Class for Service Elevator(s): Class A.
3. Rated Speed: 150 fpm.
4. Operation System: Selective-collective automatic operation.
5. Auxiliary Operations:

a. Battery-powered automatic evacuation.
b. Earthquake Emergency Operation: Comply with requirements in ASME A17.1/CSA B44.
c. Automatic dispatching of loaded car.
d. Nuisance-call cancel.
e. Loaded-car bypass.
f. Automatic operation of lights and ventilation fans.

6. Security Features: Car-to-lobby feature.
7. Car Enclosures:

a. Inside Width, Depth, and Height: As indicated on Drawings.
b. Front Walls (Return Panels): Satin stainless-steel, ASTM A 480, No. 4 finish.
c. Car Fixtures: Satin stainless-steel, ASTM A 480, No. 4 finish.
d. Side and Rear Wall Panels: Plastic laminate.

e. Reveals: Satin stainless-steel, ASTM A 480, No. 4 finish .
f. Door Faces (Interior): Satin stainless-steel, ASTM A 480, No. 4 finish.
g. Door Sills: Aluminum.
h. Ceiling: Satin stainless-steel, ASTM A 480, No. 4 finish.
i. Handrails: **HR61**; 1½ inches round satin stainless-steel, at sides and rear of car.
j. Floor prepared to receive resilient flooring (specified in Section 096519 "Resilient Tile Flooring").

8. Hoistway Entrances:

a. Width and Height: As indicated on Drawings.
b. Type: Single-speed side sliding.
c. Frames: Satin stainless-steel, ASTM A 480, No. 4 finish.
d. Doors: Satin stainless-steel, ASTM A 480, No. 4 finish.
e. Sills: Aluminum.

9. Hall Fixtures: Satin stainless-steel, ASTM A 480, No. 4 finish.
10. Additional Requirements:

a. Provide inspection certificate in each car, mounted under acrylic cover with frame made from satin stainless-steel, ASTM A 480, No. 4 finish.

2.4 TRACTION SYSTEMS

A. Elevator Machines: Permanent magnet, variable-voltage, variable-frequency, ac-type hoisting machines and solid-state power converters.

1. Provide regenerative system.
2. Limit total harmonic distortion of regenerated power to five percent (5%) per IEEE 519.
3. Provide means for absorbing regenerated power when elevator system is operating on standby power.
4. Provide line filters or chokes to prevent electrical peaks or spikes from feeding back into building power system.

B. Inserts: Furnish required concrete and masonry inserts and similar anchorage devices for installing guide rails, machinery, and other components of elevator work. Device installation is specified in another Section.

C. Machine Beams: Provide steel framing to support elevator hoisting machine and deflector sheaves from the building structure. Comply with Section 055000 "Metal Fabrications" for materials and fabrication.

D. Car Frame and Platform: Bolted- or welded-steel units.

E. Guides: Roller guides or polymer-coated, non-lubricated sliding guides. Provide guides at top and bottom of car and counterweight frames.

F. Coated-Steel Belts: Polyurethane coated belts with high-tensile-grade, zinc-plated steel cords and a flat profile on the running surface and the backside of the belt. The belts shall have an FT-1 rating as referenced by NFPA 13. All driving sheaves and deflector sheaves should have a crowned profile to ensure center tracking of the belts. A continuous 24/7 monitoring system using resistance-based technology has to be installed to continuously monitor the integrity of the coated steel belts and provide advanced notice of belt wear.

G. Governor Rope: Shall be steel and shall consist of at least eight (8) strands wound about a sisal core center.

2.5 OPERATION SYSTEMS

A. Provide manufacturer's standard microprocessor operation systems as required to provide type of operation indicated.

B. Auxiliary Operations:

1. Single-Car Battery-Powered Automatic Evacuation: If power fails and car is at a floor, it remains at that floor, opens its doors, and shuts down. If car is between floors, it moves to the next floor above or below, opens its doors, and shuts down. System includes rechargeable battery and automatic recharging system.
2. Emergency Use:

   a. Provide Phase I "Emergency Recall" and Phase II "Firefighter's In-Car Operation" in accordance with ANSI/ASME A17.1.

      1) Special emergency service Phase I to return the elevator non-stop to the designated landing will be initiated by an elevator smoke detector system or a key switch provided at the designated landing.
      2) A key switch in the car shall be provided for in-car control of each elevator when on Phase II of Special Emergency Service.

   b. Designated Landing: Lower Level.

3. Automatic Dispatching of Loaded Car: When carload exceeds eighty percent (80%) of rated capacity, doors begin closing.
4. Nuisance-Call Cancel: When car calls exceed a preset number while carload is less than a predetermined weight, all car calls are canceled. Preset number of calls and predetermined weight can be adjusted.
5. Loaded-Car Bypass: When carload exceeds eighty percent (80%) of rated capacity, car responds only to car calls, not to hall calls.
6. Automatic Operation of Lights and Fan: When elevator is stopped and unoccupied with doors closed, lighting, ventilation fan, and cab displays are de-energized after 5 minutes and are re-energized before car doors open.

C. Security features shall not affect emergency firefighters' service.

1. Car-to-Lobby Feature: Feature, activated by keyswitch at main lobby, that causes car to return immediately to lobby and open doors for inspection. On deactivation by keyswitch, calls registered before keyswitch activation are completed and normal operation is resumed.

2.6 DOOR REOPENING DEVICES

A. Infrared Array: Provide door reopening device with uniform array of thirty-six (36) or more microprocessor-controlled, infrared light beams projecting across car entrance. Interruption of one (1) or more light beams shall cause doors to stop and reopen.

B. Nudging Feature: After car doors are prevented from closing for predetermined adjustable time, through activating door reopening device, a loud buzzer shall sound and doors shall begin to close at reduced kinetic energy.

2.7 CAR ENCLOSURES

A. Provide steel-framed car enclosures with nonremovable wall panels, with removable car roof, access doors, power door operators, and ventilation.

1. Provide standard railings complying with ASME A17.1/CSA B44 on car tops where required by ASME A17.1/CSA B44.

B. Materials and Finishes: Manufacturer's standards, but not less than the following:

1. Subfloor:

a. Exterior, underlayment grade plywood, not less than 5/8-inch nominal thickness.

2. Floor Finish:

a. Specified in Section 096519 “Resilient Tile Flooring”, **LVT-1**.

3. Plastic-Laminate Wall Panels: Plastic laminate adhesively applied to ½-inch fire-retardant-treated particleboard with manufacturer's standard protective edge trim. Panels shall have a flame-spread index of 25 or less, when tested according to ASTM E 84. Plastic-laminate color, texture, and pattern as selected by Architect from manufacturer's full range.
4. Fabricate car with recesses and cutouts for signal equipment.
5. Fabricate car door frame integrally with front wall of car.
6. Stainless-Steel Doors: Flush, hollow-metal construction; fabricated from stainless-steel sheet.
7. Sight Guards: Provide sight guards on car doors.
8. Sills: Extruded or machined metal, with grooved surface, ¼-inch-thick.
9. Metal Ceiling: Flush panels, with a total of six (6) rectangular LED lights; **CL98**. Align ceiling panel joints with joints between wall panels.

2.8 HOISTWAY ENTRANCES

A. Hoistway Entrance Assemblies: Manufacturer's standard horizontal-sliding, door-and-frame hoistway entrances complete with track systems, hardware, sills, and accessories. Frame size and profile shall accommodate hoistway wall construction.

B. Fire-Rated Hoistway Entrance Assemblies: Door and frame assemblies shall comply with NFPA 80 and be listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction based on testing at as close-to-neutral pressure as possible according to NFPA 252 or UL 10B.

1. Fire-Protection Rating: 1 hour with 30-minute temperature rise of 450 deg F (250 deg C).

C. Materials and Fabrication: Manufacturer's standards, but not less than the following:

1. Stainless-Steel Frames: Formed from stainless-steel sheet.
2. Star of Life Symbol: Identify emergency elevators with star of life symbol, not less than 3 inches high, on both jambs of hoistway door frames.
3. Stainless-Steel Doors: Flush, hollow-metal construction; fabricated from stainless-steel sheet.
4. Sight Guards: Provide sight guards on doors matching door edges.
5. Sills: Extruded or machined metal, with grooved surface, ¼-inch-thick.

6. Non-shrink, Nonmetallic Grout: Factory-packaged, non-staining, non-corrosive, nongaseous grout complying with ASTM C 1107.

2.9 SIGNAL EQUIPMENT

A. Provide hall-call and car-call buttons that light when activated and remain lit until call has been fulfilled. Provide vandal-resistant buttons and lighted elements illuminated with LEDs.

B. Car-Control Stations: Provide manufacturer's standard recessed car-control stations; **KSS 570**. Mount in return panel adjacent to car door unless otherwise indicated.

1. Mark buttons and switches for required use or function. Use both tactile symbols and Braille.
2. Provide "No Smoking" sign matching car-control station, either integral with car-control station or mounted adjacent to it, with text and graphics as required by authorities having jurisdiction.

C. Emergency Communication System: Two-way voice communication system, with visible signal, which dials preprogrammed number of monitoring station and does not require handset use. System is contained in flush-mounted cabinet, with identification, instructions for use, and battery backup power supply.

D. Firefighters' Two-Way Telephone Communication Service: Provide telephone jack in each car and required conductors in traveling cable for firefighters' two-way telephone communication service specified in Section 283111 “Digital, Addressable Fire Alarm System”.

E. Car Position Indicator: Provide illuminated, digital-type car position indicator, located above car door or above car-control station. Also, provide audible signal to indicate to passengers that car is either stopping at or passing each of the floors served. Include travel direction arrows if not provided in car-control station.

F. Hall Push-Button Stations: Provide one (1) hall push-button station at each landing.

1. Provide units with flat faceplate for mounting with body of unit recessed in wall.
2. Equip units with buttons for calling elevator and for indicating desired direction of travel.
3. Provide telephone jack in each unit for firefighters' two-way telephone communication service specified in Section 283111 “Digital, Addressable Fire Alarm System”.

G. Hall Lanterns: Units with illuminated arrows; but provide single arrow at terminal landings. Provide the following:

1. Units with flat faceplate for mounting with body of unit recessed in wall and with illuminated elements projecting from faceplate for ease of angular viewing.

H. Hall Annunciator: With each hall lantern, provide audible signals indicating car arrival and direction of travel. Signals sound once for up and twice for down.

1. At manufacturer's option, audible signals may be placed on cars.

I. Hall Position Indicators: Provide illuminated, digital-display-type position indicators, located above hoistway entrance at ground floor. Provide units with flat faceplate and with body of unit recessed in wall.

1. Integrate ground-floor hall lanterns with hall position indicators.

J. Standby Power Elevator Selector Switches: Provide switches, as required by ASME A17.1/CSA B44, where indicated. Adjacent to switches, provide illuminated signal that indicates when normal power supply has failed. For each elevator, provide illuminated signals that indicate when they are operational and when they are at the designated emergency return level with doors open.

2.10 FINISH MATERIALS

A. Stainless-Steel Sheet: ASTM A 240, Type 304.

B. Stainless-Steel Bars: ASTM A 276, Type 304.

C. Stainless-Steel Tubing: ASTM A 554, Grade MT 304.

D. Aluminum Extrusions: ASTM B 221, Alloy 6063.

F. Plastic Laminate: High-pressure type complying with NEMA LD 3, Type HGS for flat applications.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine elevator areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work. Examine hoistways, hoistway openings, and pits as constructed; verify critical dimensions; and examine supporting structure and other conditions under which elevator work is to be installed.

B. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Comply with manufacturer's written instructions.

B. Welded Construction: Provide welded connections for installing elevator work where bolted connections are not required for subsequent removal or for normal operation, adjustment, inspection, maintenance, and replacement of worn parts. Comply with AWS standards for workmanship and for qualifications of welding operators.

C. Sound Isolation: Mount rotating and vibrating equipment on vibration-isolating mounts to minimize vibration transmission to structure and structure-borne noise due to elevator system.

D. Lubricate operating parts of systems, including ropes, as recommended by manufacturers.

E. Alignment: Coordinate installation of hoistway entrances with installation of elevator guide rails for accurate alignment of entrances with car. Where possible, delay final adjustment of sills and doors until car is operable in shaft. Reduce clearances to minimum, safe, workable dimension at each landing.

F. Leveling Tolerance: 1/8-inch, up or down, regardless of load and travel direction.

G. Set sills flush with finished floor surface at landing. Fill space under sill solidly with non-shrink, nonmetallic grout.

H. Locate hall signal equipment for elevators as follows unless otherwise indicated:

1. Place hall lanterns either above or beside each hoistway entrance.
2. Mount hall lanterns at a minimum of 72 inches above finished floor.

3.3 FIELD QUALITY CONTROL

A. Acceptance Testing: On completion of elevator installation and before permitting elevator use (either temporary or permanent), perform acceptance tests as required and recommended by ASME A17.1/CSA B44 and by governing regulations and agencies.

B. Advise Owner, Architect, and authorities having jurisdiction in advance of dates and times that tests are to be performed on elevators.

3.4 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to operate, adjust, and maintain elevator.

B. Check operation of elevator with Owner's personnel present before date of Substantial Completion and again not more than one (1) month before end of warranty period. Determine that operation systems and devices are functioning properly.

3.5 MAINTENANCE SERVICE

A. Initial Maintenance Service: Beginning at Substantial Completion, maintenance service shall include twelve (12) months' full maintenance by skilled employees of elevator Installer. Include monthly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper elevator operation at rated speed and capacity. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.

1. Perform maintenance during normal working hours.
2. Include 24-hour-per-day, 7-day-per-week emergency callback service with response time of 2 hours or less.

END OF SECTION 142123.16

SECTION 144200 - WHEELCHAIR LIFTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Vertical platform lifts.
2. Inclined platform lifts.

B. Related Requirements:

1. Section 033000 "Cast-in-Place Concrete" for setting sleeves, inserts, and anchoring devices in concrete.
2. Section 061000 “Rough Carpentry” for blocking as required for lift installation.

1.3 DEFINITIONS

A. Definitions in ASME A18.1 apply to Work of this Section.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components, and finishes for lifts.
2. Include rated capacities, operating characteristics, electrical characteristics, safety features, controls, finishes and accessories.

B. Shop Drawings: For each lift.

1. Include plans, elevations, sections, attachment details, and required clearances.
2. Indicate dimensions, weights, loads, and points of load to building structure.
3. Include details of equipment assemblies, method of field assembly, components, and location and size of each field connection.
4. Include diagrams for power, signal, and control wiring.

C. Samples: For surfaces and components with factory-applied color finishes.

1. Include Samples of integrally colored materials and accessories involving color selection.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For manufacturer and Installer.

B. Product Certificates: For each type of lift.

1. Include statement that runway, ramp or pit, dimensions as shown on Drawings, and electrical service as shown and specified are adequate for lift being provided.

C. Evaluation Reports: For post-installed anchors and power-actuated fasteners, from ICC-ES.

D. Sample Warranty: For special warranty.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For each type of lift to include in operation and maintenance manuals.

1. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:

a. Parts list with sources indicated.
b. Recommended parts inventory list.

B. Inspection and Acceptance Certificates and Operating Permits: As required by authorities having jurisdiction for normal, unrestricted use of lifts.

1.7 QUALITY ASSURANCE

A. Manufacturer shall have not less than twenty (20) years of experience in the design and manufacture of wheelchair lifts.

B. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.

1. Maintenance Proximity: Not more than 2 hours normal travel time from Installer's place of business to Project site.

1.8 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of lifts that fail in materials or workmanship within specified warranty period.

1. Warranty Period for Vertical Lift: Four (4) years from date of Substantial Completion.

a. Drive Train: Ten (10) years from date of Substantial Completion.

2. Warranty Period for Inclined Lift: Two (2) years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Accessibility Standard: Comply with applicable provisions in the USDOJ's "2010 ADA Standards for Accessible Design" and ICC A117.1.

B. Regulatory Requirements: Comply with ASME A18.1, "Safety Standard for Platform Lifts and Stairway Chairlifts."

2.2 VERTICAL PLATFORM LIFTS

A. Vertical Platform Lift, General: Pre-engineered lift system.

1. Basis-of-Design:

a. Ascension; **Virtuoso 5460FG**

2. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Bella Elevator, as distributed by Symmetry Elevating Solutions
b. Inclinator Company of America
c. Liftavator, Inc.
d. National Wheel-O-Vator Co., Inc. (The)
e. ThyssenKrupp Access; a ThyssenKrupp company
f. Substitutions: Under provisions of Section 012500 “Substitution Procedures”.

B. Number of Stops: Two (2).

C. Platform Size: 36 by 54 inches.

D. Door Operation and Clear Opening Width: Low-energy, power-operated doors that remain open for 20 seconds minimum; end door with minimum 32-inch clear opening width.

E. Rated Speed: 7 fpm.

F. Power Supply: Electric.

1. Electrical Characteristics:

a. Horsepower: ½.
b. Voltage: 120-V ac, single phase, 60 Hz, 15 A.

G. Emergency Operation: Provide manual operation and battery backup power system to raise or lower units in case of malfunction or power loss. Battery backup system must be hard wired to the input power and to the lift. Unit shall have audible alarm for low battery power condition.

H. Self-Supporting Units: Support vertical loads of units only at base, with lateral support only at landing levels.

I. Platform: Steel sheet or galvanized-steel sheet with manufacturer's standard non-skid flooring.

J. Platform Enclosure and Door: Rectangular steel-tube frame with flush, steel-sheet panels and ¼-inch-thick acrylic glazing.

K. Safety Devices:

1. Platform Controls: Control panel with directional switches and emergency alarm button.
2. Landing Controls: Call station with directional switches; remote mounted on adjacent walls, working in conjunction with power assist paddles.
3. Constant pressure operation.
4. Grounded electrical system with upper, lower, and final limit switches and 12VDC operating controls.

5. Gate switches to prevent platform movement if either platform gate is open.
6. Lift platform stop height switch.
7. Safety skirt that completely encloses and protects the area under the platform, with switches to stop platform movement in the case of excess skirt deflection.
8. Grab rail on platform.
9. Manual lowering device.
10. Upper Landing Gate: 42 inches high, self-closing with mechanical interlock and steel sheet.
11. Platform Door: 43 inches high, self-closing with mechanical interlock and steel sheet.
12. Battery Operation: Provide emergency battery power for at least five (5) complete lift cycles.

2.3 INCLINED PLATFORM LIFT

A. Inclined Platform Lift, General: Pre-engineered lift system.

1. Basis-of-Design:

a. Garaventa Lift; **Model X3**

2. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. AmeriGlide Accessibility Solutions
b. Savaria
c. Substitutions: Under provisions of Section 012500 “Substitution Procedures”.

B. Number of Stops: Two (2).

C. Platform Size: 31½ by 48 inches.

D. Rated Speed: 13 fpm.

E. Electrical Characteristics:

1. Voltage: 120-V ac, single phase, 60 Hz.

F. Emergency Operation: Provide manual operation and battery power system to raise or lower units to a landing in case of malfunction or power loss.

G. Platform: Aluminum floor plate with non-skid surface texture.

1. Automatic Folding Platforms: When not in use, platforms shall automatically fold up against wall to minimize projection into stairway.

H. Under Platform Obstruction Sensing:

1. Provide under-platform sensing device to stop platform from traveling in the downward direction when encountering 4 lb./f. of pressure.
2. Platform is permitted to travel in the opposite direction of the obstruction to allow clearing.

I. Platform Guarding: Guard platform with passenger-restraining arms.

1. Passenger-Restraining Arms: Stainless-steel tubing, power operated.

J. Ramp: Retractable ramp matching platform to provide transition from floor to lift platform. Ramp lowers to floor automatically when lifts reach landing. Ramp rises automatically when lift control is activated for lift to leave landing.

1. Ramp Finish: Finish ramps to match lift platform.

K. Platform Kick Plate: Provide on the non-boarding and non-guide rail side of the platform a kick plate of not less 6 inches in height, measured vertically from the platform deck.

L. Support to Structure: Provide framing and brackets to support vertical loads from floor or stair treads and only lateral loads from walls. Fabricate framing and brackets from steel rectangular tubing, plates, shapes, and bars.

M. Guide Rails: Fabricate from aluminum tubing.

N. Controls:

1. Controls: 24 VDC low-voltage type.
2. Platform equipped with emergency stop switch located within reach of passenger. Emergency stop button shall cause electric power to be removed from the drive system stopping lift immediately.
3. Platform operating controls to be illuminated continuous pressure buttons with directional arrows, functional by key switch only, and an emergency stop switch mounted on the front surface of the platform control panel.
4. When the platform arrives at landing and the user releases the directional control button, the arm on the entry side of the platform is automatically raised and the corresponding platform ramp is simultaneously lowered (automatic platforms only).
5. Allow the platform to be called to the opposite landing in the folded position.

O. Platform On-Board Emergency Alarm: Provide platform with an on-board alarm that sounds when emergency stop button is pushed. The alarm shall have a battery back-up so that it will continue to function if lift power is lost.

P. Call Stations:

1. Provide wireless call stations at both landings, keyed with continuous pressure.
2. Call stations shall be provided with directional control buttons for call and send.
3. A one-touch control system shall be used to automatically fold/unfold the platform, boarding ramps, and passenger safety arms.

Q. Accessories: Provide units with the following accessories:

1. Caution sign as required by ASME A18.1.

2.4 MATERIALS

A. Steel Plates, Shapes, and Bars: ASTM A 36.

B. Steel Tubing: ASTM A 500.

C. Steel Pipe: ASTM A 53; standard weight (Schedule 40) unless otherwise indicated or required by loads.

D. Steel Sheet: ASTM A 1008, cold-rolled commercial steel (CS) or ASTM A 1011 hot-rolled, commercial steel (CS); as required for each use.

E. Aluminum: Alloy and temper recommended by aluminum producer and finisher for type of use, corrosion resistance, and finish indicated; manufacturer's standard strengths and thicknesses for type of use.

1. Extruded Aluminum: ASTM B 221.
2. Aluminum Sheet and Plate: ASTM B 209.

F. Stainless-Steel Tubing: ASTM A 554, Grade MT-304.

G. Acrylic Glazing: ASTM D 4802, Category A-1 (cell-cast) or Category A-2 (continuous cast), Finish 1 (smooth or polished), clear.

2.5 FASTENERS

A. Post-Installed Anchors: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC01 or ICC-ES AC193 as appropriate for the substrate.

1. Material for Interior Locations: Carbon-steel components zinc-plated to comply with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5, unless otherwise indicated.

B. Power-Actuated Fasteners: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.

2.6 GENERAL FINISH REQUIREMENTS

A. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.7 FINISHES

A. Steel Factory Finish:

1. Baked-Enamel or Powder-Coat Finish: Clean, pretreat, and apply manufacturer's standard, two-coat, baked-on finish consisting of prime coast and thermosetting topcoat with a minimum dry film thickness of 1-mil for topcoat.
2. Color and Gloss: As selected by Architect and Owner from manufacturer's entire range.

B. Stainless-Steel Finishes:

1. Grab Rail Finish: Directional satin finish No. 4.

C. Aluminum Finishes:

1. Baked-Enamel or Powder-Coat Finish: AAMA 2603 except with a minimum dry film thickness of 1.5 mils. Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.

a. Color and Gloss: As selected by Architect and Owner from manufacturer's entire range.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, critical dimensions, and other conditions affecting performance of the Work.

B. Minimum Headroom Clearance: Verify that installed lift will have a minimum headroom of 80 inches above any point on platform floor at any point of travel.

C. Prepare written report, endorsed by Installer, listing conditions detrimental to performance.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Comply with ASME A18.1 and manufacturer's written instructions for installation of lifts unless otherwise indicated.

B. Secure lifts to building construction as follows unless otherwise indicated:

1. For hollow masonry anchorage, use toggle bolts.

C. Wiring Method: Conceal conductors and cables within housings of units or building construction. Do not install conduit exposed to view in finished spaces. Bundle, lace, and train conductors to terminal points with no excess and without exceeding manufacturer's limitations on bending radii.

D. Coordinate platform doors with platform travel and positioning.

E. Adjust stops for accurate stopping and leveling at each landing, within required tolerances.

1. Leveling Tolerance: ¼-inch up or down, regardless of load and direction of travel.

F. Adjust retractable ramps to meet maximum allowable slope and change-in-elevation requirements, and to lie fully against landing surfaces.

G. Lubricate operating parts of lift, including drive mechanism, guide rails, hinges, safety devices, and hardware.

H. Test safety devices and verify smoothness of required protective enclosures and fasciae.

3.3 FIELD QUALITY CONTROL

A. Acceptance Testing: On completion of lift installation and before permitting use of lifts, perform acceptance tests as required and recommended by ASME A18.1 and authorities having jurisdiction.

B. Operating Test: In addition to above testing, load lifts to rated capacity and operate continuously for 30 minutes between lowest and highest landings served. Readjust stops, signal equipment, and other devices for accurate stopping and operation of system.

C. Advise Owner, Architect, and authorities having jurisdiction in advance of dates and times tests are to be performed on lifts.

3.4 MAINTENANCE SERVICE

A. Initial Maintenance Service: Beginning at Substantial Completion, maintenance service shall include twelve (12) months' full maintenance by skilled employees of lift Installer. Include quarterly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper lift operation. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.

3.5 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain lifts. Include a review of emergency systems and emergency procedures to be followed at time of operational failure and other building emergencies.

B. Check operation of lifts with Owner's personnel present and before date of Substantial Completion. Determine that operating systems and devices are functioning properly.

C. Check operation of lifts with Owner's personnel present not more than one (1) month before end of warranty period. Determine that operating systems and devices are functioning properly.

END OF SECTION 144200

SECTION 210100 - GENERAL CONDITIONS FOR FIRE PROTECTION TRADE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1. General Conditions, Supplementary Conditions and Division 01 paragraphs may be repeated in this Division for emphasis or for inclusion of more stringent/additional related requirements. Such repetition shall not be construed to reduce the requirements of those Divisions nor to eliminate other requirements under those Divisions.

1.2 DESCRIPTION

A. The General Conditions are a part of this Division and are to be considered a part of this Contract.

B. Where items of the General Conditions are repeated in other Sections of the Specifications, it is merely intended to qualify or to call particular attention to them. It is not intended that any other parts of the General Conditions shall be assumed to be omitted if not repeated therein.

C. This Section applies equally and specifically to all Contractors supplying labor and/or equipment and/or materials as required under each Section of Division 21.

D. The following information contains specifications of Work in connection with, and in addition to, this Division:

1. All Drawings associated with the project.
2. All specifications associated with the project.

E. Divisions of work responsibilities shall be defined and directed by the Construction Manager.

1.3 INTENT

A. It is the intent of the Specifications and Drawings to call for finished work, tested and ready for operation.

B. Furnish, deliver, and install any apparatus, appliance, material, or work not shown on Drawings but mentioned in the Specifications, or vice versa, or any incidental accessories necessary to make the Work complete and perfect in all respects and ready for operation, even if not particularly specified, under their respective Section without additional expense to the Owner.

C. Include in the work minor details not usually shown or specified but necessary for proper installation and operation, as though they were hereinafter shown or specified.

D. Provide Engineer written notice of any materials or apparatus believed inadequate or unsuitable; in violation of laws, ordinances, rules, or regulations of authorities having jurisdiction; and any necessary items of Work omitted. In the absence of such written notice, it is mutually agreed

that Work under each Section has included the cost of all required items for the accepted, satisfactory functioning of the entire system without extra compensation.

E. The Work indicated is diagrammatic. The Architect and/or Engineer may require as part of this Contract, the relocation of devices to reasonable distances from the general locations shown.

F. Verbal clarifications of the Drawings or Specifications during the bid period are not to be relied upon. Refer any questions or clarifications to the Engineer as indicated in the Division 00 documents.

1.4 DRAWINGS

A. Drawings are diagrammatic and indicate the general arrangement of systems and work included in the Contract. (Do not scale the Drawings.) Consult the Architectural Drawings and Details for exact location of fixtures and equipment; where same are not definitely located, obtain this information from the Architect.

B. Closely follow Drawings in layout of Work; check Drawings of other Divisions to verify spaces in which work will be installed. Maintain maximum headroom. Where space conditions appear inadequate, Engineer shall be notified before proceeding with installations.

C. Engineer may, without extra charge, make reasonable modifications in the layout as needed to prevent conflict with work of other trades and/or for proper execution of the work.

D. Where variances occur between the Drawings and Specifications or within either of the Documents, include the item or arrangement of better quality, greater quantity, or higher cost in the Contract price. The Engineer shall decide on the item and the manner in which the work shall be installed.

1.5 SURVEYS AND MEASUREMENTS

A. Before submitting a Bid, the Contractor shall visit the site and shall become thoroughly familiar with all conditions under which the work will be installed. Contractor will be held responsible for any assumptions, omissions, or errors made as a result of failure to become familiar with the site and the Contract Documents.

B. Base all measurements, both horizontal and vertical, from established benchmarks. All Work shall agree with these established lines and levels. Verify all measurements at the site and check the correctness of same as related to the Work.

C. Should the Contractor discover any discrepancies between actual measurements and those indicated which prevent following good practice or the intent of the Drawings and Specifications, notify the Engineer do not proceed with that Work until instructions have been received from the Engineer.

1.6 CODES AND STANDARDS

A. The Codes and Standards listed below apply to all Work. Where Codes or Standards are mentioned in these Specifications, follow the latest edition or revision.

B. The current adopted editions of the following State or local Codes apply:

2018 Connecticut State Building Code (CSBC) including portions of the 2015 International Building Code
2018 Connecticut State Fire Code
2018 Connecticut State Fire Safety Code including portions of the 2015 International Fire Code (CSFSC)
2015 NFPA 101 Life Safety Code (NFPA101)
2015 Connecticut Fire Prevention Code (CFPC)
2015 NFPA 1 Fire Code (NFPA101)
NFPA 13/2013, Standard for the Installation of Sprinkler Systems
NFPA 54/2015, National Fuel Gas Code
NFPA 70/2017, National Electrical Code
NFPA 72/2013, National Fire Alarm Code
AWWA Standards
Factory Mutual Approval Guide: latest edition.
Pipe Hangers and Supports: MSS SP-58.
UL Compliance.
The American National Standards Institute (ANSI) A117.1/2009
Local Building Code

C. The following Standards shall be used where referenced by the following abbreviations:

AABC Associated Air Balance Council
ACGIH American Conference of Governmental Industrial Hygienists
ADC Air Diffusion Council
AGA American Gas Association
AIA American Institute of Architects
AMCA Air Moving and Conditioning Association
ANSI American National Standards Institute
API American Petroleum Institute
ARI Air Conditioning and Refrigeration Institute
ASE Association of Safety Engineers
ASHRAE American Society of Heating, Refrigerating and Air Conditioning Engineers
ASME American Society of Mechanical Engineers
ASPE American Society of Plumbing Engineers
ASTM American Society of Testing and Materials
AWS American Welding Society
AWWA American Water Works Association
CGA Compressed Gas Association
CSA Canadian Standards Association
CISPI Cast Iron Soil Pipe Institute
EJMA Expansion Joint Manufacturing Association
EPA Environmental Protection Agency
FM Factory Mutual Insurance Association
FSSC Federal Specification
HIS Hydraulic Institute Standards
IBR Institute of Boiler and Radiator Manufacturers
IEEE Institute of Electrical and Electronics Engineers
IRI Industrial Risk Insurers
ISO Insurance Services Office
MCAA Mechanical Contractors Association of America
MSS Manufacturers Standardization Society

NBS National Bureau of Standards
NEBB National Environmental Balancing Bureau
NEMA National Electrical Manufacturers Association
NFPA National Fire Protection Association
NOFI National Oil Fuel Institute
NRC National Research Council
NSC National Safety Council
NSF National Sanitation Foundation
OSHA Occupational Safety and Health Administration
PDI Plumbing and Drainage Institute
SAMA Scientific Apparatus Manufacturers Association
SBI Steel Boiler Industry (Division of Hydronics Institute)
SMACNA Sheet Metal and Air Conditioning Contractors National Association
STI Steel Tank Institute
UL Underwriters' Laboratories

D. All materials furnished and all work installed shall comply with the rules and recommendations of the NFPA, the requirements of the local utility companies, the recommendations of the fire insurance rating organization having jurisdiction, and the requirements of all Governmental departments having jurisdiction.

E. Include in the Work, without extra cost to the Owner, any labor, materials, services, apparatus, and Drawings in order to comply with all applicable laws, ordinances, rules, and regulations, whether or not shown on Drawings and/or specified.

1.7 PERMITS AND FEES

A. Give all necessary notices, obtain all permits; pay all Government and State sales taxes and fees where applicable, and other costs, including utility connections or extensions in connection with the Work. File all necessary Drawings, prepare all Documents, and obtain all necessary approvals of all Governmental and State departments having jurisdiction, obtain all required certificates of inspections for Work, and deliver a copy to the Engineer before request for acceptance and final payment for the Work.

1.8 SEISMIC RESTRAINT

A. General: This project is in a seismic zone per State and/or Local Codes and Ordinances and all materials and equipment shall be installed, supported, and seismically restrained accordingly. Verify current seismic requirements based on project location and with Code requirements.

B. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in the jurisdiction where the Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of vibration isolation bases and seismic restraints that are similar to those required for this Project in material, design, and extent.

C. Shop Drawings: Show designs and calculations, certified by a professional engineer, for the following:

1. Design Calculations: Calculations for selection of vibration isolators, design of vibration isolation bases, design of seismic supports, and selection of seismic restraints for all equipment and materials.
2. Vibration Isolation Base Details: Detail fabrication, including anchorages and attachments to the structure and to the supported equipment. Include auxiliary motor slides and rails, and base weights.
3. Seismic Restraint Details: Detail fabrication and attachment of restraints, supports and snubbers.

D. Installation: Installation shall be carried out in strict accordance with the Seismic Engineer's submittal, current Code, accepted standards, and the equipment and material manufacturers' recommendations.

1.9 COORDINATION

A. Carry out all work in conjunction with other trades and give full cooperation in order that all Work may proceed with a minimum of delay and interference. Particular emphasis is placed on timely installation of major apparatus and furnishing other Contractors, especially the General Contractor or Construction Manager, with information as to openings, chases, sleeves, bases, inserts, equipment locations, panels, access doors, etc. required by other trades.

B. Contractors are required to examine all the Project Drawings and mutually arrange Work so as to avoid interference. In general, ductwork, heating piping, sprinkler piping, and drainage lines take precedence over water, gas, and electrical conduits. The Engineer regarding the arrangement of Work, which cannot be agreed upon by the Contractors, will make final decisions.

C. Where the Work of the Contractor will be installed in close proximity to or will interfere with Work of other trades, assist in working out space conditions to make a satisfactory adjustment.

D. If Work is installed before coordinating with other Divisions or so as to cause interference with Work of other Sections, the Contractor causing the interference will make necessary changes to correct the condition without extra charge to the Owner.

E. Initial contact and coordination has been conducted with utility entities for the purpose of the preparation of Bid Documents. The Contractor shall coordinate all final specific utility requirements.

1.10 ACCEPTANCES

A. The equipment, materials, Workmanship, design, and arrangement of all Work installed are subject to the review of the Engineer.

B. Within thirty (30) days after the awarding of a Contract, submit to the Engineer for review a list of manufacturers of equipment proposed for the Work. The intent to use the exact makes specified does not relieve the Contractor of the responsibility of submitting such a list.

1. If extensive or unacceptable delivery time is expected on a particular item of equipment specified, notify the Engineer, in writing, within thirty (30) days of the awarding of the Contract. In such instances, deviations may be made pending acceptance by the Engineer or the Owner's representative.

C. Where any specific material, process, or method of construction or manufactured article is specified by reference to the catalog or model number of a manufacturer, the Specifications are to be used as a guide and are not intended to take precedence over the basic duty and performance specified or noted on the Drawings. In all cases, verify the duty specified with the specific characteristics of the equipment offered for review. Equipment characteristics are to be used as mandatory requirements where the Contractor proposes to use an acceptable equivalent.

D. If material or equipment is installed before shop drawing review, liability for its removal and replacement is assumed by the Contractor, at no extra charge to the Owner, if, in the opinion of the Engineer, the material or equipment does not meet the intent of the Drawings and Specifications.

E. Failure on the part of the Engineer to reject shop drawings or to reject Work in progress shall not be interpreted as acceptance of Work not in conformance with the Drawings and/or Specifications. Correct Work not in conformance with the Drawings and/or Specifications whenever non-conformance is discovered.

1.11 EQUIPMENT DEVIATIONS

A. Refer to Section 016000 “Product Requirements”. Where the Contractor proposes to deviate (substitute or provide an equivalent) from the equipment or materials as hereinafter specified, he shall do so by making a request in writing. The Contractor shall state in his request whether it is a substitution or an equivalent to that specified and the amount of credit or extra cost involved. A copy of said request shall be included in the Base Bid with manufacturer's equipment cuts. The Base Bid shall be based on using the materials and equipment as specified and scheduled with no exceptions. Equipment manufacturers scheduled on Drawings are considered Base Bid and any other acceptable manufacturers listed in the specifications is considered a substitution and equipment deviation and subject to the requirements for equipment substitution and deviation. When any alternate manufacturer does not qualify acceptable, as determined by the Engineer, provide the Base Bid manufacturer at no additional cost to Owner.

B. In these Specifications and on the accompanying Drawings, one (1) or more makes of materials, apparatus, or appliances may have been specified for use in this installation. This has been done for convenience in fixing the standard of workmanship, finish, and design required for installation. In the event that only one (1) manufacturer of a product is specified, and it is found that the manufacturer has discontinued the product, the Contractor shall use an acceptable equivalent product that meets the requirements of an equivalent product, as noted below, and has all the features of the originally specified product. The details of workmanship, finish, and design, and the guaranteed performance of any material, apparatus, or appliance which the Contractor desires to deviate for those mentioned herein shall also conform to these standards.

C. Where no specific make of material, apparatus, or appliance is mentioned, any first-class product made by a reputable manufacturer may be submitted for the Engineer's review.

D. Where two (2) or more names are given as equivalents, the Contractor must use the specified item or one (1) of the named equivalents. Where one (1) name only is used and is followed by the words "or acceptable equivalent", the Contractor must use the item named or he may apply for an equipment deviation through the prescribed manner in accordance with this Specification.

E. Equipment, material, or devices submitted for review as an "accepted equivalent" shall meet the following requirements:

1. The equivalent shall have the same construction features such as, but not limited to:

    a. Material thickness, gauge, weight, density, etc.
    b. Welded, riveted, bolted, etc., construction.
    c. Finish, undercoatings, corrosion protection.

2. The equivalent shall perform with the same or better operating efficiency.
3. The equivalent shall have equal or greater reserve capacity.
4. The equivalent shall be locally represented by the manufacturer for service, parts, and technical information.
5. The equivalent shall bear the same labels of performance certification as is applicable to the specified item, such as AMCA or ARI labels.

F. Where the Contractor proposes to use an item of equipment other than specified or detailed on the Drawings which requires any redesign of the structure, partitions, foundations, piping, wiring, or any other part of the mechanical, electrical, or architectural layout, all such redesign and all new drawings and detailing required therefore shall be prepared by the Designers of Record at the expense of the Contractor and at no additional cost to the Owner.

G. Where such accepted deviation or substitution requires a different quantity and arrangement of piping, ductwork, valves, pumps, insulation, wiring, conduit, and equipment from that specified or indicated on the Drawings, the Contractor shall, with the acceptance by the Engineer, furnish and install any such additional equipment required by the system at no additional cost to the Owner, including any costs added to other trades due to the substitution.

H. The Engineer shall determine if an "accepted equivalent" to a manufacturer listed in the Specifications is considered acceptable.

1.12 SHOP DRAWINGS

A. Refer to individual specification sections for additional submittal information.

B. Submitted shop drawings of fire sprinkler system(s) and/or fire standpipe system(s) shall be sealed and signed by an Engineer registered to practice engineering in the State of Connecticut or licensed Layout Technician registered in the State of Connecticut.

C. All fire protection submittals shall be submitted in a single package. “Piece-Meal” or “Partial” submittals will not be accepted, and will be rejected and returned without review, unless prior approval from the Engineer has been obtained. NO EXCEPTIONS.

1. Submittals shall be provided in an expandable, 3-ring, hard cover binder, Labeled with the Project information. The submittals for the entire Fire Protection Division 21 Series Sections shall be submitted at the same time, not “section-by-section.”
2. Each section within the binder shall be tabbed, by plumbing specification section, and include al materials specified in that section.
3. Two (2) full and complete companies of the binders shall be provided for preliminary review. Upon review, the engineer will retain one (1) copy and the other copy will returned to the Contractors, for distribution to the subcontractors. The second review shall include the total number of copies of the binders as required by Division 01.
4. The two (2) copies for preliminary review shall be submitted within ninety (90) days of execution of the Contract.

5. An index shall be provided indicating:

    a. A complete shop drawing log depicting ALL submittals to be provided for the Division, whether included in the full package or not. Log shall be updated to reflect the submittals provided.
    b. Specification section.
    c. Product.
    d. Plan code.
    e. Supplier, Manufacturer, Model Number, Contact List, etc.

D. Fire protection long lead items are excluded from requirement but must be submitted complete in their entirety by specification section, when provided.

E. The Contractor shall submit for review detailed shop drawings of all equipment and material specified in each section and coordinated ductwork layouts. No material or equipment may be delivered to the job site or installed until the Contractor has received shop drawings for the particular material or equipment which have been properly reviewed.

F. Shop drawings shall be submitted within 60 days after award of Contract before any material or equipment is purchased. The Contractor shall submit for review copies of all shop drawings to be incorporated in the Contract. Refer to the General Conditions for the quantity of copies required for submission. Where quantities are not specified, provide seven (7) copies for review.

G. Provide shop drawings for all devices specified under equipment specifications for all systems, materials, equipment, and/or devices. Shop drawings shall include manufacturers' names, catalog numbers, cuts, diagrams, and other such descriptive data as may be required to identify and accept the equipment. A complete list in each category (example: all fixtures) of all shop drawings, catalog cuts, material lists, etc., shall be submitted to the Engineer at one (1) time. No consideration will be given to a partial shop drawing submittal.

    1. Equipment shop drawings shall contain full range performance curves, graphs, tables, or other pertinent data which clearly indicates operational range of a given unit size. Computer generated/plotted curves, based solely on design performance, will not be accepted.
    2. All specific options and/or alternatives shall be clearly indicated. Failure to do so shall be grounds for rejection.

H. Submittals shall be marked with the trade involved, i.e., HVAC, plumbing, fire protection, etc. and the specific associated specification section.

I. Where multiple quantities or types of equipment are being submitted, provide a cover sheet (with a list of contents) on the submittal identifying the equipment or material being submitted.

J. Failure to submit shop drawings in ample time for review shall not entitle the Contractor to an extension of Contract time. No claim for extension by reason of such default will be allowed, nor shall the Contractor be entitled to purchase, furnish and/or install equipment which has not been reviewed by the Engineer. The Contractor shall incur all costs associated with delay of construction due to equipment and/or materials arriving late due to late or improper shop drawing submittal.

K. The Contractor shall furnish all necessary templates, patterns, etc., for installation work and for the purpose of making adjoining work conform; furnish setting plans and shop details to other trades as required.

L. Acceptance rendered on shop drawings shall not be considered as a guarantee of measurements or building conditions. Where drawings are reviewed, review does not indicate that drawings have been checked in detail; said approval does not in any way relieve the Contractor from his responsibility or necessity of furnishing material or performing work as required by the Contract Drawings and Specifications. Verify available space prior to submitting shop drawings.

M. Acceptance of shop drawings shall not apply to quantity nor relieve Contractor of his responsibility to comply with intent of Drawings and Specifications.

N. Acceptance of shop drawings is final and no further changes will be allowed without the written consent of the Engineer.

O. Shop drawing submittal sheets which may show items that are not being furnished shall have those items crossed off to clearly indicate which items will be furnished.

P. Contractor shall make any corrections required by Engineer and shall resubmit required number of corrected copies of shop drawings or new samples until accepted. Contractor shall direct specific attention in writing or on resubmitted shop drawings to revisions other than corrections requested by Engineer on previous submissions. Engineer shall review no more than one (1) resubmittal of any shop drawing or sample at Owner’s expense. The fees for review of additional resubmittals shall be paid by the Contractor at the Engineer’s standard rates.

Q. Conform the Fire Protection work to the requirements herein. Provide offsets, fittings, drains, and accessories which may be required to accommodate structural, HVAC, plumbing, existing conditions, etc. Investigate the structural and finish conditions affecting the work and arrange the work accordingly. Provide such piping, fittings, valves, and accessories as may be required to meet such conditions.

1.13 CHANGES IN WORK

A. Change Order is a written order to the Contractor signed by the Owner and the Architect, issued after Contracts have been awarded, authorizing a change in the work or an adjustment in the Contract sum or the Contract time. A Change Order signed by the Contractor indicates his agreement therewith, including the adjustment in the Contract sum or the Contract time.

B. All changes in the work shall follow the recommendations of the AIA "General Conditions of the Contract for Construction", Article 7.

1.14 MANUFACTURER'S IDENTIFICATION

A. All component parts of each item of equipment or device shall bear the manufacturer's nameplate giving name of manufacturer, description, size, type, serial and model number, electrical characteristics, etc., in order to facilitate maintenance or replacement. The nameplate of a Contractor or distributor will not be acceptable.

B. All material and equipment for the electrical portion of the mechanical systems shall bear the label of or be listed by UL, or other accredited authoritative agencies or testing organizations approved by the authority having jurisdiction.

1.15 RECORD DRAWINGS

A. Maintain at the job site a record set of Sprinkler Drawings on which any changes in location or routing of all equipment, materials and access panels shall be recorded.

B. At the end of construction, the Contractor shall provide the Owner with a complete set of As-Built Drawings, including all updated coordination drawings, ductwork, and piping plans. Prepare As-Built documentation utilizing the most recent version of AutoCAD. Provide the Owner with a "CD ROM" disk and one (1) set of reproducible documents.

C. If electronic copies of the contract documents are made available to the Contractor for use in production of As-Built documentation, the Contractor assumes responsibility for completeness and accuracy of the As-Built documents. Translation or manipulation of electronic documents provided to the Contractor is the responsibility of the Contractor.

1.16 MATERIALS AND WORKMANSHIP

A. All materials and apparatus required for the work, except as otherwise specifically indicated, shall be new, of first-class quality, and shall be furnished, delivered, erected, connected, and finished in every detail and be so selected and arranged as to fit properly into the building spaces. Where no specific type or quality of material is given, a first-class standard article as accepted by industry standards shall be furnished.

B. The Contractor shall furnish the services of an experienced superintendent who shall be constantly in charge of the installation of the work together with all skilled workmen, fitters, metal workers, welders, helpers, and laborers required to unload, transfer, erect, connect, adjust, start, operate, and test each system.

C. Unless otherwise specifically indicated on the Drawings or Specifications, all equipment and materials shall be installed with the acceptance of the Engineer and in accordance with the recommendations of the manufacturer. This includes the performance of such tests as the manufacturer recommends.

D. All labor for installation of mechanical systems shall be performed by experienced, skilled tradesmen under the supervision of a licensed journeyman foreman. All work shall be of a quality consistent with good trade practice and shall be installed in a neat, workmanlike manner. The Engineer reserves the right to reject any work which, in his opinion, has been installed in a substandard, dangerous, or unserviceable manner. The Contractor shall replace said work in a satisfactory manner at no extra cost to the Owner.

1.17 PROTECTION OF MATERIALS AND EQUIPMENT

A. Work under each Section shall include protecting the work and material of all other Sections from damage by work or workmen and shall include making good all damage thus caused.

B. The Contractor shall be responsible for work and equipment until the facility has been accepted by the Owner. Protect work against theft, injury, or damage and carefully store material and

equipment received on site which is not immediately installed. Close open ends of work with temporary covers or plugs during construction to prevent entry of foreign material.

C. Work under each Section includes receiving, unloading, uncrating, storing, protecting, setting in place, and completely connecting equipment supplied under each Section. Work under each Section shall also include exercising special care in handling and protecting equipment and fixtures and shall include the cost of replacing any of the equipment and fixtures which are missing or damaged.

D. Equipment and material stored on the job site shall be protected from the weather, vehicles, dirt and/or damage by workmen or machinery. Ensure that all electrical or absorbent equipment or material is protected from moisture during storage.

1.18 BASES AND SUPPORTS

A. Unless otherwise specifically noted, the Contractor shall furnish all necessary supports, rails, framing, bases, and piers required for all equipment furnished under this Division.

B. Unless otherwise indicated in individual trade Sections, pumps, fans, air handlers, boilers, chillers, tanks, compressors, and other rotating machinery shall be mounted on a minimum of 4-inch-high concrete pads which shall be furnished and installed per Division 03. All pads shall be extended not less than 4 inches beyond machine base in all directions and sufficient for seismic anchoring with top edge chamfered. Shop drawings of all foundations and pads shall be submitted to the Engineer for review before they are constructed. The Mechanical Contractor shall field coordinate all required dimensional and necessary loading information.

C. Construction of foundations, supports, pads, bases, and piers where mounted on the floor shall be of the same finish quality as the adjacent and surrounding flooring material.

D. Unless otherwise shown, all equipment shall be securely attached to the building structure in an acceptable manner. Attachments shall be of a strong and durable nature; any attachments that are insufficient, in the opinion of the Engineer, shall be replaced as directed without extra cost to the Owner.

E. All equipment supports shall be designed and constructed such that the equipment will be capable of resisting both vertical and horizontal movement. The equipment shall be positively anchored to the bases or supports to resist vertical movement. The equipment and its supports shall be provided with suitable restraints to resist horizontal movement from any direction as dictated by applicable seismic Codes.

1.19 SLEEVES, INSERTS, AND ANCHOR BOLTS

A. The Contractor shall provide, set in place, and be held responsible for the location of all sleeves, inserts, and anchor bolts required for the work. In the event that failure to do so requires cutting and patching of finished work, it shall be done at the Contractor's expense.

1. It is the responsibility of the Contractor to furnish cast-in-place sleeves, inserts, and anchors in sufficient time to be installed during initial concrete pours. Where job schedules make this impossible, coordinate and obtain acceptance from the Structural Engineer for alternate installation methods.

B. All pipes and conduits passing through floors, walls, or partitions shall be provided with sleeves having an inside diameter 1-inch larger than the outside diameter of the pipe, conduit, or insulation enclosing the pipe.

C. Penetrations through fire-rated walls, ceilings, and all floors (except slab on grade) in which piping or ducts pass shall be filled solidly with acceptable fire-stopping material.

D. When ducts, piping, or conduit penetrate the floor of a mechanical room located above an occupied space, such penetrations shall be made completely watertight, such that a liquid leak shall not pass through the penetration.

1.20 FIRESTOPS AND SEALS

A. Refer to Section 078413 "Penetration Firestopping" for additional and more specific information and ASTM E 814 and F&T Ratings.

B. Firestopping systems shall be submitted as shop drawing.

C. Penetrations through fire-rated walls, ceiling, or floors shall be sealed with a UL approved fire-stop fitting classified for an hourly rating equivalent to the fire rating of the wall, ceiling, or floor.

D. Through wall and floor seals shall be used to provide a positive means of sealing pipes or ducts which pass through the concrete foundation of a structure below grade or below ground water level. Seals shall also be used at entry points through concrete walls or floors which must be sealed.

E. All piping and conduit penetrations through the roof shall be provided with Pate Type PCA pipe curb assemblies or acceptable equivalent. Coordinate installation details with the roofing system being used for the project.

1.21 CUTTING AND PATCHING

A. All cutting and patching shall be done per Division 01 requirements. The Contractor shall furnish sketches showing the location and sizes of all openings, chases, etc., required for the installation of work.

B. Work under this Division shall include furnishing, locating, and setting inserts and/or sleeves required before the floors and walls are built or be responsible for cutting, drilling, or chopping where sleeves and inserts were not installed or correctly located. The Contractor shall do all drilling required for the installation of hangers.

C. Exercise extreme caution when core drilling or punching openings in concrete floor slabs in order to avoid cutting or damaging structural members. No structural members or structural slabs/floors shall be cut without the written acceptance of the Structural Engineer and all such cutting shall be done in a manner directed by him.

1.22 SCAFFOLDING, RIGGING, HOISTING

A. The Contractor shall furnish all scaffolding, rigging, hoisting, and services necessary for erection and delivery into the premises any equipment and apparatus furnished under this Division. Remove same from premises when no longer required.

1.23 EXCAVATION AND BACKFILLING

A. Excavation and backfilling shall be done per Division 31 of the Specifications.

B. It is the responsibility of the Contractor to coordinate sizes, depths, fill, and bedding requirements and any other excavation work required under this Division.

1.24 WATERPROOFING

A. Where any work pierces waterproofing, including waterproof concrete and floors in wet areas, the method of installation shall be reviewed by the Engineer before work is done. The Contractor shall furnish all necessary sleeves, caulking, and flashing required to make openings absolutely watertight.

1.25 ACCESSIBILITY AND ACCESS PANELS

A. The Contractor shall be responsible for the sufficiency of the size of shafts and chases, the adequate thickness of partitions, and the adequate clearance in double partitions and hung ceilings for the proper installation of the work.

B. Locate all equipment which must be serviced, operated, or maintained in fully accessible positions. Equipment shall include, but not be limited to motors, controllers, coil, valves, switchgear, drain points, etc. Access doors shall be furnished if required for better accessibility. Minor deviations from the Drawings may be made to allow better accessibility, but changes of magnitude or which involve extra cost shall not be made without the acceptance of the Engineer.

C. Access doors in walls, ceilings, floors, etc., shall be field coordinated. It is the responsibility of the Contractor to coordinate and provide information regarding the sizes and quantities of access doors required for his work. The Contractor shall arrange his work in such a manner as to minimize the quantity of access doors required, such as grouping shutoff valves in the same area. Where possible, locate valves in already accessible areas, such as lay-in ceilings, etc.

D. On a clean set of prints, the Contractor shall mark in red pencil the location of each required access door, including its size and fire rating (if any), and shall submit the print to the Architect for review before access doors are purchased or installed.

E. Upon completion of the Project, the Contractor shall physically demonstrate that all equipment and devices installed have been located and/or provided with adequate access panels for repair, maintenance, and/or operation. Any equipment not so furnished shall be relocated or provided with additional access panels by the installing Contractor at no additional cost to the Owner.

F. Permanent ladders for access to equipment when shown on Plans shall be furnished and installed. Coordinate exact requirements in field.

1.26 TEMPORARY OPENINGS

A. The Contractor shall ascertain from an examination of the Drawings whether any special temporary openings in the building will be required for the admission of apparatus provided under this Division and shall coordinate the requirements accordingly. In the event of failure of the Contractor to give sufficient notice in time to arrange for these openings during construction, the Contractor shall assume all costs of providing such openings thereafter.

1.27 SHUTDOWNS

A. When installation of a new system requires the temporary shutdown of an existing operating system, the connection of the new system shall be performed at such time as designated by the Owner's representative.

B. The Engineer and the Owner shall be notified of the estimated duration of the shutdown period at least ten (10) days in advance of the date the work is to be performed.

C. Work shall be arranged for continuous performance whenever possible. The Contractor shall provide all necessary labor, including overtime if required, to assure that existing operating services will be shut down only during the time actually required to make necessary connections.

1.28 TAGS AND CHARTS

A. Each valve and piece of apparatus under this Division shall be provided with suitable brass or laminated plastic tags and ceiling tag securely fastened with brass chains, screws, or rivets. Equipment shall be numbered with laminated plastic tags or neatly stenciled letters 2 inches high using designations in equipment schedules and/or shall conform to a directory indicating number, location, and use of each item. Directories shall be prepared under each Section and shall be glass framed.

1. Directory shall indicate valve tag number and the unit number, floor/area branch line, main line, service, or other pertinent data to quickly and easily identify the valve’s purpose.

1.29 ESCUTCHEONS

A. The Contractor shall provide escutcheons on pipes wherever they pass through floors, ceilings, walls, or partitions in finished visible locations. See Section 078413 “Penetration Firestopping” for further requirements.

1.30 PAINTING

A. All finish painting in completed areas shall be performed per Division 09 of the Specifications.

B. All materials shipped to the job site under this Division, such as grilles, registers, and/or radiation covers, shall have standard manufacturer's finish, unless otherwise specified.

C. The Contractor shall paint conduits, pipe, and equipment wherever it can be seen through a register or louver. Paint shall not cover-up labels and other identifying items. Paint shall be flat black, rust preventative type.

D. All uninsulated outdoor piping and fittings shall be properly primed with zinc-rich primer and finished with a minimum of two (2) coats of high grade exterior enamel.

1.31 PIPE EXPANSION

A. All pipe connections shall be installed to allow for freedom of movement of the piping during expansion and contraction without springing. Provide engineered design, layout, details, and fabrication, submitted with registered professional engineer sign and seal, of swing joints, expansion loops, and expansion joints with proper anchors and guides. Pay particular attention to plastic piping with high coefficients of expansion.

1. Consideration of required seismic lateral restraints shall be given when anchoring piping and making provision for expansion.

1.32 ELECTRICAL CONNECTIONS

A. Unless otherwise specified, all wiring shall be furnished and installed per Division 26 Specifications.

B. The Contractor furnishing equipment shall furnish the motor controller required for the equipment. Provide properly sized overload heaters and all required accessories with all motor controllers. See Division 26 for motor controller requirements.

C. All power wiring shall be furnished and installed per Division 26 complete from power source to motor or equipment junction box including power wiring through the motor controller and proper means of disconnect per NEC and Division 26. The Division 26 Contractor shall provide all disconnects, unless noted otherwise.

1.33 QUIET OPERATION

A. Equipment and material used in the various systems described herein shall not produce a sound level greater than 55 decibels in the area served. If noise level is deemed objectionable by the Owner/Engineer, the Contractor shall test and record sound levels in the presence of the Owner/Engineer. The sound level shall be observed on the "A" weighting network of a sound level or sound survey meter. The ASHRAE "Guide and Data Book" provides a means to determine sound level of mechanical equipment when the total of background plus equipment sound levels exceeds the minimum acceptable equipment sound level.

B. If objectionable noises or vibrations of any magnitude are produced and transmitted to occupied portions of the building by apparatus, piping, ducts, or other parts of the mechanical work, the Contractor shall make such changes or additions as necessary without extra cost to the Owner.

1.34 MAINTENANCE

A. The Contractor shall provide the necessary skilled labor to assure the proper operation and to provide all required current and preventative maintenance for all equipment and controls provided under this Division until final acceptance of the building by the Owner. The Contractor shall not assume acceptance of the building by the Owner until he receives written notification.

B. The Contractor shall receive calls for any and all problems experienced in the operation of the equipment provided under this Division and he shall take steps to immediately correct any deficiencies that may exist.

C. The Contractor shall provide a check list and shall put a copy of it in the boiler or main mechanical room. The check list shall itemize each piece of equipment furnished under his Section.

1. The Contractor shall certify on this check list that he has examined each piece of equipment and that, in his opinion, it is operating as intended by the manufacturer, it has been properly lubricated, and that all necessary current and preventative maintenance has been performed as recommended by the manufacturer and by good and accepted practice.

D. Where normal preventative maintenance for any piece of equipment requires special tools, the Contractor shall furnish the appropriate tools for that piece of equipment (i.e., special filter removal hooks, valve wrenches, etc.).

1.35 LUBRICATION

A. All equipment installed under this Contract having moving parts and requiring lubrication shall be properly lubricated according to manufacturer's recommendations prior to testing and operation. Any such equipment discovered to have been operated before lubrication by the Contractor is subject to rejection and replacement at no additional cost to the Owner. Units furnished with sealed bearings are exempted.

B. The Contractor shall furnish and install, as appropriate on all equipment requiring lubrication, Zerk pressure gun grease fittings, or sight gravity-feed oilers equipped with shutoff and needle valve adjustment. Units furnished with sealed bearings and lifetime lubrication are exempted. All fittings and oilers are to be fully accessible for lubrication with equipment which does not require special adapters. Where fittings would be otherwise inaccessible, furnish and install extended grease lines.

1.36 CLEANING

A. The Contractor shall be responsible for keeping the jobsite clean, safe, and neat throughout the duration of construction. The Contractor shall clean up his own debris daily and shall coordinate removal of rubbish and debris with the General Contractor/Construction Manager.

1. No debris, construction materials, cigarette butts, coffee cups, etc., shall be left above suspended ceilings.

B. The Contractor shall thoroughly clean and flush all piping and equipment of all foreign substances, oils, burrs, solder, flux, etc., inside and out before being placed in operation.

C. If any part of a system should be stopped or damaged by any foreign matter after being placed in operation, the system shall be disconnected, cleaned, and reconnected wherever necessary to locate and/or remove obstructions. Any work damaged in the course of removing obstructions shall be repaired or replaced when the system is reconnected at no additional cost to the Owner.

D. During the course of construction, all ducts and pipes shall be capped in an acceptable manner to insure adequate protection against the entrance of foreign matter.

E. Upon completion of all work under the Contract, the Contractor shall remove from the premises all rubbish, debris, and excess materials left over from his work. Any oil or grease stains on floor areas caused by the Contractor shall be removed and floor areas left clean.

1.37 OPERATING INSTRUCTIONS

A. Upon completion of all work and tests, the Contractor shall furnish the necessary skilled labor and helpers for operating his system and equipment for a period specified under each applicable Section of this Division. During this period, he shall fully instruct the Owner or the Owner's representative in the operation, adjustment, and maintenance of all equipment furnished. The Contractor shall give at least 72 hours' notice to the Owner and the Engineer in advance of this period.

B. The Contractor shall formally submit for delivery to the Engineer three (3) complete bound sets of typewritten or blueprinted instructions for operating and maintaining all systems and equipment included in this Division. All instructions shall be submitted in draft for review prior to final issue. Manufacturer's advertising literature or catalogs will not be acceptable for operating and maintenance instruction.

C. The Contractor, in the above-mentioned instructions, shall include the maintenance schedule for the principal items of equipment furnished under this Division.

D. The appropriate Contractor shall physically demonstrate procedures for all routine maintenance of all equipment furnished under each respective Section to assure accessibility to all devices.

E. An authorized manufacturer's representative shall attest in writing that the equipment has been properly installed prior to startup of any major equipment. The following equipment will require this inspection: pumps; air conditioning equipment, controls, air handling equipment, boilers. These letters will be bound into the operating and maintenance books.

F. Refer to individual trade Sections for any other particular requirements related to operating instructions.

1.38 ADJUSTING AND TESTING

A. After all the equipment and accessories to be furnished are in place, they shall be put in final adjustment and subjected to such operating tests so as to assure the Engineer that they are in proper adjustment and in satisfactory, permanent operating condition.

B. Where requested by the Engineer, a factory-trained service engineering representative shall inspect the installation and assist in the initial startup and adjustment to the equipment. The period of these services shall be for such time as necessary to secure proper installation and adjustments. After the equipment is placed in permanent operation, the service engineering representative shall supervise the initial operation of the equipment and instruct the personnel responsible for operation and maintenance of the equipment. The service engineering representative shall notify the Contractor in writing that the equipment was installed according to manufacturer's recommendations and is operating as intended by the manufacturer.

1.39 GUARANTEES

A. The Contractor shall guarantee all equipment, material, and workmanship under these Specifications and the Contract for a period of one (1) year from the date of final acceptance by Owner, unless otherwise noted.

B. During this guarantee period, all defects developing through faulty equipment, materials, or workmanship shall be corrected or replaced immediately by the Contractor without expense to the Owner. Such repairs or replacements shall be made to the Engineer's satisfaction.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 210100

SECTION 210517 - SLEEVES AND SLEEVE SEALS FOR FIRE-SUPPRESSION PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Sleeves.
2. Stack-sleeve fittings.
3. Sleeve-seal systems.
4. Sleeve-seal fittings.
5. Grout.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.4 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

PART 2 - PRODUCTS

2.1 SLEEVES

A. Cast-Iron Wall Pipes: Cast or fabricated of cast or ductile iron and equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop unless otherwise indicated.

B. Galvanized Steel Pipe Sleeves: ASTM A53/A53M, Type E, Grade B, Schedule 40**,** galvanized, with plain ends and integral welded waterstop collar.

C. Galvanized-Steel Sheet Sleeves: 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint.

2.2 STACK-SLEEVE FITTINGS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Jay R. Smith Mfg. Co.

2. Zurn Industries, LLC.

B. Description: Manufactured, Dura-coated or Duco-coated or galvanized cast-iron sleeve with integral clamping flange for use in waterproof floors and roofs. Include clamping ring, bolts, and nuts for membrane flashing.

1. Underdeck Clamp: Clamping ring with setscrews.

2.3 SLEEVE-SEAL SYSTEMS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Advance Products & Systems, Inc.
2. CALPICO, Inc.
3. GPT; an EnPro Industries company.
4. Metraflex Company (The).
5. Proco Products, Inc.

B. Description:

1. Modular sealing-element unit, designed for field assembly, for filling annular space between piping and sleeve.
2. Designed to form a hydrostatic seal of 20 psig minimum.
3. Sealing Elements: EPDM-rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size.
4. Pressure Plates: Carbon steel or Composite plastic.
5. Connecting Bolts and Nuts: Carbon steel, with corrosion-resistant coating, ASTM B633, of length required to secure pressure plates to sealing elements.

2.4 SLEEVE-SEAL FITTINGS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Advance Products & Systems, Inc.
2. CALPICO, Inc.
3. GPT; an EnPro Industries company.
4. Metraflex Company (The).
5. Proco Products, Inc.

B. Description: Manufactured plastic, sleeve-type, waterstop assembly made for imbedding in concrete slab or wall.

C. Plastic or rubber waterstop collar with center opening to match piping OD.

2.5 GROUT

A. Description: Nonshrink, for interior and exterior sealing openings in non-fire-rated walls or floors.

B. Standard: ASTM C1107/C1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.

C. Design Mix: 5000-psi, 28-day compressive strength.

D. Packaging: Premixed and factory packaged.

PART 3 - EXECUTION

3.1 SLEEVE INSTALLATION

A. Install sleeves for piping passing through penetrations in floors, partitions, roofs, and walls.

B. For sleeves that will have sleeve-seal system installed, select sleeves of size large enough to provide 1-inch annular clear space between piping and concrete slabs and walls.

1. Sleeves are not required for core-drilled holes.

C. Install sleeves in concrete floors, concrete roof slabs, and concrete walls as new slabs and walls are constructed.
1. Cut sleeves to length for mounting flush with both surfaces.

a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches above finished floor level.

2. Using grout, seal space outside of sleeves in slabs and walls without sleeve-seal system.

D. Install sleeves for pipes passing through interior partitions.

1. Cut sleeves to length for mounting flush with both surfaces.
2. Install sleeves that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation.
3. Seal annular space between sleeve and piping or piping insulation; use joint sealants appropriate for size, depth, and location of joint. Comply with requirements for sealants specified in Section 079200 "Joint Sealants."

E. Fire-Resistance-Rated Penetrations, Horizontal Assembly Penetrations, and Smoke Barrier Penetrations: Maintain indicated fire or smoke rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with fire- and smoke- stop materials. Comply with requirements for firestopping and fill materials specified in Section 078413 "Penetration Firestopping." Fire-seal shall be UL Listed, approved and tested fire and/or smoke sealing material installed in all fire and/or smoke rated floors and partitions in accordance with NFPA, local code and manufacturer’s recommendations

3.2 STACK-SLEEVE-FITTING INSTALLATION

A. Install stack-sleeve fittings in new slabs as slabs are constructed.

1. Install fittings that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation.
2. Secure flashing between clamping flanges for pipes penetrating floors with membrane waterproofing. Comply with requirements for flashing specified in Section 076200 "Sheet Metal Flashing and Trim."
3. Install section of cast-iron soil pipe to extend sleeve to 2 inches above finished floor level.

4. Extend cast-iron sleeve fittings below floor slab as required to secure clamping ring if ring is specified.
5. Use grout to seal around the outside of stack-sleeve fittings.

B. Fire-Resistance-Rated Penetrations, Horizontal Assembly Penetrations, and Smoke Barrier Penetrations: Maintain indicated fire or smoke rating of floors at pipe penetrations. Seal pipe penetrations with fire- or smoke-stop materials. Comply with requirements for firestopping specified in Section 078413 "Penetration Firestopping."

3.3 SLEEVE-SEAL-SYSTEM INSTALLATION

A. Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at service piping entries into building.

B. Select type, size, and number of sealing elements required for piping material and size and for sleeve ID or hole size. Position piping in center of sleeve. Center piping in penetration, assemble sleeve-seal system components, and install in annular space between piping and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make a watertight seal.

3.4 SLEEVE-SEAL-FITTING INSTALLATION

A. Install sleeve-seal fittings in new walls and slabs as they are constructed.

B. Assemble fitting components of length to be flush with both surfaces of concrete slabs and walls. Position waterstop flange to be centered in concrete slab or wall.

C. Secure nailing flanges to concrete forms.

D. Use grout to seal the space around outside of sleeve-seal fittings.

3.5 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. Leak Test: After allowing for a full cure, test sleeves and sleeve seals for leaks. Repair leaks and retest until no leaks exist.

B. Sleeves and sleeve seals will be considered defective if they do not pass tests and inspections.

C. Prepare test and inspection reports.

3.6 SLEEVE AND SLEEVE-SEAL SCHEDULE

A. Use sleeves and sleeve seals for the following piping-penetration applications:

1. Exterior Concrete Walls above Grade:

a. Piping Smaller Than NPS 6: Galvanized steel pipe sleeves with Sleeve-seal fittings.
b. Piping NPS 6 and Larger: Galvanized steel pipe sleeves with Sleeve-seal fittings.

2. Exterior Concrete Walls below Grade:

    a. Piping Smaller Than NPS 6: Galvanized steel pipe sleeves with sleeve-seal system.

        1) Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.

    b. Piping NPS 6 and Larger: Galvanized steel pipe sleeves with sleeve-seal system.

        1) Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.

3. Concrete Slabs-on-Grade:

    a. Piping Smaller Than NPS 6: Galvanized steel pipe sleeves with sleeve-seal system.

        1) Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.

    b. Piping NPS 6 and Larger: Galvanized steel pipe sleeves with sleeve-seal system

        1) Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.

4. Concrete Slabs above Grade:

    a. Piping Smaller Than NPS 6: Galvanized steel pipe sleeves or Sleeve-seal fittings.
    b. Piping NPS 6 and Larger: Galvanized steel pipe sleeves or Sleeve-seal fittings.

5. Interior Partitions:

    a. Piping Smaller Than NPS 6: Galvanized steel pipe sleeves.
    b. Piping NPS 6 and Larger: Galvanized-steel sheet sleeves.

END OF SECTION 210517

SECTION 210518 - ESCUTCHEONS FOR FIRE-SUPPRESSION PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Escutcheons.
2. Floor plates.

1.3 DEFINITIONS

A. Existing Piping to Remain: Existing piping that is not to be removed and that is not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

PART 2 - PRODUCTS

2.1 ESCUTCHEONS

A. One-Piece, Cast-Brass Type: With polished, chrome-plated and rough-brass finish and setscrew fastener.

B. One-Piece, Deep-Pattern Type: Deep-drawn, box-shaped brass with polished, chrome-plated finish and spring-clip fasteners.

C. One-Piece, Stamped-Steel Type: With chrome-plated finish and spring-clip fasteners.

D. Split-Plate, Brass Type: With polished, chrome-plated and rough brass finish; concealed hinge; and spring-clip fasteners.

E. Split-Plate, Stamped-Steel Type: With chrome-plated finish; **concealed** hinge; and spring-clip fasteners.

2.2 FLOOR PLATES

A. One-Piece Floor Plates: Cast-iron flange with holes for fasteners.

B. Split-Casting Floor Plates: Cast Brass with concealed hinge.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install escutcheons for piping penetrations of walls, ceilings, and finished floors.

B. Install escutcheons with ID to closely fit around pipe, tube, and insulation of piping and with OD that completely covers opening.

1. Escutcheons for New Piping:

a. Piping with Fitting or Sleeve Protruding from Wall: One-piece, deep pattern.
b. Chrome-Plated Piping: One-piece cast brass with polished, chrome-plated finish.
c. Insulated Piping: One-piece stamped steel with polished, chrome-plated finish.
d. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece steel with polished, chrome-plated finish.
e. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece steel with polished, chrome-plated finish.
f. Bare Piping in Unfinished Service Spaces: One-piece cast brass with rough-brass finish, or one-piece stamped steel with chrome-plated finish.
g. Bare Piping in Equipment Rooms: One-piece cast brass with rough-brass finish or one-piece stamped steel chrome-plated finish.

2. Escutcheons for Existing Piping to Remain:

a. Chrome-Plated Piping: Split-plate, stamped steel with concealed hinge with polished, chrome-plated finish.
b. Insulated Piping: Split-plate, stamped steel with concealed hinge with polished, chrome-plated finish.
c. Bare Piping at Wall and Floor Penetrations in Finished Spaces: Split-plate, stamped steel with concealed hinge with polished, chrome-plated finish.
d. Bare Piping at Ceiling Penetrations in Finished Spaces: Split-plate, stamped steel with concealed hinge with polished, chrome-plated finish.
e. Bare Piping in Unfinished Service Spaces: Split-plate, brass with concealed hinge and rough-brass finish or split-plate, stamped steel with concealed hinge with chrome-plated finish.
f. Bare Piping in Equipment Rooms: Split-plate, brass with concealed hinge and rough-brass finish or split-plate, stamped steel with concealed hinge with chrome-plated finish.

C. Install floor plates for piping penetrations of equipment-room floors.

D. Install floor plates with ID to closely fit around pipe, tube, and insulation of piping and with OD that completely covers opening.

1. New Piping: One-piece, floor plate.
2. Existing Piping: Split floor plate.

3.2 FIELD QUALITY CONTROL

A. Using new materials, replace broken and damaged escutcheons and floor plates.

END OF SECTION 210518

SECTION 210523 - GENERAL-DUTY VALVES FOR WATER-BASED FIRE-SUPPRESSION PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Iron butterfly valves with indicators.
2. Check valves.
3. Iron OS&Y gate valves.
4. Trim and drain valves.

1.3 DEFINITIONS

A. NBR: Acrylonitrile-butadiene, Buna-N, or nitrile rubber.

B. NRS: Non-rising stem.

C. OS&Y: Outside screw and yoke.

D. SBR: Styrene-butadiene rubber.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of valve.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Prepare valves for shipping as follows:

1. Protect internal parts against rust and corrosion.
2. Protect threads, flange faces, and weld ends.
3. Set valves open to minimize exposure of functional surfaces.

B. Use the following precautions during storage:

1. Maintain valve end protection.
2. Store valves indoors and maintain at higher than ambient dew point temperature. If outdoor storage is necessary, store valves off the ground in watertight enclosures.

C. Use sling to handle large valves; rig sling to avoid damage to exposed parts. Do not use operating handles or stems as lifting or rigging points.

D. Protect flanges and specialties from moisture and dirt.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR VALVES

A. UL Listed: Valves shall be listed in UL's "Online Certifications Directory" under the headings listed below and shall bear UL mark:

1. Main Level: HAMV - Fire Main Equipment.

a. Level 1: HCBZ – Indicator Posts, Gate Valve.
b. Level 1: HLOT – Valves.

1) Level 3: HLUG – Ball Valves, System Control.
2) Level 3: HLXS – Butterfly Valves.
3) Level 3: HMER – Check Valves.
4) Level 3: HMRZ – Gate Valves.

2. Main Level: VDGT - Sprinkler System & Water Spray System Devices.

a. Level 1: VQGU – Valves, Trim and Drain.

B. FM Global Approved: Valves shall be listed in its "Approval Guide," under the headings listed below:

1. Automated Sprinkler Systems:

a. Indicator posts.
b. Valves.

1) Gate valves.
2) Check valves.

a) Single check valves.

3) Miscellaneous valves.

C. Source Limitations for Valves: Obtain valves for each valve type from single manufacturer.

D. ASME Compliance:

1. ASME B16.1 for flanges on iron valves.
2. ASME B1.20.1 for threads for threaded-end valves.
3. ASME B31.9 for building services piping valves.

E. AWWA Compliance: Comply with AWWA C606 for grooved-end connections.

F. NFPA Compliance: Comply with NFPA 24 for valves.

G. Valve Pressure Ratings: Not less than the minimum pressure rating indicated or higher as required by system pressures.

H. Valve Sizes: Same as upstream piping unless otherwise indicated.

I. Valve Actuator Types:

1. Worm-gear actuator with handwheel for quarter-turn valves, except for trim and drain valves.
2. Handwheel: For other than quarter-turn trim and drain valves.
3. Handlever: For quarter-turn trim and drain valves NPS 2 and smaller.

2.2 IRON BUTTERFLY VALVES WITH INDICATORS

A. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

1. Anvil International
2. NIBCO INC.
3. Tyco Fire Products LP
4. Victaulic Company
5. Zurn Industries, LLC

B. Description:

1. Standard: UL 1091 and FM Global standard for indicating valves, (butterfly or ball type), Class Number 112.
2. Minimum Pressure Rating: 175 psig.
3. Body Material: Cast or ductile iron with nylon, EPDM, epoxy, or polyamide coating.
4. Seat Material: EPDM.
5. Stem: Stainless-steel.
6. Disc: Ductile iron, and EPDM or SBR coated.
7. Actuator: Worm gear or traveling nut.
8. Supervisory Switch: Internal or external.
9. Body Design: Grooved-end connections.

2.3 CHECK VALVES

A. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

1. Anvil International
2. NIBCO INC.
3. Reliable Automatic Sprinkler Co., Inc. (The)
4. Tyco Fire Products LP
5. Victaulic Company

B. Description:

1. Standard: UL 312 and FM Global standard for swing check valves, Class Number 1210.
2. Minimum Pressure Rating: 175 psig.
3. Type: Single swing check.
4. Body Material: Cast iron, ductile iron, or bronze.
5. Clapper: Bronze, ductile iron, or stainless-steel with elastomeric seal.
6. Clapper Seat: Brass, bronze, or stainless-steel.
7. Hinge Shaft: Bronze or stainless-steel.
8. Hinge Spring: Stainless-steel.
9. End Connections: Flanged, grooved, or threaded.

2.4 IRON OS&Y GATE VALVES

A. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

1. Hammond Valve
2. NIBCO INC.
3. Victaulic Company
4. Watts; a Watts Water Technologies company
5. Zurn Industries, LLC

B. Description:

1. Standard: UL 262 and FM Global standard for fire-service water control valves (OS&Y- and NRS-type gate valves).
2. Minimum Pressure Rating: 175 psig.
3. Body and Bonnet Material: Cast or ductile iron.
4. Wedge: Cast or ductile iron, or bronze with elastomeric coating.
5. Wedge Seat: Cast or ductile iron, or bronze with elastomeric coating.
6. Stem: Brass or bronze.
7. Packing: Non-asbestos PTFE.
8. Supervisory Switch: External.
9. End Connections: Flanged, grooved or threaded.

2.5 TRIM AND DRAIN VALVES

A. Ball Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

a. Apollo Valves; Conbraco Industries, Inc.
b. Milwaukee Valve Company
c. NIBCO INC.
d. Potter Roemer LLC
e. Tyco Fire Products LP

2. Description:

a. Pressure Rating: 175 psig.
b. Body Design: Two-piece.
c. Body Material: Forged brass or bronze.
d. Port size: Full or standard.
e. Seats: PTFE.
f. Stem: Bronze or stainless-steel.
g. Ball: Chrome-plated brass.
h. Actuator: Handlever.
i. End Connections for Valves NPS 1 through NPS 2: Threaded ends.
j. End Connections for Valves NPS 2-1/2 and larger: Grooved ends.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine valve interior for cleanliness, freedom from foreign matter, and corrosion. Remove special packing materials, such as blocks, used to prevent disc movement during shipping and handling.

B. Operate valves in positions from fully open to fully closed. Examine guides and seats made accessible by such operations.

C. Examine threads on valve and mating pipe for form and cleanliness.

D. Examine mating flange faces for conditions that might cause leakage. Check bolting for proper size, length, and material. Verify that gasket is of proper size, that its material composition is suitable for service, and that it is free from defects and damage.

E. Do not attempt to repair defective valves; replace with new valves.

3.2 GENERAL REQUIREMENTS FOR VALVE INSTALLATION

A. Install listed fire-protection shutoff valves supervised-open, located to control sources of water supply except from fire-department connections.

B. Install check valve in each water-supply connection. Install backflow preventers instead of check valves in potable-water-supply sources.

C. Install valves having threaded connections with unions at each piece of equipment arranged to allow easy access, service, maintenance, and equipment removal without system shutdown. Provide separate support where necessary.

D. Install valves in horizontal piping with stem at or above the pipe center.

E. Install valves in position to allow full stem movement.

F. Comply with requirements in Section 210553 "Identification for Fire-Suppression Piping and Equipment" for valve tags and schedules and signs on surfaces concealing valves; and the NFPA standard applying to the piping system in which valves are installed. Install permanent identification signs indicating the portion of system controlled by each valve.

END OF SECTION 210523

SECTION 210548 - VIBRATION AND SEISMIC CONTROLS FOR FIRE-SUPPRESSION PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Elastomeric isolation pads.
2. Elastomeric isolation mounts.
3. Restrained elastomeric isolation mounts.
4. Pipe-riser resilient supports.
5. Resilient pipe guides.
6. Elastomeric hangers.
7. Snubbers.
8. Restraint channel bracings.
9. Seismic-restraint accessories.
10. Mechanical anchor bolts.
11. Adhesive anchor bolts.

1.3 DEFINITIONS

A. IBC: International Building Code.

B. ICC-ES: ICC-Evaluation Service.

C. OSHPD: Office of Statewide Health Planning & Development (for the State of California).

D. CSBC: Connecticut State Building Code.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include rated load, rated deflection, and overload capacity for each vibration isolation device.
2. Illustrate and indicate style, material, strength, fastening provision, and finish for each type and size of vibration isolation device and seismic-restraint component required.

    a. Tabulate types and sizes of seismic restraints, complete with report numbers and rated strength in tension and shear as evaluated by an agency acceptable to authorities having jurisdiction.
    b. Annotate to indicate application of each product submitted and compliance with requirements.

3. Interlocking Snubbers: Include ratings for horizontal, vertical, and combined loads.

B. Delegated-Design Submittal: For each vibration isolation and seismic-restraint device.

1. Include design calculations and details for selecting vibration isolators and seismic restraints complying with performance requirements, design criteria, and analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
2. Design Calculations: Calculate static and dynamic loading due to equipment weight and operation, due to seismic forces required to select vibration isolators, and due to seismic restraints.
3. Riser Supports: Include riser diagrams and calculations showing anticipated expansion and contraction at each support point, initial and final loads on building structure, spring deflection changes, and seismic loads. Include certification that riser system was examined for excessive stress and that none exists.
4. Seismic-Restraint Details:

    a. Design Analysis: To support selection and arrangement of seismic restraints. Include calculations of combined tensile and shear loads.
    b. Details: Indicate fabrication and arrangement. Detail attachments of restraints to the restrained items and to the structure. Show attachment locations, methods, and spacings. Identify components, list their strengths, and indicate directions and values of forces transmitted to the structure during seismic events. Indicate association with vibration isolation devices.
    c. Coordinate seismic-restraint and vibration isolation details with wind-restraint details required for equipment mounted outdoors. Comply with requirements in other Sections for equipment mounted outdoors.
    d. Preapproval and Evaluation Documentation: By an agency acceptable to authorities having jurisdiction, showing maximum ratings of restraint items and the basis for approval (tests or calculations).

1.5 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Show coordination of vibration isolation device installation and seismic bracing for fire-suppression piping and equipment with other systems and equipment in the vicinity, including other supports and restraints, if any.

B. Qualification Data: For professional engineer and testing agency.

C. Welding certificates.

D. Field quality-control reports.

1.6 QUALITY ASSURANCE

A. Testing Agency Qualifications: An independent agency, with the experience and capability to conduct the testing indicated, that is an NRTL as defined by OSHA in 29 CFR 1910.7 and that is acceptable to authorities having jurisdiction.

B. Comply with seismic-restraint requirements of the Connecticut State Building Code, unless requirements in this Section are more stringent.

C. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code - Steel."

D. Seismic-restraint devices shall have horizontal and vertical load testing and analysis and shall bear anchorage preapproval OPA number from OSHPD, preapproval by ICC-ES, or

preapproval by another agency acceptable to authorities having jurisdiction, showing maximum seismic-restraint ratings. Ratings based on independent testing are preferred to ratings based on calculations. If preapproved ratings are unavailable, submittals based on independent testing are preferred. Calculations (including combining shear and tensile loads) to support seismic-restraint designs must be signed and sealed by a qualified professional engineer.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Seismic-Restraint Loading:

1. Refer to General Notes on Structural Drawings for Seismic Load Criteria.
2. Rated strengths, features, and applications shall be as defined in reports by an agency acceptable to authorities having jurisdiction.

    a. Structural Safety Factor: Allowable strength in tension, shear, and pullout force of components shall be at least four (4) times the maximum seismic forces to which they are subjected.

2.2 ELASTOMERIC ISOLATION PADS

A. Elastomeric Isolation Pads:

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

    a. Ace Mountings Co., Inc.
    b. California Dynamics Corporation
    c. Isolation Technology, Inc.
    d. Kinetics Noise Control, Inc.
    e. Mason Industries, Inc.
    f. Novia; A Division of C&P
    g. Vibration Eliminator Co., Inc.
    h. Vibration Isolation
    i. Vibration Mountings & Controls, Inc.

2. Fabrication: Single or multiple layers of sufficient durometer stiffness for uniform loading over pad area.
3. Size: Factory or field cut to match requirements of supported equipment.
4. Pad Material: Oil and water resistant with elastomeric properties.
5. Surface Pattern: Ribbed or waffle pattern.
6. Infused nonwoven cotton or synthetic fibers.
7. Load-bearing metal plates adhered to pads.
8. Sandwich-Core Material: Resilient and/or elastomeric.

    a. Surface Pattern: Ribbed and/or waffle pattern.
    b. Infused nonwoven cotton or synthetic fibers.

2.3 ELASTOMERIC ISOLATION MOUNTS

A. Double-Deflection, Elastomeric Isolation Mounts:

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

    a. Ace Mountings Co., Inc.
    b. California Dynamics Corporation
    c. Isolation Technology, Inc.
    d. Kinetics Noise Control, Inc.
    e. Mason Industries, Inc.
    f. Novia; A Division of C&P
    g. Vibration Eliminator Co., Inc.
    h. Vibration Isolation
    i. Vibration Mountings & Controls, Inc.

2. Mounting Plates:

    a. Top Plate: Encapsulated steel load transfer top plates, factory drilled and threaded.
    b. Baseplate: Encapsulated steel bottom plates with holes provided for anchoring to support structure.

3. Elastomeric Material: Molded, oil-resistant rubber, neoprene, or other elastomeric material.

2.4 RESTRAINED ELASTOMERIC ISOLATION MOUNTS

A. Restrained Elastomeric Isolation Mounts.

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

    a. Ace Mountings Co., Inc.
    b. California Dynamics Corporation
    c. Isolation Technology, Inc.
    d. Kinetics Noise Control, Inc.
    e. Mason Industries, Inc.
    f. Novia; A Division of C&P
    g. Vibration Eliminator Co., Inc.
    h. Vibration Isolation
    i. Vibration Mountings & Controls, Inc.

2. Description: All-directional isolator with seismic restraints containing two (2) separate and opposing elastomeric elements that prevent central threaded element and attachment hardware from contacting the housing during normal operation.

    a. Housing: Cast-ductile iron or welded steel.
    b. Elastomeric Material: Molded, oil-resistant rubber, neoprene, or other elastomeric material.

2.5 PIPE-RISER RESILIENT SUPPORT

A. Description: All-directional, acoustical pipe anchor consisting of two (2) steel tubes separated by a minimum ½-inch-thick neoprene.

1. Vertical-Limit Stops: Steel and neoprene vertical-limit stops arranged to prevent vertical travel in both directions.

2. Maximum Load Per Support: 500 psig on isolation material providing equal isolation in all directions.

2.6 RESILIENT PIPE GUIDES

A. Description: Telescopic arrangement of two (2) steel tubes or post-and-sleeve arrangement separated by a minimum ½-inch-thick neoprene.

1. Factory-Set Height Guide with Shear Pin: Shear pin shall be removable and reinsertable to allow for selection of pipe movement. Guides shall be capable of motion to meet location requirements.

2.7 ELASTOMERIC HANGERS

A. Elastomeric Mount in a Steel Frame with Upper and Lower Steel Hanger Rods:

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

a. Ace Mountings Co., Inc.
b. California Dynamics Corporation
c. Isolation Technology, Inc.
d. Kinetics Noise Control, Inc.
e. Mason Industries, Inc.
f. Vibration Eliminator Co., Inc.
g. Vibration Mountings & Controls, Inc.

2. Frame: Steel, fabricated with a connection for an upper threaded hanger rod and an opening on the underside to allow for a maximum of 30 degrees of angular lower hanger-rod misalignment without binding or reducing isolation efficiency.
3. Dampening Element: Molded, oil-resistant rubber, neoprene, or other elastomeric material with a projecting bushing for the underside opening preventing steel to steel contact.

2.8 SNUBBERS

A. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

1. Kinetics Noise Control, Inc.
2. Mason Industries, Inc.
3. Vibration Mountings & Controls, Inc.

B. Description: Factory fabricated using welded structural-steel shapes and plates, anchor bolts, and replaceable resilient isolation washers and bushings.

1. Anchor bolts for attaching to concrete shall be seismic-rated, drill-in, and stud-wedge or female-wedge type.
2. Resilient Isolation Washers and Bushings: Oil- and water-resistant neoprene.
3. Maximum ¼-inch air gap, and minimum ¼-inch-thick resilient cushion.

2.9 RESTRAINT CHANNEL BRACINGS

A. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

1. B-line, an Eaton business
2. Hilti, Inc.
3. Mason Industries, Inc.
4. Unistrut; Part of Atkore International

B. Description: MFMA-4, shop- or field-fabricated bracing assembly made of slotted steel channels with accessories for attachment to braced component at one end and to building structure at the other end and other matching components and with corrosion-resistant coating; rated in tension, compression, and torsion forces.

2.10 SEISMIC-RESTRAINT ACCESSORIES

A. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

1. B-line, an Eaton business
2. Kinetics Noise Control, Inc.
3. Mason Industries, Inc.
4. TOLCO
5. Vibration & Seismic Technologies, LLC

B. Hanger-Rod Stiffener: Steel tube or steel slotted-support-system sleeve with internally bolted connections to hanger rod.

C. Hinged and Swivel Brace Attachments: Multifunctional steel connectors for attaching hangers to rigid channel bracings.

D. Bushings for Floor-Mounted Equipment Anchor Bolts: Neoprene bushings designed for rigid equipment mountings and matched to type and size of anchor bolts and studs.

E. Bushing Assemblies for Wall-Mounted Equipment Anchorage: Assemblies of neoprene elements and steel sleeves designed for rigid equipment mountings and matched to type and size of attachment devices used.

F. Resilient Isolation Washers and Bushings: One-piece, molded, oil- and water-resistant neoprene, with a flat washer face.

2.11 MECHANICAL ANCHOR BOLTS

A. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

1. B-line, an Eaton business
2. Hilti, Inc.
3. Kinetics Noise Control, Inc.
4. Mason Industries, Inc.

B. Mechanical Anchor Bolts: Drilled-in and stud-wedge or female-wedge type in zinc-coated steel for interior applications and stainless steel for exterior applications. Select anchor bolts with strength required for anchor and as tested according to ASTM E 488.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and equipment to receive vibration isolation and seismic-control devices for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine roughing-in of reinforcement and cast-in-place anchors to verify actual locations before installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 APPLICATIONS

A. Multiple Pipe Supports: Secure pipes to trapeze member with clamps approved for application by an agency acceptable to authorities having jurisdiction.

B. Hanger-Rod Stiffeners: Install hanger-rod stiffeners where indicated or scheduled on Drawings to receive them and where required to prevent buckling of hanger rods due to seismic forces.

C. Strength of Support and Seismic-Restraint Assemblies: Where not indicated, select sizes of components so strength is adequate to carry present and future static and seismic loads within specified loading limits.

3.3 VIBRATION CONTROL AND SEISMIC-RESTRAINT DEVICE INSTALLATION

A. Coordinate the location of embedded connection hardware with supported equipment attachment and mounting points.

B. Installation of vibration isolators must not cause any change of position of equipment, piping, or ductwork resulting in stresses or misalignment.

C. Equipment Restraints:

1. Install seismic snubbers on fire-suppression equipment mounted on vibration isolators. Locate snubbers as close as possible to vibration isolators and bolt to equipment base and supporting structure.
2. Install resilient bolt isolation washers on equipment anchor bolts where clearance between anchor and adjacent surface exceeds 0.125-inch.
3. Install seismic-restraint devices using methods approved by an agency acceptable to authorities having jurisdiction that provides required submittals for component.

D. Piping Restraints:

1. Comply with requirements in MSS SP-127.
2. Space lateral supports a maximum of 40 feet o.c., and longitudinal supports a maximum of 80 feet o.c.
3. Brace a change of direction longer than 12 feet.

E. Install seismic-restraint devices using methods approved by an agency acceptable to authorities having jurisdiction that provides required submittals for component.

F. Install bushing assemblies for anchor bolts for floor-mounted equipment, arranged to provide resilient media between anchor bolt and mounting hole in concrete base.

G. Install bushing assemblies for mounting bolts for wall-mounted equipment, arranged to provide resilient media where equipment or equipment-mounting channels are attached to wall.

H. Attachment to Structure: If specific attachment is not indicated, anchor bracing to structure at flanges of beams, at upper truss chords of bar joists, or at concrete members.

I. Drilled-in Anchors:

1. Identify position of reinforcing steel and other embedded items prior to drilling holes for anchors. Do not damage existing reinforcing or embedded items during coring or drilling. Notify the Engineer if reinforcing steel or other embedded items are encountered during drilling. Locate and avoid prestressed tendons, electrical and telecommunications conduit, and gas lines.
2. Do not drill holes in concrete or masonry until concrete, mortar, or grout has achieved full design strength.
3. Wedge Anchors: Protect threads from damage during anchor installation. Heavy-duty sleeve anchors shall be installed with sleeve fully engaged in the structural element to which anchor is to be fastened.
4. Set anchors to manufacturer's recommended torque, using a torque wrench.
5. Install zinc-coated steel anchors for interior and stainless-steel anchors for exterior applications.

3.4 ACCOMMODATION OF DIFFERENTIAL SEISMIC MOTION

A. Install flexible connections in piping where they cross seismic joints, where adjacent sections or branches are supported by different structural elements, and where the connections terminate with connection to equipment that is anchored to a different structural element from the one supporting the connections as they approach equipment. Comply with requirements in Section 211313 "Wet-Pipe Sprinkler Systems" for piping flexible connections.

3.5 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Tests and Inspections:

1. Provide evidence of recent calibration of test equipment by a testing agency acceptable to authorities having jurisdiction.
2. Schedule test with Owner, through Architect, before connecting anchorage device to restrained component (unless post-connection testing has been approved), and with at least seven (7) days' advance notice.
3. Obtain Architect's approval before transmitting test loads to structure. Provide temporary load-spreading members.
4. Test at least four (4) of each type and size of installed anchors and fasteners selected by Architect.
5. Test to ninety percent (90%) of rated proof load of device.
6. Measure isolator restraint clearance.
7. Measure isolator deflection.
8. Verify snubber minimum clearances.

C. Remove and replace malfunctioning units and retest as specified above.

D. Prepare test and inspection reports.

END OF SECTION 210548

SECTION 210553 - IDENTIFICATION FOR FIRE-SUPPRESSION PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Equipment labels.
2. Warning signs and labels.
3. Pipe labels.
4. Valve tags.
5. Warning tags.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Samples: For color, letter style, and graphic representation required for each identification material and device.

C. Equipment-Label Schedule: Include a listing of all equipment to be labeled and the proposed content for each label.

D. Valve Schedules: Valve numbering scheme.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance Data: For each piping system to include in maintenance manuals.

PART 2 - PRODUCTS

2.1 EQUIPMENT LABELS

A. Metal Labels for Equipment:

1. Material and Thickness: Brass, 0.032-inch-thick, with predrilled holes for attachment hardware.
2. Letter Color: Red.
3. Background Color: White.
4. Minimum Label Size: Length and width vary for required label content, but not less than 2½-by-¾-inch.
5. Minimum Letter Size: ¼-inch for name of units if viewing distance is less than 24 inches, ½-inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
6. Fasteners: Stainless-steel rivets or self-tapping screws.

7. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

B. Label Content: Include equipment's Drawing designation or unique equipment number, Drawing numbers where equipment is indicated (plans, details, and schedules), and the Specification Section number and title where equipment is specified.

C. Equipment-Label Schedule: For each item of equipment to be labeled, on 8½-by-11-inch bond paper. Tabulate equipment identification number and identify Drawing numbers where equipment is indicated (plans, details, and schedules) and the Specification Section number and title where equipment is specified. Equipment schedule shall be included in operation and maintenance data.

2.2 WARNING SIGNS AND LABELS

A. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8-inch-thick, with predrilled holes for attachment hardware.

B. Letter Color: Black.

C. Background Color: Yellow.

D. Maximum Temperature: Able to withstand temperatures up to 160 deg F (71 deg C).

E. Minimum Label Size: Length and width vary for required label content, but not less than 2½-by-¾-inch.

F. Minimum Letter Size: ¼-inch for name of units if viewing distance is less than 24 inches, ½-inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.

G. Fasteners: Stainless-steel rivets or self-tapping screws.

H. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

I. Label Content: Include caution and warning information, plus emergency notification instructions.

2.3 PIPE LABELS

A. General Requirements for Manufactured Pipe Labels: Preprinted, color-coded, with lettering indicating service and showing flow direction.

B. Pretensioned Pipe Labels: Precoiled, semirigid plastic formed to cover full circumference of pipe and to attach to pipe without fasteners or adhesive.

C. Self-Adhesive Pipe Labels: Printed plastic with contact-type, permanent-adhesive backing.

D. Pipe-Label Contents: Include identification of piping service using same designations or abbreviations as used on Drawings; pipe size; and an arrow indicating flow direction.

1. Flow-Direction Arrows: Integral with piping-system service lettering to accommodate both directions, or as separate unit on each pipe label to indicate flow direction.
2. Lettering Size: At least 1½ inches high.

E. Pipe-Label Colors:

1. Background Color: Red.
2. Letter Color: White.

2.4 VALVE TAGS

A. Valve Tags: Stamped or engraved with ¼-inch letters for piping-system abbreviation and ½-inch numbers.

1. Tag Material: Brass, 0.032-inch-thick, with predrilled holes for attachment hardware.
2. Fasteners: Brass wire-link chain, beaded chain or S-hook.
3. Valve-Tag Color: Red.
4. Letter Color: White.

B. Valve Schedules: For each piping system, on 8½-by-11-inch (A4) bond paper. Tabulate valve number, piping system, system abbreviation (as shown on valve tag), location of valve (room or space), normal-operating position (open, closed, or modulating), and variations for identification. Mark valves for emergency shutoff and similar special uses.

1. Valve-tag schedule shall be included in operation and maintenance data.

2.5 WARNING TAGS

A. Warning Tags: Preprinted or partially preprinted, accident-prevention tags, of plasticized card stock with matte finish suitable for writing.

1. Size: Approximately 4 by 7 inches.
2. Fasteners: Brass grommet and wire.
3. Nomenclature: Large-size primary caption such as "DANGER," "CAUTION," or "DO NOT OPERATE."
4. Color: Yellow background with black lettering.

PART 3 - EXECUTION

3.1 PREPARATION

A. Clean piping and equipment surfaces of substances that could impair bond of identification devices, including dirt, oil, grease, release agents, and incompatible primers, paints, and encapsulants.

3.2 LABEL INSTALLATION

A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.

B. Coordinate installation of identifying devices with locations of access panels and doors.

C. Install or permanently fasten labels on each major item of mechanical equipment.

D. Locate equipment labels where accessible and visible.

E. Piping Color-Coding: Painting of piping is specified in Section 099123 "Interior Painting."

F. Pipe-Label Locations: Locate pipe labels where piping is exposed or above accessible ceilings in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior exposed locations as follows:

1. Near each valve and control device.
2. Near each branch connection excluding short takeoffs. Where flow pattern is not obvious, mark each pipe at branch.
3. Near penetrations through walls, floors, ceilings, and inaccessible enclosures.
4. At access doors, manholes, and similar access points that permit view of concealed piping.
5. Near major equipment items and other points of origination and termination.
6. Spaced at maximum intervals of 50 feet along each run. Reduce intervals to 25 feet in areas of congested piping and equipment.
7. On piping above removable acoustical ceilings. Omit intermediately spaced labels.

3.3 VALVE-TAG INSTALLATION

A. Install tags on valves and control devices in piping systems. List tagged valves in a valve-tag schedule.

B. Valve-Tag Application Schedule: Tag valves according to size, shape, and with captions similar to those indicated in "Valve-Tag Size and Shape" Subparagraph below:

1. Valve-Tag Size and Shape:

a. Wet-Pipe Sprinkler System: 2 inches round.

3.4 WARNING-TAG INSTALLATION

A. Write required message on, and attach warning tags to, equipment and other items where required.

END OF SECTION 210553

SECTION 210800 – COMMISSIONING OF FIRE PROTECTION SYSTEMS

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

A. Work under this contract shall conform under requirements of Division 019100, Division 210000, General Requirements, Conditions of the Contract, and Supplementary Conditions. This specification covers commissioning of fire protection systems which are part of this project.

B. Furnish labor and material to accomplish complete fire protection systems commissioning as specified herein.

C. All trades must adhere to the applicable commissioning and testing guidelines and best practices.

1.2 SECTION INCLUDES

A. This specification section provides a general overview of the fire protection commissioning process and must be read in conjunction with the following related sections:

1. Construction Documents for affected building systems.
2. Section includes the commissioning process requirements for fire protection equipment.
3. Fire protection trade specific commissioning sections in Division 210000.
4. This project is pursuing LEED Certification. See related specifications for sustainable design requirements affecting work of this Section.

1.3 INTRODUCTION

A. Commissioning is a process, and its purpose includes the below:

1. To clearly document the design intent.
2. To verify that the systems installation and performance is in accordance with the plans, specifications, and design intent.
3. To train the owner's operators so that they fully understand the design intent and the operation and maintenance requirements of the equipment.
4. To witness & verify all systems are integrated & operating as intended by the Basis of Design (BOD).
5. Coordinate a warranty phase transition through close-out of the project.

B. Definitions

1. Commissioning: the process of ensuring that systems are designed, installed functionally tested and capable of being operated and maintained to perform in conformity with the design intent. The commissioning begins with planning and includes design, construction, start-up, acceptance, and training, and can be applied throughout the life of the building.
2. Commissioning authority: the designated person, company, or agent who implements the overall commissioning process.
3. Commissioning Plan: A document defining the commissioning process, which is developed in increasing detail as the project progresses through its various phases.
4. Commissioning report: the document that records the results of the commissioning process, including the as-built performance of the fire protection system and unresolved issues.

5. Commissioning specification: the contract document that details the objective, scope, and implementation of the construction and acceptance phases of the commissioning process as developed in the design-phase Commissioning Plan.
6. Commissioning team: those people responsible for working together in carrying out the commissioning process.
7. Design intent: a detailed explanation of the ideas, concepts, and criteria that are defined by the owner to be important. This typically is an expansion of the information provided in the Owner's Program.
8. Design intent document: a detailed written document, evolving throughout the commissioning process, clearly defining items and criteria of the design intent.
9. Functional Performance Testing (FPT): the process of determining the ability of a system to operate in accordance with the final design intent.
10. Systems Manual: a composite document that expands the scope of the operation manual and maintenance manual by including the additional information gathered by the commissioning process.
11. Verification: that full range of checks and tests carried out to determine if all components, subsystems, systems, and interfaces between systems operate in accordance with the contract documents. In this context, “operate” includes all modes and sequences of control operation, interlocks and conditional control responses, and specified responses to abnormal or emergency conditions.

C. Scope of Work during Design Development Phase

1. The CxA reviews the Owner Project Requirements (OPR) and Basis of Design (BoD) documentation.
2. The CxA conducts an initial review of the design prior to the construction documents phase.
3. The CxA conducts a focused review of the construction documents when close to completion. This review should be conducted prior to issuing the construction documents for bid and captured in the commissioning report.
4. Prepare a pre-construction phase commissioning plan.
5. Review and comment on submittals from each Contractor for compliance with the OPR, BoD, Contract Documents, and construction-phase commissioning plan. Review and comment on performance expectations of systems and equipment and interfaces between systems relating to the OPR and BoD.

D. Scope of Work during Construction Phase

1. Review required submittals and test data
2. Help finalize details of the Commissioning Plan
3. Organize/facilitate periodic commissioning team meetings
4. Review start-up and testing and balancing reports
5. Participate in O&M training
6. Review revised Owner’s Project Requirements (OPR)
7. Review revised Basis Of Design (BOD)
8. Provide revised commissioning plan
9. Integrate Cx tasks into construction schedule
10. Coordinate a construction phase commissioning kick-off meeting
11. Provide submittal review and comments
12. Review of test and balance report.
13. Perform a controls point-to-point check report review
14. Coordinate a controls integration coordination meeting (FA, FP, P, HVAC, ELEC)
15. Provide a master commissioned equipment list
16. Review start-up reports.
17. Provide pre-functional procedures & test data forms
18. Provide functional testing procedures & test data forms
19. Coordinate test procedure & review with the GC and the Engineer
20. Review contractor test reports
21. Draft commissioning meeting agenda and minutes

22. Execute fire & smoke inspections and testing
23. Maintain a commissioning issues log

E. Scope of work during Acceptance Testing Phase

1. Verify approved sequences of operations
2. Coordinate test procedure & review with the GC and the Engineer.
3. Draft commissioning meeting agenda and minutes
4. Review training agendas, materials, and schedule
5. Review contractor test reports
6. Coordinate, witness, and document functional performance tests
7. Verify that the system complies with the contract documents,
8. Perform functional performance testing,
9. Conduct O&M staff walkthrough of systems
10. Conduct Operations & Maintenance review
11. Submit final test report,
12. Assemble a systems manual
13. Identify and document deficiencies,
14. Execute an issue resolution log
15. Remedy deficiencies and retest,

F. Scope of Work during Post-Occupancy Phase

1. Establish an as-built record of the system performance,
2. Complete the as-built records,
3. Complete the Systems Manual
4. Confirm training plan has been implemented
5. Compile final systems manual
6. Compile operations and maintenance plan
7. Turn over all required close out documentation and warranties.
8. Perform seasonal testing
9. Submit final commissioning report
10. Perform 10-month review
11. Develop ongoing Cx plan

G. Systems to be Included in Commissioning Process

All fire protection systems, sub-systems, and equipment installed, interconnected, and integrated under Division 210000 shall be commissioned. This includes but is not limited to:

1. Pre-Action Systems
2. Sprinkler Systems
3. BMS Integration

1.4 QUALITY ASSURANCE

A. The Contractor will provide qualified point person throughout the commissioning process.

1. The point person will attend all commissioning team meeting and provide all required documentation requested by the CxA.
2. Contractor to provide onsite technician for functional performance test activities support, as required by the CxA.
3. Contractors will comply with tests that follow manufacturer’s calibration procedures and intervals. Recalibrate test instruments immediately after instruments have been repaired resulting from being dropped or damaged. Affix calibration tags to test instruments. Furnish calibration records to CxA upon request.

B. Related Requirements

1. Section 019100 - General Commissioning Requirements.
2. LEED Sustainable Design Requirements.
3. Contractor shall adhere to all requirements of Division 210000.
4. NFPA 3 and NFPA 4
5. NFPA 25, 2011 Edition
6. 2014 NYC Fire code.
7. NFPA, ASME, and associated testing guidelines.

C. References:

1. ASHRAE Standard 202-2018: Commissioning Process for Buildings and Systems.
2. ASHRAE Application Handbook – 2019: Chapter 44 – HVAC Commissioning (Building Commissioning).
3. ASHRAE Guideline 4-2019: Preparation of Operating and Maintenance Documentation for Building Systems.
4. ASHRAE Guideline 0-2019: The Commissioning Process.
5. ASHRAE Guideline 1.3-2018: Building Operations and Maintenance Training for the HVAC&R Commissioning Process
6. NFPA 3: Recommended Practice on Commissioning and Integrated Testing of Fire Protection and Life Safety Systems
7. NFPA 4: Standard for Integrated Fire Protection and Life Safety System Testing
8. LEED V4: Energy and Atmosphere Prerequisite Fundamental Commissioning and Verification
9. LEED V4: Energy and Atmosphere Credit Enhanced Commissioning
10. Associated testing guidelines.

1.5 RESPONSIBILITIES

A. Fire Protection Contractor

1. Include cost of commissioning requirements in the contract price.
2. Include requirements for submittal data, O&M data, and training in each purchase order or sub-contract written.
3. Updated Submittals: Keep the CxA informed of all changes to control system documentation made during programming and setup; revise and resubmit when substantial changes are made.
4. Ensure cooperation and participation of specialty sub-contractors such as piping.
5. Ensure all fire protection systems meet all construction, inspections, installation, and pre-functional testing. Submit all documents verifying completion to the CxA meets all requirements in accordance with Divisions 210000.
6. Prepare preliminary schedule for fire protection system orientations and inspections, O&M manual submissions, training sessions, pipe testing, equipment start-up, and task completion for use by the CxA. Update schedule as appropriate throughout the construction period.
7. Include all hydrostatic testing and pressure testing for fire protection systems as specified in Division 210000 and local codes.
8. Include all static tests / integrity tests specified in Division 210000 and local codes.
9. Verify proper safeties and interlocks are included in design.
10. Verify proper sizing of control valves and actuators based on design pressure drops.
11. Verify proper selection of sensor ranges.
12. CxA will develop and submit pre-functional forms for distribute. Contractor to complete forms. Startup Reports, Pre-functional Checklists, and Trend Logs: Submit for approval of CxA.
13. Ensure subcontractors perform assigned commissioning responsibilities.
14. Provide manufacturer's representatives to execute starting of equipment.
15. Ensure participation of equipment manufacturers in appropriate start-up, testing, and training activities when required by individual equipment specifications.
16. Perform and document completed startup and system operational checkout procedures, providing copy to Commissioning Authority (CxA).

17. Notify the Commissioning Authority a minimum of two weeks in advance, so that the witnessing equipment and system start-up and testing can begin.
18. Provide factory supervised startup services for equipment and systems where specified. Coordinate work with manufacturer and CxA.
19. Coordinate with equipment manufacturers to determine specific requirements to maintain validity of warranties.
20. Attend Construction Phase coordination meeting scheduled by the Commissioning Authority.
21. Assist the CxA in all verification and functional performance tests.
22. Provide personnel to assist CxA during equipment or system verification checks, and functional performance tests as needed.
23. Assist the Commissioning Authority in all verification and functional performance tests. Prepare preliminary schedule for fire protection system orientations and inspections, O&M manual submission, training session, piping/fire protection system testing, equipment start-up, and task completion for use by the Commissioning Authority (CxA). Update schedule as appropriate throughout the construction period.
24. Conduct fire protection system orientation and inspection at the equipment placement completion stage.
25. Ensure participation of major equipment manufacturers in appropriate training and testing activities.
26. Participate in, and schedule vendors and Contractors to participate in the training sessions as set up by the Commissioning Authority.
27. Attend initial training session.
28. Update drawings to the record condition to date, and review with the Commissioning Authority.
29. Gather O&M data on all equipment and assemble in binders as required by the Commissioning Specification. Submit to Commissioning Authority prior to the completion of construction. The O&Ms shall include the following:

    a. Specific step-by-step instructions on how to perform and apply all functions, features, modes, etc. mentioned in the controls training sections of this specification and other features of this system. Provide an index and clear table of contents. Include the detailed technical manual for programming and customizing control loops and algorithms.
    b. Full as-built set of control drawings.
    c. Full as-built sequence of operations for each piece of equipment.
    d. Full points list; in addition to the information on the original points list submittal, include a listing of all rooms with the following information for each room:

        1) Floor.
        2) Room number.
        3) Room name.
        4) Unit ID.
        5) Reference drawing number.
        6) Flow rates

    e. Full print out of all schedules and set points after testing and acceptance of the system.
    f. Control equipment component submittals, parts lists, etc.
    g. Warranty requirements.
    h. Copies of all checkout tests and calibrations performed by the Contractor (not commissioning tests).
    i. Organize and subdivide the manual with permanently labeled tabs for each of the following data in the given order:

        1) Sequences of operation.
        2) Control drawings.
        3) Points lists.
        4) Controller and/or module data.

5) Thermostats and timers.
6) Sensors and DP switches.
7) Valves and valve actuators.
8) Program setups (software program printouts).

30. Submit updated version of control system documentation, for inclusion with operation and maintenance data.
31. Show actual locations of all static and differential pressure sensors (water pressure) on project record drawings.
32. Submit reviewed O&M manuals available prior to scheduling of training sessions.
33. Provide written notification to the General Contractor and Commissioning Authority that the following work has been completed in accordance with the contract documents, and that the equipment, systems, and sub-system are operating as required.

    a. Fire protection equipment including pre-action systems, pumps, sensors, valves, piping, and all Division 210800 equipment.
    b. Fire stopping in the fire rated construction, caulking, gaskets, and sealing of smoke barriers.
    c. Verify building control systems are functioning to monitor fire protection equipment.

B. Automatic Controls and Building Automatic System Contractors

1. Include cost for commissioning requirements in the contract price.
2. Ensure all fire protection systems meet all requirements in accordance with Division 210000.
3. Review design for controllability with respect to selected manufacturer's equipment.
4. Verify proper hardware specification exists for functional performance required by specification and sequence of operation.
5. Clarify all questions of operation/monitoring.
6. Attend initial commissioning coordination meeting scheduled by the Commissioning Authority.
7. Provide the following submittals to the Commissioning Authority.

    a. Hardware and software submittals
    b. Control panel construction shop drawings.
    c. Narrative description of each control sequence for each piece of equipment controlled.
    d. Diagrams showing all; control points, sensor locations, point names, actuators, controls, and where necessary points of access superimposed on diagrams of the physical equipment.
    e. Logic diagrams showing the logic flow of the system.
    f. A list of all control points, including analog inputs, analog outputs, digital inputs, and digital outputs. Include the values of all parameters for each system point. Provide a separate list for each stand alone control unit.
    g. A complete control language program listing including all software routines employed in operating the control system. Also provide a program write-up, organized in the same manner as the control software. This narrative shall describe the logic flow of the software and the functions of each routine and sub-routine. It should explain individual math or logic operations that are not clear from reading the software listing.
    h. Hardware operation and maintenance manuals.
    i. Application software and project applications code manuals.

8. Verify proper installation and performance of controls/BAS hardware and software provided by others.
9. Integrate installation and programming schedule with construction and commissioning schedules.
10. Provide thorough training operating professionals on hardware operations and programming, and the application program for the system.

11. Demonstrate system performance to Commissioning Authority including all modes of system operation (e.g. normal, abnormal, emergency).
12. Provide control system technician for use during system verification and functional performance testing.
13. Provide systems modifications as required.
14. Verify BACNET connections to Landlord systems as applicable.

C. Equipment Suppliers and Miscellaneous Contractors

1. Include cost for commissioning requirements in the contract price.
2. Provide submittals, and appropriate O&M manual sections
3. Provide factory supervised startup services for equipment and systems where specified. Coordinate work with manufacturer and CxA.
4. Attend initial commissioning coordination meeting scheduled by the Commissioning authority.
5. Participate in training sessions as scheduled by the Commissioning Authority
6. Demonstrate performance of equipment as applicable

1.6 DOCUMENTATION

A. The Commissioning Authority shall oversee and maintain the development of commissioning documentation. The commissioning documentation shall be kept in three ring binders, and organized by system and sub-system when practical. All pages shall be numbered, and a table of contents page(s) shall be provided. The commissioning documentation shall include, but not be limited to, the following:

1. A detailed description of the design intent for the project, listing operating parameters, control sequences, occupancy conditions etc.
2. A complete description of how the fire protection system is intended to operate.
3. All accepted shop drawings of fire protection equipment. Shop drawings shall be full size sheets folded as required to fit in binders.
4. Final Commissioning Plan
5. All pre-functional performance test checklists, signed by indicating personnel, organized by system and sub-system.
6. All verification and functional performance test checklists/results, signed by indicated personnel, organized by system and sub-system.
7. Start-Up reports, test & inspection reports and certificates.
8. Gasket, flange, welding, fittings inspection and testing checklist, signed by indicating personnel.
9. Issues Log with corrective action verification.
10. Trend data & off-season functional performance testing.
11. Final Commissioning Report
12. Three copies of the operation and maintenance (O&M) manuals specified in other sections of these specifications shall be included with the commissioning documentation. The manuals shall be incorporated in the commissioning documentation prior to commencement of O&M training required in this and other sections of the specification. Preparation of O&M manuals shall be as specified in these specifications.

PART 2 - PRODUCTS

2.1 TEST EQUIPMENT

A. The appropriate Contractor(s) shall furnish all special tools and equipment required during the commissioning process. A list of all tools and equipment to be used during commissioning shall be submitted to the Commissioning Authority for approval. The owner shall furnish necessary utilities for the commissioning process.

B. All testing equipment used on jobsite will require a valid and non-expired calibration certificate.

C. Provide all standard testing equipment required to perform startup and initial checkout and required functional performance testing; unless otherwise noted such testing equipment will NOT become the property of Owner.

D. Equipment-Specific Tools: Where special testing equipment, tools and instruments are specific to a piece of equipment, are only available from the vendor, and are required to accomplish startup or Functional Testing, provide such equipment, tools, and instruments as part of the work at no extra cost to Owner; such equipment, tools, and instruments are to become the property of Owner.

2.2 TEST EQUIPMENT, PROPRIETARY

A. Proprietary test equipment and software required by any equipment manufacturer for programming and/or start-up, whether specified or not, shall be provided by the manufacturer of the equipment. Manufacturer shall provide the test equipment, demonstrate it's use, and assist in the commissioning process as needed. Proprietary test equipment (and software) shall become the property of the owner upon completion of the commissioning process.

PART 3 - EXECUTION

3.1 GENERAL

A. A pre-construction meeting of all commissioning team members shall be held at a time and place designated by the owner. The purpose shall be to familiarize all parties with the commissioning process, and to ensure that the responsibilities of each party are clearly understood.

B. The Contractor shall complete all phases of work so the systems can be started, tested, balanced, and acceptance procedures undertaken. This includes the complete installation of all equipment, materials, pipe, duct, wire, insulation, controls, etc. per the contract documents and related directives, clarifications, and change orders.

C. A Commissioning Plan shall be developed by the Commissioning Authority. The Contractor shall assist the Commissioning Authority in preparing the Commissioning Plan by providing all necessary information pertaining to the actual equipment and installation. If contractor initiated system changes have been made that alter the commissioning process, the commissioning Authority shall notify the Contracting Officer.

D. Acceptance procedures are normally intended to begin prior to completion of a system and/or sub-systems, and shall be coordinated with the Division 210000 contractor. Start of acceptance procedures before system completion does not relieve the contractor from completing those systems as per the schedule.

3.2 PREPARATION

A. The Construction Manager and subcontractors are to cooperate with the CxA in development of the Pre-Functional Checklists and Functional Test Procedures.

B. The Construction Manager and subcontractors are to furnish additional information requested by the CxA.

C. The Construction Manager and subcontractors are to prepare a preliminary schedule for fire protection pipe testing and equipment start-up for use by the CxA; update the schedule as appropriate.

D. Notify the CxA forty-eight (48) hours in advance when pipe testing and startup of each piece of equipment will occur; when commissioning activities not yet performed or not yet scheduled will

delay construction notify ahead of time and be proactive in seeing that the CxA has the scheduling information needed to efficiently execute the commissioning process.

E. Put all fire protection equipment and systems into operation and continue operation during each working day of testing, adjusting, and balancing and commissioning, as required.

F. Provide temperature and pressure taps in accordance with Contract Documents.

3.3 PARTICIPATION IN ACCEPTANCE PROCEDURES

A. The Contractor shall provide skilled technicians to start-up and debug all systems within Division 210000. These same technicians shall be made available to assist the Commissioning Authority in completing the commissioning program. Work schedules, time required for testing, etc. shall be requested by the Commissioning Authority and coordinated by the contractor. Contractor shall ensure that the qualified technician(s) are available and present during the agreed upon schedules and of sufficient duration to complete the necessary tests, adjustments, and/or problem resolutions.

B. System performance problems and discrepancies may require additional technician time, Commissioning Authority time, reconstruction of systems, and/or replacement of system components. The additional technician time shall be made available for subsequent commissioning periods until the required system performance is obtained.

C. The Commissioning Authority reserves the right to question the appropriateness and qualifications of the technicians relative to each item of equipment, system, and/or sub-system. Qualifications of technicians shall include expert knowledge relative to the specific equipment involved and a willingness to work with the Commissioning Authority. Contractor shall provide adequate documentation and tools to start-up and test the equipment, system, and/or sub-system.

3.4 DEFICIENCY RESOLUTION

A. In some systems, improper adjustments, misapplied equipment, and/or deficient performance under varying loads will result in additional work being required to commission the systems. This work shall be completed under the direction of the Contracting Officer, with input from the contractor, equipment supplier, and Commissioning Authority. Whereas all members shall have input and the opportunity to discuss, debate, and work out problems, the Contracting Officer shall have final jurisdiction over any additional work done to achieve performance.

B. Corrective work shall be completed in a timely fashion to permit the completion of the commissioning process. Experimentation to demonstrate system performance may be permitted. If the Commissioning Authority deems the experimentation work to be ineffective or untimely as it relates to the commissioning process, the Commissioning Authority shall notify the Contracting Officer, indicating the nature of the problem, expected steps to be taken, and suggested deadline(s) for completion of activities. If the deadline(s) pass without resolution of the problem, the Contracting Officer reserves the right to obtain supplementary services and/or equipment to resolve the problem. Costs incurred to solve the problems in an expeditious manner shall be the contractor's responsibility.

3.5 ADDITIONAL COMMISSIONING

A. Additional commissioning activities may be required after system adjustments, replacements, etc., are completed. The contractor (s) supplier and Commissioning Authority shall include a reasonable reserve to complete this work as part of their contractual obligations.

3.6 ACCEPTANCE PROCEDURES

A. Verification Tests

1. Scope of verification tests

    a. Operating tests and checks to verify that all components, equipment, systems, sub-systems, and interfaces between systems, operate in accordance with contract documents. These tests are to include all operating modes, interlocks, specified control responses, specific responses to abnormal or emergency conditions and verifications of the proper response of the building automation system controllers and sensors.
    b. All functional testing will ensure that the fire protection systems meet the following requirements of Division 210000.
    c. Verify fire protection systems has been installed, calibrated, started, and operating according to contract documents.
    d. Verify fire protection system instrumentation and controls systems have been completed and calibrated according to contract documents.

2. Participants in verification tests

    a. The Commissioning Authority shall be responsible for preparing the scope of these tests. The Commissioning Authority shall schedule the tests and assemble the commissioning team members who shall be responsible for the tests. Participating contractors, manufacturers, suppliers, etc. shall include all costs to do the work involved in these tests in their proposals.
    b. Fire protection contractor – provide the services of a technician(s) who is (are) familiar with the construction and operation of this system. Provide access to the contract plans, shop drawings, and equipment cut sheets of all installed equipment.
    c. Controls contractor – provide the services of a controls engineer who is familiar with the details of the project. Provide details of the control system, schematics, and a narrative description of control sequences of operation.
    d. Fire alarm contractor – provide the services of a technician(s) who is (are) familiar with the construction and operation of this system. Provide access to the contract plans, shop drawings, and equipment cut sheets of all installed equipment.
    e. Mechanical contractor – provide the services of a technician(s) who is (are) familiar with the construction and operation of this system. Provide access to the contract plans, shop drawings, and equipment cut sheets of all installed equipment.

3. Documentation and Reporting Requirements

    a. Provide checklists for each component, piece of equipment, system, and sub-system, including all interfaces, interlocks, etc. Each item to be tested shall have a different entry line with space provided for comments. Separate checklists shall be prepared for each mode of operation. Provide space to indicate whether the mode under test responded as required or not. Also, provide space for all necessary parties to sign off on each checklist.
    b. Data sheets used in verification of the proper operation of the control system shall include each controller to be verified, and its location. For each controller, provide space for recording the readout of the controller, the reading at the controller's sensor(s), and any comments. Also, provide space for all necessary parties to sign off on each checklist.
    c. All test procedures and data sheets shall be submitted to the design professional for review and acceptance.

4. Instrumentation

    a. The Commissioning Authority shall furnish all measurement instrumentation for the verification tests. All instruments will have calibrated within the one year period prior to these tests.

5. Verification Procedures

a. The Commissioning Authority shall direct and witness the verification operating tests and checks for all equipment and systems.

1) Set the system equipment (i.e., pre-action panel, piping, fire alarm connections, etc.) into the operating mode to be tested, i.e. bypass, normal auto position, normal manual position, emergency power, and alarm conditions.
2) The Commissioning Authority shall inspect and verify the position of each device and interlock identified on the checklist. Each item shall be signed off as acceptable (yes), or failed (no).
3) This test shall be repeated for each operating cycle that applies to the fire protection system being tested.
4) Operating checks shall include all safety cutouts, alarms and interlocks with smoke control and life safety systems during all modes of operation of the fire protection system.
5) If during a test an operating deficiency is observed, appropriate comments shall be added to the checklist data sheet & an issues log with corrective action verified and tracked until final commissioning report is submitted.
6) Review hydrostatic test reports.
7) Verify welding certificates have been submitted & reviewed.
8) Verification of the proper responses of monitoring and control system controllers and sensors as follows:

a) For each controller or sensor, record the indicated monitoring and control system reading, and the test instrument reading.
b) If the initial test indicates that the test reading is outside of the control range of the installed device, the calibration of the installed device shall be checked and adjusted as required. The deficient device shall be re-tested and the results recorded on the checklist data sheet.

b. The Commissioning Authority shall direct and witness the field verification of the final TAB report.

1) The Commissioning Authority shall select, at random, 10 percent of the report data for verifications.
2) The TAB contractor shall be given sufficient advance notice of the date of field verification. However, they shall not be informed in advance of the data points to be verified. The TAB contractor must use the same instruments (by model and serial number) that were used when the original data were collected.

c. If the deficiencies are identified during verification, the General Contractor must be notified, and action taken to remedy the deficiency. The final tabulated checklist data sheets shall be reviewed by the Design Professional and the Commissioning Authority, to determine if verification is complete, and the operating system is functioning in accordance with the contract documents.

B. Functional Performance Testing

1. Scope of Functional Performance Testing

a. Functional performance tests shall determine if the fire protection system is providing the required service in accordance with the final design intent. Following is a list of test examples:

1) Determine capability of fire protection system to hold rated pressure.
2) Verify alarms and sequences associated with the pre-action systems.
3) Verify pre-action system interconnections with HVAC, fire alarm, and electrical systems.

b. See attached Functional Performance Test samples in the Commissioning Plan.

2. Submittals

a. Detailed procedures for each series of tests shall be submitted to the Commissioning Authority for review and acceptance. The procedures shall include samples of the data sheets that will be part of the reports.

3. Participants in Functional Performance Tests

a. Participants in the functional performance tests shall be the same as those listed in the verification tests

4. Instrumentation

a. In addition to the instrumentation requirements detailed under verification, the commissioning authority may need to provide data acquisition equipment to record data for the complete range of testing

5. Functional Performance Test Procedures

a. The Commissioning Authority shall supervise and direct all functional performance tests.
b. For each test, the Commissioning Authority shall install the measuring instruments and logging devices to record test data for the required test period. The instrumentation shall monitor and record all operating conditions to allow for complete evaluation of the test results.
c. Measurement will be required to allow for calculation of total capacity of the system for each mode of operation under test.

6. Documentation and Reporting Requirements

a. All measured data, data sheets, and a comprehensive summary, describing the operation of the fire protection system at the time of testing shall be submitted to the commissioning authority.
b. A preliminary functional performance test report shall be prepared by the Commissioning Authority and submitted to the Design Professional or review. Any identified deficiencies need to be evaluated by the Design Professional and Construction Manager to determine if they are part of the contractor's contractual obligations. Construction deficiencies shall be corrected by the responsible contractor(s) and the specific functional performance test repeated.
c. If it is determined that the fire protection system is constructed in accordance with the contract documents, and the performance deficiencies are not part of the contract documents, the Contracting Officer must decide whether any required modifications needed to bring the performance of the fire protection system up to the finalized design intent shall be implemented, or if the test shall be accepted as submitted. If corrective work is performed, the Contracting Officer shall determine if a portion or all required functional performance tests should be repeated, and a revised report submitted.

3.7 OPERATING AND MAINTENANCE MANUAL

A. Refer to project specifications for complete O&M manual requirements.

1. System Descriptions:

a. Each major system shall be described, typewritten, in general terms, including major components, interconnections, theory of operation, theory of controls, unusual features and major safety precautions. This information should correlate

with information provided in the manufacturer's instruction book. This section shall include, but not limited to, the following data:

1) Detailed description of each system and each of its components showing piping, valves, controls, and other components, with diagrams and illustrations where applicable.
2) Wiring and control diagrams with data to explain detailed operation and control of each component.
3) Control sequences describing start-up, all modes of operation, shut down, & emergency shutdown.
4) Corrected shop drawings.
5) Approved products data including all performance curves and rating data.
6) Copies of approved certifications (welding, hydrostatic testing…etc.) and laboratory test reports (where applicable).
7) Copies of warranties.

b. System diagrams or drawings shall be incorporated in the appropriate systems descriptions including systems boundaries for testing for the CxA will be highlighted. These diagrams or drawings should be reduced in size or folded to usefully fit into the manual.

2. Operating Instructions:

a. Condensed, typewritten, suitable for posting, instructions shall be provided for each major piece of equipment. Where more than one (1) common unit is installed, one instruction is adequate. The instructions shall provide procedures for:

1) Starting up the equipment/system.
2) Shutting down the equipment/system.
3) Operating the equipment in emergency or unusual conditions.
4) Safety precautions.
5) Trouble shooting suggestions.
6) Status indicators
7) Other pertinent data applicable to the operation of particular systems or equipment.

b. The instructions shall be suitable for posting adjacent to the equipment concerned.

c. The Contractor shall provide instructions for all installed systems.

3. Ongoing and preventative Maintenance

a. Condensed, typewritten procedures for recommended ongoing and preventive maintenance actions shall be provided for each category of equipment/system.

This information shall include, but not be limited to the following:

1) Maintenance and overhaul instructions.
2) Lubricating schedule including type, grade, temperature, and frequency range.
3) Part list, including source of supply and recommended spare parts.
4) Name, address, and 24 hour telephone number of each subcontractor who installed equipment and systems, and local representative for each type of system.
5) Other pertinent data applicable to the maintenance of particular systems or equipment.

b. These recommended preventative maintenance actions shall be categorized by the following recommended frequencies:

1) Weekly
2) Monthly
3) Quarterly
4) Semi-Annual
5) Annual
6) Other

3.8 OPERATING AND MAINTENANCE TRAINING

A. The Fire protection Contractor, and appropriate sub-contractors, shall provide comprehensive operating and maintenance instruction on building systems prior to delivery. The instruction shall include classroom instruction deliver by competent instructors based upon the contents of the operating manual. Emphasis shall be placed upon overall systems diagrams and descriptions, and why systems were designed as they were. The overall system instructions shall preferably be delivered by the consulting engineers. The classroom instructions shall also include detailed equipment instruction by qualified manufacturer representatives for all equipment for which operating instructions are provided. The manufacturer representative training shall emphasize operating instructions, and preventive maintenance as described in the operating manual. Provide training agenda to CxA one week prior to the training session. At a minimum, the training sessions shall cover the following items:

1. Types of installed systems IS THIS APPLICABLE TO FIRE PROTECTION?
2. Theory of operation

    a. Design intent
    b. Occupied vs. unoccupied or partial occupancy
    c. Seasonal modes of operation
    d. Emergency conditions and procedures
    e. Energy efficiency
    f. Other issues important to facility operation.

3. System operations.
4. Use of control system.

    a. Sequence of operation
    b. Problem indicators
    c. Diagnostics
    d. Corrective actions

5. Service, maintenance, diagnostics and repair.
6. Use of reports and logs.
7. Troubleshooting, investigation of malfunctions, and determining reasons for the problems.

B. Each classroom training period shall be followed by an inspection, explanation and demonstration of the system concerned by the instructors.

C. The contractor shall be responsible for organizing, arranging, and delivering a schedule of system training agreeable with the facility manager.

D. The contractor shall provide two (2) training sessions if required to accommodate operating shifts.

E. The contractor shall provide, at or before substantial completion, a proposed agenda for each system and schedule of the above training for approval by the Commissioning Authority (CxA).

END OF SECTION 210800

SECTION 211100 - FACILITY FIRE-SUPPRESSION WATER-SERVICE PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes fire-suppression water-service piping and related components outside, 5 feet and less from the building, and service entrance piping through floor into the building, including main shutoff valve and backflow preventer assembly within Sprinkler Room. Refer to Civil drawings for Fire Service piping more than 5 feet outside the building.

B. Section includes fire department inlet connection piping outside, 5 feet and less from the building. Refer to Civil drawings for fire department piping and free-standing fire department connection more than 5 feet outside the building. Sprinkler Contractor shall furnish free-standing Fire Department Connection and all accessories to Site Contractor for installation.

C. Comply with all requirements specified herein for fire suppression water service piping.

D. Related Sections:

1. Section 211313 "Wet-Pipe Sprinkler Systems" for wet-pipe fire-suppression sprinkler systems inside the building.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Field quality-control reports.

1.4 QUALITY ASSURANCE

A. Regulatory Requirements:

1. Comply with requirements of utility company supplying water. Include tapping of water mains and backflow prevention.
2. Comply with standards of authorities having jurisdiction for fire-suppression water-service piping, including materials, hose threads, installation, and testing.

B. Piping materials shall bear label, stamp, or other markings of specified testing agency.

C. Comply with the "Approval Guide," published by FM Global, or UL's "Fire Protection Equipment Directory" for fire-service-main products.

D. NFPA Compliance: Comply with NFPA 24 for materials, installations, tests, flushing, and valve and hydrant supervision for fire-suppression water-service piping.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Preparation for Transport: Prepare valves according to the following:

1. Ensure that valves are dry and internally protected against rust and corrosion.
2. Protect valves against damage to threaded ends and flange faces.
3. Set valves in best position for handling. Set valves closed to prevent rattling.

B. During Storage: Use precautions for valves according to the following:

1. Do not remove end protectors unless necessary for inspection; then reinstall for storage.
2. Protect from weather. Store indoors and maintain temperature higher than ambient dew point temperature. Support off the ground or pavement in watertight enclosures when outdoor storage is necessary.

C. Handling: Use sling to handle valves if size requires handling by crane or lift. Rig valves to avoid damage to exposed parts. Do not use handwheels or stems as lifting or rigging points.

D. Deliver piping with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe-end damage and to prevent entrance of dirt, debris, and moisture.

E. Protect stored piping from moisture and dirt. Elevate above grade. Do not exceed structural capacity of floor when storing inside.

F. Protect flanges, fittings, and specialties from moisture and dirt.

1.6 COORDINATION

A. Coordinate connection to site fire service piping with Site Contractor and water utility.

B. Coordinate connection to site fire department connection piping with Site Contractor.

PART 2 - PRODUCTS

2.1 DUCTILE-IRON PIPE AND FITTINGS

A. Mechanical-Joint, Ductile-Iron Pipe: AWWA C151, cement-lined, with mechanical-joint bell and plain spigot end.

B. Push-on-Joint, Ductile-Iron Pipe: AWWA C151, cement-lined, with push-on-joint bell and plain spigot end.

C. Mechanical-Joint, Ductile-Iron Fittings: AWWA C110, ductile- or gray-iron standard pattern or AWWA C153, ductile-iron compact pattern.

1. Glands, Gaskets, and Bolts: AWWA C111, ductile- or gray-iron glands, rubber gaskets, and steel bolts.

D. Push-on-Joint, Ductile-Iron Fittings: AWWA C153, ductile-iron compact pattern.

1. Gaskets: AWWA C111, rubber.

E. Flanges: ASME B16.1, Class 125, cast iron.

2.2 SPECIAL PIPE FITTINGS

A. Ductile-Iron Deflection Fittings:

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

a. EBAA Iron, Inc.

2. Description: Compound, ductile-iron coupling fitting with sleeve and one (1) or two (2) flexing sections for up to 15-degree deflection, gaskets, and restrained-joint ends complying with AWWA C110 or AWWA C153. Include AWWA C111, ductile-iron glands, rubber gaskets, and steel bolts.
3. Pressure Rating: 250 psig minimum.

2.3 PIPING SPECIALTIES

A. Transition Fittings: Manufactured fitting or coupling same size as, with pressure rating at least equal to and ends compatible with, piping to be joined.

2.4 VALVES

A. UL-Listed or FM-Approved Gate Valves (Main Service Shutoff):

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

a. Clow Valve Company; a division of McWane, Inc.
b. Crane Co.; Crane Valve Group; Stockham Division
c. Hammond Valve
d. Milwaukee Valve Company
e. Mueller Co.; Water Products Division

2. 175-psig, UL-Listed or FM-Approved, Iron, OS&Y, Gate Valves:

a. Description: Iron body and bonnet and bronze seating material.
b. Standards: UL 262 and "Approval Guide," published by FM Global, listing.
c. Pressure Rating: 175 psig minimum.
d. End Connections: Flanged or grooved.
e. Provide tamper switch.

2.5 BACKFLOW PREVENTER

A. Double Check, Detector-Assembly Backflow Preventer:

1. Basis-of-Design Product: Subject to compliance with requirements (including, but not limited to, short lay-length and pressure drop requirements), provide Watts LF709 DCDA, or comparable product by one (1) of the following (do not submit Ames Silver Bullet type):

a. Ames Fire & Waterworks; a division of Watts Water Technologies, Inc.
b. Conbraco Industries, Inc.; Apollo Valves
c. FEBCO; SPX Valves & Controls
d. Zurn Plumbing Products Group; Wilkins Water Control Products Division

2. Standards: ASSE 1047 and UL's "Fire Protection Equipment Directory" listing or "Approval Guide," published by FM Global, listing.
3. Operation: Continuous-pressure applications.
4. Pressure Loss: 7 psig maximum, through middle one-third of flow range.
5. Size: 6 inches.
6. Estimated Design Flow Rate: 500 GPM (Ordinary Hazard-Group 2 minimum design flow rate: 0.15 GPM/SF x 1500 SF, + 200 GPM inside hose (stage standpipe) allowance).
7. Pressure Loss at Estimated Design Flow Rate: 7 psig.
8. Body Material: Stainless steel.
9. End Connections: Flanged at assembly inlet and outlet.
10. Configuration: Designed for horizontal, straight through flow.
11. Accessories:

    a. Valves: UL 262, "Approval Guide," published by FM Global, listing, approved; OS&Y gate type with flanged ends on assembly inlet and outlet. Provide tamper switch on each OS&Y gate valve.
    b. Bypass: With displacement-type water meter, shutoff valves, and double check backflow preventer.

2.6 ALARM DEVICES

A. General: UL 753 and "Approval Guide," published by FM Global, listing, of types and sizes to mate and match piping and equipment.

B. Supervisory Switches: Single pole, double throw; designed to signal valve in other than fully open position.

PART 3 - EXECUTION

3.1 EARTHWORK

A. Comply with excavating, trenching, and backfilling requirements in Section 312000 "Earth Moving."

3.2 PIPING INSTALLATION

A. Coordinate connection to Site Fire Service Piping and Site Fire Department Inlet Connection Piping with Site Contractor, water utility and Construction Supervisor.

B. Connect to new 6 inch fire service piping 5 feet outside the building, and extend through floor slab into Second Floor-Part C Sprinkler Room, providing main service shutoff valve and backflow preventer assembly with leak detection.

C. Connect to new 4 inch fire department inlet piping 5 feet outside the building, and extend through floor slab into Second Floor-Part C Sprinkler Room.

D. Comply with NFPA 24 for fire-service-main piping materials and installation.

E. Install ductile-iron, water-service piping according to AWWA C600 and AWWA M41.

1. Install encasement for piping according to ASTM A 674 or AWWA C105.
2. Bury piping with depth of cover over top at least 60 inches.

F. Install piping by tunneling or jacking, or combination of both, under streets and other obstructions that cannot be disturbed.

G. Install underground piping with restrained joints at horizontal and vertical changes in direction. Use restrained-joint piping, thrust blocks, anchors, tie-rods and clamps, and other supports.

H. Comply with requirements in Section 211313 “Wet-Pipe Sprinkler Systems” for fire-suppression-water piping inside the building, downstream of the backflow preventer.

I. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 210517 "Sleeves and Seals for Fire Suppression Piping".

J. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Section 210517 "Sleeves and Seals for Fire Suppression Piping".

3.3 JOINT CONSTRUCTION

A. Install couplings, flanges, flanged fittings, unions, nipples, and transition and special fittings that have finish and pressure rating same as or higher than systems pressure rating for aboveground applications unless otherwise indicated.

B. Remove scale, slag, dirt, and debris from outside and inside of pipes and fittings before assembly.

C. Ductile-Iron Piping, Gasketed Joints for Fire-Service-Main Piping: UL 194.

D. Ductile-Iron Piping, Grooved Joints: Cut-groove pipe. Assemble joints with grooved-end, ductile-iron-piping couplings, gaskets, lubricant, and bolts.

E. Flanged Joints: Select appropriate gasket material in size, type, and thickness suitable for water service. Join flanges with bolts according to ASME B31.9.

F. Do not use flanges or unions for underground piping.

3.4 ANCHORAGE INSTALLATION

A. Anchorage, General: Install water-distribution piping with restrained joints. Anchorages and restrained-joint types that may be used include the following:

1. Concrete thrust blocks.
2. Locking mechanical joints.
3. Set-screw mechanical retainer glands.
4. Bolted flanged joints.
5. Heat-fused joints.
6. Pipe clamps and tie rods.

B. Install anchorages for tees, plugs and caps, bends, crosses, valves, and hydrant branches in fire-suppression water-service piping according to NFPA 24 and the following:

1. Gasketed-Joint, Ductile-Iron, Water-Service Piping: According to AWWA C600.

C. Apply full coat of asphalt or other acceptable corrosion-resistant material to surfaces of installed ferrous anchorage devices.

3.5 VALVE INSTALLATION

A. UL-Listed or FM-Approved Gate Valves: Comply with NFPA 24.

3.6 BACKFLOW PREVENTER INSTALLATION

A. Install backflow preventers of type, size, and capacity indicated. Include valves, test cocks and detector assembly. Install according to requirements of water utility, local plumbing and health departments and all other authorities having jurisdiction.

B. Do not install bypass piping around backflow preventers.

C. Support NPS 2-1/2 (DN 65) and larger backflow preventers and piping on concrete piers. Comply with requirements for concrete piers in Section 032000 "Concrete Work".

3.7 ALARM DEVICE INSTALLATION

A. General: Comply with NFPA 24 for devices and methods of valve supervision.

B. Supervisory Switches: Supervise valves in open position.

1. Valves: Grind away portion of exposed valve stem. Bolt switch, with plunger in stem depression, to OS&Y gate-valve yoke.

C. Connect alarm devices to building's fire-alarm system. Wiring and fire-alarm devices are specified in Division 28 Sections.

3.8 CONNECTIONS

A. Connect fire-suppression water-service piping to site fire service main, coordinating required fittings with Site Contractor.

B. Connect fire-suppression water-service piping to interior fire-suppression piping, at discharge of backflow preventer.

C. Connect underground/under slab fire department inlet connection piping to site fire department inlet connection piping, coordinating required fittings with Site Contractor.

D. Connect underground/under slab fire department inlet connection piping to above-slab interior fire department inlet connection piping, at floor flange in First Floor Sprinkler Room.

3.9 FIELD QUALITY CONTROL

A. Use test procedure prescribed by authorities having jurisdiction or, if method is not prescribed by authorities having jurisdiction, use procedure described below.

B. Piping Tests: Conduct piping tests before joints are covered and after concrete thrust blocks have hardened sufficiently. Fill pipeline twenty-four (24) hours before testing and apply test pressure to stabilize system. Use only potable water.

C. Hydrostatic Tests: Test at not less than one-and-one-half (1.5) times the working pressure for two (2) hours.

1. Increase pressure in 50-psig increments and inspect each joint between increments. Hold at test pressure for one hour; decrease to 0 psig. Slowly increase again to test

pressure and hold for one (1) more hour. Maximum allowable leakage is 2 quarts per hour per 100 joints. Remake leaking joints with new materials and repeat test until leakage is within allowed limits.

D. Prepare test and inspection reports.

3.10 CLEANING

A. Clean fire-suppression water-service piping and fire department inlet connection piping as follows:

1. Purge new piping systems and parts of existing systems that have been altered, extended, or repaired before use.
2. Use purging and disinfecting procedure prescribed by authorities having jurisdiction or, if method is not prescribed by authorities having jurisdiction, use procedure described in NFPA 24 for flushing of piping. Flush piping system with clean, potable water until dirty water does not appear at points of outlet.

B. Prepare reports of purging activities.

3.11 PIPING SCHEDULE

A. Underground and under slab fire-suppression water-service and fire department inlet connection piping shall be one of the following:

1. Mechanical-joint, cement-lined ductile-iron pipe; mechanical-joint, ductile- or gray-iron, standard-pattern fittings; glands, gaskets, and bolts; and gasketed joints.
2. Push-on-joint, cement-lined ductile-iron pipe; push-on-joint, ductile-iron compact-pattern fittings; and gasketed joints.

B. Aboveground fire-suppression water-service piping shall be grooved-end, ductile-iron pipe; grooved-end, ductile-iron pipe appurtenances; and grooved joints.

C. Above-slab fire department inlet connection piping: refer to Section 211313 “Wet-Pipe Sprinkler Systems”.

3.12 VALVE SCHEDULE

A. Standard-pressure, aboveground fire-suppression water-service shutoff valves NPS 3 (DN 80) and larger shall be the following:

1. 175-psig, UL-listed and FM-approved, iron, OS&Y gate valves.

END OF SECTION 211100

SECTION 211119 - FIRE-DEPARTMENT CONNECTIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Free-standing fire-department connections.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each fire-department connection.

PART 2 - PRODUCTS

2.1 FREE-STANDING FIRE-DEPARTMENT CONNECTION

A. Free-standing Fire Department Connection:

1. Manufacturers: Subject to compliance with requirements (including but not limited to required UL listing), provide products by one (1) of the following:

a. Lansdale International
b. Kochek Co.Inc.
c. Fire-End & Croker Corporation
d. Guardian Fire Equipment, Inc.
e. Potter-Roemer Fire Protection Equipment

2. Standard: UL 405.
3. Type: Free-standing, located on site where indicated on Civil and or Fire Protection plans.
4. Rated pressure: 175 psig (minimum).
5. Body Material: forged aluminum or forged steel.
6. Body Style: 30 degree angle down.
7. Inlet: Storz type coupling, 5-inch Storz x 4-inch NPT, with lever lock.
8. Number of Inlets: One (1).
9. Caps: Powder-coated forged aluminum or powder-coated forged steel with chain.
10. Powder-coat finish color shall be selected by Architect and Owner from manufacturer’s entire range.
11. Outlet: With pipe threads.
12. Outlet Size: NPS 4.
13. Outlet Location: Back.

a. Mount above finished grade with inlet at exact height selected by North Haven Fire Department.

b. Provide fire department connection piping below grade (minimum cover 5’-0”) from sprinkler room to fire department connection.

c. Provide automatic (ball-drip) drip and gravel drainage bed at base of riser, for complete water drainage from riser to below frost level.

14. Escutcheon Identification Plate: Round, brass, base-of-riser or back-of-inlet type.

a. Escutcheon Identification Plate Marking: Similar to “AUTO SPKR/STANDPIPE”.

15. Connection Finish: Powder-coated; finish color shall be selected by Architect.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of fire-department connections.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install free-standing fire-department connections and accessories.

B. Install automatic (ball-drip) drain valve at base of fire department connection riser, and at each check valve for fire-department connection.

END OF SECTION 211119

SECTION 211200 - FIRE-SUPPRESSION STANDPIPES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Pipes, fittings, and specialties.
2. Fire Hose Valves (FHV).
3. Fire Valve Cabinets (FVC)
4. Riser Control Valves
5. Alarm devices.
6. Pressure gauges.

B. Related Requirements:
1. Section 210523 "General-Duty Valves for Water-Based Fire-Suppression Piping."
2. Section 211119 "Fire Department Connections" for exposed-, flush-, and yard-type fire-department connections.
3. Section 211313 "Wet-Pipe Sprinkler Systems" for wet-pipe sprinkler piping.
4. Section 284621.11 "Addressable Fire-Alarm Systems" for connections to alarm devices.

1.3 DEFINITIONS

A. Standard-Pressure Standpipe Piping: Fire-suppression standpipe piping designed to operate at maximum working pressure of 175 psig

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

B. Shop Drawings: For fire-suppression standpipes.

1. Include plans, elevations, sections, and attachment details.
2. Include diagrams for power, signal, and control wiring.

C. Delegated-Design Submittal: For standpipe systems indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.5 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Floor plans, sections, and other details, drawn to scale, or BIM model, showing the items described in this Section and coordinated with all building trades.

B. Qualification Data: For Installer and professional engineer.

C. Approved Standpipe Drawings: Working plans, prepared in accordance with NFPA 14, that have been approved by authorities having jurisdiction, including hydraulic calculations if applicable.

D. Welding certificates.

E. Fire-hydrant flow test report.

F. Field Test Reports and Certificates: Indicate and interpret test results for compliance with performance requirements and as described in NFPA 14. Include "Contractor's Material and Test Certificate for Aboveground Piping" and "Contractor's Material and Test Certificate for Underground Piping."

G. Field quality-control reports.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For fire-suppression standpipes specialties to include in emergency, operation, and maintenance manuals.

1.7 QUALITY ASSURANCE

A. Installer Qualifications:

1. Installer's responsibilities include designing, fabricating, and installing fire-suppression standpipes and providing professional engineering services needed to assume engineering responsibility. Base calculations on results of fire-hydrant flow test performed within one calendar year of project start. Arranging for the flow test by the water utility (Aquarian Water) is the Contractor’s responsibility and paying for the flow test shall be included in the Contractor’s bid.

a. Engineering Responsibility: Preparation of working plans, calculations, and field test reports by a qualified professional engineer.

B. Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTIONS

A. Automatic Wet-Type, Class III Standpipe System: Includes NPS 2-1/2 fire hose valves with NPS 1-1/2 reducer fitting, has open water-supply valve with pressure maintained, and is capable of supplying water demand.

2.2 PERFORMANCE REQUIREMENTS

A. Fire-Rated Fire-Protection Cabinets: Listed and labeled to comply with requirements in ASTM E814 for fire-resistance rating of walls where they are installed.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. NFPA Standards: Fire-suppression standpipe equipment, specialties, accessories, installation, and testing shall comply with NFPA 14. Provide 4” minimum standpipe main sizing to individual hose valve drops/connections.

D. Standard-Pressure, Fire-Suppression Standpipe System Component: Listed for 175-psig minimum working pressure.

E. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 “Quality Requirements” to design fire-suppression standpipe systems.

1. The Contractor shall arrange and pay for a new fire hydrant flow test to be performed by the water utility, The Metropolitan District (MDC). Contractor shall base his hydraulic calculations and shop drawings on the new flow test results, verifying routing and sizing of all existing-to-remain fire service piping, and all existing building standpipe piping which is to be used, even temporarily, during construction.

a. For general information only, the static pressure observed on the gauge at the existing alarm check valve on November 6, 2019 was 85 psi.

F. Fire-suppression standpipe design shall be approved by authorities having jurisdiction.

1. Standpipe system supply piping shall be sized, with Fire Department pumping pressure of 150 psig at most remote fire department connection, to provide minimum residual pressure at each hose-connection outlet as follows:

a. NPS 1-1/2 Hose Connections: **65 psig**.
b. NPS 2-1/2 Hose Connections: **100 psig.**

G. Seismic Performance: Fire-suppression standpipes shall withstand the effects of earthquake motions determined in accordance with NFPA 13 and the State of Connecticut Building Code. See Section 210548 "Vibration and Seismic Controls for Fire-Suppression Piping and Equipment."

H. Interruption of Existing Fire-Suppression Standpipe Service: Do not interrupt fire-suppression standpipe service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary fire-suppression standpipe service in accordance with requirements indicated:

1. Notify Construction Manager and Owner’s Director of Facilities no fewer than two (2) days in advance of proposed interruption of fire-suppression standpipe service.
2. Do not proceed with interruption of fire-suppression standpipe service without Construction Manager's and Owner's Director of Facilities’ written permission.

2.3 PIPING MATERIALS

A. Comply with requirements in Part 3 "Piping Schedule" Article for applications of pipe, tube, and fitting materials and for joining methods for specific services, service locations, and pipe sizes.

2.4 BLACK STEEL PIPE AND ASSOCIATED FITTINGS

A. Schedule 40: ASTM A53/A53M, Type E, Grade B, or ASTM A795/A795M, Type E, Grade A, with factory- or field-formed ends to accommodate joining method.

B. Schedule 10: ASTM A135/A135M Type E, Grade A.

C. Uncoated, Steel Couplings: ASTM A865/A865M, threaded.

D. Uncoated, Gray-Iron Threaded Fittings: ASME B16.4, Class 125, standard pattern.

E. Malleable- or Ductile-Iron Unions: UL 860.

F. Steel Welding Fittings: ASTM A234/A234M and ASME B16.9.

G. Grooved-Joint, Steel-Pipe Appurtenances:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Anvil International; a subsidiary of Mueller Water Products, Inc.
   b. Tyco Fire & Building Products LP.
   c. Victaulic Company.
2. Pressure Rating: **175-psig** minimum.
3. Grooved-End Fittings for Steel Piping: ASTM A47/A47M malleable-iron casting or ASTM A536 ductile-iron casting, with dimensions matching steel pipe.
4. Grooved-End-Pipe Couplings for Steel Piping: AWWA C606 and UL 213 rigid pattern, unless otherwise indicated, for steel-pipe dimensions. Include ferrous housing sections, EPDM-rubber gasket, and bolts and nuts.

2.5 PIPING JOINING MATERIALS

A. Welding Filler Metals: Comply with AWS D10.12M/D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

2.6 FIRE HOSE VALVES (FHV)

A. Nonadjustable-Valve Hose Connections:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Elkhart Brass Mfg. Co., Inc.
   b. Guardian Fire Equipment, Inc.
   c. Potter Roemer LLC.
   d. Tyco Fire & Building Products LP.
2. Standard: UL 668 hose valve for connecting fire hose.
3. Standpipe Class: III
4. Pressure Rating: 300-psig minimum.
5. Material: Brass or bronze.

6. Size: NPS 2 1/2 hose valve with NPS 2 ½ x 1-1/2 FxM reducer and NPS 1-1/2 cap & chain.
7. Inlet: Female pipe threads.
8. Outlet: *NST male pipe threads with lugged cap, gasket, and chain. Include hose valve threads according to NFPA 1963 and matching local fire-department threads*: **NST - Reconfirm with local fire department before submitting product for approval and ordering.*
9. Pattern: Angle.
10. Finish: Cast brass with red handwheel.
11. Basis of Design: Potter-Roemer Model 4065 with 2815 series NPS 2 1/2 x 1-1/2 FxM reducer and 4600 series NPS 1-1/2 cap & chain.

2.7 FIRE VALVE CABINETS (FVC)

A. Cabinet Type: Suitable for specified fire hose valve.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Fire End and Croker Corporation
      b. Guardian Fire Equipment, Inc.
      c. Potter Roemer LLC.

B. Cabinet Construction: Two-hour fire rated.

   1. Fire-Rated Cabinets: Construct fire-rated cabinets with double walls fabricated from 0.043-inch-thick cold-rolled steel sheet lined with minimum 5/8-inch-thick fire-barrier material. Provide factory-drilled mounting holes.

   2. UL Classified, 7N43.

C. Cabinet Material: Cold-rolled steel sheet.

D. Recessed Cabinet:
   1. Exposed Flat Trim: One-piece combination trim and perimeter door frame overlapping surrounding wall surface, with exposed trim face and wall return at outer edge (backbend).

E. Semirecessed Cabinet: One-piece combination trim and perimeter door frame overlapping surrounding wall surface, with exposed trim face and wall return at outer edge (backbend).

   1. Square-Edge Trim: 2-inch backbend depth.

F. Cabinet Trim Material: Steel sheet.

G. Door Material: Steel sheet.

H. Door Style: Fully glazed panel with frame.

I. Door Glazing: Clear tempered safety glass.

J. Door Hardware: Manufacturer's standard door-operating hardware of proper type for cabinet type, trim style, and door material and style indicated.

   1. Provide projecting lever handle with cam-action latch.

2. Provide continuous hinge, of same material and finish as trim, permitting door to open 180 degrees.

K. Accessories:
1. Door Lock: Cam lock that allows door to be opened during emergency by pulling sharply on door handle.
2. Identification: Lettering on door glazing complying with authorities having jurisdiction for letter style and size, reading ”FIRE DEPARTMENT VALVE”.

L. Materials:

1. Cold-Rolled Steel: ASTM A1008/A1008M, Commercial Steel (CS), Type B.

a. Finish: Factory-applied baked enamel, TGIC polyester powder coat, HAA polyester powder coat, epoxy powder coat, or polyester/epoxy hybrid powder coat, complying with AAMA 2603.
b. Color: White.
2. Tempered Float Glass: ASTM C1048, Kind FT, Condition A, Type I, Quality q3, 3 mm thick, Class 1 (clear).

2.8 RISER CONTROL VALVES

A. For each and every standpipe riser and combination standpipe/sprinkler riser, provide a supervised riser control valve for isolation and service.
1. Riser control valves may be either iron butterfly valves with factory-installed indicators, or iron OS&Y gate valves with field-installed tamper switches. Refer to 210523 "General-Duty Valves for Water-Based Fire-Suppression Piping".

2.9 ALARM DEVICES

A. Match alarm-device material and connection types to piping and equipment materials and connection types.

B. For each and every standpipe riser and combination standpipe/sprinkler riser, provide a flow switch to monitor standpipe water flow.

C. Water-Flow Indicators:

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

a. Potter Electric Signal Company, LLC
b. System Sensor
c. Watts; a Watts Water Technologies company

2. Standard: UL 346.
3. Water-Flow Detector: Electrically supervised.
4. Components: Two (2) single-pole, double-throw circuit switches for isolated alarm and auxiliary contacts, 7 A, 125-V ac and 0.25 A, 24-V dc; complete with factory-set, field-adjustable retard element to prevent false signals and tamperproof cover that sends signal if removed.
5. Type: Paddle operated.
6. Pressure Rating: 250 psig.

7. Design Installation: Horizontal or vertical.

D. Valve Supervisory Switches:

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

a. Fire-Lite Alarms, Inc.; a Honeywell International company
b. Kennedy Valve Company; a division of McWane, Inc.
c. Potter Electric Signal Company, LLC
d. System Sensor

2. Standard: UL 346.
3. Type: Electrically supervised.
4. Components: Single-pole, double-throw switch with normally closed contacts.
5. Design: Signals that controlled valve is in other than fully open position.
6. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.10 PRESSURE GAUGES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. AMETEK, Inc.
2. Ashcroft Inc.
3. Brecco Corporation.
4. WIKA Instrument Corporation.

B. Standard: UL 393.

C. Dial Size: 3-1/2- to 4-1/2-inch diameter.

D. Pressure Gage Range: Zero to 250 psig minimum.

E. Water System Piping Gage: Include "WATER" or "AIR/WATER" label on dial face.

PART 3 - EXECUTION

3.1 PREPARATION

A. Arrange for a new flow test by the water utility (MDC). Paying for the flow test shall be included in the Contractor's bid.

B. Verify routing, size(s) and elevation data for the existing fire service piping which shall remain and be reused in the renovation.

C. Verify routing and sizing of existing building fire standpipe piping which shall remain and be actively used (even temporarily) during the construction.

3.2 EXAMINATION

A. Examine roughing-in for fire hose valves (FHV) and fire valve cabinets (FVC) to verify actual locations of piping connections before installation.

B. Examine walls and partitions for suitable thickness, fire- and smoke-rated construction, framing for fire valve cabinets, and other conditions where fire hose valves and fire valve cabinets are to be installed.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.3 PIPING INSTALLATION

A. Locations and Arrangements: Drawing plans, schematics, and diagrams indicate general location and arrangement of piping. Install piping as indicated, as far as practical.

1. Deviations from approved working plans for piping require written approval from authorities having jurisdiction. File written approval with Architect before deviating from approved working plans.

B. Piping Standard: Comply with requirements in NFPA 14 for installation of fire-suppression standpipe piping.

C. Install seismic restraints on piping. Comply with requirements in NFPA 13 for seismic-restraint device materials and installation. Refer to General Notes on Structural drawings for building-specific seismic design criteria.

D. Install listed fittings to make changes in direction, branch takeoffs from mains, and reductions in pipe sizes.

E. Install drain valves on standpipes. Extend drain piping to outside of building.

F. Install automatic (ball drip) drain valves to drain piping between fire-department connections and check valves. Drain to floor drain or outside building.

G. Install alarm devices in piping systems.

H. Install hangers and supports for standpipe system piping in accordance with NFPA 14. Comply with requirements in NFPA 13 for hanger materials.

I. Install pressure gauges on riser or feed main and at top of each standpipe. Include pressure gauges with connection of not less than NPS ¼ and with soft-metal seated globe valve, arranged for draining pipe between gauge and valve. Install gauges to permit removal, and install where they are not subject to freezing.

J. Fill wet-type standpipe system piping with water.

K. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 210517 "Sleeves and Sleeve Seals for Fire-Suppression Piping."

L. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Section 210517 "Sleeves and Sleeve Seals for Fire-Suppression Piping."

M. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 210518 "Escutcheons for Fire-Suppression Piping."

3.4 JOINT CONSTRUCTION

A. Install couplings, flanges, flanged fittings, unions, nipples, and transition and special fittings that have finish and pressure ratings same as or higher than system's pressure rating for aboveground applications unless otherwise indicated.

B. Install unions adjacent to each valve in pipes NPS 2 and smaller.

C. Install flanges, flange adapters, or couplings for grooved-end piping on valves, apparatus, and equipment having NPS 2-1/2 and larger end connections.

D. Ream ends of pipes and tubes, and remove burrs. Bevel plain ends of steel pipe.

E. Remove scale, slag, dirt, and debris from inside and outside of pipes, tubes, and fittings before assembly.

F. Threaded Joints: Thread pipe with tapered pipe threads in accordance with ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

1. Apply appropriate tape or thread compound to external pipe threads.
2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged.

G. Steel-Piping, Roll-Grooved Joints: Roll rounded-edge groove in end of pipe in accordance with AWWA C606. Assemble coupling with housing, gasket, lubricant, and bolts. Join steel pipe and grooved-end fittings in accordance with AWWA C606 for steel-pipe grooved joints.

H. Welded Joints: Construct joints according to AWS D10.12M/D10.12, using qualified processes and welding operators according to "Quality Assurance" Article.

1. Shop weld pipe joints where welded piping is indicated. Do not use welded joints for galvanized-steel pipe.

I. Dissimilar-Material Piping Joints: Make joints using adapters compatible with materials of both piping systems.

3.5 VALVE AND SPECIALTIES INSTALLATION

A. Install listed fire-protection valves, trim and drain valves, controls, and specialties in accordance with NFPA 14, authorities having jurisdiction and manufacturer's instructions.

B. Install listed fire-protection supervised-open shutoff valves, located to control sources of water supply, except from fire-department connections. Install permanent identification signs indicating portion of system controlled by each valve.

3.6 FIRE HOSE VALVE (FHV) INSTALLATION

A. Install fire hose valves adjacent to standpipes.

B. Install freestanding fire hose valves for access and minimum passage restriction.

1. Where the lowest free-standing fire hose valve on a standpipe system is fed from above, so that the standpipe can be detected by cane to meet ADA requirements, continue the standpipe to the floor and cap, installing blind flange at bottom outlet of the horizontal tee to the fire hose valve.
2. At the highest level of fire hose valve installation on each exposed standpipe system, for continuous appearance, extend the standpipe full size to above the accessible ceiling, and cap.

C. Install NPS 2-1/2 fire hose valves with quick-disconnect NPS 2-1/2 by NPS 1-1/2 reducer adapter, cap and chain.

D. Where indicated with (FVC) on the drawings, install fire hose valves (FHV) in fire valve cabinets (FVC). Include pipe escutcheons, with finish matching valves, inside cabinet where water-supply piping penetrates cabinet. Install valves at angle required for connection of fire hose. Comply with requirements for fire valve cabinets (FVC) in this Section.

3.7 FIRE VALVE CABINET INSTALLATION

A. Each and every fire valve cabinet shall include a fire hose valve (FHV) installation.

B. Install fire valve cabinets recessed or semi-recessed so as not to extend more than 4 inches from the wall face, to meet ADA requirements.

3.8 IDENTIFICATION

A. Install labeling and pipe markers on equipment and piping in accordance with NFPA 14 requirements.

B. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

3.9 FIELD QUALITY CONTROL

A. Perform tests and inspections.
1. Notify the authority having jurisdiction and the Owner’s representative at least two (2) days in advance of all tests and inspections.
2. All final acceptance tests and inspections shall be performed in the presence of the Owner’s representative and the authority having jurisdiction, and their signatures shall be obtained on final acceptance test and inspection written documentation.

B. Tests and Inspections:

1. Leak Test: After installation, charge systems and test for leaks. Repair leaks and retest until no leaks exist.
2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

3. Flush, test, and inspect standpipe systems in accordance with NFPA 14, "System Acceptance" chapter.
4. Energize circuits to electrical equipment and devices.
5. Coordinate with fire-alarm tests. Operate as required.
6. Verify that equipment hose threads and or connection methods conform to local fire-department equipment requirements.

C. Fire-suppression standpipe system will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

3.10 PIPING SCHEDULE

A. Piping between Fire-Department Connections and Check Valves: Galvanized, standard-weight steel pipe with grooved ends, grooved-end fittings, grooved-end-pipe couplings, and grooved joints.

B. Standard-pressure, wet-type fire-suppression standpipe piping, NPS 2 and smaller shall be the following:

1. Schedule 40, black-steel pipe with threaded ends; uncoated, gray-iron threaded fittings; and threaded joints.

C. Standard-pressure, wet-type fire-suppression standpipe piping, NPS 2-1/2 and larger shall be one of the following:

1. Schedule 40, black-steel pipe with threaded ends; uncoated, gray-iron threaded fittings; and threaded joints.
2. Schedule 40, black-steel pipe with roll-grooved ends; uncoated, grooved-end fittings for steel piping; grooved-end-pipe couplings for steel piping; and grooved joints.
3. Schedule 40, black-steel pipe with plain ends; steel welding fittings; and welded joints.
4. Schedule 10, black-steel pipe with roll-grooved ends; uncoated, grooved-end fittings for steel piping; grooved-end-pipe couplings for steel piping; and grooved joints.
5. Schedule 10, black-steel pipe with plain ends; welding fittings; and welded joints.

END OF SECTION 211200

SECTION 211313 - WET-PIPE SPRINKLER SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Section includes complete demolition of existing, and provision of new building sprinkler systems, components, and accessories inside the building.

a. The facility is presently served by an existing 4-inch fire service, which rises through floor slab in Sprinkler Room C2095. This service is to be demolished and replaced with a new 6-inch fire service.
b. Refer to Civil Drawings for information regarding demolishing of existing 4” fire service and provision of new 6” fire service more than 5’-0” outside the building.

2. Pipes, fittings, and specialties.
3. Flexible connectors.
4. Specialty valves.
5. Sprinklers.
6. Alarm devices.
7. Pressure gages.

1.3 DEFINITIONS

A. Standard-Pressure Sprinkler Piping: Wet-pipe sprinkler system piping designed to operate at working pressure of 175-psig minimum.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

B. Shop Drawings: For all building wet-pipe sprinkler systems, existing to remain and new.

1. Include plans, elevations, sections, and attachment details.
2. Include diagrams for power, signal, and control wiring.

C. Delegated-Design Submittal: For wet-pipe sprinkler systems indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.5 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Sprinkler systems, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Domestic water piping.
2. HVAC hydronic piping.
3. HVAC ductwork.
4. HVAC equipment.
5. Items penetrating or attached to finished ceiling, including but not limited to the following:

    a. Lighting fixtures.
    b. Air outlets and inlets.
    c. Speakers, motion sensors, smoke and or heat detectors, etc.
    d. Electrical Equipment requiring clearances from sprinkler systems.

B. Qualification Data: For qualified Installer and professional engineer.

C. Approved Sprinkler Piping Drawings: Working plans, prepared according to NFPA 13, that have been approved by authorities having jurisdiction, including hydraulic calculations.

D. Welding certificates (For fabrication of pipe support, if used).

E. Field Test Reports and Certificates: Indicate and interpret test results for compliance with performance requirements and as described in NFPA 13. Include "Contractor's Material and Test Certificate for Aboveground Piping."

F. Field quality-control reports.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For wet-pipe sprinkler systems and specialties to include in emergency, operation, and maintenance manuals.

1.7 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Sprinkler Cabinets: Finished, wall-mounted, steel cabinet with hinged cover, and with space for minimum of six (6) spare sprinklers plus sprinkler wrench. Include number of sprinklers required by NFPA 13 and sprinkler wrench. Include separate cabinet with sprinklers and wrench for each type of sprinkler used on Project.

1.8 QUALITY ASSURANCE

A. Installer Qualifications:

1. Installer's responsibilities include designing, fabricating, and installing sprinkler systems and providing professional engineering services needed to assume engineering responsibility.

    a. Engineering Responsibility: Preparation of working plans, calculations, and field test reports by a qualified professional engineer.

B. Welding Qualifications: Qualify procedures and operators according to 2010 ASME Boiler and Pressure Vessel Code. (For fabrication of pipe support, if used.)

1.9 FIELD CONDITIONS

A. Interruption of Existing Sprinkler Service: Do not interrupt sprinkler service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary sprinkler service according to requirements indicated:

1. Notify Construction Manager and Owner's Director of Facilities no fewer than two (2) days in advance of proposed interruption of sprinkler service.
2. Do not proceed with interruption of sprinkler service without Construction Manager's and Owner's Director of Facilities' written permission.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Sprinkler system equipment, specialties, accessories, installation, and testing shall comply with the following:

1. NFPA 13.

B. Standard-Pressure Piping System Component: Listed for 175-psig minimum working pressure.

C. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design wet-pipe sprinkler systems.

1. According to the water utility, South Central Connecticut Regional Water Authority (RWA), the 12" street water main, to which the site fire main is to be connected under this project, does not have fire hydrants for flow testing. Contractor shall coordinate with RWA to obtain projected static pressure in the 12" main at the point of the site fire main connection, and shall base his hydraulic calculations on RWA's exact fire service arrangement, and on Civil drawings (for new site fire main and fire service routing, material, etc.). In addition to the building's sprinkler demand, include 250 GPM on the site fire main, from street main tap to 6" fire service branch takeoff, for exterior hydrant allowance.

2. Sprinkler system design shall be approved by authorities having jurisdiction.

a. Margin of Safety for Available Water Flow and Pressure: Five percent (5%), including losses through water-service piping, valves, and backflow preventers.
b. Sprinkler Occupancy Hazard Classifications:

1) Offices, Classrooms, Toilet Rooms: Light Hazard.
2) Corridors, Vestibules, Lobbies: Light Hazard.
3) Cafeteria and Gymnasium: Light Hazard.
4) Stage: Ordinary Hazard, Group 2.
5) Libraries except Large Stack Areas: Light Hazard.
6) Commercial Kitchen Areas: Ordinary Hazard, Group 1.
7) Building Service Areas: Ordinary Hazard, Group 1.
8) Mechanical Equipment Rooms: Ordinary Hazard, Group 1.
9) Electrical Equipment Rooms: Ordinary Hazard, Group 1.
10) Storage Areas, incl. Janitor's Closets: Ordinary Hazard, Group 2.
11) Libraries-Large Stack Areas: Ordinary Hazard, Group 2.

3. Minimum Density for Automatic-Sprinkler Piping Design:

a. Light-Hazard Occupancy: 0.10 gpm over 1500-sq. ft. area.
b. Ordinary-Hazard, Group 1 Occupancy: 0.15 gpm over 1500-sq. ft. area.
c. Ordinary-Hazard, Group 2 Occupancy: 0.20 gpm over 1500-sq. ft. area.

4. Maximum Protection Area per Sprinkler: According to UL listing.
5. Maximum Protection Area per Sprinkler:

a. Light Hazard Areas: 225 sq. ft. (if all NFPA 13 requirements for this coverage are met).
b. Ordinary Hazard Areas: 130 sq. ft.

D. Seismic Performance: Sprinkler piping shall withstand the effects of earthquake motions determined according to NFPA 13 and the Connecticut State Building Code.

1. Refer to General Notes on Structural Drawings for Seismic Load Criteria.

2.2 STEEL PIPE AND FITTINGS

A. Standard-Weight (Schedule 40), Black- or Galvanized-Steel Pipe: UL/FM, ASTM A 53, Type E, Grade B, or ASTM A795, Type E, Grade A. Pipe ends may be factory or field formed to match joining method.

B. Schedule 10, Black-Steel Pipe: UL/FM, ASTM A 135, Type E, Grade A. Plain end.

C. Galvanized- and Black-Steel Pipe Nipples: ASTM A 733, made of ASTM A 53, standard-weight, seamless steel pipe with threaded ends.

D. Galvanized- and Uncoated-Steel Couplings: ASTM A 865, threaded.

E. Galvanized and Uncoated, Gray-Iron Threaded Fittings: ASME B16.4, Class 125, standard pattern.

F. Galvanized and Uncoated, Malleable-Iron Threaded Fittings: ASME B16.3, Class 150, standard pattern.

G. Malleable- or Ductile-Iron Unions: UL 860.

H. Cast-Iron Flanges: ASME 16.1, Class 125.

I. Steel Flanges and Flanged Fittings: ASME B16.5, Class 150.

1. Pipe-Flange Gasket Materials: EPDM rubber gasket.

a. Class 125 and Class 250, Cast-Iron, Flat-Face Flanges: Full-face gaskets.
b. Class 150 and Class 300, Ductile-Iron or -Steel, Raised-Face Flanges: Ring-type gaskets.

2. Metal, Pipe-Flange Bolts and Nuts: Carbon steel unless otherwise indicated.

J. Grooved-Joint, Steel-Pipe Appurtenances:

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

a. Anvil International

b. Tyco Fire Products LP
c. Victaulic Company

2. Pressure Rating: 175-psig minimum.
3. Painted Grooved-End Fittings for Steel Piping: ASTM A 47, malleable-iron casting or ASTM A 536, ductile-iron casting, with dimensions matching steel pipe.
4. Grooved-End-Pipe Couplings for Steel Piping: AWWA C606 and UL 213 rigid pattern, unless otherwise indicated, for steel-pipe dimensions. Include ferrous housing sections, EPDM-rubber gasket, and bolts and nuts.

2.3 SPECIALTY VALVES

A. Listed in UL's "Fire Protection Equipment Directory" or FM Global's "Approval Guide."

B. Pressure Rating:

1. Standard-Pressure Piping Specialty Valves: 175-psig minimum.

C. Body Material: Cast or ductile iron.

D. Size: Same as connected piping.

E. End Connections: Flanged or grooved.

F. Automatic (Ball Drip) Drain Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

a. Reliable Automatic Sprinkler Co., Inc. (The)
b. Tyco Fire Products LP

2. Standard: UL 1726.
3. Pressure Rating: 175-psig minimum.
4. Type: Automatic draining, ball check.
5. Size: NPS 3/4.
6. End Connections: Threaded.

2.4 BACKFLOW PREVENTER

A. Double-Check Detector Backflow-Prevention Assemblies:

1. Subject to compliance with requirements, provide product by one (1) of the following:

a. Ames Fire & Waterworks
b. FEBCO
c. Watts; a Watts Water Technology Company

2. Standards: ASSE 1015.
3. Operation: Continuous-pressure applications unless otherwise indicated.
4. Pressure Loss: 6 psig maximum, through middle third of flow range.
5. Size: 6 inches.
6. Design Flow Rate: 500 gpm (Wet-Pipe System, Ordinary Hazard Group 2, 0.20 GPM/1500 SF, plus 200 gpm hose allowance assigned to stage standpipe system.)

a. Note: Water demand in excess of this minimum design flow, known as “overage”, is expected; the actual amount of overage will be determined from Contractor’s hydraulic calculations generated from working shop drawings.

7. Selected Unit Flow Range Limits (UL rating): 0 to 1400 gpm (minimum).
8. Pressure Loss at Design Flow Rate: 4 psig maximum for Basis-of-Design model and 6-
9. inch size.
10. Body: Cast iron with interior lining that complies with AWWA C550 or that is FDA approved, or stainless steel for NPS 2-1/2 and larger.
11. End Connections: Flanged for NPS 2-1/2 and larger.
12. Configuration: Designed for horizontal, straight-through flow.
13. Construction: NSF 61-Annex G lead-free certified.
14. Accessories:

a. Listed OS&Y gate valves with flanged ends and supervisory switches on inlet and outlet.
b. Detector Assembly to monitor unauthorized use of water from the fire protection service/system; readout in CFM. Metered bypass detector branch shall have backflow preventer type matching main backflow preventer, that is, a double check backflow preventer.

15. Basis-of-Design:

a. Watts **LF757 DCDA-OSY**
b. Wilkins **350DA-CFM**
c. Wilkins **350ASTDA-CFM**

2.5 SPRINKLER PIPING SPECIALTIES

A. Branch Outlet Fittings:

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

a. Anvil International
b. Tyco Fire Products LP
c. Victaulic Company

2. Standard: UL 213.
3. Pressure Rating: 175-psig minimum.
4. Body Material: Ductile-iron housing with EPDM seals and bolts and nuts.
5. Type: Mechanical-tee and -cross fittings.
6. Configurations: Snap-on and strapless, ductile-iron housing with branch outlets.
7. Size: Of dimension to fit onto sprinkler main and with outlet connections as required to match connected branch piping.
8. Branch Outlets: Grooved, plain-end pipe, or threaded.

B. Flow Detection and Test Assemblies:

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

a. Reliable Automatic Sprinkler Co., Inc. (The)
b. Tyco Fire Products LP
c. Victaulic Company

2. Standard: UL's "Fire Protection Equipment Directory" or FM Global's "Approval Guide."
3. Pressure Rating: 175-psig minimum.
4. Body Material: Cast- or ductile-iron housing with orifice, sight glass, and integral test valve.
5. Size: Same as connected piping.
6. Inlet and Outlet: Threaded or grooved.

C. Sprinkler Inspector's Test Fittings:

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

   a. AGF Manufacturing Inc.
   b. Tyco Fire Products LP
   c. Victaulic Company

2. Standard: UL's "Fire Protection Equipment Directory" or FM Global's "Approval Guide."
3. Pressure Rating: 175-psig minimum.
4. Body Material: Cast- or ductile-iron housing with sight glass.
5. Size: Same as connected piping.
6. Inlet and Outlet: Threaded.

D. Flexible Sprinkler Hose Fittings:

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

   a. FlexHead Industries, Inc.
   b. Gateway Tubing, Inc.
   c. Victaulic Company

2. Standard: UL 1474.
3. Type: Flexible hose for connection to sprinkler, and with bracket for connection to ceiling grid.
4. Pressure Rating: 175-psig minimum.
5. Size: Same as connected piping, for sprinkler.
6. Maximum Length: 5 feet.

2.6 SPRINKLERS

A. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

1. Reliable Automatic Sprinkler Co., Inc. (The)
2. Tyco Fire Products LP
3. Victaulic Company

B. Listed in UL's "Fire Protection Equipment Directory" or FM Global's "Approval Guide."

C. Pressure Rating for Automatic Sprinklers: 175-psig minimum.

D. Automatic Sprinklers with Heat-Responsive Element shall meet the following criteria:

1. Nonresidential Applications: UL 199.
2. Quick Response.

3. Characteristics: Nominal ½-inch orifice with Discharge Coefficient K of 5.6, and for "Ordinary" temperature classification rating unless otherwise indicated or required by application.

E. Sprinkler Finishes: Chrome plated, bronze and painted.

F. Sprinkler Escutcheons: Materials, types, and finishes for the following sprinkler mounting applications. Escutcheons for concealed, flush, and recessed-type sprinklers are specified with sprinklers.

1. Ceiling Mounting, Standard or Recessed Pendent: Chrome-plated steel, one-piece, flat.
2. Sidewall Mounting: Chrome-plated steel, one-piece, flat.

G. Sprinkler Guards:

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

a. Reliable Automatic Sprinkler Co., Inc. (The)
b. Tyco Fire Products LP
c. Victaulic Company

2. Standard: UL 199.
3. Type: Wire cage with fastening device for attaching to sprinkler.

2.7 ALARM DEVICES

A. Alarm-device types shall match piping and equipment connections.

B. Water-Flow Indicators:

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

a. Potter Electric Signal Company, LLC
b. System Sensor
c. Watts; a Watts Water Technologies company

2. Standard: UL 346.
3. Water-Flow Detector: Electrically supervised.
4. Components: Two (2) single-pole, double-throw circuit switches for isolated alarm and auxiliary contacts, 7 A, 125-V ac and 0.25 A, 24-V dc; complete with factory-set, field-adjustable retard element to prevent false signals and tamperproof cover that sends signal if removed.
5. Type: Paddle operated.
6. Pressure Rating: 250 psig.
7. Design Installation: Horizontal or vertical.

C. Pressure Switches:

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

a. Potter Electric Signal Company, LLC
b. System Sensor

c. Tyco Fire Products LP

2. Standard: UL 346.
3. Type: Electrically supervised water-flow switch with retard feature.
4. Components: Single-pole, double-throw switch with normally closed contacts.
5. Design Operation: Rising pressure signals water flow.

D. Valve Supervisory Switches:

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

a. Fire-Lite Alarms, Inc.; a Honeywell International company
b. Kennedy Valve Company; a division of McWane, Inc.
c. Potter Electric Signal Company, LLC
d. System Sensor

2. Standard: UL 346.
3. Type: Electrically supervised.
4. Components: Single-pole, double-throw switch with normally closed contacts.
5. Design: Signals that controlled valve is in other than fully open position.
6. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

E. Electrically Operated Alarm Bell (if req'd by AHJ):
1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:
a. Fire-Lite Alarms; a Honeywell company
b. Notifier; a Honeywell company
c. Potter Electric Signal Company
2. Basis-of-Design: Potter Electric Signal **Series PBA-AC**, with **Model BBK-1** weatherproof backbox.
3. Standard: UL 464.
4. Type: Vibrating, metal alarm bell; 120 VAC
5. Backbox: weatherproof
6. Size: 8-inch minimum diameter.
7. Finish: Red-enamel factory finish, suitable for outdoor use.

2.8 PRESSURE GAGES

A. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

1. AGF Manufacturing Inc.
2. AMETEK, Inc.
3. Ashcroft Inc.
4. Brecco Corporation
5. WIKA Instrument Corporation

B. Standard: UL 393.

C. Dial Size: 3½- to 4½-inch diameter.

D. Pressure Gage Range: 0- to 250-psig minimum.

E. Label: Include "WATER" label on dial face.

PART 3 - EXECUTION

3.1 PREPARATION

A. Arrange for a new fire-hydrant flow test according to NFPA 13 and NFPA 291 if existing area flow test results are more than one (1) calendar year prior to project start. Use results for system design calculations required in "Quality Assurance" Article. All associated flow test costs shall be included in the Bid.

B. Report test results promptly and in writing.

3.2 BUILDING SPRINKLER / STANDPIPE DISTRIBUTION

A. Building sprinkler/standpipe system distribution shall be served by two alarm check valve risers (R1 and R2), each with multiple sprinkler zones, one zone for each floor. General arrangement:

1. Riser 1: Serves Building Part C, with a sprinkler zone for each of two floors, and supply to Stage standpipe system.

2. Riser 2: Serves Building Parts A & B, with a sprinkler zone for each of three upper floors; in addition, a subzone SZCA is provided on the 1st floor zone branch main which supplies the Basement sprinkler system.

B. For each standpipe riser, provide a supervised control valve and flow switch.

C. For each of the sprinkler zones, provide a sprinkler zone control assembly (SCZA), and a wet inspector’s test connection, located in a hydraulically remote location of the sprinkler zone, in a secured area coordinated with the Owner's Director of Facilities.

D. The Fire Department Connection piping connection to the building sprinkler/standpipe distribution piping shall be located downstream of the fire service backflow preventer and upstream of the R1 & R2 riser control valves. Refer to Detail on Drawing P801.

3.3 PIPING INSTALLATION

A. Locations and Arrangements: Drawing plans, schematics, and diagrams indicate general location and arrangement of existing sprinkler system piping to remain and proposed new sprinkler system piping. Install piping as indicated on Contractor-generated coordinated and approved working plans.

1. Deviations from approved working plans for piping require written approval from authorities having jurisdiction. File written approval with Architect before deviating from approved working plans.
2. Coordinate layout and installation of sprinklers with other construction that penetrates ceilings, including light fixtures, HVAC equipment, and partition assemblies.

B. Piping Standard: Comply with NFPA 13 requirements for installation of sprinkler piping.

C. Install seismic restraints on piping. Comply with NFPA 13 and the State of Connecticut Building Code requirements for seismic-restraint device materials and installation. Refer to Section 210548 "Vibration and Seismic Controls for Fire-Suppression Piping and Equipment."

D. Use listed fittings to make changes in direction, branch takeoffs from mains, and reductions in pipe sizes.

E. Install unions adjacent to each valve in pipes NPS 2 and smaller.

F. Install flanges, flange adapters, or couplings for grooved-end piping on valves, apparatus, and equipment having NPS 2-1/2 and larger end connections.

G. Install "Inspector's Test Connections" in sprinkler system piping, complete with shutoff valve, and sized and located according to NFPA 13.

H. Install sprinkler piping with drains for complete system drainage.

I. Install sprinkler piping so as to minimize the number of auxiliary low point drains required.

J. Install automatic (ball drip) drain valve at each check valve for fire-department connection, to drain piping between fire-department connection and check valve. Install drain piping to and spill over floor drain or to outside building. Also, at base of exterior FDC riser.

K. Install alarm devices in piping systems.

L. Install hangers and supports for sprinkler system piping according to NFPA 13. Comply with requirements for hanger materials in NFPA 13. Refer to Section 210548 "Vibration and Seismic Controls for Fire-Suppression Piping and Equipment."

M. Install pressure gages on main riser, on each zone feed main and at each sprinkler test connection. Include pressure gages with connection not less than NPS 1/4 and with soft-metal seated globe valve, arranged for draining pipe between gage and valve. Install gages to permit removal, and install where they are not subject to freezing.

N. Fill sprinkler system piping with water.

O. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 210517 "Sleeves and Sleeve Seals for Fire-Suppression Piping."

P. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Section 210517 "Sleeves and Sleeve Seals for Fire-Suppression Piping."

Q. Install escutcheons for exposed piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 210518 "Escutcheons for Fire-Suppression Piping."

3.4 JOINT CONSTRUCTION

A. Install couplings, flanges, flanged fittings, unions, nipples, and transition and special fittings that have finish and pressure ratings same as or higher than system's pressure rating for aboveground applications unless otherwise indicated.

B. Install unions adjacent to each valve in pipes NPS 2 and smaller.

C. Install flanges, flange adapters, or couplings for grooved-end piping on valves, apparatus, and equipment having NPS 2-1/2 and larger end connections.

D. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

E. Remove scale, slag, dirt, and debris from inside and outside of pipes, tubes, and fittings before assembly.

F. Flanged Joints: Select appropriate gasket material in size, type, and thickness suitable for water service. Join flanges with gasket and bolts according to ASME B31.9.

G. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

1. Apply appropriate tape or thread compound to external pipe threads.
2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged.

H. Steel-Piping, Roll-Grooved Joints: Roll rounded-edge groove in end of pipe according to AWWA C606. Assemble coupling with housing, gasket, lubricant, and bolts. Join steel pipe and grooved-end fittings according to AWWA C606 for steel-pipe grooved joints.

I. Dissimilar-Material Piping Joints: Make joints using adapters compatible with materials of both piping systems.

3.5 VALVE AND SPECIALTIES INSTALLATION

A. Install listed fire-protection valves, trim and drain valves, specialty valves and trim, controls, and specialties according to NFPA 13 and authorities having jurisdiction.

B. Install listed fire-protection shutoff valves supervised open, located to control sources of water supply except from fire-department connections. Install permanent identification signs indicating portion of system controlled by each valve.

C. Install check valve in each water-supply connection. Install backflow preventers instead of check valves in potable-water-supply sources.

D. Specialty Valves:

1. Install valves in vertical position for proper direction of flow, in main supply to system.
2. Install auto drip valves to as to fully drain trapped portions of piping upstream of check valves and eliminate freeze potential. Pipe drip to floor drain or other waste receptor with air gap per code.

3.6 SPRINKLER INSTALLATION

A. Install sprinklers in suspended ceilings in center of 2 x 2 acoustical ceiling panels, unless specifically noted otherwise on the Drawings.

B. Install sprinklers in suspended ceilings in center or quarter points of 2 x 4 acoustical ceiling panels, unless specifically noted otherwise on the Drawings.

C. Install dry-type sprinklers with water supply from heated space. Do not install pendent or sidewall, wet-type sprinklers in areas subject to freezing.

D. Install sprinklers into flexible, sprinkler hose fittings, and install hose into bracket on ceiling grid.

3.7 IDENTIFICATION

A. Install labeling and pipe markers on equipment and piping according to requirements in NFPA 13.

B. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

3.8 FIELD QUALITY CONTROL

A. Perform tests and inspections.
   1. Notify the authority having jurisdiction and the Owner’s representative at least two (2) days in advance of all tests and inspections.
   2. All final acceptance tests and inspections shall be performed in the presence of the Owner’s representative and the authority having jurisdiction, and their signatures shall be obtained on final acceptance test and inspection written documentation.

B. Tests and Inspections:

   1. Leak Test: After installation, charge systems and test for leaks. Repair leaks and retest until no leaks exist.
   2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
   3. Flush, test, and inspect sprinkler systems according to NFPA 13, "Systems Acceptance" Chapter.
   4. Energize circuits to electrical equipment and devices.
   5. Coordinate with fire-alarm tests. Operate as required.
   6. Verify that equipment hose threads are same as local fire department equipment.

C. Arrange and pay for inspection/testing of the new fire service backflow preventer required and performed by the Water Utility.

D. Sprinkler piping system will be considered defective if it does not pass tests and inspections.

E. Prepare test and inspection reports.

3.9 CLEANING

A. Clean dirt and debris from sprinklers.

B. Only sprinklers with their original factory finish are acceptable. Remove and replace any sprinklers that are painted or have any other finish than their original factory finish.

3.10 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's sprinkler system maintenance contractor to adjust, operate, and maintain specialty valves, and to become familiar with the locations of all control valves and inspector’s tests.

3.11 PIPING SCHEDULE

A. Piping between Fire Department Connections and check valves, and Other Normally Dry Piping Systems: Galvanized, standard-weight steel pipe with grooved ends, grooved-end fittings, grooved-end-pipe couplings, and grooved joints. NPS 2 and smaller may also be Standard-

weight, galvanized-steel pipe with threaded ends; galvanized, gray-iron threaded fittings; and threaded joints.

B. Sprinkler specialty fittings may be used, downstream of control valves, instead of specified fittings.

C. Standard-pressure, wet-pipe sprinkler system, NPS 2 and smaller, shall be one (1) of the following:

1. Standard-weight, black-steel pipe with threaded ends; uncoated, gray-iron threaded fittings; and threaded joints.
2. Standard-weight, black-steel pipe with roll-grooved ends; uncoated, grooved-end fittings for steel piping; grooved-end-pipe couplings for steel piping; and grooved joints.

D. Standard-pressure, wet-pipe sprinkler system, NPS 2-1/2 and larger, shall be one (1) of the following:

1. Standard-weight, black-steel pipe with threaded ends; uncoated, gray-iron threaded fittings; and threaded joints.
2. Standard-weight, black-steel pipe with roll-grooved ends; uncoated, grooved-end fittings for steel piping; grooved-end-pipe couplings for steel piping; and grooved joints.
3. Schedule 10 black-steel pipe with roll-grooved ends; uncoated, grooved-end fittings for steel piping; grooved-end-pipe couplings for steel piping; and grooved joints.

3.12 SPRINKLER SCHEDULE

A. Use sprinkler types in subparagraphs below for the following applications:

1. Rooms without Ceilings: Upright sprinklers.
2. Rooms with Suspended Ceilings: Pendent sprinklers; concealed type unless specifically noted otherwise.
3. Wall Mounting: Sidewall sprinklers.
4. Spaces Subject to Freezing: Upright, pendent, dry sprinklers; and sidewall, dry sprinklers as indicated.
5. Special Applications: Extended-coverage sprinklers where indicated.
6. Refer to Sprinkler Schedule on the drawings.

B. Provide sprinkler types in subparagraphs below with finishes indicated.

1. Concealed Pendent Sprinklers: Rough brass, with factory-painted white cover plate.
2. Upright, Pendent and Sidewall Sprinklers: Chrome plated in finished spaces exposed to view; rough bronze in unfinished spaces not exposed to view.
3. Refer to Sprinkler Schedule on the drawings.

END OF SECTION 211313

SECTION 211316 - DRY-PIPE SPRINKLER SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Pipes, fittings, and specialties.
2. Fire-protection valves.
3. Sprinkler specialty pipe fittings.
4. Sprinklers.
5. Alarm devices.
6. Pressure gages.
7. Dry pipe compressed air equipment, piping, and controls.
8. Dry pipe nitrogen generation equipment, piping, and controls.

B. Related Sections:

1. Section 210517 “Sleeves and Sleeve-Seals for Fire-Suppression Piping” for fittings and installations such as sleeves, sleeve seals, and escutcheons.

1.3 DEFINITIONS

A. Standard-Pressure Sprinkler Piping: Dry-pipe sprinkler system piping designed to operate at working pressure 175 psig maximum.

B. Nitrogen Generation System: system of equipment, piping, controls which is capable of storing ninety-eight percent (98%+) pure nitrogen and introducing the nitrogen into the dry-pipe or pre-action sprinkler system.

1.4 SYSTEM DESCRIPTIONS

A. Dry-Pipe Sprinkler System with Nitrogen Generation System: Automatic sprinklers are attached to piping containing compressed air and to piping containing ninety-eight percent (98%+) pure nitrogen. The initial system fill and subsequent refills of 30-minute-maximum duration shall be from the compressed-air supply system. Once the system is charged with compressed-air, the compressed-air is gradually replaced with the nitrogen until the system is completely filled with the nitrogen, creating a highly corrosion resistant environment within the piping. Opening of the sprinklers releases the nitrogen and/or compressed-air and permits water pressure to open dry-pipe valve. Water then flows into piping and discharges from sprinklers that are open.

1.5 PERFORMANCE REQUIREMENTS

A. Standard-Pressure Piping System Component: Listed for 175-psig minimum working pressure.

B. Delegated Design: Design sprinkler system(s), including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria

indicated. If the following test was performed more than one (1) calendar year prior to start of construction, the Contractor is responsible to arrange and pay for a new area flow test, with the residual hydrant being the hydrant closest to the proposed point of new fire service tap into the Lebanon Ave water main.

C. Sprinkler system design shall be approved by authorities having jurisdiction.

1. Margin of Safety for Available Water Flow and Pressure: 10 psig, including losses through water-service piping, valves, and backflow preventers.
2. Sprinkler Occupancy Hazard Classifications:

   a. Toilet Rooms, Break Rooms, and General Travel Areas: Light Hazard.
   b. Building Service Areas (Excluding Storage Areas), such as Mechanical and/or Electrical Equipment Rooms, and Other Areas Containing Mechanical and/or Electrical Equipment; Parking Areas: Ordinary Hazard, Group 1.
   c. Storage Areas, including Janitor's Closets, Tool Storage, Vehicle Equipment Storage and Mezzanines: Ordinary Hazard, Group 2.

3. Minimum Density for Automatic-Sprinkler Piping Design:

   a. Light-Hazard Occupancy: 0.10 gpm over most remote 1950 sq. ft. area.
   b. Ordinary-Hazard, Group 1: 0.15 gpm over most remote 1950 sq. ft. area.
   c. Ordinary Hazard, Group 2: 0.20 gpm over most remote 1950 sq. ft. area

4. Maximum Protection Area per Sprinkler: Per UL listing.
5. Maximum Protection Area per Sprinkler (actual maximum allowed depends on construction encountered and approval restrictions of sprinkler types used):

   a. Light Hazard: 225 sq. ft.
   b. Ordinary Hazards: 130 sq. ft.
   c. Areas with pitched ceilings or roofs, or with other than smooth ceiling construction: according to NFPA 13 for the construction and slope encountered, and sprinkler types used.

6. Total Combined Hose-Stream Demand Requirement: According to NFPA 13 unless otherwise indicated:

   a. Light-Hazard Occupancies: 100 gpm for 30 minutes.
   b. Ordinary Hazard Occupancies: 250 gpm for 60 minutes, with remote or central station water flow alarm service.

D. Seismic Performance: Sprinkler piping shall withstand the effects of earthquake motions determined according to the Building Code of the State of Connecticut. Refer to Structural contract documents for seismic design criteria.

1.6 SUBMITTALS

A. Submittals-General: Full product data, working shop drawings, hydraulic calculations keyed to the Shop Drawings and designer's qualifications shall be submitted to the Engineer, the Fire Marshal's Office, and the Owner's Insurance Carrier for review and approval. Do not proceed with installation until approval has been received from all three reviewing entities.

B. Product Data: For each type of product indicated. Include size, rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

C. Shop Drawings: For dry pipe sprinkler systems. Include plans, elevations, sections, details, and attachments to other work.

1. Wiring Diagrams: For power, signal, and control wiring.

D. Delegated-Design Submittal: For sprinkler systems indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation. Obtain a new water flow test: refer to “Performance Requirements”, this Section.

E. Coordination Drawings: Sprinkler systems, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Domestic water, fuel gas, compressed air, drainage, and vent piping.
2. HVAC equipment and piping.
3. Ductwork.
4. Items penetrating finished ceiling including but not limited to the following:

a. Lighting fixtures.
b. Air outlets and inlets.

F. Qualification Data: For qualified Installer and professional engineer.

G. Approved Sprinkler Piping Drawings: Working plans, prepared according to NFPA 13, that have been approved by authorities having jurisdiction including fire marshal and fire insurance underwriter, including hydraulic calculations.

H. Fire-hydrant flow test report (test date must be a maximum one (1) calendar year prior to project construction start date).

I. Field Test Reports and Certificates: Indicate and interpret test results for compliance with performance requirements and as described in NFPA 13. Include "Contractor's Material and Test Certificate for Aboveground Piping."

J. Field quality-control reports.

K. Operation and Maintenance Data: For sprinkler specialties to include in emergency, operation, and maintenance manuals.

1.7 QUALITY ASSURANCE

A. Installer Qualifications:

1. Installer's responsibilities include designing, fabricating, and installing sprinkler systems and providing professional engineering services needed to assume engineering responsibility. Base calculations on results of new fire-hydrant flow test, obtained from Water & Sewer Divisions, and paid for as part of Contractor’s trade work.

a. Engineering Responsibility: Preparation of working plans, calculations, and field test reports by a qualified professional engineer.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. NFPA Standards: Sprinkler system equipment, specialties, accessories, installation, and testing shall comply with the following:

1. NFPA 13, "Installation of Sprinkler Systems."
2. NFPA 24, "Installation of Private Fire Service Mains and Their Appurtenances."

1.8 COORDINATION

A. Coordinate layout and installation of sprinklers with other construction that penetrates ceilings, including light fixtures, HVAC equipment, and partition assemblies.

1.9 EXTRA MATERIALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Sprinkler Cabinets: Finished, wall-mounted, steel cabinet with hinged cover, and with space for minimum of six (6) spare sprinklers plus sprinkler wrench. Include number of sprinklers required by NFPA 13 and sprinkler wrench. Include separate cabinet with sprinklers and wrench for each type of sprinkler used on Project.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

A. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, and fitting materials, and joining methods for specific services, service locations, and pipe sizes.

2.2 STEEL PIPE AND FITTINGS

A. Standard Weight, Black Steel Pipe: ASTM A 53, threaded or roll-grooved ends.

B. Standard Weight, Galvanized-Steel Pipe: ASTM A 53, Type E, Grade B., threaded or roll-grooved ends.

C. Schedule 10, Black-Steel Pipe: ASTM A 135 or ASTM A 795, Schedule 10 in NPS 5 (DN 125) and smaller; and NFPA 13-specified wall thickness in NPS 6 to NPS 10 (DN 150 to DN 250), threaded, roll-grooved or flanged joints. Welded joints may be used on piping 4 inches and larger where and as approved by Code, Owner’s fire insurance underwriter, and authorities having jurisdiction.

D. Black-Steel Pipe Nipples: ASTM A 733, made of ASTM A 53, standard-weight, seamless steel pipe with threaded ends.

E. Uncoated, Steel Couplings: ASTM A 865, threaded.

F. Uncoated, Gray-Iron Threaded Fittings: ASME B16.4, Class 125, standard pattern.

G. Malleable- or Ductile-Iron Unions: UL 860.

H. Cast-Iron Flanges: ASME 16.1, Class 125.

I. Steel Flanges and Flanged Fittings: ASME B16.5, Class 150.

J. Steel Welding Fittings: ASTM A 234 and ASME B16.9.

K. Grooved-Joint, Steel-Pipe Appurtenances:

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

a. Anvil International, Inc.
b. Corcoran Piping System Co.
c. National Fittings, Inc.
d. Shurjoint Piping Products
e. Tyco Fire & Building Products LP
f. Victaulic Company

2. Pressure Rating: 175 psig.
3. Uncoated, Grooved-End Fittings for Steel Piping: ASTM A 47, malleable-iron casting or ASTM A 536, ductile-iron casting; with dimensions matching steel pipe.
4. Grooved-End-Pipe Couplings for Steel Piping: AWWA C606 and UL 213, rigid pattern, unless otherwise indicated, for steel-pipe dimensions. Include ferrous housing sections, EPDM-rubber gasket, and bolts and nuts.
5. Galvanized, Grooved End Fittings for Steel Piping: ASTM A 47, malleable-iron casting or ASTM A 536, ductile-iron casting; with dimensions matching steel pipe.

L. Galvanized-Steel Pipe Nipples: ASTM A 733, made of ASTM A 53, standard-weight, seamless steel pipe with threaded ends.

M. Galvanized, Steel Couplings: ASTM A 865, threaded.

N. Galvanized, Gray-Iron Threaded Fittings: ASME B16.4, Class 125, standard pattern.

2.3 LISTED FIRE-PROTECTION VALVES

A. General Requirements:

1. Valves shall be UL listed and FM approved.
2. Minimum Pressure Rating for Standard-Pressure Piping: 175 psig.

B. Ball Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

a. Anvil International, Inc.
b. Victaulic Company of America
c. NIBCO, INC.

2. Standard: UL 1091 except with ball instead of disc.
3. Valves NPS 1-1/2 (DN 40) and Smaller: Bronze body with threaded ends.
4. Valves NPS 2 and NPS 2-1/2 (DN 50 and DN 65): Bronze body with threaded ends or ductile-iron body with grooved ends.
5. Valves NPS 3 (DN 80): Ductile-iron body with grooved ends.

C. Iron Butterfly Valves (NPS 2-1/2 to NPS 4):

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

    a. Kennedy Valve; a division of McWane, Inc.
    b. Milwaukee Valve Company
    c. NIBCO INC.
    d. Tyco Fire & Building Products LP
    e. Victaulic Company

2. Standard: UL 1091.
3. Pressure Rating: 175 psig.
4. Body Material: Ductile iron.
5. Disc and Stem: 316 stainless-steel disc.
6. Seat: EPDM.
7. Style: Wafer.
8. End Connections: Grooved.

D. Check Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

    a. Kennedy Valve; a division of McWane, Inc.
    b. Milwaukee Valve Company
    c. Mueller Co.; Water Products Division
    d. Reliable Automatic Sprinkler Co., Inc.
    e. Tyco Fire & Building Products LP
    f. Victaulic Company
    g. Viking Corporation

2. Standard: UL 312.
3. Pressure Rating: 250 psig minimum
4. Type: Swing check.
5. Body Material: Cast iron.
6. End Connections: Grooved.

E. Bronze OS&Y Gate Valves (NPS 2 and Smaller):

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

    a. Crane Co.; Crane Valve Group; Crane Valves
    b. Crane Co.; Crane Valve Group; Stockham Division
    c. Milwaukee Valve Company
    d. NIBCO INC.
    e. United Brass Works, Inc.

2. Standard: UL 262.
3. Pressure Rating: 175 psig.
4. Body Material: Bronze.
5. Disc: Solid wedge type.
6. End Connections: Threaded.

F. Iron OS&Y Gate Valves (NPS 2-1/2 and larger):

1. Manufacturers: Subject to compliance with requirements provide products by one (1) of the following:

    a. Crane Co.; Crane Valve Group; Stockham Division
    b. Hammond Valve
    c. Milwaukee Valve Company
    d. Mueller Co.; Water Products Division
    e. Tyco Fire & Building Products LP

2. Standard: UL 262.
3. Pressure Rating: 250 psig minimum.
4. Body Material: Cast or ductile iron.
5. Trim and Stem: Bronze.
6. End Connections: Grooved.

G. Indicating Valves on piping to alarm devices such as electric alarm bells:

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

    a. Kennedy Valve; a division of McWane, Inc.
    b. Milwaukee Valve Company
    c. NIBCO INC.
    d. Tyco Fire & Building Products LP
    e. Victaulic Company

2. Standard: UL 1091.
3. Pressure Rating: 175 psig minimum.
4. Valves NPS 2 (DN 50) and Smaller:

    a. Valve Type: Ball or butterfly.
    b. Body Material: Bronze.
    c. End Connections: Threaded.

5. Valve Operation: Integral electrical, 115-V ac, prewired, single-circuit, supervisory switch.

2.4 TRIM AND DRAIN VALVES

A. General Requirements:

1. Standard: UL's "Fire Protection Equipment Directory" listing or "Approval Guide," published by FM Global, listing.
2. Pressure Rating: 175 psig minimum.

B. Angle Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

    a. Fire Protection Products, Inc.
    b. United Brass Works, Inc.

C. Ball Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

    a. Conbraco Industries, Inc.; Apollo Valves
    b. Kennedy Valve; a division of McWane, Inc.
    c. Milwaukee Valve Company
    d. NIBCO INC.
    e. Tyco Fire & Building Products LP
    f. Victaulic Company

D. Globe Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

    a. Fire Protection Products, Inc.
    b. United Brass Works, Inc.

E. Plug Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following

    a. Southern Manufacturing Group

2.5 SPECIALTY VALVES

A. General Requirements:

1. Standard: UL's "Fire Protection Equipment Directory" listing or "Approval Guide," published by FM Global, listing.
2. Pressure Rating:

    a. Standard-Pressure Piping Specialty Valves: 175 psig minimum.

3. Body Material: Cast or ductile iron.
4. Size: Same as connected piping.
5. End Connections: Grooved.

B. Dry-Pipe Valves:

1. Basis-of-Design:

    a. Reliable Automatic Sprinkler Co., Inc.; **Model D**

2. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

    a. Globe Fire Sprinkler Corporation
    b. Tyco Fire & Building Products LP
    c. Victaulic Company
    d. Viking Corporation

3. Standard: UL 260
4. Design: Differential-pressure type.

5. Include UL 1486, quick-opening devices, trim sets for air supply, drain, priming level, alarm connections, ball drip valves, pressure gages, priming chamber attachment, and fill-line attachment.
6. Air-Pressure Maintenance Device:

    a. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

        1) Globe Fire Sprinkler Corporation
        2) Reliable Automatic Sprinkler Co., Inc.
        3) Tyco Fire & Building Products LP
        4) Victaulic Company
        5) Viking Corporation

    b. Standard: UL 260.
    c. Type: Automatic device to maintain minimum air pressure in piping.
    d. Air Pressure Maintenance package: include shutoff valves to permit servicing without shutting down sprinkler piping, bypass valve for quick filling, pressure regulator or switch to maintain pressure, strainer, pressure ratings with 14- to 60-psig adjustable range, and 175-psig outlet pressure.

7. Air Compressor:

    a. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

        1) Gast Manufacturing Inc.
        2) General Air Products, Inc.
        3) Viking Corporation

    b. Standard: UL's "Fire Protection Equipment Directory" listing or "Approval Guide," published by FM Global, listing.
    c. Motor Horsepower: Fractional.
    d. Power: 120-V ac, 60 Hz, single phase, unless arranged otherwise with electrical contractor at no additional charge to the Owner.

C. Automatic (Ball Drip) Drain Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

    a. AFAC Inc.
    b. Reliable Automatic Sprinkler Co., Inc.
    c. Tyco Fire & Building Products LP

2. Standard: UL 1726.
3. Pressure Rating: 175 psig minimum.
4. Type: Automatic draining, ball check.
5. Size: NPS 3/4.
6. End Connections: Threaded.

2.6 NITROGEN GENERATION SYSTEM

A. General Requirements: UL-listed and FM approved for fire protection sprinkler system service.

B. Approved Manufacturers: Subject to compliance with requirements, provide corrosion-inhibiting nitrogen-generating system by one (1) of the following:

1. South-Tek Systems, Inc.
2. Engineered Corrosion Solutions
3. Potter Electric Signal Company, LLC

C. The corrosion-inhibiting nitrogen generation system shall be capable of producing ninety-eight percent (98%+) pure nitrogen in order to service the dry-pipe sprinkler system. The corrosion-inhibiting nitrogen generation system shall include a nitrogen generator, feed air compressor, refrigerated air dryer, pre-treatment air filtration package, leak detection system, air bypass tamper alarm, fire protection system compressed air auto-purging device, supervisory gas monitoring device, and nitrogen storage tank.

D. The system shall be sized to accommodate the entire volume of the dry-pipe sprinkler system as arranged, coordinated, hydraulically calculated, and indicated on the sprinkler contractor's approved shop drawings. Sizing shall be according to the system manufacturer's sizing tables.

E. Coordinate system's required electrical control, monitoring, and alarm provisions with the project electrician.

F. Follow manufacturer's system installation details, including interface with other dry-pipe system components.

G. Provide air maintenance device for the dry-pipe sprinkler system.

H. Locate Nitrogen Generation system equipment, panel and tank as can be coordinated to the dry-pipe valve. Mount components stacked on wall with manufacturer's mounting components.

1. Do not obstruct testing and maintenance clearances for other equipment such as backflow preventers, dry-pipe valve and riser, and domestic water service valves, meters, etc.

I. Install nitrogen generation system's auto-purge device at hydraulically remote location in the dry-pipe sprinkler system, in accordance with nitrogen generation system manufacturer's best recommendation.

2.7 SPRINKLER SPECIALTY PIPE FITTINGS

A. General Requirements for Dry-Pipe-System Fittings: UL-listed and FM approved for dry-pipe service.

B. Branch Outlet Fittings:

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

a. Anvil International, Inc.
b. National Fittings, Inc.
c. Shurjoint Piping Products
d. Tyco Fire & Building Products LP
e. Victaulic Company

2. Standard: UL 213.
3. Pressure Rating: 175 psig minimum.

4. Body Material: Ductile-iron housing with EPDM seals and bolts and nuts.
5. Type: Mechanical-T and -cross fittings.
6. Configurations: Snap-on and strapless, ductile-iron housing with branch outlets.
7. Size: Of dimension to fit onto sprinkler main and with outlet connections as required to match connected branch piping.
8. Branch Outlets: Grooved, plain-end pipe, or threaded.

C. Flow Detection and Test Assemblies:

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

    a. AGF Manufacturing Inc.
    b. Reliable Automatic Sprinkler Co., Inc.
    c. Tyco Fire & Building Products LP
    d. Victaulic Company

2. Standard: UL's "Fire Protection Equipment Directory" listing or "Approval Guide," published by FM Global, listing.
3. Pressure Rating: 175 psig minimum.
4. Body Material: Cast- or ductile-iron housing with orifice, sight glass, and integral test valve.
5. Size: Same as connected piping.
6. Inlet and Outlet: Threaded.

D. Branch Line Testers:

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

    a. Elkhart Brass Mfg. Company, Inc.
    b. Fire-End & Croker Corporation
    c. Potter Roemer

2. Standard: UL 199.
3. Pressure Rating: 175 psig minimum.
4. Body Material: Brass.
5. Size: Same as connected piping.
6. Inlet: Threaded.
7. Drain Outlet: Threaded and capped.
8. Branch Outlet: Threaded, for sprinkler.

E. Sprinkler Inspector's Test Fittings:

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

    a. AGF Manufacturing Inc.
    b. Triple R Specialty
    c. Tyco Fire & Building Products LP
    d. Victaulic Company
    e. Viking Corporation

2. Standard: UL's "Fire Protection Equipment Directory" listing or "Approval Guide," published by FM Global, listing.

3. Pressure Rating: 175 psig minimum.
4. Body Material: Cast- or ductile-iron housing with sight glass.
5. Size: Same as connected piping.
6. Inlet and Outlet: Threaded.

2.8 SPRINKLERS

A. Manufacturers: Subject to compliance with requirements, provide all sprinklers by one (1) of the following:

1. Globe Fire Sprinkler Corporation
2. Reliable Automatic Sprinkler Co., Inc.
3. Tyco Fire & Building Products LP
4. Victaulic Company
5. Viking Corporation

B. General Requirements:

1. Standard: UL's "Fire Protection Equipment Directory" listing or "Approval Guide," published by FM Global, listing.

a. Specific application sprinklers for protecting attics must be UL listed for their intended use.

2. Pressure Rating for Automatic Sprinklers: 175 psig minimum.

C. General Application Automatic Sprinklers with Heat-Responsive Element:

1. Nonresidential Applications: UL 199
2. Characteristics: Nominal ½-inch orifice with discharge coefficient K of 5.6, and for "Ordinary" temperature classification rating unless otherwise indicated or required by NFPA 13 for specific area of application.

D. Sprinkler Finishes:

1. Chrome plated.
2. Bronze.
3. Painted.

E. Special Coatings:

1. Wax.
2. Lead.
3. Corrosion-resistant paint.

F. Sprinkler Escutcheons: Materials, types, and finishes for the following sprinkler mounting applications. Escutcheons for concealed, flush, and recessed-type sprinklers are specified with sprinklers.

1. Ceiling Mounting: Chrome-plated steel, two-piece, with 1-inch (minimum) vertical adjustment.
2. Sidewall Mounting: Chrome-plated steel, one-piece, flat.

G. Sprinkler Guards:

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

    a. Reliable Automatic Sprinkler Co., Inc.
    b. Tyco Fire & Building Products LP
    c. Victaulic Company
    d. Viking Corporation

2. Standard: UL 199.
3. Type: Wire cage with fastening device for attaching to sprinkler.

2.9 ALARM DEVICES

A. Alarm-device types shall match piping and equipment connections.

B. Electrically Operated Alarm Bell:

1. None required; dry sprinkler system shall be alarmed through flow switch of wet sprinkler zone feeding the dry sprinkler system. Dry pipe valve activation shall be notified through building addressable Fire Alarm system.

    a. Fire-Lite Alarms; a Honeywell company

C. Pressure Switches:

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

    a. Potter Electric Signal Company
    b. System Sensor; a Honeywell company

2. Standard: UL 346.
3. Type: Electrically supervised water-flow switch with retard feature.
4. Components: Single-pole, double-throw switch with normally closed contacts.
5. Design Operation: Rising pressure signals water flow.

D. Valve Supervisory Switches:

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

    a. Fire-Lite Alarms; a Honeywell company
    b. Potter Electric Signal Company
    c. System Sensor; a Honeywell company

2. Standard: UL 346.
3. Type: Electrically supervised.
4. Components: Single-pole, double-throw switch with normally closed contacts.
5. Design: Signals that controlled valve is in other than fully open position.

2.10 PRESSURE GAGES

A. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

1. AMETEK, Inc.; U.S. Gauge Division
2. Ashcroft, Inc.
3. Brecco Corporation
4. WIKA Instrument Corporation

B. Standard: UL 393.

C. Dial Size: 3½- to 4½-inch diameter.

D. Pressure Gage Range: 0 to 250 psig minimum.

E. Water System Piping Gage: Include "WATER" or "AIR/WATER" label on dial face.

F. Air and Nitrogen Systems Piping Gages: Include retard feature and "AIR" or "AIR/WATER" label on dial face.

PART 3 - EXECUTION

3.1 PREPARATION

A. Perform fire-hydrant flow test (if required under Article 1.5) according to NFPA 13 and NFPA 291. Use results for system design calculations required in "Quality Assurance" Article.

B. Report test results promptly and in writing.

3.2 PIPING INSTALLATION

A. Locations and Arrangements: Drawing plans, schematics, and diagrams indicate general location and arrangement of piping. Install piping as indicated, as far as practical.

1. Deviations from approved working plans for piping require written approval from authorities having jurisdiction. File written approval with Architect before deviating from approved working plans.

B. Piping Standard: Comply with requirements in NFPA 13 for installation of sprinkler piping.

C. Install seismic restraints on piping. Comply with requirements of the State of Connecticut Building Code and in NFPA 13 (whichever is more stringent) for seismic-restraint device materials and installation.

D. Use listed fittings to make changes in direction, branch takeoffs from mains, and reductions in pipe sizes.

E. Install unions adjacent to each valve in pipes NPS 2 and smaller.

F. Install flanges, flange adapters, or couplings for grooved-end piping on valves, apparatus, and equipment having NPS 2-1/2 and larger end connections.

G. Install Dry Type "Inspector's Test Connection" in most hydraulically remote area of dry pipe sprinkler system piping, complete with shutoff valve, and sized and located according to NFPA 13.

H. Install sprinkler piping with drains for complete system drainage.

I. Install sprinkler piping with venting for complete replacement of compressed air with nitrogen throughout the entire dry-pipe sprinkler system.

J. Install nitrogen generation system in accordance with manufacturer's instructions and best recommendations.

K. Install nitrogen generation system's auto-purge device at hydraulically remote location in the dry-pipe sprinkler system, in accordance with nitrogen generation system manufacturer's best recommendation.

L. Connect nitrogen generation system and compressed-air supplies to dry-pipe sprinkler piping.

M. Connect compressed air system to the following piping and wiring:

1. Pressure gages and controls.
2. Electrical power system.
3. Fire-alarm devices, including low-pressure alarm.

N. Connect nitrogen generation system to the following piping and wiring:

1. Pressure gages and controls.
2. Electrical power system.
3. Fire-alarm devices, including low-pressure alarm (leak detection or compressor trouble).

O. Install alarm devices in piping systems.

P. Install hangers and supports for sprinkler system piping according to NFPA 13. Comply with requirements in NFPA 13 for hanger materials.

Q. Install pressure gages on riser or feed main, and at each sprinkler test connection. Include pressure gages with connection not less than NPS 1/4 and with soft metal seated globe valve, arranged for draining pipe between gage and valve. Install gages to permit removal, and install where they will not be subject to freezing.

R. Drain dry-pipe sprinkler piping.

S. Pressurize and check dry-pipe sprinkler system piping and compressors.

T. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 210517 "Sleeves and Sleeve-Seals for Fire-Suppression Piping."

U. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Section 210517 "Sleeves and Sleeve-Seals for Fire-Suppression Piping."

V. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 210518 "Escutcheons for Fire-Suppression Piping."

3.3 JOINT CONSTRUCTION

A. Install couplings, flanges, flanged fittings, unions, nipples, and transition and special fittings that have finish and pressure ratings same as or higher than system's pressure rating for aboveground applications unless otherwise indicated.

B. Install unions adjacent to each valve in pipes NPS 2 and smaller.

C. Install flanges, flange adapters, or couplings for grooved-end piping on valves, apparatus, and equipment having NPS 2-1/2 and larger end connections.

D. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

E. Remove scale, slag, dirt, and debris from inside and outside of pipes, tubes, and fittings before assembly.

F. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

1. Apply appropriate tape or thread compound to external pipe threads.
2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged.

G. Dissimilar-Material Piping Joints: Make joints using adapters compatible with materials of both piping systems.

3.4 VALVE AND SPECIALTIES INSTALLATION

A. Install listed fire-protection valves, trim and drain valves, specialty valves and trim, controls, and specialties according to NFPA 13 and authorities having jurisdiction.

B. Install listed fire-protection shutoff and control valves supervised open, located to control sources of water supply except from fire-department connections. Install permanent identification signs indicating portion of system controlled by each valve.

C. Specialty Valves:

1. General Requirements: Install in vertical position for proper direction of flow, in main supply to system.
2. Dry-Pipe Valves: Install trim sets for air supply, drain, priming level, alarm connections, ball drip valves, pressure gages, priming chamber attachment, and fill-line attachment.

    a. Install air compressor and compressed-air supply piping.
    b. Air-Pressure Maintenance Package: Install shutoff valves to permit servicing without shutting down sprinkler system; bypass valve for quick system filling; pressure regulator or switch to maintain system pressure; strainer; pressure ratings with 14- to 60-psig adjustable range; and 175-psig maximum inlet pressure.
    c. Install nitrogen generation system and connect to dry-pipe system. Coordinate interface and operation with rest of dry-pipe devices and controls.
    d. Initial system charge may be compressed air. Once the system is charged to design pressure and leak tests indicate the system is virtually leak-free, close the air isolation valve and operate the nitrogen generator to gradually replace the compressed air charge with nitrogen. Comply with NPFA and nitrogen generation equipment manufacturer’s requirements and instructions.

3.5 SPRINKLER INSTALLATION

A. Install sprinklers in suspended ceilings in center of acoustical ceiling panels.

B. Install dry type pendent and sidewall sprinklers in dry pipe sprinklers systems; DO NOT install wet type pendent or sidewall sprinklers in areas subject to freezing. Standard wet type upright sprinklers may be installed in dry pipe sprinkler systems which are properly pitched back to drain or main riser per NFPA 13 requirements.

3.6 IDENTIFICATION

A. Install labeling and pipe markers on equipment and piping according to requirements in NFPA 13.

B. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

3.7 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Tests and Inspections:

1. Leak Test: After installation, charge systems and test for leaks. Repair leaks and retest until no leaks exist.
2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
3. Flush, test, and inspect sprinkler systems according to NFPA 13, "Systems Acceptance" Chapter.
4. Energize circuits to electrical equipment and devices.
5. Start and run air compressors.
6. Start and run nitrogen generators.
7. Follow nitrogen generation system manufacturer’s instructions and best recommendations for system startup and adjustment.
8. Coordinate with fire-alarm tests. Operate as required.

C. Sprinkler piping system will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

3.8 CLEANING

A. Clean dirt and debris from sprinklers.

B. Remove and replace sprinklers with paint other than factory finish.

3.9 DEMONSTRATION

A. Provide 4 hours of training to Owner's maintenance personnel to adjust, operate, and maintain specialty valves.

3.10 PIPING SCHEDULE

A. Refer to Schedule on Drawings.

B. Standard-pressure, normally dry piping systems not charged with ninety-eight percent (98%+) pure nitrogen:

1. Standard-weight galvanized-steel pipe with threaded or roll-grooved ends; galvanized threaded or grooved-end fittings for steel piping; grooved-end-pipe couplings for steel piping; and grooved joints. Repair all damage to galvanizing coating with CRC Zinc-IT, or approved equal, zinc-rich compound (minimum ninety percent (90%) pure zinc) for cold application.

3.11 SPRINKLER SCHEDULE

A. Use Quick Response sprinklers; provide types in subparagraphs below for the following applications:

1. Rooms without Ceilings: Upright sprinklers.
2. Rooms with Suspended Ceilings: Dry recessed pendent sprinklers; standard coverage.
3. Wall Mounting: Dry sidewall sprinklers; standard coverage.

B. Provide types in subparagraphs below with finishes indicated:

1. Dry Recessed Pendent Sprinklers: Bright chrome, with bright chrome escutcheon.
2. Dry Upright, and Dry Sidewall Sprinklers: Chrome plated in small finished rooms; otherwise rough bronze; wax coated where exposed to acids, chemicals, or other corrosive fumes.

END OF SECTION 211316

SECTION 220100 - GENERAL CONDITIONS FOR PLUMBING TRADE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1. General Conditions, Supplementary Conditions and Division 01 paragraphs may be repeated in this Division for emphasis or for inclusion of more stringent/additional related requirements. Such repetition shall not be construed to reduce the requirements of those Divisions nor to eliminate other requirements under those Divisions.

1.2 DESCRIPTION

A. The General Conditions are a part of this Division and are to be considered a part of this Contract.

B. Where items of the General Conditions are repeated in other Sections of the Specifications, it is merely intended to qualify or to call particular attention to them. It is not intended that any other parts of the General Conditions shall be assumed to be omitted if not repeated therein.

C. This Section applies equally and specifically to all Contractors supplying labor and/or equipment and/or materials as required under each Section of Division 22.

D. The following information contains specifications of Work in connection with, and in addition to, this Division:

1. All drawings associated with the project.
2. All specifications associated with the project.

E. Divisions of work responsibilities shall be defined and directed by the Construction Manager.

1.3 INTENT

A. It is the intent of the Specifications and Drawings to call for finished work, tested and ready for operation.

B. Furnish, deliver, and install any apparatus, appliance, material, or Work not shown on Drawings but mentioned in the Specifications, or vice versa, or any incidental accessories necessary to make the Work complete and perfect in all respects and ready for operation, even if not particularly specified, under their respective Section without additional expense to the Owner.

C. Include in the work minor details not usually shown or specified but necessary for proper installation and operation, as though they were hereinafter shown or specified.

D. Provide Engineer written notice of any materials or apparatus believed inadequate or unsuitable; in violation of laws, ordinances, rules, or regulations of authorities having jurisdiction; and any necessary items of Work omitted. In the absence of such written notice, it is mutually agreed that Work under each Section has included the cost of all required items for the accepted, satisfactory functioning of the entire system without extra compensation.

E. The Work indicated is diagrammatic. The Architect and/or Engineer may require as part of this Contract, the relocation of devices to reasonable distances from the general locations shown.

F. Verbal clarifications of the Drawings or Specifications during the bid period are not to be relied upon. Refer any questions or clarifications to the Engineer as indicated in Division 00.

1.4 DRAWINGS

A. Drawings are diagrammatic and indicate the general arrangement of systems and work included in the Contract. (Do not scale the Drawings.) Consult the Architectural Drawings and Details for exact location of fixtures and equipment; where same are not definitely located, obtain this information from the Architect.

B. Closely follow Drawings in layout of Work; check Drawings of other Divisions to verify spaces in which work will be installed. Maintain maximum headroom. Where space conditions appear inadequate, Engineer shall be notified before proceeding with installations.

C. Engineer may, without extra charge, make reasonable modifications in the layout as needed to prevent conflict with work of other trades and/or for proper execution of the work.

D. Where variances occur between the Drawings and Specifications or within either of the Documents, include the item or arrangement of better quality, greater quantity, or higher cost in the Contract price. The Engineer shall decide on the item and the manner in which the work shall be installed.

1.5 SURVEYS AND MEASUREMENTS

A. Before submitting a Bid, the Contractor shall visit the site and shall become thoroughly familiar with all conditions under which the work will be installed. Contractor will be held responsible for any assumptions, omissions, or errors made as a result of failure to become familiar with the site and the Contract Documents.

B. Base all measurements, both horizontal and vertical, from established benchmarks. All Work shall agree with these established lines and levels. Verify all measurements at the site and check the correctness of same as related to the Work.

C. Should the Contractor discover any discrepancies between actual measurements and those indicated which prevent following good practice or the intent of the Drawings and Specifications, notify the Engineer do not proceed with that Work until instructions have been received from the Engineer.

1.6 CODES AND STANDARDS

A. The Codes and Standards listed below apply to all Work. Where Codes or Standards are mentioned in these Specifications, follow the latest edition or revision.

B. The current adopted editions of the following State or local Codes apply:

2022 State of Connecticut Building Code / 2021 IBC with CT Amendments
2022 State of Connecticut fire Safety Code / 2021 IFC with CT Amendments
2022 International Existing Building Code (including CT Amendments)
2022 International Mechanical Code (including CT Amendments)
2022 International Plumbing Code (including CT Amendments)
2022 International Energy Conservation Code (including CT Amendments)
2022 National Electric Code (NFPA 70 / 2020 CT Amendments)

2017 ICC/ANSI A117.1 Accessible and Usable Buildings and Facilities
2015 International Plumbing Code and referenced publications
NFPA 54/2021, National Fuel Gas Code
NFPA 72/2019, National Fire Alarm Code
AWWA Standards
Factory Mutual Approval Guide: latest edition.
Pipe Hangers and Supports: MSS SP-58.
UL Compliance.
Local Building Code

2018 Connecticut State Building Code (CSBC) including portions of the 2015 International Building Code
2018 Connecticut State Fire Code
2018 Connecticut State Fire Safety Code including portions of the 2015 International Fire Code (CSFSC)
2015 NFPA 101 Life Safety Code (NFPA101)
2015 Connecticut Fire Prevention Code (CFPC)
2015 NFPA 1 Fire Code (NFPA101)
2015 International Plumbing Code and referenced publications
2015 International Mechanical Code and referenced publications NFPA 54/2015, National Fuel Gas Code
NFPA 70/2017, National Electrical Code
NFPA 72/2013, National Fire Alarm Code
AWWA Standards
Factory Mutual Approval Guide: latest edition.
Pipe Hangers and Supports: MSS SP-58.
UL Compliance.
The American National Standards Institute (ANSI) A117.1/2009
Local Building Code

C. The following Standards shall be used where referenced by the following abbreviations:

AABC Associated Air Balance Council
ACGIH American Conference of Governmental Industrial Hygienists
ADC Air Diffusion Council
AGA American Gas Association
AIA American Institute of Architects
AMCA Air Moving and Conditioning Association
ANSI American National Standards Institute
API American Petroleum Institute
ARI Air Conditioning and Refrigeration Institute
ASE Association of Safety Engineers
ASHRAE American Society of Heating, Refrigerating and Air Conditioning Engineers
ASME American Society of Mechanical Engineers
ASPE American Society of Plumbing Engineers
ASTM American Society of Testing and Materials
AWS American Welding Society
AWWA American Water Works Association
CGA Compressed Gas Association
CSA Canadian Standards Association
CISPI Cast Iron Soil Pipe Institute
EJMA Expansion Joint Manufacturing Association
EPA Environmental Protection Agency
FM Factory Mutual Insurance Association

FSSC Federal Specification
HIS Hydraulic Institute Standards
IBR Institute of Boiler and Radiator Manufacturers
IEEE Institute of Electrical and Electronics Engineers
IRI Industrial Risk Insurers
ISO Insurance Services Office
MCAA Mechanical Contractors Association of America
MSS Manufacturers Standardization Society
NBS National Bureau of Standards
NEBB National Environmental Balancing Bureau
NEMA National Electrical Manufacturers Association
NFPA National Fire Protection Association
NOFI National Oil Fuel Institute
NRC National Research Council
NSC National Safety Council
NSF National Sanitation Foundation
OSHA Occupational Safety and Health Administration
PDI Plumbing and Drainage Institute
SAMA Scientific Apparatus Manufacturers Association
SBI Steel Boiler Industry (Division of Hydronics Institute)
SMACNA Sheet Metal and Air Conditioning Contractors National Association
STI Steel Tank Institute
UL Underwriters' Laboratories

D. All materials furnished and all work installed shall comply with the rules and recommendations of the NFPA, the requirements of the local utility companies, the recommendations of the fire insurance rating organization having jurisdiction, and the requirements of all Governmental departments having jurisdiction.

E. Include in the Work, without extra cost to the Owner, any labor, materials, services, apparatus, and Drawings in order to comply with all applicable laws, ordinances, rules, and regulations, whether or not shown on Drawings and/or specified.

1.7 PERMITS AND FEES

A. Give all necessary notices, obtain all permits; pay all Government and State sales taxes and fees where applicable, and other costs, including utility connections or extensions in connection with the Work. File all necessary Drawings, prepare all Documents and obtain all necessary approvals of all Governmental and State departments having jurisdiction, obtain all required certificates of inspections for Work, and deliver a copy to the Engineer before request for acceptance and final payment for the Work.

1.8 SEISMIC RESTRAINT

A. General: This project is in a seismic zone per State and/or Local Codes and Ordinances and all materials and equipment shall be installed, supported, and seismically restrained accordingly. Verify current seismic requirements based on project location and with Code requirements.

B. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in the jurisdiction where the Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of vibration isolation bases and seismic restraints that are similar to those required for this Project in material, design, and extent.

C. Shop Drawings: Show designs and calculations, certified by a professional engineer, for the following:

1. Design Calculations: Calculations for selection of vibration isolators, design of vibration isolation bases, design of seismic supports, and selection of seismic restraints for all equipment and materials.
2. Vibration Isolation Base Details: Detail fabrication, including anchorages and attachments to the structure and to the supported equipment. Include auxiliary motor slides and rails, and base weights.
3. Seismic Restraint Details: Detail fabrication and attachment of restraints, supports, and snubbers.

D. Installation: Installation shall be carried out in strict accordance with the Seismic Engineer's submittal, current Code, accepted standards, and the equipment and material manufacturers' recommendations.

1.9 COORDINATION

A. Carry out all work in conjunction with other trades and give full cooperation in order that all Work may proceed with a minimum of delay and interference. Particular emphasis is placed on timely installation of major apparatus and furnishing other Contractors, especially the General Contractor or Construction Manager, with information as to openings, chases, sleeves, bases, inserts, equipment locations, panels, access doors, etc. required by other trades.

B. Contractors are required to examine all the Project Drawings and mutually arrange Work so as to avoid interference. In general, ductwork, heating piping, sprinkler piping, and drainage lines take precedence over water, gas, and electrical conduits. The Engineer regarding the arrangement of Work, which cannot be agreed upon by the Contractors, will make final decisions.

C. Where the Work of the Contractor will be installed in close proximity to or will interfere with Work of other trades, assist in working out space conditions to make a satisfactory adjustment.

D. If Work is installed before coordinating with other Divisions or so as to cause interference with Work of other Sections, the Contractor causing the interference will make necessary changes to correct the condition without extra charge to the Owner.

E. Initial contact and coordination have been conducted with utility entities for the purpose of the preparation of Bid Documents. The Contractor shall coordinate all final specific utility requirements.

1.10 ACCEPTANCES

A. The equipment, materials, Workmanship, design, and arrangement of all Work installed are subject to the review of the Engineer.

B. Within thirty (30) days after the awarding of a Contract, submit to the Engineer for review a list of manufacturers of equipment proposed for the Work. The intent to use the exact makes specified does not relieve the Contractor of the responsibility of submitting such a list.

1. If extensive or unacceptable delivery time is expected on a particular item of equipment specified, notify the Engineer, in writing, within thirty (30) days of the awarding of the Contract. In such instances, deviations may be made pending acceptance by the Engineer or the Owner's representative.

C. Where any specific material, process, or method of construction or manufactured article is specified by reference to the catalog or model number of a manufacturer, the Specifications are to be used as a guide and are not intended to take precedence over the basic duty and

performance specified or noted on the Drawings. In all cases, verify the duty specified with the specific characteristics of the equipment offered for review. Equipment characteristics are to be used as mandatory requirements where the Contractor proposes to use an acceptable equivalent.

D. If material or equipment is installed before shop drawing review, liability for its removal and replacement is assumed by the Contractor, at no extra charge to the Owner, if, in the opinion of the Engineer, the material or equipment does not meet the intent of the Drawings and Specifications.

E. Failure on the part of the Engineer to reject shop drawings or to reject Work in progress shall not be interpreted as acceptance of Work not in conformance with the Drawings and/or Specifications. Correct Work not in conformance with the Drawings and/or Specifications whenever non-conformance is discovered.

1.11 EQUIPMENT DEVIATIONS

A. Refer to Section 016000 “Product Requirements”. Where the Contractor proposes to deviate (substitute or provide an equivalent) from the equipment or materials as hereinafter specified, he shall do so by making a request in writing. The Contractor shall state in his request whether it is a substitution or an equivalent to that specified and the amount of credit or extra cost involved. A copy of said request shall be included in the Base Bid with manufacturer's equipment cuts. The Base Bid shall be based on using the materials and equipment as specified and scheduled with no exceptions. Equipment Manufacturers Scheduled on Drawings are considered Base Bid and any other acceptable manufacturers listed in the specifications is considered a substitution and equipment deviation and subject to the requirements for equipment substitution and deviation. When any alternate manufacturer does not qualify acceptable, as determined by the Engineer, provide the Base Bid manufacturer at no additional cost to Owner.

B. In these Specifications and on the accompanying Drawings, one (1) or more makes of materials, apparatus, or appliances may have been specified for use in this installation. This has been done for convenience in fixing the standard of workmanship, finish, and design required for installation. In the event that only one (1) manufacturer of a product is specified, and it is found that the manufacturer has discontinued the product, the Contractor shall use an acceptable equivalent product that meets the requirements of an equivalent product, as noted below, and has all the features of the originally specified product. The details of workmanship, finish, and design, and the guaranteed performance of any material, apparatus, or appliance which the Contractor desires to deviate for those mentioned herein shall also conform to these standards.

C. Where no specific make of material, apparatus, or appliance is mentioned, any first-class product made by a reputable manufacturer may be submitted for the Engineer's review.

D. Where two (2) or more names are given as equivalents, the Contractor must use the specified item or one (1) of the named equivalents. Where one (1) name only is used and is followed by the words "or acceptable equivalent", the Contractor must use the item named or he may apply for an equipment deviation through the prescribed manner in accordance with this Specification.

E. Equipment, material, or devices submitted for review as an "accepted equivalent" shall meet the following requirements:

1. The equivalent shall have the same construction features such as, but not limited to:

a. Material thickness, gauge, weight, density, etc.

b. Welded, riveted, bolted, etc., construction.
c. Finish, undercoatings, corrosion protection.

2. The equivalent shall perform with the same or better operating efficiency.
3. The equivalent shall have equal or greater reserve capacity.
4. The equivalent shall be locally represented by the manufacturer for service, parts, and technical information.
5. The equivalent shall bear the same labels of performance certification as is applicable to the specified item, such as AMCA or ARI labels.

F. Where the Contractor proposes to use an item of equipment other than specified or detailed on the Drawings which requires any redesign of the structure, partitions, foundations, piping, wiring, or any other part of the mechanical, electrical, or architectural layout, all such redesign and all new drawings and detailing required therefore shall be prepared by the Designers of Record at the expense of the Contractor and at no additional cost to the Owner.

G. Where such accepted deviation or substitution requires a different quantity and arrangement of piping, ductwork, valves, pumps, insulation, wiring, conduit, and equipment from that specified or indicated on the Drawings, the Contractor shall, with the acceptance by the Engineer, furnish and install any such additional equipment required by the system at no additional cost to the Owner, including any costs added to other trades due to the substitution.

H. The Engineer shall determine if an "accepted equivalent" to a manufacturer listed in the Specifications is considered acceptable.

1.12 SHOP DRAWINGS

A. Refer to individual specification sections for additional submittal information.

B. All plumbing submittals shall be submitted in a single package. “Piece-Meal” or “Partial” submittals will not be accepted, and will be rejected and returned without review, unless prior approval from the Engineer has been obtained. NO EXCEPTIONS.

1. Submittals shall be provided in an expandable, 3-ring, hard cover binder, labeled with the Project information. The submittals for the entire Fire Protection Division 21 Sections shall be submitted at the same time, not “section-by-section.”
2. Each section within the binder shall be tabbed, by plumbing specification section, and include al materials specified in that section.
3. Two (2) full and complete companies of the binders shall be provided for preliminary review. Upon review, the engineer will retain one (1) copy and the other copy will returned to the Contractors, for distribution to the subcontractors. The second review shall include the total number of copies of the binders as required by Division 01.
4. The two (2) copies for preliminary review shall be submitted within ninety (90) days of execution of the Contract.
5. An index shall be provided indicating:

a. A complete shop drawing log depicting ALL submittals to be provided for the Division, whether included in the full package or not. Log shall be updated to reflect the submittals provided.
b. Specification section.
c. Product.
d. Plan code.
e. Supplier, Manufacturer, Model Number, Contact List, etc.

C. Plumbing long lead items are excluded from requirement but must be submitted complete in their entirety by specification section, when provided.

D. The Contractor shall submit for review detailed shop drawings of all equipment and material specified in each section and coordinated ductwork layouts. No material or equipment may be delivered to the job site or installed until the Contractor has received shop drawings for the particular material or equipment which have been properly reviewed.

E. Shop drawings shall be submitted within sixty (60) days after award of Contract before any material or equipment is purchased. The Contractor shall submit for review copies of all shop drawings to be incorporated in the Contract. Refer to the General Conditions for the quantity of copies required for submission. Where quantities are not specified, provide seven (7) copies for review.

F. Provide shop drawings for all devices specified under equipment specifications for all systems, materials, equipment, and/or devices. Shop drawings shall include manufacturers' names, catalog numbers, cuts, diagrams, and other such descriptive data as may be required to identify and accept the equipment. A complete list in each category (example: all fixtures) of all shop drawings, catalog cuts, material lists, etc., shall be submitted to the Engineer at one (1) time. No consideration will be given to a partial shop drawing submittal.

1. Equipment shop drawings shall contain full range performance curves, graphs, tables, or other pertinent data which clearly indicates operational range of a given unit size. Computer generated/plotted curves, based solely on design performance, will not be accepted.
2. All specific options and/or alternatives shall be clearly indicated. Failure to do so shall be grounds for rejection.

G. Submittals shall be marked with the trade involved, i.e., HVAC, plumbing, fire protection, etc. and the specific associated specification section.

H. Where multiple quantities or types of equipment are being submitted, provide a cover sheet (with a list of contents) on the submittal identifying the equipment or material being submitted.

I. Failure to submit shop drawings in ample time for review shall not entitle the Contractor to an extension of Contract time. No claim for extension by reason of such default will be allowed, nor shall the Contractor be entitled to purchase, furnish, and/or install equipment which has not been reviewed by the Engineer. The Contractor shall incur all costs associated with delay of construction due to equipment and/or materials arriving late due to late or improper shop drawing submittal.

J. The Contractor shall furnish all necessary templates, patterns, etc., for installation work and for the purpose of making adjoining work conform; furnish setting plans and shop details to other trades as required.

K. Acceptance rendered on shop drawings shall not be considered as a guarantee of measurements or building conditions. Where drawings are reviewed, review does not indicate that drawings have been checked in detail; said approval does not in any way relieve the Contractor from his responsibility or necessity of furnishing material or performing work as required by the Contract Drawings and Specifications. Verify available space prior to submitting shop drawings.

L. Acceptance of shop drawings shall not apply to quantity nor relieve Contractor of his responsibility to comply with intent of Drawings and Specifications.

M. Acceptance of shop drawings is final and no further changes will be allowed without the written consent of the Engineer.

N. Shop drawing submittal sheets which may show items that are not being furnished shall have those items crossed off to clearly indicate which items will be furnished.

O. Contractor shall make any corrections required by Engineer and shall resubmit required number of corrected copies of shop drawings or new samples until accepted. Contractor shall direct specific attention in writing or on resubmitted shop drawings to revisions other than corrections requested by Engineer on previous submissions. Engineer shall review no more than one (1) resubmittal of any shop drawing or sample at Owner's expense. The fees for review of additional resubmittals shall be paid by the Contractor at the Engineer's standard rates.

P. Conform the plumbing work to the requirements herein. Provide offsets, fittings, drains, and accessories which may be required to accommodate structural, HVAC, plumbing, existing conditions, etc. Investigate the structural and finish conditions affecting the work and arrange the work accordingly. Provide such piping, fittings, valves, and accessories as may be required to meet such conditions.

1.13 CHANGES IN WORK

A. Change Order is a written order to the Contractor signed by the Owner and the Architect, issued after Contracts have been awarded, authorizing a change in the work or an adjustment in the Contract sum or the Contract time. A Change Order signed by the Contractor indicates his agreement therewith, including the adjustment in the Contract sum or the Contract time.

B. All changes in the work shall follow the recommendations of the AIA "General Conditions of the Contract for Construction", Article 7.

1.14 MANUFACTURER'S IDENTIFICATION

A. All component parts of each item of equipment or device shall bear the manufacturer's nameplate giving name of manufacturer, description, size, type, serial and model number, electrical characteristics, etc., in order to facilitate maintenance or replacement. The nameplate of a Contractor or distributor will not be acceptable.

B. All material and equipment for the electrical portion of the mechanical systems shall bear the label of or be listed by UL, or other accredited authoritative agencies or testing organizations approved by the authority having jurisdiction.

1.15 RECORD DRAWINGS

A. Maintain at the job site a record set of Mechanical Drawings on which any changes in location or routing of all equipment, materials and access panels shall be recorded.

B. At the end of construction, the Contractor shall provide the Owner with a complete set of As-Built Drawings, including all updated coordination drawings, ductwork, and piping plans. Prepare As-Built documentation utilizing the most recent version of AutoCAD. Provide the Owner with a "CD ROM" disk and one (1) set of reproducible mylar documents.

C. If electronic copies of the contract documents are made available to the Contractor for use in production of As-Built documentation, the Contractor assumes responsibility for completeness and accuracy of the As-Built documents. Translation or manipulation of electronic documents provided to the Contractor is the responsibility of the Contractor.

1.16 MATERIALS AND WORKMANSHIP

A. All materials and apparatus required for the work, except as otherwise specifically indicated, shall be new, of first-class quality, and shall be furnished, delivered, erected, connected, and finished in every detail and be so selected and arranged as to fit properly into the building spaces. Where no specific type or quality of material is given, a first-class standard article as accepted by industry standards shall be furnished.

B. The Contractor shall furnish the services of an experienced superintendent who shall be constantly in charge of the installation of the work together with all skilled workmen, fitters, metal workers, welders, helpers, and laborers required to unload, transfer, erect, connect, adjust, start, operate, and test each system.

C. Unless otherwise specifically indicated on the Drawings or Specifications, all equipment and materials shall be installed with the acceptance of the Engineer and in accordance with the recommendations of the manufacturer. This includes the performance of such tests as the manufacturer recommends.

D. All labor for installation of mechanical systems shall be performed by experienced, skilled tradesmen under the supervision of a licensed journeyman foreman. All work shall be of a quality consistent with good trade practice and shall be installed in a neat, workmanlike manner. The Engineer reserves the right to reject any work which, in his opinion, has been installed in a substandard, dangerous, or unserviceable manner. The Contractor shall replace said work in a satisfactory manner at no extra cost to the Owner.

1.17 PROTECTION OF MATERIALS AND EQUIPMENT

A. Work under each Section shall include protecting the work and material of all other Sections from damage by work or workmen and shall include making good all damage thus caused.

B. The Contractor shall be responsible for work and equipment until the facility has been accepted by the Owner. Protect work against theft, injury, or damage and carefully store material and equipment received on site which is not immediately installed. Close open ends of work with temporary covers or plugs during construction to prevent entry of foreign material.

C. Work under each Section includes receiving, unloading, uncrating, storing, protecting, setting in place, and completely connecting equipment supplied under each Section. Work under each Section shall also include exercising special care in handling and protecting equipment and fixtures and shall include the cost of replacing any of the equipment and fixtures which are missing or damaged.

D. Equipment and material stored on the job site shall be protected from the weather, vehicles, dirt and/or damage by workmen or machinery. Ensure that all electrical or absorbent equipment or material is protected from moisture during storage.

1.18 BASES AND SUPPORTS

A. Unless otherwise specifically noted, the Contractor shall furnish all necessary supports, rails, framing, bases, and piers required for all equipment furnished under this Division.

B. Unless otherwise indicated in individual trade Sections, pumps, fans, air handlers, boilers, chillers, tanks, compressors, and other rotating machinery shall be mounted on a minimum of 4-inch-high concrete pads which shall be furnished and installed per Division 03. All pads shall be extended not less than 4 inches beyond machine base in all directions and sufficient for seismic anchoring with top edge chamfered. Shop drawings of all foundations and pads shall be

submitted to the Engineer for review before they are constructed. The Mechanical Contractor shall field coordinate all required dimensional and necessary loading information.

C. Construction of foundations, supports, pads, bases, and piers where mounted on the floor shall be of the same finish quality as the adjacent and surrounding flooring material.

D. Unless otherwise shown, all equipment shall be securely attached to the building structure in an acceptable manner. Attachments shall be of a strong and durable nature; any attachments that are insufficient, in the opinion of the Engineer, shall be replaced as directed without extra cost to the Owner.

E. All equipment supports shall be designed and constructed such that the equipment will be capable of resisting both vertical and horizontal movement. The equipment shall be positively anchored to the bases or supports to resist vertical movement. The equipment and its supports shall be provided with suitable restraints to resist horizontal movement from any direction as dictated by applicable seismic Codes.

1.19 SLEEVES, INSERTS, AND ANCHOR BOLTS

A. The Contractor shall provide, set in place, and be held responsible for the location of all sleeves, inserts, and anchor bolts required for the work. In the event that failure to do so requires cutting and patching of finished work, it shall be done at the Contractor's expense.

1. It is the responsibility of the Contractor to furnish cast-in-place sleeves, inserts, and anchors in sufficient time to be installed during initial concrete pours. Where job schedules make this impossible, coordinate and obtain acceptance from the Structural Engineer for alternate installation methods.

B. All pipes and conduits passing through floors, walls or partitions shall be provided with sleeves having an inside diameter 1-inch larger than the outside diameter of the pipe, conduit, or insulation enclosing the pipe.

C. Penetrations through fire-rated walls, ceilings, and all floors (except slab on grade) in which piping or ducts pass shall be filled solidly with acceptable firestopping material.

D. When ducts, piping, or conduit penetrate the floor of a mechanical room located above an occupied space, such penetrations shall be made completely watertight, such that a liquid leak shall not pass through the penetration.

1.20 FIRESTOPS AND SEALS

A. Refer to Section 078413 “Penetration Firestopping” for additional and more specific information and ASTM E 814 and F&T Ratings.

B. Firestopping systems shall be submitted as shop drawing.

C. Penetrations through fire-rated walls, ceiling, or floors shall be sealed with a UL approved firestop fitting classified for an hourly rating equivalent to the fire rating of the wall, ceiling, or floor.

D. Through wall and floor seals shall be used to provide a positive means of sealing pipes or ducts which pass through the concrete foundation of a structure below grade or below ground water level. Seals shall also be used at entry points through concrete walls or floors which must be sealed.

E. All piping and conduit penetrations through the roof shall be provided with Pate Type PCA pipe curb assemblies or acceptable equivalent. Coordinate installation details with the roofing system being used for the project.

1.21 CUTTING AND PATCHING

A. All cutting and patching shall be done per Division 01 requirements. The Contractor shall furnish sketches showing the location and sizes of all openings, chases, etc., required for the installation of work.

B. Work under this Division shall include furnishing, locating, and setting inserts and/or sleeves required before the floors and walls are built or be responsible for cutting, drilling, or chopping where sleeves and inserts were not installed or correctly located. The Contractor shall do all drilling required for the installation of hangers.

C. Exercise extreme caution when core drilling or punching openings in concrete floor slabs in order to avoid cutting or damaging structural members. No structural members or structural slabs/floors shall be cut without the written acceptance of the Structural Engineer and all such cutting shall be done in a manner directed by him.

1.22 SCAFFOLDING, RIGGING, HOISTING

A. The Contractor shall furnish all scaffolding, rigging, hoisting, and services necessary for erection and delivery into the premises any equipment and apparatus furnished under this Division. Remove same from premises when no longer required.

1.23 EXCAVATION AND BACKFILLING

A. Excavation and backfilling shall be done per Division 31 of the Specifications.

B. It is the responsibility of the Contractor to coordinate sizes, depths, fill, and bedding requirements and any other excavation work required under this Division.

1.24 WATERPROOFING

A. Where any work pierces waterproofing, including waterproof concrete and floors in wet areas, the method of installation shall be reviewed by the Engineer before work is done. The Contractor shall furnish all necessary sleeves, caulking, and flashing required to make openings absolutely watertight.

1.25 ACCESSIBILITY AND ACCESS PANELS

A. The Contractor shall be responsible for the sufficiency of the size of shafts and chases, the adequate thickness of partitions, and the adequate clearance in double partitions and hung ceilings for the proper installation of the work.

B. Locate all equipment which must be serviced, operated, or maintained in fully accessible positions. Equipment shall include, but not be limited to motors, controllers, coil, valves, switchgear, drain points, etc. Access doors shall be furnished if required for better accessibility. Minor deviations from the Drawings may be made to allow better accessibility, but changes of magnitude or which involve extra cost shall not be made without the acceptance of the Engineer.

C. Access doors in walls, ceilings, floors, etc., shall be field coordinated. It is the responsibility of the Contractor to coordinate and provide information regarding the sizes and quantities of

access doors required for his work. The Contractor shall arrange his work in such a manner as to minimize the quantity of access doors required, such as grouping shutoff valves in the same area. Where possible, locate valves in already accessible areas, such as lay-in ceilings, etc.

D. On a clean set of prints, the Contractor shall mark in red pencil the location of each required access door, including its size and fire rating (if any), and shall submit the print to the Architect for review before access doors are purchased or installed.

E. Upon completion of the Project, the Contractor shall physically demonstrate that all equipment and devices installed have been located and/or provided with adequate access panels for repair, maintenance and/or operation. Any equipment not so furnished shall be relocated or provided with additional access panels by the installing Contractor at no additional cost to the Owner.

F. Permanent ladders for access to equipment when shown on Plans shall be furnished and installed. Coordinate exact requirements in field.

1.26 TEMPORARY OPENINGS

A. The Contractor shall ascertain from an examination of the Drawings whether any special temporary openings in the building will be required for the admission of apparatus provided under this Division and shall coordinate the requirements accordingly. In the event of failure of the Contractor to give sufficient notice in time to arrange for these openings during construction, the Contractor shall assume all costs of providing such openings thereafter.

1.27 SHUTDOWNS

A. When installation of a new system requires the temporary shutdown of an existing operating system, the connection of the new system shall be performed at such time as designated by the Owner's representative.

B. The Engineer and the Owner shall be notified of the estimated duration of the shutdown period at least ten (10) days in advance of the date the work is to be performed.

C. Work shall be arranged for continuous performance whenever possible. The Contractor shall provide all necessary labor, including overtime if required, to assure that existing operating services will be shut down only during the time actually required to make necessary connections.

1.28 TAGS AND CHARTS

A. Each valve and piece of apparatus under this Division shall be provided with suitable brass or laminated plastic tags and ceiling tag securely fastened with brass chains, screws, or rivets. Equipment shall be numbered with laminated plastic tags or neatly stenciled letters 2 inches high using designations in equipment schedules and/or shall conform to a directory indicating number, location, and use of each item. Directories shall be prepared under each Section and shall be glass framed.

1. Directory shall indicate valve tag number and the unit number, floor/area branch line, main line, service, or other pertinent data to quickly and easily identify the valve’s purpose.

1.29 ESCUTCHEONS

A. The Contractor shall provide escutcheons on pipes wherever they pass through floors, ceilings, walls, or partitions in finished visible locations. See Section 078413 “Penetration Firestopping” for further requirements.

1.30 PAINTING

A. All finish painting in completed areas shall be performed per Division 09 of the Specifications.

B. All materials shipped to the job site under this Division, such as grilles, registers, and/or radiation covers, shall have standard manufacturer's finish, unless otherwise specified.

C. The Contractor shall paint the interior of all ducts wherever the interior of the duct can be seen through a register or louver. Paint shall be flat black, rust preventative type.

D. The Contractor shall paint conduits, pipe, and equipment wherever it can be seen through a register or louver. Paint shall not cover-up labels and other identifying items. Paint shall be flat black, rust preventative type.

E. All uninsulated outdoor piping and fittings shall be properly primed with zinc-rich primer and finished with a minimum of two (2) coats of high-grade exterior enamel.

1.31 PIPE EXPANSION

A. All pipe connections shall be installed to allow for freedom of movement of the piping during expansion and contraction without springing. Provide engineered design, layout, details, and fabrication, submitted with registered professional engineer sign and seal, of swing joints, expansion loops, and expansion joints with proper anchors and guides. Pay particular attention to plastic piping with high coefficients of expansion.

1. Consideration of required seismic lateral restraints shall be given when anchoring piping and making provision for expansion.

1.32 ELECTRICAL CONNECTIONS

A. Unless otherwise specified, all wiring shall be furnished and installed per Division 26 Specifications.

B. The Contractor furnishing equipment shall furnish the motor controller required for the equipment. Provide properly sized overload heaters and all required accessories with all motor controllers. See Division 26 for motor controller requirements.

C. All power wiring shall be furnished and installed per Division 26 complete from power source to motor or equipment junction box including power wiring through the motor controller and proper means of disconnect per NEC and Division 26. The Division 26 Contractor shall provide all disconnects, unless noted otherwise.

1.33 QUIET OPERATION

A. Equipment and material used in the various systems described herein shall not produce a sound level greater than 55 decibels in the area served. If noise level is deemed objectionable by the Owner/Engineer, the Contractor shall test and record sound levels in the presence of the Owner/Engineer. The sound level shall be observed on the "A" weighting network of a sound level or sound survey meter. The ASHRAE "Guide and Data Book" provides a means to

determine sound level of mechanical equipment when the total of background plus equipment sound levels exceeds the minimum acceptable equipment sound level.

B. If objectionable noises or vibrations of any magnitude are produced and transmitted to occupied portions of the building by apparatus, piping, ducts, or other parts of the mechanical work, the Contractor shall make such changes or additions as necessary without extra cost to the Owner.

1.34 MAINTENANCE

A. The Contractor shall provide the necessary skilled labor to assure the proper operation and to provide all required current and preventative maintenance for all equipment and controls provided under this Division until final acceptance of the building by the Owner. The Contractor shall not assume acceptance of the building by the Owner until he receives written notification.

B. The Contractor shall receive calls for any and all problems experienced in the operation of the equipment provided under this Division and he shall take steps to immediately correct any deficiencies that may exist.

C. The Contractor shall provide a check list and shall put a copy of it in the boiler or main mechanical room. The check list shall itemize each piece of equipment furnished under his Section.

1. The Contractor shall certify on this check list that he has examined each piece of equipment and that, in his opinion, it is operating as intended by the manufacturer, it has been properly lubricated, and that all necessary current and preventative maintenance has been performed as recommended by the manufacturer and by good and accepted practice.

D. Where normal preventative maintenance for any piece of equipment requires special tools, the Contractor shall furnish the appropriate tools for that piece of equipment (i.e., special filter removal hooks, valve wrenches, etc.).

1.35 LUBRICATION

A. All equipment installed under this Contract having moving parts and requiring lubrication shall be properly lubricated according to manufacturer's recommendations prior to testing and operation. Any such equipment discovered to have been operated before lubrication by the Contractor is subject to rejection and replacement at no additional cost to the Owner. Units furnished with sealed bearings are exempted.

B. The Contractor shall furnish and install, as appropriate on all equipment requiring lubrication, Zerk pressure gun grease fittings or sight gravity-feed oilers equipped with shutoff and needle valve adjustment. Units furnished with sealed bearings and lifetime lubrication are exempted. All fittings and oilers are to be fully accessible for lubrication with equipment which does not require special adapters. Where fittings would be otherwise inaccessible, furnish and install extended grease lines.

1.36 CLEANING

A. The Contractor shall be responsible for keeping the jobsite clean, safe, and neat throughout the duration of construction. The Contractor shall clean up his own debris daily and shall coordinate removal of rubbish and debris with the General Contractor/Construction Manager.

1. No debris, construction materials, cigarette butts, coffee cups, etc., shall be left above suspended ceilings.

B. The Contractor shall thoroughly clean and flush all piping and equipment of all foreign substances, oils, burrs, solder, flux, etc., inside and out before being placed in operation.

C. If any part of a system should be stopped or damaged by any foreign matter after being placed in operation, the system shall be disconnected, cleaned, and reconnected wherever necessary to locate and/or remove obstructions. Any work damaged in the course of removing obstructions shall be repaired or replaced when the system is reconnected at no additional cost to the Owner.

D. During the course of construction, all ducts and pipes shall be capped in an acceptable manner to insure adequate protection against the entrance of foreign matter.

E. Upon completion of all work under the Contract, the Contractor shall remove from the premises all rubbish, debris, and excess materials left over from his work. Any oil or grease stains on floor areas caused by the Contractor shall be removed and floor areas left clean.

1.37 OPERATING INSTRUCTIONS

A. Upon completion of all work and tests, the Contractor shall furnish the necessary skilled labor and helpers for operating his system and equipment for a period specified under each applicable Section of this Division. During this period, he shall fully instruct the Owner or the Owner's representative in the operation, adjustment, and maintenance of all equipment furnished. The Contractor shall give at least 72 hours’ notice to the Owner and the Engineer in advance of this period.

B. The Contractor shall formally submit for delivery to the Engineer three (3) complete bound sets of typewritten or blueprinted instructions for operating and maintaining all systems and equipment included in this Division. All instructions shall be submitted in draft for review prior to final issue. Manufacturer's advertising literature or catalogs will not be acceptable for operating and maintenance instruction.

C. The Contractor, in the above-mentioned instructions, shall include the maintenance schedule for the principal items of equipment furnished under this Division.

D. The appropriate Contractor shall physically demonstrate procedures for all routine maintenance of all equipment furnished under each respective Section to assure accessibility to all devices.

E. An authorized manufacturer's representative shall attest in writing that the equipment has been properly installed prior to startup of any major equipment. The following equipment will require this inspection: pumps; air conditioning equipment, controls, air handling equipment, boilers. These letters will be bound into the operating and maintenance books.

F. Refer to individual trade Sections for any other particular requirements related to operating instructions.

1.38 ADJUSTING AND TESTING

A. After all the equipment and accessories to be furnished are in place, they shall be put in final adjustment and subjected to such operating tests so as to assure the Engineer that they are in proper adjustment and in satisfactory, permanent operating condition.

B. Where requested by the Engineer, a factory-trained service engineering representative shall inspect the installation and assist in the initial startup and adjustment to the equipment. The period of these services shall be for such time as necessary to secure proper installation and adjustments. After the equipment is placed in permanent operation, the service engineering

representative shall supervise the initial operation of the equipment and instruct the personnel responsible for operation and maintenance of the equipment. The service engineering representative shall notify the Contractor in writing that the equipment was installed according to manufacturer's recommendations and is operating as intended by the manufacturer.

1.39 GUARANTEES

A. The Contractor shall guarantee all equipment, material, and workmanship under these Specifications and the Contract for a period of one (1) year from the date of final acceptance by Owner, unless otherwise noted.

B. During this guarantee period, all defects developing through faulty equipment, materials, or workmanship shall be corrected or replaced immediately by the Contractor without expense to the Owner. Such repairs or replacements shall be made to the Engineer's satisfaction.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 220100

SECTION 220513 - COMMON MOTOR REQUIREMENTS FOR PLUMBING EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes general requirements for single-phase and polyphase, general-purpose, horizontal, small and medium, squirrel-cage induction motors for use on ac power systems up to 600 V and installed at equipment manufacturer's factory or shipped separately by equipment manufacturer for field installation.

1.3 COORDINATION

A. Coordinate features of motors, installed units, and accessory devices to be compatible with the following:

1. Motor controllers.
2. Torque, speed, and horsepower requirements of the load.
3. Ratings and characteristics of supply circuit and required control sequence.
4. Ambient and environmental conditions of installation location.

PART 2 - PRODUCTS

2.1 GENERAL MOTOR REQUIREMENTS

A. Comply with NEMA MG 1 unless otherwise indicated.

B. Comply with IEEE 841 for severe-duty motors.

2.2 MOTOR CHARACTERISTICS

A. Duty: Continuous duty at ambient temperature of 100 deg F and at altitude of 3300 feet above sea level.

B. Capacity and Torque Characteristics: Sufficient to start, accelerate, and operate connected loads at designated speeds, at installed altitude and environment, with indicated operating sequence, and without exceeding nameplate ratings or considering service factor.

2.3 POLYPHASE MOTORS

A. Description: NEMA MG 1, Design B, medium induction motor.

B. Efficiency: Energy efficient, as defined in NEMA MG 1.

C. Service Factor: 1.15.

D. Multispeed Motors: Variable torque.

1. For motors with 2:1 speed ratio, consequent pole, single winding.
2. For motors with other than 2:1 speed ratio, separate winding for each speed.

E. Multispeed Motors: Separate winding for each speed.

F. Rotor: Random-wound, squirrel cage.

G. Bearings: Regreasable, shielded, antifriction ball bearings suitable for radial and thrust loading.

H. Temperature Rise: Match insulation rating.

I. Insulation: Class F.

J. Code Letter Designation:

1. Motors 15 HP and Larger: NEMA starting Code F or Code G.
2. Motors Smaller than 15 HP: Manufacturer's standard starting characteristic.

K. Enclosure Material: Cast iron for motor frame sizes 324T and larger; rolled steel for motor frame sizes smaller than 324T.

2.4 POLYPHASE MOTORS WITH ADDITIONAL REQUIREMENTS

A. Motors Used with Reduced-Voltage and Multispeed Controllers: Match wiring connection requirements for controller with required motor leads. Provide terminals in motor terminal box, suited to control method.

B. Motors Used with Variable Frequency Controllers: Ratings, characteristics, and features coordinated with and approved by controller manufacturer.

1. Windings: Copper magnet wire with moisture-resistant insulation varnish, designed and tested to resist transient spikes, high frequencies, and short time rise pulses produced by pulse-width modulated inverters.
2. Energy- and Premium-Efficient Motors: Class B temperature rise; Class F insulation.
3. Inverter-Duty Motors: Class F temperature rise; Class H insulation.
4. Thermal Protection: Comply with NEMA MG 1 requirements for thermally protected motors.

C. Severe-Duty Motors: Comply with IEEE 841, with 1.15 minimum service factor.

2.5 SINGLE-PHASE MOTORS

A. Motors larger than 1/20 hp shall be one of the following, to suit starting torque and requirements of specific motor application:

1. Permanent-split capacitor.
2. Split phase.
3. Capacitor start, inductor run.
4. Capacitor start, capacitor run.

B. Multispeed Motors: Variable-torque, permanent-split-capacitor type.

C. Bearings: Prelubricated, antifriction ball bearings or sleeve bearings suitable for radial and thrust loading.

D. Motors 1/20 HP and Smaller: Shaded-pole type.

E. Thermal Protection: Internal protection to automatically open power supply circuit to motor when winding temperature exceeds a safe value calibrated to temperature rating of motor insulation. Thermal-protection device shall automatically reset when motor temperature returns to normal range.

PART 3 - EXECUTION (Not Used)

END OF SECTION 220513

SECTION 220516 - EXPANSION FITTINGS AND LOOPS FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Rubber union connector packless expansion joints.
2. Flexible-hose packless expansion joints.
3. Metal-bellows packless expansion joints.
4. Externally pressurized metal-bellows packless expansion joints.
5. Rubber packless expansion joints.
6. Grooved-joint expansion joints.
7. Alignment guides and anchors.
8. Pipe loops and swing connections.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Delegated-Design Submittal: For each anchor and alignment guide, including analysis data, signed and sealed by the qualified professional engineer responsible for their preparation.

1. Design Calculations: Calculate requirements for thermal expansion of piping systems and for selecting and designing expansion joints, loops, and swing connections.
2. Anchor Details: Detail fabrication of each anchor indicated. Show dimensions and methods of assembly and attachment to building structure.
3. Alignment Guide Details: Detail field assembly and attachment to building structure.
4. Schedule: Indicate type, manufacturer's number, size, material, pressure rating, end connections, and location for each expansion joint.

1.4 INFORMATIONAL SUBMITTALS

A. Welding certificates.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For expansion joints to include in maintenance manuals.

1.6 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code - Steel."

B. Pipe and Pressure-Vessel Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Compatibility: Products shall be suitable for piping service fluids, materials, working pressures, and temperatures.

B. Capability: Products to absorb two hundred percent (200%) of maximum axial movement between anchors.

2.2 PACKLESS EXPANSION JOINTS

A. Rubber Union Connector Expansion Joints:

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

    a. Amber/Booth Company, Inc.; a VMC Group Company
    b. Flex-Hose Co., Inc.
    c. Flexicraft Industries
    d. General Rubber Corporation
    e. Mason Industries, Inc.
    f. Proco Products, Inc.
    g. Unaflex
    h. Unisource Manufacturing, Inc.

2. Material: Twin reinforced-rubber spheres with external restraining cables.
3. Minimum Pressure Rating: 150 psig at 170 deg F, unless otherwise indicated.
4. End Connections for NPS 2 and Smaller: Threaded.

B. Flexible-Hose Packless Expansion Joints:

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

    a. Flex Pression Ltd.
    b. Flex-Hose Co., Inc.
    c. Flexicraft Industries
    d. Mason Industries, Inc.
    e. Metraflex Company (The)
    f. Unisource Manufacturing, Inc.

2. Description: Manufactured assembly with inlet and outlet elbow fittings and two (2) flexible-metal-hose legs joined by long-radius, 180-degree return bend or center section of flexible hose.
3. Flexible Hose: Corrugated-metal inner hoses and braided outer sheaths.
4. Expansion Joints for Copper Tubing NPS 2 and Smaller: Copper-alloy fittings with solder-joint end connections.

    a. Bronze hoses and single-braid bronze sheaths with 450 psig at 70 deg F and 340 psig at 450 deg F ratings.
    b. Bronze hoses and double-braid bronze sheaths with 700 psig at 70 deg F and 500 psig at 450 deg F ratings.

5. Expansion Joints for Copper Tubing NPS 2-1/2 to NPS 4: Copper-alloy fittings with threaded end connections.

    a. Stainless-steel hoses and single-braid, stainless-steel sheaths with 300 psig at 70 deg F and 225 psig at 450 deg F ratings.
    b. Stainless-steel hoses and double-braid, stainless-steel sheaths with 420 psig at 70 deg F and 315 psig at 450 deg F ratings.

6. Expansion Joints for Steel Piping NPS 2 and Smaller: Carbon-steel fittings with threaded end connections.

    a. Stainless-steel hoses and single-braid, stainless-steel sheaths with 450 psig at 70 deg F and 325 psig at 600 deg F ratings.
    b. Stainless-steel hoses and double-braid, stainless-steel sheaths with 700 psig at 70 deg F and 515 psig at 600 deg F ratings.

7. Expansion Joints for Steel Piping NPS 2-1/2 to NPS 6: Carbon-steel fittings with flanged end connections.

    a. Stainless-steel hoses and single-braid, stainless-steel sheaths with 200 psig at 70 deg F and 145 psig at 600 deg F ratings.
    b. Stainless-steel hoses and double-braid, stainless-steel sheaths with 275 psig at 70 deg F and 200 psig at 600 deg F ratings.

8. Expansion Joints for Steel Piping NPS 8 to NPS 12: Carbon-steel fittings with flanged end connections.

    a. Stainless-steel hoses and single-braid, stainless-steel sheaths with 125 psig at 70 deg F and 90 psig at 600 deg F ratings.
    b. Stainless-steel hoses and double-braid, stainless-steel sheaths with 165 psig at 70 deg F and 120 psig at 600 deg F ratings.

9. Expansion Joints for Steel Piping NPS 14 and Larger: Carbon-steel fittings with flanged end connections.

    a. Stainless-steel hoses and double-braid, stainless-steel sheaths with 165 psig at 70 deg F and 120 psig at 600 deg F ratings.

C. Metal-Bellows Packless Expansion Joints:

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

    a. Adsco Manufacturing LLC
    b. American BOA, Inc.
    c. Badger Industries, Inc.
    d. Expansion Joint Systems, Inc.
    e. Flex Pression Ltd.
    f. Flex-Hose Co., Inc.
    g. Flexicraft Industries
    h. Flex-Weld, Inc.
    i. Flo Fab Inc.
    j. Hyspan Precision Products, Inc.
    k. Mason Industries, Inc.
    l. Metraflex Company (The)

m. Proco Products, Inc.
n. Senior Flexonics Pathway
o. Tozen Corporation
p. U.S. Bellows, Inc.
q. Unaflex
r. Unisource Manufacturing, Inc.
s. Universal Metal Hose
t. WahlcoMetroflex

2. Standards: ASTM F 1120 and EJMA's "Standards of the Expansion Joint Manufacturers Association, Inc."
3. Type: Circular, corrugated bellows with external tie rods.
4. Minimum Pressure Rating: 150 psig, unless otherwise indicated.
5. Configuration: Single joint class(es), unless otherwise indicated.
6. Expansion Joints for Copper Tubing: Single- or multi- ply phosphor-bronze bellows, copper pipe ends, and brass shrouds.

   a. End Connections for Copper Tubing NPS 2 and Smaller: Threaded.
   b. End Connections for Copper Tubing NPS 2-1/2 to NPS 4: Threaded.
   c. End Connections for Copper Tubing NPS 5 and Larger: Flanged.

7. Expansion Joints for Steel Piping: Single- or multi- ply stainless-steel bellows, steel pipe ends, and carbon-steel shroud.

   a. End Connections for Steel Pipe NPS 2 and Smaller: Threaded.
   b. End Connections for Steel Pipe NPS 2-1/2 and Larger: Flanged.

D. Externally Pressurized Metal-Bellows Packless Expansion Joints:

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

   a. Adsco Manufacturing LLC
   b. Flex-Hose Co., Inc.
   c. Hyspan Precision Products, Inc.
   d. Mason Industries, Inc.
   e. Metraflex Company (The)
   f. U.S. Bellows, Inc.

2. Minimum Pressure Rating: 150 psig, unless otherwise indicated.
3. Description:

   a. Totally enclosed, externally pressurized, multi-ply, stainless-steel bellows isolated from fluid flow by an internal pipe sleeve.
   b. Carbon-steel housing.
   c. Drain plugs and lifting lug for NPS 3 and larger.
   d. Bellows shall have operating clearance between the internal pipe sleeves and the external shrouds.
   e. Joints shall be supplied with a built-in scale to confirm the starting position and operating movement.
   f. Joint Axial Movement: 4 inches of compression and 0.75-inch of extension.

4. Permanent Locking Bolts: Set locking bolts to maintain joint lengths during installation. Temporary welding tabs that are removed after installation in lieu of locking bolts are not acceptable.

5. End Connection Configuration: Flanged; one (1) raised, fixed and one (1) floating flange.

E. Rubber Packless Expansion Joints:

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

a. Amber/Booth Company, Inc.; a VMC Group Company
b. Flex-Hose Co., Inc.
c. Flexicraft Industries
d. Flex-Weld, Inc.
e. Garlock Sealing Technologies
f. General Rubber Corporation
g. Mason Industries, Inc.
h. Metraflex Company (The)
i. Proco Products, Inc.
j. Red Valve Company, Inc.
k. Tozen Corporation
l. Unaflex
m. Unisource Manufacturing, Inc.

2. Standards: ASTM F 1123 and FSA's "Technical Handbook: Non-Metallic Expansion Joints and Flexible Pipe Connectors."
3. Material: Fabric-reinforced rubber complying with FSA-PSJ-703.
4. Arch Type: Single or multiple arches with external control rods.
5. Spherical Type: Single or multiple spheres with external control rods.
6. Minimum Pressure Rating for NPS 1-1/2 to NPS 4: 150 psig at 220 deg F.
7. Minimum Pressure Rating for NPS 5 and NPS 6: 140 psig at 200 deg F.
8. Minimum Pressure Rating for NPS 8 to NPS 12: 140 psig at 180 deg F.
9. Material for Fluids Containing Acids, Alkalis, or Chemicals: Ethylene-propylene-diene terpolymer rubber.
10. Material for Fluids Containing Gas, Hydrocarbons, or Oil: Buna-N.
11. Material for Water: Ethylene-propylene-diene terpolymer rubber.
12. End Connections: Full-faced, integral steel flanges with steel retaining rings.

2.3 GROOVED-JOINT EXPANSION JOINTS

A. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

1. Anvil International
2. Shurjoint Piping Products
3. Victaulic Company

B. Description: Factory-assembled expansion joint made of several grooved-end pipe nipples, couplings, and grooved joints.

C. Standard: AWWA C606, for grooved joints.

D. Nipples: Galvanized, ASTM A 53, Schedule 40, Type E or S, steel pipe with grooved ends.

E. Couplings: Refer to manufacturer’s requirements for quantity, flexible type for steel-pipe dimensions. Include ferrous housing sections, Buna-N gasket suitable for diluted acid, alkaline fluids, and cold and hot water ethylene-propylene-diene terpolymer rubber gasket suitable for cold and hot water, and bolts and nuts.

2.4 ALIGNMENT GUIDES AND ANCHORS

A. Alignment Guides:

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

a. Adsco Manufacturing LLC
b. Advanced Thermal Systems, Inc.
c. Flex-Hose Co., Inc.
d. Flexicraft Industries
e. Flex-Weld, Inc.
f. Hyspan Precision Products, Inc.
g. Mason Industries, Inc.
h. Metraflex Company (The)
i. Senior Flexonics Pathway
j. U.S. Bellows, Inc.
k. Unisource Manufacturing, Inc.

2. Description: Steel, factory-fabricated alignment guide, with bolted two-section outer cylinder and base for attaching to structure; with two-section guiding slider for bolting to pipe.

B. Anchor Materials:

1. Steel Shapes and Plates: ASTM A 36.
2. Bolts and Nuts: ASME B18.10 or ASTM A 183, steel hex head.
3. Washers: ASTM F 844, steel, plain, flat washers.
4. Mechanical Fasteners: Insert-wedge-type stud with expansion plug anchor for use in hardened Portland cement concrete, with tension and shear capacities appropriate for application.

a. Stud: Threaded, zinc-coated carbon steel.
b. Expansion Plug: Zinc-coated steel.
c. Washer and Nut: Zinc-coated steel.

5. Chemical Fasteners: Insert-type stud, bonding-system anchor for use with hardened Portland cement concrete, with tension and shear capacities appropriate for application.

a. Bonding Material: ASTM C 881, Type IV, Grade 3, two-component epoxy resin suitable for surface temperature of hardened concrete where fastener is to be installed.
b. Stud: ASTM A 307, zinc-coated carbon steel with continuous thread on stud, unless otherwise indicated.
c. Washer and Nut: Zinc-coated steel.

PART 3 - EXECUTION

3.1 EXPANSION JOINT INSTALLATION

A. Install expansion joints of sizes matching sizes of piping in which they are installed.

B. Install metal-bellows expansion joints according to EJMA's "Standards of the Expansion Joint Manufacturers Association, Inc."

C. Install rubber packless expansion joints according to FSA-PSJ-703.

D. Install grooved-joint expansion joints to grooved-end steel piping.

3.2 PIPE LOOP AND SWING CONNECTION INSTALLATION

A. Install pipe loops cold-sprung in tension or compression as required to partly absorb tension or compression produced during anticipated change in temperature.

B. Connect risers and branch connections to mains with at least five (5) pipe fittings, including tee in main.

C. Connect risers and branch connections to terminal units with at least four (4) pipe fittings, including tee in riser.

D. Connect mains and branch connections to terminal units with at least four (4) pipe fittings, including tee in main.

3.3 ALIGNMENT-GUIDE AND ANCHOR INSTALLATION

A. Install alignment guides to guide expansion and to avoid end-loading and torsional stress.

B. Install two (2) guides on each side of pipe expansion fittings and loops. Install guides nearest to expansion joint not more than four (4) pipe diameters from expansion joint.

C. Attach guides to pipe, and secure guides to building structure.

D. Install anchors at locations to prevent stresses from exceeding those permitted by ASME B31.9 and to prevent transfer of loading and stresses to connected equipment.

E. Anchor Attachments:

1. Anchor Attachment to Steel Pipe: Attach by welding. Comply with ASME B31.9 and ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."
2. Anchor Attachment to Copper Tubing: Attach with pipe hangers. Use MSS SP-69, Type 24; U bolts bolted to anchor.

F. Fabricate and install steel anchors by welding steel shapes, plates, and bars. Comply with ASME B31.9 and AWS D1.1.

1. Anchor Attachment to Steel Structural Members: Attach by welding.
2. Anchor Attachment to Concrete Structural Members: Attach by fasteners. Follow fastener manufacturer's written instructions.

G. Use grout to form flat bearing surfaces for guides and anchors attached to concrete.

END OF SECTION 220516

SECTION 220517 - SLEEVES AND SLEEVE SEALS FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Sleeves.
2. Stack-sleeve fittings.
3. Sleeve-seal systems.
4. Sleeve-seal fittings.
5. Grout.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

PART 2 - PRODUCTS

2.1 SLEEVES

A. Cast-Iron Wall Pipes: Cast or fabricated of cast or ductile iron and equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop unless otherwise indicated.

B. Galvanized-Steel Wall Pipes: ASTM A 53, Schedule 40, with plain ends and welded steel collar; zinc coated.

C. Galvanized-Steel-Pipe Sleeves: ASTM A 53, Type E, Grade B, Schedule 40, zinc coated, with plain ends.

D. PVC-Pipe Sleeves: ASTM D 1785, Schedule 40.

E. Galvanized-Steel-Sheet Sleeves: 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint.

F. Molded-PE or -PP Sleeves: Removable, tapered-cup shaped, and smooth outer surface with nailing flange for attaching to wooden forms.

G. Molded-PVC Sleeves: With nailing flange for attaching to wooden forms.

2.2 STACK-SLEEVE FITTINGS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Jay R. Smith Mfg. Co.
2. Zurn Industries, LLC

B. Description: Manufactured, cast-iron sleeve with integral clamping flange. Include clamping ring, bolts, and nuts for membrane flashing.

1. Underdeck Clamp: Clamping ring with setscrews.

2.3 SLEEVE-SEAL SYSTEMS

A. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

1. Advance Products & Systems, Inc.
2. CALPICO, Inc.
3. GPT; an EnPro Industries company
4. Metraflex Company (The)
5. Proco Products, Inc.

B. Description: Modular sealing-element unit, designed for field assembly, for filling annular space between piping and sleeve.

1. Sealing Elements: EPDM-rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
2. Pressure Plates: Plastic or stainless-steel.
3. Connecting Bolts and Nuts: Stainless-steel of length required to secure pressure plates to sealing elements.

2.4 SLEEVE-SEAL FITTINGS

A. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

1. Advance Products & Systems, Inc.
2. CALPICO, Inc.
3. GPT; an EnPro Industries company
4. Metraflex Company (The)
5. Proco Products, Inc.

B. Description: Manufactured plastic, sleeve-type, waterstop assembly made for imbedding in concrete slab or wall. Unit has plastic or rubber waterstop collar with center opening to match piping OD.

2.5 GROUT

A. Standard: ASTM C 1107, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.

B. Characteristics: Non-shrink; recommended for interior and exterior applications.

C. Design Mix: 5000-psi, 28-day compressive strength.

D. Packaging: Premixed and factory packaged.

PART 3 - EXECUTION

3.1 SLEEVE INSTALLATION

A. Install sleeves for piping passing through penetrations in floors, partitions, roofs, and walls.

B. For sleeves that will have sleeve-seal system installed, select sleeves of size large enough to provide 1-inch annular clear space between piping and concrete slabs and walls.

1. Sleeves are not required for core-drilled holes.

C. Install sleeves in concrete floors, concrete roof slabs, and concrete walls as new slabs and walls are constructed.

1. Permanent sleeves are not required for holes in slabs formed by molded-PE or -PP sleeves.
2. Cut sleeves to length for mounting flush with both surfaces.

a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches above finished floor level.

3. Using grout, seal the space outside of sleeves in slabs and walls without sleeve-seal system.

D. Install sleeves for pipes passing through interior partitions.

1. Cut sleeves to length for mounting flush with both surfaces.
2. Install sleeves that are large enough to provide ¼-inch annular clear space between sleeve and pipe or pipe insulation.
3. Seal annular space between sleeve and piping or piping insulation; use joint sealants appropriate for size, depth, and location of joint. Comply with requirements for sealants specified in Section 079200 "Joint Sealants."

E. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Comply with requirements for firestopping specified in Section 078413 "Penetration Firestopping."

3.2 STACK-SLEEVE-FITTING INSTALLATION

A. Install stack-sleeve fittings in new slabs as slabs are constructed.

1. Install fittings that are large enough to provide ¼-inch annular clear space between sleeve and pipe or pipe insulation.
2. Secure flashing between clamping flanges for pipes penetrating floors with membrane waterproofing. Comply with requirements for flashing specified in Section 076200 "Sheet Metal Flashing and Trim."
3. Install section of cast-iron soil pipe to extend sleeve to 2 inches above finished floor level.
4. Extend cast-iron sleeve fittings below floor slab as required to secure clamping ring if ring is specified.
5. Using grout, seal the space around outside of stack-sleeve fittings.

B. Fire-Barrier Penetrations: Maintain indicated fire rating of floors at pipe penetrations. Seal pipe penetrations with firestop materials. Comply with requirements for firestopping specified in Section 078413 "Penetration Firestopping."

3.3 SLEEVE-SEAL-SYSTEM INSTALLATION

A. Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at service piping entries into building.

B. Select type, size, and number of sealing elements required for piping material and size and for sleeve ID or hole size. Position piping in center of sleeve. Center piping in penetration, assemble sleeve-seal system components, and install in annular space between piping and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make a watertight seal.

3.4 SLEEVE-SEAL-FITTING INSTALLATION

A. Install sleeve-seal fittings in new walls and slabs as they are constructed.

B. Assemble fitting components of length to be flush with both surfaces of concrete slabs and walls. Position waterstop flange to be centered in concrete slab or wall.

C. Secure nailing flanges to concrete forms.

D. Using grout, seal the space around outside of sleeve-seal fittings.

3.5 SLEEVE AND SLEEVE-SEAL SCHEDULE

A. Use sleeves and sleeve seals for the following piping-penetration applications:

1. Exterior Concrete Walls above Grade:

a. Piping Smaller Than NPS 6: Galvanized-steel wall sleeves.
b. Piping NPS 6 and Larger: Galvanized-steel wall sleeves.

2. Exterior Concrete Walls below Grade:

a. Piping Smaller Than NPS 6: Galvanized-steel wall sleeves with sleeve-seal system.

1) Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.

b. Piping NPS 6 and Larger: Galvanized-steel wall sleeves with sleeve-seal system.

1) Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.

3. Concrete Slabs-on-Grade:

a. Piping Smaller Than NPS 6: Galvanized-steel wall sleeves with sleeve-seal system.

1) Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.

b. Piping NPS 6 and Larger: Galvanized-steel wall sleeves with sleeve-seal system.

1) Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.

4. Concrete Slabs above Grade:

a. Copper piping: Molded PVC sleeves.
b. Ferrous Piping (All Sizes): Galvanized-steel-pipe sleeves.

END OF SECTION 220517

SECTION 220518 - ESCUTCHEONS FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Escutcheons.
2. Floor plates.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

PART 2 - PRODUCTS

2.1 ESCUTCHEONS

A. One-Piece, Stamped-Steel Type: With chrome-plated finish and spring-clip fasteners.

B. Split-Casting Brass Type: With polished, chrome-plated, and rough-brass finish and with concealed hinge and setscrew.

C. Split-Plate, Stamped-Steel Type: With chrome-plated finish, concealed hinge, and spring-clip fasteners.

2.2 FLOOR PLATES

A. One-Piece Floor Plates: Cast-iron flange with holes for fasteners.

B. Split-Casting Floor Plates: Cast brass with concealed hinge.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install escutcheons for piping penetrations of walls, ceilings, and finished floors.

B. Install escutcheons with ID to closely fit around pipe, tube, and insulation of insulated piping and with OD that completely covers opening.

1. Escutcheons for New Piping:

a. Piping with Fitting or Sleeve Protruding from Wall: One-piece, deep-pattern type.

b. Chrome-Plated Piping: One-piece, cast-brass type with polished, chrome-plated finish.
c. Insulated Piping: One-piece, stamped-steel type.
d. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, cast-brass type with polished, chrome-plated finish.
e. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, stamped-steel type.
f. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece, cast-brass type with polished, chrome-plated finish.
g. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece, stamped-steel type.
h. Bare Piping in Unfinished Service Spaces: One-piece, cast-brass type with rough-brass finish.
i. Bare Piping in Unfinished Service Spaces: One-piece, stamped-steel type.
j. Bare Piping in Equipment Rooms: One-piece, cast-brass type with rough-brass finish.
k. Bare Piping in Equipment Rooms: One-piece, stamped-steel type.

2. Escutcheons for Existing Piping:

a. Chrome-Plated Piping: Split-casting brass type with polished, chrome-plated finish.
b. Insulated Piping: Split-plate, stamped-steel type with concealed hinge.
c. Bare Piping at Wall and Floor Penetrations in Finished Spaces: Split-casting brass type with polished, chrome-plated finish.
d. Bare Piping at Wall and Floor Penetrations in Finished Spaces: Split-plate, stamped-steel type with concealed hinge.
e. Bare Piping at Ceiling Penetrations in Finished Spaces: Split-casting brass type with polished, chrome-plated finish.
f. Bare Piping at Ceiling Penetrations in Finished Spaces: Split-plate, stamped-steel type with concealed hinge.
g. Bare Piping in Unfinished Service Spaces: Split-casting brass type with rough-brass finish.
h. Bare Piping in Unfinished Service Spaces: Split-plate, stamped-steel type with concealed hinge.
i. Bare Piping in Equipment Rooms: Split-casting brass type with rough-brass finish.
j. Bare Piping in Equipment Rooms: Split-plate, stamped-steel type with concealed hinge.

C. Install floor plates for piping penetrations of equipment-room floors.

D. Install floor plates with ID to closely fit around pipe, tube, and insulation of piping and with OD that completely covers opening.

1. New Piping: One-piece, floor-plate type.
2. Existing Piping: Split-casting, floor-plate type.

3.2 FIELD QUALITY CONTROL

A. Replace broken and damaged escutcheons and floor plates using new materials.

END OF SECTION 220518

SECTION 220519 - METERS AND GAGES FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Bimetallic-actuated thermometers.
2. Filled-system thermometers.
3. Liquid-in-glass thermometers.
4. Thermowells.
5. Dial-type pressure gages.
6. Gage attachments.
7. Test plugs.
8. Test-plug kits.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.4 INFORMATIONAL SUBMITTALS

A. Product Certificates: For each type of meter and gage.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For meters and gages to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 BIMETALLIC-ACTUATED THERMOMETERS

A. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

1. Ashcroft Inc.
2. Ernst Flow Industries
3. Marsh Bellofram
4. Miljoco Corporation
5. Nanmac Corporation
6. Noshok
7. Palmer Wahl Instrumentation Group
8. REOTEMP Instrument Corporation
9. Tel-Tru Manufacturing Company
10. Trerice, H. O. Co.

11. Watts; a Watts Water Technologies company
12. Weiss Instruments, Inc.
13. Weksler Glass Thermometer Corp.
14. WIKA Instrument Corporation
15. Winters Instruments - U.S.

B. Standard: ASME B40.200.

C. Case: Liquid-filled and sealed type(s); stainless-steel with 3-inch nominal diameter.

D. Dial: Nonreflective aluminum with permanently etched scale markings and scales in deg F.

E. Connector Type(s): Union joint, adjustable angle and rigid, bottom, with unified-inch screw threads.

F. Connector Size: ½-inch, with ASME B1.1 screw threads.

G. Stem: 0.25- or 0.375-inch in diameter; stainless steel.

H. Window: Plain glass.

I. Ring: Stainless-steel.

J. Element: Bimetal coil.

K. Pointer: Dark-colored metal.

L. Accuracy: Plus or minus one percent (+/-1%) of scale range.

2.2 FILLED-SYSTEM THERMOMETERS

A. Direct-Mounted, Metal-Case, Vapor-Actuated Thermometers:

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

    a. Ashcroft Inc.
    b. Marsh Bellofram
    c. Miljoco Corporation
    d. Palmer Wahl Instrumentation Group
    e. REOTEMP Instrument Corporation
    f. Trerice, H. O. Co.
    g. Weiss Instruments, Inc.

2. Standard: ASME B40.200.
3. Case: Sealed type, cast aluminum or drawn steel; 4½-inch nominal diameter.
4. Element: Bourdon tube or other type of pressure element.
5. Movement: Mechanical, with link to pressure element and connection to pointer.
6. Dial: Nonreflective aluminum with permanently etched scale markings graduated in deg F.
7. Pointer: Dark-colored metal.
8. Window: Glass.
9. Ring: Stainless-steel.
10. Connector Type(s): Union joint, adjustable, 180 degrees in vertical plane, 360 degrees in horizontal plane, with locking device rigid, bottom; with ASME B1.1 screw threads.

11. Thermal System: Liquid-filled bulb in copper-plated steel, aluminum, or brass stem and of length to suit installation.

    a. Design for Thermowell Installation: Bare stem.

12. Accuracy: Plus or minus one percent (+/-1%) of scale range.

B. Remote-Mounted, Metal-Case, Vapor-Actuated Thermometers:

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

    a. AMETEK, Inc.
    b. Ashcroft Inc.
    c. Marsh Bellofram
    d. Miljoco Corporation
    e. Palmer Wahl Instrumentation Group
    f. REOTEMP Instrument Corporation
    g. Trerice, H. O. Co.
    h. Weiss Instruments, Inc.
    i. WIKA Instrument Corporation

2. Standard: ASME B40.200.
3. Case: Sealed type, cast aluminum or drawn steel; 4½-inch nominal diameter with back flange and holes for panel mounting.
4. Element: Bourdon tube or other type of pressure element.
5. Movement: Mechanical, with link to pressure element and connection to pointer.
6. Dial: Nonreflective aluminum with permanently etched scale markings graduated in deg F.
7. Pointer: Dark-colored metal.
8. Window: Glass.
9. Ring: Stainless-steel.
10. Connector Type(s): Union joint, bottom; with ASME B1.1 screw threads.
11. Thermal System: Liquid-filled bulb in copper-plated steel, aluminum, or brass stem and of length to suit installation.

    a. Design for Thermowell Installation: Bare stem.

12. Accuracy: Plus or minus one percent (+/-1%) of scale range.

2.3 LIQUID-IN-GLASS THERMOMETERS

A. Metal-Case, Compact-Style, Liquid-in-Glass Thermometers:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. Trerice, H. O. Co.

2. Standard: ASME B40.200.
3. Case: Cast aluminum; 6-inch nominal size.
4. Case Form: Back angle unless otherwise indicated.
5. Tube: Glass with magnifying lens and blue organic liquid.

6. Tube Background: Nonreflective aluminum with permanently etched scale markings graduated in deg F.
7. Window: Glass or plastic.
8. Stem: Aluminum or brass and of length to suit installation.

    a. Design for Thermowell Installation: Bare stem.

9. Connector: ¾-inch, with ASME B1.1 screw threads.
10. Accuracy: Plus or minus one percent (+/-1%) of scale range or one (1) scale division, to a maximum of one and one-half percent (1.5%) of scale range.

B. Metal-Case, Industrial-Style, Liquid-in-Glass Thermometers:

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

    a. Flo Fab Inc.
    b. Miljoco Corporation
    c. Palmer Wahl Instrumentation Group
    d. Tel-Tru Manufacturing Company
    e. Trerice, H. O. Co.
    f. Weiss Instruments, Inc.
    g. Weksler Glass Thermometer Corp.
    h. Winters Instruments - U.S.

2. Standard: ASME B40.200.
3. Case: Cast aluminum; 7-inch nominal size unless otherwise indicated.
4. Case Form: Adjustable angle unless otherwise indicated.
5. Tube: Glass with magnifying lens and blue organic liquid.
6. Tube Background: Nonreflective aluminum with permanently etched scale markings graduated in deg F.
7. Window: Glass.
8. Stem: Aluminum and of length to suit installation.

    a. Design for Thermowell Installation: Bare stem.

9. Connector: 1¼ inches, with ASME B1.1 screw threads.
10. Accuracy: Plus or minus one percent (+/-1%) of scale range or one (1) scale division, to a maximum of one and one-half percent (1.5%) of scale range.

2.4 THERMOWELLS

A. Thermowells:

1. Standard: ASME B40.200.
2. Description: Pressure-tight, socket-type fitting made for insertion into piping tee fitting.
3. Material for Use with Copper Tubing: CNR or CUNI.
4. Material for Use with Steel Piping: CRES.
5. Type: Stepped shank unless straight or tapered shank is indicated.
6. External Threads: NPS 1/2, NPS 3/4, or NPS 1, ASME B1.20.1 pipe threads.
7. Internal Threads: ½-, ¾-, and 1-inch, with ASME B1.1 screw threads.
8. Bore: Diameter required to match thermometer bulb or stem.
9. Insertion Length: Length required to match thermometer bulb or stem.
10. Lagging Extension: Include on thermowells for insulated piping and tubing.

11. Bushings: For converting size of thermowell's internal screw thread to size of thermometer connection.

B. Heat-Transfer Medium: Mixture of graphite and glycerin.

2.5 PRESSURE GAGES

A. Direct-Mounted, Metal-Case, Dial-Type Pressure Gages:

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

a. Ametek U.S. Gauge
b. Ashcroft Inc.
c. Ernst Flow Industries
d. Flo Fab Inc.
e. Marsh Bellofram
f. Miljoco Corporation
g. Noshok
h. Palmer Wahl Instrumentation Group
i. REOTEMP Instrument Corporation
j. Tel-Tru Manufacturing Company
k. Trerice, H. O. Co.
l. Watts; a Watts Water Technologies company
m. Weiss Instruments, Inc.
n. Weksler Glass Thermometer Corp.
o. WIKA Instrument Corporation
p. Winters Instruments - U.S.

2. Standard: ASME B40.100.
3. Case: Liquid-filled Sealed type(s); cast aluminum or drawn steel; 4½-inch nominal diameter.
4. Pressure-Element Assembly: Bourdon tube unless otherwise indicated.
5. Pressure Connection: Brass, with NPS 1/4 or NPS 1/2, ASME B1.20.1 pipe threads and bottom-outlet type unless back-outlet type is indicated.
6. Movement: Mechanical, with link to pressure element and connection to pointer.
7. Dial: Nonreflective aluminum with permanently etched scale markings graduated in psi.
8. Pointer: Dark-colored metal.
9. Window: Glass.
10. Ring: Stainless-steel.
11. Accuracy: Grade A, plus or minus one percent (+/-1%) of middle half of scale range.

B. Remote-Mounted, Metal-Case, Dial-Type Pressure Gages:

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

a. Ametek U.S. Gauge
b. Ashcroft Inc.
c. Ernst Flow Industries
d. Flo Fab Inc.
e. Marsh Bellofram
f. Miljoco Corporation
g. Noshok
h. Palmer Wahl Instrumentation Group

i. REOTEMP Instrument Corporation
j. Tel-Tru Manufacturing Company
k. Trerice, H. O. Co.
l. Watts; a Watts Water Technologies company
m. Weiss Instruments, Inc.
n. WIKA Instrument Corporation
o. Winters Instruments - U.S.

2. Standard: ASME B40.100.
3. Case: Liquid-filled Sealed type; cast aluminum or drawn steel; 4½-inch nominal diameter with back flange and holes for panel mounting.
4. Pressure-Element Assembly: Bourdon tube unless otherwise indicated.
5. Pressure Connection: Brass, with NPS 1/4 or NPS 1/2, ASME B1.20.1 pipe threads and bottom-outlet type unless back-outlet type is indicated.
6. Movement: Mechanical, with link to pressure element and connection to pointer.
7. Dial: Nonreflective aluminum with permanently etched scale markings graduated in psi.
8. Pointer: Dark-colored metal.
9. Window: Glass.
10. Ring: Stainless-steel.
11. Accuracy: Grade A, plus or minus one percent (+/-1%) of middle half of scale range.

2.6 GAGE ATTACHMENTS

A. Snubbers: ASME B40.100, brass; with NPS 1/4 or NPS 1/2, ASME B1.20.1 pipe threads and porous-metal-type surge-dampening device. Include extension for use on insulated piping.

B. Valves: Brass ball, with NPS 1/4 or NPS 1/2, ASME B1.20.1 pipe threads.

2.7 TEST PLUGS

A. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

1. Flow Design, Inc.
2. Miljoco Corporation
3. Nexus Valve, Inc.
4. Peterson Equipment Co., Inc.
5. Sisco Manufacturing Company, Inc.
6. Trerice, H. O. Co.
7. Watts; a Watts Water Technologies company
8. Weiss Instruments, Inc.
9. Weksler Glass Thermometer Corp.

B. Description: Test-station fitting made for insertion into piping tee fitting.

C. Body: Brass or stainless-steel with core inserts and gasketed and threaded cap. Include extended stem on units to be installed in insulated piping.

D. Thread Size: NPS 1/4 or NPS 1/2, ASME B1.20.1 pipe thread.

E. Minimum Pressure and Temperature Rating: 500 psig at 200 deg F.

F. Core Inserts: EPDM self-sealing rubber.

2.8 TEST-PLUG KITS

A. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

1. Flow Design, Inc.
2. Miljoco Corporation
3. Nexus Valve, Inc.
4. Peterson Equipment Co., Inc.
5. Sisco Manufacturing Company, Inc.
6. Trerice, H. O. Co.
7. Watts; a Watts Water Technologies company
8. Weiss Instruments, Inc.

B. Furnish one (1) test-plug kit containing thermometer(s), one (1) pressure gage and adapter, and carrying case. Thermometer sensing elements, pressure gage, and adapter probes shall be of diameter to fit test plugs and of length to project into piping.

C. Low-Range Thermometer: Small, bimetallic insertion type with 1- to 2-inch-diameter dial and tapered-end sensing element. Dial range shall be at least 25 to 125 deg F.

D. High-Range Thermometer: Small, bimetallic insertion type with 1- to 2-inch-diameter dial and tapered-end sensing element. Dial range shall be at least 0 to 220 deg F.

E. Pressure Gage: Small, Bourdon-tube insertion type with 2- to 3-inch-diameter dial and probe. Dial range shall be at least 0 to 200 psig.

F. Carrying Case: Metal or plastic, with formed instrument padding.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install thermowells with socket extending to center of pipe and in vertical position in piping tees.

B. Install thermowells of sizes required to match thermometer connectors. Include bushings if required to match sizes.

C. Install thermowells with extension on insulated piping.

D. Fill thermowells with heat-transfer medium.

E. Install direct-mounted thermometers in thermowells and adjust vertical and tilted positions.

F. Install remote-mounted thermometer bulbs in thermowells and install cases on panels; connect cases with tubing and support tubing to prevent kinks. Use minimum tubing length.

G. Install direct-mounted pressure gages in piping tees with pressure gage located on pipe at the most readable position.

H. Install remote-mounted pressure gages on panel.

I. Install valve and snubber in piping for each pressure gage for fluids.

J. Install test plugs in piping tees.

K. Install thermometers in the following locations:

1. Inlet and outlet of each water heater.
2. Inlets and outlets of each domestic water heat exchanger.
3. Inlet and outlet of each domestic hot-water storage tank.
4. Inlet and outlet of each remote domestic water chiller.

L. Install pressure gages in the following locations:

1. Building water service entrance into building.
2. Inlet and outlet of each pressure-reducing valve.
3. Suction and discharge of each domestic water pump.

3.2 CONNECTIONS

A. Install meters and gages adjacent to machines and equipment to allow service and maintenance of meters, gages, machines, and equipment.

3.3 ADJUSTING

A. Adjust faces of meters and gages to proper angle for best visibility.

3.4 THERMOMETER SCHEDULE

A. Install 9-inch case when installed below 8’-0” AFF; 12-inch case above 8’-0” AFF.

B. Install bimetallic-actuated dial thermometers in the following locations:

1. Inlet and outlet of each thermal storage tank.

C. Install liquid-filled case-type, vapor actuated dial thermometers at suction and discharge of each pump, chiller condenser and chilled water inlets and outlets, air handling unit hydronic coil inlets and outlets.

D. Provide the following temperature ranges for thermometers:

1. Domestic Hot Water: 30 to 180 deg F, with 2-degree scale divisions (Minus 1 to plus 82 deg C, with 1-degree scale divisions).

E. Thermometer stems shall be of length to match thermowell insertion length.

3.5 THERMOMETER SCALE-RANGE SCHEDULE

A. Scale Range for Domestic Cold-Water Piping: 0 to 100 deg F.

B. Scale Range for Domestic Hot-Water Piping: 0 to 250 deg F.

3.6 PRESSURE-GAGE SCHEDULE

A. Install dry-case-type pressure gages for discharge of each pressure-reducing valve.

B. Install dry case-type pressure gages at chilled- and condenser-water inlets and outlets of chillers, air handling unit with hydronic coil inlets and outlets.

C. Install dry case-type pressure gages at suction and discharge of each pump.

D. Discharge of each pressure-reducing valve.

3.7 PRESSURE-GAGE SCALE-RANGE SCHEDULE

A. Scale Range for Water Service Piping: 0 to 200 psi.

B. Scale Range for Domestic Water Piping: 0 to 200 psi.

END OF SECTION 220519

SECTION 220523.12 - BALL VALVES FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Bronze ball valves.

1.3 DEFINITIONS

A. CWP: Cold working pressure.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of valve.

1. Certification that products comply with NSF 61 Annex G and NSF 372.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Prepare valves for shipping as follows:

1. Protect internal parts against rust and corrosion.
2. Protect threads, flange faces, and soldered ends.
3. Set ball valves open to minimize exposure of functional surfaces.

B. Use the following precautions during storage:

1. Maintain valve end protection.
2. Store valves indoors and maintain at higher-than-ambient-dew-point temperature. If outdoor storage is necessary, store valves off the ground in watertight enclosures.

C. Use sling to handle large valves; rig sling to avoid damage to exposed parts. Do not use operating handles or stems as lifting or rigging points.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR VALVES

A. Source Limitations for Valves: Obtain each type of valve from single source from single manufacturer.

B. ASME Compliance:

1. ASME B1.20.1 for threads for threaded end valves.

2. ASME B16.1 for flanges on iron valves.
3. ASME B16.5 for flanges on steel valves.
4. ASME B16.10 and ASME B16.34 for ferrous valve dimensions and design criteria.
5. ASME B16.18 for solder-joint connections.
6. ASME B31.9 for building services piping valves.

C. NSF Compliance: NSF 61 Annex G and NSF 372 for valve materials for potable-water service.

D. Bronze valves shall be made with dezincification-resistant materials. Bronze valves made with copper alloy (brass) containing more than fifteen percent (15%) zinc are not permitted.

E. Valve Pressure-Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.

F. Valve Sizes: Same as upstream piping unless otherwise indicated.

G. Valve Actuator Types:

1. Gear Actuator: For quarter-turn valves NPS 4 and larger.
2. Handlever: For quarter-turn valves smaller than NPS 4.

H. Valves in Insulated Piping:

1. Include 2-inch stem extensions.
2. Extended operating handles of nonthermal-conductive material and protective sleeves that allow operation of valves without breaking vapor seals or disturbing insulation.
3. Memory stops that are fully adjustable after insulation is applied.

2.2 BRONZE BALL VALVES

A. Bronze Ball Valves, One-Piece with Bronze Trim:

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

a. Apollo Valves; Conbraco Industries, Inc.
b. NIBCO INC.
c. Watts; a Watts Water Technologies company

2. Description:

a. Standard: MSS SP-110.
b. CWP Rating: 400 psig.
c. Body Design: One-piece.
d. Body Material: Bronze.
e. Ends: Threaded.
f. Seats: PTFE.
g. Stem: Bronze.
h. Ball: Chrome-plated brass.
i. Port: Reduced.

B. Bronze Ball Valves, One-Piece with Stainless-Steel Trim:

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

a. Apollo Valves; Conbraco Industries, Inc.
b. NIBCO INC.
c. Watts; a Watts Water Technologies company

2. Description:

a. Standard: MSS SP-110.
b. CWP Rating: 600 psig.
c. Body Design: One-piece.
d. Body Material: Bronze.
e. Ends: Threaded.
f. Seats: PTFE.
g. Stem: Stainless-steel.
h. Ball: Stainless-steel, vented.
i. Port: Reduced.

C. Bronze Ball Valves, Two-Piece with Full Port, and Bronze or Brass Trim:

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

a. Apollo Valves; Conbraco Industries, Inc.
b. Crane; Crane Energy Flow Solutions
c. Hammond Valve
d. Lance Valves
e. Milwaukee Valve Company
f. NIBCO INC.
g. Watts; a Watts Water Technologies company
h. Zurn Industries, LLC

2. Description:

a. Standard: MSS SP-110.
b. CWP Rating: 600 psig.
c. Body Design: Two-piece.
d. Body Material: Bronze.
e. Ends: Threaded and soldered.
f. Seats: PTFE.
g. Stem: Bronze or brass.
h. Ball: Chrome-plated brass.
i. Port: Full.

D. Bronze Ball Valves, Two-Piece with Full Port and Stainless-Steel Trim:

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

a. Apollo Valves; Conbraco Industries, Inc.
b. Crane; Crane Energy Flow Solutions
c. Hammond Valve
d. Lance Valves
e. Milwaukee Valve Company
f. NIBCO INC.
g. Watts; a Watts Water Technologies company

2. Description:

    a. Standard: MSS SP-110.
    b. CWP Rating: 600 psig.
    c. Body Design: Two-piece.
    d. Body Material: Bronze.
    e. Ends: Threaded or soldered.
    f. Seats: PTFE.
    g. Stem: Stainless-steel.
    h. Ball: Stainless-steel, vented.
    i. Port: Full.

E. Bronze Ball Valves, Two-Piece with Regular Port and Bronze or Brass Trim:

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

    a. Apollo Valves; Conbraco Industries, Inc.
    b. DynaQuip Controls
    c. Hammond Valve
    d. Milwaukee Valve Company
    e. NIBCO INC.
    f. Watts; a Watts Water Technologies company

2. Description:

    a. Standard: MSS SP-110.
    b. CWP Rating: 600 psig.
    c. Body Design: Two-piece.
    d. Body Material: Bronze.
    e. Ends: Threaded.
    f. Seats: PTFE.
    g. Stem: Bronze or brass.
    h. Ball: Chrome-plated brass.
    i. Port: Regular.

F. Bronze Ball Valves, Two-Piece with Regular Port and Stainless-Steel Trim:

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

    a. Apollo Valves; Conbraco Industries, Inc.
    b. Hammond Valve
    c. NIBCO INC.
    d. Stockham; Crane Energy Flow Solutions
    e. Watts; a Watts Water Technologies company

2. Description:

    a. Standard: MSS SP-110.
    b. CWP Rating: 600 psig.
    c. Body Design: Two-piece.
    d. Body Material: Bronze.
    e. Ends: Threaded.
    f. Seats: PTFE.

g. Stem: Stainless-steel.
h. Ball: Stainless-steel, vented.
i. Port: Regular.

G. Bronze Ball Valves, Three-Piece with Full Port and Bronze or Brass Trim:

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

a. Apollo Valves; Conbraco Industries, Inc.
b. DynaQuip Controls
c. Hammond Valve
d. Milwaukee Valve Company
e. NIBCO INC.
f. Red-White Valve Corporation
g. Watts; a Watts Water Technologies company

2. Description:

a. Standard: MSS SP-110.
b. CWP Rating: 600 psig.
c. Body Design: Three-piece.
d. Body Material: Bronze.
e. Ends: Threaded.
f. Seats: PTFE.
g. Stem: Bronze or brass.
h. Ball: Chrome-plated brass.
i. Port: Full.

H. Bronze Ball Valves, Three-Piece with Full Port and Stainless-Steel Trim:

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

a. Apollo Valves; Conbraco Industries, Inc.
b. Hammond Valve
c. Milwaukee Valve Company
d. NIBCO INC.
e. Watts; a Watts Water Technologies company

2. Description:

a. Standard: MSS SP-110.
b. CWP Rating: 600 psig.
c. Body Design: Three-piece.
d. Body Material: Bronze.
e. Ends: Threaded.
f. Seats: PTFE.
g. Stem: Stainless-steel.
h. Ball: Stainless-steel, vented.
i. Port: Full.

I. Bronze Ball Valves, Three-Piece with Regular Port and Bronze Trim:

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

    a. Apollo Valves; Conbraco Industries, Inc.
    b. Jamesbury; Metso
    c. NIBCO INC.

2. Description:

    a. Standard: MSS SP-110.
    b. CWP Rating: 600 psig.
    c. Body Design: Three-piece.
    d. Body Material: Bronze
    e. Ends: Threaded or soldered.
    f. Seats: PTFE.
    g. Stem: Bronze.
    h. Ball: Chrome-plated brass.
    i. Port: Regular.

J. Bronze Ball Valves, Three-Piece with Regular Port and Stainless-Steel Trim:

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

    a. Apollo Valves; Conbraco Industries, Inc.
    b. Jamesbury; Metso
    c. NIBCO INC.

2. Description:

    a. Standard: MSS SP-110.
    b. CWP Rating: 600 psig.
    c. Body Design: Three-piece.
    d. Body Material: Bronze.
    e. Ends: Threaded or soldered.
    f. Seats: PTFE.
    g. Stem: Stainless-steel.
    h. Ball: Stainless-steel, vented.
    i. Port: Regular.

K. Bronze Ball Valves, Two-Piece, Safety-Exhaust:

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

    a. Apollo Valves; Conbraco Industries, Inc.
    b. Jamesbury; Metso
    c. NIBCO INC.

2. Description:

    a. Standard: MSS SP-110.
    b. CWP Rating: 600 psig.
    c. Body Design: Two-piece.
    d. Body Material: Bronze, ASTM B 584, Alloy C844.

e. Ends: Threaded.
f. Seats: PTFE.
g. Stem: Stainless-steel.
h. Ball: Chrome-plated brass, with exhaust vent opening for pneumatic applications.
i. Port: Full.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine valve interior for cleanliness, freedom from foreign matter, and corrosion. Remove special packing materials, such as blocks, used to prevent disc movement during shipping and handling.

B. Operate valves in positions from fully open to fully closed. Examine guides and seats made accessible by such operations.

C. Examine threads on valve and mating pipe for form and cleanliness.

D. Examine mating flange faces for conditions that might cause leakage. Check bolting for proper size, length, and material. Verify that gasket is of proper size, that its material composition is suitable for service, and that it is free from defects and damage.

E. Do not attempt to repair defective valves; replace with new valves.

3.2 VALVE INSTALLATION

A. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.

B. Locate valves for easy access and provide separate support where necessary.

C. Install valves in horizontal piping with stem at or above center of pipe.

D. Install valves in position to allow full stem movement.

E. Install valve tags. Comply with requirements in Section 220553 "Identification for Plumbing Piping and Equipment" for valve tags and schedules.

3.3 GENERAL REQUIREMENTS FOR VALVE APPLICATIONS

A. If valves with specified CWP ratings are unavailable, the same types of valves with higher CWP ratings may be substituted.

B. Select valves with the following end connections:

1. For Copper Tubing, NPS 2 and Smaller: Threaded ends except where solder-joint valve-end option is indicated in valve schedules.
2. For Copper Tubing, NPS 2-1/2 to NPS 4: Flanged ends except where threaded valve-end option is indicated in valve schedules.
3. For Copper Tubing, NPS 5 and Larger: Flanged ends.

3.4 VALVE SCHEDULE (150 PSIG OR LESS)

A. Pipe NPS 2 and Smaller:

1. Refer to Valve Schedule on Drawings.

END OF SECTION 220523.12

SECTION 220523.13 - BUTTERFLY VALVES FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Iron, single-flange butterfly valves.
2. Iron, grooved-end butterfly valves.
3. Chain wheels.

1.3 DEFINITIONS

A. CWP: Cold working pressure.

B. EPDM: Ethylene propylene-diene terpolymer rubber.

C. NBR: Acrylonitrile-butadiene, Buna-N, or nitrile rub

1.4 ACTION SUBMITTALS

A. Product Data: For each type of valve.

1. Certification that products comply with NSF 61 Annex G and NSF 372.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Prepare valves for shipping as follows:

1. Protect internal parts against rust and corrosion.
2. Protect threads, flange faces, grooves, and weld ends.
3. Set butterfly valves closed or slightly open.

B. Use the following precautions during storage:

1. Maintain valve end protection.
2. Store valves indoors and maintain at higher-than-ambient-dew-point temperature. If outdoor storage is necessary, store valves off the ground in watertight enclosures.

C. Use sling to handle large valves; rig sling to avoid damage to exposed parts. Do not use handwheels or stems as lifting or rigging points.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR VALVES

A. Source Limitations for Valves: Obtain each type of valve from single source from single manufacturer.

B. ASME Compliance:

1. ASME B1.20.1 for threads for threaded end valves.
2. ASME B16.1 for flanges on iron valves.
3. ASME B16.10 and ASME B16.34 for ferrous valve dimensions and design criteria.
4. ASME B16.18 for solder joint.
5. ASME B31.9 for building services piping valves.

C. AWWA Compliance: Comply with AWWA C606 for grooved-end connections.

D. NSF Compliance: NSF 61 Annex G and NSF 372 for valve materials for potable-water service.

E. Valve Pressure-Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.

F. Valve Sizes: Same as upstream piping unless otherwise indicated.

G. Valve Actuator Types:

1. Gear Actuator: For valves NPS 8 (DN 200) and larger.
2. Hand lever: For valves NPS 6 (DN 150) and smaller.
3. Chainwheel: Device for attachment to gear, hand lever, or stem; of size and with chain for mounting height, according to "Valve Installation" Article.

2.2 IRON, SINGLE-FLANGE BUTTERFLY VALVES

A. Manufacturers::

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

a. American Valve, Inc.
b. Apollo Valves; Conbraco Industries, Inc.
c. Crane; Crane Energy Flow Solutions
d. Hammond Valve
e. Jenkins Valves; Crane Energy Flow Solutions
f. Jomar Valve
g. KITZ Corporation
h. Macomb Groups (The)
i. Milwaukee Valve Company
j. NIBCO INC.
k. Powell Valves
l. Red-White Valve Corporation
m. Stockham; Crane Energy Flow Solutions
n. Watts; a Watts Water Technologies company

B. Iron, Single-Flange Butterfly Valves with Aluminum-Bronze Disc:

1. Description:

    a. Standard: MSS SP-67, Type I.
    b. CWP Rating: 200 psig.
    c. Body Design: Lug type; suitable for bidirectional dead-end service at rated pressure without use of downstream flange.
    d. Body Material: ASTM A 126, cast iron or ASTM A 536, ductile iron.
    e. Seat: EPDM.
    f. Stem: One- or two-piece stainless-steel.
    g. Disc: Aluminum bronze.

C. Iron, Single-Flange Butterfly Valves with Stainless-Steel Disc:

1. Description:

    a. Standard: MSS SP-67, Type I.
    b. CWP Rating, NPS 12 (DN 300) and Smaller: 200 psig.
    c. Body Design: Lug type; suitable for bidirectional dead-end service at rated pressure without use of downstream flange.
    d. Body Material: ASTM A 126, cast iron or ASTM A 536, ductile iron.
    e. Seat: EPDM.
    f. Stem: One- or two-piece stainless-steel.
    g. Disc: Stainless-steel.

2.3 CHAINWHEELS

A. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

1. Babbitt Steam Specialty Co.
2. Roto Hammer Industries
3. Trumbull Industries

B. Description: Valve actuation assembly with sprocket rim, chain guides, chain, and attachment brackets for mounting chainwheels directly to hand wheels.

1. Sprocket Rim with Chain Guides: Ductile or cast iron, of type and size required for valve. Include zinc or epoxy coating.
2. Chain: Hot-dip galvanized steel, of size required to fit sprocket rim.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine valve interior for cleanliness, freedom from foreign matter, and corrosion. Remove special packing materials, such as blocks, used to prevent disc movement during shipping and handling.

B. Operate valves in positions from fully open to fully closed. Examine guides and seats made accessible by such operations.

C. Examine threads on valve and mating pipe for form and cleanliness.

D. Examine mating flange faces for conditions that might cause leakage. Check bolting for proper size, length, and material. Verify that gasket is of proper size, that its material composition is suitable for service, and that it is free from defects and damage.

E. Do not attempt to repair defective valves; replace with new valves.

3.2 VALVE INSTALLATION

A. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.

B. Locate valves for easy access and provide separate support where necessary.

C. Install valves in horizontal piping with stem at or above center of pipe.

D. Install valves in position to allow full stem movement.

E. Install chainwheels on operators for gate valves NPS 4 and larger and more than 96 inches above floor. Extend chains to 60 inches above finished floor.

F. Install valve tags. Comply with requirements in Section 220553 "Identification for Plumbing Piping and Equipment" for valve tags and schedules.

3.3 ADJUSTING

A. Adjust or replace valve packing after piping systems have been tested and put into service but before final adjusting and balancing. Replace valves if persistent leaking occurs.

3.4 GENERAL REQUIREMENTS FOR VALVE APPLICATIONS

A. Use butterfly valves for shutoff service only.

B. If valves with specified CWP ratings are unavailable, the same types of valves with higher CWP ratings may be substituted.

C. For Grooved-End Copper Tubing and Steel Piping: Valve ends may be grooved.

3.5 VALVE SCHEDULE

A. Refer to Schedule on Drawings.

END OF SECTION 220523.13

SECTION 220523.14 - CHECK VALVES FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Bronze swing check valves.

1.3 DEFINITIONS

A. CWP: Cold working pressure.

B. EPDM: Ethylene propylene-diene terpolymer rubber.

C. NBR: Acrylonitrile-butadiene, Buna-N, or nitrile rubber.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of valve.

1. Certification that products comply with NSF 61 Annex G and NSF 372.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Prepare valves for shipping as follows:

1. Protect internal parts against rust and corrosion.
2. Protect threads, flange faces, grooves, and weld ends.
3. Set check valves in either closed or open position.

B. Use the following precautions during storage:

1. Maintain valve end protection.
2. Store valves indoors and maintain at higher-than-ambient-dew-point temperature. If outdoor storage is necessary, store valves off the ground in watertight enclosures.

C. Use sling to handle large valves; rig sling to avoid damage to exposed parts. Do not use handwheels or stems as lifting or rigging points.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR VALVES

A. Source Limitations for Valves: Obtain each type of valve from single source from single manufacturer.

B. ASME Compliance:

1. ASME B1.20.1 for threads for threaded end valves.
2. ASME B16.1 for flanges on iron valves.
3. ASME B16.10 and ASME B16.34 for ferrous valve dimensions and design criteria.
4. ASME B16.18 for solder joint.
5. ASME B31.9 for building services piping valves.

C. AWWA Compliance: Comply with AWWA C606 for grooved-end connections.

D. NSF Compliance: NSF 61 Annex G and NSF 372 for valve materials for potable-water service.

E. Bronze valves shall be made with dezincification-resistant materials. Bronze valves made with copper alloy (brass) containing more than fifteen percent (15%) zinc are not permitted.

F. Valve Pressure-Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.

G. Valve Sizes: Same as upstream piping unless otherwise indicated.

H. Valve Bypass and Drain Connections: MSS SP-45.

2.2 BRONZE SWING CHECK VALVES

A. Bronze Swing Check Valves with Bronze Disc, Class 125:

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

a. American Valve, Inc.
b. Apollo Valves; Conbraco Industries, Inc.
c. Crane; Crane Energy Flow Solutions
d. Hammond Valve
e. Jenkins Valves; Crane Energy Flow Solutions
f. KITZ Corporation
g. Macomb Groups (The)
h. Milwaukee Valve Company
i. NIBCO INC.
j. Powell Valves
k. Red-White Valve Corporation
l. Stockham; Crane Energy Flow Solutions
m. Watts; a Watts Water Technologies company

2. Description:

a. Standard: MSS SP-80, Type 3.
b. CWP Rating: 200 psig.
c. Body Design: Horizontal flow.
d. Body Material: ASTM B 62, bronze.
e. Ends: Threaded or soldered. See valve schedule articles.
f. Disc: Bronze.

B. Bronze Swing Check Valves with Nonmetallic Disc, Class 125:

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

    a. Apollo Valves; Conbraco Industries, Inc.
    b. Crane; Crane Energy Flow Solutions
    c. Hammond Valve
    d. Jenkins Valves; Crane Energy Flow Solutions
    e. KITZ Corporation
    f. Milwaukee Valve Company
    g. NIBCO INC.
    h. Red-White Valve Corporation
    i. Stockham; Crane Energy Flow Solutions
    j. Watts; a Watts Water Technologies company

2. Description:

    a. Standard: MSS SP-80, Type 4.
    b. CWP Rating: 200 psig.
    c. Body Design: Horizontal flow.
    d. Body Material: ASTM B 62, bronze.
    e. Ends: Threaded or soldered. See valve schedule articles.
    f. Disc: PTFE.

C. Bronze Swing Check Valves with Bronze Disc, Class 150:

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

    a. American Valve, Inc.
    b. Apollo Valves; Conbraco Industries, Inc.
    c. Crane; Crane Energy Flow Solutions
    d. Jenkins Valves; Crane Energy Flow Solutions
    e. Jomar Valve
    f. KITZ Corporation
    g. Macomb Groups (The)
    h. Milwaukee Valve Company
    i. NIBCO INC.
    j. Red-White Valve Corporation
    k. Stockham; Crane Energy Flow Solutions

2. Description:

    a. Standard: MSS SP-80, Type 3.
    b. CWP Rating: 300 psig.
    c. Body Design: Horizontal flow.
    d. Body Material: ASTM B 62, bronze.
    e. Ends: Threaded or soldered. See valve schedule articles.
    f. Disc: Bronze.

D. Bronze Swing Check Valves with Nonmetallic Disc, Class 150:

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

    a. Crane; Crane Energy Flow Solutions

b. Hammond Valve
c. Jenkins Valves; Crane Energy Flow Solutions
d. Milwaukee Valve Company
e. NIBCO INC.
f. Watts; a Watts Water Technologies company

2. Description:

a. Standard: MSS SP-80, Type 4.
b. CWP Rating: 300 psig.
c. Body Design: Horizontal flow.
d. Body Material: ASTM B 62, bronze.
e. Ends: Threaded or soldered. See valve schedule articles.
f. Disc: PTFE.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine valve interior for cleanliness, freedom from foreign matter, and corrosion. Remove special packing materials, such as blocks, used to prevent disc movement during shipping and handling.

B. Operate valves in positions from fully open to fully closed. Examine guides and seats made accessible by such operations.

C. Examine threads on valve and mating pipe for form and cleanliness.

D. Examine mating flange faces for conditions that might cause leakage. Check bolting for proper size, length, and material. Verify that gasket is of proper size, that its material composition is suitable for service, and that it is free from defects and damage.

E. Do not attempt to repair defective valves; replace with new valves.

3.2 VALVE INSTALLATION

A. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.

B. Locate valves for easy access and provide separate support where necessary.

C. Install valves in horizontal piping with stem at or above center of pipe.

D. Install valves in position to allow full stem movement.

E. Install check valves for proper direction of flow and as follows:

1. Swing Check Valves: In horizontal position with hinge pin level.
2. Center-Guided and Plate-Type Check Valves: In horizontal or vertical position, between flanges.
3. Lift Check Valves: With stem upright and plumb.

F. Install valve tags. Comply with requirements in Section 220553 "Identification for Plumbing Piping and Equipment" for valve tags and schedules.

3.3 ADJUSTING

A. Adjust or replace valve packing after piping systems have been tested and put into service but before final adjusting and balancing. Replace valves if persistent leaking occurs.

3.4 GENERAL REQUIREMENTS FOR VALVE APPLICATIONS

A. If valve applications are not indicated, use the following:

1. Pump-Discharge Check Valves:

a. NPS 2 and Smaller: Bronze swing check valves with bronze or nonmetallic disc.
b. NPS 2-1/2 and Larger for Domestic Water: Iron swing check valves with lever and weight or spring; or iron, center-guided, metal-seat or resilient-seat check valves.
c. NPS 2-1/2 and Larger for Sanitary Waste and Storm Drainage: Iron swing check valves with lever and weight or spring.

B. If valves with specified CWP ratings are unavailable, the same types of valves with higher CWP ratings may be substituted.

C. End Connections:

1. For Copper Tubing, NPS 2 and Smaller: Threaded or soldered.
2. For Copper Tubing, NPS 2-1/2 to NPS 4: Flanged or threaded.
3. For Copper Tubing, NPS 5 and Larger: Flanged.
4. For Steel Piping, NPS 2 and Smaller: Threaded.
5. For Steel Piping, NPS 2-1/2 to NPS 4: Flanged or threaded.
6. For Steel Piping, NPS 5 and Larger: Flanged.
7. For Grooved-End Copper Tubing and Steel Piping: Grooved.

3.5 DOMESTIC HOT- AND COLD-WATER VALVE SCHEDULE

A. Pipe NPS 2 and Smaller: Bronze swing check valves with bronze disc, Class 125, with threaded end connections.

B. Pipe NPS 2-1/2 and Larger:

1. Iron swing check valves with metal seats, Class 125, with threaded or flanged end connections.
2. Iron swing check valves with closure control lever and weight, Class 125, with threaded or flanged end connections.
3. Iron, grooved-end swing check valves, 300 CWP.
4. Iron, center-guided check valves with compact wafer, Class 125.
5. Iron, center-guided check valves with globe, metal resilient seat, Class 125, with threaded or flanged end connections.
6. Iron, dual-plate check valves with resilient seat, Class 125, with threaded or flanged end connections.
7. Iron, single-plate check valves with resilient seat, Class 125, with threaded or flanged end connections.

END OF SECTION 220523.14

SECTION 220529 - HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Metal pipe hangers and supports.
2. Trapeze pipe hangers.
3. Fiberglass pipe hangers.
4. Metal framing systems.
5. Fiberglass strut systems.
6. Thermal-hanger shield inserts.
7. Fastener systems.
8. Pipe stands.
9. Pipe positioning systems.
10. Equipment supports.

1.3 DEFINITIONS

A. MSS: Manufacturers Standardization Society of The Valve and Fittings Industry Inc.

1.4 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design trapeze pipe hangers and equipment supports, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

B. Structural Performance: Hangers and supports for plumbing piping and equipment shall withstand the effects of gravity loads and stresses within limits and under conditions indicated according to ASCE/SEI 7.

1. Design supports for multiple pipes, including pipe stands, capable of supporting combined weight of supported systems, system contents, and test water.
2. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.
3. Design seismic-restraint hangers and supports for piping and equipment and obtain approval from authorities having jurisdiction.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Signed and sealed by a qualified professional engineer. Show fabrication and installation details and include calculations for the following: include Product Data for components:

1. Trapeze pipe hangers.
2. Metal framing systems.
3. Fiberglass strut systems.
4. Pipe stands.
5. Equipment supports.

C. Delegated-Design Submittal: For trapeze hangers indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1. Detail fabrication and assembly of trapeze hangers.
2. Design Calculations: Calculate requirements for designing trapeze hangers.

1.6 INFORMATIONAL SUBMITTALS

A. Welding certificates.

1.7 QUALITY ASSURANCE

A. Structural Steel Welding Qualifications: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code - Steel."

B. Pipe Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.

PART 2 - PRODUCTS

2.1 METAL PIPE HANGERS AND SUPPORTS

A. Carbon-Steel Pipe Hangers and Supports:

1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
2. Galvanized Metallic Coatings: Pregalvanized or hot dipped.
3. Nonmetallic Coatings: Plastic coating, jacket, or liner.
4. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.
5. Hanger Rods: Continuous-thread rod, nuts, and washer made of stainless-steel.

B. Stainless-Steel Pipe Hangers and Supports:

1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
2. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.
3. Hanger Rods: Continuous-thread rod, nuts, and washer made of stainless-steel.

C. Copper Pipe Hangers:

1. Description: MSS SP-58, Types 1 through 58, copper-coated-steel, factory-fabricated components.
2. Hanger Rods: Continuous-thread rod, nuts, and washer made of stainless-steel.

2.2 TRAPEZE PIPE HANGERS

A. Description: MSS SP-69, Type 59, shop- or field-fabricated pipe-support assembly made from structural carbon-steel shapes with MSS SP-58 carbon-steel hanger rods, nuts, saddles, and U-bolts.

2.3 FIBERGLASS PIPE HANGERS

A. Clevis-Type, Fiberglass Pipe Hangers:

1. Description: Similar to MSS SP-58, Type 1, steel pipe hanger except hanger is made of fiberglass or fiberglass-reinforced resin.
2. Hanger Rods: Continuous-thread rod, washer, and nuts made of stainless-steel.

B. Strap-Type, Fiberglass Pipe Hangers:

1. Description: Similar to MSS SP-58, Type 9 or Type 10, steel pipe hanger except hanger is made of fiberglass-reinforced resin.
2. Hanger Rod and Fittings: Continuous-thread rod, washer, and nuts made of stainless-steel.

2.4 METAL FRAMING SYSTEMS

A. MFMA Manufacturer Metal Framing Systems:

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

a. Allied Tube & Conduit; a part of Atkore International
b. B-line, an Eaton business
c. Flex-Strut Inc.
d. Thomas & Betts Corporation; A Member of the ABB Group
e. Unistrut; Part of Atkore International
f. Wesanco, Inc.

2. Description: Shop- or field-fabricated pipe-support assembly for supporting multiple parallel pipes.
3. Standard: MFMA-4.
4. Channels: Continuous slotted steel channel with inturned lips.
5. Channel Nuts: Formed or stamped steel nuts or other devices designed to fit into channel slot and, when tightened, prevent slipping along channel.
6. Hanger Rods: Continuous-thread rod, nuts, and washer made of stainless-steel.
7. Metallic Coating: Hot-dipped galvanized.
8. Paint Coating: Epoxy.
9. Plastic Coating: Epoxy.

2.5 THERMAL-HANGER SHIELD INSERTS

A. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

1. Carpenter & Paterson, Inc.
2. Clement Support Services
3. ERICO International Corporation
4. National Pipe Hanger Corporation

5. PHS Industries, Inc.
6. Pipe Shields Inc.
7. Piping Technology & Products, Inc.
8. Rilco Manufacturing Co., Inc.
9. Value Engineered Products, Inc.

B. Insulation-Insert Material for Cold Piping: ASTM C 591, Type VI, Grade 1 polyisocyanurate with 125-psig minimum compressive strength and vapor barrier.

C. Insulation-Insert Material for Hot Piping: ASTM C 591, Type VI, Grade 1 polyisocyanurate with 125-psig minimum compressive strength.

D. For Trapeze or Clamped Systems: Insert and shield shall cover entire circumference of pipe.

E. For Clevis or Band Hangers: Insert and shield shall cover lower 180 degrees of pipe.

F. Insert Length: Extend 2 inches beyond sheet metal shield for piping operating below ambient air temperature.

2.6 FASTENER SYSTEMS

A. Mechanical-Expansion Anchors: Insert-wedge-type, stainless- steel anchors, for use in hardened Portland cement concrete; with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

2.7 PIPE STANDS

A. General Requirements for Pipe Stands: Shop- or field-fabricated assemblies made of manufactured corrosion-resistant components to support roof-mounted piping.

B. Compact Pipe Stand: One-piece plastic unit with integral-rod roller, pipe clamps, or V-shaped cradle to support pipe, for roof installation without membrane penetration.

C. Low-Type, Single-Pipe Stand: One-piece stainless-steel base unit with plastic roller, for roof installation without membrane penetration.

D. High-Type, Single-Pipe Stand:

1. Description: Assembly of base, vertical and horizontal members, and pipe support, for roof installation without membrane penetration.
2. Base: Stainless-steel.
3. Vertical Members: Two (2) or more cadmium-plated-steel or stainless-steel, continuous-thread rods.
4. Horizontal Member: Cadmium-plated-steel or stainless-steel rod with plastic or stainless-steel, roller-type pipe support.

E. High-Type, Multiple-Pipe Stand:

1. Description: Assembly of bases, vertical and horizontal members, and pipe supports, for roof installation without membrane penetration.
2. Bases: One (1) or more; plastic.
3. Vertical Members: Two (2) or more protective-coated-steel channels.
4. Horizontal Member: Protective-coated-steel channel.
5. Pipe Supports: Galvanized-steel, clevis-type pipe hangers.

F. Curb-Mounting-Type Pipe Stands: Shop- or field-fabricated pipe supports made from structural-steel shapes, continuous-thread rods, and rollers, for mounting on permanent stationary roof curb.

2.8 PIPE POSITIONING SYSTEMS

A. Description: IAPMO PS 42, positioning system of metal brackets, clips, and straps for positioning piping in pipe spaces; for plumbing fixtures in commercial applications.

2.9 EQUIPMENT SUPPORTS

A. Description: Welded, shop- or field-fabricated equipment support made from structural carbon-steel shapes.

2.10 MISCELLANEOUS MATERIALS

A. Structural Steel: ASTM A 36, carbon-steel plates, shapes, and bars; black and galvanized.

B. Grout: ASTM C 1107, factory-mixed and -packaged, dry, hydraulic-cement, non-shrink and nonmetallic grout; suitable for interior and exterior applications.

1. Properties: Non-staining, noncorrosive, and nongaseous.
2. Design Mix: 5000-psi, 28-day compressive strength.

PART 3 - EXECUTION

3.1 HANGER AND SUPPORT INSTALLATION

A. Metal Pipe-Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from the building structure.

B. Metal Trapeze Pipe-Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Arrange for grouping of parallel runs of horizontal piping, and support together on field-fabricated trapeze pipe hangers.

1. Pipes of Various Sizes: Support together and space trapezes for smallest pipe size or install intermediate supports for smaller diameter pipes as specified for individual pipe hangers.
2. Field fabricate from ASTM A 36, carbon-steel shapes selected for loads being supported. Weld steel according to AWS D1.1.

C. Fiberglass Pipe-Hanger Installation: Comply with applicable portions of MSS SP-69 and MSS SP-89. Install hangers and attachments as required to properly support piping from building structure.

D. Metal Framing System Installation: Arrange for grouping of parallel runs of piping, and support together on field-assembled metal framing systems.

E. Fiberglass Strut System Installation: Arrange for grouping of parallel runs of piping, and support together on field-assembled fiberglass struts.

F. Thermal-Hanger Shield Installation: Install in pipe hanger or shield for insulated piping.

G. Fastener System Installation:

1. Install mechanical-expansion anchors in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.

H. Pipe Stand Installation:

1. Pipe Stand Types except Curb-Mounted Type: Assemble components and mount on smooth roof surface. Do not penetrate roof membrane.
2. Curb-Mounted-Type Pipe Stands: Assemble components or fabricate pipe stand and mount on permanent, stationary roof curb. See Section 077200 "Roof Accessories" for curbs.

I. Pipe Positioning-System Installation: Install support devices to make rigid supply and waste piping connections to each plumbing fixture.

J. Install hangers and supports complete with necessary attachments, inserts, bolts, rods, nuts, washers, and other accessories.

K. Equipment Support Installation: Fabricate from welded-structural-steel shapes.

L. Install hangers and supports to allow controlled thermal and seismic movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.

M. Install lateral bracing with pipe hangers and supports to prevent swaying.

N. Install building attachments within concrete slabs or attach to structural steel. Install additional attachments at concentrated loads, including valves, flanges, and strainers, NPS 2-1/2 and larger and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten inserts to forms and install reinforcing bars through openings at top of inserts.

O. Load Distribution: Install hangers and supports so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.

P. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and to not exceed maximum pipe deflections allowed by ASME B31.9 for building services piping.

Q. Insulated Piping:

1. Attach clamps and spacers to piping.

a. Piping Operating above Ambient Air Temperature: Clamp may project through insulation.
b. Piping Operating below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.
c. Do not exceed pipe stress limits allowed by ASME B31.9 for building services piping.

2. Install MSS SP-58, Type 39, protection saddles if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.

a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.

3. Install MSS SP-58, Type 40, protective shields on cold piping with vapor barrier. Shields shall span an arc of 180 degrees.

    a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.

4. Shield Dimensions for Pipe: Not less than the following:

    a. NPS 1/4 to NPS 3-1/2: 12 inches long and 0.048-inch-thick.
    b. NPS 4: 12 inches long and 0.06-inch-thick.
    c. NPS 5 and NPS 6: 18 inches long and 0.06-inch-thick.
    d. NPS 8 to NPS 14: 24 inches long and 0.075-inch-thick.
    e. NPS 16 to NPS 24: 24 inches long and 0.105- inch-thick.

5. Pipes NPS 8 and Larger: Include wood or reinforced calcium-silicate-insulation inserts of length at least as long as protective shield.
6. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.

3.2 EQUIPMENT SUPPORTS

A. Fabricate structural-steel stands to suspend equipment from structure overhead or to support equipment above floor.

B. Grouting: Place grout under supports for equipment and make bearing surface smooth.

C. Provide lateral bracing, to prevent swaying, for equipment supports.

3.3 METAL FABRICATIONS

A. Cut, drill, and fit miscellaneous metal fabrications for trapeze pipe hangers and equipment supports.

B. Fit exposed connections together to form hairline joints. Field weld connections that cannot be shop welded because of shipping size limitations.

C. Field Welding: Comply with AWS D1.1 procedures for shielded, metal arc welding; appearance and quality of welds; and methods used in correcting welding work; and with the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. Finish welds at exposed connections so no roughness shows after finishing and so contours of welded surfaces match adjacent contours.

3.4 ADJUSTING

A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.

B. Trim excess length of continuous-thread hanger and support rods to 1½ inches.

3.5 PAINTING

A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.

1. Apply paint by brush or spray to provide a minimum dry film thickness of 2.0 mils.

B. Touchup: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal are specified in Division 09.

C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

3.6 HANGER AND SUPPORT SCHEDULE

A. Specific hanger and support requirements are in Sections specifying piping systems and equipment.

B. Comply with MSS SP-69 for pipe-hanger selections and applications that are not specified in piping system Sections.

C. Use hangers and supports with galvanized metallic coatings for piping and equipment that will not have field-applied finish.

D. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.

E. Use carbon-steel pipe hangers and supports, metal trapeze pipe hangers and metal framing systems and attachments for general service applications.

F. Use stainless-steel pipe hangers and fiberglass pipe hangers and fiberglass strut systems and stainless-steel attachments for hostile environment applications.

G. Use copper-plated pipe hangers and stainless-steel attachments for copper piping and tubing.

H. Use padded hangers for piping that is subject to scratching.

I. Use thermal-hanger shield inserts for insulated piping and tubing.

J. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Adjustable, Steel Clevis Hangers (MSS Type 1): For suspension of non-insulated or insulated, stationary pipes NPS 1/2 to NPS 30.
2. Yoke-Type Pipe Clamps (MSS Type 2): For suspension of up to 1050 deg F, pipes NPS 4 to NPS 24, requiring up to 4 inches of insulation.
3. Carbon- or Alloy-Steel, Double-Bolt Pipe Clamps (MSS Type 3): For suspension of pipes NPS 3/4 to NPS 36, requiring clamp flexibility and up to 4 inches of insulation.
4. Steel Pipe Clamps (MSS Type 4): For suspension of cold and hot pipes NPS 1/2 to NPS 24 if little or no insulation is required.
5. Pipe Hangers (MSS Type 5): For suspension of pipes NPS 1/2 to NPS 4, to allow off-center closure for hanger installation before pipe erection.
6. Adjustable, Swivel Split- or Solid-Ring Hangers (MSS Type 6): For suspension of non-insulated, stationary pipes NPS 3/4 to NPS 8.

7. Adjustable, Steel Band Hangers (MSS Type 7): For suspension of non-insulated, stationary pipes NPS 1/2 to NPS 8.
8. Adjustable Band Hangers (MSS Type 9): For suspension of non-insulated, stationary pipes NPS 1/2 to NPS 8.
9. Adjustable, Swivel-Ring Band Hangers (MSS Type 10): For suspension of non-insulated, stationary pipes NPS 1/2 to NPS 8.
10. Split Pipe Ring with or without Turnbuckle Hangers (MSS Type 11): For suspension of non-insulated, stationary pipes NPS 3/8 to NPS 8.
11. Extension Hinged or Two-Bolt Split Pipe Clamps (MSS Type 12): For suspension of non-insulated, stationary pipes NPS 3/8 to NPS 3.
12. U-Bolts (MSS Type 24): For support of heavy pipes NPS 1/2 to NPS 30.
13. Clips (MSS Type 26): For support of insulated pipes not subject to expansion or contraction.
14. Pipe Saddle Supports (MSS Type 36): For support of pipes NPS 4 to NPS 36, with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate.
15. Pipe Stanchion Saddles (MSS Type 37): For support of pipes NPS 4 to NPS 36, with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate, and with U-bolt to retain pipe.
16. Adjustable Pipe Saddle Supports (MSS Type 38): For stanchion-type support for pipes NPS 2-1/2 to NPS 36 if vertical adjustment is required, with steel-pipe base stanchion support and cast-iron floor flange.
17. Single-Pipe Rolls (MSS Type 41): For suspension of pipes NPS 1 to NPS 30, from two (2) rods if longitudinal movement caused by expansion and contraction might occur.
18. Adjustable Roller Hangers (MSS Type 43): For suspension of pipes NPS 2-1/2 to NPS 24, from single rod if horizontal movement caused by expansion and contraction might occur.
19. Complete Pipe Rolls (MSS Type 44): For support of pipes NPS 2 to NPS 42 if longitudinal movement caused by expansion and contraction might occur but vertical adjustment is not necessary.
20. Pipe Roll and Plate Units (MSS Type 45): For support of pipes NPS 2 to NPS 24 if small horizontal movement caused by expansion and contraction might occur and vertical adjustment is not necessary.
21. Adjustable Pipe Roll and Base Units (MSS Type 46): For support of pipes NPS 2 to NPS 30 if vertical and lateral adjustment during installation might be required in addition to expansion and contraction.

K. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers NPS 3/4 to NPS 24.
2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers NPS 3/4 to NPS 24 if longer ends are required for riser clamps.

L. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel Turnbuckles (MSS Type 13): For adjustment up to 6 inches for heavy loads.
2. Steel Clevises (MSS Type 14): For 120 to 450 deg F piping installations.
3. Swivel Turnbuckles (MSS Type 15): For use with MSS Type 11, split pipe rings.
4. Malleable-Iron Sockets (MSS Type 16): For attaching hanger rods to various types of building attachments.
5. Steel Weldless Eye Nuts (MSS Type 17): For 120 to 450 deg F piping installations.

M. Building Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel or Malleable Concrete Inserts (MSS Type 18): For upper attachment to suspend pipe hangers from concrete ceiling.
2. Top-Beam C-Clamps (MSS Type 19): For use under roof installations with bar-joist construction, to attach to top flange of structural shape.
3. Side-Beam or Channel Clamps (MSS Type 20): For attaching to bottom flange of beams, channels, or angles.
4. Center-Beam Clamps (MSS Type 21): For attaching to center of bottom flange of beams.
5. Welded Beam Attachments (MSS Type 22): For attaching to bottom of beams if loads are considerable and rod sizes are large.
6. C-Clamps (MSS Type 23): For structural shapes.
7. Top-Beam Clamps (MSS Type 25): For top of beams if hanger rod is required tangent to flange edge.
8. Side-Beam Clamps (MSS Type 27): For bottom of steel I-beams.
9. Steel-Beam Clamps with Eye Nuts (MSS Type 28): For attaching to bottom of steel I-beams for heavy loads.
10. Linked-Steel Clamps with Eye Nuts (MSS Type 29): For attaching to bottom of steel I-beams for heavy loads, with link extensions.
11. Malleable-Beam Clamps with Extension Pieces (MSS Type 30): For attaching to structural steel.
12. Welded-Steel Brackets: For support of pipes from below or for suspending from above by using clip and rod. Use one of the following for indicated loads:

    a. Light (MSS Type 31): 750 lb.
    b. Medium (MSS Type 32): 1500 lb.
    c. Heavy (MSS Type 33): 3000 lb.

13. Side-Beam Brackets (MSS Type 34): For sides of steel or wooden beams.
14. Plate Lugs (MSS Type 57): For attaching to steel beams if flexibility at beam is required.
15. Horizontal Travelers (MSS Type 58): For supporting piping systems subject to linear horizontal movement where headroom is limited.

N. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel-Pipe-Covering Protection Saddles (MSS Type 39): To fill interior voids with insulation that matches adjoining insulation.
2. Protection Shields (MSS Type 40): Of length recommended in writing by manufacturer to prevent crushing insulation.
3. Thermal-Hanger Shield Inserts: For supporting insulated pipe.

O. Spring Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Restraint-Control Devices (MSS Type 47): Where indicated to control piping movement.
2. Spring Cushions (MSS Type 48): For light loads if vertical movement does not exceed 1¼ inches.
3. Spring-Cushion Roll Hangers (MSS Type 49): For equipping Type 41, roll hanger with springs.
4. Spring Sway Braces (MSS Type 50): To retard sway, shock, vibration, or thermal expansion in piping systems.
5. Variable-Spring Hangers (MSS Type 51): Preset to indicated load and limit variability factor to twenty-five percent (25%) to allow expansion and contraction of piping system from hanger.
6. Variable-Spring Base Supports (MSS Type 52): Preset to indicated load and limit variability factor to twenty-five percent (25%) to allow expansion and contraction of piping system from base support.

7. Variable-Spring Trapeze Hangers (MSS Type 53): Preset to indicated load and limit variability factor to twenty-five percent (25%) to allow expansion and contraction of piping system from trapeze support.
8. Constant Supports: For critical piping stress and if necessary, to avoid transfer of stress from one support to another support, critical terminal, or connected equipment. Include auxiliary stops for erection, hydrostatic test, and load-adjustment capability. These supports include the following types:

    a. Horizontal (MSS Type 54): Mounted horizontally.
    b. Vertical (MSS Type 55): Mounted vertically.
    c. Trapeze (MSS Type 56): Two (2) vertical-type supports and one trapeze member.

P. Comply with MSS SP-69 for trapeze pipe-hanger selections and applications that are not specified in piping system Sections.

Q. Comply with MFMA-103 for metal framing system selections and applications that are not specified in piping system Sections.

R. Use mechanical-expansion anchors instead of building attachments where required in concrete construction.

S. Use pipe positioning systems in pipe spaces behind plumbing fixtures to support supply and waste piping for plumbing fixtures.

END OF SECTION 220529

SECTION 220533 - HEAT TRACING FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes plumbing piping heat tracing for freeze prevention and flow maintenance of buried greasy waste for the kitchen waste piping with the following electric heating cables:

1. Self-regulating, parallel resistance.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include rated capacities, operating characteristics, and furnished specialties and accessories.
2. Schedule heating capacity, length of cable, spacing, and electrical power requirement for each electric heating cable required.

B. Shop Drawings: For electric heating cable.

1. Include plans, elevations, sections, and attachment details.
2. Include diagrams for power, signal, and control wiring.

1.4 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

B. Sample Warranty: For special warranty.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For electric heating cables to include in operation and maintenance manuals.

1.6 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace electric heating cable that fails in materials or workmanship within specified warranty period.

1. Warranty Period: Two (2) years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SELF-REGULATING, PARALLEL-RESISTANCE HEATING CABLES

A. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

1. Chromalox, Inc.
2. Nelson Heat Trace
3. Raychem; Tyco Thermal Controls
4. Thermon Americas Inc.

B. Comply with IEEE 515.1.

C. Heating Element: Pair of parallel No. 16 AWG, nickel-coated, stranded copper bus wires embedded in crosslinked conductive polymer core, which varies heat output in response to temperature along its length. Terminate with waterproof, factory-assembled, non-heating leads with connectors at one end, and seal the opposite end watertight. Cable shall be capable of crossing over itself once without overheating.

D. Electrical Insulating Jacket: Flame-retardant polyolefin.

E. Cable Cover: Tinned-copper braid and polyolefin outer jacket or fluoropolymer outer jacket.

F. Maximum Operating Temperature (Power On): 150 deg F.

G. Maximum Exposure Temperature (Power Off): 185 deg F or 150 deg F.

H. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

I. Capacities and Characteristics:

1. See Schedule on Drawings for details.

2.2 CONTROLS

A. Pipe-Mounted Thermostats for Freeze Protection:

1. Remote bulb unit with adjustable temperature range from 30 to 50 deg F.
2. Snap action; open-on-rise, single-pole switch with minimum current rating adequate for connected cable.
3. Remote bulb on capillary, resistance temperature device, or thermistor for directly sensing pipe-wall temperature.
4. Corrosion-resistant, waterproof control enclosure.

B. Digital Electronic Controller for Greasy Waste:

1. Remote bulb unit with adjustable temperature range from 32 to 200 deg F.
2. Remote bulb on capillary, resistance temperature device, or thermistor for directly sensing pipe-wall temperature.
3. Corrosion-resistant, waterproof NEMA 4X control enclosure.
4. Integral Ground Fault Protection.

2.3 ACCESSORIES

A. Cable Installation Accessories: Fiberglass tape, heat-conductive putty, cable ties, silicone end seals and splice kits, and installation clips all furnished by manufacturer, or as recommended in writing by manufacturer.

B. Warning Labels: Refer to Section 220553 "Identification for Plumbing Piping and Equipment."

C. Warning Tape: Continuously printed "Electrical Tracing"; vinyl, at least 3 mils thick, and with pressure-sensitive, permanent, waterproof, self-adhesive back.

1. Width for Markers on Pipes with OD, Including Insulation, Less Than 6 Inches: ¾-inch minimum.
2. Width for Markers on Pipes with OD, Including Insulation, 6 Inches or Larger: 1½ inches minimum.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine surfaces and substrates to receive electric heating cables for compliance with requirements for installation tolerances and other conditions affecting performance.

1. Ensure surfaces and pipes in contact with electric heating cables are free of burrs and sharp protrusions.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 APPLICATIONS

A. Install the following types of electric heating cable for the applications described:

1. Temperature Maintenance & Freeze Protection: Self-regulating, parallel-resistance heating cable.

3.3 INSTALLATION

A. Install electric heating cable across expansion, construction, and control joints according to manufacturer's written instructions; use cable-protection conduit and slack cable to allow movement without damage to cable.

B. Electric Heating-Cable Installation for Freeze Protection for Piping:

1. Install electric heating cables after piping has been tested and before insulation is installed.
2. Install electric heating cables according to IEEE 515.1.
3. Install insulation over piping with electric cables according to Section 220719 "Plumbing Piping Insulation."
4. Install warning tape on piping insulation where piping is equipped with electric heating cables.

C. Set field-adjustable switches and circuit-breaker trip ranges.

3.4 CONNECTIONS

A. Ground equipment according to Section 260526 "Grounding and Bonding for Electrical Systems."

B. Connect wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

3.5 FIELD QUALITY CONTROL

A. Perform the following tests and inspections with the assistance of a factory-authorized service representative:

1. Perform tests after cable installation but before application of coverings such as insulation, wall or ceiling construction, or concrete.
2. Test cables for electrical continuity and insulation integrity before energizing.
3. Test cables to verify rating and power input. Energize and measure voltage and current simultaneously.

B. Repeat tests for continuity, insulation resistance, and input power after applying thermal insulation on pipe-mounted cables.

C. Cables will be considered defective if they do not pass tests and inspections.

D. Prepare test and inspection reports.

3.6 PROTECTION

A. Protect installed heating cables, including non-heating leads, from damage during construction.

B. Remove and replace damaged heat-tracing cables.

END OF SECTION 220533

SECTION 220548 - VIBRATION AND SEISMIC CONTROLS FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Elastomeric isolation pads.
2. Elastomeric isolation mounts.
3. Restrained elastomeric isolation mounts.
4. Open-spring isolators.
5. Housed-spring isolators.
6. Restrained-spring isolators.
7. Housed-restrained-spring isolators.
8. Pipe-riser resilient supports.
9. Resilient pipe guides.
10. Elastomeric hangers.
11. Spring hangers.
12. Snubbers.
13. Restraint channel bracings.
14. Restraint cables.
15. Seismic-restraint accessories.
16. Mechanical anchor bolts.
17. Adhesive anchor bolts.

1.3 DEFINITIONS

A. IBC: International Building Code.

B. ICC-ES: ICC-Evaluation Service.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include rated load, rated deflection, and overload capacity for each vibration isolation device.
2. Illustrate and indicate style, material, strength, fastening provision, and finish for each type and size of vibration isolation device and seismic-restraint component required.

    a. Tabulate types and sizes of seismic restraints, complete with report numbers and rated strength in tension and shear as evaluated by an agency acceptable to authorities having jurisdiction.
    b. Annotate to indicate application of each product submitted and compliance with requirements.

3. Interlocking Snubbers: Include ratings for horizontal, vertical, and combined loads.

B. Shop Drawings:

1. Detail fabrication and assembly of equipment bases. Detail fabrication including anchorages and attachments to structure and to supported equipment.

C. Delegated-Design Submittal: For each vibration isolation and seismic-restraint device.

1. Include design calculations and details for selecting vibration isolators and seismic restraints complying with performance requirements, design criteria, and analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
2. Design Calculations: Calculate static and dynamic loading due to equipment weight and operation, due to seismic forces required to select vibration isolators, and due to seismic restraints.
3. Riser Supports: Include riser diagrams and calculations showing anticipated expansion and contraction at each support point, initial and final loads on building structure, spring deflection changes, and seismic loads. Include certification that riser system was examined for excessive stress and that none exists.
4. Seismic-Restraint Details:

a. Design Analysis: To support selection and arrangement of seismic restraints. Include calculations of combined tensile and shear loads.
b. Details: Indicate fabrication and arrangement. Detail attachments of restraints to the restrained items and to the structure. Show attachment locations, methods, and spacings. Identify components, list their strengths, and indicate directions and values of forces transmitted to the structure during seismic events. Indicate association with vibration isolation devices.
c. Coordinate seismic-restraint and vibration isolation details with wind-restraint details required for equipment mounted outdoors. Comply with requirements in other Sections for equipment mounted outdoors.
d. Preapproval and Evaluation Documentation: By an agency acceptable to authorities having jurisdiction, showing maximum ratings of restraint items and the basis for approval (tests or calculations).

1.5 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Show coordination of vibration isolation device installation and seismic bracing for plumbing piping and equipment with other systems and equipment in the vicinity, including other supports and restraints, if any.

B. Qualification Data: For professional engineer and testing agency.

C. Welding certificates.

D. Field quality-control reports.

1.6 QUALITY ASSURANCE

A. Testing Agency Qualifications: An independent agency, with the experience and capability to conduct the testing indicated, that is an NRTL as defined by OSHA in 29 CFR 1910.7 and that is acceptable to authorities having jurisdiction.

B. Comply with seismic-restraint requirements in the IBC unless requirements in this Section are more stringent.

C. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code - Steel."

D. Seismic-restraint devices shall have horizontal and vertical load testing and analysis and shall bear anchorage preapproval OPA number from OSHPD, preapproval by ICC-ES, or preapproval by another agency acceptable to authorities having jurisdiction, showing maximum seismic-restraint ratings. Ratings based on independent testing are preferred to ratings based on calculations. If preapproved ratings are unavailable, submittals based on independent testing are preferred. Calculations (including combining shear and tensile loads) to support seismic-restraint designs must be signed and sealed by a qualified professional engineer.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Seismic-Restraint Loading:

1. Rated strengths, features, and applications shall be as defined in reports by an agency acceptable to authorities having jurisdiction.

    a. Structural Safety Factor: Allowable strength in tension, shear, and pullout force of components shall be at least four (4) times the maximum seismic forces to which they are subjected.

2.2 ELASTOMERIC ISOLATION PADS

A. Elastomeric Isolation Pads:

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

    a. Ace Mountings Co., Inc.
    b. California Dynamics Corporation
    c. Isolation Technology, Inc.
    d. Kinetics Noise Control, Inc.
    e. Mason Industries, Inc.
    f. Novia; A Division of C&P
    g. Vibration Eliminator Co., Inc.
    h. Vibration Isolation
    i. Vibration Mountings & Controls, Inc.

2. Fabrication: Single or multiple layers of sufficient durometer stiffness for uniform loading over pad area.
3. Size: Factory or field cut to match requirements of supported equipment.
4. Pad Material: Oil and water resistant with elastomeric properties.
5. Surface Pattern: Ribbed and/or waffle pattern.
6. Infused nonwoven cotton or synthetic fibers.
7. Load-bearing metal plates adhered to pads.
8. Sandwich-Core Material: Resilient and/or elastomeric.

    a. Surface Pattern: Ribbed and/or waffle pattern.

b. Infused nonwoven cotton or synthetic fibers.

2.3 ELASTOMERIC ISOLATION MOUNTS

A. Double-Deflection, Elastomeric Isolation Mounts:

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

a. Ace Mountings Co., Inc.
b. California Dynamics Corporation
c. Isolation Technology, Inc.
d. Kinetics Noise Control, Inc.
e. Mason Industries, Inc.
f. Novia; A Division of C&P
g. Vibration Eliminator Co., Inc.
h. Vibration Isolation
i. Vibration Mountings & Controls, Inc.

2. Mounting Plates:

a. Top Plate: Encapsulated steel load transfer top plates, factory drilled and threaded with threaded studs or bolts.
b. Baseplate: Encapsulated steel bottom plates with holes provided for anchoring to support structure.

3. Elastomeric Material: Molded, oil-resistant rubber, neoprene, or other elastomeric material.

2.4 RESTRAINED ELASTOMERIC ISOLATION MOUNTS

A. Restrained Elastomeric Isolation Mounts:

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

a. Ace Mountings Co., Inc.
b. California Dynamics Corporation
c. Isolation Technology, Inc.
d. Kinetics Noise Control, Inc.
e. Mason Industries, Inc.
f. Novia; A Division of C&P
g. Vibration Eliminator Co., Inc.
h. Vibration Isolation
i. Vibration Mountings & Controls, Inc.

2. Description: All-directional isolator with seismic restraints containing two (2) separate and opposing elastomeric elements that prevent central threaded element and attachment hardware from contacting the housing during normal operation.

a. Housing: Cast-ductile iron or welded steel.
b. Elastomeric Material: Molded, oil-resistant rubber, neoprene, or other elastomeric material.

2.5 OPEN-SPRING ISOLATORS

A. Freestanding, Laterally Stable, Open-Spring Isolators:

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

    a. Ace Mountings Co., Inc.
    b. California Dynamics Corporation
    c. Isolation Technology, Inc.
    d. Kinetics Noise Control, Inc.
    e. Mason Industries, Inc.
    f. Novia; A Division of C&P
    g. Vibration Eliminator Co., Inc.
    h. Vibration Isolation
    i. Vibration Mountings & Controls, Inc.

2. Outside Spring Diameter: Not less than eighty percent (80%) of the compressed height of the spring at rated load.
3. Minimum Additional Travel: Fifty percent (50%) of the required deflection at rated load.
4. Lateral Stiffness: More than eighty percent (80%) of rated vertical stiffness.
5. Overload Capacity: Support two hundred percent (200%) of rated load, fully compressed, without deformation or failure.
6. Baseplates: Factory-drilled steel plate for bolting to structure with an elastomeric isolator pad attached to the underside. Baseplates shall limit floor load to 500 psig.
7. Top Plate and Adjustment Bolt: Threaded top plate with adjustment bolt and cap screw to fasten and level equipment.

2.6 HOUSED-SPRING ISOLATORS

A. Freestanding, Laterally Stable, Open-Spring Isolators in Two-Part Telescoping Housing:

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

    a. Ace Mountings Co., Inc.
    b. California Dynamics Corporation
    c. Isolation Technology, Inc.
    d. Kinetics Noise Control, Inc.
    e. Mason Industries, Inc.
    f. Vibration Eliminator Co., Inc.
    g. Vibration Isolation
    h. Vibration Mountings & Controls, Inc.

2. Outside Spring Diameter: Not less than eighty percent (80%) of the compressed height of the spring at rated load.
3. Minimum Additional Travel: Fifty percent (50%) of the required deflection at rated load.
4. Lateral Stiffness: More than eighty percent (80%) of rated vertical stiffness.
5. Overload Capacity: Support two hundred percent (200%) of rated load, fully compressed, without deformation or failure.
6. Two-Part Telescoping Housing: A steel top and bottom frame separated by an elastomeric material and enclosing the spring isolators.

    a. Drilled base housing for bolting to structure with an elastomeric isolator pad attached to the underside. Bases shall limit floor load to 500 psig.

b. Top housing with attachment and leveling bolt or threaded mounting holes and internal leveling device and elastomeric pad.

2.7 RESTRAINED-SPRING ISOLATORS

A. Freestanding, Laterally Stable, Open-Spring Isolators with Vertical-Limit Stop Restraint:

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

a. Ace Mountings Co., Inc.
b. California Dynamics Corporation
c. Isolation Technology, Inc.
d. Kinetics Noise Control, Inc.
e. Mason Industries, Inc.
f. Novia; A Division of C&P
g. Vibration Eliminator Co., Inc.
h. Vibration Isolation
i. Vibration Mountings & Controls, Inc.

2. Housing: Steel housing with vertical-limit stops to prevent spring extension due to weight being removed.

a. Base with holes for bolting to structure with an elastomeric isolator pad attached to the underside. Bases shall limit floor load to 500 psig.
b. Top plate with threaded mounting holes.
c. Internal leveling bolt that acts as blocking during installation.

3. Restraint: Limit stop as required for equipment and authorities having jurisdiction.
4. Outside Spring Diameter: Not less than eighty percent (80%) of the compressed height of the spring at rated load.
5. Minimum Additional Travel: Fifty percent (50%) of the required deflection at rated load.
6. Lateral Stiffness: More than eighty percent (80%) of rated vertical stiffness.
7. Overload Capacity: Support two hundred percent (200%) of rated load, fully compressed, without deformation or failure.

2.8 HOUSED-RESTRAINED-SPRING ISOLATORS

A. Freestanding, Steel, Open-Spring Isolators with Vertical-Limit Stop Restraint in Two-Part Telescoping Housing:

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

a. Ace Mountings Co., Inc.
b. California Dynamics Corporation
c. Isolation Technology, Inc.
d. Kinetics Noise Control, Inc.
e. Mason Industries, Inc.
f. Vibration Eliminator Co., Inc.
g. Vibration Isolation
h. Vibration Mountings & Controls, Inc.

2. Two-Part Telescoping Housing: A steel top and bottom frame separated by an elastomeric material and enclosing the spring isolators. Housings are equipped with adjustable snubbers to limit vertical movement.

    a. Drilled base housing for bolting to structure with an elastomeric isolator pad attached to the underside. Bases shall limit floor load to 500 psig.
    b. Threaded top housing with adjustment bolt and cap screw to fasten and level equipment.

3. Outside Spring Diameter: Not less than eighty percent (80%) of the compressed height of the spring at rated load.
4. Minimum Additional Travel: Fifty percent (50%) of the required deflection at rated load.
5. Lateral Stiffness: More than eighty percent (80%) of rated vertical stiffness.
6. Overload Capacity: Support two hundred percent (200%) of rated load, fully compressed, without deformation or failure.

2.9 PIPE-RISER RESILIENT SUPPORT

A. Description: All-directional, acoustical pipe anchor consisting of two (2) steel tubes separated by a minimum ½-inch-thick neoprene.

1. Vertical-Limit Stops: Steel and neoprene vertical-limit stops arranged to prevent vertical travel in both directions.
2. Maximum Load Per Support: 500 psig on isolation material providing equal isolation in all directions.

2.10 RESILIENT PIPE GUIDES

A. Description: Telescopic arrangement of two (2) steel tubes or post and sleeve arrangement separated by a minimum ½-inch-thick neoprene.

1. Factory-Set Height Guide with Shear Pin: Shear pin shall be removable and reinsertable to allow for selection of pipe movement. Guides shall be capable of motion to meet location requirements.

2.11 ELASTOMERIC HANGERS

A. Elastomeric Mount in a Steel Frame with Upper and Lower Steel Hanger Rods:

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

    a. Ace Mountings Co., Inc.
    b. California Dynamics Corporation
    c. Isolation Technology, Inc.
    d. Kinetics Noise Control, Inc.
    e. Mason Industries, Inc.
    f. Novia; A Division of C&P
    g. Vibration Eliminator Co., Inc.
    h. Vibration Mountings & Controls, Inc.

2. Frame: Steel, fabricated with a connection for an upper threaded hanger rod and an opening on the underside to allow for a maximum of 30 degrees of angular lower hanger-rod misalignment without binding or reducing isolation efficiency.

3. Dampening Element: Molded, oil-resistant rubber, neoprene, or other elastomeric material with a projecting bushing for the underside opening preventing steel to steel contact.

2.12 SPRING HANGERS

A. Combination Coil-Spring and Elastomeric-Insert Hanger with Spring and Insert in Compression:

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

a. Ace Mountings Co., Inc.
b. California Dynamics Corporation
c. Kinetics Noise Control, Inc.
d. Mason Industries, Inc.
e. Novia; A Division of C&P
f. Vibration Eliminator Co., Inc.
g. Vibration Isolation.
h. Vibration Mountings & Controls, Inc.

2. Frame: Steel, fabricated for connection to threaded hanger rods and to allow for a maximum of 30 degrees of angular hanger-rod misalignment without binding or reducing isolation efficiency.
3. Outside Spring Diameter: Not less than eighty percent (80%) of the compressed height of the spring at rated load.
4. Minimum Additional Travel: Fifty percent (50%) of the required deflection at rated load.
5. Lateral Stiffness: More than eighty percent (80%) of rated vertical stiffness.
6. Overload Capacity: Support two hundred percent (200%) of rated load, fully compressed, without deformation or failure.
7. Elastomeric Element: Molded, oil-resistant rubber or neoprene. Steel-washer-reinforced cup to support spring and bushing projecting through bottom of frame.
8. Adjustable Vertical Stop: Steel washer with neoprene washer "up-stop" on lower threaded rod.
9. Self-centering hanger-rod cap to ensure concentricity between hanger rod and support spring coil.

2.13 SNUBBERS

A. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

1. Kinetics Noise Control, Inc.
2. Mason Industries, Inc.
3. Novia; A Division of C&P
4. Vibration Mountings & Controls, Inc.

B. Description: Factory fabricated using welded structural-steel shapes and plates, anchor bolts, and replaceable resilient isolation washers and bushings.

1. Anchor bolts for attaching to concrete shall be seismic-rated, drill-in, and stud-wedge or female-wedge type.
2. Resilient Isolation Washers and Bushings: Oil- and water-resistant neoprene.
3. Maximum ¼-inch air gap, and minimum ¼-inch-thick resilient cushion.

2.14 RESTRAINT CHANNEL BRACINGS

A. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

1. B-line, an Eaton business
2. Hilti, Inc.
3. Mason Industries, Inc.
4. Unistrut; Part of Atkore International

B. Description: MFMA-4, shop- or field-fabricated bracing assembly made of slotted steel channels with accessories for attachment to braced component at one end and to building structure at the other end and other matching components and with corrosion-resistant coating; rated in tension, compression, and torsion forces.

2.15 RESTRAINT CABLES

A. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

1. Kinetics Noise Control, Inc.
2. Mason Industries, Inc.
3. Novia; A Division of C&P
4. Vibration & Seismic Technologies, LLC
5. Vibration Mountings & Controls, Inc.

B. Restraint Cables: ASTM A 492 stainless-steel cables. End connections made of steel assemblies with thimbles, brackets, swivel, and bolts designed for restraining cable service; with a minimum of two (2) clamping bolts for cable engagement.

2.16 SEISMIC-RESTRAINT ACCESSORIES

A. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

1. B-line, an Eaton business
2. Kinetics Noise Control, Inc.
3. Mason Industries, Inc.
4. Novia; A Division of C&P
5. TOLCO
6. Vibration & Seismic Technologies, LLC

B. Hanger-Rod Stiffener: Steel tube or steel slotted-support-system sleeve with internally bolted connections to hanger rod.

C. Hinged and Swivel Brace Attachments: Multifunctional steel connectors for attaching hangers to rigid channel bracings and restraint cables.

D. Bushings for Floor-Mounted Equipment Anchor Bolts: Neoprene bushings designed for rigid equipment mountings and matched to type and size of anchor bolts and studs.

E. Bushing Assemblies for Wall-Mounted Equipment Anchorage: Assemblies of neoprene elements and steel sleeves designed for rigid equipment mountings and matched to type and size of attachment devices used.

F. Resilient Isolation Washers and Bushings: One-piece, molded, oil- and water-resistant neoprene, with a flat washer face.

2.17 MECHANICAL ANCHOR BOLTS

A. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

1. B-line, an Eaton business
2. Hilti, Inc.
3. Kinetics Noise Control, Inc.
4. Mason Industries, Inc.

B. Mechanical Anchor Bolts: Drilled-in and stud-wedge or female-wedge type in zinc-coated steel for interior applications and stainless-steel for exterior applications. Select anchor bolts with strength required for anchor and as tested according to ASTM E 488.

2.18 ADHESIVE ANCHOR BOLTS

A. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

1. Hilti, Inc.
2. Kinetics Noise Control, Inc.
3. Mason Industries, Inc.

B. Adhesive Anchor Bolts: Drilled-in and capsule anchor system containing PVC or urethane methacrylate-based resin and accelerator, or injected polymer or hybrid mortar adhesive. Provide anchor bolts and hardware with zinc-coated steel for interior applications and stainless-steel for exterior applications. Select anchor bolts with strength required for anchor and as tested according to ASTM E 488.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and equipment to receive vibration isolation and seismic-control devices for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine roughing-in of reinforcement and cast-in-place anchors to verify actual locations before installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 APPLICATIONS

A. Multiple Pipe Supports: Secure pipes to trapeze member with clamps approved for application by an agency acceptable to authorities having jurisdiction.

B. Hanger-Rod Stiffeners: Install hanger-rod stiffeners where indicated or scheduled on Drawings to receive them and where required to prevent buckling of hanger rods due to seismic forces.

C. Strength of Support and Seismic-Restraint Assemblies: Where not indicated, select sizes of components so strength is adequate to carry present and future static and seismic loads within specified loading limits.

3.3 VIBRATION CONTROL AND SEISMIC-RESTRAINT DEVICE INSTALLATION

A. Coordinate the location of embedded connection hardware with supported equipment attachment and mounting points and with requirements for concrete reinforcement and formwork specified in Section 033000 “Cast-In-Place Concrete”.

B. Installation of vibration isolators must not cause any change of position of equipment, piping, or ductwork resulting in stresses or misalignment.

C. Comply with requirements in Section 077200 "Roof Accessories" for installation of roof curbs, equipment supports, and roof penetrations.

D. Equipment Restraints:

1. Install seismic snubbers on plumbing equipment mounted on vibration isolators. Locate snubbers as close as possible to vibration isolators and bolt to equipment base and supporting structure.
2. Install resilient bolt isolation washers on equipment anchor bolts where clearance between anchor and adjacent surface exceeds 0.125-inch.
3. Install seismic-restraint devices using methods approved by an agency acceptable to authorities having jurisdiction that provides required submittals for component.

E. Piping Restraints:

1. Comply with requirements in MSS SP-127.
2. Space lateral supports a maximum of 40 feet o.c., and longitudinal supports a maximum of 80 feet o.c.
3. Brace a change of direction longer than 12 feet.

F. Install cables so they do not bend across edges of adjacent equipment or building structure.

G. Install seismic-restraint devices using methods approved by an agency acceptable to authorities having jurisdiction that provides required submittals for component.

H. Install bushing assemblies for anchor bolts for floor-mounted equipment, arranged to provide resilient media between anchor bolt and mounting hole in concrete base.

I. Install bushing assemblies for mounting bolts for wall-mounted equipment, arranged to provide resilient media where equipment or equipment-mounting channels are attached to wall.

J. Attachment to Structure: If specific attachment is not indicated, anchor bracing to structure at flanges of beams, at upper truss chords of bar joists, or at concrete members.

K. Drilled-in Anchors:

1. Identify position of reinforcing steel and other embedded items prior to drilling holes for anchors. Do not damage existing reinforcing or embedded items during coring or drilling. Notify the Structural Engineer if reinforcing steel or other embedded items are encountered during drilling. Locate and avoid pre-stressed tendons, electrical and telecommunications conduit, and gas lines.

2. Do not drill holes in concrete or masonry until concrete, mortar, or grout has achieved full design strength.
3. Wedge Anchors: Protect threads from damage during anchor installation. Heavy-duty sleeve anchors shall be installed with sleeve fully engaged in the structural element to which anchor is to be fastened.
4. Adhesive Anchors: Clean holes to remove loose material and drilling dust prior to installation of adhesive. Place adhesive in holes proceeding from the bottom of the hole and progressing toward the surface in such a manner as to avoid introduction of air pockets in the adhesive.
5. Set anchors to manufacturer's recommended torque, using a torque wrench.
6. Install zinc-coated steel anchors for interior and stainless-steel anchors for exterior applications.

3.4 ACCOMMODATION OF DIFFERENTIAL SEISMIC MOTION

A. Install flexible connections in piping where they cross seismic joints, where adjacent sections or branches are supported by different structural elements, and where the connections terminate with connection to equipment that is anchored to a different structural element from the one supporting the connections as they approach equipment. Comply with requirements in Section 221116 "Domestic Water Piping" for piping flexible connections.

3.5 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Tests and Inspections:

1. Provide evidence of recent calibration of test equipment by a testing agency acceptable to authorities having jurisdiction.
2. Schedule test with Owner, through Architect, before connecting anchorage device to restrained component (unless post-connection testing has been approved), and with at least seven (7) days' advance notice.
3. Obtain Architect's approval before transmitting test loads to structure. Provide temporary load-spreading members.
4. Test at least four (4) of each type and size of installed anchors and fasteners selected by Architect.
5. Test to ninety percent (90%) of rated proof load of device.
6. Measure isolator restraint clearance.
7. Measure isolator deflection.
8. Verify snubber minimum clearances.

C. Remove and replace malfunctioning units and retest as specified above.

D. Prepare test and inspection reports.

3.6 ADJUSTING

A. Adjust isolators after piping system is at operating weight.

B. Adjust limit stops on restrained-spring isolators to mount equipment at normal operating height. After equipment installation is complete, adjust limit stops so they are out of contact during normal operation.

END OF SECTION 220548

SECTION 220553 - IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Equipment labels.
2. Warning signs and labels.
3. Pipe labels.
4. Stencils.
5. Valve tags.
6. Warning tags.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Samples: For color, letter style, and graphic representation required for each identification material and device.

C. Equipment Label Schedule: Include a listing of all equipment to be labeled with the proposed content for each label.

D. Valve numbering scheme.

E. Valve Schedules: For each piping system to include in maintenance manuals.

PART 2 - PRODUCTS

2.1 EQUIPMENT LABELS

A. Metal Labels for Equipment:

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

a. Brady Corporation
b. Brimar Industries, Inc.
c. Carlton Industries, LP
d. Champion America
e. Craftmark Pipe Markers
f. Emedco
g. Kolbi Pipe Marker Co.
h. LEM Products Inc.
i. Marking Services, Inc.

j. Seton Identification Products

2. Material and Thickness: Brass, 0.032-inch minimum thickness, and having predrilled or stamped holes for attachment hardware.
3. Letter Color: White.
4. Background Color: Black.
5. Minimum Label Size: Length and width vary for required label content, but not less than 2½-by-¾-inch.
6. Minimum Letter Size: ¼-inch for name of units if viewing distance is less than 24 inches, ½-inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-quarters the size of principal lettering.
7. Fasteners: Stainless-steel rivets or self-tapping screws.
8. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

B. Plastic Labels for Equipment:

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

a. Brady Corporation
b. Brimar Industries, Inc.
c. Carlton Industries, LP
d. Champion America
e. Craftmark Pipe Markers
f. Emedco
g. Kolbi Pipe Marker Co.
h. LEM Products Inc.
i. Marking Services, Inc.
j. Seton Identification Products

2. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8-inch-thick and having predrilled holes for attachment hardware.
3. Letter Color: White.
4. Background Color: Black.
5. Maximum Temperature: Able to withstand temperatures up to 160 deg F.
6. Minimum Label Size: Length and width vary for required label content, but not less than 2½-by-¾-inch.
7. Minimum Letter Size: ¼-inch for name of units if viewing distance is less than 24 inches, ½-inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-quarters the size of principal lettering.
8. Fasteners: Stainless-steel rivets or self-tapping screws.
9. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

C. Label Content: Include equipment's Drawing designation or unique equipment number, drawing numbers where equipment is indicated (plans, details, and schedules), and the Specification Section number and title where equipment is specified.

D. Equipment Label Schedule: For each item of equipment to be labeled, on 8½-by-11-inch bond paper. Tabulate equipment identification number and identify drawing numbers where equipment is indicated (plans, details, and schedules) and the Specification Section number and title where equipment is specified. Equipment schedule shall be included in operation and maintenance data.

2.2 WARNING SIGNS AND LABELS

A. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

1. Brady Corporation
2. Brimar Industries, Inc.
3. Carlton Industries, LP
4. Champion America
5. Craftmark Pipe Markers
6. emedco
7. LEM Products Inc.
8. Marking Sevices Inc.
9. National Marker Company
10. Seton Identification Products
11. Stranco, Inc.

B. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8-inch-thick, and having predrilled holes for attachment hardware.

C. Letter Color: Black.

D. Background Color: Yellow.

E. Maximum Temperature: Able to withstand temperatures up to 160 deg F.

F. Minimum Label Size: Length and width vary for required label content, but not less than 2½-by-¾-inch.

G. Minimum Letter Size: ¼-inch for name of units if viewing distance is less than 24 inches, ½-inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-quarters the size of principal lettering.

H. Fasteners: Stainless-steel rivets or self-tapping screws.

I. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

J. Label Content: Include caution and warning information plus emergency notification instructions.

2.3 PIPE LABELS

A. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

1. Actioncraft Products, Inc.; a division of Industrial Test Equipment Co., Inc.
2. Brady Corporation
3. Brimar Industries, Inc.
4. Carlton Industries, LP
5. Champion America
6. Craftmark Pipe Markers
7. Emedco
8. Kolbi Pipe Marker Co.
9. LEM Products Inc.
10. Marking Sevices Inc.
11. Seton Identification Products

B. General Requirements for Manufactured Pipe Labels: Preprinted, color-coded, with lettering indicating service, and showing flow direction.

C. Pretensioned Pipe Labels: Precoiled, semirigid plastic formed to cover full circumference of pipe and to attach to pipe without fasteners or adhesive.

D. Self-Adhesive Pipe Labels: Printed plastic with contact-type, permanent-adhesive backing.

E. Pipe Label Contents: Include identification of piping service using same designations or abbreviations as used on Drawings; also include pipe size and an arrow indicating flow direction.

1. Flow-Direction Arrows: Integral with piping-system service lettering to accommodate both directions or as separate unit on each pipe label to indicate flow direction.
2. Lettering Size: Size letters according to ASME A13.1 for piping.

2.4 STENCILS

A. Stencils for Piping:

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

a. Brimar Industries, Inc.
b. Carlton Industries, LP
c. Champion America
d. Craftmark Pipe Markers
e. Kolbi Pipe Marker Co.
f. Marking Sevices Inc.

2. Lettering Size: Size letters according to ASME A13.1 for piping.
3. Stencil Material: Fiberboard or metal.
4. Stencil Paint: Exterior, gloss, acrylic enamel in colors complying with recommendations in ASME A13.1 unless otherwise indicated. Paint may be in pressurized spray-can form.
5. Identification Paint: Exterior, acrylic enamel in colors according to ASME A13.1 unless otherwise indicated. Paint may be in pressurized spray-can form.

2.5 VALVE TAGS

A. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

1. Actioncraft Products, Inc.; a division of Industrial Test Equipment Co., Inc.
2. Brady Corporation
3. Brimar Industries, Inc.
4. Carlton Industries, LP
5. Champion America
6. Craftmark Pipe Markers
7. emedco
8. Kolbi Pipe Marker Co.
9. LEM Products Inc.
10. Marking Sevices Inc.
11. Seton Identification Products

B. Valve Tags: Stamped or engraved with ¼-inch letters for piping system abbreviation and ½-inch numbers.

1. Tag Material: Brass, 0.032-inch minimum thickness, and having predrilled or stamped holes for attachment hardware.
2. Fasteners: Brass wire-link chain or S-hook.

C. Valve Schedules: For each piping system, on 8½-by-11-inch bond paper. Tabulate valve number, piping system, system abbreviation (as shown on valve tag), location of valve (room or space), normal-operating position (open, closed, or modulating), and variations for identification. Mark valves for emergency shutoff and similar special uses.

1. Valve-tag schedule shall be included in operation and maintenance data.

2.6 WARNING TAGS

A. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

1. Brady Corporation
2. Brimar Industries, Inc.
3. Carlton Industries, LP
4. Champion America
5. Craftmark Pipe Markers
6. Emedco
7. Kolbi Pipe Marker Co.
8. LEM Products Inc.
9. Marking Sevices Inc.
10. Seton Identification Products

B. Description: Preprinted or partially preprinted accident-prevention tags of plasticized card stock with matte finish suitable for writing.

1. Size: 3 by 5¼ inches minimum.
2. Fasteners: Brass grommet and wire.
3. Nomenclature: Large-size primary caption such as "DANGER," "CAUTION," or "DO NOT OPERATE."
4. Color: Safety yellow background with black lettering.

PART 3 - EXECUTION

3.1 PREPARATION

A. Clean piping and equipment surfaces of substances that could impair bond of identification devices, including dirt, oil, grease, release agents, and incompatible primers, paints, and encapsulants.

3.2 GENERAL INSTALLATION REQUIREMENTS

A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.

B. Coordinate installation of identifying devices with locations of access panels and doors.

C. Install identifying devices before installing acoustical ceilings and similar concealment.

3.3 EQUIPMENT LABEL INSTALLATION

A. Install or permanently fasten labels on each major item of mechanical equipment.

B. Locate equipment labels where accessible and visible.

3.4 PIPE LABEL INSTALLATION

A. Piping Color Coding: Painting of piping is specified in Division 09.

B. Stenciled Pipe Label Option: Stenciled labels may be provided instead of manufactured pipe labels, at Installer's option. Install stenciled pipe labels, complying with ASME A13.1, with painted, color-coded bands or rectangles on each piping system.

1. Identification Paint: Use for contrasting background.
2. Stencil Paint: Use for pipe marking.

C. Pipe Label Locations: Locate pipe labels where piping is exposed or above accessible ceilings in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior exposed locations as follows:

1. Near each valve and control device.
2. Near each branch connection, excluding short takeoffs for fixtures and terminal units. Where flow pattern is not obvious, mark each pipe at branch.
3. Near penetrations through walls, floors, ceilings, and inaccessible enclosures.
4. At access doors, manholes, and similar access points that permit view of concealed piping.
5. Near major equipment items and other points of origination and termination.
6. Spaced at maximum intervals of 50 feet along each run. Reduce intervals to 25 feet in areas of congested piping and equipment.
7. On piping above removable acoustical ceilings. Omit intermediately spaced labels.

D. Directional Flow Arrows: Arrows shall be used to indicate direction of flow in pipes, including pipes where flow is allowed in both directions.

E. Pipe Label Color Schedule:

1. Natural Gas Piping:

   a. Background: Safety blue.
   b. Letter Colors: White.

2. Domestic Water Piping

   a. Background: Safety green.
   b. Letter Colors: White.

3. Sanitary Waste and Storm Drainage Piping:

   a. Background Color: Safety gray.
   b. Letter Color: White.

3.5 VALVE-TAG INSTALLATION

A. Install tags on valves and control devices in piping systems, except check valves, valves within factory-fabricated equipment units, shutoff valves, faucets, convenience and lawn-watering hose connections, and similar roughing-in connections of end-use fixtures and units. List tagged valves in a valve schedule.

B. Valve-Tag Application Schedule: Tag valves according to size, shape, and color scheme and with captions similar to those indicated in the following subparagraphs:

1. Valve-Tag Size and Shape:

a. Cold Water: 2 inches, round.
b. Hot Water: 2 inches, round.
c. Natural Gas: 2 inches, round.

2. Valve-Tag Colors:

a. Cold Water: Safety green.
b. Hot Water: Safety green.
c. Natural Gas: Safety yellow

3. Letter Colors:

a. Cold Water: White.
b. Hot Water: White.
c. Natural Gas: White.

3.6 WARNING-TAG INSTALLATION

A. Write required message on, and attach warning tags to, equipment and other items where required.

END OF SECTION 220553

SECTION 220719 - PLUMBING PIPING INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes insulating the following plumbing piping services:

1. Domestic cold-water piping.
2. Domestic hot-water piping.
3. Domestic recirculating hot-water piping.
4. Sanitary waste piping exposed to freezing conditions.
5. Storm water piping exposed to freezing conditions.
6. Roof drains and rainwater leaders.
7. Supplies and drains for handicap-accessible lavatories and sinks.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include thermal conductivity, water-vapor permeance thickness, and jackets (both factory- and field-applied, if any).

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

1. Detail application of protective shields, saddles, and inserts at hangers for each type of insulation and hanger.
2. Detail attachment and covering of heat tracing inside insulation.
3. Detail insulation application at pipe expansion joints for each type of insulation.
4. Detail insulation application at elbows, fittings, flanges, valves, and specialties for each type of insulation.
5. Detail removable insulation at piping specialties, equipment connections, and access panels.
6. Detail application of field-applied jackets.
7. Detail application at linkages of control devices.

C. Samples: For each type of insulation and jacket indicated. Identify each Sample, describing product and intended use. Sample sizes are as follows:

1. Preformed Pipe Insulation Materials: 12 inches long by NPS 2.
2. Jacket Materials for Pipe: 12 inches long by NPS 2.
3. Sheet Jacket Materials: 12 inches square.
4. Manufacturer's Color Charts: For products where color is specified, show the full range of colors available for each type of finish material.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Installer.

B. Material Test Reports: From a qualified testing agency acceptable to authorities having jurisdiction indicating, interpreting, and certifying test results for compliance of insulation materials, sealers, attachments, cements, and jackets, with requirements indicated. Include dates of tests and test methods employed.

C. Field quality-control reports.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Skilled mechanics who have successfully completed an apprenticeship program or another craft training program certified by the Department of Labor, Bureau of Apprenticeship and Training.

B. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products according to ASTM E 84 by a testing agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing agency.

1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.

C. Mockups: Before installing insulation, build mockups for each type of insulation and finish listed below to demonstrate quality of insulation application and finishes. Build mockups in the location indicated or, if not indicated, as directed by Architect. Use materials indicated for the completed Work.

1. Piping Mockups:

a. One (1) 10-foot section of NPS 2 straight pipe.
b. One (1) each of a 90-degree threaded, welded, and flanged elbow.
c. One (1) each of a threaded, welded, and flanged tee fitting.
d. One (1) NPS 2 or smaller valve, and one (1) NPS 2-1/2 or larger valve.
e. Four (4) support hangers including hanger shield and insert.
f. One (1) threaded strainer and one (1) flanged strainer with removable portion of insulation.
g. One (1) threaded reducer and one (1) welded reducer.
h. One (1) pressure temperature tap.
i. One (1) mechanical coupling.

2. For each mockup, fabricate cutaway sections to allow observation of application details for insulation materials, adhesives, mastics, attachments, and jackets.
3. Notify Architect seven (7) days in advance of dates and times when mockups will be constructed.
4. Obtain Architect's approval of mockups before starting insulation application.
5. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
6. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
7. Demolish and remove mockups when directed.

D. Comply with the following applicable standards and other requirements specified for miscellaneous components:

1. Supply and Drain Protective Shielding Guards: ICC A117.1.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Packaging: Insulation material containers shall be marked by manufacturer with appropriate ASTM standard designation, type and grade, and maximum use temperature.

1.7 COORDINATION

A. Coordinate sizes and locations of supports, hangers, and insulation shields specified in Section 220529 "Hangers and Supports for Plumbing Piping and Equipment."

B. Coordinate clearance requirements with piping Installer for piping insulation application. Before preparing piping Shop Drawings, establish and maintain clearance requirements for installation of insulation and field-applied jackets and finishes and for space required for maintenance.

C. Coordinate installation and testing of heat tracing.

1.8 SCHEDULING

A. Schedule insulation application after pressure testing systems and, where required, after installing and testing heat tracing. Insulation application may begin on segments that have satisfactory test results.

B. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

PART 2 - PRODUCTS

2.1 INSULATION MATERIALS

A. Comply with requirements in "Piping Insulation Schedule, General," "Indoor Piping Insulation Schedule," "Outdoor, Aboveground Piping Insulation Schedule," and "Outdoor, Underground Piping Insulation Schedule" articles for where insulating materials shall be applied.

B. Products shall not contain asbestos, lead, mercury, or mercury compounds.

C. Products that come in contact with stainless-steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.

D. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.

E. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.

F. Cellular Glass: Inorganic, incombustible, foamed or cellulated glass with annealed, rigid, hermetically sealed cells. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Pittsburgh Corning Corporation

2. Block Insulation: ASTM C 552, Type I.
3. Special-Shaped Insulation: ASTM C 552, Type III.
4. Preformed Pipe Insulation without Jacket: Comply with ASTM C 552, Type II, Class 1.
5. Preformed Pipe Insulation with Factory-Applied ASJ-SSL: Comply with ASTM C 552, Type II, Class 2.
6. Factory fabricate shapes according to ASTM C 450 and ASTM C 585.

G. Flexible Elastomeric Insulation: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534, Type I for tubular materials.

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

a. Aeroflex USA, Inc.
b. Armacell LLC
c. K-Flex USA

H. Mineral-Fiber Blanket Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 553, Type II and ASTM C 1290, Type I. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

a. CertainTeed Corporation
b. Johns Manville; a Berkshire Hathaway company
c. Knauf Insulation
d. Manson Insulation Inc.
e. Owens Corning

I. Mineral-Fiber, Preformed Pipe Insulation:

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

a. Johns Manville; a Berkshire Hathaway company
b. Knauf Insulation
c. Manson Insulation Inc.
d. Owens Corning

2. Type I, 850 Deg F Materials: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 547, Type I, Grade A, with factory-applied ASJ-SSL. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

J. Phenolic:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Kingspan Tarec Industrial Insulation NV
b. Resolco International BV

2. Preformed pipe insulation of rigid, expanded, closed-cell structure. Comply with ASTM C 1126, Type III, Grade 1.
3. Block insulation of rigid, expanded, closed-cell structure. Comply with ASTM C 1126, Type II, Grade 1.
4. Factory fabricate shapes according to ASTM C 450 and ASTM C 585.
5. Factory-Applied Jacket: ASJ. Requirements are specified in "Factory-Applied Jackets" Article.

K. Polyolefin: Unicellular, polyethylene thermal plastic insulation. Comply with ASTM C 534 or ASTM C 1427, Type I, Grade 1 for tubular materials.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Armacell LLC
b. Nomaco Insulation

2.2 INSULATING CEMENTS

A. Mineral-Fiber Insulating Cement: Comply with ASTM C 195.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Ramco Insulation, Inc.

B. Expanded or Exfoliated Vermiculite Insulating Cement: Comply with ASTM C 196.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Ramco Insulation, Inc.

C. Mineral-Fiber, Hydraulic-Setting Insulating and Finishing Cement: Comply with ASTM C 449.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Ramco Insulation, Inc.

2.3 ADHESIVES

A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated, unless otherwise indicated.

B. Cellular-Glass Adhesive: Two-component, thermosetting urethane adhesive containing no flammable solvents, with a service temperature range of minus 100 to plus 200 deg F.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Foster Brand; H. B. Fuller Construction Products

C. Flexible Elastomeric and Polyolefin Adhesive: Comply with MIL-A-24179A, Type II, Class I.

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

a. Aeroflex USA, Inc.
b. Armacell LLC
c. Foster Brand; H. B. Fuller Construction Products
d. K-Flex USA

D. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

a. Childers Brand; H. B. Fuller Construction Products
b. Eagle Bridges - Marathon Industries
c. Foster Brand; H. B. Fuller Construction Products
d. Mon-Eco Industries, Inc.

E. Phenolic Adhesive: Solvent-based resin adhesive, with a service temperature range of minus 75 to plus 300 deg F.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Childers Brand; H. B. Fuller Construction Products
b. Foster Brand; H. B. Fuller Construction Products

F. ASJ Adhesive, and FSK Jacket Adhesive: Comply with MIL-A-3316C, Class 2, Grade A for bonding insulation jacket lap seams and joints.

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

a. Childers Brand; H. B. Fuller Construction Products
b. Eagle Bridges - Marathon Industries
c. Foster Brand; H. B. Fuller Construction Products
d. Mon-Eco Industries, Inc.

G. PVC Jacket Adhesive: Compatible with PVC jacket.

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

a. Dow Corning Corporation
b. Johns Manville; a Berkshire Hathaway company
c. P.I.C. Plastics, Inc.
d. Speedline Corporation

2.4 MASTICS

A. Materials shall be compatible with insulation materials, jackets, and substrates; comply with MIL-PRF-19565C, Type II.

B. Vapor-Barrier Mastic: Water based; suitable for indoor use on below-ambient services.

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

a. Foster Brand; H. B. Fuller Construction Products
b. Knauf Insulation
c. Vimasco Corporation

2. Water-Vapor Permeance: ASTM E 96, Procedure B, 0.013 perm at 43-mil dry film thickness.
3. Service Temperature Range: Minus 20 to plus 180 deg F.
4. Solids Content: ASTM D 1644, fifty-eight percent (58%) by volume and seventy percent (70%) by weight.
5. Color: White.

C. Breather Mastic: Water based; suitable for indoor and outdoor use on above-ambient services.

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

a. Childers Brand; H. B. Fuller Construction Products
b. Eagle Bridges - Marathon Industries
c. Foster Brand; H. B. Fuller Construction Products
d. Knauf Insulation
e. Mon-Eco Industries, Inc.
f. Vimasco Corporation

2. Water-Vapor Permeance: ASTM F 1249, 1.8 perms at 0.0625-inch dry film thickness.
3. Service Temperature Range: Minus 20 to plus 180 deg F.
4. Solids Content: Sixty percent (60%) by volume and sixty-six percent (66%) by weight.
5. Color: White.

2.5 LAGGING ADHESIVES

A. Description: Comply with MIL-A-3316C, Class I, Grade A, and shall be compatible with insulation materials, jackets, and substrates.

1. For indoor applications, use lagging adhesives that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
2. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

a. Childers Brand; H. B. Fuller Construction Products
b. Foster Brand; H. B. Fuller Construction Products
c. Vimasco Corporation

3. Fire-resistant, water-based lagging adhesive and coating for use indoors to adhere fire-resistant lagging cloths over pipe insulation.
4. Service Temperature Range: 0 to plus 180 deg F.

5. Color: White.

2.6 SEALANTS

A. Joint Sealants for Cellular-Glass and Phenolic Products:

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

a. Childers Brand; H. B. Fuller Construction Products
b. Eagle Bridges - Marathon Industries
c. Foster Brand; H. B. Fuller Construction Products
d. Mon-Eco Industries, Inc.
e. Pittsburgh Corning Corporation

2. Materials shall be compatible with insulation materials, jackets, and substrates.
3. Permanently flexible, elastomeric sealant.
4. Service Temperature Range: Minus 100 to plus 300 deg F.
5. Color: White or gray.

B. FSK and Metal Jacket Flashing Sealants:

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

a. Childers Brand; H. B. Fuller Construction Products
b. Eagle Bridges - Marathon Industries
c. Foster Brand; H. B. Fuller Construction Products
d. Mon-Eco Industries, Inc.

2. Materials shall be compatible with insulation materials, jackets, and substrates.
3. Fire- and water-resistant, flexible, elastomeric sealant.
4. Service Temperature Range: Minus 40 to plus 250 deg F.
5. Color: Aluminum.

C. ASJ Flashing Sealants, and Vinyl, PVDC, and PVC Jacket Flashing Sealants:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Childers Brand; H. B. Fuller Construction Products

2. Materials shall be compatible with insulation materials, jackets, and substrates.
3. Fire- and water-resistant, flexible, elastomeric sealant.
4. Service Temperature Range: Minus 40 to plus 250 deg F.
5. Color: White.

2.7 FACTORY-APPLIED JACKETS

A. Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:

1. ASJ: White, kraft-paper, fiberglass-reinforced scrim with aluminum-foil backing; complying with ASTM C 1136, Type I.

2. ASJ-SSL: ASJ with self-sealing, pressure-sensitive, acrylic-based adhesive covered by a removable protective strip; complying with ASTM C 1136, Type I.
3. FSK Jacket: Aluminum-foil, fiberglass-reinforced scrim with kraft-paper backing; complying with ASTM C 1136, Type II.

2.8 FIELD-APPLIED FABRIC-REINFORCING MESH

A. Woven Glass-Fiber Fabric: Approximately 2 oz./sq. yd. with a thread count of 10 strands by 10 strands/sq. in. for covering pipe and pipe fittings.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Childers Brand; H. B. Fuller Construction Products

B. Woven Polyester Fabric: Approximately 1 oz./sq. yd. with a thread count of 10 strands by 10 strands/sq. in., in a Leno weave, for pipe.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Foster Brand; H. B. Fuller Construction Products
b. Vimasco Corporation

2.9 FIELD-APPLIED CLOTHS

A. Woven Glass-Fiber Fabric: Comply with MIL-C-20079H, Type I, plain weave, and presized a minimum of 8 oz./sq. yd.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Alpha Associates, Inc.

2.10 FIELD-APPLIED JACKETS

A. Field-applied jackets shall comply with ASTM C 921, Type I, unless otherwise indicated.

B. PVC Jacket: High-impact-resistant, UV-resistant PVC complying with ASTM D 1784, Class 16354-C; thickness as scheduled; roll stock ready for shop or field cutting and forming. Thickness is indicated in field-applied jacket schedules.

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

a. Johns Manville; a Berkshire Hathaway company
b. P.I.C. Plastics, Inc.
c. Proto Corporation
d. Speedline Corporation

2. Adhesive: As recommended by jacket material manufacturer.
3. Color: Color-code jackets based on system. Color as selected by Architect.

4. Factory-fabricated fitting covers to match jacket if available; otherwise, field fabricate.

    a. Shapes: 45- and 90-degree, short- and long-radius elbows, tees, valves, flanges, unions, reducers, end caps, soil-pipe hubs, traps, mechanical joints, and P-trap and supply covers for lavatories.

C. Metal Jacket:

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

    a. Childers Brand; H. B. Fuller Construction Products
    b. ITW Insulation Systems; Illinois Tool Works, Inc.
    c. RPR Products, Inc.

2. Aluminum Jacket: Comply with ASTM B 209, Alloy 3003, 3005, 3105, or 5005, Temper H-14.

    a. Factory cut and rolled to size.
    b. Finish and thickness are indicated in field-applied jacket schedules.
    c. Moisture Barrier for Indoor Applications: 3-mil-thick, heat-bonded polyethylene and kraft paper.
    d. Moisture Barrier for Outdoor Applications: 3-mil-thick, heat-bonded polyethylene and kraft paper.
    e. Factory-Fabricated Fitting Covers:

        1) Same material, finish, and thickness as jacket.
        2) Preformed 2-piece or gore, 45- and 90-degree, short- and long-radius elbows.
        3) Tee covers.
        4) Flange and union covers.
        5) End caps.
        6) Beveled collars.
        7) Valve covers.
        8) Field fabricate fitting covers only if factory-fabricated fitting covers are not available.

3. Stainless-Steel Jacket: ASTM A 167 or ASTM A 240.

    a. Factory cut and rolled to size.
    b. Material, finish, and thickness are indicated in field-applied jacket schedules.
    c. Moisture Barrier for Indoor Applications: 3-mil-thick, heat-bonded polyethylene and kraft paper.
    d. Moisture Barrier for Outdoor Applications: 3-mil-thick, heat-bonded polyethylene and kraft paper.
    e. Factory-Fabricated Fitting Covers:

        1) Same material, finish, and thickness as jacket.
        2) Preformed 2-piece or gore, 45- and 90-degree, short- and long-radius elbows.
        3) Tee covers.
        4) Flange and union covers.
        5) End caps.
        6) Beveled collars.
        7) Valve covers.

8) Field fabricate fitting covers only if factory-fabricated fitting covers are not available.

D. Underground Direct-Buried Jacket: 125-mil-thick vapor barrier and waterproofing membrane consisting of a rubberized bituminous resin reinforced with a woven-glass fiber or polyester scrim and laminated aluminum foil.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Pittsburgh Corning Corporation
b. Polyguard Products, Inc.

2.11 TAPES

A. ASJ Tape: White vapor-retarder tape matching factory-applied jacket with acrylic adhesive, complying with ASTM C 1136.

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

a. Avery Dennison Corporation, Specialty Tapes Division
b. Compac Corporation
c. Ideal Tape Co., Inc., an American Biltrite Company
d. Knauf Insulation
e. Venture Tape

2. Width: 3 inches.
3. Thickness: 11.5 mils.
4. Adhesion: 90 ounces force/inch in width.
5. Elongation: Two percent (2%).
6. Tensile Strength: 40 lbf/inch in width.
7. ASJ Tape Disks and Squares: Precut disks or squares of ASJ tape.

B. FSK Tape: Foil-face, vapor-retarder tape matching factory-applied jacket with acrylic adhesive; complying with ASTM C 1136.

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

a. Avery Dennison Corporation, Specialty Tapes Division
b. Compac Corporation
c. Ideal Tape Co., Inc., an American Biltrite Company
d. Knauf Insulation
e. Venture Tape

2. Width: 3 inches.
3. Thickness: 6.5 mils.
4. Adhesion: 90 ounces force/inch in width.
5. Elongation: Two percent (2%).
6. Tensile Strength: 40 lbf/inch in width.
7. FSK Tape Disks and Squares: Precut disks or squares of FSK tape.

C. PVC Tape: White vapor-retarder tape matching field-applied PVC jacket with acrylic adhesive; suitable for indoor and outdoor applications.

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

a. Compac Corporation
b. Ideal Tape Co., Inc., an American Biltrite Company
c. Venture Tape

2. Width: 2 inches.
3. Thickness: 6 mils.
4. Adhesion: 64 ounces force/inch in width.
5. Elongation: Five hundred percent (500%).
6. Tensile Strength: 18 lbf/inch in width.

D. Aluminum-Foil Tape: Vapor-retarder tape with acrylic adhesive.

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

a. Avery Dennison Corporation, Specialty Tapes Division
b. Compac Corporation
c. Ideal Tape Co., Inc., an American Biltrite Company
d. Knauf Insulation
e. Venture Tape

2. Width: 2 inches.
3. Thickness: 3.7 mils.
4. Adhesion: 100 ounces force/inch in width.
5. Elongation: Five percent (5%).
6. Tensile Strength: 34 lbf/inch in width.

2.12 SECUREMENTS

A. Bands:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. ITW Insulation Systems; Illinois Tool Works, Inc.
b. RPR Products, Inc.

2. Stainless Steel: ASTM A 167 or ASTM A 240, Type 316; 0.015-inch-thick, ¾-inch-wide with wing seal or closed seal.
3. Aluminum: ASTM B 209, Alloy 3003, 3005, 3105, or 5005; Temper H-14, 0.020-inch-thick, ¾-inch-wide with wing seal or closed seal.

B. Staples: Outward-clinching insulation staples, nominal ¾-inch-wide, stainless-steel or Monel.

C. Wire: 0.062-inch soft-annealed, stainless-steel.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. C & F Wire

2.13 PROTECTIVE SHIELDING GUARDS

A. Protective Shielding Pipe Covers:

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

    a. Engineered Brass Company
    b. Insul-Tect Products Co.
    c. McGuire Manufacturing
    d. Plumberex Specialty Products, Inc.
    e. Truebro
    f. Zurn Industries, LLC

2. Description: Manufactured plastic wraps for covering plumbing fixture hot- and cold-water supplies and trap and drain piping. Comply with Americans with Disabilities Act (ADA) requirements.

B. Protective Shielding Piping Enclosures:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. Truebro
    b. Zurn Industries, LLC

2. Description: Manufactured plastic enclosure for covering plumbing fixture hot- and cold-water supplies and trap and drain piping. Comply with ADA requirements.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of insulation application.

1. Verify that systems to be insulated have been tested and are free of defects.
2. Verify that surfaces to be insulated are clean and dry.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Preparation: Clean and prepare surfaces to be insulated. Before insulating, apply a corrosion coating to insulated surfaces as follows:

1. Stainless-Steel: Coat 300 series stainless-steel with an epoxy primer 5 mils thick and an epoxy finish 5 mils thick if operating in a temperature range between 140 and 300 deg F. Consult coating manufacturer for appropriate coating materials and application methods for operating temperature range.
2. Carbon Steel: Coat carbon steel operating at a service temperature between 32 and 300 deg F with an epoxy coating. Consult coating manufacturer for appropriate coating materials and application methods for operating temperature range.

B. Coordinate insulation installation with the trade installing heat tracing. Comply with requirements for heat tracing that apply to insulation.

C. Mix insulating cements with clean potable water; if insulating cements are to be in contact with stainless-steel surfaces, use demineralized water.

3.3 GENERAL INSTALLATION REQUIREMENTS

A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of piping including fittings, valves, and specialties.

B. Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item of pipe system as specified in insulation system schedules.

C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.

D. Install insulation with longitudinal seams at top and bottom of horizontal runs.

E. Install multiple layers of insulation with longitudinal and end seams staggered.

F. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.

G. Keep insulation materials dry during application and finishing.

H. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.

I. Install insulation with least number of joints practical.

J. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.

1. Install insulation continuously through hangers and around anchor attachments.
2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
4. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect jacket from tear or puncture by hanger, support, and shield.

K. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.

L. Install insulation with factory-applied jackets as follows:

1. Draw jacket tight and smooth.
2. Cover circumferential joints with 3-inch-wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches o.c.
3. Overlap jacket longitudinal seams at least 1½ inches. Install insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 2 inches o.c.

    a. For below-ambient services, apply vapor-barrier mastic over staples.

4. Cover joints and seams with tape, according to insulation material manufacturer's written instructions, to maintain vapor seal.
5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to pipe flanges and fittings.

M. Cut insulation in a manner to avoid compressing insulation more than seventy-five percent (75%) of its nominal thickness.

N. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.

O. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.

P. For above-ambient services, do not install insulation to the following:

1. Vibration-control devices.
2. Testing agency labels and stamps.
3. Nameplates and data plates.
4. Cleanouts.

3.4 PENETRATIONS

A. Insulation Installation at Roof Penetrations: Install insulation continuously through roof penetrations.

1. Seal penetrations with flashing sealant.
2. For applications requiring only indoor insulation, terminate insulation above roof surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
3. Extend jacket of outdoor insulation outside roof flashing at least 2 inches below top of roof flashing.
4. Seal jacket to roof flashing with flashing sealant.

B. Insulation Installation at Underground Exterior Wall Penetrations: Terminate insulation flush with sleeve seal. Seal terminations with flashing sealant.

C. Insulation Installation at Aboveground Exterior Wall Penetrations: Install insulation continuously through wall penetrations.

1. Seal penetrations with flashing sealant.

2. For applications requiring only indoor insulation, terminate insulation inside wall surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
3. Extend jacket of outdoor insulation outside wall flashing and overlap wall flashing at least 2 inches.
4. Seal jacket to wall flashing with flashing sealant.

D. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.

E. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Install insulation continuously through penetrations of fire-rated walls and partitions.

1. Comply with requirements in Section 078413 "Penetration Firestopping" for firestopping and fire-resistive joint sealers.

F. Insulation Installation at Floor Penetrations:

1. Pipe: Install insulation continuously through floor penetrations.
2. Seal penetrations through fire-rated assemblies. Comply with requirements in Section 078413 "Penetration Firestopping."

3.5 GENERAL PIPE INSULATION INSTALLATION

A. Requirements in this article generally apply to all insulation materials except where more specific requirements are specified in various pipe insulation material installation articles.

B. Insulation Installation on Fittings, Valves, Strainers, Flanges, and Unions:

1. Install insulation over fittings, valves, strainers, flanges, unions, and other specialties with continuous thermal and vapor-retarder integrity unless otherwise indicated.
2. Insulate pipe elbows using preformed fitting insulation or mitered fittings made from same material and density as adjacent pipe insulation. Each piece shall be butted tightly against adjoining piece and bonded with adhesive. Fill joints, seams, voids, and irregular surfaces with insulating cement finished to a smooth, hard, and uniform contour that is uniform with adjoining pipe insulation.
3. Insulate tee fittings with preformed fitting insulation or sectional pipe insulation of same material and thickness as used for adjacent pipe. Cut sectional pipe insulation to fit. Butt each section closely to the next and hold in place with tie wire. Bond pieces with adhesive.
4. Insulate valves using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two (2) times the thickness of pipe insulation, or one (1) pipe diameter, whichever is thicker. For valves, insulate up to and including the bonnets, valve stuffing-box studs, bolts, and nuts. Fill joints, seams, and irregular surfaces with insulating cement.
5. Insulate strainers using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two (2) times the thickness of pipe insulation, or one (1) pipe diameter, whichever is thicker. Fill joints, seams, and irregular surfaces with insulating cement. Insulate strainers so strainer basket flange or plug can be easily removed and replaced without damaging the insulation and jacket. Provide a removable reusable insulation cover. For below-ambient services, provide a design that maintains vapor barrier.

6. Insulate flanges and unions using a section of oversized preformed pipe insulation. Overlap adjoining pipe insulation by not less than two (2) times the thickness of pipe insulation, or one (1) pipe diameter, whichever is thicker.
7. Cover segmented insulated surfaces with a layer of finishing cement and coat with a mastic. Install vapor-barrier mastic for below-ambient services and a breather mastic for above-ambient services. Reinforce the mastic with fabric-reinforcing mesh. Trowel the mastic to a smooth and well-shaped contour.
8. For services not specified to receive a field-applied jacket except for flexible elastomeric and polyolefin, install fitted PVC cover over elbows, tees, strainers, valves, flanges, and unions. Terminate ends with PVC end caps. Tape PVC covers to adjoining insulation facing using PVC tape.
9. Stencil or label the outside insulation jacket of each union with the word "union." Match size and color of pipe labels.

C. Insulate instrument connections for thermometers, pressure gages, pressure temperature taps, test connections, flow meters, sensors, switches, and transmitters on insulated pipes. Shape insulation at these connections by tapering it to and around the connection with insulating cement and finish with finishing cement, mastic, and flashing sealant.

D. Install removable insulation covers at locations indicated. Installation shall conform to the following:

1. Make removable flange and union insulation from sectional pipe insulation of same thickness as that on adjoining pipe. Install same insulation jacket as adjoining pipe insulation.
2. When flange and union covers are made from sectional pipe insulation, extend insulation from flanges or union long at least two (2) times the insulation thickness over adjacent pipe insulation on each side of flange or union. Secure flange cover in place with stainless-steel or aluminum bands. Select band material compatible with insulation and jacket.
3. Construct removable valve insulation covers in same manner as for flanges, except divide the two-part section on the vertical center line of valve body.
4. When covers are made from block insulation, make two halves, each consisting of mitered blocks wired to stainless-steel fabric. Secure this wire frame, with its attached insulation, to flanges with tie wire. Extend insulation at least 2 inches over adjacent pipe insulation on each side of valve. Fill space between flange or union cover and pipe insulation with insulating cement. Finish cover assembly with insulating cement applied in two (2) coats. After first coat is dry, apply and trowel second coat to a smooth finish.
5. Unless a PVC jacket is indicated in field-applied jacket schedules, finish exposed surfaces with a metal jacket.

3.6 INSTALLATION OF CELLULAR-GLASS INSULATION

A. Insulation Installation on Straight Pipes and Tubes:

1. Secure each layer of insulation to pipe with wire or bands and tighten bands without deforming insulation materials.
2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
3. For insulation with factory-applied jackets on above-ambient services, secure laps with outward clinched staples at 6 inches o.c.
4. For insulation with factory-applied jackets on below-ambient services, do not staple longitudinal tabs. Instead, secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.

B. Insulation Installation on Pipe Flanges:

1. Install preformed pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of cellular-glass block insulation of same thickness as pipe insulation.
4. Install jacket material with manufacturer's recommended adhesive, overlap seams at least 1-inch, and seal joints with flashing sealant.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install preformed sections of same material as straight segments of pipe insulation when available. Secure according to manufacturer's written instructions.
2. When preformed sections of insulation are not available, install mitered sections of cellular-glass insulation. Secure insulation materials with wire or bands.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed sections of cellular-glass insulation to valve body.
2. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
3. Install insulation to flanges as specified for flange insulation application.

3.7 INSTALLATION OF FLEXIBLE ELASTOMERIC INSULATION

A. Seal longitudinal seams and end joints with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

B. Insulation Installation on Pipe Flanges:

1. Install pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of sheet insulation of same thickness as pipe insulation.
4. Secure insulation to flanges and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install mitered sections of pipe insulation.
2. Secure insulation materials and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed valve covers manufactured of same material as pipe insulation when available.
2. When preformed valve covers are not available, install cut sections of pipe and sheet insulation to valve body. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
3. Install insulation to flanges as specified for flange insulation application.

4. Secure insulation to valves and specialties and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

3.8 INSTALLATION OF MINERAL-FIBER INSULATION

A. Insulation Installation on Straight Pipes and Tubes:

1. Secure each layer of preformed pipe insulation to pipe with wire or bands and tighten bands without deforming insulation materials.
2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
3. For insulation with factory-applied jackets on above-ambient surfaces, secure laps with outward clinched staples at 6 inches o.c.
4. For insulation with factory-applied jackets on below-ambient surfaces, do not staple longitudinal tabs. Instead, secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.

B. Insulation Installation on Pipe Flanges:

1. Install preformed pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with mineral-fiber blanket insulation.
4. Install jacket material with manufacturer's recommended adhesive, overlap seams at least 1-inch, and seal joints with flashing sealant.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install preformed sections of same material as straight segments of pipe insulation when available.
2. When preformed insulation elbows and fittings are not available, install mitered sections of pipe insulation, to a thickness equal to adjoining pipe insulation. Secure insulation materials with wire or bands.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed sections of same material as straight segments of pipe insulation when available.
2. When preformed sections are not available, install mitered sections of pipe insulation to valve body.
3. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
4. Install insulation to flanges as specified for flange insulation application.

3.9 INSTALLATION OF PHENOLIC INSULATION

A. General Installation Requirements:

1. Secure single-layer insulation with stainless-steel bands at 12-inch intervals and tighten bands without deforming insulation materials.
2. Install 2-layer insulation with joints tightly butted and staggered at least 3 inches. Secure inner layer with 0.062-inch wire spaced at 12-inch intervals. Secure outer layer with stainless-steel bands at 12-inch intervals.

B. Insulation Installation on Straight Pipes and Tubes:

1. Secure each layer of insulation to pipe with wire or bands and tighten bands without deforming insulation materials.
2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
3. For insulation with factory-applied jackets on above-ambient services, secure laps with outward clinched staples at 6 inches o.c.
4. For insulation with factory-applied jackets with vapor retarders on below-ambient services, do not staple longitudinal tabs. Instead, secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.

C. Insulation Installation on Pipe Flanges:

1. Install preformed pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of block insulation of same material and thickness as pipe insulation.

D. Insulation Installation on Pipe Fittings and Elbows:

1. Install preformed insulation sections of same material as straight segments of pipe insulation. Secure according to manufacturer's written instructions.

E. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed insulation sections of same material as straight segments of pipe insulation. Secure according to manufacturer's written instructions.
2. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
3. Install insulation to flanges as specified for flange insulation application.

3.10 INSTALLATION OF POLYOLEFIN INSULATION

A. Insulation Installation on Straight Pipes and Tubes:

1. Seal split-tube longitudinal seams and end joints with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

B. Insulation Installation on Pipe Flanges:

1. Install pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of polyolefin sheet insulation of same thickness as pipe insulation.
4. Secure insulation to flanges and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install mitered sections of polyolefin pipe insulation.
2. Secure insulation materials and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install cut sections of polyolefin pipe and sheet insulation to valve body.
2. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
3. Install insulation to flanges as specified for flange insulation application.
4. Secure insulation to valves and specialties, and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

3.11 FIELD-APPLIED JACKET INSTALLATION

A. Where glass-cloth jackets are indicated, install directly over bare insulation or insulation with factory-applied jackets.

1. Draw jacket smooth and tight to surface with 2-inch overlap at seams and joints.
2. Embed glass cloth between two (2) 0.062-inch-thick coats of lagging adhesive.
3. Completely encapsulate insulation with coating, leaving no exposed insulation.

B. Where FSK jackets are indicated, install as follows:

1. Draw jacket material smooth and tight.
2. Install lap or joint strips with same material as jacket.
3. Secure jacket to insulation with manufacturer's recommended adhesive.
4. Install jacket with 1½-inch laps at longitudinal seams and 3-inch-wide joint strips at end joints.
5. Seal openings, punctures, and breaks in vapor-retarder jackets and exposed insulation with vapor-barrier mastic.

C. Where PVC jackets are indicated, install with 1-inch overlap at longitudinal seams and end joints. Seal with manufacturer's recommended adhesive.

1. Apply two (2) continuous beads of adhesive to seams and joints, one bead under lap and the finish bead along seam and joint edge.

D. Where metal jackets are indicated, install with 2-inch overlap at longitudinal seams and end joints. Overlap longitudinal seams arranged to shed water. Seal end joints with weatherproof sealant recommended by insulation manufacturer. Secure jacket with stainless-steel bands 12 inches o.c. and at end joints.

3.12 FINISHES

A. Insulation with ASJ, Glass-Cloth, or Other Paintable Jacket Material: Paint jacket with paint system identified below.

1. Flat Acrylic Finish: Two (2) finish coats over a primer that is compatible with jacket material and finish coat paint. Add fungicidal agent to render fabric mildew proof.

a. Finish Coat Material: Interior, flat, latex-emulsion size.

B. Flexible Elastomeric Thermal Insulation: After adhesive has fully cured, apply two (2) coats of insulation manufacturer's recommended protective coating.

C. Color: Final color as selected by Architect and Owner from manufacturer’s entire range. Vary first and second coats to allow visual inspection of the completed Work.

D. Do not field paint aluminum or stainless-steel jackets.

3.13 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Tests and Inspections:

1. Inspect pipe, fittings, strainers, and valves, randomly selected by Architect, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection shall be limited to three (3) locations of straight pipe, three (3) locations of threaded fittings, three (3) locations of welded fittings, two (2) locations of threaded strainers, two (2) locations of welded strainers, three (3) locations of threaded valves, and three (3) locations of flanged valves for each pipe service defined in the "Piping Insulation Schedule, General" Article.

C. All insulation applications will be considered defective Work if sample inspection reveals noncompliance with requirements.

3.14 PIPING INSULATION SCHEDULE, GENERAL

A. Acceptable preformed pipe and tubular insulation materials and thicknesses are identified for each piping system and pipe size range. If more than one (1) material is listed for a piping system, selection from materials listed is Contractor's option.

B. Items Not Insulated: Unless otherwise indicated, do not install insulation on the following:

1. Drainage piping located in crawl spaces.
2. Underground piping.
3. Chrome-plated pipes and fittings unless there is a potential for personnel injury.

3.15 PIPING INSULATION SCHEDULE

A. Refer to Schedule on Drawings.

3.16 INDOOR, FIELD-APPLIED JACKET SCHEDULE

A. Install jacket over insulation material. For insulation with factory-applied jacket, install the field-applied jacket over the factory-applied jacket. If more than one (1) material is listed, selection from materials listed is Contractor's option.

B. Piping, Exposed:

1. PVC: 30 mils thick.
2. Aluminum, Stucco Embossed: 0.040-inch-thick.
3. Painted Aluminum, Stucco Embossed: 0.032-inch-thick.
4. Stainless-Steel, Type 316, Stucco Embossed: 0.024-inch-thick.

3.17 OUTDOOR, FIELD-APPLIED JACKET SCHEDULE

A. Install jacket over insulation material. For insulation with factory-applied jacket, install the field-applied jacket over the factory-applied jacket. If more than one (1) material is listed, selection from materials listed is Contractor's option.

B. Piping, Exposed:

1. PVC: 40 mils thick.
2. Painted Aluminum, Stucco Embossed with Z-Shaped Locking Seam: 0.040-inch-thick.
3. Stainless-Steel, Type 316, Stucco Embossed with Z-Shaped Locking Seam: 0.024-inch-thick.

3.18 UNDERGROUND, FIELD-INSTALLED INSULATION JACKET

A. For underground direct-buried piping applications, install underground, waterproof direct-buried jacket over insulation material.

END OF SECTION 220719

SECTION 220800 – COMMISSIONING OF PLUMBING SYSTEMS

PART 1 - GENERAL – typical phasing notes, same as other comments for other sections

1.1 GENERAL REQUIREMENTS

A. Work under this contract shall conform under requirements of Division 019100, Division 220000, General Requirements, Conditions of the Contract, and Supplementary Conditions. This specification covers commissioning of plumbing systems which are part of this project.

B. Furnish labor and material to accomplish complete plumbing systems commissioning as specified herein.

C. All trades must adhere to the applicable commissioning and testing guidelines and best practices.

1.2 SECTION INCLUDES

A. This specification section provides a general overview of the plumbing commissioning process and must be read in conjunction with the following related sections:

1. Construction Documents for affected building systems.
2. Section includes the commissioning process requirements for plumbing equipment.
3. Plumbing trade specific commissioning sections in Division 220000.
4. This project is pursuing LEED Certification. See related specifications for sustainable design requirements affecting work of this Section.

1.3 INTRODUCTION

A. Commissioning is a process, and its purpose includes the below:

1. To clearly document the design intent.
2. To verify that the systems installation and performance is in accordance with the plans, specifications and design intent.
3. To train the owner's operators so that they fully understand the design intent and the operation and maintenance requirements of the equipment.
4. To witness & verify all systems are integrated & operating as intended by the Basis of Design (BOD).
5. Coordinate a warranty phase transition through close-out of the project.

B. Definitions

1. Commissioning: the process of ensuring that systems are designed, installed functionally tested and capable of being operated and maintained to perform in conformity with the design intent. The commissioning begins with planning and includes design, construction, start-up, acceptance, and training, and can be applied throughout the life of the building.
2. Commissioning authority: the designated person, company, or agent who implements the overall commissioning process.
3. Commissioning Plan: A document defining the commissioning process, which is developed in increasing detail as the project progresses through its various phases.
4. Commissioning report: the document that records the results of the commissioning process, including the as-built performance of the plumbing system and unresolved issues.

5. Commissioning specification: the contract document that details the objective, scope, and implementation of the construction and acceptance phases of the commissioning process as developed in the design-phase Commissioning Plan.
6. Commissioning team: those people responsible for working together in carrying out the commissioning process.
7. Design intent: a detailed explanation of the ideas, concepts, and criteria that are defined by the owner to be important. This typically is an expansion of the information provided in the Owner's Program.
8. Design intent document: a detailed written document, evolving throughout the commissioning process, clearly defining items and criteria of the design intent.
9. Functional Performance Testing (FPT): the process of determining the ability of a system to operate in accordance with the final design intent.
10. Systems Manual: a composite document that expands the scope of the operation manual and maintenance manual by including the additional information gathered by the commissioning process.
11. Verification: that full range of checks and tests carried out to determine if all components, subsystems, systems, and interfaces between systems operate in accordance with the contract documents. In this context, “operate” includes all modes and sequences of control operation, interlocks and conditional control responses, and specified responses to abnormal or emergency conditions.

C. Scope of Work during Design Development Phase

1. The CxA reviews the Owner Project Requirements (OPR) and Basis of Design (BoD) documentation.
2. The CxA conducts an initial review of the design prior to the construction documents phase.
3. The CxA conducts a focused review of the construction documents when close to completion. This review should be conducted prior to issuing the construction documents for bid and captured in the commissioning report.
4. Prepare a pre-construction phase commissioning plan.
5. Review and comment on submittals from each Contractor for compliance with the OPR, BoD, Contract Documents, and construction-phase commissioning plan. Review and comment on performance expectations of systems and equipment and interfaces between systems relating to the OPR and BoD.

D. Scope of Work during Construction Phase

1. Review required submittals and test data
2. Help finalize details of the Commissioning Plan
3. Organize/facilitate periodic commissioning team meetings
4. Review start-up and testing and balancing reports
5. Participate in O&M training
6. Review revised Owner’s Project Requirements (OPR)
7. Review revised Basis Of Design (BOD)
8. Provide revised commissioning plan
9. Integrate Cx tasks into construction schedule
10. Coordinate a construction phase commissioning kick-off meeting
11. Provide submittal review and comments
12. Review of test and balance report.
13. Perform a controls point-to-point check report review
14. Coordinate a controls integration coordination meeting (FA, FP, P, HVAC, ELEC)
15. Provide a master commissioned equipment list
16. Review start-up reports.
17. Provide pre-functional procedures & test data forms
18. Provide functional testing procedures & test data forms
19. Coordinate test procedure & review with the GC and the Engineer
20. Review contractor test reports
21. Draft commissioning meeting agenda and minutes

22. Execute fire & smoke inspections and testing
23. Maintain a commissioning issues log

E. Scope of work during Acceptance Testing Phase

1. Verify approved sequences of operations
2. Coordinate test procedure & review with the GC and the Engineer.
3. Draft commissioning meeting agenda and minutes
4. Review training agendas, materials, and schedule
5. Review contractor test reports
6. Coordinate, witness, and document functional performance tests
7. Verify that the system complies with the contract documents,
8. Perform functional performance testing,
9. Conduct O&M staff walkthrough of systems
10. Conduct Operations & Maintenance review
11. Submit final test report,
12. Assemble a systems manual
13. Identify and document deficiencies,
14. Execute an issue resolution log
15. Remedy deficiencies and retest,

F. Scope of Work during Post-Occupancy Phase

1. Establish an as-built record of the system performance,
2. Complete the as-built records,
3. Complete the Systems Manual
4. Confirm training plan has been implemented
5. Compile final systems manual
6. Compile operations and maintenance plan
7. Turn over all required close out documentation and warranties.
8. Perform seasonal testing
9. Submit final commissioning report
10. Perform 10-month review
11. Develop ongoing Cx plan

G. Systems to be Included in Commissioning Process

All plumbing systems, sub-systems, and equipment installed, interconnected, and integrated under Division 220000 shall be commissioned. This includes but is not limited to:

1. Electric Water Heater
2. Leak Detection
3. Heat Trace
4. BMS Integration (temporary and permanent)

1.4 QUALITY ASSURANCE

A. The Contractor will provide qualified point person throughout the commissioning process.

1. The point person will attend all commissioning team meeting and provide all required documentation requested by the CxA.
2. Contractor to provide onsite technician for functional performance test activities support, as required by the CxA.
3. Contractors will comply with tests that follow manufacturer’s calibration procedures and intervals. Recalibrate test instruments immediately after instruments have been repaired resulting from being dropped or damaged. Affix calibration tags to test instruments. Furnish calibration records to CxA upon request.

B. Related Requirements

1. Section 019100 - General Commissioning Requirements.
2. LEED Sustainable Design Requirements.
3. Contractor shall adhere to all requirements of Division 220000.

C. References:

1. ASHRAE Standard 202-2018: Commissioning Process for Buildings and Systems.
2. ASHRAE Application Handbook – 2019: Chapter 44 – HVAC Commissioning (Building Commissioning).
3. ASHRAE Guideline 4-2019: Preparation of Operating and Maintenance Documentation for Building Systems.
4. ASHRAE Guideline 0-2019: The Commissioning Process.
5. ASHRAE Guideline 1.3-2018: Building Operations and Maintenance Training for the HVAC&R Commissioning Process
6. LEED V4: Energy and Atmosphere Prerequisite Fundamental Commissioning and Verification
7. LEED V4: Energy and Atmosphere Credit Enhanced Commissioning
8. Associated testing guidelines.

1.5 RESPONSIBILITIES

A. Plumbing Contractor

1. Include cost of commissioning requirements in the contract price.
2. Include requirements for submittal data, O&M data, and training in each purchase order or sub-contract written.
3. Updated Submittals: Keep the CxA informed of all changes to control system documentation made during programming and setup; revise and resubmit when substantial changes are made.
4. Ensure cooperation and participation of specialty sub-contractors such as sheet metal, piping, refrigeration, water treatment, and TAB.
5. Ensure all plumbing systems & domestic hot water systems meet all construction, inspections, installation, and pre-functional testing. Submit all documents verifying completion to the CxA meets all requirements in accordance with Divisions 220000.
6. Prepare preliminary schedule for plumbing system orientations and inspections, O&M manual submissions, training sessions, pipe testing, flushing and cleaning, equipment start-up, TAB and task completion for use by the CxA. Update schedule as appropriate throughout the construction period.
7. Include all hydrostatic testing and pressure tests specified in Division 220000 and local codes.
8. Include all static tests / integrity tests specified in Division 220000 and local codes.
9. CxA will develop and submit pre-functional forms for distribute. Contractor to complete forms. Startup Reports, Pre-functional Checklists, and Trend Logs: Submit for approval of CxA.
10. Ensure temperature controls installer performs assigned commissioning responsibilities.
11. Ensure TAB agency performs assigned commissioning responsibilities.
12. Ensure subcontractors perform assigned commissioning responsibilities.
13. Provide manufacturer's representatives to execute starting of equipment. Ensure representatives are available and present during agreed upon schedules and are in attendance for duration to complete TAB work.
14. Notify the Commissioning Authority a minimum of two weeks in advance of the time for start of the TAB work. Attend the initial TAB meeting for review of the official TAB procedures.
15. Ensure participation of equipment manufacturers in appropriate start-up, testing, and training activities when required by individual equipment specifications.
16. Perform and document completed startup and system operational checkout procedures, providing copy to Commissioning Authority (CxA).
17. Notify the Commissioning Authority a minimum of two weeks in advance, so that the witnessing equipment and system start-up and testing can begin.

18. Provide factory supervised startup services for equipment and systems where specified. Coordinate work with manufacturer and CxA.
19. Coordinate with equipment manufacturers to determine specific requirements to maintain validity of warranties.
20. Attend Construction Phase coordination meeting scheduled by the Commissioning Authority.
21. Assist the CxA in all verification and functional performance tests.
22. Provide personnel to assist CxA during equipment or system verification checks, and functional performance tests as needed.
23. Assist the Commissioning Authority in all verification and functional performance tests. Prepare preliminary schedule for plumbing system orientations and inspections, O&M manual submission, training session, piping/plumbing system testing, flushing, cleaning, equipment start-up, TAB and task completion for use by the Commissioning Authority (CxA). Update schedule as appropriate throughout the construction period.
24. Conduct plumbing system orientation and inspection at the equipment placement completion stage.
25. Ensure participation of major equipment manufacturers in appropriate training and testing activities.
26. Participate in, and schedule vendors and Contractors to participate in the training sessions as set up by the Commissioning Authority.
27. Attend initial training session.
28. Update drawings to the record condition to date, and review with the Commissioning Authority.
29. Gather O&M data on all equipment and assemble in binders as required by the Commissioning Specification. Submit to Commissioning Authority prior to the completion of construction. The O&Ms shall include the following:

    a. Specific step-by-step instructions on how to perform and apply all functions, features, modes, etc. mentioned in the controls training sections of this specification and other features of this system. Provide an index and clear table of contents. Include the detailed technical manual for programming and customizing control loops and algorithms.
    b. Full as-built set of control drawings.
    c. Full as-built sequence of operations for each piece of equipment.
    d. Full points list; in addition to the information on the original points list submittal, include a listing of all rooms with the following information for each room:

        1) Floor.
        2) Room number.
        3) Room name.
        4) Plumbing unit ID.
        5) Reference drawing number.
        6) Heating and/or cooling valve tag ID.
        7) Minimum water flow rate.
        8) Maximum water flow rate.

    e. Full print out of all schedules and set points after testing and acceptance of the system.
    f. Full as-built print out of software program.
    g. Electronic copy on disk of the entire program for this facility.
    h. Marking of all system sensors and thermostats on the as-built floor plan and plumbing drawings with their control system designations.
    i. Maintenance instructions, including sensor calibration requirements and methods by sensor type, etc.
    j. Control equipment component submittals, parts lists, etc.
    k. Warranty requirements.
    l. Copies of all checkout tests and calibrations performed by the Contractor (not commissioning tests).

m. Organize and subdivide the manual with permanently labeled tabs for each of the following data in the given order:

1) Sequences of operation.
2) Control drawings.
3) Points lists.
4) Controller and/or module data.
5) Thermostats and timers.
6) Sensors and DP switches.
7) Valves and valve actuators.
8) Program setups (software program printouts).

30. Submit updated version of control system documentation, for inclusion with operation and maintenance data.
31. Show actual locations of all static and differential pressure sensors (water pressure) on project record drawings.
32. Submit reviewed O&M manuals available prior to scheduling of training sessions.
33. Provide written notification to the General Contractor and Commissioning Authority that the following work has been completed in accordance with the contract documents, and that the equipment, systems, and sub-system are operating as required.

a. Plumbing equipment including all pumps, fixtures, piping, and all Division 220800 equipment.
b. Fire stopping in the fire rated construction, caulking, gaskets, and sealing of smoke barriers.
c. Verify building control systems are functioning to control plumbing equipment.

B. Test, Adjust, and Balance Contractor

1. Include cost for commissioning requirements in the contract price.
2. Attend initial commissioning coordination meeting scheduled by the Commissioning Authority.
3. Submit the TAB procedures to the Commissioning Authority and Design Professional for review and acceptance of domestic hot water systems & plumbing systems balancing.
4. Ensure all TAB work being performed on the domestic hot water systems & plumbing systems meet all requirements in accordance applicable articles in Division 220000.
5. Attend the TAB review meeting scheduled by the Commissioning Authority. Be prepared to discuss the procedures that shall be followed in testing, adjusting, and balancing the plumbing system.
6. Notify CxA 10 days in advance of TAB work and provide access for the CxA to witness balancing work.
7. TAB contractor will provide their own tools, & instruments for balancing domestic hot water systems & plumbing systems:

a. The TAB contractor will use same tools & instruments when original data was collected.
b. Failure of more than 10% of items in a TAB report will result in a failed TAB report.
c. TAB contractor will remedy the deficiency and notify the CxA so the verification of failed portions can be performed.

8. Participate in training sessions as scheduled by the Commissioning Authority,
9. After the completion of TAB work, and the submittal of the final TAB report, notify the Plumbing Contractor and the General Contractor.
10. Participate in Verification of the TAB report, which will consist of repeating and selected measurement contained in the TAB where required by the Commissioning Authority for verification or diagnostic purposes.

C. Automatic Controls and Building Automatic System Contractors

1. Include cost for commissioning requirements in the contract price.
2. Ensure all plumbing systems meet all requirements in accordance with Division 220000.
3. Review design for controllability with respect to selected manufacturer's equipment.
4. Verify proper hardware specification exists for functional performance required by specification and sequence of operation.
5. Verify proper safeties and interlocks are included in design.
6. Verify proper sizing of control valves and actuators based on design pressure drops.
7. Verify proper selection of sensor ranges.
8. Clarify all questions of operation.
9. Attend initial commissioning coordination meeting scheduled by the Commissioning Authority.
10. Provide the following submittals to the Commissioning Authority.

    a. Hardware and software submittals
    b. Control panel construction shop drawings.
    c. Narrative description of each control sequence for each piece of equipment controlled.
    d. Diagrams showing all; control points, sensor locations, point names, actuators, controls, and where necessary points of access superimposed on diagrams of the physical equipment.
    e. Logic diagrams showing the logic flow of the system.
    f. A list of all control points, including analog inputs, analog outputs, digital inputs, and digital outputs. Include the values of all parameters for each system point. Provide a separate list for each stand alone control unit.
    g. A complete control language program listing including all software routines employed in operating the control system. Also provide a program write-up, organized in the same manner as the control software. This narrative shall describe the logic flow of the software and the functions of each routine and sub-routine. It should explain individual math or logic operations that are not clear from reading the software listing.
    h. Hardware operation and maintenance manuals.
    i. Application software and project applications code manuals.

11. Verify proper installation and performance of controls/BAS hardware and software provided by others.
12. Integrate installation and programming schedule with construction and commissioning schedules.
13. Provide thorough training operating professionals on hardware operations and programming, and the application program for the system.
14. Demonstrate system performance to Commissioning Authority including all modes of system operation (e.g. normal, abnormal, emergency).
15. Provide control system technician for use during system verification and functional performance testing.
16. Provide systems modifications as required.
17. Provide support and coordination with TAB contractors on all interfaces between their scopes of work. Provide all devices, such as portable operator terminals, for TAB use in completing TAB procedures.
18. Set-up required trend logs to facilitate the commissioning process.
19. Verify metering tie-in points via load testing where applicable
20. Controls contractor shall furnish required equipment for commissioning of metering points.
21. Verify BACNET connections to Landlord systems as applicable.
22. The functional testing of equipment with respect to the building automation system shall include both commissioning of any temporary network and re-commissioning of the systems after migrating to the permanent network. Re-commissioning activities may consist of a re-verification of safeties and confirmation of any IP address updates.

D. Equipment Suppliers and Miscellaneous Contractors

1. Include cost for commissioning requirements in the contract price.
2. Provide submittals, and appropriate O&M manual sections
3. Provide factory supervised startup services for equipment and systems where specified. Coordinate work with manufacturer and CxA.
4. Attend initial commissioning coordination meeting scheduled by the Commissioning authority.
5. Participate in training sessions as scheduled by the Commissioning Authority
6. Demonstrate performance of equipment as applicable

1.6 DOCUMENTATION

A. The Commissioning Authority shall oversee and maintain the development of commissioning documentation. The commissioning documentation shall be kept in three ring binders, and organized by system and sub-system when practical. All pages shall be numbered, and a table of contents page(s) shall be provided. The commissioning documentation shall include, but not be limited to, the following:

1. A detailed description of the design intent for the project, listing operating parameters, control sequences, occupancy conditions etc.
2. A complete description of how the plumbing system is intended to operate.
3. Approved final test and balance report for the plumbing being commissioned.
4. All accepted shop drawings of plumbing equipment. Shop drawings shall be full size sheets folded as required to fit in binders.
5. Final Commissioning Plan
6. All pre-functional performance test checklists, signed by indicating personnel, organized by system and sub-system.
7. All verification and functional performance test checklists/results, signed by indicated personnel, organized by system and sub-system.
8. Start-Up reports, test & inspection reports and certificates.
9. Gasket, flange, welding, fittings inspection and testing checklist, signed by indicating personnel.
10. Issues Log with corrective action verification.
11. Trend data & off-season functional performance testing.
12. Final Commissioning Report
13. Three copies of the operation and maintenance (O&M) manuals specified in other sections of these specifications shall be included with the commissioning documentation. The manuals shall be incorporated in the commissioning documentation prior to commencement of O&M training required in this and other sections of the specification. Preparation of O&M manuals shall be as specified in these specifications.

PART 2 - PRODUCTS

2.1 TEST EQUIPMENT

A. The appropriate Contractor(s) shall furnish all special tools and equipment required during the commissioning process. A list of all tools and equipment to be used during commissioning shall be submitted to the Commissioning Authority for approval. The owner shall furnish necessary utilities for the commissioning process.

B. All testing equipment used on jobsite will require a valid and non-expired calibration certificate.

C. Provide all standard testing equipment required to perform startup and initial checkout and required functional performance testing; unless otherwise noted such testing equipment will NOT become the property of Owner.

D. Equipment-Specific Tools: Where special testing equipment, tools and instruments are specific to a piece of equipment, are only available from the vendor, and are required to accomplish startup or Functional Testing, provide such equipment, tools, and instruments as part of the

work at no extra cost to Owner; such equipment, tools, and instruments are to become the property of Owner.

2.2 TEST EQUIPMENT, PROPRIETARY

A. Proprietary test equipment and software required by any equipment manufacturer for programming and/or start-up, whether specified or not, shall be provided by the manufacturer of the equipment. Manufacturer shall provide the test equipment, demonstrate it's use, and assist in the commissioning process as needed. Proprietary test equipment (and software) shall become the property of the owner upon completion of the commissioning process.

PART 3 - EXECUTION

3.1 GENERAL

A. A pre-construction meeting of all commissioning team members shall be held at a time and place designated by the owner. The purpose shall be to familiarize all parties with the commissioning process, and to ensure that the responsibilities of each party are clearly understood.

B. The Contractor shall complete all phases of work so the systems can be started, tested, balanced, and acceptance procedures undertaken. This includes the complete installation of all equipment, materials, pipe, duct, wire, insulation, controls, etc. per the contract documents and related directives, clarifications, and change orders.

C. A Commissioning Plan shall be developed by the Commissioning Authority. The Contractor shall assist the Commissioning Authority in preparing the Commissioning Plan by providing all necessary information pertaining to the actual equipment and installation. If contractor initiated system changes have been made that alter the commissioning process, the commissioning Authority shall notify the Contracting Officer.

D. Acceptance procedures are normally intended to begin prior to completion of a system and/or sub-systems, and shall be coordinated with the Division 220000 contractor. Start of acceptance procedures before system completion does not relieve the contractor from completing those systems as per the schedule.

3.2 PREPARATION

A. The Construction Manager and subcontractors are to cooperate with the CxA in development of the Pre-Functional Checklists and Functional Test Procedures.

B. The Construction Manager and subcontractors are to furnish additional information requested by the CxA.

C. The Construction Manager and subcontractors are to prepare a preliminary schedule for plumbing pipe testing, flushing and cleaning, equipment start-up and testing, adjusting, and balancing start and completion for use by the CxA; update the schedule as appropriate.

D. Notify the CxA forty-eight (48) hours in advance when pipe testing, flushing, cleaning, startup of each piece of equipment and testing, adjusting, and balancing will occur; when commissioning activities not yet performed or not yet scheduled will delay construction notify ahead of time and be proactive in seeing that the CxA has the scheduling information needed to efficiently execute the commissioning process.

E. Put all plumbing equipment and systems into operation and continue operation during each working day of testing, adjusting, and balancing and commissioning, as required.

F. Provide temperature and pressure taps in accordance with Contract Documents.

3.3 PARTICIPATION IN ACCEPTANCE PROCEDURES

A. The Contractor shall provide skilled technicians to start-up and debug all systems within Division 220000. These same technicians shall be made available to assist the Commissioning Authority in completing the commissioning program. Work schedules, time required for testing, etc. shall be requested by the Commissioning Authority and coordinated by the contractor. Contractor shall ensure that the qualified technician(s) are available and present during the agreed upon schedules and of sufficient duration to complete the necessary tests, adjustments, and/or problem resolutions.

B. System performance problems and discrepancies may require additional technician time, Commissioning Authority time, reconstruction of systems, and/or replacement of system components. The additional technician time shall be made available for subsequent commissioning periods until the required system performance is obtained.

C. The Commissioning Authority reserves the right to question the appropriateness and qualifications of the technicians relative to each item of equipment, system, and/or sub-system. Qualifications of technicians shall include expert knowledge relative to the specific equipment involved and a willingness to work with the Commissioning Authority. Contractor shall provide adequate documentation and tools to start-up and test the equipment, system, and/or sub-system.

3.4 DEFICIENCY RESOLUTION

A. In some systems, improper adjustments, misapplied equipment, and/or deficient performance under varying loads will result in additional work being required to commission the systems. This work shall be completed under the direction of the Contracting Officer, with input from the contractor, equipment supplier, and Commissioning Authority. Whereas all members shall have input and the opportunity to discuss, debate, and work out problems, the Contracting Officer shall have final jurisdiction over any additional work done to achieve performance.

B. Corrective work shall be completed in a timely fashion to permit the completion of the commissioning process. Experimentation to demonstrate system performance may be permitted. If the Commissioning Authority deems the experimentation work to be ineffective or untimely as it relates to the commissioning process, the Commissioning Authority shall notify the Contracting Officer, indicating the nature of the problem, expected steps to be taken, and suggested deadline(s) for completion of activities. If the deadline(s) pass without resolution of the problem, the Contracting Officer reserves the right to obtain supplementary services and/or equipment to resolve the problem. Costs incurred to solve the problems in an expeditious manner shall be the contractor’s responsibility.

3.5 ADDITIONAL COMMISSIONING

A. Additional commissioning activities may be required after system adjustments, replacements, etc., are completed. The contractor (s) supplier and Commissioning Authority shall include a reasonable reserve to complete this work as part of their contractual obligations.

3.6 SEASONAL COMMISSIONING

A. Seasonal commissioning pertains to testing under full load conditions during peak heating and peak cooling seasons, as well as part load conditions in the spring and fall. Initial commissioning shall be done as soon as contract work is completed, regardless of season. Subsequent commissioning may be undertaken at any time thereafter to ascertain adequate performance during the different seasons.

B. Heating equipment shall be tested during winter design extremes. Cooling equipment shall be tested during summer design extremes with a fully occupied building. Each contractor and

supplier shall be responsible to participate in the initial and the alternate peak season tests of the systems as required & demonstrate performance.

3.7 ACCEPTANCE PROCEDURES

A. Verification Tests

1. Scope of verification tests

a. Operating tests and checks to verify that all components, equipment, systems, sub-systems, and interfaces between systems, operate in accordance with contract documents. These tests are to include all operating modes, interlocks, specified control responses, specific responses to abnormal or emergency conditions and verifications of the proper response of the building automation system controllers and sensors.
b. All functional testing will ensure that the plumbing systems meet the following requirements of Division 220000.
c. Verify plumbing systems has been installed, calibrated, started, and operating according to contract documents.
d. Verify plumbing system instrumentation and controls systems have been completed and calibrated according to contract documents.
e. Verify the validity of the TAB report.

2. Participants in verification tests

a. The Commissioning Authority shall be responsible for preparing the scope of these tests. The Commissioning Authority shall schedule the tests and assemble the commissioning team members who shall be responsible for the tests. Participating contractors, manufacturers, suppliers, etc. shall include all costs to do the work involved in these tests in their proposals.
b. Plumbing contractor – provide the services of a technician(s) who is (are) familiar with the construction and operation of this system. Provide access to the contract plans, shop drawings, and equipment cut sheets of all installed equipment.
c. Controls contractor – provide the services of a controls engineer who is familiar with the details of the project. Provide details of the control system, schematics, and a narrative description of control sequences of operation.

3. Documentation and Reporting Requirements

a. Provide checklists for each component, piece of equipment, system, and sub-system, including all interfaces, interlocks, etc. Each item to be tested shall have a different entry line with space provided for comments. Separate checklists shall be prepared for each mode of operation. Provide space to indicate whether the mode under test responded as required or not. Also, provide space for all necessary parties to sign off on each checklist.
b. Data sheets used in verification of the proper operation of the control system shall include each controller to be verified, and its location. For each controller, provide space for recording the readout of the controller, the reading at the controller's sensor(s), and any comments. Also, provide space for all necessary parties to sign off on each checklist.
c. All test procedures and data sheets shall be submitted to the design professional for review and acceptance.

4. Instrumentation

a. The Commissioning Authority shall furnish all measurement instrumentation for the verification tests. All instruments will have calibrated within the one year period prior to these tests.

5. Verification Procedures

a. The Commissioning Authority shall direct and witness the verification operating tests and checks for all equipment and systems.

1) Set the system equipment (i.e., water heaters, pumps, ejectors, etc.) into the operating mode to be tested, i.e. normal shut down, normal auto position, normal manual position, unoccupied cycle, emergency power, and alarm conditions.
2) The Commissioning Authority shall inspect and verify the position of each device and interlock identified on the checklist. Each item shall be signed off as acceptable (yes), or failed (no).
3) This test shall be repeated for each operating cycle that applies to the plumbing system being tested.
4) Operating checks shall include all safety cutouts, alarms and interlocks with smoke control and life safety systems during all modes of operation of the plumbing system.
5) If during a test an operating deficiency is observed, appropriate comments shall be added to the checklist data sheet & an issues log with corrective action verified and tracked until final commissioning report is submitted.
6) Witness hydrostatic testing and pressure tests specified pressure & hydrostatic test certificate is submitted.
7) Verify welding certificates have been submitted & reviewed.
8) Verification of the proper responses of monitoring and control system controllers and sensors as follows:

a) For each controller or sensor, record the indicated monitoring and control system reading, and the test instrument reading.
b) If the initial test indicates that the test reading is outside of the control range of the installed device, the calibration of the installed device shall be checked and adjusted as required. The deficient device shall be re-tested and the results recorded on the checklist data sheet.

b. The Commissioning Authority shall direct and witness the field verification of the final TAB report.

1) The Commissioning Authority shall select, at random, 10 percent of the report data for verifications.
2) The TAB contractor shall be given sufficient advance notice of the date of field verification. However, they shall not be informed in advance of the data points to be verified. The TAB contractor must use the same instruments (by model and serial number) that were used when the original data were collected.

c. If the deficiencies are identified during verification, the General Contractor must be notified, and action taken to remedy the deficiency. The final tabulated checklist data sheets shall be reviewed by the Design Professional and the Commissioning Authority, to determine if verification is complete, and the operating system is functioning in accordance with the contract documents.

B. Functional Performance Testing

1. Scope of Functional Performance Testing

a. Functional performance tests shall determine if the plumbing system is providing the required service in accordance with the final design intent. Following is a list of test examples:

1) Determine capability of domestic water system to deliver domestic water at the design required rate of flow.
2) Determine capacity of domestic hot water system to deliver hot water at the design temperature.
3) Determine the ability of the sanitary, acid waste, cold water, and storm water systems to perform at design flow rate.

b. See attached Functional Performance Test samples in the Commissioning Plan.

2. Submittals

a. Detailed procedures for each series of tests shall be submitted to the Commissioning Authority for review and acceptance. The procedures shall include samples of the data sheets that will be part of the reports.

3. Participants in Functional Performance Tests

a. Participants in the functional performance tests shall be the same as those listed in the verification tests

4. Instrumentation

a. In addition to the instrumentation requirements detailed under verification, the commissioning authority may need to provide data acquisition equipment to record data for the complete range of testing

5. Functional Performance Test Procedures

a. The Commissioning Authority shall supervise and direct all functional performance tests.
b. For each test, the Commissioning Authority shall install the measuring instruments and logging devices to record test data for the required test period. The instrumentation shall monitor and record all operating conditions to allow for complete evaluation of the test results.
c. Measurement will be required to allow for calculation of total capacity of the system for each mode of operation under test.

6. Documentation and Reporting Requirements

a. All measured data, data sheets, and a comprehensive summary, describing the operation of the plumbing system at the time of testing shall be submitted to the commissioning authority.
b. A preliminary functional performance test report shall be prepared by the Commissioning Authority and submitted to the Design Professional or review. Any identified deficiencies need to be evaluated by the Design Professional and Construction Manager to determine if they are part of the contractor's contractual obligations. Construction deficiencies shall be corrected by the responsible contractor(s) and the specific functional performance test repeated.
c. If it is determined that the plumbing system is constructed in accordance with the contract documents, and the performance deficiencies are not part of the contract documents, the Contracting Officer must decide whether any required modifications needed to bring the performance of the plumbing system up to the finalized design intent shall be implemented, or if the test shall be accepted as submitted. If corrective work is performed, the Contracting Officer shall determine if a portion or all required functional performance tests should be repeated, and a revised report submitted.

3.8 OPERATING AND MAINTENANCE MANUAL

A. Refer to project specifications for complete O&M manual requirements.

1. System Descriptions:

a. Each major system shall be described, typewritten, in general terms, including major components, interconnections, theory of operation, theory of controls, unusual features and major safety precautions. This information should correlate with information provided in the manufacturer's instruction book. This section shall include, but not limited to, the following data:

1) Detailed description of each system and each of its components showing piping, valves, controls, and other components, with diagrams and illustrations where applicable.
2) Wiring and control diagrams with data to explain detailed operation and control of each component.
3) Control sequences describing start-up, all modes of operation, shut down, & emergency shutdown.
4) Corrected shop drawings.
5) Approved products data including all performance curves and rating data.
6) Copies of approved certifications (welding, hydrostatic testing…etc.) and laboratory test reports (where applicable).
7) Copies of warranties.

b. System diagrams or drawings shall be incorporated in the appropriate systems descriptions including systems boundaries for testing for the CxA will be highlighted. These diagrams or drawings should be reduced in size or folded to usefully fit into the manual.

2. Operating Instructions:

a. Condensed, typewritten, suitable for posting, instructions shall be provided for each major piece of equipment. Where more than one (1) common unit is installed, one instruction is adequate. The instructions shall provide procedures for:

1) Starting up the equipment/system.
2) Shutting down the equipment/system.
3) Operating the equipment in emergency or unusual conditions.
4) Safety precautions.
5) Trouble shooting suggestions.
6) Status indicators
7) Other pertinent data applicable to the operation of particular systems or equipment.

b. The instructions shall be suitable for posting adjacent to the equipment concerned.

c. The Contractor shall provide instructions for all installed systems.

3. Ongoing and preventative Maintenance

a. Condensed, typewritten procedures for recommended ongoing and preventive maintenance actions shall be provided for each category of equipment/system.

This information shall include, but not be limited to the following:

1) Maintenance and overhaul instructions.

2) Lubricating schedule including type, grade, temperature, and frequency range.
3) Part list, including source of supply and recommended spare parts.
4) Name, address, and 24 hour telephone number of each subcontractor who installed equipment and systems, and local representative for each type of system.
5) Other pertinent data applicable to the maintenance of particular systems or equipment.

b. These recommended preventative maintenance actions shall be categorized by the following recommended frequencies:

1) Weekly
2) Monthly
3) Quarterly
4) Semi-Annual
5) Annual
6) Other

3.9 OPERATING AND MAINTENANCE TRAINING

A. The Plumbing Contractor, and appropriate sub-contractors, shall provide comprehensive operating and maintenance instruction on building systems prior to delivery. The instruction shall include classroom instruction deliver by competent instructors based upon the contents of the operating manual. Emphasis shall be placed upon overall systems diagrams and descriptions, and why systems were designed as they were. The overall system instructions shall preferably be delivered by the consulting engineers. The classroom instructions shall also include detailed equipment instruction by qualified manufacturer representatives for all equipment for which operating instructions are provided. The manufacturer representative training shall emphasize operating instructions, and preventive maintenance as described in the operating manual. Provide training agenda to CxA one week prior to the training session. At a minimum, the training sessions shall cover the following items:

1. Types of installed systems
2. Theory of operation

a. Design intent
b. Occupied vs. unoccupied or partial occupancy
c. Seasonal modes of operation
d. Emergency conditions and procedures
e. Energy efficiency
f. Other issues important to facility operation.

3. System operations.
4. Use of control system.

a. Sequence of operation
b. Problem indicators
c. Diagnostics
d. Corrective actions

5. Service, maintenance, diagnostics and repair.
6. Use of reports and logs.
7. Troubleshooting, investigation of malfunctions, and determining reasons for the problems.

B. Each classroom training period shall be followed by an inspection, explanation and demonstration of the system concerned by the instructors.

C. The contractor shall be responsible for organizing, arranging, and delivering a schedule of system training agreeable with the facility manager.

D. The contractor shall provide two (2) training sessions if required to accommodate operating shifts.

E. The contractor shall provide, at or before substantial completion, a proposed agenda for each system and schedule of the above training for approval by the Commissioning Authority (CxA).

END OF SECTION 220800

SECTION 221116 - DOMESTIC WATER PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Copper tube and fittings.
2. Piping joining materials.
3. Encasement for piping.
4. Transition fittings.
5. Dielectric fittings.

1.3 ACTION SUBMITTALS

A. Product Data: For transition fittings and dielectric fittings.

1.4 INFORMATIONAL SUBMITTALS

A. System purging and disinfecting activities report.

B. Field quality-control reports.

1.5 FIELD CONDITIONS

A. Interruption of Existing Water Service: Do not interrupt water service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary water service according to requirements indicated:

1. Notify Construction Manager and Owner no fewer than two (2) days in advance of proposed interruption of water service.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

A. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, fitting materials, and joining methods for specific services, service locations, and pipe sizes.

B. Potable-water piping and components shall comply with NSF 14 and NSF 61 Annex G. Plastic piping components shall be marked with "NSF-pw."

C. Comply with NSF Standard 372 for low lead.

2.2 COPPER TUBE AND FITTINGS

A. Hard Copper Tube: ASTM B 88, Type L water tube, drawn temper.

B. Soft Copper Tube: ASTM B 88, Type K and ASTM B 88, Type L water tube, annealed temper.

C. Cast-Copper, Solder-Joint Fittings: ASME B16.18, pressure fittings.

D. Wrought-Copper, Solder-Joint Fittings: ASME B16.22, wrought-copper pressure fittings.

E. Bronze Flanges: ASME B16.24, Class 150, with solder-joint ends.

F. Copper Unions:

1. MSS SP-123.
2. Cast-copper-alloy, hexagonal-stock body.
3. Ball-and-socket, metal-to-metal seating surfaces.
4. Solder-joint or threaded ends.

G. Copper Pressure-Seal-Joint Fittings:

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

a. Apollo Valves; Conbraco Industries, Inc.
b. Elkhart Products Corporation
c. NIBCO INC.
d. Viega LLC
e. Mueller Industries

2. Fittings for NPS 2 and Smaller: Wrought-copper fitting with EPDM-rubber, O-ring seal in each end.
3. Fittings for NPS 2-1/2 to NPS 4: Cast-bronze or wrought-copper fitting with EPDM-rubber, O-ring seal in each end.

H. Copper Push-on-Joint Fittings:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Elkhart Products Corporation
b. Victaulic Company

2. Description:

a. Cast-copper fitting complying with ASME B16.18 or wrought-copper fitting complying with ASME B 16.22.
b. Stainless-steel teeth and EPDM-rubber, O-ring seal in each end instead of solder-joint ends.

I. Copper-Tube, Extruded-Tee Connections:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. T-DRILL Industries Inc.

2. Description: Tee formed in copper tube according to ASTM F 2014.

J. Appurtenances for Grooved-End Copper Tubing:

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

    a. Anvil International
    b. Grinnell Mechanical Products
    c. Shurjoint Piping Products
    d. Victaulic Company

2. Bronze Fittings for Grooved-End, Copper Tubing: ASTM B 75 copper tube or ASTM B 584 bronze castings.
3. Mechanical Couplings for Grooved-End Copper Tubing:

    a. Copper-tube dimensions and design similar to AWWA C606.
    b. Ferrous housing sections.
    c. EPDM-rubber gaskets suitable for hot and cold water.
    d. Bolts and nuts.
    e. Minimum Pressure Rating: 300 psig.

2.3 PIPING JOINING MATERIALS

A. Pipe-Flange Gasket Materials:

1. AWWA C110/A21.10, rubber, flat face, 1/8-inch-thick or ASME B16.21, nonmetallic and asbestos free unless otherwise indicated.
2. Full-face or ring type unless otherwise indicated.

B. Metal, Pipe-Flange Bolts and Nuts: ASME B18.2.1, carbon steel unless otherwise indicated.

C. Solder Filler Metals: ASTM B 32, lead-free alloys.

D. Flux: ASTM B 813, water flushable.

E. Brazing Filler Metals: AWS A5.8, BCuP Series, copper-phosphorus alloys for general-duty brazing unless otherwise indicated.

F. Solvent Cements for Joining CPVC Piping and Tubing: ASTM F 493.

G. Solvent Cements for Joining PVC Piping: ASTM D 2564. Include primer according to ASTM F 656.

H. Plastic, Pipe-Flange Gaskets, Bolts, and Nuts: Type and material recommended by piping system manufacturer unless otherwise indicated.

2.4 ENCASEMENT FOR PIPING

A. Standard: ASTM A 674 or AWWA C105/A21.5.

B. Form: Sheet or tube.

C. Color: Black or natural.

2.5 TRANSITION FITTINGS

A. General Requirements:

1. Same size as pipes to be joined.
2. Pressure rating at least equal to pipes to be joined.
3. End connections compatible with pipes to be joined.

B. Fitting-Type Transition Couplings: Manufactured piping coupling or specified piping system fitting.

C. Sleeve-Type Transition Coupling: AWWA C219.

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

a. Cascade Waterworks Mfg. Co.
b. Dresser, Inc.
c. Ford Meter Box Company, Inc. (The)
d. Jay R. Smith Mfg. Co.
e. JCM Industries, Inc.
f. Romac Industries, Inc.
g. Smith-Blair, Inc.
h. Viking Johnson

D. Plastic-to-Metal Transition Fittings:

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

a. Charlotte Pipe and Foundry Company
b. Harvel Plastics, Inc.
c. Spears Manufacturing Company
d. Uponor

2. Description:

a. CPVC or PVC one-piece fitting with manufacturer's Schedule 80 equivalent dimensions.
b. One (1) end with threaded brass insert and one (1) solvent-cement-socket or threaded end.

E. Plastic-to-Metal Transition Unions:

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

a. Colonial Engineering, Inc.
b. NIBCO INC.
c. Spears Manufacturing Company

2. Description:

a. CPVC or PVC four-part union.
b. Brass or stainless-steel threaded end.
c. Solvent-cement-joint or threaded plastic end.
d. Rubber O-ring.
e. Union nut.

2.6 DIELECTRIC FITTINGS

A. General Requirements: Assembly of copper alloy and ferrous materials with separating nonconductive insulating material. Include end connections compatible with pipes to be joined.

B. Dielectric Unions:

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

a. A.Y. McDonald Mfg. Co.
b. Capitol Manufacturing Company
c. Central Plastics Company
d. HART Industrial Unions, LLC
e. Jomar Valve
f. Matco-Norca
g. Watts; a Watts Water Technologies company
h. Wilkins
i. Zurn Industries, LLC

2. Standard: ASSE 1079.
3. Pressure Rating: 125 psig minimum at 180 deg F.
4. End Connections: Solder-joint copper alloy and threaded ferrous.

C. Dielectric Flanges:

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

a. Capitol Manufacturing Company
b. Central Plastics Company
c. Matco-Norca
d. Watts; a Watts Water Technologies company
e. Wilkins
f. Zurn Industries, LLC

2. Standard: ASSE 1079.
3. Factory-fabricated, bolted, companion-flange assembly.
4. Pressure Rating: 125 psig minimum at 180 deg F.
5. End Connections: Solder-joint copper alloy and threaded ferrous; threaded solder-joint copper alloy and threaded ferrous.

D. Dielectric-Flange Insulating Kits:

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

    a. Advance Products & Systems, Inc.
    b. Calpico, Inc.
    c. Central Plastics Company
    d. Pipeline Seal and Insulator, Inc.

2. Nonconducting materials for field assembly of companion flanges.
3. Pressure Rating: 150 psig.
4. Gasket: Neoprene or phenolic.
5. Bolt Sleeves: Phenolic or polyethylene.
6. Washers: Phenolic with steel backing washers.

E. Dielectric Nipples:

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

    a. Elster Perfection Corporation
    b. Grinnell Mechanical Products
    c. Matco-Norca
    d. Precision Plumbing Products
    e. Victaulic Company

2. Standard: IAPMO PS 66.
3. Electroplated steel nipple complying with ASTM F 1545.
4. Pressure Rating and Temperature: 300 psig at 225 deg F.
5. End Connections: Male threaded or grooved.
6. Lining: Inert and noncorrosive, propylene.

PART 3 - EXECUTION

3.1 EARTHWORK

A. Comply with requirements in Section 312000 "Earth Moving" for excavating, trenching, and backfilling.

3.2 PIPING INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of domestic water piping. Indicated locations and arrangements are used to size pipe and calculate friction loss, expansion, and other design considerations. Install piping as indicated unless deviations to layout are approved on coordination drawings.

B. Install copper tubing under building slab according to CDA's "Copper Tube Handbook."

C. Install ductile-iron piping under building slab with restrained joints according to AWWA C600 and AWWA M41.

D. Install underground copper tube and ductile-iron pipe in PE encasement according to ASTM A 674 or AWWA C105/A21.5.

E. Install shutoff valve, hose-end drain valve, strainer, pressure gage, and test tee with valve inside the building at each domestic water-service entrance. Comply with requirements for pressure gages in Section 220519 "Meters and Gages for Plumbing Piping" and with requirements for drain valves and strainers in Section 221119 "Domestic Water Piping Specialties."

F. Install shutoff valve immediately upstream of each dielectric fitting.

G. Install water-pressure-reducing valves downstream from shutoff valves. Comply with requirements for pressure-reducing valves in Section 221119 "Domestic Water Piping Specialties."

H. Install domestic water piping level without pitch and plumb.

I. Rough-in domestic water piping for water-meter installation according to utility company's requirements.

J. Install seismic restraints on piping. Comply with requirements for seismic-restraint devices in Section 220548 "Vibration and Seismic Controls for Plumbing Piping and Equipment."

K. Install piping concealed from view and protected from physical contact by building occupants unless otherwise indicated and except in equipment rooms and service areas.

L. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

M. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal, and coordinate with other services occupying that space.

N. Install piping to permit valve servicing.

O. Install nipples, unions, special fittings, and valves with pressure ratings the same as or higher than the system pressure rating used in applications below unless otherwise indicated.

P. Install piping free of sags and bends.

Q. Install fittings for changes in direction and branch connections.

R. Install unions in copper tubing at final connection to each piece of equipment, machine, and specialty.

S. Install pressure gages on suction and discharge piping for each plumbing pump and packaged booster pump. Comply with requirements for pressure gages in Section 220519 "Meters and Gages for Plumbing Piping."

T. Install thermostats in hot-water circulation piping. Comply with requirements for thermostats in Section 221123 "Domestic Water Pumps."

U. Install thermometers on inlet and outlet piping from each water heater. Comply with requirements for thermometers in Section 220519 "Meters and Gages for Plumbing Piping."

V. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."

W. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."

X. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 220518 "Escutcheons for Plumbing Piping."

3.3 JOINT CONSTRUCTION

A. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

B. Remove scale, slag, dirt, and debris from inside and outside of pipes, tubes, and fittings before assembly.

C. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

1. Apply appropriate tape or thread compound to external pipe threads.
2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged.

D. Brazed Joints for Copper Tubing: Comply with CDA's "Copper Tube Handbook," "Brazed Joints" chapter.

E. Soldered Joints for Copper Tubing: Apply ASTM B 813, water-flushable flux to end of tube. Join copper tube and fittings according to ASTM B 828 or CDA's "Copper Tube Handbook."

F. Pressure-Sealed Joints for Copper Tubing: Join copper tube and pressure-seal fittings with tools recommended by fitting manufacturer.

G. Push-on Joints for Copper Tubing: Clean end of tube. Measure insertion depth with manufacturer's depth gage. Join copper tube and push-on-joint fittings by inserting tube to measured depth.

H. Extruded-Tee Connections: Form tee in copper tube according to ASTM F 2014. Use tool designed for copper tube; drill pilot hole, form collar for outlet, dimple tube to form seating stop, and braze branch tube into collar.

I. Joint Construction for Grooved-End Copper Tubing: Make joints according to AWWA C606. Roll groove ends of tubes. Lubricate and install gasket over ends of tubes or tube and fitting. Install coupling housing sections over gasket with keys seated in tubing grooves. Install and tighten housing bolts.

J. Flanged Joints: Select appropriate asbestos-free, nonmetallic gasket material in size, type, and thickness suitable for domestic water service. Join flanges with gasket and bolts according to ASME B31.9.

K. Joints for Dissimilar-Material Piping: Make joints using adapters compatible with materials of both piping systems.

3.4 TRANSITION FITTING INSTALLATION

A. Install transition couplings at joints of dissimilar piping.

B. Transition Fittings in Underground Domestic Water Piping:

1. Fittings for NPS 1-1/2 and Smaller: Fitting-type coupling.
2. Fittings for NPS 2 and Larger: Sleeve-type coupling.

C. Transition Fittings in Aboveground Domestic Water Piping NPS 2 and Smaller: Plastic-to-metal transition fittings or unions.

3.5 DIELECTRIC FITTING INSTALLATION

A. Install dielectric fittings in piping at connections of dissimilar metal piping and tubing.

B. Dielectric Fittings for NPS 2 and Smaller: Use dielectric unions.

C. Dielectric Fittings for NPS 2-1/2 and larger: Use dielectric flanges or flange kits.

3.6 HANGER AND SUPPORT INSTALLATION

A. Comply with requirements for seismic-restraint devices in Section 220548 "Vibration and Seismic Controls for Plumbing Piping and Equipment."

B. Comply with requirements for pipe hanger, support products, and installation in Section 220529 "Hangers and Supports for Plumbing Piping and Equipment."

1. Vertical Piping: MSS Type 8 or 42, clamps.
2. Individual, Straight, Horizontal Piping Runs:

a. 100 Feet and Less: MSS Type 1, adjustable, steel clevis hangers.
b. Longer Than 100 Feet: MSS Type 43, adjustable roller hangers.
c. Longer Than 100 Feet if Indicated: MSS Type 49, spring cushion rolls.

3. Multiple, Straight, Horizontal Piping Runs 100 Feet or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
4. Base of Vertical Piping: MSS Type 52, spring hangers.

C. Support vertical piping and tubing at base and at each floor.

D. Rod diameter may be reduced one size for double-rod hangers, to a minimum of 3/8-inch.

E. Install hangers for copper tubing with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 3/4 and Smaller: 60 inches with 3/8-inch rod.
2. NPS 1 and NPS 1-1/4: 72 inches with 3/8-inch rod.
3. NPS 1-1/2 and NPS 2: 96 inches with 3/8-inch rod.
4. NPS 2-1/2: 108 inches with ½-inch rod.
5. NPS 3 to NPS 5: 10 feet with ½-inch rod.
6. NPS 6: 10 feet with 5/8-inch rod.
7. NPS 8: 10 feet with ¾-inch rod.

F. Install supports for vertical copper tubing every 10 feet.

G. Support piping and tubing not listed in this article according to MSS SP-58 and manufacturer's written instructions.

3.7 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. When installing piping adjacent to equipment and machines, allow space for service and maintenance.

C. Connect domestic water piping to exterior water-service piping. Use transition fitting to join dissimilar piping materials.

D. Connect domestic water piping to water-service piping with shutoff valve; extend and connect to the following:

1. Domestic Water Booster Pumps: Cold-water suction and discharge piping.
2. Water Heaters: Cold-water inlet and hot-water outlet piping in sizes indicated, but not smaller than sizes of water heater connections.
3. Plumbing Fixtures: Cold- and hot-water-supply piping in sizes indicated, but not smaller than that required by plumbing code.
4. Equipment: Cold- and hot-water-supply piping as indicated, but not smaller than equipment connections. Provide shutoff valve and union for each connection. Use flanges instead of unions for NPS 2-1/2 and larger.

3.8 IDENTIFICATION

A. Identify system components. Comply with requirements for identification materials and installation in Section 220553 "Identification for Plumbing Piping and Equipment."

B. Label pressure piping with system operating pressure.

3.9 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. Piping Inspections:

a. Do not enclose, cover, or put piping into operation until it has been inspected and approved by authorities having jurisdiction.
b. During installation, notify authorities having jurisdiction at least one (1) day before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction:

1) Roughing-in Inspection: Arrange for inspection of piping before concealing or closing in after roughing in and before setting fixtures.
2) Final Inspection: Arrange for authorities having jurisdiction to observe tests specified in "Piping Tests" Subparagraph below and to ensure compliance with requirements.

c. Reinspection: If authorities having jurisdiction find that piping will not pass tests or inspections, make required corrections and arrange for reinspection.
d. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

2. Piping Tests:

a. Fill domestic water piping. Check components to determine that they are not air bound and that piping is full of water.
b. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit a separate report for each test, complete with diagram of portion of piping tested.
c. Leave new, altered, extended, or replaced domestic water piping uncovered and unconcealed until it has been tested and approved. Expose work that was covered or concealed before it was tested.
d. Cap and subject piping to static water pressure of 50 psig above operating pressure, without exceeding pressure rating of piping system materials. Isolate test source and allow it to stand for 4 hours. Leaks and loss in test pressure constitute defects that must be repaired.
e. Repair leaks and defects with new materials, and retest piping or portion thereof until satisfactory results are obtained.
f. Prepare reports for tests and for corrective action required.

B. Domestic water piping will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports.

3.10 ADJUSTING

A. Perform the following adjustments before operation:

1. Close drain valves, hydrants, and hose bibbs.
2. Open shutoff valves to fully open position.
3. Open throttling valves to proper setting.
4. Adjust balancing valves in hot-water-circulation return piping to provide adequate flow.

a. Manually adjust ball-type balancing valves in hot-water-circulation return piping to provide hot-water flow in each branch.
b. Adjust calibrated balancing valves to flows indicated.

5. Remove plugs used during testing of piping and for temporary sealing of piping during installation.
6. Remove and clean strainer screens. Close drain valves and replace drain plugs.
7. Remove filter cartridges from housings and verify that cartridges are as specified for application where used and are clean and ready for use.
8. Check plumbing specialties and verify proper settings, adjustments, and operation.

3.11 CLEANING

A. Clean and disinfect potable domestic water piping as follows:

1. Purge new piping and parts of existing piping that have been altered, extended, or repaired before using.
2. Use purging and disinfecting procedures prescribed by authorities having jurisdiction; if methods are not prescribed, use procedures described in either AWWA C651 or AWWA C652 or follow procedures described below:

a. Flush piping system with clean, potable water until dirty water does not appear at outlets.
b. Fill and isolate system according to either of the following:

1) Fill system or part thereof with water/chlorine solution with at least 50 ppm of chlorine. Isolate with valves and allow to stand for 24 hours.
2) Fill system or part thereof with water/chlorine solution with at least 200 ppm of chlorine. Isolate and allow to stand for 3 hours.

c. Flush system with clean, potable water until no chlorine is in water coming from system after the standing time.
d. Repeat procedures if biological examination shows contamination.
e. Submit water samples in sterile bottles to authorities having jurisdiction.

B. Clean non-potable domestic water piping as follows:

1. Purge new piping and parts of existing piping that have been altered, extended, or repaired before using.
2. Use purging procedures prescribed by authorities having jurisdiction or if methods are not prescribed, follow procedures described below:

a. Flush piping system with clean, potable water until dirty water does not appear at outlets.
b. Submit water samples in sterile bottles to authorities having jurisdiction. Repeat procedures if biological examination shows contamination.

C. Prepare and submit reports of purging and disinfecting activities. Include copies of water-sample approvals from authorities having jurisdiction.

D. Clean interior of domestic water piping system. Remove dirt and debris as work progresses.

3.12 PIPING SCHEDULE

A. Transition and special fittings with pressure ratings at least equal to piping rating may be used in applications below unless otherwise indicated.

B. Flanges and unions may be used for aboveground piping joints unless otherwise indicated.

C. Fitting Option: Extruded-tee connections and brazed joints may be used on aboveground copper tubing.

D. Refer to Schedule on Drawings.

3.13 VALVE SCHEDULE

A. Refer to Schedule on Drawings.

END OF SECTION 221116

SECTION 221119 - DOMESTIC WATER PIPING SPECIALTIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Vacuum breakers.
2. Backflow preventers.
3. Water pressure-reducing valves.
4. Balancing valves.
5. Self Actuating Thermostatic balancing valves.
6. Temperature-actuated, water mixing valves.
7. Strainers.
8. Outlet boxes.
9. Hose bibbs.
10. Wall hydrants.
11. Drain valves.
12. Water-hammer arresters.
13. Air vents.
14. Trap-seal primer valves.
15. Trap-seal primer systems.
16. Specialty valves.
17. Flexible connectors.
18. Water meters.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For domestic water piping specialties.

1. Include diagrams for power, signal, and control wiring.

1.4 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For domestic water piping specialties to include in emergency, operation, and maintenance manuals.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR PIPING SPECIALTIES

A. Potable-water piping and components shall comply with NSF 61 Annex G and NSF 14.

2.2 PERFORMANCE REQUIREMENTS

A. Minimum Working Pressure for Domestic Water Piping Specialties: 125 psig unless otherwise indicated.

2.3 VACUUM BREAKERS

A. Pipe-Applied, Atmospheric-Type Vacuum Breakers:

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

a. Ames Co.
b. Apollo Valves; Conbraco Industries, Inc.
c. Cash Acme
d. FEBCO
e. Watts; a Watts Water Technologies company
f. Zurn Industries, LLC

2. Standard: ASSE 1001.
3. Size: NPS 1/4 to NPS 3, as required to match connected piping.
4. Body: Bronze.
5. Inlet and Outlet Connections: Threaded.
6. Finish: Chrome plated.

B. Hose-Connection Vacuum Breakers:

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

a. Apollo Valves; Conbraco Industries, Inc.
b. Arrowhead Brass Products
c. Cash Acme
d. Legend Valve & Fitting, Inc.
e. Prier Products, Inc.
f. Watts; a Watts Water Technologies company
g. Woodford Manufacturing Company
h. Zurn Industries, LLC

2. Standard: ASSE 1011.
3. Body: Bronze, nonremovable, with manual drain.
4. Outlet Connection: Garden-hose threaded complying with ASME B1.20.7.
5. Finish: Rough bronze.

C. Pressure Vacuum Breakers:

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

a. Ames Co.
b. Ames Fire & Waterworks
c. Apollo Valves; Conbraco Industries, Inc.
d. FEBCO
e. Flomatic Corporation
f. Toro Company (The)
g. Watts; a Watts Water Technologies company
h. Zurn Industries, LLC

2. Standard: ASSE 1020.
3. Operation: Continuous-pressure applications.
4. Pressure Loss: 5 psig maximum, through middle third of flow range.
5. Accessories:

a. Valves: Ball type, on inlet and outlet.

D. Spill-Resistant Vacuum Breakers:

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

a. Apollo Valves; Conbraco Industries, Inc.
b. Watts; a Watts Water Technologies company
c. Zurn Industries, LLC

2. Standard: ASSE 1056.
3. Operation: Continuous-pressure applications.
4. Accessories:

a. Valves: Ball type, on inlet and outlet.

2.4 SELF ACTUATING THERMOSTATIC BALANCING VALVE (SATBV)

A. Basis of Design: Furnish and install CircuitSolver as indicated on the plans. CircuitSolver shall be self contained and fully automatic without additional piping or control mechanisms. Valve shall be a CircuitSolver as manufactured by ThermOmegaTech, Inc., or equivalent by approved manufacturer.

1. SATBV device shall regulate the flow of recirculated domestic hot water based on water temperature entering the SATBV regardless of system operating pressure.
   a. Even when fully closed the SATBV shall bypass a small amount hot water to maintain dynamic control of the recirculating loop.
   b. SATBV shall be factory adjustable as required by project conditions.
   c. SATBV shall be available in sizes ranging from ½” NPT to 2” NPT.

2 SATBV device’s body and all internal components shall be constructed of stainless steel with major components constructed of type 303 stainless steel.

A. SATBV sizes ½” through 2” shall be rated to 200 PSIG maximum working pressure.
   1. All SATBV shall be standard tapered female pipe thread, NPT.
B. All SATBV shall be rated to 300°F (148.9°C) maximum working temperature.
C. All SATBV shall be NSF-61 certified for use in all domestic water systems.

D. Thermal actuator shall be spring loaded and self cleaning, delivering closing thrust sufficient to keep orifice opening free of scale deposits.

3 Installation of CIRCUITSOLVER shall be made by qualified tradesmen. Install SATBV in each domestic hot water return piping branch beyond last hot water device in that branch.

A. Provide suitable line size isolation valves, unions, and strainer as indicated in piping detail shown on the drawings.
B. Provide suitable access panel as required in non-accessible ceilings and walls.

2.5 BACKFLOW PREVENTERS

A. Intermediate Atmospheric-Vent Backflow Preventers:

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

a. Apollo Valves; Conbraco Industries, Inc.
b. Cash Acme
c. FEBCO
d. Legend Valve & Fitting, Inc.
e. Watts; a Watts Water Technologies company
f. Zurn Industries, LLC

2. Standard: ASSE 1012.
3. Operation: Continuous-pressure applications.
4. Body: Bronze.
5. End Connections: Union, solder joint.
6. Finish: Chrome plated.

B. Reduced-Pressure-Principle Backflow Preventers:

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

a. Ames Co.
b. Ames Fire & Waterworks
c. Apollo Valves; Conbraco Industries, Inc.
d. FEBCO
e. Flomatic Corporation
f. Watts; a Watts Water Technologies company
g. Zurn Industries, LLC

2. Standard: ASSE 1013.
3. Operation: Continuous-pressure applications.
4. Pressure Loss: 12 psig maximum, through middle third of flow range.
5. Accessories:

a. Valves NPS 2 and Smaller: Ball type with threaded ends on inlet and outlet.
b. Valves NPS 2-1/2 and Larger: Outside-screw and yoke-gate type with flanged ends on inlet and outlet.
c. Air-Gap Fitting: ASME A112.1.2, matching backflow-preventer connection.

C. Hose-Connection Backflow Preventers:

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

    a. Apollo Valves; Conbraco Industries, Inc.
    b. Watts; a Watts Water Technologies company
    c. Woodford Manufacturing Company

2. Standard: ASSE 1052.
3. Operation: Up to 10-foot head of water back pressure.
4. Inlet Size: NPS 1/2 or NPS 3/4.
5. Outlet Size: Garden-hose thread complying with ASME B1.20.7.
6. Capacity: At least 3-gpm flow.

D. Backflow-Preventer Test Kits:

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

    a. Apollo Valves; Conbraco Industries, Inc.
    b. FEBCO
    c. Flomatic Corporation
    d. Watts; a Watts Water Technologies company
    e. Zurn Industries, LLC

2. Description: Factory calibrated, with gages, fittings, hoses, and carrying case with test-procedure instructions.

2.6 WATER PRESSURE-REDUCING VALVES

A. Water Regulators:

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

    a. Apollo Valves; Conbraco Industries, Inc.
    b. Cash Acme
    c. Honeywell Water Controls
    d. Watts; a Watts Water Technologies company
    e. Zurn Industries, LLC

2. Standard: ASSE 1003.
3. Pressure Rating: Initial working pressure of 150 psig.
4. Body: Bronze with chrome-plated finish for NPS 2 and smaller; cast iron with interior lining that complies with AWWA C550 or that is FDA approved for NPS 2-1/2 and NPS 3.
5. Valves for Booster Heater Water Supply: Include integral bypass.
6. End Connections: Threaded for NPS 2 and smaller; flanged for NPS 2-1/2 and NPS 3.

2.7 BALANCING VALVES

A. Copper-Alloy Calibrated Balancing Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

    a. Armstrong International, Inc.

b. Flo Fab Inc.
c. ITT Corporation.
d. NIBCO INC.
e. Schneider Electric USA, Inc.
f. TACO Incorporated.
g. Watts; a Watts Water Technologies company.

2. Type: Ball or Y-pattern globe valve with two (2) readout ports and memory-setting indicator.
3. Body: Brass or bronze.
4. Size: Same as connected piping, but not larger than NPS 2.
5. Accessories: Meter hoses, fittings, valves, differential pressure meter, and carrying case.

2.8 TEMPERATURE-ACTUATED, WATER MIXING VALVES

A. Primary, Thermostatic, Water Mixing Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

a. Acorn Engineering Company
b. Apollo Valves; Conbraco Industries, Inc.
c. Armstrong International, Inc.
d. Honeywell Home Water Controls
e. Lawler Manufacturing Company, Inc.
f. Leonard Valve Company
g. Powers
h. Symmons Industries, Inc.
i. Zurn Industries, LLC

2. Standard: ASSE 1017.
3. Pressure Rating: 125 psig minimum unless otherwise indicated.
4. Type: thermostatically controlled, water mixing valve.
5. Material: Bronze body with corrosion-resistant interior components.
6. Connections: Threaded union inlets and outlet.
7. Accessories: Manual temperature control, check stops on hot- and cold-water supplies, and adjustable, temperature-control handle.

B. Individual-Fixture, Water Tempering Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

a. Acorn Engineering Company
b. Apollo Valves; Conbraco Industries, Inc.
c. Cash Acme
d. Honeywell Home Water Controls
e. Lawler Manufacturing Company, Inc.
f. Leonard Valve Company
g. Powers
h. Watts; a Watts Water Technologies company
i. Zurn Industries, LLC

2. Standard: ASSE 1016, thermostatically controlled, water tempering valve.
3. Pressure Rating: 125 psig minimum unless otherwise indicated.

4. Body: Bronze body with corrosion-resistant interior components.
5. Temperature Control: Adjustable.
6. Inlets and Outlet: Threaded.
7. Finish: Rough or chrome-plated bronze.
8. Tempered-Water Setting: 105 deg F.
9. Tempered-Water Design Flow Rate: 0.5 gpm.

2.9 STRAINERS FOR DOMESTIC WATER PIPING

A. Y-Pattern Strainers:

1. Pressure Rating: 125 psig minimum unless otherwise indicated.
2. Body: Bronze for NPS 2 and smaller; cast iron with interior lining that complies with AWWA C550 or that is FDA approved, epoxy coated and for NPS 2-1/2 and larger.
3. End Connections: Threaded for NPS 2 and smaller; flanged for NPS 2-1/2 and larger.
4. Screen: Stainless-steel with round perforations unless otherwise indicated.
5. Drain: Factory-installed, hose-end drain valve.

2.10 OUTLET BOXES

A. Clothes Washer Outlet Boxes:

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

    a. Acorn Engineering Company
    b. Guy Gray Manufacturing Co., Inc.
    c. IPS Corporation
    d. LSP Products Group, Inc.
    e. Oatey
    f. Plastic Oddities
    g. Symmons Industries, Inc.
    h. Watts; a Watts Water Technologies company
    i. Whitehall Manufacturing
    j. Zurn Industries, LLC

2. Mounting: Recessed.
3. Material and Finish: Enameled-steel or epoxy-painted-steel box and faceplate.
4. Faucet: Combination valved fitting or separate hot- and cold-water valved fittings complying with ASME A112.18.1. Include garden-hose thread complying with ASME B1.20.7 on outlets.
5. Supply Shutoff Fittings: NPS 1/2 gate, globe, or ball valves and NPS 1/2 copper, water tubing.
6. Drain: NPS 2 standpipe and P-trap for direct waste connection to drainage piping.
7. Inlet Hoses: Two (2) 60-inch-long, rubber household clothes washer inlet hoses with female, garden-hose-thread couplings. Include rubber washers.
8. Drain Hose: One (1) 48-inch-long, rubber household clothes washer drain hose with hooked end.

B. Icemaker Outlet Boxes:

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

    a. Acorn Engineering Company

b. IPS Corporation
c. LSP Products Group, Inc.
d. Oatey
e. Plastic Oddities

2. Mounting: Recessed.
3. Material and Finish: Enameled-steel or epoxy-painted-steel box and faceplate.
4. Faucet: Valved fitting complying with ASME A112.18.1. Include NPS 1/2 or smaller copper tube outlet.
5. Supply Shutoff Fitting: NPS 1/2 gate, globe, or ball valve and NPS 1/2 copper, water tubing.

2.11 HOSE BIBBS

A. Hose Bibbs:

1. Standard: ASME A112.18.1 for sediment faucets.
2. Body Material: Bronze.
3. Seat: Bronze, replaceable.
4. Supply Connections: NPS 1/2 or NPS 3/4 threaded or solder-joint inlet.
5. Outlet Connection: Garden-hose thread complying with ASME B1.20.7.
6. Pressure Rating: 125 psig.
7. Vacuum Breaker: Integral or field-installation, nonremovable, drainable, hose-connection vacuum breaker complying with ASSE 1011.
8. Finish for Equipment Rooms: Rough bronze, or chrome or nickel plated.
9. Finish for Service Areas: Chrome or nickel plated.
10. Finish for Finished Rooms: Chrome or nickel plated.
11. Operation for Equipment Rooms: Wheel handle or operating key.
12. Operation for Service Areas: Wheel handle.
13. Operation for Finished Rooms: Operating key.
14. Include operating key with each operating-key hose bibb.
15. Include integral wall flange with each chrome- or nickel-plated hose bibb.

2.12 WALL HYDRANTS

A. Non-Freeze Wall Hydrants:

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

a. Jay R. Smith Mfg. Co.
b. Josam Company
c. Tyler Pipe; a subsidiary of McWane Inc.
d. Woodford Manufacturing Company
e. Zurn Industries, LLC

2. Standard: ASME A112.21.3M for concealed outlet, self-draining wall hydrants.
3. Pressure Rating: 125 psig.
4. Operation: Loose key.
5. Casing and Operating Rod: Of length required to match wall thickness. Include wall clamp.
6. Inlet: NPS 3/4 or NPS 1.
7. Outlet: Concealed, with integral vacuum breaker and garden-hose thread complying with ASME B1.20.7.
8. Box: Deep, flush mounted with cover.

9. Box and Cover Finish: Polished nickel bronze.
10. Outlet: Exposed, with integral vacuum breaker and garden-hose thread complying with ASME B1.20.7.
11. Nozzle and Wall-Plate Finish: Polished nickel bronze.
12. Operating Keys(s): Two (2) with each wall hydrant.

2.13 DRAIN VALVES

A. Ball-Valve-Type, Hose-End Drain Valves:

1. Standard: MSS SP-110 for standard-port, two-piece ball valves.
2. Pressure Rating: 400-psig minimum CWP.
3. Size: NPS 3/4.
4. Body: Copper alloy.
5. Ball: Chrome-plated brass.
6. Seats and Seals: Replaceable.
7. Handle: Vinyl-covered steel.
8. Inlet: Threaded or solder joint.
9. Outlet: Threaded, short nipple with garden-hose thread complying with ASME B1.20.7 and cap with brass chain.

B. Gate-Valve-Type, Hose-End Drain Valves:

1. Standard: MSS SP-80 for gate valves.
2. Pressure Rating: Class 125.
3. Size: NPS 3/4.
4. Body: ASTM B 62 bronze.
5. Inlet: NPS 3/4 threaded or solder joint.
6. Outlet: Garden-hose thread complying with ASME B1.20.7 and cap with brass chain.

C. Stop-and-Waste Drain Valves:

1. Standard: MSS SP-110 for ball valves or MSS SP-80 for gate valves.
2. Pressure Rating: 200-psig minimum CWP or Class 125.
3. Size: NPS 3/4.
4. Body: Copper alloy or ASTM B 62 bronze.
5. Drain: NPS 1/8 side outlet with cap.

2.14 WATER-HAMMER ARRESTERS

A. Water-Hammer Arresters:

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

   a. AMTROL, Inc.
   b. Jay R. Smith Mfg. Co.
   c. Josam Company
   d. Precision Plumbing Products
   e. Tyler Pipe; a subsidiary of McWane Inc.
   f. Zurn Industries, LLC

2. Standard: ASSE 1010 or PDI-WH 201.
3. Type: Copper tube with piston.
4. Size: ASSE 1010, Sizes AA and A through F, or PDI-WH 201, Sizes A through F.

2.15 TRAP-SEAL PRIMER DEVICE

A. Supply-Type, Trap-Seal Primer Device:

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

a. Jay R. Smith Mfg. Co.
b. MIFAB, Inc.
c. Precision Plumbing Products
d. Sioux Chief Manufacturing Company, Inc.
e. Trapguard ProVent Systems
f. Watts; a Watts Water Technologies company
g. Zurn Industries, LLC

2. Standard: ASSE 1018.
3. Pressure Rating: 125 psig minimum.
4. Body: Bronze.
5. Inlet and Outlet Connections: NPS 1/2 threaded, union, or solder joint.
6. Gravity Drain Outlet Connection: NPS 1/2 threaded or solder joint.
7. Finish: Chrome plated, or rough bronze for units used with pipe or tube that is not chrome finished.

B. Drainage-Type, Trap-Seal Primer Device:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Jay R. Smith Mfg. Co.

2. Standard: ASSE 1044, lavatory P-trap with NPS 3/8 minimum, trap makeup connection.
3. Size: NPS 1-1/4 minimum.
4. Material: Chrome-plated, cast brass.

2.16 FLEXIBLE CONNECTORS

A. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

1. Flex Pression Ltd.
2. Flex-Hose Co., Inc.
3. Flexicraft Industries
4. Flex-Weld, Inc.
5. Hyspan Precision Products, Inc.
6. Mercer Gasket & Shim, Inc.
7. Metraflex Company (The)
8. Proco Products, Inc.
9. Tozen Corporation
10. Unaflex
11. Universal Metal Hose

B. Bronze-Hose Flexible Connectors: Corrugated-bronze tubing with bronze wire-braid covering and ends brazed to inner tubing.

1. Working-Pressure Rating: Minimum 200 psig.
2. End Connections NPS 2 and Smaller: Threaded copper pipe or plain-end copper tube.
3. End Connections NPS 2-1/2 and Larger: Flanged copper alloy.

C. Stainless-Steel-Hose Flexible Connectors: Corrugated-stainless-steel tubing with stainless-steel wire-braid covering and ends welded to inner tubing.

1. Working-Pressure Rating: Minimum 200 psig.
2. End Connections NPS 2 and Smaller: Threaded steel-pipe nipple.
3. End Connections NPS 2-1/2 and Larger: Flanged steel nipple.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install backflow preventers in each water supply to mechanical equipment and systems and to other equipment and water systems that may be sources of contamination. Comply with authorities having jurisdiction.

1. Locate backflow preventers in same room as connected equipment or system.
2. Install drain for backflow preventers with atmospheric-vent drain connection with air-gap fitting, fixed air-gap fitting, or equivalent positive pipe separation of at least two (2) pipe diameters in drain piping and pipe-to-floor drain. Locate air-gap device attached to or under backflow preventer. Simple air breaks are unacceptable for this application.
3. Do not install bypass piping around backflow preventers.

B. Install balancing valves in locations where they can easily be adjusted.

C. Install temperature-actuated, water mixing valves with check stops or shutoff valves on inlets and with shutoff valve on outlet.

1. Install cabinet-type units recessed in or surface mounted on wall as specified.

D. Install Y-pattern strainers for water on supply side of each control valve, water pressure-reducing valve, solenoid valve, and pump.

E. Install water-hammer arresters in water piping according to PDI-WH 201.

3.2 CONNECTIONS

A. Comply with requirements for ground equipment in Section 260526 "Grounding and Bonding for Electrical Systems."

B. Fire-retardant-treated-wood blocking is specified in Section 260519 "Low-Voltage Electrical Power Conductors and Cables" for electrical connections.

3.3 LABELING AND IDENTIFYING

A. Equipment Nameplates and Signs: Install engraved plastic-laminate equipment nameplate or sign on or near each of the following:

1. Pressure vacuum breakers.
2. Intermediate atmospheric-vent backflow preventers.
3. Reduced-pressure-principle backflow preventers.

4. Double-check, backflow-prevention assemblies.
5. Carbonated-beverage-machine backflow preventers.
6. Dual-check-valve backflow preventers.
7. Reduced-pressure-detector, fire-protection, backflow-preventer assemblies.
8. Double-check, detector-assembly backflow preventers.
9. Water pressure-reducing valves.
10. Calibrated balancing valves.
11. Primary, thermostatic, water mixing valves.
12. Manifold, thermostatic, water mixing-valve assemblies.
13. Primary water tempering valves.
14. Outlet boxes.
15. Hose stations.
16. Supply-type, trap-seal primer valves.
17. Trap-seal primer systems.

B. Distinguish among multiple units, inform operator of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations, in addition to identifying unit. Nameplates and signs are specified in Section 220553 "Identification for Plumbing Piping and Equipment."

3.4 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. Test each reduced-pressure-principle backflow preventer according to authorities having jurisdiction and the device's reference standard.

B. Domestic water piping specialties will be considered defective if they do not pass tests and inspections.

C. Prepare test and inspection reports.

3.5 ADJUSTING

A. Set field-adjustable pressure set points of water pressure-reducing valves.

B. Set field-adjustable flow set points of balancing valves.

C. Set field-adjustable temperature set points of temperature-actuated, water mixing valves.

END OF SECTION 221119

SECTION 221123 - DOMESTIC WATER PUMPS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. In-line, seal less centrifugal pumps.
2. Horizontally mounted, in-line, close-coupled centrifugal pumps.

1.3 DEFINITIONS

A. Low Voltage: As defined in NFPA 70 for circuits and equipment operating at less than 50 V or for remote-control, signaling power-limited circuits.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include materials of construction, rated capacities, certified performance curves with operating points plotted on curves, operating characteristics, electrical characteristics, and furnished specialties and accessories.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For domestic water pumps to include in operation and maintenance manuals.

1.6 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency and marked for intended location and application.

B. UL Compliance: Comply with UL 778 for motor-operated water pumps.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Retain shipping flange protective covers and protective coatings during storage.

B. Protect bearings and couplings against damage.

1.8 COORDINATION

A. Coordinate sizes and locations of concrete bases with actual equipment provided.

PART 2 - PRODUCTS

2.1 IN-LINE, SEALLESS CENTRIFUGAL PUMPS

A. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

1. Flo Fab Inc.
2. Grundfos Pumps Corp.
3. TACO Comfort Solutions, Inc.
4. WILO USA LLC - WILO Canada Inc.

B. Description: Factory-assembled and -tested, in-line, close-coupled, canned-motor, seal-less, overhung-impeller centrifugal pumps.

C. Pump Construction:

1. Pump and Motor Assembly: Hermetically sealed, replaceable-cartridge type with motor and impeller on common shaft and designed for installation with pump and motor shaft horizontal.
2. Casing: Bronze, with threaded or companion-flange connections.
3. Impeller: Plastic.
4. Motor: Single speed, unless otherwise indicated.

D. Capacities and Characteristics:

1. Refer to Schedules on Drawings for pump requirements.

2.2 VERTICALLY MOUNTED, IN-LINE, CLOSE-COUPLED CENTRIFUGAL PUMPS

A. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

1. Alyan Pump Company
2. Armstrong Pumps, Inc.
3. Bell & Gossett; a Xylem brand
4. Flo Fab Inc.
5. Grundfos Pumps Corp.
6. Marshall Engineered Products Co.
7. PACO Pumps; Grundfos Pumps Corporation, USA
8. Pentair Pump Group
9. TACO Comfort Solutions, Inc.
10. Thrush Co. Inc.
11. Weinman Division

B. Description: Factory-assembled and -tested, in-line, single-stage, close-coupled, overhung-impeller centrifugal pumps designed for installation with pump and motor shaft mounted vertical.

C. Pump Construction:

1. Casing: Radially split, cast iron, with wear rings and threaded companion-flange connections for pumps with NPS 2 pipe connections and flanged connections for pumps with NPS 2-1/2 pipe connections. Include pump manufacturer's base attachment for mounting pump on concrete base.
2. Impeller: Statically and dynamically balanced, closed, and keyed to shaft.

3. Shaft and Shaft Sleeve: Stainless-steel shaft, with copper-alloy shaft sleeve.
4. Seal: Mechanical, with carbon-steel rotating ring, stainless-steel spring, ceramic seat, and rubber bellows and gasket. Include water slinger on shaft between motor and seal.
5. Bearings: Oil-lubricated; bronze-journal or ball type.
6. Shaft Coupling: Flexible or rigid type if pump is provided with coupling.

D. Motor: Single speed, with grease-lubricated ball bearings; rigidly mounted to pump casing.

E. Capacities and Characteristics:

1. Refer to Schedules on Drawings for pump requirements.

2.3 MOTORS

A. Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements for motors specified in Section 220513 "Common Motor Requirements for Plumbing Equipment."

1. Motor Sizes: Minimum size as indicated. If not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.

2.4 CONTROLS

A. Pressure Switches: Electric, adjustable for control of water-supply pump.

1. Type: Water-immersion pressure sensor, for installation in piping.
2. Enclosure: NEMA 250, Type 4X.
3. Operation of Pump: On or off.
4. Transformer: Provide if required.
5. Power Requirement: 120 V, ac.

B. Thermostats: Electric; adjustable for control of hot-water circulation pump.

1. Type: Water-immersion temperature sensor, for installation in piping.
2. Range: 65 to 200 deg F.
3. Enclosure: NEMA 250, Type 4X.
4. Operation of Pump: On or off.
5. Transformer: Provide if required.
6. Power Requirement: 120 V, ac.
7. Settings: Start pump at 105 deg F and stop pump at 120 deg F.

C. Timers: Electric, for control of hot-water circulation pump.

1. Type: Programmable, seven-day clock with manual override on-off switch.
2. Enclosure: NEMA 250, Type 1, suitable for wall mounting.
3. Operation of Pump: On or off.
4. Transformer: Provide if required.
5. Power Requirement: 120-V ac.
6. Programmable Sequence of Operation: Up to two (2) on-off cycles each day for seven (7) days.

D. Time-Delay Relays: Electric, for control of hot-water circulation pump between water heater and connected hot-water storage tank.

1. Type: Adjustable time-delay relay.

2. Range: Up to 5 minutes.
3. Setting: 5 minutes.
4. Enclosure: NEMA 250, Type 4X.
5. Operation of Pump: On or off.
6. Transformer: Provide if required.
7. Power Requirement: 120-V ac.
8. Programmable Sequence of Operation: Limit pump operation to periods of burner operation plus maximum 5 minutes after the burner stops.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine roughing-in of domestic-water-piping system to verify actual locations of connections before pump installation.

3.2 PUMP INSTALLATION

A. Comply with HI 1.4.

B. Install in-line, seal-less centrifugal pumps with shaft horizontal unless otherwise indicated.

C. Install continuous-thread hanger rods and spring hangers with vertical-limit stop of size required to support pump weight.

1. Comply with requirements for vibration isolation devices specified in Section 220548 "Vibration and Seismic Controls for Plumbing Piping and Equipment." Fabricate brackets or supports as required.
2. Comply with requirements for hangers and supports specified in Section 220529 "Hangers and Supports for Plumbing Piping and Equipment."

D. Install pressure switches in water supply piping.

E. Install thermostats in hot-water return piping.

F. Install timers.

3.3 CONNECTIONS

A. Comply with requirements for piping specified in Section 221116 "Domestic Water Piping." Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to pumps to allow service and maintenance.

C. Connect domestic water piping to pumps. Install suction and discharge piping equal to or greater than size of pump nozzles.

1. Install flexible connectors adjacent to pumps in suction and discharge piping of the following pumps:

a. Horizontally mounted, in-line, close-coupled centrifugal pumps.
b. Comply with requirements for flexible connectors specified in Section 221116 "Domestic Water Piping."

D. Install shutoff valve and strainer on suction side of each pump, and check, shutoff, and throttling valves on discharge side of each pump. Install valves same size as connected piping. Comply with requirements for valves specified in Section 220523.12 "Ball Valves for Plumbing Piping," Section 220523.13 "Butterfly Valves for Plumbing Piping," and Section 220523.14 "Check Valves for Plumbing Piping," and comply with requirements for strainers specified in Section 221119 "Domestic Water Piping Specialties."

1. Install pressure gage and snubber at suction of each pump and pressure gage and snubber at discharge of each pump. Install at integral pressure-gage tappings where provided or install pressure-gage connectors in suction and discharge piping around pumps. Comply with requirements for pressure gages and snubbers specified in Section 220519 "Meters and Gages for Plumbing Piping."

E. Connect pressure switches, thermostats, time-delay relays, and timers to pumps that they control.

F. Interlock pump between water heater and hot-water storage tank with water heater burner and time-delay relay.

3.4 IDENTIFICATION

A. Comply with requirements for identification specified in Section 220553 "Identification for Plumbing Piping and Equipment" for identification of pumps.

3.5 STARTUP SERVICE

A. Engage a factory-authorized service representative to perform startup service.

1. Complete installation and startup checks according to manufacturer's written instructions.
2. Check piping connections for tightness.
3. Clean strainers on suction piping.
4. Set pressure switches, thermostats, timers, and time-delay relays for automatic starting and stopping operation of pumps.
5. Perform the following startup checks for each pump before starting:

    a. Verify bearing lubrication.
    b. Verify that pump is free to rotate by hand and that pump for handling hot liquid is free to rotate with pump hot and cold. If pump is bound or drags, do not operate until cause of trouble is determined and corrected.
    c. Verify that pump is rotating in the correct direction.

6. Prime pump by opening suction valves and closing drains and prepare pump for operation.
7. Start motor.
8. Open discharge valve slowly.
9. Adjust temperature settings on thermostats.
10. Adjust timer settings.

3.6 ADJUSTING

A. Adjust domestic water pumps to function smoothly and lubricate as recommended by manufacturer.

B. Adjust initial temperature set points.

C. Set field-adjustable switches and circuit-breaker trip ranges as indicated.

END OF SECTION 221123

SECTION 221316 - SANITARY WASTE AND VENT PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Pipe, tube, and fittings.
2. Specialty pipe fittings.
3. Encasement for underground metal piping.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For hubless, single-stack drainage system. Include plans, elevations, sections, and details.

1.4 INFORMATIONAL SUBMITTALS

A. Seismic Qualification Certificates: For waste and vent piping, accessories, and components, from manufacturer.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
2. Detailed description of piping anchorage devices on which the certification is based and their installation requirements.

B. Field quality-control reports.

1.5 FIELD CONDITIONS

A. Interruption of Existing Sanitary Waste Service: Do not interrupt service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary service according to requirements indicated:

1. Notify Architect, Construction Manager, and Owner no fewer than two (2) days in advance of proposed interruption of sanitary waste service.
2. Do not proceed with interruption of sanitary waste service without Construction Manager's and Owner's written permission.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Components and installation shall be capable of withstanding the following minimum working pressure unless otherwise indicated:

1. Soil, Waste, and Vent Piping: 10-foot head of water.
2. Waste, Force-Main Piping: 50 psig.

B. Seismic Performance: Soil, waste, and vent piping and support and installation shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

2.2 PIPING MATERIALS

A. Piping materials shall bear label, stamp, or other markings of specified testing agency.

B. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, fitting materials, and joining methods for specific services, service locations, and pipe sizes.

2.3 HUB-AND-SPIGOT, CAST-IRON SOIL PIPE AND FITTINGS

A. Pipe and Fittings: ASTM A 74, Service and Extra Heavy class(es).

B. Gaskets: ASTM C 564, rubber.

C. Calking Materials: ASTM B 29, pure lead and oakum or hemp fiber.

2.4 HUBLESS, CAST-IRON SOIL PIPE AND FITTINGS

A. Pipe and Fittings: ASTM A 888 or CISPI 301.

B. Heavy-Duty, Hubless-Piping Couplings:

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

a. ANACO-Husky
b. Charlotte Pipe and Foundry Company
c. Clamp-All Corp.
d. Mission Rubber Company, LLC; a division of MCP Industries
e. Tyler Pipe; a subsidiary of McWane Inc.

2. Standards: ASTM C 1277 and ASTM C 1540.
3. Description: Stainless-steel shield with stainless-steel bands and tightening devices; and ASTM C 564, rubber sleeve with integral, center pipe stop.

2.5 PVC PIPE AND FITTINGS

A. Comply with NSF 14, "Plastics Piping Systems Components and Related Materials," for plastic piping components. Include marking with "NSF-dwv" for plastic drain, waste, and vent piping and "NSF-sewer" for plastic sewer piping.

B. Solid-Wall PVC Pipe: ASTM D 2665, drain, waste, and vent.

C. PVC Socket Fittings: ASTM D 2665, made to ASTM D 3311, drain, waste, and vent patterns and to fit Schedule 40 pipe.

D. Adhesive Primer: ASTM F 656.

E. Solvent Cement: ASTM D 2564.

2.6 VRF / COOLING COIL CONDENSATE DRAIN PIPING

A. If more than one material is listed, material selection is Contractor's option.

B. PRE-INSULATED PEX Tube:
1. Source Limitations: Obtain PEX tube from single manufacturer.
2. Tube Material: PEX plastic in accordance with ASTM F876 and ASTM F877.
3. ½" microcellular foam insulation: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534, Type I for tubular materials. Flame-spread index of 25 or less, and smoke-developed index of 50 or less

C. PRE-INSULATED PEX Tube Fittings:
1. Source Limitations: Obtain PEX tube fittings from single manufacturer.
2. Fittings: ASTM F1807, metal insert and copper crimp rings.
3. Push-Fit Fittings: ASSE 1061, push-fit fittings.
4. ½" microcellular foam insulation: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534, Type I for tubular materials. Flame-spread index of 25 or less, and smoke-developed index of 50 or less

D. Discharge from condensate pump for individual VRF / fan coil unit to gravity condensate drain line: Polyethylene, polypropylene, or PVDF pipe or tubing provided with in-line check valve. Gravity drain shall not be flexible tubing.

E. Drain size in accordance with the International Mechanical Code:

EQUIPMENT CAPACITY	MINIMUM CONDENSATE PIPE DIAMETER (inch)
Up to 20 tons of refrigeration	3/4 inch
Over 20 tons to 40 tons of refrigeration	1 inch
Over 40 tons to 90 tons of refrigeration	1 1/4 inches
Over 90 tons to 125 tons of refrigeration	1 1/2 inches
Over 125 tons to 250 tons of refrigeration	2 inches

For SI: 1 inch = 25.4 mm, 1 ton of capacity = 3.517 kW.

2.7 SPECIALTY PIPE FITTINGS

A. Transition Couplings:

1. Fitting-Type Transition Couplings: Manufactured piping coupling or specified piping system fitting.
2. Unshielded, Non-Pressure Transition Couplings:

a. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

1) Dallas Specialty & Mfg. Co.
2) Fernco Inc.

3) Froet Industries LLC
4) Mission Rubber Company, LLC; a division of MCP Industries
5) Plastic Oddities

b. Standard: ASTM C 1173.
c. Description: Elastomeric, sleeve-type, reducing or transition pattern. Include shear ring and corrosion-resistant-metal tension band and tightening mechanism on each end.
d. End Connections: Same size as and compatible with pipes to be joined.
e. Sleeve Materials:

1) For Cast-Iron Soil Pipes: ASTM C 564, rubber.
2) For Plastic Pipes: ASTM F 477, elastomeric seal or ASTM D 5926, PVC.
3) For Dissimilar Pipes: ASTM D 5926, PVC or other material compatible with pipe materials being joined.

3. Shielded, Non-Pressure Transition Couplings:

a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1) Cascade Waterworks Mfg. Co.
2) Mission Rubber Company, LLC; a division of MCP Industries

b. Standard: ASTM C 1460.

c. Description: Elastomeric or rubber sleeve with full-length, corrosion-resistant outer shield and corrosion-resistant-metal tension band and tightening mechanism on each end.
d. End Connections: Same size as and compatible with pipes to be joined.

4. Pressure Transition Couplings:

a. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

1) Cascade Waterworks Mfg. Co.
2) Dresser, Inc.
3) EBAA Iron, Inc.
4) Ford Meter Box Company, Inc. (The)
5) Jay R. Smith Mfg. Co.
6) JCM Industries, Inc.
7) Romac Industries, Inc.
8) Viking Johnson

b. Standard: AWWA C219.
c. Description: Metal, sleeve-type same size as, with pressure rating at least equal to, and ends compatible with, pipes to be joined.
d. Center-Sleeve Material: Manufacturer's standard.
e. Gasket Material: Natural or synthetic rubber.
f. Metal Component Finish: Corrosion-resistant coating or material.

B. Dielectric Fittings:

1. Dielectric Unions:

    a. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

        1) A.Y. McDonald Mfg. Co.
        2) Capitol Manufacturing Company
        3) Central Plastics Company
        4) HART Industrial Unions, LLC
        5) Jomar Valve
        6) Matco-Norca
        7) Watts; a Watts Water Technologies company
        8) Wilkins
        9) Zurn Industries, LLC

    b. Description:

        1) Standard: ASSE 1079.
        2) Pressure Rating: 125 psig minimum at 180 deg F.
        3) End Connections: Solder-joint copper alloy and threaded ferrous.

2. Dielectric Flanges:

    a. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

        1) Capitol Manufacturing Company
        2) Central Plastics Company
        3) Matco-Norca
        4) Watts; a Watts Water Technologies company
        5) Wilkins
        6) Zurn Industries, LLC

    b. Description:

        1) Standard: ASSE 1079.
        2) Factory-fabricated, bolted, companion-flange assembly.
        3) Pressure Rating: 125 psig minimum at 180 deg F.
        4) End Connections: Solder-joint copper alloy and threaded ferrous; threaded solder-joint copper alloy and threaded ferrous.

3. Dielectric-Flange Insulating Kits:

    a. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

        1) Advance Products & Systems, Inc.
        2) Calpico, Inc.
        3) Central Plastics Company
        4) Pipeline Seal and Insulator, Inc.

    b. Description:

        1) Nonconducting materials for field assembly of companion flanges.
        2) Pressure Rating: 150 psig.

3) Gasket: Neoprene or phenolic.
4) Bolt Sleeves: Phenolic or polyethylene.
5) Washers: Phenolic with steel backing washers.

4. Dielectric Nipples:

a. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

1) Elster Perfection Corporation
2) Grinnell Mechanical Products
3) Matco-Norca
4) Precision Plumbing Products
5) Victaulic Company

b. Description:

1) Standard: IAPMO PS 66.
2) Electroplated steel nipple.
3) Pressure Rating: 300 psig at 225 deg F.
4) End Connections: Male threaded or grooved.
5) Lining: Inert and noncorrosive, propylene.

PART 3 - EXECUTION

3.1 EARTH MOVING

A. Comply with requirements for excavating, trenching, and backfilling specified in Section 312000 "Earth Moving."

3.2 PIPING INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems.

1. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations.
2. Install piping as indicated unless deviations to layout are approved on coordination drawings.

B. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.

C. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

D. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

E. Install piping to permit valve servicing.

F. Install piping at indicated slopes.

G. Install piping free of sags and bends.

H. Install fittings for changes in direction and branch connections.

I. Install piping to allow application of insulation.

J. Install seismic restraints on piping. Comply with requirements for seismic-restraint devices specified in Section 220548 "Vibration and Seismic Controls for Plumbing Piping and Equipment."

K. Make changes in direction for soil and waste drainage and vent piping using appropriate branches, bends, and long-sweep bends.

1. Sanitary tees and short-sweep ¼ bends may be used on vertical stacks if change in direction of flow is from horizontal to vertical.
2. Use long-turn, double Y-branch and 1/8-bend fittings if two (2) fixtures are installed back-to-back or side by side with common drain pipe.

    a. Straight tees, elbows, and crosses may be used on vent lines.

3. Do not change direction of flow more than 90 degrees.
4. Use proper size of standard increasers and reducers if pipes of different sizes are connected.

    a. Reducing size of waste piping in direction of flow is prohibited.

L. Lay buried building waste piping beginning at low point of each system.

1. Install true to grades and alignment indicated, with unbroken continuity of invert. Place hub ends of piping upstream.
2. Install required gaskets according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements.
3. Maintain swab in piping and pull past each joint as completed.

M. Install soil and waste and vent piping at the following minimum slopes unless otherwise indicated:

1. Building Sanitary Waste: 2 percent downward in direction of flow for piping NPS 3 and smaller; one percent (1%) downward in direction of flow for piping NPS 4 and larger.
2. Horizontal Sanitary Waste Piping: Two percent (2%) downward in direction of flow.
3. Vent Piping: One percent (1%) down toward vertical fixture vent or toward vent stack.

N. Install cast-iron soil piping according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."

1. Install encasement on underground piping according to ASTM A 674 or AWWA C105/A 21.5.

O. Install aboveground copper tubing according to CDA's "Copper Tube Handbook."

P. Plumbing Specialties:

1. Install backwater valves in sanitary waster gravity-flow piping.

    a. Comply with requirements for backwater valves specified in Section 221319 "Sanitary Waste Piping Specialties."

2. Install cleanouts at grade and extend to where building sanitary drains connect to building sanitary sewers in sanitary waste gravity-flow piping.

    a. Install cleanout fitting with closure plug inside the building in sanitary drainage force-main piping.
    b. Comply with requirements for cleanouts specified in Section 221319 "Sanitary Waste Piping Specialties."

3. Install drains in sanitary waste gravity-flow piping.

    a. Comply with requirements for drains specified in Section 221319 "Sanitary Waste Piping Specialties."

Q. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.

R. Install sleeves for piping penetrations of walls, ceilings, and floors.

1. Comply with requirements for sleeves specified in Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."

S. Install sleeve seals for piping penetrations of concrete walls and slabs.

1. Comply with requirements for sleeve seals specified in Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."

T. Install escutcheons for piping penetrations of walls, ceilings, and floors.

1. Comply with requirements for escutcheons specified in Section 220518 "Escutcheons for Plumbing Piping."

U. ABS or PVC piping shall not be installed in plenum ceiling areas. Use cast iron piping for those areas.

3.3 JOINT CONSTRUCTION

A. Join hub-and-spigot, cast-iron soil piping with gasket joints according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for compression joints.

B. Join hub-and-spigot, cast-iron soil piping with calked joints according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for lead-and-oakum calked joints.

C. Join hubless, cast-iron soil piping according to CISPI 310 and CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for hubless-piping coupling joints.

D. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1.

1. Cut threads full and clean using sharp dies.
2. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

    a. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
    b. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged.

c. Do not use pipe sections that have cracked or open welds.

3.4 SPECIALTY PIPE FITTING INSTALLATION

A. Transition Couplings:

1. Install transition couplings at joints of piping with small differences in ODs.
2. In Waste Drainage Piping: Shielded, non-pressure transition couplings.
3. In Aboveground Force Main Piping: Fitting-type transition couplings.
4. In Underground Force Main Piping:

a. NPS 1-1/2 and Smaller: Fitting-type transition couplings.
b. NPS 2 and Larger: Pressure transition couplings.

B. Dielectric Fittings:

1. Install dielectric fittings in piping at connections of dissimilar metal piping and tubing.
2. Dielectric Fittings for NPS 2 and Smaller: Use dielectric unions.
3. Dielectric Fittings for NPS 2-1/2 to NPS 4: Use dielectric flanges.
4. Dielectric Fittings for NPS 5 and Larger: Use dielectric flange kits.

3.5 VALVE INSTALLATION

A. Comply with requirements in Section 220523.12 "Ball Valves for Plumbing Piping," Section 220523.13 "Butterfly Valves for Plumbing Piping," and Section 220523.14 "Check Valves for Plumbing Piping" for general-duty valve installation requirements.

B. Shutoff Valves:

1. Install shutoff valve on each sewage pump discharge.
2. Install gate or full-port ball valve for piping NPS 2 and smaller.
3. Install gate valve for piping NPS 2-1/2 and larger.

C. Check Valves: Install swing check valve, between pump and shutoff valve, on each sewage pump discharge.

3.6 HANGER AND SUPPORT INSTALLATION

A. Comply with requirements for seismic-restraint devices specified in Section 220548 "Vibration and Seismic Controls for Plumbing Piping and Equipment."

B. Comply with requirements for pipe hanger and support devices and installation specified in Section 220529 "Hangers and Supports for Plumbing Piping and Equipment."

1. Install carbon-steel pipe hangers for horizontal piping in noncorrosive environments.
2. Install carbon-steel pipe support clamps for vertical piping in noncorrosive environments.
3. Install stainless-steel pipe support clamps for vertical piping in corrosive environments.
4. Vertical Piping: MSS Type 8 or Type 42, clamps.
5. Install individual, straight, horizontal piping runs:

a. 100 Feet and Less: MSS Type 1, adjustable, steel clevis hangers.
b. Longer Than 100 Feet: MSS Type 43, adjustable roller hangers.
c. Longer Than 100 Feet if Indicated: MSS Type 49, spring cushion rolls.

6. Multiple, Straight, Horizontal Piping Runs 100 Feet or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
7. Base of Vertical Piping: MSS Type 52, spring hangers.

C. Support horizontal piping and tubing within 12 inches of each fitting, valve, and coupling.

D. Support vertical piping and tubing at base and at each floor.

E. Rod diameter may be reduced one size for double-rod hangers, with 3/8-inch minimum rods.

F. Install hangers for cast-iron soil piping with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 1-1/2 and NPS 2: 60 inches with 3/8-inch rod.
2. NPS 3: 60 inches with ½-inch rod.
3. NPS 4 and NPS 5: 60 inches with 5/8-inch rod.
4. NPS 6 and NPS 8: 60 inches with ¾-inch rod.
5. NPS 10 and NPS 12: 60 inches with 7/8-inch rod.
6. Spacing for 10-foot lengths may be increased to 10 feet. Spacing for fittings is limited to 60 inches.

G. Install supports for vertical cast-iron soil piping every 15 feet.

H. Install supports for vertical copper tubing every 10 feet.

I. Install hangers for PVC piping with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 1-1/2 and NPS 2: 48 inches with 3/8-inch rod.
2. NPS 3: 48 inches with ½-inch rod.
3. NPS 4 and NPS 5: 48 inches with 5/8-inch rod.
4. NPS 6 and NPS 8: 48 inches with ¾-inch rod.
5. NPS 10 and NPS 12: 48 inches with 7/8-inch rod.

J. Install supports for vertical PVC piping every 48 inches.

K. Support piping and tubing not listed above according to MSS SP-58 and manufacturer's written instructions.

3.7 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Connect soil and waste piping to exterior sanitary sewerage piping. Use transition fitting to join dissimilar piping materials.

C. Connect waste and vent piping to the following:

1. Plumbing Fixtures: Connect waste piping in sizes indicated, but not smaller than required by plumbing code.
2. Plumbing Fixtures and Equipment: Connect atmospheric vent piping in sizes indicated, but not smaller than required by authorities having jurisdiction.
3. Plumbing Specialties: Connect waste and vent piping in sizes indicated, but not smaller than required by plumbing code.

4. Install test tees (wall cleanouts) in conductors near floor and floor cleanouts with cover flush with floor.
5. Comply with requirements for cleanouts and drains specified in Section 221319 "Sanitary Waste Piping Specialties."
6. Equipment: Connect waste piping as indicated.

    a. Provide shutoff valve if indicated and union for each connection.
    b. Use flanges instead of unions for connections NPS 2-1/2 and larger.

D. Connect force-main piping to the following:

1. Sanitary Sewer: To exterior force main.
2. Sewage Pump: To sewage pump discharge.

E. Where installing piping adjacent to equipment, allow space for service and maintenance of equipment.

F. Make connections according to the following unless otherwise indicated:

1. Install unions, in piping NPS 2 and smaller, adjacent to each valve and at final connection to each piece of equipment.
2. Install flanges, in piping NPS 2-1/2 and larger, adjacent to flanged valves and at final connection to each piece of equipment.

3.8 IDENTIFICATION

A. Identify exposed sanitary waste and vent piping.

B. Comply with requirements for identification specified in Section 220553 "Identification for Plumbing Piping and Equipment."

3.9 FIELD QUALITY CONTROL

A. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction.

1. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.
2. Final Inspection: Arrange for final inspection by authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.

B. Reinspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for reinspection.

C. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

D. Test sanitary waste and vent piping according to procedures of authorities having jurisdiction or, in absence of published procedures, as follows:

1. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired.

    a. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.

2. Leave uncovered and unconcealed new, altered, extended, or replaced waste and vent piping until it has been tested and approved.

    a. Expose work that was covered or concealed before it was tested.

3. Roughing-in Plumbing Test Procedure: Test waste and vent piping except outside leaders on completion of roughing-in.

    a. Close openings in piping system and fill with water to point of overflow, but not less than 10-foot head of water.
    b. From 15 minutes before inspection starts to completion of inspection, water level must not drop.
    c. Inspect joints for leaks.

4. Finished Plumbing Test Procedure: After plumbing fixtures have been set and traps filled with water, test connections and prove they are gastight and watertight.

    a. Plug vent-stack openings on roof and building drains where they leave building. Introduce air into piping system equal to pressure of 1-inch wg.
    b. Use U-tube or manometer inserted in trap of water closet to measure this pressure.
    c. Air pressure must remain constant without introducing additional air throughout period of inspection.
    d. Inspect plumbing fixture connections for gas and water leaks.

5. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.
6. Prepare reports for tests and required corrective action.

3.10 CLEANING AND PROTECTION

A. Clean interior of piping. Remove dirt and debris as work progresses.

B. Protect sanitary waste and vent piping during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.

C. Place plugs in ends of uncompleted piping at end of day and when work stops.

D. Exposed PVC Piping: Protect plumbing vents exposed to sunlight with two (2) coats of water-based latex paint.

E. Repair damage to adjacent materials caused by waste and vent piping installation.

3.11 PIPING SCHEDULE

A. Flanges and unions may be used on aboveground pressure piping unless otherwise indicated.

B. Refer to Schedules on Drawings.

END OF SECTION 221316

SECTION 221319 - SANITARY WASTE PIPING SPECIALTIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Cleanouts.
2. Roof flashing assemblies.
3. Through-penetration firestop assemblies.
4. Miscellaneous sanitary drainage piping specialties.

1.3 DEFINITIONS

A. ABS: Acrylonitrile-butadiene-styrene.

B. FOG: Fats, oils, and greases.

C. PVC: Polyvinyl chloride.

1.4 ACTION SUBMITTALS

A. Shop Drawings:

1. Show fabrication and installation details for frost-resistant vent terminals.

1.5 INFORMATIONAL SUBMITTALS

A. Seismic Qualification Certificates: For FOG disposal systems, accessories, and components, from manufacturer.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

B. Field quality-control reports.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For sanitary waste piping specialties to include in emergency, operation, and maintenance manuals.

PART 2 - PRODUCTS

2.1 ASSEMBLY DESCRIPTIONS

A. Sanitary waste piping specialties shall bear label, stamp, or other markings of specified testing agency.

B. Comply with NSF 14 for plastic sanitary waste piping specialty components.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing, and marked for intended location and application.

2.2 CLEANOUTS

A. Cast-Iron Exposed Cleanouts:

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

   a. Jay R. Smith Mfg. Co.
   b. Josam Company
   c. Tyler Pipe; a subsidiary of McWane Inc.
   d. Zurn Industries, LLC

2. Standard: ASME A112.36.2M.
3. Size: Same as connected drainage piping
4. Body Material: Hub-and-spigot, cast-iron soil pipe T-branch as required to match connected piping.
5. Closure: Countersunk, brass plug.
6. Closure Plug Size: Same as or not more than one (1) size smaller than cleanout size.

B. Cast-Iron Exposed Floor Cleanouts:

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

   a. Jay R. Smith Mfg. Co.
   b. Josam Company
   c. Tyler Pipe; a subsidiary of McWane Inc.
   d. Zurn Industries, LLC

2. Standard: ASME A112.36.2M for adjustable housing cast-iron soil pipe with cast-iron ferrule cleanout.
3. Size: Same as connected branch.
4. Type: Adjustable housing cast-iron soil pipe with cast-iron ferrule.
5. Body or Ferrule: Cast iron.
6. Clamping Device: Required.
7. Outlet Connection: Inside caulk.
8. Closure: Brass plug with straight threads and gasket.
9. Adjustable Housing Material: Cast iron.
10. Frame and Cover Material and Finish: Nickel-bronze, copper alloy.
11. Frame and Cover Shape: Round.
12. Top Loading Classification: Heavy-duty.
13. Riser: ASTM A 74, Service class, cast-iron drainage pipe fitting and riser to cleanout.

C. Cast-Iron Wall Cleanouts:

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

   a. Jay R. Smith Mfg. Co.
   b. Josam Company
   c. MIFAB, Inc.
   d. Tyler Pipe; a subsidiary of McWane Inc.
   e. Watts; a Watts Water Technologies company
   f. Zurn Industries, LLC

2. Standard: ASME A112.36.2M. Include wall access.
3. Size: Same as connected drainage piping.
4. Body: Hub-and-spigot, cast-iron soil pipe T-branch as required to match connected piping.
5. Closure Plug:

   a. Brass.
   b. Countersunk or raised head.
   c. Drilled and threaded for cover attachment screw.
   d. Size: Same as or not more than one (1) size smaller than cleanout size.

6. Wall Access: Round, flat, chrome-plated brass or stainless-steel cover plate with screw.

2.3 ROOF FLASHING ASSEMBLIES

A. Roof Flashing Assemblies:

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

   a. Acorn Engineering Company
   b. Thaler Metal Industries Ltd.
   c. Zurn Industries, LLC

2. Description: Manufactured assembly made of 4.0-lb/sq. ft., 0.0625-inch thick, lead flashing collar and skirt extending at least 6 inches from pipe, with galvanized-steel boot reinforcement and counterflashing fitting.

   a. Open-Top Vent Cap: Without cap.
   b. Low-Silhouette Vent Cap: With vandal-proof vent cap.
   c. Extended Vent Cap: With field-installed, vandal-proof vent cap.

2.4 THROUGH-PENETRATION FIRESTOP ASSEMBLIES

A. Through-Penetration Firestop Assemblies:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

   a. ProSet Systems Inc.

2. Standard: UL 1479 assembly of sleeve-and-stack fitting with firestopping plug.

3. Size: Same as connected soil, waste, or vent stack.
4. Sleeve: Molded-PVC plastic, of length to match slab thickness and with integral nailing flange on one end for installation in cast-in-place concrete slabs.
5. Stack Fitting: ASTM A 48, gray-iron, hubless-pattern wye branch with neoprene O-ring at base and gray-iron plug in thermal-release harness. Include PVC protective cap for plug.
6. Special Coating: Corrosion resistant on interior of fittings.

2.5 MISCELLANEOUS SANITARY DRAINAGE PIPING SPECIALTIES

A. Open Drains:

1. Description: Shop or field fabricate from ASTM A 74, Service class, hub-and-spigot, cast-iron soil-pipe fittings. Include P-trap, hub-and-spigot riser section; and where required, increaser fitting joined with ASTM C 564 rubber gaskets.
2. Size: Same as connected waste piping with increaser fitting of size indicated**.**

B. Deep-Seal Traps:

1. Description: Cast-iron or bronze casting, with inlet and outlet matching connected piping and cleanout trap-seal primer valve connection.
2. Size: Same as connected waste piping.

    a. NPS 2: 4-inch-minimum water seal.
    b. NPS 2-1/2 and Larger: 5-inch-minimum water seal.

C. Floor-Drain, Trap-Seal Primer Fittings:

1. Description: Cast iron, with threaded inlet and threaded or spigot outlet, and trap-seal primer valve connection.
2. Size: Same as floor drain outlet with NPS 1/2 side inlet.

D. Air-Gap Fittings:

1. Standard: ASME A112.1.2, for fitting designed to ensure fixed, positive air gap between installed inlet and outlet piping.
2. Body: Bronze or cast iron.
3. Inlet: Opening in top of body.
4. Outlet: Larger than inlet.
5. Size: Same as connected waste piping and with inlet large enough for associated indirect waste piping.

E. Sleeve Flashing Device:

1. Description: Manufactured, cast-iron fitting, with clamping device that forms sleeve for pipe floor penetrations of floor membrane. Include galvanized-steel pipe extension in top of fitting that will extend 1-inch above finished floor and galvanized-steel pipe extension in bottom of fitting that will extend through floor slab.
2. Size: As required for close fit to riser or stack piping.

F. Stack Flashing Fittings:

1. Description: Counterflashing-type, cast-iron fitting, with bottom recess for terminating roof membrane, and with threaded or hub top for extending vent pipe.
2. Size: Same as connected stack vent or vent stack.

G. Vent Caps:

1. Description: Cast-iron body with threaded or hub inlet and vandal-proof design. Include vented hood and setscrews to secure to vent pipe.
2. Size: Same as connected stack vent or vent stack.

H. Frost-Resistant Vent Terminals:

1. Description: Manufactured or shop-fabricated assembly constructed of copper, lead-coated copper, or galvanized steel.
2. Design: To provide 1-inch enclosed air space between outside of pipe and inside of flashing collar extension, with counterflashing.

I. Expansion Joints:

1. Standard: ASME A112.6.4.
2. Body: Cast iron with bronze sleeve, packing, and gland.
3. End Connections: Matching connected piping.
4. Size: Same as connected soil, waste, or vent piping.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install cleanouts in aboveground piping and building drain piping according to the following, unless otherwise indicated:

1. Size same as drainage piping up to NPS 4. Use NPS 4 for larger drainage piping unless larger cleanout is indicated.
2. Locate at each change in direction of piping greater than 45 degrees.
3. Locate at minimum intervals of 50 feet for piping NPS 4 and smaller and 100 feet for larger piping.
4. Locate at base of each vertical soil and waste stack.

B. For floor cleanouts for piping below floors, install cleanout deck plates with top flush with finished floor.

C. For cleanouts located in concealed piping, install cleanout wall access covers, of types indicated, with frame and cover flush with finished wall.

D. Install roof flashing assemblies on sanitary stack vents and vent stacks that extend through roof. Comply with requirements in Section 076200 "Sheet Metal Flashing and Trim."

E. Install flashing fittings on sanitary stack vents and vent stacks that extend through roof. Comply with requirements in Section 076200 "Sheet Metal Flashing and Trim."

F. Install through-penetration firestop assemblies in plastic conductors and stacks at floor penetrations.

1. Comply with requirements in Section 078413 "Penetration Firestopping."

G. Assemble open drain fittings and install with top of hub 1-inch above floor.

H. Install deep-seal traps on floor drains and other waste outlets, if indicated.

I. Install floor-drain, trap-seal primer fittings on inlet to floor drains that require trap-seal primer connection.

1. Exception: Fitting may be omitted if trap has trap-seal primer connection.
2. Size: Same as floor drain inlet.

J. Install air-gap fittings on draining-type backflow preventers and on indirect-waste piping discharge into sanitary drainage system.

K. Install sleeve and sleeve seals with each riser and stack passing through floors with waterproof membrane.

L. Install vent caps on each vent pipe passing through roof.

M. Install frost-resistant vent terminals on each vent pipe passing through roof. Maintain 1-inch clearance between vent pipe and roof substrate.

N. Install expansion joints on vertical stacks and conductors. Position expansion joints for easy access and maintenance.

O. Install frost-proof vent caps on each vent pipe passing through roof. Maintain 1-inch clearance between vent pipe and roof substrate.

P. Assemble components of FOG disposal systems and install on floor.

1. Install trap, vent, fresh-air inlet, and flow-control fitting according to authorities having jurisdiction.
2. Install shelf fastened to reinforcement in wall construction and adjacent to unit, unless otherwise indicated.
3. Install culture bottle, culture metering pump, timer, and control on shelf. Install tubing between culture bottle, metering pump, and chamber.

Q. Install wood-blocking reinforcement for wall-mounting-type specialties.

R. Install traps on plumbing specialty drain outlets. Omit traps on indirect wastes unless trap is indicated.

3.2 CONNECTIONS

A. Comply with requirements in Section 221316 "Sanitary Waste and Vent Piping" for piping installation requirements. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to equipment to allow service and maintenance.

C. FOG Disposal Systems: Connect inlet and outlet to unit, connect flow-control fitting and fresh-air inlet piping to unit inlet piping, and connect vent piping between trap and media chamber. Connect electrical power.

D. Ground equipment according to Section 260526 "Grounding and Bonding for Electrical Systems."

E. Connect wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

3.3 FLASHING INSTALLATION

A. Comply with requirements in Section 076200 "Sheet Metal Flashing and Trim."

B. Fabricate flashing from single piece unless large pans, sumps, or other drainage shapes are required.

C. Install sheet flashing on pipes, sleeves, and specialties passing through or embedded in floors and roofs with waterproof membrane.

1. Pipe Flashing: Sleeve type, matching pipe size, with minimum length of 10 inches, and skirt or flange extending at least 8 inches around pipe.
2. Sleeve Flashing: Flat sheet, with skirt or flange extending at least 8 inches around sleeve.
3. Embedded Specialty Flashing: Flat sheet, with skirt or flange extending at least 8 inches around specialty.

D. Set flashing on floors and roofs in solid coating of bituminous cement.

E. Secure flashing into sleeve and specialty clamping ring or device.

F. Install flashing for piping passing through roofs with counterflashing or commercially made flashing fittings, according to Section 076200 "Sheet Metal Flashing and Trim."

G. Extend flashing up vent pipe passing through roofs and turn down into pipe, or secure flashing into cast-iron sleeve having calking recess.

3.4 FIELD QUALITY CONTROL

A. Perform tests and inspections and prepare test reports.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect field-assembled FOG disposal systems and their installation, including piping and electrical connections, and to assist in testing.

B. Tests and Inspections:

1. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

3.5 PROTECTION

A. Protect drains during remainder of construction period to avoid clogging with dirt or debris and to prevent damage from traffic or construction work.

B. Place plugs in ends of uncompleted piping at end of each day or when work stops.

END OF SECTION 221319

SECTION 221319.13 - SANITARY DRAINS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Floor drains.

1.3 DEFINITIONS

A. ABS: Acrylonitrile-butadiene styrene.

B. FRP: Fiberglass-reinforced plastic.

C. HDPE: High-density polyethylene.

D. PE: Polyethylene.

E. PP: Polypropylene.

F. PVC: Polyvinyl chloride.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

PART 2 - PRODUCTS

2.1 DRAIN ASSEMBLIES

A. Sanitary drains shall bear label, stamp, or other markings of specified testing agency.

B. Comply with NSF 14 for plastic sanitary piping specialty components.

2.2 FLOOR DRAINS

A. Cast-Iron Floor Drains:

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

a. Jay R. Smith Mfg. Co.
b. Josam Company
c. Tyler Pipe; a subsidiary of McWane Inc.
d. Zurn Industries, LLC

2. Standard: ASME A112.6.3.

B. Stainless-Steel Floor Drains, ASME A112.3.1:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Jay R. Smith Mfg. Co.
b. Josam Company
c. Tyler Pipe; a subsidiary of McWane Inc.
d. Zurn Industries, LLC

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install floor drains at low points of surface areas to be drained. Set grates of drains flush with finished floor, unless otherwise indicated.

1. Position floor drains for easy access and maintenance.
2. Set floor drains below elevation of surrounding finished floor to allow floor drainage.
3. Set with grates depressed according to the following drainage area radii:

a. Radius, 30 Inches or Less: Equivalent to one percent (1%) slope, but not less than ¼-inch total depression.
b. Radius, 30 to 60 Inches: Equivalent to one percent (1%) slope.
c. Radius, 60 Inches or Larger: Equivalent to one percent (1%) slope, but not greater than 1-inch total depression.

4. Install floor-drain flashing collar or flange, so no leakage occurs between drain and adjoining flooring.

a. Maintain integrity of waterproof membranes where penetrated.

5. Install individual traps for floor drains connected to sanitary building drain, unless otherwise indicated.

3.2 CONNECTIONS

A. Comply with requirements in Section 221316 "Sanitary Waste and Vent Piping" for piping installation requirements. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Comply with requirements in Section 221319 "Sanitary Waste Piping Specialties" for backwater valves, air admittance devices and miscellaneous sanitary drainage piping specialties.

C. Install piping adjacent to equipment to allow service and maintenance.

D. Ground equipment according to Section 260526 "Grounding and Bonding for Electrical Systems."

E. Connect wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

3.3 LABELING AND IDENTIFYING

A. Distinguish among multiple units, inform operator of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations, in addition to identifying unit. Nameplates and signs are specified in Section 220553 "Identification for Plumbing Piping and Equipment."

3.4 PROTECTION

A. Protect drains during remainder of construction period to avoid clogging with dirt or debris and to prevent damage from traffic or construction work.

B. Place plugs in ends of uncompleted piping at end of each day or when work stops.

END OF SECTION 221319.13

SECTION 221323 - SANITARY WASTE INTERCEPTORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Solids interceptors.

1.3 DEFINITIONS

A. FRP: Fiberglass-reinforced plastic.

B. PP: Polypropylene plastic.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of metal and plastic interceptor. Include materials of fabrication, dimensions, rated capacities, retention capacities, operating characteristics, size, and location of each pipe connection, furnished specialties, and accessories.

B. Shop Drawings: For each type and size of precast concrete interceptor indicated.

1. Include materials of construction, dimensions, rated capacities, retention capacities, location, and size of each pipe connection, furnished specialties, and accessories.

1.5 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Interceptors, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Piping connections. Include size, location, and elevation of each.
2. Interface with underground structures and utility services.

1.6 FIELD CONDITIONS

A. Interruption of Existing Sewer Services: Do not interrupt services to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary sewer services according to requirements indicated:

1. Notify Architect, Construction Manager, and Owner no fewer than seven (7) days in advance of proposed interruption of service.
2. Do not proceed with interruption of sewer services without written permission.

PART 2 - PRODUCTS

2.1 SOLIDS INTERCEPTORS

A. Cast-Iron or Steel Solids Interceptors:

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

a. Jay R. Smith Mfg. Co.
b. Josam Company
c. Rockford Sanitary Systems, Inc.
d. Schier Products Company
e. Tyler Pipe; a subsidiary of Wade Inc.
f. Zurn Industries, LLC

2. Type: Factory-fabricated interceptor made for removing and retaining sediment from wastewater.
3. Body Material: Cast iron or steel.
4. Interior Separation Device: Baffles.

PART 3 - EXECUTION

3.1 EARTHWORK

A. Excavating, trenching, and backfilling are specified in Section 312000 "Earth Moving."

3.2 INSTALLATION

A. Install precast concrete interceptors according to ASTM C 891.

B. Set interceptors level and plumb.

C. Install manhole risers from top of underground concrete interceptors to manholes and gratings at finished grade.

D. Set tops of manhole frames and covers flush with finished surface in pavements.

1. Set tops 3 inches above finish surface elsewhere unless otherwise indicated.

E. Set tops of grating frames and grates flush with finished surface.

F. Install grease interceptors, including trapping, venting, and flow-control fitting, according to authorities having jurisdiction and with clear space for servicing.

1. Above-Floor Installation: Set unit with bottom resting on floor unless otherwise indicated.
2. Flush with Floor Installation: Set unit and extension, if required, with cover flush with finished floor.
3. Recessed Floor Installation: Set unit in receiver housing having bottom or cradle supports, with receiver housing cover flush with finished floor.
4. Install cleanout immediately downstream from interceptors not having integral cleanout on outlet.

G. Install solids interceptors with cleanout immediately downstream from interceptors that do not have integral cleanout on outlet.

1. Install trap on interceptors that do not have integral trap and are connected to sanitary drainage and vent systems.

3.3 CONNECTIONS

A. Piping installation requirements are specified in Section 221316 "Sanitary Waste and Vent Piping." Drawings indicate general arrangement of piping, fittings, and specialties.

B. Make piping connections between interceptors and piping systems.

3.4 IDENTIFICATION

A. Identification materials and installation are specified in Section 312000 "Earth Moving."

1. Arrange for installation of green warning tapes directly over piping and at outside edges of underground interceptors.
2. Use warning tapes or detectable warning tape over ferrous piping.
3. Use detectable warning tape over nonferrous piping and over edges of underground structures.

B. Equipment Nameplates and Signs: Install engraved plastic-laminate equipment nameplate or sign on or near each of the following:

1. Solids interceptors.

3.5 PROTECTION

A. Protect sanitary waste interceptors from damage during construction period.

B. Repair damage to adjacent materials caused by sanitary waste interceptor installation.

END OF SECTION 221323

SECTION 221416 - STORM DRAINAGE PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Pipe, tube, and fittings.
2. Specialty pipe fittings.

1.3 PERFORMANCE REQUIREMENTS

A. Components and installation shall be capable of withstanding the following minimum working pressure unless otherwise indicated:

1. Storm Drainage Piping: 10-foot head of water.

B. Seismic Performance: Storm drainage piping and support and installation shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

1.5 INFORMATIONAL SUBMITTALS

A. Seismic Qualification Certificates: For storm drainage piping, accessories, and components, from manufacturer.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
2. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

B. Field quality-control reports.

1.6 QUALITY ASSURANCE

A. Piping materials shall bear label, stamp, or other markings of specified testing agency.

B. Comply with NSF/ANSI 14, "Plastics Piping System Components and Related Materials," for plastic piping components. Include marking with "NSF-drain" for plastic drain piping and "NSF-sewer" for plastic sewer piping.

1.7 PROJECT CONDITIONS

A. Interruption of Existing Storm-Drainage Service: Do not interrupt service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary service according to requirements indicated:

1. Notify Architect, Construction Manager, and Owner no fewer than two (2) days in advance of proposed interruption of storm-drainage service.
2. Do not proceed with interruption of storm-drainage service without written permission.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

A. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, fitting materials, and joining methods for specific services, service locations, and pipe sizes.

2.2 HUB-AND-SPIGOT, CAST-IRON SOIL PIPE AND FITTINGS

A. Pipe and Fittings: ASTM A 74, Service and Extra Heavy classes.

B. Gaskets: ASTM C 564, rubber.

C. Calking Materials: ASTM B 29, pure lead and oakum or hemp fiber.

2.3 HUBLESS, CAST-IRON SOIL PIPE AND FITTINGS

A. Pipe and Fittings: ASTM A 888 or CISPI 301.

B. Heavy-Duty, Hubless-Piping Couplings:

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

a. ANACO-Husky
b. Charlotte Pipe and Foundry Company
c. Clamp-All Corp.
d. Ideal Clamp Products, Inc.
e. Mission Rubber Company, LLC; a division of MCP Industries
f. Tyler Pipe; a subsidiary of McWane Inc.

2. Standards: ASTM C 1277 and ASTM C 1540.
3. Description: Stainless-steel shield with stainless-steel bands and tightening devices; and ASTM C 564, rubber sleeve with integral, center pipe stop.

2.4 PVC PIPE AND FITTINGS

A. Solid-Wall PVC Pipe: ASTM D 2665, drain, waste, and vent.

B. PVC Socket Fittings: ASTM D 2665, made to ASTM D 3311, drain, waste, and vent patterns and to fit Schedule 40 pipe.

C. Adhesive Primer: ASTM F 656.

D. Solvent Cement: ASTM D 2564.

2.5 SPECIALTY PIPE FITTINGS

A. Transition Couplings:

1. General Requirements: Fitting or device for joining piping with small differences in ODs or of different materials. Include end connections same size as and compatible with pipes to be joined.
2. Fitting-Type Transition Couplings: Manufactured piping coupling or specified-piping-system fitting.
3. Unshielded, Non-Pressure Transition Couplings:

a. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

1) Dallas Specialty & Mfg. Co.
2) Fernco Inc.
3) Mission Rubber Company, LLC; a division of MCP Industries
4) Plastic Oddities

b. Standard: ASTM C 1173.
c. Description: Elastomeric, sleeve-type, reducing or transition pattern. Include shear ring and corrosion-resistant-metal tension band and tightening mechanism on each end.
d. Sleeve Materials:

1) For Cast-Iron Soil Pipes: ASTM C 564, rubber.
2) For Plastic Pipes: ASTM F 477, elastomeric seal or ASTM D 5926, PVC.
3) For Dissimilar Pipes: ASTM D 5926, PVC or other material compatible with pipe materials being joined.

4. Shielded, Non-Pressure Transition Couplings:

a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1) Cascade Waterworks Mfg. Co.
2) Mission Rubber Company, LLC; a division of MCP Industries

b. Standard: ASTM C 1460.
c. Description: Elastomeric or rubber sleeve with full-length, corrosion-resistant outer shield and corrosion-resistant-metal tension band and tightening mechanism on each end.

5. Pressure Transition Couplings:

a. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

1) Cascade Waterworks Mfg. Co.
2) EBAA Iron, Inc.
3) Ford Meter Box Company, Inc. (The)
4) JCM Industries, Inc.

5) Romac Industries, Inc.

b. Standard: AWWA C219.
c. Description: Metal, sleeve-type couplings same size as, with pressure rating at least equal to and ends compatible with, pipes to be joined.
d. Center-Sleeve Material: Manufacturer's standard.
e. Gasket Material: Natural or synthetic rubber.
f. Metal Component Finish: Corrosion-resistant coating or material.

B. Dielectric Fittings:

1. General Requirements: Assembly of copper alloy and ferrous materials with separating nonconductive insulating material. Include end connections compatible with pipes to be joined.
2. Dielectric Unions:

a. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

1) A.Y. McDonald Mfg. Co.
2) Capitol Manufacturing Company
3) Central Plastics Company
4) HART Industrial Unions, LLC
5) Jomar Valve
6) Matco-Norca
7) Watts; a Watts Water Technologies company
8) Zurn Industries, LLC

b. Description:

1) Standard: ASSE 1079.
2) Pressure Rating: 150 psig at 180 deg F.
3) End Connections: Solder-joint copper alloy and threaded ferrous.

3. Dielectric Flanges:

a. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

1) Central Plastics Company
2) Matco-Norca
3) Watts; a Watts Water Technologies company
4) Zurn Industries, LLC

b. Description:

1) Standard: ASSE 1079.
2) Factory-fabricated, bolted, companion-flange assembly.
3) Pressure Rating: 150 psig.
4) End Connections: Solder-joint copper alloy and threaded ferrous; threaded solder-joint copper alloy and threaded ferrous.

4. Dielectric-Flange Insulating Kits:

a. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

1) Advance Products & Systems, Inc.
2) Calpico, Inc.
3) Central Plastics Company
4) GPT; an EnPro Industries company

b. Description:

1) Nonconducting materials for field assembly of companion flanges.
2) Pressure Rating: 150 psig.
3) Gasket: Neoprene or phenolic.
4) Bolt Sleeves: Phenolic or polyethylene.
5) Washers: Phenolic with steel-backing washers.

5. Dielectric Nipples:

a. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

1) Grinnell Mechanical Products
2) Matco-Norca
3) Precision Plumbing Products
4) Victaulic Company

b. Description:

1) Electroplated steel nipple complying with ASTM F 1545.
2) Pressure Rating: 300 psig at 225 deg F.
3) End Connections: Male threaded or grooved.
4) Lining: Inert and noncorrosive, propylene.

PART 3 - EXECUTION

3.1 EARTH MOVING

A. Comply with requirements for excavating, trenching, and backfilling specified in Section 312000 "Earth Moving."

3.2 PIPING INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations from layout are approved on coordination drawings.

B. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.

C. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

D. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

E. Install piping to permit valve servicing.

F. Install piping at indicated slopes.

G. Install piping free of sags and bends.

H. Install fittings for changes in direction and branch connections.

I. Install piping to allow application of insulation.

J. Install seismic restraints on piping. Comply with requirements for seismic-restraint devices specified in Section 220548 "Vibration and Seismic Controls for Plumbing Piping and Equipment."

K. Make changes in direction for storm drainage piping using appropriate branches, bends, and long-sweep bends. Do not change direction of flow more than 90 degrees. Use proper size of standard increasers and reducers if pipes of different sizes are connected. Reducing size of drainage piping in direction of flow is prohibited.

L. Lay buried building storm drainage piping beginning at low point of each system. Install true to grades and alignment indicated, with unbroken continuity of invert. Place hub ends of piping upstream. Install required gaskets according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements. Maintain swab in piping and pull past each joint as completed.

M. Install storm drainage piping at the following minimum slopes unless otherwise indicated:

1. Building Storm Drain: Two percent (2%) downward in direction of flow for piping NPS 3 and smaller; one percent (1%) downward in direction of flow for piping NPS 4 and larger.
2. Horizontal Storm-Drainage Piping: Two percent (2%) downward in direction of flow.

N. Install cast-iron soil piping according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."

1. Install encasement on underground piping according to ASTM A 674 or AWWA C105.

O. Install aboveground PVC piping according to ASTM D 2665.

P. Install underground PVC piping according to ASTM D 2321.

Q. Plumbing Specialties:

1. Install cleanouts at grade and extend to where building storm drains connect to building storm sewers in storm drainage gravity-flow piping. Install cleanout fitting with closure plug inside the building in storm drainage force-main piping. Comply with requirements for cleanouts specified in Section 221423 "Storm Drainage Piping Specialties."
2. Install drains in storm drainage gravity-flow piping. Comply with requirements for drains specified in Section 221423 "Storm Drainage Piping Specialties."

R. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.

S. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."

T. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."

U. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 220518 "Escutcheons for Plumbing Piping."

V. ABS or PVC piping shall not be installed in plenum ceiling areas. Use cast iron piping for those areas.

3.3 JOINT CONSTRUCTION

A. Hub-and-Spigot, Cast-Iron Soil Piping Gasketed Joints: Join according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for compression joints.

B. Hub-and-Spigot, Cast-Iron Soil Piping Calked Joints: Join according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for lead-and-oakum calked joints.

C. Hubless, Cast-Iron Soil Piping Coupled Joints: Join according to CISPI 310 and CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for hubless-piping coupling joints.

D. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

E. Plastic, Non-Pressure-Piping, Solvent-Cemented Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:

1. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements.
2. PVC Piping: Join according to ASTM D 2855 and ASTM D 2665 Appendices.

3.4 SPECIALTY PIPE FITTING INSTALLATION

A. Transition Couplings:

1. Install transition couplings at joints of piping with small differences in ODs.
2. In Drainage Piping: Shielded, non-pressure transition couplings.
3. In Aboveground Force-Main Piping: Fitting-type transition couplings.
4. In Underground Force-Main Piping:

a. NPS 1-1/2 and Smaller: Fitting-type transition couplings.
b. NPS 2 and Larger: Pressure transition couplings.

B. Dielectric Fittings:

1. Install dielectric fittings in piping at connections of dissimilar metal piping and tubing.

2. Dielectric Fittings for NPS 2 and Smaller: Use dielectric unions.
3. Dielectric Fittings for NPS 2-1/2 to NPS 4: Use dielectric flanges.
4. Dielectric Fittings for NPS 5 and Larger: Use dielectric flange kits.

3.5 VALVE INSTALLATION

A. General valve installation requirements are specified in Section 220523.12 "Ball Valves for Plumbing Piping" and Section 220523.14 "Check Valves for Plumbing Piping".

B. Shutoff Valves: Install shutoff valve on each sump pump discharge.

1. Install gate or full-port ball valve for piping NPS 2 and smaller.
2. Install gate valve for piping NPS 2-1/2 and larger.

C. Check Valves: Install swing-check valve, between pump and shutoff valve, on each sump pump discharge.

3.6 HANGER AND SUPPORT INSTALLATION

A. Comply with requirements for seismic-restraint devices specified in Section 220548 "Vibration and Seismic Controls for Plumbing Piping and Equipment."

B. Comply with requirements for pipe hanger and support devices and installation specified in Section 220529 "Hangers and Supports for Plumbing Piping and Equipment."

1. Install carbon-steel pipe hangers for horizontal piping in noncorrosive environments.
2. Install stainless-steel pipe hangers for horizontal piping in corrosive environments.
3. Install carbon-steel pipe support clamps for vertical piping in noncorrosive environments.
4. Install stainless-steel pipe support clamps for vertical piping in corrosive environments.
5. Vertical Piping: MSS Type 8 or Type 42, clamps.
6. Individual, Straight, Horizontal Piping Runs:

    a. 100 Feet and Less: MSS Type 1, adjustable, steel clevis hangers.
    b. Longer Than 100 Feet: MSS Type 43, adjustable roller hangers.
    c. Longer Than 100 Feet if Indicated: MSS Type 49, spring cushion rolls.

7. Multiple, Straight, Horizontal Piping Runs 100 Feet or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
8. Base of Vertical Piping: MSS Type 52, spring hangers.

C. Support horizontal piping and tubing within 12 inches of each fitting, valve, and coupling.

D. Support vertical piping and tubing at base and at each floor.

E. Rod diameter may be reduced one size for double-rod hangers, with 3/8-inch minimum rods.

F. Install hangers for cast-iron soil piping with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 1-1/2 and NPS 2: 60 inches with 3/8-inch rod.
2. NPS 3: 60 inches with ½-inch rod.
3. NPS 4 and NPS 5: 60 inches with 5/8-inch rod.
4. NPS 6 and NPS 8: 60 inches with ¾-inch rod.
5. NPS 10 and NPS 12: 60 inches with 7/8-inch rod.

6. Spacing for 10-foot pipe lengths may be increased to 10 feet. Spacing for fittings is limited to 60 inches.

G. Install supports for vertical cast-iron soil piping every 15 feet.

H. Install hangers for PVC piping with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 1-1/2 and NPS 2: 48 inches with 3/8-inch rod.
2. NPS 3: 48 inches with ½-inch rod.
3. NPS 4 and NPS 5: 48 inches with 5/8-inch rod.
4. NPS 6 and NPS 8: 48 inches with ¾-inch rod.
5. NPS 10 and NPS 12: 48 inches with 7/8-inch rod.

I. Install supports for vertical PVC piping every 48 inches.

J. Support piping and tubing not listed above according to MSS SP-69 and manufacturer's written instructions.

3.7 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Connect interior storm drainage piping to exterior storm drainage piping. Use transition fitting to join dissimilar piping materials.

C. Connect storm drainage piping to roof drains and storm drainage specialties.

1. Install test tees (wall cleanouts) in conductors near floor, and floor cleanouts with cover flush with floor.
2. Comply with requirements for cleanouts and drains specified in Section 221423 "Storm Drainage Piping Specialties."

D. Where installing piping adjacent to equipment, allow space for service and maintenance of equipment.

E. Make connections according to the following unless otherwise indicated:

1. Install unions, in piping NPS 2 and smaller, adjacent to each valve and at final connection to each piece of equipment.
2. Install flanges, in piping NPS 2-1/2 and larger, adjacent to flanged valves and at final connection to each piece of equipment.

3.8 IDENTIFICATION

A. Identify exposed storm drainage piping. Comply with requirements for identification specified in Section 220553 "Identification for Plumbing Piping and Equipment."

3.9 FIELD QUALITY CONTROL

A. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction.

1. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in.

2. Final Inspection: Arrange for final inspection by authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.

B. Reinspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for reinspection.

C. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

D. Test storm drainage piping according to procedures of authorities having jurisdiction or, in absence of published procedures, as follows:

1. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.
2. Leave uncovered and unconcealed new, altered, extended, or replaced storm drainage piping until it has been tested and approved. Expose work that was covered or concealed before it was tested.
3. Test Procedure: Test storm drainage piping on completion of roughing-in. Close openings in piping system and fill with water to point of overflow, but not less than 10-foot head of water. From 15 minutes before inspection starts until completion of inspection, water level must not drop. Inspect joints for leaks.
4. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.
5. Prepare reports for tests and required corrective action.

3.10 CLEANING

A. Clean interior of piping. Remove dirt and debris as work progresses.

B. Protect drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.

C. Place plugs in ends of uncompleted piping at end of day and when work stops.

D. Exposed PVC Piping: Protect plumbing vents exposed to sunlight with two (2) coats of water-based latex paint.

E. Repair damage to adjacent materials caused by storm drainage piping installation.

3.11 PIPING SCHEDULE

A. Flanges and unions may be used on aboveground pressure piping unless otherwise indicated.

B. Refer to Schedules on Drawings.

END OF SECTION 221416

SECTION 221423 - STORM DRAINAGE PIPING SPECIALTIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Roof drains.
2. Miscellaneous storm drainage piping specialties.
3. Cleanouts.
4. Through-penetration firestop assemblies.
5. Flashing materials.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

1.4 QUALITY ASSURANCE

A. Drainage piping specialties shall bear label, stamp, or other markings of specified testing agency.

PART 2 - PRODUCTS

2.1 METAL ROOF DRAINS

A. Cast-Iron, Large-Sump, General-Purpose Roof Drains:

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

a. Jay R. Smith Mfg. Co.
b. Josam Company
c. Wade; a subsidiary of McWane Inc.
d. Zurn Industries, LLC

2. Standard: ASME A112.6.4, for general-purpose roof drains.
3. Body Material: Cast iron.
4. Combination Flashing Ring and Gravel Stop: Required.
5. Outlet: Bottom outlet.
6. Dome Material: Cast iron.
7. Extension Collars: Required.
8. Underdeck Clamp: Required.

2.2 CLEANOUTS

A. Floor Cleanouts:

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

   a. Jay R. Smith Mfg. Co.
   b. Josam Company
   c. Tyler Pipe; a subsidiary of McWane Inc.
   d. Wade; a subsidiary of McWane Inc.
   e. Zurn Industries, LLC

2. Standard: ASME A112.36.2M, for cleanouts.
3. Size: Same as connected branch.
4. Type: Adjustable housing.
5. Body or Ferrule Material: Cast iron.
6. Clamping Device: Not required.
7. Outlet Connection: Inside caulk.
8. Closure: Brass plug with straight threads and gasket.
9. Adjustable Housing Material: Cast iron with threads.
10. Frame and Cover Material and Finish: Nickel-bronze, copper alloy.
11. Frame and Cover Shape: Round.
12. Top-Loading Classification: Medium Duty.
13. Riser: ASTM A 74, Service class, cast-iron drainage pipe fitting and riser to cleanout.

B. Test Tees:

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

   a. Jay R. Smith Mfg. Co.
   b. Josam Company
   c. Tyler Pipe; a subsidiary of McWane Inc.
   d. Zurn Industries, LLC

2. Standard: ASME A112.36.2M and ASTM A 74, ASTM A 888, or CISPI 301, for cleanout test tees.
3. Size: Same as connected drainage piping.
4. Body Material: Hub-and-spigot, cast-iron soil-pipe T-branch or hubless, cast-iron soil-pipe test tee as required to match connected piping.
5. Closure Plug: Countersunk brass.
6. Closure Plug Size: Same as or not more than one (1) size smaller than cleanout size.

C. Wall Cleanouts:

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

   a. Jay R. Smith Mfg. Co.
   b. Josam Company
   c. Tyler Pipe; a subsidiary of McWane Inc.
   d. Wade; a subsidiary of McWane Inc.
   e. Zurn Industries, LLC

2. Standard: ASME A112.36.2M, for cleanouts. Include wall access.
3. Size: Same as connected drainage piping.
4. Body Material: as required to match connected piping.
5. Closure: Countersunk or raised-head cast-iron plug.
6. Closure Plug Size: Same as or not more than one (1) size smaller than cleanout size.
7. Wall Access: Round, flat, chrome-plated brass or stainless-steel cover plate with screw.

2.3 FLASHING MATERIALS

A. Copper Sheet: ASTM B 152,12 oz./sq. ft.

B. Zinc-Coated Steel Sheet: ASTM A 653, with 0.20 percent copper content and 0.04-inch minimum thickness unless otherwise indicated. Include G90 hot-dip galvanized, mill-phosphatized finish for painting if indicated.

C. Elastic Membrane Sheet: ASTM D 4068, flexible, chlorinated polyethylene, 40-mil minimum thickness.

D. Fasteners: Metal compatible with material and substrate being fastened.

E. Metal Accessories: Sheet metal strips, clamps, anchoring devices, and similar accessory units required for installation; matching or compatible with material being installed.

F. Solder: ASTM B 32, lead-free alloy.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install roof drains at low points of roof areas according to roof membrane manufacturer's written installation instructions.

1. Install flashing collar or flange of roof drain to prevent leakage between drain and adjoining roofing. Maintain integrity of waterproof membranes where penetrated.
2. Install expansion joints, if indicated, in roof drain outlets.
3. Position roof drains for easy access and maintenance.

B. Install downspout adapters on outlet of back-outlet parapet roof drains and connect to sheet metal downspouts.

C. Install conductor nozzles at exposed bottom of conductors where they spill onto grade.

D. Install cleanouts in aboveground piping and building drain piping according to the following instructions unless otherwise indicated:

1. Use cleanouts the same size as drainage piping up to NPS 4. Use NPS 4 for larger drainage piping unless larger cleanout is indicated.
2. Locate cleanouts at each change in direction of piping greater than 45 degrees.
3. Locate cleanouts at minimum intervals of 50 feet for piping NPS 4 and smaller and 100 feet for larger piping.
4. Locate cleanouts at base of each vertical soil and waste stack.

E. For floor cleanouts for piping below floors, install cleanout deck plates with top flush with finished floor.

F. For cleanouts located in concealed piping, install cleanout wall access covers, of types indicated, with frame and cover flush with finished wall.

G. Install horizontal backwater valves in floor with cover flush with floor.

H. Install drain-outlet backwater valves in outlet of drains.

I. Install test tees in vertical conductors and near floor.

J. Install wall cleanouts in vertical conductors. Install access door in wall if indicated.

K. Install trench drains at low points of surface areas to be drained. Set grates of drains flush with finished surface unless otherwise indicated.

L. Assemble channel drainage system components according to manufacturer's written instructions. Install on support devices so that top will be flush with adjacent surface.

M. Install through-penetration firestop assemblies in plastic conductors at concrete floor penetrations.

N. Install sleeve flashing device with each conductor passing through floors with waterproof membrane.

3.2 CONNECTIONS

A. Comply with requirements for piping specified in Section 221416 "Storm Drainage Piping." Drawings indicate general arrangement of piping, fittings, and specialties.

3.3 FLASHING INSTALLATION

A. Fabricate flashing from single piece of metal unless large pans, sumps, or other drainage shapes are required. Join flashing according to the following if required:

1. Lead Sheets: Burn joints of 6.0-lb/sq. ft. lead sheets, 0.0938-inch thickness or thicker. Solder joints of 4.0-lb/sq. ft. lead sheets, 0.0625-inch thickness or thinner.
2. Copper Sheets: Solder joints of copper sheets.

B. Install sheet flashing on pipes, sleeves, and specialties passing through or embedded in floors and roofs with waterproof membrane.

1. Pipe Flashing: Sleeve type, matching the pipe size, with a minimum length of 10 inches and with skirt or flange extending at least 8 inches around pipe.
2. Sleeve Flashing: Flat sheet, with skirt or flange extending at least 8 inches around sleeve.
3. Embedded Specialty Flashing: Flat sheet, with skirt or flange extending at least 8 inches around specialty.

C. Set flashing on floors and roofs in solid coating of bituminous cement.

D. Secure flashing into sleeve and specialty clamping ring or device.

E. Fabricate and install flashing and pans, sumps, and other drainage shapes.

3.4 PROTECTION

A. Protect drains during remainder of construction period to avoid clogging with dirt or debris and to prevent damage from traffic or construction work.

B. Place plugs in ends of uncompleted piping at end of each day or when work stops.

END OF SECTION 221423

SECTION 221623 - NATURAL-GAS PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Pipes, tubes, and fittings.
2. Piping specialties.
3. Piping and tubing joining materials.
4. Valves.
5. Pressure regulators.
6. Service meters.
7. Concrete bases.

1.3 DEFINITIONS

A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct shafts, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.

B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.

C. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.

1.4 PERFORMANCE REQUIREMENTS

A. Minimum Operating-Pressure Ratings:

1. Piping and Valves: 100 psig minimum unless otherwise indicated.
2. Service Regulators: 65 psig minimum unless otherwise indicated.
3. Minimum Operating Pressure of Service Meter: 5 psig.

B. Delegated Design: Design restraints and anchors for natural-gas piping and equipment, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of the following:

1. Piping specialties.
2. Corrugated, stainless-steel tubing with associated components.
3. Valves. Include pressure rating, capacity, settings, and electrical connection data of selected models.

4. Pressure regulators. Indicate pressure ratings and capacities.
5. Service meters. Indicate pressure ratings and capacities. Include bypass fittings and meter bars.
6. Dielectric fittings.

B. Shop Drawings: For facility natural-gas piping layout. Include plans, piping layout and elevations, sections, and details for fabrication of pipe anchors, hangers, supports for multiple pipes, alignment guides, expansion joints and loops, and attachments of the same to building structure. Detail location of anchors, alignment guides, and expansion joints and loops.

1. Shop Drawing Scale: ¼-inch per foot.
2. Detail mounting, supports, and valve arrangements for service meter assembly and pressure regulator assembly.

C. Delegated-Design Submittal: For natural-gas piping and equipment indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1. Detail fabrication and assembly of seismic restraints.
2. Design Calculations: Calculate requirements for selecting seismic restraints.

1.6 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Plans and details, drawn to scale, on which natural-gas piping is shown and coordinated with other installations, using input from installers of the items involved.

B. Site Survey: Plans, drawn to scale, on which natural-gas piping is shown and coordinated with other services and utilities.

C. Qualification Data: For qualified professional engineer.

D. Welding certificates.

E. Field quality-control reports.

1.7 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For motorized gas valves, pressure regulators and service meters to include in emergency, operation, and maintenance manuals.

1.8 QUALITY ASSURANCE

A. Steel Support Welding Qualifications: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code - Steel."

B. Pipe Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Handling Flammable Liquids: Remove and dispose of liquids from existing natural-gas piping according to requirements of authorities having jurisdiction.

B. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and to prevent entrance of dirt, debris, and moisture.

C. Store and handle pipes and tubes having factory-applied protective coatings to avoid damaging coating and protect from direct sunlight.

D. Protect stored PE pipes and valves from direct sunlight.

1.10 PROJECT CONDITIONS

A. Perform site survey, research public utility records, and verify existing utility locations. Contact utility-locating service for area where Project is located.

B. Interruption of Existing Natural-Gas Service: Do not interrupt natural-gas service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide purging and startup of natural-gas supply according to requirements indicated:

1. Notify Architect, Construction Manager, and Owner no fewer than two (2) days in advance of proposed interruption of natural-gas service.
2. Do not proceed with interruption of natural-gas service without written permission.

1.11 COORDINATION

A. Coordinate sizes and locations of concrete bases with actual equipment provided.

B. Coordinate requirements for access panels and doors for valves installed concealed behind finished surfaces. Comply with requirements in Section 083113 "Access Doors and Frames."

PART 2 - PRODUCTS

2.1 PIPES, TUBES, AND FITTINGS

A. Steel Pipe: ASTM A 53, black steel, Schedule 40, Type E or S, Grade B.

1. Malleable-Iron Threaded Fittings: ASME B16.3, Class 150, standard pattern.
2. Wrought-Steel Welding Fittings: ASTM A 234 for butt welding and socket welding.
3. Unions: ASME B16.39, Class 150, malleable iron with brass-to-iron seat, ground joint, and threaded ends.
4. Forged-Steel Flanges and Flanged Fittings: ASME B16.5, minimum Class 150, including bolts, nuts, and gaskets of the following material group, end connections, and facings:

    a. Material Group: 1.1.
    b. End Connections: Threaded or butt welding to match pipe.
    c. Lapped Face: Not permitted underground.
    d. Gasket Materials: ASME B16.20, metallic, flat, asbestos free, aluminum o-rings, and spiral-wound metal gaskets.
    e. Bolts and Nuts: ASME B18.2.1, carbon steel aboveground and stainless-steel underground.

5. Protective Coating for Underground Piping: Factory-applied, three-layer coating of epoxy, adhesive, and PE.

a. Joint Cover Kits: Epoxy paint, adhesive, and heat-shrink PE sleeves.

2.2 PIPING SPECIALTIES

A. Appliance Flexible Connectors:

1. Indoor, Fixed-Appliance Flexible Connectors: Comply with ANSI Z21.24.
2. Indoor, Movable-Appliance Flexible Connectors: Comply with ANSI Z21.69.
3. Outdoor, Appliance Flexible Connectors: Comply with ANSI Z21.75.
4. Corrugated stainless-steel tubing with polymer coating.
5. Operating-Pressure Rating: 0.5 psig.
6. End Fittings: Zinc-coated steel.
7. Threaded Ends: Comply with ASME B1.20.1.
8. Maximum Length: 72 inches.

B. Quick-Disconnect Devices: Comply with ANSI Z21.41.

1. Copper-alloy convenience outlet and matching plug connector.
2. Nitrile seals.
3. Hand operated with automatic shutoff when disconnected.
4. For indoor or outdoor applications.
5. Adjustable, retractable restraining cable.

C. Y-Pattern Strainers:

1. Body: ASTM A 126, Class B, cast iron with bolted cover and bottom drain connection.
2. End Connections: Threaded ends for NPS 2 and smaller; flanged ends for NPS 2-1/2 and larger.
3. Strainer Screen: 40-mesh startup strainer and perforated stainless-steel basket with fifty percent (50%) free area.
4. CWP Rating: 125 psig.

D. Basket Strainers:

1. Body: ASTM A 126, Class B, high-tensile cast iron with bolted cover and bottom drain connection.
2. End Connections: Threaded ends for NPS 2 and smaller; flanged ends for NPS 2-1/2 and larger.
3. Strainer Screen: 40-mesh startup strainer and perforated stainless-steel basket with fifty percent (50%) free area.
4. CWP Rating: 125 psig.

E. T-Pattern Strainers:

1. Body: Ductile or malleable iron with removable access coupling and end cap for strainer maintenance.
2. End Connections: Grooved ends.
3. Strainer Screen: 40-mesh startup strainer and perforated stainless-steel basket with fifty-seven percent (57%) free area.
4. CWP Rating: 750 psig.

F. Weatherproof Vent Cap: Cast- or malleable-iron increaser fitting with corrosion-resistant wire screen, with free area at least equal to cross-sectional area of connecting pipe and threaded-end connection.

2.3 JOINING MATERIALS

A. Joint Compound and Tape: Suitable for natural gas.

B. Welding Filler Metals: Comply with AWS D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

C. Brazing Filler Metals: Alloy with melting point greater than 1000 deg F complying with AWS A5.8. Brazing alloys containing more than 0.05 percent phosphorus are prohibited.

2.4 MANUAL GAS SHUTOFF VALVES

A. See "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles for where each valve type is applied in various services.

B. General Requirements for Metallic Valves, NPS 2 and Smaller: Comply with ASME B16.33.

1. CWP Rating: 125 psig.
2. Threaded Ends: Comply with ASME B1.20.1.
3. Dryseal Threads on Flare Ends: Comply with ASME B1.20.3.
4. Tamperproof Feature: Locking feature for valves indicated in "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
5. Listing: Listed and labeled by an NRTL acceptable to authorities having jurisdiction for valves 1-inch and smaller.
6. Service Mark: Valves 1¼ inches to NPS 2 shall have initials "WOG" permanently marked on valve body.

C. General Requirements for Metallic Valves, NPS 2-1/2 and Larger: Comply with ASME B16.38.

1. CWP Rating: 125 psig.
2. Flanged Ends: Comply with ASME B16.5 for steel flanges.
3. Tamperproof Feature: Locking feature for valves indicated in "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
4. Service Mark: Initials "WOG" shall be permanently marked on valve body.

D. Bronze Plug Valves: MSS SP-78.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. A.Y. McDonald Mfg. Co.
    b. Lee Brass Company

2. Body: Bronze, complying with ASTM B 584.
3. Plug: Bronze.
4. Ends: Threaded, socket, or flanged as indicated in "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
5. Operator: Square head or lug type with tamperproof feature where indicated.
6. Pressure Class: 125 psig.
7. Listing: Valves NPS 1 and smaller shall be listed and labeled by an NRTL acceptable to authorities having jurisdiction.
8. Service: Suitable for natural-gas service with "WOG" indicated on valve body.

E. Cast-Iron, Lubricated Plug Valves: MSS SP-78.

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

   a. A.Y. McDonald Mfg. Co.
   b. Flowserve Corporation
   c. Homestead Valve
   d. Milliken Valve Company
   e. Mueller Co.
   f. R & M Energy Systems; Robbins & Myers

2. Body: Cast iron, complying with ASTM A 126, Class B.
3. Plug: Bronze or nickel-plated cast iron.
4. Seat: Coated with thermoplastic.
5. Stem Seal: Compatible with natural gas.
6. Ends: Threaded or flanged as indicated in "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
7. Operator: Square head or lug type with tamperproof feature where indicated.
8. Pressure Class: 125 psig.
9. Listing: Valves NPS 1 and smaller shall be listed and labeled by an NRTL acceptable to authorities having jurisdiction.
10. Service: Suitable for natural-gas service with "WOG" indicated on valve body.

F. Valve Boxes:

1. Cast-iron, two-section box.
2. Top section with cover with "GAS" lettering.
3. Bottom section with base to fit over valve and barrel a minimum of 5 inches in diameter.
4. Adjustable cast-iron extensions of length required for depth of bury.
5. Include tee-handle, steel operating wrench with socket end fitting valve nut or flat head, and with stem of length required to operate valve.

2.5 MOTORIZED GAS VALVES

A. Automatic Gas Valves: Comply with ANSI Z21.21.

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

   a. Dungs, Karl, Inc.
   b. Eaton
   c. Eclipse Innovative Thermal Technologies
   d. Honeywell Building Solutions; Honeywell International, Inc.
   e. Johnson Controls

2. Body: Brass or aluminum.
3. Seats and Disc: Nitrile rubber.
4. Springs and Valve Trim: Stainless-steel.
5. Normally closed.
6. Visual position indicator.
7. Electric or Mechanical operator for actuation by appliance automatic shutoff device.

B. Electrically Operated Valves: Comply with UL 429.

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

    a. Dungs, Karl, Inc.
    b. Eclipse Innovative Thermal Technologies
    c. Goyen Valve Corp.
    d. Magnatrol Valve Corporation
    e. Parker Hannifin Corporation
    f. Watts; a Watts Water Technologies company

2. Pilot operated.
3. Body: Brass or aluminum.
4. Seats and Disc: Nitrile rubber.
5. Springs and Valve Trim: Stainless-steel.
6. 120-V ac, 60 Hz, Class B, continuous-duty molded coil, and replaceable.
7. NEMA ICS 6, Type 4, coil enclosure.
8. Normally closed.
9. Visual position indicator.

2.6 PRESSURE REGULATORS

A. General Requirements:

1. Single stage and suitable for natural gas.
2. Steel jacket and corrosion-resistant components.
3. Elevation compensator.
4. End Connections: Threaded for regulators NPS 2 and smaller; flanged for regulators NPS 2-1/2 and larger.

B. Service Pressure Regulators: Comply with ANSI Z21.80.

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

    a. Actaris
    b. American Meter Company
    c. Fisher Control Valves & Instruments; a brand of Emerson Process Management
    d. Invensys
    e. Itron Gas
    f. Richards Industries

2. Body and Diaphragm Case: Cast iron or die-cast aluminum.
3. Springs: Zinc-plated steel; interchangeable.
4. Diaphragm Plate: Zinc-plated steel.
5. Seat Disc: Nitrile rubber resistant to gas impurities, abrasion, and deformation at the valve port.
6. Orifice: Aluminum; interchangeable.
7. Seal Plug: Ultraviolet-stabilized, mineral-filled nylon.
8. Single-port, self-contained regulator with orifice no larger than required at maximum pressure inlet, and no pressure sensing piping external to the regulator.
9. Pressure regulator shall maintain discharge pressure setting downstream, and not exceed one hundred fifty percent (150%) of design discharge pressure at shutoff.
10. Overpressure Protection Device: Factory mounted on pressure regulator.
11. Atmospheric Vent: Factory- or field-installed, stainless-steel screen in opening if not connected to vent piping.

C. Maximum Inlet Pressure 2 psi.

D. Line Pressure Regulators: Comply with ANSI Z21.80.

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

    a. Actaris
    b. American Meter Company
    c. Eclipse Innovative Thermal Technologies
    d. Fisher Control Valves & Instruments; a brand of Emerson Process Management
    e. Invensys
    f. Itron Gas
    g. Maxitrol Company
    h. Richards Industries

2. Body and Diaphragm Case: Cast iron or die-cast aluminum.
3. Springs: Zinc-plated steel; interchangeable.
4. Diaphragm Plate: Zinc-plated steel.
5. Seat Disc: Nitrile rubber resistant to gas impurities, abrasion, and deformation at the valve port.
6. Orifice: Aluminum; interchangeable.
7. Seal Plug: Ultraviolet-stabilized, mineral-filled nylon.
8. Single-port, self-contained regulator with orifice no larger than required at maximum pressure inlet, and no pressure sensing piping external to the regulator.
9. Pressure regulator shall maintain discharge pressure setting downstream, and not exceed one hundred fifty percent (150%) of design discharge pressure at shutoff.
10. Overpressure Protection Device: Factory mounted on pressure regulator.
11. Atmospheric Vent: Factory- or field-installed, stainless-steel screen in opening if not connected to vent piping.
12. Maximum Inlet Pressure: 2 psig.

E. Appliance Pressure Regulators: Comply with ANSI Z21.18.

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

    a. Canadian Meter Company Inc.
    b. Eaton
    c. Harper Wyman Co.
    d. Maxitrol Company
    e. SCP, Inc.

2. Body and Diaphragm Case: Die-cast aluminum.
3. Springs: Zinc-plated steel; interchangeable.
4. Diaphragm Plate: Zinc-plated steel.
5. Seat Disc: Nitrile rubber.
6. Seal Plug: Ultraviolet-stabilized, mineral-filled nylon.
7. Factory-Applied Finish: Minimum three-layer polyester and polyurethane paint finish.
8. Regulator may include vent limiting device, instead of vent connection, if approved by authorities having jurisdiction.
9. Maximum Inlet Pressure: 2 psig.

2.7 DIELECTRIC FITTINGS

A. General Requirements: Assembly of copper alloy and ferrous materials with separating nonconductive insulating material. Include end connections compatible with pipes to be joined.

B. Dielectric Unions:

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

a. A.Y. McDonald Mfg. Co.
b. Capitol Manufacturing Company
c. Central Plastics Company
d. HART Industrial Unions, LLC
e. Jomar Valve
f. Matco-Norca
g. Watts; a Watts Water Technologies company
h. Wilkins
i. Zurn Industries, LLC

2. Description:

a. Standard: ASSE 1079.
b. Pressure Rating: 125 psig minimum at 180 deg F.
c. End Connections: Solder-joint copper alloy and threaded ferrous.

C. Dielectric Flanges:

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

a. Capitol Manufacturing Company
b. Central Plastics Company
c. Matco-Norca
d. Watts; a Watts Water Technologies company
e. Wilkins

2. Description:

a. Standard: ASSE 1079.
b. Factory-fabricated, bolted, companion-flange assembly.
c. Pressure Rating: 125 psig minimum at 180 deg F.
d. End Connections: Solder-joint copper alloy and threaded ferrous; threaded solder-joint copper alloy and threaded ferrous.

D. Dielectric-Flange Insulating Kits:

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

a. Advance Products & Systems, Inc.
b. Calpico, Inc.
c. Central Plastics Company
d. Pipeline Seal and Insulator, Inc.

2. Description:

a. Nonconducting materials for field assembly of companion flanges.
b. Pressure Rating: 150 psig.
c. Gasket: Neoprene or phenolic.
d. Bolt Sleeves: Phenolic or polyethylene.
e. Washers: Phenolic with steel backing washers.

2.8 LABELING AND IDENTIFYING

A. Detectable Warning Tape: Acid- and alkali-resistant, PE film warning tape manufactured for marking and identifying underground utilities, a minimum of 6 inches wide and 4 mils thick, continuously inscribed with a description of utility, with metallic core encased in a protective jacket for corrosion protection, detectable by metal detector when tape is buried up to 30 inches deep; colored yellow.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine roughing-in for natural-gas piping system to verify actual locations of piping connections before equipment installation.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Close equipment shutoff valves before turning off natural gas to premises or piping section.

B. Inspect natural-gas piping according to NFPA 54 to determine that natural-gas utilization devices are turned off in piping section affected.

C. Comply with NFPA 54 requirements for prevention of accidental ignition.

3.3 OUTDOOR PIPING INSTALLATION

A. Comply with NFPA 54 for installation and purging of natural-gas piping.

B. Install underground, natural-gas piping buried at least 36 inches below finished grade. Comply with requirements in Section 312000 "Earth Moving" for excavating, trenching, and backfilling.

1. If natural-gas piping is installed less than 36 inches below finished grade, install it in containment conduit.

C. Install underground, PE, natural-gas piping according to ASTM D 2774.

D. Steel Piping with Protective Coating:

1. Apply joint cover kits to pipe after joining to cover, seal, and protect joints.
2. Repair damage to PE coating on pipe as recommended in writing by protective coating manufacturer.
3. Replace pipe having damaged PE coating with new pipe.

E. Install fittings for changes in direction and branch connections.

F. Install pressure gage upstream and downstream from each service regulator. Pressure gages are specified in Section 230519 "Meters and Gages for HVAC Piping."

3.4 INDOOR PIPING INSTALLATION

A. Comply with NFPA 54 for installation and purging of natural-gas piping.

B. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements are used to size pipe and calculate friction loss, expansion, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.

C. Arrange for pipe spaces, chases, slots, sleeves, and openings in building structure during progress of construction, to allow for mechanical installations.

D. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.

E. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

F. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

G. Locate valves for easy access.

H. Install natural-gas piping at uniform grade of two percent (2%) down toward drip and sediment traps.

I. Install piping free of sags and bends.

J. Install fittings for changes in direction and branch connections.

K. Verify final equipment locations for roughing-in.

L. Comply with requirements in Sections specifying gas-fired appliances and equipment for roughing-in requirements.

M. Drips and Sediment Traps: Install drips at points where condensate may collect, including service-meter outlets. Locate where accessible to permit cleaning and emptying. Do not install where condensate is subject to freezing.

1. Construct drips and sediment traps using tee fitting with bottom outlet plugged or capped. Use nipple a minimum length of three (3) pipe diameters, but not less than 3 inches long and same size as connected pipe. Install with space below bottom of drip to remove plug or cap.

N. Extend relief vent connections for service regulators, line regulators, and overpressure protection devices to outdoors and terminate with weatherproof vent cap.

O. Conceal pipe installations in walls, pipe spaces, utility spaces, above ceilings, below grade or floors, and in floor channels unless indicated to be exposed to view.

P. Concealed Location Installations: Except as specified below, install concealed natural-gas piping and piping installed under the building in containment conduit constructed of steel pipe

with welded joints as described in Part 2. Install a vent pipe from containment conduit to outdoors and terminate with weatherproof vent cap.

1. Above Accessible Ceilings: Natural-gas piping, fittings, valves, and regulators may be installed in accessible spaces without containment conduit.
2. In Floors: Install natural-gas piping with welded or brazed joints and protective coating in cast-in-place concrete floors. Cover piping to be cast in concrete slabs with minimum of 1½ inches of concrete. Piping may not be in physical contact with other metallic structures such as reinforcing rods or electrically neutral conductors. Do not embed piping in concrete slabs containing quick-set additives or cinder aggregate.
3. In Floor Channels: Install natural-gas piping in floor channels. Channels must have cover and be open to space above cover for ventilation.
4. In Walls or Partitions: Protect tubing installed inside partitions or hollow walls from physical damage using steel striker barriers at rigid supports.

    a. Exception: Tubing passing through partitions or walls does not require striker barriers.

5. Prohibited Locations:

    a. Do not install natural-gas piping in or through circulating air ducts, clothes or trash chutes, chimneys or gas vents (flues), ventilating ducts, or dumbwaiter or elevator shafts.
    b. Do not install natural-gas piping in solid walls or partitions.

Q. Use eccentric reducer fittings to make reductions in pipe sizes. Install fittings with level side down.

R. Connect branch piping from top or side of horizontal piping.

S. Install unions in pipes NPS 2 and smaller, adjacent to each valve, at final connection to each piece of equipment. Unions are not required at flanged connections.

T. Do not use natural-gas piping as grounding electrode.

U. Install strainer on inlet of each line-pressure regulator and automatic or electrically operated valve.

V. Install pressure gage upstream and downstream from each line regulator. Pressure gages are specified in Section 230519 "Meters and Gages for HVAC Piping."

W. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 230517 "Sleeves and Sleeve Seals for HVAC Piping."

X. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Section 230517 "Sleeves and Sleeve Seals for HVAC Piping."

Y. Install escutcheons for piping penetrations of walls, ceilings, and floors.

3.5 SERVICE-METER ASSEMBLY INSTALLATION

A. Install service-meter assemblies aboveground, on concrete bases.

B. Install metal shutoff valves upstream from service regulators. Shutoff valves are not required at second regulators if two regulators are installed in series.

C. Install strainer on inlet of service-pressure regulator and meter set.

D. Install service regulators mounted outside with vent outlet horizontal or facing down. Install screen in vent outlet if not integral with service regulator.

E. Install metal shutoff valves upstream from service meters. Install dielectric fittings downstream from service meters.

F. Install service meters downstream from pressure regulators.

G. Install metal bollards to protect meter assemblies.

3.6 VALVE INSTALLATION

A. Install manual gas shutoff valve for each gas appliance ahead of corrugated stainless-steel tubing, aluminum, or copper connector.

B. Install underground valves with valve boxes.

C. Install regulators and overpressure protection devices with maintenance access space adequate for servicing and testing.

3.7 PIPING JOINT CONSTRUCTION

A. Ream ends of pipes and tubes and remove burrs.

B. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

C. Threaded Joints:

1. Thread pipe with tapered pipe threads complying with ASME B1.20.1.
2. Cut threads full and clean using sharp dies.
3. Ream threaded pipe ends to remove burrs and restore full inside diameter of pipe.
4. Apply appropriate tape or thread compound to external pipe threads unless dryseal threading is specified.
5. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

D. Welded Joints:

1. Construct joints according to AWS D10.12, using qualified processes and welding operators.
2. Bevel plain ends of steel pipe.
3. Patch factory-applied protective coating as recommended by manufacturer at field welds and where damage to coating occurs during construction.

E. PE Piping Heat-Fusion Joints: Clean and dry joining surfaces by wiping with clean cloth or paper towels. Join according to ASTM D 2657.

1. Plain-End Pipe and Fittings: Use butt fusion.
2. Plain-End Pipe and Socket Fittings: Use socket fusion.

3.8 HANGER AND SUPPORT INSTALLATION

A. Install seismic restraints on piping. Comply with requirements for seismic-restraint devices specified in Section 230548 "Vibration and Seismic Controls for HVAC."

B. Comply with requirements for pipe hangers and supports specified in Section 230529 "Hangers and Supports for HVAC Piping and Equipment."

C. Install hangers for horizontal steel piping with the following maximum spacing and minimum rod sizes:

1. NPS 1 and Smaller: Maximum span, 96 inches; minimum rod size, 3/8-inch.
2. NPS 1-1/4: Maximum span, 108 inches; minimum rod size, 3/8-inch.
3. NPS 1-1/2 and NPS 2: Maximum span, 108 inches; minimum rod size, 3/8-inch.
4. NPS 2-1/2 to NPS 3-1/2: Maximum span, 10 feet; minimum rod size, ½-inch.
5. NPS 4 and Larger: Maximum span, 10 feet; minimum rod size, 5/8-inch.

3.9 CONNECTIONS

A. Connect to utility's gas main according to utility's procedures and requirements.

B. Install natural-gas piping electrically continuous and bonded to gas appliance equipment grounding conductor of the circuit powering the appliance according to NFPA 70.

C. Install piping adjacent to appliances to allow service and maintenance of appliances.

D. Connect piping to appliances using manual gas shutoff valves and unions. Install valve within 72 inches of each gas-fired appliance and equipment. Install union between valve and appliances or equipment.

E. Sediment Traps: Install tee fitting with capped nipple in bottom to form drip, as close as practical to inlet of each appliance.

3.10 LABELING AND IDENTIFYING

A. Comply with requirements in Section 220553 "Identification for Plumbing Piping and Equipment" for piping and valve identification.

B. Install detectable warning tape directly above gas piping, 12 inches below finished grade, except 6 inches below subgrade under pavements and slabs.

3.11 PAINTING

A. Comply with requirements in Section 099113 "Exterior Painting" and Section 099123 "Interior Painting" for painting interior and exterior natural-gas piping.

B. Paint exposed, exterior metal piping, valves, service regulators, and piping specialties, except components, with factory-applied paint or protective coating.

1. Alkyd System: MPI EXT 5.1D.

a. Prime Coat: Alkyd anticorrosive metal primer.
b. Intermediate Coat: Exterior alkyd enamel matching topcoat.
c. Topcoat: Exterior alkyd enamel flat.
d. Color: Gray.

C. Paint exposed, interior metal piping, valves, service regulators, and piping specialties, except components, with factory-applied paint or protective coating.

1. Latex Over Alkyd Primer System: MPI INT 5.1Q.

a. Prime Coat: Alkyd anticorrosive metal primer.
b. Intermediate Coat: Interior latex matching topcoat.
c. Topcoat: Interior latex flat.
d. Color: Gray.

2. Alkyd System: MPI INT 5.1E.

a. Prime Coat: Alkyd anticorrosive metal primer.
b. Intermediate Coat: Interior alkyd matching topcoat.
c. Topcoat: Interior alkyd flat.
d. Color: Gray.

D. Damage and Touchup: Repair marred and damaged factory-applied finishes with materials and by procedures to match original factory finish.

3.12 CONCRETE BASES

A. Concrete Bases: Anchor equipment to concrete base according to seismic codes at Project.

1. Construct concrete bases of dimensions indicated, but not less than 4 inches larger in both directions than supported unit.
2. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of the base.
3. Install epoxy-coated anchor bolts for supported equipment that extend through concrete base, and anchor into structural concrete floor.
4. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
5. Install anchor bolts to elevations required for proper attachment to supported equipment.
6. Use 3000-psig, 28-day, compressive-strength concrete and reinforcement as specified in Section 033000 "Cast-in-Place Concrete."

3.13 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Tests and Inspections:

1. Test, inspect, and purge natural gas according to NFPA 54 and authorities having jurisdiction.

C. Natural-gas piping will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

3.14 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain earthquake valves.

3.15 PIPING SCHEDULE

A. See Schedule on Drawings.

B. Containment Conduit: Steel pipe with wrought-steel fittings and welded joints. Coat pipe and fittings with protective coating for steel piping.

3.16 UNDERGROUND MANUAL GAS SHUTOFF VALVE SCHEDULE

A. Connections to Existing Gas Piping: Use valve and fitting assemblies made for tapping utility's gas mains and listed by an NRTL.

B. Underground:

1. PE valves.
2. NPS 2 and Smaller: Bronze plug valves.
3. NPS 2-1/2 and Larger: Cast-iron, lubricated plug valves.

3.17 ABOVEGROUND MANUAL GAS SHUTOFF VALVE SCHEDULE

A. Distribution piping valves for pipe sizes NPS 2 and smaller shall be the following:

1. Bronze plug valve.

B. Distribution piping valves for pipe sizes NPS 2-1/2 and larger shall be the following:

1. Cast-iron, lubricated plug valve.

C. Valves in branch piping for single appliance shall be the following:

1. Bronze plug valve.

END OF SECTION 221623

SECTION 223400 - FUEL-FIRED, DOMESTIC-WATER HEATERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Commercial Gas-fired, tankless, domestic-water heaters.
   2. Domestic-water heater accessories.

1.3 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Commercial domestic-water heaters shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

   1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified

1.4 ACTION SUBMITTALS

A. Product Data: For each type and size of domestic-water heater indicated. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

B. Shop Drawings:

   1. Wiring Diagrams: For power, signal, and control wiring.

1.5 INFORMATIONAL SUBMITTALS

A. Seismic Qualification Certificates: For fuel-fired, domestic-water heaters, accessories, and components, from manufacturer.

   1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
   2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
   3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

B. Product Certificates: For each type of commercial gas-fired, tankless, domestic-water heater, from manufacturer.

C. Domestic-Water Heater Labeling: Certified and labeled by testing agency acceptable to authorities having jurisdiction.

D. Source quality-control reports.

E. Field quality-control reports.

F. Warranty: Sample of special warranty.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For fuel-fired, domestic-water heaters to include in emergency, operation, and maintenance manuals.

1.7 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. ASHRAE/IESNA Compliance: Fabricate and label fuel-fired, domestic-water heaters to comply with ASHRAE/IESNA 90.1.

C. ASME Compliance:

1. Where ASME-code construction is indicated, fabricate and label commercial, domestic-water heater storage tanks to comply with ASME Boiler and Pressure Vessel Code: Section VIII, Division 1.
2. Where ASME-code construction is indicated, fabricate and label commercial, finned-tube, domestic-water heaters to comply with ASME Boiler and Pressure Vessel Code: Section IV.

D. NSF Compliance: Fabricate and label equipment components that will be in contact with potable water to comply with NSF 61 Annex G, "Drinking Water System Components - Health Effects."

1.8 COORDINATION

A. Coordinate sizes and locations of concrete bases with actual equipment provided.

1.9 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of fuel-fired, domestic-water heaters that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Structural failures including storage tank and supports.
b. Faulty operation of controls.
c. Deterioration of metals, metal finishes, and other materials beyond normal use.

2. Warranty Periods: From date of Substantial Completion.

a. Gas-Fired, Tankless, Domestic-Water Heaters:

1) Heat Exchanger: 10 years.
2) Controls and Other Components: 2 years.

PART 2 - PRODUCTS

2.1 GAS-FIRED, TANKLESS, DOMESTIC-WATER HEATERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. IntelliHot
2. Bradford White Corporation.
3. Navien.
4. Heat Transfer Products, Inc.
5. Rheem Manufacturing Company.
6. Rinnai Corporation.
7. Smith, A. O. Corporation.

B. Standard: ANSI Z21.10.3/CSA 4.3 for gas-fired, instantaneous, domestic-water heaters for indoor application.

C. Construction: Copper piping or tubing complying with NSF 61 Annex G barrier materials for potable water, without storage capacity.

1. Tappings: ASME B1.20.1 pipe thread.
2. Pressure Rating: 150 psig.
3. Heat Exchanger: Copper tubing.
4. Insulation: Comply with ASHRAE/IESNA 90.1 or ASHRAE 90.2.
5. Jacket: Metal, with enameled finish, or plastic.
6. Burner: For use with tankless, domestic-water heaters and natural-gas fuel.
7. Automatic Ignition: Manufacturer's proprietary system for automatic, gas ignition.
8. Temperature Control: Adjustable thermostat.

D. Support: Bracket for wall mounting.

E. Capacity and Characteristics:

1. Refer to drawing schedule

2.2 DOMESTIC-WATER HEATER ACCESSORIES

A. Domestic-Water Compression Tanks:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. AMTROL, Inc.
b. Flexcon Industries.
c. Honeywell Water Controls.

d. Pentair Pump Group.
e. Smith, A. O. Corporation.
f. State Industries.
g. TACO Comfort Solutions, Inc.

2. Description: Steel, pressure-rated tank constructed with welded joints and factory-installed butyl-rubber diaphragm. Include air precharge to minimum system-operating pressure at tank.

3. Construction:

a. Tappings: Factory-fabricated steel, welded to tank before testing and labeling. Include ASME B1.20.1 pipe thread.
b. Interior Finish: Comply with NSF 61 Annex G barrier materials for potable-water tank linings, including extending finish into and through tank fittings and outlets.
c. Air-Charging Valve: Factory installed.

4. Capacity and Characteristics:

a. Refer to drawing schedule

B. Piping-Type Heat Traps: Field-fabricated piping arrangement according to ASHRAE/IESNA 90.1 or ASHRAE 90.2.

C. Heat-Trap Fittings: ASHRAE 90.2.

D. Manifold Kits: Domestic-water heater manufacturer's factory-fabricated inlet and outlet piping for field installation, for multiple domestic-water heater installation. Include ball-, butterfly-, or gate-type shutoff valves to isolate each domestic-water heater and balancing valves to provide balanced flow through each domestic-water heater.

E. Comply with requirements for ball-, butterfly-, or gate-type shutoff valves specified in Section 220523.12 "Ball Valves for Plumbing Piping," Section 220523.13 "Butterfly Valves for Plumbing Piping," and Section 220523.15 "Gate Valves for Plumbing Piping."

1. Comply with requirements for balancing valves specified in Section 221119 "Domestic Water Piping Specialties."

F. Gas Shutoff Valves: ANSI Z21.15/CSA 9.1-M, manually operated. Furnish for installation in piping.

G. Gas Pressure Regulators: ANSI Z21.18/CSA 6.3, appliance type. Include 2-psig pressure rating as required to match gas supply.

H. Automatic Gas Valves: ANSI Z21.21/CSA 6.5, appliance, electrically operated, on-off automatic valve.

I. Combination Temperature-and-Pressure Relief Valves: Include relieving capacity at least as great as heat input, and include pressure setting less than domestic-water heater working-pressure rating. Select relief valves with sensing element that extends into storage tank.

1. Gas-Fired, Domestic-Water Heaters: ANSI Z21.22/CSA 4.4-M.

J. Pressure Relief Valves: Include pressure setting less than domestic-water heater working-pressure rating.

1. Gas-Fired, Domestic-Water Heaters: ANSI Z21.22/CSA 4.4-M.

K. Vacuum Relief Valves: ANSI Z21.22/CSA 4.4-M.

L. Domestic-Water Heater Stands: Manufacturer's factory-fabricated steel stand for floor mounting, capable of supporting domestic-water heater and water. Provide dimension that will support bottom of domestic-water heater a minimum of 18 inches above the floor.

M. Domestic-Water Heater Mounting Brackets: Manufacturer's factory-fabricated steel bracket for wall mounting, capable of supporting domestic-water heater and water.

2.3 SOURCE QUALITY CONTROL

A. Factory Tests: Test and inspect assembled domestic-water heaters[**and storage tanks**] specified to be ASME-code construction, according to ASME Boiler and Pressure Vessel Code.

B. Hydrostatically test **commercial** domestic-water heaters to minimum of one and one-half times pressure rating before shipment.

C. Domestic-water heaters will be considered defective if they do not pass tests and inspections. Comply with requirements in Section 014000 "Quality Requirements" for retesting and reinspecting requirements and Section 017300 "Execution" for requirements for correcting the Work.

D. Prepare test and inspection reports.

PART 3 - EXECUTION

3.1 DOMESTIC-WATER HEATER INSTALLATION

A. Tankless, Domestic-Water Heater Mounting: Install tankless, domestic-water heaters at least 18 inches above floor on wall bracket.

1. Maintain manufacturer's recommended clearances.
2. Arrange units so controls and devices that require servicing are accessible.
3. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
4. Install anchor bolts to elevations required for proper attachment to supported equipment.
5. Anchor domestic-water heaters to substrate.

B. Install domestic-water heaters level and plumb, according to layout drawings, original design, and referenced standards. Maintain manufacturer's recommended clearances. Arrange units so controls and devices needing service are accessible.

1. Install shutoff valves on domestic-water-supply piping to domestic-water heaters and on domestic-hot-water outlet piping. Comply with requirements for shutoff valves specified in Section 220523.12 "Ball Valves for Plumbing Piping," Section 220523.13 "Butterfly Valves for Plumbing Piping," and Section 220523.15 "Gate Valves for Plumbing Piping."

C. Install gas-fired, domestic-water heaters according to NFPA 54.

1. Install gas shutoff valves on gas supply piping to gas-fired, domestic-water heaters without shutoff valves.
2. Install gas pressure regulators on gas supplies to gas-fired, domestic-water heaters without gas pressure regulators if gas pressure regulators are required to reduce gas pressure at burner.
3. Install automatic gas valves on gas supplies to gas-fired, domestic-water heaters if required for operation of safety control.
4. Comply with requirements for gas shutoff valves, gas pressure regulators, and automatic gas valves specified in Section 231123 "Facility Natural-Gas Piping."

D. Install commercial domestic-water heaters with seismic-restraint devices. Comply with requirements for seismic-restraint devices specified in Section 220548 "Vibration and Seismic Controls for Plumbing Piping and Equipment."

E. Install combination temperature-and-pressure relief valves in top portion of storage tanks. Use relief valves with sensing elements that extend into tanks. Extend commercial-water-heater relief-valve outlet, with drain piping same as domestic-water piping in continuous downward pitch, and discharge by positive air gap onto closest floor drain.

F. Install combination temperature-and pressure relief valves in water piping for domestic-water heaters without storage. Extend commercial-water-heater relief-valve outlet, with drain piping same as domestic-water piping in continuous downward pitch, and discharge by positive air gap onto closest floor drain.

G. Install water-heater drain piping as indirect waste to spill by positive air gap into open drains or over floor drains. Install hose-end drain valves at low points in water piping for domestic-water heaters that do not have tank drains. Comply with requirements for hose-end drain valves specified in Section 221119 "Domestic Water Piping Specialties."

H. Install thermometer on outlet piping of domestic-water heaters. Comply with requirements for thermometers specified in Section 220519 "Meters and Gages for Plumbing Piping."

I. Assemble and install inlet and outlet piping manifold kits for multiple domestic-water heaters. Fabricate, modify, or arrange manifolds for balanced water flow through each domestic-water heater. Include shutoff valve and thermometer in each domestic-water heater inlet and outlet, and throttling valve in each domestic-water heater outlet. Comply with requirements for valves specified in Section 220523.12 "Ball Valves for Plumbing Piping," Section 220523.13 "Butterfly Valves for Plumbing Piping," and Section 220523.15 "Gate Valves for Plumbing Piping," and comply with requirements for thermometers specified in Section 220519 "Meters and Gages for Plumbing Piping."

J. Install piping-type heat traps on inlet and outlet piping of domestic-water heater storage tanks without integral or fitting-type heat traps.

K. Fill domestic-water heaters with water.

L. Charge domestic-water compression tanks with air.

3.2 CONNECTIONS

A. Comply with requirements for domestic-water piping specified in Section 221116 "Domestic Water Piping."

B. Comply with requirements for gas piping specified in Section 231123 "Facility Natural-Gas Piping."

C. Drawings indicate general arrangement of piping, fittings, and specialties.

D. Where installing piping adjacent to fuel-fired, domestic-water heaters, allow space for service and maintenance of water heaters. Arrange piping for easy removal of domestic-water heaters.

3.3 IDENTIFICATION

A. Identify system components. Comply with requirements for identification specified in Section 220553 "Identification for Plumbing Piping and Equipment."

3.4 FIELD QUALITY CONTROL

A. Perform tests and inspections.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.
2. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
3. Operational Test: After electrical circuitry has been energized, start units to confirm proper operation.
4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

B. Domestic-water heaters will be considered defective if they do not pass tests and inspections. Comply with requirements in Section 014000 "Quality Requirements" for retesting and reinspecting requirements and Section 017300 "Execution" for requirements for correcting the Work.

C. Prepare test and inspection reports.

3.5 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain gas-fired, tankless domestic-water heaters.

END OF SECTION 223400

SECTION 224213.13 - COMMERCIAL WATER CLOSETS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Water closets.
2. Flushometer valves.
3. Toilet seats.
4. Supports.

1.3 DEFINITIONS

A. Effective Flush Volume: Average of two (2) reduced flushes and one (1) full flush per fixture.

B. Remote Water Closet: Located more than 30 feet from other drain line connections or fixture and where less than one and one-half (1½) drainage fixture units are upstream of the drain line connection.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for water closets.
2. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

B. Shop Drawings: Include diagrams for power, signal, and control wiring.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For flushometer valves and electronic sensors to include in operation and maintenance manuals.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that are packaged with protective covering for storage and identified with labels describing contents.

1. Flushometer-Valve Repair Kits: Equal to ten percent (10%) of amount of each type installed, but no fewer than six (6) of each type.

PART 2 - PRODUCTS

2.1 WATER CLOSETS

A. Water Closets:

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

a. American Standard America
b. Kohler Co.
c. Sloan Valve Company
d. TOTO USA, INC.
e. Zurn Industries, LLC

2. Bowl:

a. Standards: ASME A112.19.2/CSA B45.1 and ASME A112.19.5.
b. Material: Vitreous china.
c. Type: Siphon jet.
d. Style: Flushometer valve.
e. Rim Contour: Elongated.
f. Water Consumption: 1.28 gal per flush.
g. Spud Size: NPS 1-1/2.
h. Color: White.

3. Bowl-to-Drain Connecting Fitting: ASTM A 1045 or ASME A112.4.3.
4. Toilet Seat: Open front, elongated, soft close, no cover.

2.2 FLUSHOMETER VALVES

A. Flushometer Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

a. Delany Products
b. Sloan Valve Company
c. Zurn Industries, LLC

2. Standard: ASSE 1037.
3. Minimum Pressure Rating: 125 psig.
4. Features: Include integral check stop and backflow-prevention device.
5. Material: Brass body with corrosion-resistant components.
6. Consumption: 1.28 gal per flush.
7. Minimum Inlet: NPS 1.
8. Minimum Outlet: NPS 1-1/4.

2.3 TOILET SEATS

A. Toilet Seats:

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

a. American Standard America
b. Bemis Manufacturing Company
c. Centoco Manufacturing Corporation
d. Church Seats; Bemis Manufacturing Company
e. Kohler Co.
f. Olsonite Seat Co.
g. TOTO USA, INC.
h. Zurn Industries, LLC

2. Standard: IAPMO/ANSI Z124.5.
3. Material: Plastic.
4. Type: Commercial (heavy duty).
5. Shape: Elongated rim, open front.
6. Hinge: Self-sustaining, check.
7. Hinge Material: Noncorroding metal.
8. Seat Cover: Not required.
9. Color: White.

2.4 SUPPORTS

A. Water Closet Carrier:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Zurn Industries, LLC
b. Josam
c. Jay R. Smith
d. Tyler Pipe; Wade Division

2. Standard: ASME A112.6.1M.
3. Description: Waste-fitting assembly, as required to match drainage piping material and arrangement with faceplates, couplings gaskets, and feet; bolts and hardware matching fixture. Include additional extension coupling, faceplate, and feet for installation in wide pipe space.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine roughing-in of water supply and sanitary drainage and vent piping systems to verify actual locations of piping connections before water-closet installation.

B. Examine walls and floors for suitable conditions where water closets will be installed.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Water-Closet Installation:

1. Install level and plumb according to roughing-in drawings.

2. Install floor-mounted water closets on bowl-to-drain connecting fitting attachments to piping or building substrate.
3. Install accessible, wall-mounted water closets at mounting height for handicapped/elderly, according to ICC/ANSI A117.1.

B. Support Installation:

1. Install supports, affixed to building substrate, for floor-mounted, back-outlet water closets.
2. Use carrier supports with waste-fitting assembly and seal.
3. Install floor-mounted, back-outlet water closets attached to building floor substrate, onto waste-fitting seals; and attach to support.
4. Install wall-mounted, back-outlet water-closet supports with waste-fitting assembly and waste-fitting seals; and affix to building substrate.

C. Flushometer-Valve Installation:

1. Install flushometer-valve, water-supply fitting on each supply to each water closet.
2. Attach supply piping to supports or substrate within pipe spaces behind fixtures.
3. Install lever-handle flushometer valves for accessible water closets with handle mounted on open side of water closet.
4. Install actuators in locations that are easy for people with disabilities to reach.
5. Install fresh batteries in battery-powered, electronic-sensor mechanisms.

D. Install toilet seats on water closets.

E. Wall Flange and Escutcheon Installation:

1. Install wall flanges or escutcheons at piping wall penetrations in exposed, finished locations and within cabinets and millwork.
2. Install deep-pattern escutcheons if required to conceal protruding fittings.
3. Comply with escutcheon requirements specified in Section 220518 "Escutcheons for Plumbing Piping."

F. Joint Sealing:

1. Seal joints between water closets and walls and floors using sanitary-type, one-part, mildew-resistant silicone sealant.
2. Match sealant color to water-closet color.
3. Comply with sealant requirements specified in Section 079200 "Joint Sealants."

3.3 CONNECTIONS

A. Connect water closets with water supplies and soil, waste, and vent piping. Use size fittings required to match water closets.

B. Comply with water piping requirements specified in Section 221116 "Domestic Water Piping."

C. Comply with soil and waste piping requirements specified in Section 221316 "Sanitary Waste and Vent Piping."

D. Where installing piping adjacent to water closets, allow space for service and maintenance.

3.4 ADJUSTING

A. Operate and adjust water closets and controls. Replace damaged and malfunctioning water closets, fittings, and controls.

B. Adjust water pressure at flushometer valves to produce proper flow.

C. Install fresh batteries in battery-powered, electronic-sensor mechanisms.

3.5 CLEANING AND PROTECTION

A. Clean water closets and fittings with manufacturers' recommended cleaning methods and materials.

B. Install protective covering for installed water closets and fittings.

C. Do not allow use of water closets for temporary facilities unless approved in writing by Owner.

END OF SECTION 224213.13

SECTION 224213.16 - COMMERCIAL URINALS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Urinals.
2. Flushometer valves.
3. Supports.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for urinals.
2. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

B. Shop Drawings: Include diagrams for power, signal, and control wiring.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For flushometer valves to include in operation and maintenance manuals.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that are packaged with protective covering for storage and identified with labels describing contents.

1. Flushometer-Valve Repair Kits: Equal to ten percent (10%) of amount of each type installed, but no fewer than six of each type.

PART 2 - PRODUCTS

2.1 WALL-HUNG URINALS

A. Urinals: Wall hung, back outlet, siphon jet.

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

a. American Standard America
b. Kohler Co.

c. Toto
d. Zurn Industries, LLC

2. Fixture:

a. Standards: ASME A112.19.2/CSA B45.1 and ASME A112.19.5.
b. Material: Vitreous china.
c. Type: Siphon jet with extended shields.
d. Strainer or Trapway: Manufacturer's standard strainer with integral trap.
e. Water Consumption: Water saving.
f. Spud Size and Location: NPS 3/4; top.
g. Outlet Size and Location: NPS 2; back.
h. Color: White.

3. Flushometer Valve: Refer to Schedule on Drawings.
4. Waste Fitting:

a. Standard: ASME A112.18.2/CSA B125.2 for coupling.
b. Size: NPS 2.

5. Support: Type I Urinal Carrier with fixture support plates and coupling with seal and fixture bolts and hardware matching fixture. Include rectangular, steel uprights.
6. Urinal Mounting Height: Standard and Handicapped/elderly according to ICC A117.1.

2.2 URINAL FLUSHOMETER VALVES

A. Lever-Handle, Diaphragm Flushometer Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

a. Delany Products
b. Sloan Valve Company
c. Toto
d. Zurn Industries, LLC

2. Standard: ASSE 1037.
3. Minimum Pressure Rating: 125 psig.
4. Features: Include integral check stop and backflow-prevention device.
5. Material: Brass body with corrosion-resistant components.
6. Exposed Flushometer-Valve Finish: Chrome plated.
7. Panel Finish: Chrome plated or stainless-steel.
8. Style: Exposed or Concealed per Schedule on Drawings.
9. Consumption: 0.125 gal. per flush.
10. Minimum Inlet: NPS 3/4.
11. Minimum Outlet: NPS 3/4.

B. Lever-Handle, Piston Flushometer Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

a. Delany Products
b. Sloan Valve Company
c. TOTO USA, INC.

d. Zurn Industries, LLC

2. Standard: ASSE 1037.
3. Minimum Pressure Rating: 125 psig.
4. Features: Include integral check stop and backflow-prevention device.
5. Material: Brass body with corrosion-resistant components.
6. Exposed Flushometer-Valve Finish: Chrome plated.
7. Panel Finish: Chrome plated or stainless-steel.
8. Style: Exposed or Concealed per Schedule on Drawings.
9. Consumption: 0.125 gal. per flush.
10. Minimum Inlet: NPS 3/4.
11. Minimum Outlet: NPS 3/4.

2.3 SUPPORTS

A. Type I Urinal Carrier:

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

a. Jay R. Smith Mfg. Co.
b. Josam Company
c. Tyler Pipe; Wade Div.
d. Zurn Industries, LLC

2. Standard: ASME A112.6.1M.

B. Type II Urinal Carrier:

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

a. Jay R. Smith Mfg. Co.
b. Josam Company
c. Tyler Pipe; Wade Div.
d. Zurn Industries, LLC

2. Standard: ASME A112.6.1M.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine roughing-in of water supply and sanitary drainage and vent piping systems to verify actual locations of piping connections before urinal installation.

B. Examine walls and floors for suitable conditions where urinals will be installed.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Urinal Installation:

1. Install urinals level and plumb according to roughing-in drawings.

B. Support Installation:

1. Install supports, affixed to building substrate, for wall-hung urinals.
2. Use off-floor carriers with waste fitting and seal for back-outlet urinals.
3. Use carriers without waste fitting for urinals with tubular waste piping.
4. Use chair-type carrier supports with rectangular steel uprights for accessible urinals.

C. Flushometer-Valve Installation:

1. Install flushometer-valve water-supply fitting on each supply to each urinal.
2. Attach supply piping to supports or substrate within pipe spaces behind fixtures.
3. Install lever-handle flushometer valves for accessible urinals with handle mounted on open side of compartment.
4. Install fresh batteries in battery-powered, electronic-sensor mechanisms.

D. Wall Flange and Escutcheon Installation:

1. Install wall flanges or escutcheons at piping wall penetrations in exposed, finished locations.
2. Install deep-pattern escutcheons if required to conceal protruding fittings.
3. Comply with escutcheon requirements specified in Section 220518 "Escutcheons for Plumbing Piping."

E. Joint Sealing:

1. Seal joints between urinals and walls and floors using sanitary-type, one-part, mildew-resistant silicone sealant.
2. Match sealant color to urinal color.
3. Comply with sealant requirements specified in Section 079200 "Joint Sealants."

3.3 CONNECTIONS

A. Connect urinals with water supplies and soil, waste, and vent piping. Use size fittings required to match urinals.

B. Comply with water piping requirements specified in Section 221116 "Domestic Water Piping."

C. Comply with soil and waste piping requirements specified in Section 221316 "Sanitary Waste and Vent Piping."

D. Where installing piping adjacent to urinals, allow space for service and maintenance.

3.4 ADJUSTING

A. Operate and adjust urinals and controls. Replace damaged and malfunctioning urinals, fittings, and controls.

B. Adjust water pressure at flushometer valves to produce proper flow.

C. Install fresh batteries in battery-powered, electronic-sensor mechanisms.

3.5 CLEANING AND PROTECTION

A. Clean urinals and fittings with manufacturers' recommended cleaning methods and materials.

B. Install protective covering for installed urinals and fittings.

C. Do not allow use of urinals for temporary facilities unless approved in writing by Owner.

END OF SECTION 224213.16

SECTION 224216.13 - COMMERCIAL LAVATORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Lavatories.
2. Faucets.
3. Supports.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for lavatories.
2. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

B. Shop Drawings: Include diagrams for power, signal, and control wiring of automatic faucets.

1.4 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Counter cutout templates for mounting of counter-mounted lavatories.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For lavatories and faucets to include in operation and maintenance manuals.

1. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:

a. Servicing and adjustments of automatic faucets.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Faucet Washers and O-Rings: Equal to ten percent (10%) of amount of each type and size installed.
2. Faucet Cartridges and O-Rings: Equal to five percent (5%) of amount of each type and size installed.

PART 2 - PRODUCTS

2.1 VITREOUS-CHINA, WALL-MOUNTED LAVATORIES

A. Lavatory: Vitreous china, wall mounted, with back.

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

a. American Standard America
b. Kohler Co.
c. Sloan Valve Company
d. Zurn Industries, LLC

2. Fixture:

a. Standard: ASME A112.19.2/CSA B45.1.
b. Type: For wall hanging.
c. Faucet-Hole Location: Top.
d. Color: White.
e. Mounting Material: Chair carrier.

3. Faucet: Refer to Schedule on Drawings.
4. Support: Type II, concealed-arm lavatory carrier with escutcheons. Include rectangular, steel uprights.
5. Lavatory Mounting Height: Standard and Handicapped/elderly according to ICC A117.1.

2.2 SOLID-SURFACE, MODULAR LAVATORY SYSTEMS

A. Lavatory Systems: Solid-surface, linear (side-by-side) receptor.

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

a. Bradley Corporation
b. Intersan Manufacturing Company.
c. Sloan Company
d. Willoughby Industries.

2. Standard: IAPMO IGC 156.
3. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
4. Bowl(s) and Counter:

a. Standard: ICPA SS-1 for solid-surface bowls.
b. Height to Rim: 34 inches above floor.
c. Color or Finish: Selected by Architect.
d. Number of Bowls: Two (2) or three (3); see Floor Plans and Schedule on Drawings.
e. Drain: Grid with NPS 1-1/2 (DN 40) tailpiece, each bowl.

5. Faucets:

a. Standards: ASME A112.18.1/CSA B125.1 and NSF 61.
b. Type: Manufacturer's standard, chrome-plated solid brass, each bowl.

c. Control: Hardwired, sensor-actuated, pressure-balancing mixing valve with check stops for each user station.
d. Sensor: ASME A112.18.1/CSA B125.1 and UL 1951.

6. Liquid-Soap Dispensers: Manual, two (2) required.
7. Mounting: Off floor on manufacture supplied wall brackets.
8. Supply Fittings:

a. Piping: NPS 1/2 copper tubing, each bowl.
b. Valves: Shutoff valve on each supply.
c. Supply Piping: From wall.

9. Waste Fittings:

a. Standard: ASME A112.18.2/CSA B125.2.
b. Trap and Drain Piping: NPS 1-1/2 (DN 40), each bowl.

2.3 SOLID-BRASS, MANUALLY OPERATED FAUCETS

A. NSF Standard: Comply with NSF/ANSI 61 Annex G, "Drinking Water System Components - Health Effects," for faucet materials that will be in contact with potable water.

B. Lavatory Faucets: Manual-type, single-control mixing, commercial, solid-brass valve.

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

a. Bradley Corporation
b. Chicago Faucets; Geberit Company
c. Delta Faucet Company
d. Symmons Company
e. T & S Brass and Bronze Works, Inc.

2. Standard: ASME A112.18.1/CSA B125.1.
3. General: Include hot- and cold-water indicators; coordinate faucet inlets with supplies and fixture hole punchings; coordinate outlet with spout and fixture receptor.
4. Body Type: Centerset.
5. Body Material: Commercial, solid brass.
6. Finish: Polished chrome plate.
7. Maximum Flow Rate: 0.5 gpm.
8. Maximum Flow: 0.25 gal. per metering cycle.
9. Mounting Type: Deck, exposed.
10. Valve Handle(s): Single lever.
11. Spout: Rigid type.
12. Spout Outlet: Aerator.
13. Operation: Compression, manual.
14. Tailpiece Drain: Included with faucet.

2.4 SOLID-BRASS, AUTOMATICALLY OPERATED LAVATORY FAUCETS

A. NSF Standard: Comply with NSF/ANSI 61 Annex G, "Drinking Water System Components - Health Effects," for faucet materials that will be in contact with potable water.

B. Lavatory Faucets: Automatic-type, battery-powered or hard-wired, electronic-sensor-operated, mixing, solid-brass valve.

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

    a. Bradley Corporation
    b. Chicago Faucets; Geberit Company
    c. Delta Faucet Company
    d. Symmons Company
    e. T & S Brass and Bronze Works, Inc.

2. Standards: ASME A112.18.1/CSA B125.1 and UL 1951.
3. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
4. General: Include hot- and cold-water indicators; coordinate faucet inlets with supplies and fixture hole punchings; coordinate outlet with spout and fixture receptor.
5. Body Material: Commercial, solid brass.
6. Finish: Polished chrome plate.
7. Maximum Flow Rate: 0.5 gpm.
8. Maximum Flow: 0.25 gal. per metering cycle.
9. Mounting Type: Deck, exposed.
10. Valve Handle(s): Single lever.
11. Spout: Rigid type.
12. Spout Outlet: Aerator.
13. Operation: Compression, manual.
14. Tailpiece Drain: Included with faucet.

2.5 SUPPORTS

A. Type II Lavatory Carrier:

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

    a. Jay R. Smith Mfg. Co.
    b. Josam Company
    c. Tyler Pipe; Wade Div.
    d. Zurn Industries, LLC

2. Standard: ASME A112.6.1M.

B. Type III Lavatory Carrier:

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

    a. Jay R. Smith Mfg. Co.
    b. Josam Company
    c. Tyler Pipe; Wade Div.
    d. Zurn Industries, LLC

2. Standard: ASME A112.6.1M.

2.6 SUPPLY FITTINGS

A. NSF Standard: Comply with NSF/ANSI 61 Annex G, "Drinking Water System Components - Health Effects," for supply-fitting materials that will be in contact with potable water.

B. Standard: ASME A112.18.1/CSA B125.1.

C. Supply Piping: Chrome-plated-brass pipe or chrome-plated copper tube matching water-supply piping size. Include chrome-plated-brass or stainless-steel wall flange.

D. Supply Stops: Chrome-plated-brass, one-quarter-turn, ball-type or compression valve with inlet connection matching supply piping.

E. Operation: Loose key.

F. Risers:

1. NPS 3/8.
2. Chrome-plated, rigid-copper-pipe and brass straight or offset tailpieces.

2.7 WASTE FITTINGS

A. Standard: ASME A112.18.2/CSA B125.2.

B. Drain: Grid type with NPS 1-1/4 offset and straight tailpiece.

C. Trap:

1. Size: NPS 1-1/2 by NPS 1-1/4.
2. Material: Chrome-plated, two-piece, cast-brass trap and swivel elbow with 0.032-inch-thick brass tube to wall; and chrome-plated, brass or steel wall flange.

2.8 SUPPORTS

A. Type II Lavatory Carrier:

1. Standard: ASME A112.6.1M.

B. Type III Lavatory Carrier:

1. Standard: ASME A112.6.1M.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine roughing-in of water supply and sanitary drainage and vent piping systems to verify actual locations of piping connections before lavatory installation.

B. Examine counters and walls for suitable conditions where lavatories will be installed.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install lavatories level and plumb according to roughing-in drawings.

B. Install supports, affixed to building substrate, for wall-mounted lavatories.

C. Install accessible wall-mounted lavatories at handicapped/elderly mounting height for people with disabilities or the elderly, according to ICC/ANSI A117.1.

D. Install wall flanges or escutcheons at piping wall penetrations in exposed, finished locations. Use deep-pattern escutcheons if required to conceal protruding fittings. Comply with escutcheon requirements specified in Section 220518 "Escutcheons for Plumbing Piping."

E. Seal joints between lavatories, counters, and walls using sanitary-type, one-part, mildew-resistant silicone sealant. Match sealant color to fixture color. Comply with sealant requirements specified in Section 079200 "Joint Sealants."

F. Install protective shielding pipe covers and enclosures on exposed supplies and waste piping of accessible lavatories. Comply with requirements in Section 220719 "Plumbing Piping Insulation."

3.3 CONNECTIONS

A. Connect fixtures with water supplies, stops, and risers, and with traps, soil, waste, and vent piping. Use size fittings required to match fixtures.

B. Comply with water piping requirements specified in Section 221116 "Domestic Water Piping."

C. Comply with soil and waste piping requirements specified in Section 221316 "Sanitary Waste and Vent Piping."

3.4 ADJUSTING

A. Operate and adjust lavatories and controls. Replace damaged and malfunctioning lavatories, fittings, and controls.

B. Adjust water pressure at faucets to produce proper flow.

C. Install fresh batteries in battery-powered, electronic-sensor mechanisms.

3.5 CLEANING AND PROTECTION

A. After completing installation of lavatories, inspect and repair damaged finishes.

B. Clean lavatories, faucets, and other fittings with manufacturers' recommended cleaning methods and materials.

C. Provide protective covering for installed lavatories and fittings.

D. Do not allow use of lavatories for temporary facilities unless approved in writing by Owner.

END OF SECTION 224216.13

SECTION 224216.16 - COMMERCIAL SINKS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Service basins.
2. Stainless-steel, counter-mounted sinks.
3. Sink faucets.
4. Supply fittings.
5. Waste fittings.
6. Supports.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for sinks.
2. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

1.4 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Counter cutout templates for mounting of counter-mounted lavatories.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For sinks to include in maintenance manuals.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Faucet Washers and O-Rings: Equal to ten percent (10%) of amount of each type and size installed.
2. Faucet Cartridges and O-Rings: Equal to five percent (5%) of amount of each type and size installed.

PART 2 - PRODUCTS

2.1 SERVICE BASINS

A. Service Basins.

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

    a. Acorn Engineering Company
    b. Crane Plumbing, LLC
    c. Florestone Products Co., Inc.
    d. Stern-Williams Co., Inc.

2. Refer to Schedules on Drawings for characteristics and Basis-of-Design models.

2.2 STAINLESS-STEEL, COUNTER-MOUNTED SINKS

A. Sinks: Stainless-steel, counter mounted.

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

    a. Elkay Manufacturing Co.
    b. Just Manufacturing

2. Refer to Schedules on Drawings for characteristics and Basis-of-Design models.

2.3 SINK FAUCETS

A. NSF Standard: Comply with NSF/ANSI 61 Annex G, "Drinking Water System Components - Health Effects," for faucet-spout materials that will be in contact with potable water.

B. Sink Faucets: Manual type, two-lever-handle mixing valve.

1. Commercial, Solid-Brass Faucets.

    a. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

        1) Chicago Faucets; Geberit Company
        2) Delta Faucet Company
        3) Elkay Manufacturing Co.
        4) Kohler Co.
        5) Moen Incorporated
        6) Speakman Company
        7) T & S Brass and Bronze Works, Inc.
        8) Zurn Industries, LLC

2. Standard: ASME A112.18.1/CSA B125.1.

3. General: Include hot- and cold-water indicators; coordinate faucet inlets with supplies and fixture hole punchings; coordinate outlet with spout and sink receptor.
4. Body Type: Centerset.
5. Body Material: Commercial, solid brass.
6. Finish: Chrome plated.
7. Maximum Flow Rate: 2.2 gpm.
8. Handle(s): Lever.
9. Mounting Type: Back/wall, exposed.
10. Spout Type: Swing, round tubular.
11. Vacuum Breaker: Required for hose outlet.

12. Spout Outlet: Hose thread according to ASME B1.20.7.

2.4 SUPPORTS

A. Type II Sink Carrier:

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

a. Jay R. Smith Mfg. Co.
b. Josam Company
c. Wade Drains
d. Zurn Industries, LLC

2. Standard: ASME A112.6.1M.

2.5 SUPPLY FITTINGS

A. NSF Standard: Comply with NSF/ANSI 61 Annex G, "Drinking Water System Components - Health Effects," for supply-fitting materials that will be in contact with potable water.

B. Standard: ASME A112.18.1/CSA B125.1.

C. Supply Piping: Chrome-plated brass pipe or chrome-plated copper tube matching water-supply piping size. Include chrome-plated brass or stainless-steel wall flange.

D. Supply Stops: Chrome-plated brass, one-quarter-turn, ball-type or compression valve with inlet connection matching supply piping.

E. Operation: Loose key.

F. Risers:

1. NPS 3/8.
2. Chrome-plated, rigid-copper pipe.

2.6 WASTE FITTINGS

A. Standard: ASME A112.18.2/CSA B125.2.

B. Drain: Grid type with NPS 1-1/2 offset and straight tailpiece.

C. Trap:

1. Size: NPS 1-1/2.
2. Material: Chrome-plated, two-piece, cast-brass trap and swivel elbow with 0.032-inch-thick brass tube to wall; and chrome-plated brass or steel wall flange.

2.7 GROUT

A. Standard: ASTM C 1107, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.

B. Characteristics: Non-shrink; recommended for interior and exterior applications.

C. Design Mix: 5000-psi, 28-day compressive strength.

D. Packaging: Premixed and factory packaged.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine roughing-in of water supply and sanitary drainage and vent piping systems to verify actual locations of piping connections before sink installation.

B. Examine walls, floors, and counters for suitable conditions where sinks will be installed.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install sinks level and plumb according to roughing-in drawings.

B. Install supports, affixed to building substrate, for wall-hung sinks.

C. Install accessible wall-mounted sinks at handicapped/elderly mounting height according to ICC/ANSI A117.1.

D. Set floor-mounted sinks in leveling bed of cement grout.

E. Install water-supply piping with stop on each supply to each sink faucet.

1. Exception: Use ball valves if supply stops are not specified with sink. Comply with valve requirements specified in Section 220523.12 "Ball Valves for Plumbing Piping".
2. Install stops in locations where they can be easily reached for operation.

F. Install wall flanges or escutcheons at piping wall penetrations in exposed, finished locations. Use deep-pattern escutcheons if required to conceal protruding fittings. Comply with escutcheon requirements specified in Section 220518 "Escutcheons for Plumbing Piping."

G. Seal joints between sinks and counters, floors, and walls using sanitary-type, one-part, mildew-resistant silicone sealant. Match sealant color to fixture color. Comply with sealant requirements specified in Section 079200 "Joint Sealants."

H. Install protective shielding pipe covers and enclosures on exposed supplies and waste piping of accessible sinks. Comply with requirements in Section 220719 "Plumbing Piping Insulation."

3.3 CONNECTIONS

A. Connect sinks with water supplies, stops, and risers, and with traps, soil, waste, and vent piping. Use size fittings required to match fixtures.

B. Comply with water piping requirements specified in Section 221116 "Domestic Water Piping."

C. Comply with soil and waste piping requirements specified in Section 221316 "Sanitary Waste and Vent Piping."

3.4 ADJUSTING

A. Operate and adjust sinks and controls. Replace damaged and malfunctioning sinks, fittings, and controls.

B. Adjust water pressure at faucets to produce proper flow.

3.5 CLEANING AND PROTECTION

A. After completing installation of sinks, inspect and repair damaged finishes.

B. Clean sinks, faucets, and other fittings with manufacturers' recommended cleaning methods and materials.

C. Provide protective covering for installed sinks and fittings.

D. Do not allow use of sinks for temporary facilities unless approved in writing by Owner.

END OF SECTION 224216.16

SECTION 224716 - PRESSURE WATER COOLERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes pressure water coolers and related components.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of pressure water cooler.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
2. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

B. Shop Drawings: Include diagrams for power, signal, and control wiring.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance Data: For pressure water coolers to include in maintenance manuals.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Filter Cartridges: Equal to ten percent (10%) of quantity installed for each type and size indicated, but no fewer than one (1) of each.

PART 2 - PRODUCTS

2.1 PRESSURE WATER COOLERS

A. Pressure Water Coolers: Wall mounted.

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

a. Elkay Manufacturing Co.
b. Halsey Taylor
c. Haws Corporation

2. Refer to Schedules on Drawings for characteristics and Basis-of-Design models.

2.2 SUPPORTS

A. Water Cooler Carrier:

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

a. Jay R. Smith Mfg. Co.
b. Josam Company
c. Wade Drains
d. Zurn Industries, LLC

2. Standard: ASME A112.6.1M.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine roughing-in for water-supply and sanitary drainage and vent piping systems to verify actual locations of piping connections before fixture installation.

B. Examine walls and floors for suitable conditions where fixtures will be installed.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install fixtures level and plumb according to roughing-in drawings. For fixtures indicated for children, install at height required by authorities having jurisdiction.

B. Install off-the-floor carrier supports, affixed to building substrate, for wall-mounted fixtures.

C. Install mounting frames, affixed to building construction, and attach recessed, pressure water coolers to mounting frames.

D. Install water-supply piping with shutoff valve on supply to each fixture to be connected to domestic-water distribution piping. Use ball valves. Install valves in locations where they can be easily reached for operation. Valves are specified in Section 220523.12 "Ball Valves for Plumbing Piping".

E. Install trap and waste piping on drain outlet of each fixture to be connected to sanitary drainage system.

F. Install wall flanges or escutcheons at piping wall penetrations in exposed, finished locations. Use deep-pattern escutcheons where required to conceal protruding fittings. Comply with escutcheon requirements specified in Section 220518 "Escutcheons for Plumbing Piping."

G. Seal joints between fixtures and walls using sanitary-type, one-part, mildew-resistant, silicone sealant. Match sealant color to fixture color. Comply with sealant requirements specified in Section 079200 "Joint Sealants."

3.3 CONNECTIONS

A. Connect fixtures with water supplies, stops, and risers, and with traps, soil, waste, and vent piping. Use size fittings required to match fixtures.

B. Comply with water piping requirements specified in Section 221116 "Domestic Water Piping."

C. Install ball or gate shutoff valve on water supply to each fixture. Install valve upstream from filter for water cooler. Comply with valve requirements specified in Section 220523.12 "Ball Valves for Plumbing Piping."

D. Comply with soil and waste piping requirements specified in Section 221316 "Sanitary Waste and Vent Piping."

3.4 ADJUSTING

A. Adjust fixture flow regulators for proper flow and stream height.

B. Adjust pressure water-cooler temperature settings.

3.5 CLEANING

A. After installing fixture, inspect unit. Remove paint splatters and other spots, dirt, and debris. Repair damaged finish to match original finish.

B. Clean fixtures, on completion of installation, according to manufacturer's written instructions.

C. Provide protective covering for installed fixtures.

D. Do not allow use of fixtures for temporary facilities unless approved in writing by Owner.

END OF SECTION 224716

SECTION 230000 - BASIC MECHANICAL REQUIREMENTS

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Basic Mechanical Requirements specifically applicable to Division 23 Sections in addition to Division 01, General Requirements.

1.2 INTENT

A. It is the intention of the Specifications and Drawings to call for finished work, tested and ready for operation. All materials, equipment, and apparatus shall be new and of first-class quality.

B. Any apparatus, appliance, material, or work not shown on Drawings, but mentioned in the Specifications, or vice versa, or any incidental accessories or minor details not shown, but necessary to make the work complete and perfect in all respects and ready for operation, even if not particularly specified, shall be provided by the Contractor without additional expense to the Owner.

C. With submission of bid, the Contractor shall give notice to the Engineer of any materials apparatus, or omissions believed to be in violation of laws, ordinances, rules or regulations, or authorities having jurisdiction. In the absence of such written notice, it is mutually agreed that the Contractor shall include the cost of providing all systems in accordance with applicable regulations without extra compensation.

1.3 SUBMITTALS

A. Submit under provisions of Section 013300 “Submittal Procedures”.

B. Include products as required by individual Sections.

C. Submit Shop Drawings and Product Data grouped to include complete submittals of related systems, products, and accessories in a single submittal.

D. Mark dimensions and values in units to match those specified.

E. Submit plan indicating measures being taken to maintain indoor air quality of occupied portion of building during construction.

1.4 DRAWINGS AND COORDINATION

A. Drawings are schematic in nature and do not indicate every item, piece of equipment, and detail. Provide complete, operating systems.

B. Install work as closely as possible to layouts shown on Drawings. Modify work as necessary to meet job conditions and to clear other equipment. Consult Architect before making changes which affect the function or appearance of systems.

C. Dimensions, elevations, and locations are shown approximately. Verify dimensions in field.

D. Architect reserves the right to order changes in layout of such items as piping, ducts, and equipment if such changes do not substantially affect costs and if affected items have not been fabricated or installed.

E. In some cases, drawings are based on products of one (1) or several manufacturers, as listed on Contract Documents. Contractor shall be responsible for modifications made necessary by substitution of products of other manufacturers. Modifications may be required in electrical distribution materials and components, structural supports, concrete pads, gas piping, breeching and chimneys, etc.

F. Do not install part of a system until all critical components of the system and related systems have been approved. Coordinate parts of systems.

G. Coordinate work with work specified in other Sections. Relocate work if required for proper installation and functioning of other systems.

H. Install products in accordance with manufacturer's instructions. Notify Architect if Contract Documents conflict with manufacturer's instructions. Comply with Architect's interpretations.

I. Provide brackets, supports, anchors and frames required for installation of work specified in this division. Such metal work shall conform to the requirements of Section 055000 “Metal Fabrications”.

J. Where Contract Documents provide conflicting information, Contractor shall be responsible for design having highest cost.

1.5 PROJECT RECORD DRAWINGS

A. Prepare project Record Drawings of mechanical systems in conformance with the requirements of the General Conditions and Section 017839 “Project Record Documents”.

1.6 INDOOR AIR QUALITY

A. Provide measures to maintain minimum standard for indoor air quality in accordance with SMACNA guidelines, by preventing air contaminated by demolition and construction activities from being transferred to occupied portions of building when work includes renovation, addition, or alteration to building occupied during demolition/construction.

B. Measures shall include but not be limited to the following:

1. Air filtration.
2. Temporarily sealing ductwork, air inlets and outlets, and ventilation openings to prevent transfer of contaminated air.
3. Installation of bypass ducts or openings and additional temporary system modifications as required to prevent cross contamination, and to maintain proper system operation during construction.

C. Submit plan of cross contamination control measures in accordance with SMACNA guidelines prior to beginning construction.

1.7 PRELIMINARY OPERATION

A. Operate mechanical systems with required supervision for at least two (2) full days prior to substantial completion. Make necessary adjustments and check proper operation.

1.8 TESTS PRIOR TO SUBSTANTIAL COMPLETION

A. Tests shall be attended by representatives of mechanical subcontractors, equipped with instruments required to demonstrate proper functioning of systems, as specified. Demonstrate the following:

1. Equipment installed and operating in accordance with the manufacturer's specifications and instructions and with these specifications.
2. Safety and temperature controls operating as specified.
3. Systems properly flushed, cleaned and free of contaminants.
4. Systems properly balanced.
5. Motors equipped with proper overload protection and not operating under overload. Obtain ammeter readings.
6. Instruments recording properly.
7. Submit report listing system tested, date, results and description of fault corrections, if any.

1.9 WARRANTY

A. Submit written warranty of warranties covering work specified in Division 23. Warranty period shall be one (1) year from the date of Substantial Completion of the building or of the equipment being warranted, whichever is later. Owner is to receive full use of equipment for period of warranty.

1.10 OPERATING AND MAINTENANCE MANUALS

A. Submit Operating and Maintenance manuals in accordance with this Section and Section 017823 “Operation and Maintenance Data”.

B. Include operating and maintenance instructions for equipment where applicable.

C. List replacement parts and order procedure.

D. Include lubrication instructions and schedule, with types of lubricant to be used.

E. Instruct Owner's personnel in use of equipment specified in this Division.

1.11 REGULATORY REQUIREMENTS

A. Conform to applicable provisions of the Connecticut Basic Building Code which include the following:

1. 2012 International Building Code
2. 2012 International Mechanical Code
3. 2012 International Plumbing Code
4. 2012 International Energy Conservation Code

B. Amendments, alterations, deletions, and addition of certain provisions to the above as indicated in Connecticut Supplement.

C. New construction and renovation work will also conform to applicable provisions of the Connecticut Public Health Code.

D. Indoor air quality during construction will be maintained in accordance with SMACNA IAQ Guidelines for Occupied Buildings under Construction.

E. New construction and renovation work will also conform to applicable provisions of the Connecticut Fire Safety Code which include the following:

1. Code for Safety to Life from Fire in Buildings, National Fire Protection Association, Inc., Standard 101 (NFPA 101), 2003 Edition.
2. Amendments, alterations, deletions, and addition of certain provisions to the above as indicated in the Connecticut Supplement.

F. Work of this project shall be barrier free and will conform to the Americans with Disabilities Act (ADA), ICC/ANSI 117.1, and 2003 and 2010 ADA Standards for Accessible Design.

G. New construction and renovation work will comply with the requirements of the 2012 International Energy Conservation Code for energy efficiency.

H. Conform to applicable Town of Winchester requirements.

I. Obtain and pay for permits and inspections from authorities having jurisdiction.

J. Contractors shall follow the latest building codes.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 230000

SECTION 230513 - COMMON MOTOR REQUIREMENTS FOR HVAC EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes general requirements for single-phase and polyphase, general-purpose, horizontal, small and medium, squirrel-cage induction motors for use on ac power systems up to 480 V and installed at equipment manufacturer's factory or shipped separately by equipment manufacturer for field installation.

1.3 COORDINATION

A. Coordinate features of motors, installed units, and accessory devices to be compatible with the following:

1. Motor controllers.
2. Torque, speed, and horsepower requirements of the load.
3. Ratings and characteristics of supply circuit and required control sequence.
4. Ambient and environmental conditions of installation location.

PART 2 - PRODUCTS

2.1 GENERAL MOTOR REQUIREMENTS

A. Comply with requirements in this Section except when stricter requirements are specified in HVAC equipment schedules or Sections.

B. Comply with NEMA MG 1 unless otherwise indicated.

C. Comply with IEEE 841 for severe-duty motors.

2.2 MOTOR CHARACTERISTICS

A. Duty: Continuous duty at ambient temperature of 100 deg F and at altitude of 1000 feet above sea level.

B. Capacity and Torque Characteristics: Sufficient to start, accelerate, and operate connected loads at designated speeds, at installed altitude and environment, with indicated operating sequence, and without exceeding nameplate ratings or considering service factor.

2.3 POLYPHASE MOTORS

A. Description: NEMA MG 1, Design B, medium induction motor.

B. Efficiency: Energy efficient, as defined in NEMA MG 1.

C. Service Factor: 1.15.

D. Multispeed Motors: Variable torque.

1. For motors with 2:1 speed ratio, consequent pole, single winding.
2. For motors with other than 2:1 speed ratio, separate winding for each speed.

E. Multispeed Motors: Separate winding for each speed.

F. Rotor: Random-wound, squirrel cage.

G. Bearings: Re-greasable, shielded, antifriction ball bearings suitable for radial and thrust loading.

H. Temperature Rise: Match insulation rating.

I. Insulation: Class F.

J. Code Letter Designation:

1. Motors 15 HP and Larger: NEMA starting Code F or Code G.
2. Motors Smaller than 15 HP: Manufacturer's standard starting characteristic.

K. Enclosure Material: Cast iron for motor frame sizes 324T and larger; rolled steel for motor frame sizes smaller than 324T.

2.4 POLYPHASE MOTORS WITH ADDITIONAL REQUIREMENTS

A. Motors Used with Reduced-Voltage and Multispeed Controllers: Match wiring connection requirements for controller with required motor leads. Provide terminals in motor terminal box, suited to control method.

B. Motors Used with Variable Frequency Controllers: Ratings, characteristics, and features coordinated with and approved by controller manufacturer.

1. Windings: Copper magnet wire with moisture-resistant insulation varnish, designed and tested to resist transient spikes, high frequencies, and short time rise pulses produced by pulse-width modulated inverters.
2. Energy- and Premium-Efficient Motors: Class B temperature rise; Class F insulation.
3. Inverter-Duty Motors: Class F temperature rise; Class H insulation.
4. Thermal Protection: Comply with NEMA MG 1 requirements for thermally protected motors.

C. Severe-Duty Motors: Comply with IEEE 841, with 1.15 minimum service factor.

2.5 SINGLE-PHASE MOTORS

A. Motors larger than 1/20 hp shall be one of the following, to suit starting torque and requirements of specific motor application:

1. Permanent-split capacitor.
2. Split phase.
3. Capacitor start, inductor run.
4. Capacitor start, capacitor run.
5. ECM

B. Multispeed Motors: Variable-torque, permanent-split-capacitor type.

C. Bearings: Prelubricated, antifriction ball bearings or sleeve bearings suitable for radial and thrust loading.

D. Motors 1/20 HP and Smaller: Shaded-pole type.

E. Thermal Protection: Internal protection to automatically open power supply circuit to motor when winding temperature exceeds a safe value calibrated to temperature rating of motor insulation. Thermal-protection device shall automatically reset when motor temperature returns to normal range.

PART 3 - EXECUTION (Not Used)

END OF SECTION 230513

SECTION 230516 - EXPANSION FITTINGS AND LOOPS FOR HVAC PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Pipe loops and swing connections.
2. Grooved-joint expansion joints.
3. Hanger kit assembly
4. Alignment guides and anchors.

1.3 PERFORMANCE REQUIREMENTS

A. Compatibility: Products shall be suitable for piping service fluids, materials, working pressures, and temperatures.

B. Capability: Products to absorb two hundred percent (200%) of maximum axial movement between anchors.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Delegated-Design Submittal: For each anchor and alignment guide indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation. The engineer shall be licensed in the State of Connecticut.

1. Design Calculations: Calculate requirements for thermal expansion of piping systems and for selecting and designing expansion joints, loops, and swing connections.
2. Design Calculations: Calculate requirements for seismic expansion of piping systems and for selecting and designing expansion joints, loops, and swing connections.
3. Anchor Details: Detail fabrication of each anchor indicated. Show dimensions and methods of assembly and attachment to building structure.
4. Alignment Guide Details: Detail field assembly and attachment to building structure.
5. Schedule: Indicate type, manufacturer's number, size, material, pressure rating, end connections, and location for each expansion joint.
6. Scaled drawings, elevations and sections showing actual space/location and physical dimensions and clearances.

1.5 INFORMATION SUBMITTALS

A. Welding Certificates.

B. Product Certificates: For each type of expansion joint, from manufacturer.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For expansion joints to include in maintenance manuals.

1.7 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.1, "Structural Welding Code - Steel."
2. ASME Boiler and Pressure Vessel Code: Section IX.

PART 2 - PRODUCTS

2.1 ALIGNMENT GUIDES AND ANCHORS

A. Alignment Guides:

1. Manufacturers: Subject to compliance with requirements, provide products or comparable product by one (1) of the following:

a. Advanced Thermal Systems, Inc.
b. Hyspan Precision Products, Inc.
c. Metraflex, Inc.
d. Flexicraft Industries
e. Flex-Weld, Inc.
f. Mason Industries Inc.

2. Description: Steel, factory-fabricated alignment guide, with bolted two-section outer cylinder and base for attaching to structure; with two-section guiding spider for bolting to pipe.

B. Anchor Materials:

1. Steel Shapes and Plates: ASTM A 36.
2. Bolts and Nuts: ASME B18.10 or ASTM A 183, steel hex head.
3. Washers: ASTM F 844, steel, plain, flat washers.
4. Mechanical Fasteners: Insert-wedge-type stud with expansion plug anchor for use in hardened portland cement concrete, with tension and shear capacities appropriate for application.

a. Stud: Threaded, zinc-coated carbon steel.
b. Expansion Plug: Zinc-coated steel.
c. Washer and Nut: Zinc-coated steel.

5. Chemical Fasteners: Insert-type-stud, bonding-system anchor for use with hardened portland cement concrete, with tension and shear capacities appropriate for application.

a. Bonding Material: ASTM C 881, Type IV, Grade 3, two-component epoxy resin suitable for surface temperature of hardened concrete where fastener is to be installed.
b. Stud: ASTM A 307, zinc-coated carbon steel with continuous thread on stud unless otherwise indicated.
c. Washer and Nut: Zinc-coated steel.

2.2 GROOVED JOINT EXPANSION JOINTS

A. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

1. Victaulic
2. Engineer approved equal.

B. Description:

1. Factory-assembled expansion joint made of several grooved-end pipe nipples, couplings, and grooved joints. Movement capability dependent on number and style of couplings/nipples used. Pressure rating dependent on size and style of flexible couplings used. Victaulic **Style 155** or Engineer approved equal.
2. Packless, gasketed, slip-type expansion joint with grooved ends. Provides up to 3 inches of axial movement. Rated to 350 psi. Victaulic **Style 150** or Engineer approved equal.
3. Gaskets: Grade EHP or E EPDM for water and glycol services (no petroleum constituents). Select gaskets in accordance with service requirements utilizing the most recent Victaulic Gasket Selection publication.

C. Standard: AWWA C606, for grooved joints.

D. Nipples: ASTM A 53, Schedule 40, Type E or S, steel pipe with grooved ends.

PART 3 - EXECUTION

3.1 EXPANSION-JOINT INSTALLATION

A. Install expansion points of sizes matching sizes of piping in which they are installed.

B. Support all pipelines to ensure that loops do not carry the pipe load.

C. Initial pipe misalignment must not exceed 1/8-inch in any direction.

D. Install grooved-joint expansion joints to grooved-end steel piping. Grooved end expansion joints shall be installed in accordance with the manufacturer's guidelines and recommendations. The gasket style and elastomeric material (grade) shall be verified as suitable for the intended service as specified. Gaskets shall be supplied by the grooved coupling manufacturer. Grooved end shall be clean and free from indentations, projections and roll marks in the area from pipe end to groove for proper gasket sealing. A direct employee of the manufacturer, factory trained field representative shall provide on-site training to contractor's field personnel in the installation of grooved piping products. A distributor representative is not qualified for this site service on behalf of the manufacturer. Factory trained representative shall periodically review the product installation. Contractor shall remove and replace any improperly installed products without additional charges.

3.2 PIPE LOOP AND SWING CONNECTION INSTALLATION

A. Install pipe loops cold-sprung in tension or compression as required to partly absorb tension or compression produced during anticipated change in temperature.

B. Connect risers and branch connections to mains with at least five (5) pipe fittings including tee in main.

C. Connect risers and branch connections to terminal units with at least four (4) pipe fittings including tee in riser.

D. Connect mains and branch connections to terminal units with at least four (4) pipe fittings including tee in main.

E. On Victaulic grooved installations, use eight (8) flexible style couplings, four (4) 90° elbows, and three (3) grooved end pipe spools to provide expansion loops in water systems to 250°F in accordance with the latest manufacturer's recommendations for expansion compensation. Rigid couplings shall not be used on loop corners.

3.3 ALIGNMENT-GUIDE AND ANCHOR INSTALLATION

A. Install alignment guides to guide expansion and to avoid end-loading and torsional stress.

B. Install two (2) guides on each side of pipe expansion fittings and loops. Install guides nearest to expansion joint not more than four (4) pipe diameters from expansion joint.

C. Attach guides to pipe and secure guides to building structure.

D. Install anchors at locations to prevent stresses from exceeding those permitted by ASME B31.9 and to prevent transfer of loading and stresses to connected equipment.

E. Anchor Attachments:

1. Anchor Attachment to Steel Pipe: Attach by welding. Comply with ASME B31.9 and ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."
2. Anchor Attachment to Copper Tubing: Attach with pipe hangers. Use MSS SP-69, Type 24, U-bolts bolted to anchor.

F. Fabricate and install steel anchors by welding steel shapes, plates, and bars. Comply with ASME B31.9 and AWS D1.1.

1. Anchor Attachment to Steel Structural Members: Attach by welding.
2. Anchor Attachment to Concrete Structural Members: Attach by fasteners. Follow fastener manufacturer's written instructions.

G. Use grout to form flat bearing surfaces for guides and anchors attached to concrete.

END OF SECTION 230516

SECTION 230517 - SLEEVES AND SLEEVE SEALS FOR HVAC PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Sleeves.
2. Stack-sleeve fittings.
3. Sleeve-seal systems.
4. Sleeve-seal fittings.
5. Grout.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

PART 2 - PRODUCTS

2.1 SLEEVES

A. Cast-Iron Wall Pipes: Cast or fabricated of cast or ductile iron and equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop unless otherwise indicated.

B. Galvanized-Steel Wall Pipes: ASTM A 53, Schedule 40, with plain ends and welded steel collar; zinc coated.

C. Galvanized-Steel-Pipe Sleeves: ASTM A 53, Type E, Grade B, Schedule 40, zinc coated, with plain ends.

2.2 STACK-SLEEVE FITTINGS

A. Description: Manufactured, cast-iron sleeve with integral clamping flange. Include clamping ring, bolts, and nuts for membrane flashing.

1. Underdeck Clamp: Clamping ring with setscrews.

2.3 SLEEVE-SEAL SYSTEMS

A. Manufacturer:

1. GTP industries
2. Metraflex Industries
3. Calpico, Inc.

B. Description: Modular sealing-element unit, designed for field assembly, for filling annular space between piping and sleeve.

1. Sealing Elements: EPDM-rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
2. Pressure Plates: Carbon steel.
3. Connecting Bolts and Nuts: Carbon steel, with corrosion-resistant coating, of length required to secure pressure plates to sealing elements.

2.4 SLEEVE-SEAL FITTINGS

A. Description: Manufactured plastic, sleeve-type, waterstop assembly made for imbedding in concrete slab or wall. Unit has plastic or rubber waterstop collar with center opening to match piping OD.

2.5 GROUT

A. Standard: ASTM C 1107, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.

B. Characteristics: Non-Shrink; recommended for interior and exterior applications.

C. Design Mix: 5000-psi, 28-day compressive strength.

D. Packaging: Premixed and factory packaged.

PART 3 - EXECUTION

3.1 SLEEVE INSTALLATION

A. Install sleeves for piping passing through penetrations in floors, partitions, roofs, and walls.

B. For sleeves that will have sleeve-seal system installed, select sleeves of size large enough to 1-inch annular clear space between piping and concrete slabs and walls.

1. Sleeves are not required for core-drilled holes.

C. Install sleeves in concrete floors, concrete roof slabs, and concrete walls as new slabs and walls are constructed.

1. Cut sleeves to length for mounting flush with both surfaces.

a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 3-inch above finished floor level.

2. Using grout, seal the space outside of sleeves in slabs and walls without sleeve-seal system.

D. Install sleeves for pipes passing through interior partitions.

1. Cut sleeves to length for mounting flush with both surfaces.
2. Install sleeves that are large enough to provide ¼-inch annular clear space between sleeve and pipe or pipe insulation.

3. Seal annular space between sleeve and piping or piping insulation; use joint sealants appropriate for size, depth, and location of joint. Comply with requirements for sealants specified in Section 079200 "Joint Sealants."

E. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Comply with requirements for firestopping specified in Section 078413 "Penetration Firestopping."

3.2 STACK-SLEEVE-FITTING INSTALLATION

A. Install stack-sleeve fittings in new slabs as slabs are constructed.

1. Install fittings that are large enough to provide ¼-inch annular clear space between sleeve and pipe or pipe insulation.
2. Secure flashing between clamping flanges for pipes penetrating floors with membrane waterproofing. Comply with requirements for flashing specified in Section 076200 "Sheet Metal Flashing and Trim."
3. Install section of cast-iron soil pipe to extend sleeve to 3 inches above finished floor level.
4. Extend cast-iron sleeve fittings below floor slab as required to secure clamping ring if ring is specified.
5. Using grout, seal the space around outside of stack-sleeve fittings.

B. Fire-Barrier Penetrations: Maintain indicated fire rating of floors at pipe penetrations. Seal pipe penetrations with firestop materials. Comply with requirements for firestopping specified in Section 078413 "Penetration Firestopping."

3.3 SLEEVE-SEAL-SYSTEM INSTALLATION

A. Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at service piping entries into building.

B. Select type, size, and number of sealing elements required for piping material and size and for sleeve ID or hole size. Position piping in center of sleeve. Center piping in penetration, assemble sleeve-seal system components, and install in annular space between piping and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make a watertight seal.

3.4 SLEEVE-SEAL-FITTING INSTALLATION

A. Install sleeve-seal fittings in new walls and slabs as they are constructed.

B. Assemble fitting components of length to be flush with both surfaces of concrete slabs and walls. Position waterstop flange to be centered in concrete slab or wall.

C. Secure nailing flanges to concrete forms.

D. Using grout, seal the space around outside of sleeve-seal fittings.

3.5 SLEEVE AND SLEEVE-SEAL SCHEDULE

A. Use sleeves and sleeve seals for the following piping-penetration applications:

1. Exterior Concrete Walls above Grade:

a. Piping Smaller Than NPS 6: Cast Iron wall pipe sleeves.

b. Piping NPS 6: Cast Iron wall pipe sleeves.

2. Exterior Concrete Walls below Grade:

a. Piping Smaller Than NPS 6: Cast Iron wall pipe sleeves.

1) Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.

b. Piping NPS 6 and Larger: Cast Iron wall pipe sleeves with sleeve-seal system.

1) Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.

3. Concrete Slabs-on-Grade:

a. Piping Smaller Than NPS 6: Cast-Iron wall sleeves with sleeve-seal system.

1) Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.

b. Piping NPS 6 and Larger: Cast-Iron wall pipe.

1) Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.

4. Concrete Slabs above Grade:

a. Piping Smaller Than NPS 6: Cast-Iron wall pipe.
b. Piping NPS 6 and Larger: Cast-Iron wall pipe.

5. Interior Partitions:

a. Piping Smaller Than NPS 6: Galvanized-steel-pipe sleeves.
b. Piping NPS 6 and Larger: Galvanized-steel-sheet sleeves.

END OF SECTION 230517

SECTION 230519 - METERS AND GAGES FOR HVAC PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Bimetallic-actuated thermometers.
2. Filled-system thermometers.
3. Liquid-in-glass thermometers.
4. Thermowells.
5. Dial-type pressure gages.
6. Gage attachments.
7. Test plugs.
8. Test-plug kits.
9. Sight flow indicators.
10. Insertion Electromagnetic flowmeters
11. Ultrasonic thermal energy meters

B. Related Sections:

1. Section 221623 "Natural-Gas Piping" for gas meters.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Wiring Diagrams: For power, signal, and control wiring.

1.4 INFORMATIONAL SUBMITTALS

A. Product Certificates: For each type of meter and gage, from manufacturer.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For meters and gages to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 BIMETALLIC-ACTUATED THERMOMETERS

A. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

1. Ashcroft Inc.

2. Palmer Wahl Instrumentation Group
3. Trerice, H. O. Co.
4. Ernst Flow Industries
5. Miljoco Corporation

B. Standard: ASME B40.200.

C. Case: Liquid-filled and sealed type; stainless-steel with 5-inch nominal diameter.

D. Dial: Nonreflective aluminum with permanently etched scale markings and scales in deg F.

E. Connector Type(s): Union joint, adjustable angle, with unified-inch screw threads.

F. Connector Size: ½-inch, with ASME B1.1 screw threads.

G. Stem: 0.375-inch in diameter; stainless-steel.

H. Window: Plain glass.

I. Ring: Stainless-steel.

J. Element: Bimetal coil.

K. Pointer: Dark-colored metal.

L. Accuracy: Plus or minus one percent (+/-1%) of scale range.

2.2 FILLED-SYSTEM THERMOMETERS

A. Direct-Mounted, Metal-Case, Vapor-Actuated Thermometers:

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

   a. Ashcroft Inc.
   b. Palmer Wahl Instrumentation Group
   c. Trerice, H. O. Co.
   d. Miljoco Corporation
   e. Weiss Instruments, Inc.

2. Standard: ASME B40.200.
3. Case: Sealed type, cast aluminum, 5-inch nominal diameter.
4. Element: Bourdon tube.
5. Movement: Mechanical, dampening type, with link to pressure element and connection to pointer.
6. Dial: Non-reflective aluminum with permanently etched scale markings graduated in deg F (deg C).
7. Pointer: Dark-colored metal.
8. Window: Glass.
9. Ring: Stainless-steel.
10. Connector Type(s): Union joint, adjustable, 180 degrees in vertical plane, 360 degrees in horizontal plane, with locking device with ASME B1.1 screw threads.
11. Thermal System: Liquid-filled bulb in copper-plated steel, aluminum, or brass stem and of length to suit installation.

a. Design for Air-Duct Installation: With ventilated shroud.
b. Design for Thermowell Installation: Bare stem.

12. Accuracy: Plus or minus one and one-half percent (+/-1.5%) of scale range.

B. Remote-Mounted, Metal-Case, Vapor-Actuated Thermometers:

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

a. Trerice, H. O. Co.
b. Miljoco Corporation
c. Weiss Instruments, Inc.
d. Ashcroft Inc.

2. Standard: ASME B40.200.
3. Case: Sealed type, cast aluminum 5-inch nominal diameter with back flange and holes for panel mounting.
4. Element: Bourdon tube or other type of pressure element.
5. Movement: Mechanical, with link to pressure element and connection to pointer.
6. Dial: Nonreflective aluminum with permanently etched scale markings graduated in deg F (deg C).
7. Pointer: Dark-colored metal.
8. Window: Glass.
9. Ring: Stainless-steel.
10. Connector Type(s): Union joint, bottom; with ASME B1.1 screw threads.
11. Thermal System: Liquid-filled bulb in copper-plated steel, aluminum, or brass stem and of length to suit installation.

a. Design for Air-Duct Installation: With ventilated shroud.
b. Design for Thermowell Installation: Bare stem.

12. Accuracy: Plus or minus one and one-half percent (+/-1.5%) of scale range.

2.3 LIQUID-IN-GLASS THERMOMETERS

A. Metal-Case, Compact-Style, Liquid-in-Glass Thermometers:

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

a. Trerice, H. O. Co.
b. Dresser Industries, Inc.; Instrument Div.; Weksler Instruments Operating Unit
c. Ernst Gage Co.

2. Standard: ASME B40.200.
3. Case: Cast aluminum; 6-inch nominal size.
4. Case Form: Straight unless otherwise indicated.
5. Tube: Glass with magnifying lens and blue organic liquid.
6. Tube Background: Non-reflective aluminum with permanently etched scale markings graduated in deg F (deg C).
7. Window: Glass.
8. Stem: Brass and of length to suit installation.

a. Design for Air-Duct Installation: With ventilated shroud.

b. Design for Thermowell Installation: Bare stem.

9. Connector: ¾-inch, with ASME B1.1 screw threads.
10. Accuracy: Plus or minus one percent (+/-1%) of scale range or one (1) scale division, to a maximum of one and one-half percent (1.5%) of scale range.

B. Metal-Case, Industrial-Style, Liquid-in-Glass Thermometers:

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

a. Flo Fab Inc.
b. Palmer Wahl Instrumentation Group
c. Trerice, H. O. Co.
d. Miljoco Corporation
e. Weiss Instruments, Inc.

2. Standard: ASME B40.200.
3. Case: Cast aluminum; 9-inch nominal size unless otherwise indicated.
4. Case Form: Adjustable angle unless otherwise indicated.
5. Tube: Glass with magnifying lens and blue organic liquid.
6. Tube Background: Non-reflective aluminum with permanently etched scale markings graduated in deg F (deg C).
7. Window: Glass.
8. Stem: Brass and of length to suit installation.

a. Design for Air-Duct Installation: With ventilated shroud.
b. Design for Thermowell Installation: Bare stem.

9. Connector: 1¼ inches, with ASME B1.1 screw threads.
10. Accuracy: Plus or minus one percent (+/-1%) of scale range or one (1) scale division, to a maximum of one and one-half percent (1.5%) of scale range.

2.4 DUCT-THERMOMETER MOUNTING BRACKETS

A. Description: Flanged bracket with screw holes, for attachment to air duct and made to hold thermometer stem.

2.5 THERMOWELLS

A. Thermowells:

1. Standard: ASME B40.200.
2. Description: Pressure-tight, socket-type fitting made for insertion into piping tee fitting.
3. Material for Use with Copper Tubing: Stainless-steel.
4. Material for Use with Steel Piping: Stainless-steel.
5. Type: Stepped shank unless straight or tapered shank is indicated.
6. External Threads: NPS 1/2, NPS 3/4, or NPS 1, (DN 15, DN 20, or NPS 25,) ASME B1.20.1 pipe threads.
7. Internal Threads: ½-, ¾-, and 1-inch, with ASME B1.1 screw threads.
8. Bore: Diameter required to match thermometer bulb or stem.
9. Insertion Length: Length required to match thermometer bulb or stem.
10. Lagging Extension: Include on thermowells for insulated piping and tubing.
11. Bushings: For converting size of thermowell's internal screw thread to size of thermometer connection.

2.6 PRESSURE GAGES

A. Direct-Mounted, Metal-Case, Dial-Type Pressure Gages:

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

   a. Trerice, H. O. Co.
   b. Ashcroft, Inc.
   c. Ernst Flow Industries
   d. Palmer Wahl Instrumentation Group

2. Standard: ASME B40.100.
3. Case: Liquid-filled cast aluminum; 4½-inch.
4. Pressure-Element Assembly: Bourdon tube unless otherwise indicated.
5. Pressure Connection: Brass, with NPS 1/4 (DN 8), ASME B1.20.1 pipe threads and bottom-outlet type unless back-outlet type is indicated.
6. Movement: Mechanical, with link to pressure element and connection to pointer.
7. Dial: Non-reflective aluminum with permanently etched scale markings graduated in psi.
8. Pointer: Dark-colored metal.
9. Window: Glass.
10. Ring: Stainless-steel.
11. Accuracy: Grade A, plus or minus one percent (+/-1%) of middle half of scale range.

B. Remote-Mounted, Metal-Case, Dial-Type Pressure Gages:

1. Manufacturers: Subject to compliance with requirements, provide products or comparable product by one (1) of the following:

   a. AMETEK, Inc.; U.S. Gauge
   b. Palmer Wahl Instrumentation Group
   c. Trerice, H. O. Co.
   d. Ashcroft, Inc.
   e. Ernst Flow Industries

2. Standard: ASME B40.100.
3. Case: Liquid-filled type; cast aluminum; 4½-inch nominal diameter with back flange and holes for panel mounting.
4. Pressure-Element Assembly: Bourdon tube unless otherwise indicated.
5. Pressure Connection: Brass, with NPS 1/4 (DN 8), ASME B1.20.1 pipe threads and bottom-outlet type unless back-outlet type is indicated.
6. Movement: Mechanical, with link to pressure element and connection to pointer.
7. Dial: Non-reflective aluminum with permanently etched scale markings graduated in psi.
8. Pointer: Dark-colored metal.
9. Window: Glass.
10. Ring: Stainless-steel.
11. Accuracy: Grade A, plus or minus one percent (+/-1%) of middle half of scale range.

2.7 GAGE ATTACHMENTS

A. Snubbers: ASME B40.100, brass; with NPS 1/4 (DN 8) ASME B1.20.1 pipe threads and porous-metal-type surge-dampening device. Include extension for use on insulated piping.

B. Siphons: Loop-shaped section of brass pipe with NPS 1/4 (DN 8) pipe threads.

C. Valves: Brass ball with NPS 1/4 (DN 8), ASME B1.20.1 pipe threads.

2.8 TEST PLUGS

A. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

1. Flow Design, Inc.
2. Miljoco Corporation
3. Trerice, H. O. Co.
4. Peterson Equipment Co., Inc.
5. Weiss Instruments, Inc.

B. Description: Test-station fitting made for insertion into piping tee fitting.

C. Body: Brass or stainless steel with core inserts and gasketed and threaded cap. Include extended stem on units to be installed in insulated piping.

D. Thread Size: NPS 1/4 (DN 8), ASME B1.20.1 pipe thread.

E. Minimum Pressure and Temperature Rating: 500 psig at 200 deg F (3450 kPa at 93 deg C).

F. Core Inserts: EPDM self-sealing rubber.

2.9 TEST-PLUG KITS

A. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

1. Flow Design, Inc.
2. Miljoco Corporation
3. Trerice, H. O. Co.
4. Peterson Equipment Co., Inc.
5. Weiss Instruments, Inc.

B. Furnish one (1) test-plug kit containing two (2) thermometers, one (1) pressure gage and adapter, and carrying case. Thermometer sensing elements, pressure gage, and adapter probes shall be of diameter to fit test plugs and of length to project into piping.

C. Low-Range Thermometer: Small, bimetallic insertion type with 1- to 2-inch-diameter dial and tapered-end sensing element. Dial range shall be at least 25 to 100 deg F (minus 4 to plus 38 deg C).

D. High-Range Thermometer: Small, bimetallic insertion type with 1- to 2-inch-diameter dial and tapered-end sensing element. Dial range shall be at least 0 to 220 deg F (minus 18 to plus 104 deg C).

E. Pressure Gage: Small, Bourdon-tube insertion type with 2- to 3-inch-diameter dial and probe. Dial range shall be at least 0 to 200 psig.

F. Carrying Case: Metal or plastic, with formed instrument padding.

2.10 SIGHT FLOW INDICATORS

A. Manufacturers: Subject to compliance with requirements, provide products or comparable product by one (1) of the following**:**

1. Archon Industries, Inc.
2. Dwyer Instruments, Inc.
3. Emerson Process Management; Brooks Instrument
4. Ernst Flow Industries
5. KOBOLD Instruments, Inc. - USA; KOBOLD Messring GmbH

B. Description: Piping inline-installation device for visual verification of flow.

C. Construction: Bronze with sight glass and ball, flapper, or paddle wheel indicator, and threaded or flanged ends.

D. Minimum Pressure Rating: 150 psig.

E. Minimum Temperature Rating: 200 deg F (93 deg C).

F. End Connections for NPS 2 (DN 50) and Smaller: Threaded.

G. End Connections for NPS 2-1/2 (DN 65) and Larger: Flanged.

2.11 FLOWMETERS

A. Basis-of-Design Product: Subject to compliance with requirements, provide following:

1. Onicon Incorporated

B. Provide an ONICON **Model F-3500** Insertion Electromagnetic Flow Meter, complete with all installation hardware necessary to enable insertion and removal of the meter without system shutdown. The flow meter shall be hand-insertable up to 400 psi. Materials of construction for wetted metal components shall be 316 SS. The flow meter shall average velocity readings from two (2) sets of diametrically opposed electrodes. Each flow meter shall be individually wet-calibrated against a primary volumetric standard that is accurate to within 0.1% and traceable to NIST*. A certificate of calibration shall be provided with each flow meter. Accuracy shall be within plus or minus one percent (±1%) of rate from 2-20 ft/s. Overall turndown shall exceed 80:1. Output signals shall be completely isolated and shall consist of the following: (1) high resolution frequency output for use with peripheral devices such as an ONICON display module or Btu meter, (1) analog output; 4-20mA, 0-10V, or 0-5V jumper selectable, and (1) scalable dry contact output for totalization. Each flow meter shall be covered by the manufacturer’s two-year warranty.

C. Optional Flow Display: Provide a **D-1200 Series** Display Module for local or remote indication of flow rate and/or total.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install thermowells with socket extending one-third of pipe diameter and in vertical position in piping tees.

B. Install thermowells of sizes required to match thermometer connectors. Include bushings if required to match sizes.

C. Install thermowells with extension on insulated piping.

D. Fill thermowells with heat-transfer medium.

E. Install direct-mounted thermometers in thermowells and adjust vertical and tilted positions.

F. Install remote-mounted thermometer bulbs in thermowells and install cases on panels; connect cases with tubing and support tubing to prevent kinks. Use minimum tubing length.

G. Install duct-thermometer mounting brackets in walls of ducts. Attach to duct with screws.

H. Install direct-mounted pressure gages in piping tees with pressure gage located on pipe at the most readable position.

I. Install remote-mounted pressure gages on panel.

J. Install valve and snubber in piping for each pressure gage for fluids (except steam).

K. Install valve and syphon fitting in piping for each pressure gage for steam.

L. Install test plugs in piping tees.

M. Install flow indicators in piping systems in accessible positions for easy viewing.

N. Assemble and install connections, tubing, and accessories between flow-measuring elements and flowmeters according to manufacturer's written instructions.

O. Install flowmeter elements in accessible positions in piping systems.

P. Install wafer-orifice flowmeter elements between pipe flanges.

Q. Install differential-pressure-type flowmeter elements, with at least minimum straight lengths of pipe, upstream and downstream from element according to manufacturer's written instructions.

R. Install permanent indicators on walls or brackets in accessible and readable positions.

S. Install connection fittings in accessible locations for attachment to portable indicators.

T. Mount thermal-energy meters on wall if accessible; if not, provide brackets to support meters.

U. Install thermometers in the following locations:

1. Inlet and outlet of each hydronic zone.
2. Inlet and outlet of each hydronic boiler.
3. Inlet and outlet of each hydronic coil in air-handling units.
4. Inlet and outlet of each hydronic pump.
5. Two (2) inlets and two (2) outlets of each chiller.
6. Inlet and outlet of each thermal-storage tank.
7. Outside-, return-, supply-, and mixed-air ducts.

V. Install pressure gages in the following locations:

1. Discharge of each pressure-reducing valve.
2. Inlet and outlet of each hot water connection.
3. Suction and discharge of each pump.

W. Install pressure/temperature ports in the following locations:

1. Inlet and outlet of each hydronic zone.
2. Inlet and outlet of each hydronic boiler.
3. Inlet and outlet of each hydronic coil in air-handling units.
4. Inlet and outlet of each hydronic pump.
5. Two (2) inlets and two (2) outlets of each chiller.

3.2 CONNECTIONS

A. Install meters and gages adjacent to machines and equipment to allow service and maintenance of meters, gages, machines, and equipment.

B. Connect flowmeter-system elements to meters.

C. Connect flowmeter transmitters to meters.

D. Connect thermal-energy meter transmitters to meters.

3.3 ADJUSTING

A. After installation, calibrate meters according to manufacturer's written instructions.

B. Adjust faces of meters and gages to proper angle for best visibility.

3.4 THERMOMETER SCHEDULE

A. Thermometers at inlet and outlet of each hydronic zone shall be one (1) of the following:

1. Liquid-filled and sealed bimetallic-actuated type.
2. Direct-or mounted, metal-case, vapor-actuated type.
3. Compact or Industrial-style, liquid-in-glass type.
4. Test plug with chlorosulfonated polyethylene synthetic self-sealing rubber inserts.

B. Thermometers at inlet and outlet of each hydronic boiler shall be one (1) of the following:

1. Liquid-filled and sealed bimetallic-actuated type.
2. Direct-or mounted, metal-case, vapor-actuated type.
3. Compact or Industrial-style, liquid-in-glass type.
4. Test plug with chlorosulfonated polyethylene synthetic self-sealing rubber inserts.

C. Thermometers at inlets and outlets of each chiller shall be one (1) of the following:

1. Liquid-filled and sealed bimetallic-actuated type.
2. Direct-or mounted, metal-case, vapor-actuated type.
3. Compact or Industrial-style, liquid-in-glass type.
4. Test plug with chlorosulfonated polyethylene synthetic self-sealing rubber inserts.

D. Thermometers at inlet and outlet of each hydronic coil in air-handling units and built-up central systems shall be one (1) of the following:

1. Liquid-filled and sealed bimetallic-actuated type.
2. Direct-or mounted, metal-case, vapor-actuated type.
3. Compact or Industrial-style, liquid-in-glass type.
4. Test plug with chlorosulfonated polyethylene synthetic self-sealing rubber inserts.

E. Thermometers at inlets and outlets of each hydronic heat exchanger shall be one (1) of the following:

1. Liquid-filled and sealed bimetallic-actuated type.
2. Direct-or mounted, metal-case, vapor-actuated type.
3. Compact or Industrial-style, liquid-in-glass type.
4. Test plug with chlorosulfonated polyethylene synthetic self-sealing rubber inserts.

F. Thermometers at inlet and outlet of each thermal-storage tank shall be one (1) of the following:

1. Liquid-filled and sealed bimetallic-actuated type.
2. Direct-or mounted, metal-case, vapor-actuated type.
3. Compact or Industrial-style, liquid-in-glass type.
4. Test plug with chlorosulfonated polyethylene synthetic self-sealing rubber inserts.

G. Thermometers at outside-, return-, supply-, and mixed-air ducts shall be one (1) of the following:

1. Liquid-filled and sealed bimetallic-actuated type.
2. Direct-or mounted, metal-case, vapor-actuated type.
3. Compact or Industrial-style, liquid-in-glass type.

H. Thermometer stems shall be of length to match thermowell insertion length.

3.5 THERMOMETER SCALE-RANGE SCHEDULE

A. Scale Range for Chilled-Water Piping: 20 to 100 deg F (Minus 20 to plus 48 deg C).

B. Scale Range for Heating, Hot-Water Piping: 20 to 240 deg F (minus 6 to 115 deg C).

C. Scale Range for Air Ducts: 0 to 150 deg F (Minus 20 to plus 70 deg C).

3.6 PRESSURE-GAGE SCHEDULE

A. Pressure gages at discharge of each pressure-reducing valve shall be one (1) of the following:

1. Sealed direct-mounted, metal case.
2. Test plug with EPDM self-sealing rubber inserts.

B. Pressure gages at inlet and outlet of each chiller chilled-water, condenser water, hot water connection shall be one (1) of the following:

1. Sealed direct mounted, metal case.
2. Test plug with EPDM self-sealing rubber inserts.

C. Pressure gages at suction and discharge of each pump shall be one (1) of the following:

1. Sealed direct mounted, metal case.
2. Test plug with EPDM self-sealing rubber inserts.

3.7 PRESSURE-GAGE SCALE-RANGE SCHEDULE

A. Scale Range for Chilled-Water Piping: 0 to 160 psi.

B. Scale Range for heating hot water Piping: 0 to 160 psi.

3.8 FLOWMETER SCHEDULE

A. Flowmeters for Chilled-Water Piping: Insertion Electromagnetic type.

B. Flowmeters for heating hot water Piping: Insertion Electromagnetic type.

3.9 THERMAL-ENERGY METER SCHEDULE

A. Thermal-Energy Meters for Chilled-Water Piping: Ultrasonic type.

B. Thermal-Energy Meters for Heating, Hot-Water Piping: Ultrasonic type.

END OF SECTION 230519

SECTION 230523 - GENERAL-DUTY VALVES FOR HVAC PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

B. Section Includes:

1. Bronze angle valves.
2. Bronze ball valves.
3. Iron ball valves.
4. Iron, single-flange butterfly valves.
5. Iron, grooved-end butterfly valves.
6. Bronze swing check valves.
7. Iron swing check valves.
8. Iron, grooved-end swing check valves.
9. Iron, center-guided check valves.
10. Bronze gate valves.
11. Iron Gate valves
12. Bronze globe valves. Iron globe valves.
13. Iron Globe
14. Chainwheels.

C. Related Sections:

1. Section 230553 "Identification for HVAC Piping and Equipment" for valve tags.

1.2 DEFINITIONS

A. CWP: Cold working pressure.

B. EPDM: Ethylene propylene copolymer rubber.

C. NBR: Acrylonitrile-butadiene, Buna-N, or nitrile rubber.

D. NRS: Nonrising stem.

E. OS&Y: Outside screw and yoke.

F. RS: Rising stem.

G. SWP: Steam working pressure.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of valve indicated.

1.4 QUALITY ASSURANCE

A. Source Limitations for Valves: Obtain each type of valve from single source from single manufacturer.

B. ASME Compliance:

1. ASME B16.10 and ASME B16.34 for ferrous valve dimensions and design criteria.
2. ASME B31.1 for power piping valves.
3. ASME B31.9 for building services piping valves.

C. To assure uniformity and compatibility, all grooved end valves and adjoining couplings shall be the products of a single manufacturer.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Prepare valves for shipping as follows:

1. Protect internal parts against rust and corrosion.
2. Protect threads, flange faces, grooves, and weld ends.
3. Set angle, gate, and globe valves closed to prevent rattling.
4. Set ball and plug valves open to minimize exposure of functional surfaces.
5. Set butterfly valves closed or slightly open.
6. Block check valves in either closed or open position.

B. Use the following precautions during storage:

1. Maintain valve end protection.
2. Store valves indoors and maintain at higher than ambient dew point temperature. If outdoor storage is necessary, store valves off the ground in watertight enclosures.

C. Use sling to handle large valves; rig sling to avoid damage to exposed parts. Do not use handwheels or stems as lifting or rigging points.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR VALVES

A. Refer to HVAC valve schedule articles for applications of valves.

B. Valve Pressure and Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.

C. Valve Sizes: Same as upstream piping unless otherwise indicated.

D. Valve Actuator Types:

1. Gear Actuator: For For quarter-turn valves NPS 8 (DN 200) and larger
2. Handwheel: For valves other than quarter-turn types.
3. Handlever: For quarter-turn valves NPS 6 (DN 150) and smaller except plug valves.
4. Chainwheel: Device for attachment to valve handwheel, stem, or other actuator; of size and with chain for mounting height, as indicated in the "Valve Installation" Article.

E. Valves in Insulated Piping: With 2-inch stem extensions and the following features:

1. Gate Valves: With rising stem.
2. Ball Valves: With extended operating handle of non-thermal-conductive material, and protective sleeve that allows operation of valve without breaking the vapor seal or disturbing insulation.
3. Butterfly Valves: With extended neck.

F. Valve-End Connections:

1. Flanged: With flanges according to ASME B16.1 for iron valves.
2. Threaded: With threads according to ASME B1.20.1.

G. Valve Bypass and Drain Connections: MSS SP-45.

2.2 BRONZE ANGLE VALVES

A. Class 150, Bronze Angle Valves with Bronze Disc:

1. Manufacturers: Subject to compliance with requirements, provide product by one (1) of the following:

a. Crane Co.; Crane Valve Group; Stockham Division
b. Kitz Corporation
c. Milwaukee Valve Company

2. Description:

a. Standard: MSS SP-80, Type 1.
b. CWP Rating: 300 psig.
c. Body Material: ASTM B 62, bronze with integral seat and union-ring bonnet.
d. Ends: Threaded.
e. Stem and Disc: Bronze.
f. Packing: Asbestos free.
g. Handwheel: Malleable iron.

2.3 BRONZE BALL VALVES

A. Two-Piece, Full-Port, Bronze Ball Valves with Bronze Trim:

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

a. American Valve, Inc.
b. Conbraco Industries, Inc.; Apollo Valves
c. Crane Co.; Crane Valve Group; Crane Valves
d. Hammond Valve
e. Milwaukee Valve Company

2. Description:

a. Standard: MSS SP-110.
b. SWP Rating: 150 psig.
c. CWP Rating: 600 psig.
d. Body Design: Two-piece.
e. Body Material: Bronze.
f. Ends: Threaded.

g. Seats: PTFE or TFE.
h. Stem: Bronze.
i. Ball: Chrome-plated brass.
j. Port: Full.

2.4 IRON BALL VALVES

A. Class 150, Iron Ball Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

a. American Valve, Inc.
b. Conbraco Industries, Inc.; Apollo Valves
c. Kitz Corporation
d. Sure Flow Equipment Inc.
e. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Description:

a. Standard: MSS SP-72.
b. CWP Rating: 285 psig.
c. Body Design: Split body.
d. Body Material: ASTM A 126, gray iron.
e. Ends: Flanged.
f. Seats: TFE.
g. Stem: Stainless-steel. Blowout-proof.
h. Ball: Stainless-steel.
i. Port: Full.
j. Flanged ends.

2.5 IRON, SINGLE-FLANGE BUTTERFLY VALVES

A. 200 CWP, Iron, Single-Flange Butterfly Valves with EPDM Seat and Stainless-Steel Disc:

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

a. American Valve, Inc.
b. Conbraco Industries, Inc.; Apollo Valves
c. Hammond Valve
d. Kitz Corporation
e. Milwaukee Valve Company
f. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Description:

a. Standard: MSS SP-67, Type I.
b. CWP Rating: 200 psig.
c. Body Design: Lug type; suitable for bidirectional dead-end service at rated pressure without use of downstream flange.
d. Body Material: ASTM A 126, cast iron or ASTM A 536, ductile iron.
e. Seat: EPDM.
f. Stem: One- or two-piece stainless-steel.
g. Disc: Stainless-steel.

2.6 IRON, GROOVED-END BUTTERFLY VALVES

A. 300 CWP, Iron, Grooved-End Butterfly Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

a. Victaulic; **Vic®-300 MasterSeal™** and **Vic®-300 AGS**
b. Substitutions: Under provision of Section 012500 “Substitution Procedures”.

2. Description:

a. Standard: MSS SP-67, Type I.
b. NPS 8 and Smaller CWP Rating: 300 psig.
c. NPS 10 and Larger CWP Rating: 300 psig.
d. Body Material: Coated, ductile iron.
e. Stem: Two-piece stainless-steel.
f. Disc: Coated, ductile iron, offset.
g. Seal: EPDM.

2.7 BRONZE SWING CHECK VALVES

A. Class 150, Bronze Swing Check Valves with Bronze Disc:

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

a. American Valve, Inc.
b. Crane Co.; Crane Valve Group; Crane Valves
c. Milwaukee Valve Company
d. Hammond Valve
e. Kitz Corporation

2. Description:

a. Standard: MSS SP-80, Type 3.
b. CWP Rating: 300 psig.
c. Body Design: Horizontal flow.
d. Body Material: ASTM B 62, bronze.
e. Ends: Threaded.
f. Disc: Bronze.

2.8 IRON SWING CHECK VALVES

A. Class 250, Iron Swing Check Valves with Metal Seats:

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

a. Crane Co.; Crane Valve Group; Crane Valves
b. Hammond Valve
c. Milwaukee Valve Company

2. Description:

a. Standard: MSS SP-71, Type I.
b. NPS 2-1/2 to NPS 12 (DN 65 to DN 300), CWP Rating: 500 psig.
c. Body Design: Clear or full waterway.
d. Body Material: ASTM A 126, gray iron with bolted bonnet.
e. Ends: Flanged.
f. Trim: Bronze.
g. Gasket: Asbestos free.
h. Style: Compact wafer.
i. Seat: EPDM.

2.9 IRON, GROOVED-END SWING CHECK VALVES

A. 300 CWP, Iron, Grooved-End Swing Check Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

a. Victaulic; **Series 716H**, **716**, or **779**
b. Substitutions: Under provision of Section 012500 “Substitution Procedures”.

2. Description:

a. NPS 2 to NPS 3, CWP Rating: 365 psig.
b. NPS 4 to NPS 12, CWP Rating: 300 psig.
c. Body Material: ASTM A 536, ductile iron.
d. Seal: EPDM.
e. Disc: Spring operated, ductile iron or stainless-steel.

B. 230 CWP, Iron, Grooved-End Swing Check Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

a. Victaulic; **Series W715**
b. Substitutions: Under provision of Section 012500 “Substitution Procedures”.

2. Description:

a. NPS 14 to NPS 24 CWP Rating: 230 psig.
b. Body Material: ASTM A 395, ductile iron.
c. Seal: EPDM.
d. Disc: Spring operated, stainless-steel.

2.10 IRON, CENTER-GUIDED CHECK VALVES

A. Class 150, Iron, Compact-Wafer, Center-Guided Check Valves with Metal Seat:

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

a. APCO Willamette Valve and Primer Corporation
b. Crispin Valve
c. Val-Matic Valve & Manufacturing Corp.

2. Description:

a. Standard: MSS SP-125.
b. NPS 2-1/2 to NPS 12 (DN 65 to DN 300), CWP Rating: 300 psig.
c. NPS 14 to NPS 24 (DN 350 to DN 600), CWP Rating: 250 psig.
d. Body Material: ASTM A 395 or ASTM A 536, ductile iron.
e. Style: Compact wafer.
f. Seat: Bronze.

2.11 BRONZE GATE VALVES

A. Class 150, RS Bronze Gate Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

a. Crane Co.; Crane Valve Group; Crane Valves
b. Hammond Valve
c. Milwaukee Valve Company
d. Kitz Corporation

2. Description:

a. Standard: MSS SP-80, Type 2.
b. CWP Rating: 300 psig.
c. Body Material: ASTM B 62, bronze with integral seat and union-ring bonnet.
d. Ends: Threaded.
e. Stem: Bronze.
f. Disc: Solid wedge; bronze.
g. Packing: Asbestos free.
h. Handwheel: Malleable iron.

2.12 IRON GATE VALVES

A. Class 250, OS&Y, Iron Gate Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

a. Crane Co.; Crane Valve Group; Crane Valves
b. Milwaukee Valve Company
c. NIBCO INC.
d. Powell Valves
e. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Description:

a. Standard: MSS SP-70, Type I.
b. NPS 2-1/2 to NPS 12 (DN 65 to DN 300), CWP Rating: 500 psig.
c. Body Material: ASTM A 126, gray iron with bolted bonnet.
d. Ends: Flanged.
e. Trim: Bronze.
f. Disc: Solid wedge.
g. Packing and Gasket: Asbestos free.

2.13 BRONZE GLOBE VALVES

A. Class 150, Bronze Globe Valves with Nonmetallic Disc:

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

a. Crane Co.; Crane Valve Group; Crane Valves
b. Hammond Valve
c. Milwaukee Valve Company
d. Kitz Corporation
e. NIBCO INC.

2. Description:

a. Standard: MSS SP-80, Type 2.
b. CWP Rating: 300 psig.
c. Body Material: ASTM B 62, bronze with integral seat and union-ring bonnet.
d. Ends: Threaded.
e. Stem: Bronze.
f. Disc: PTFE or TFE.
g. Packing: Asbestos free.
h. Handwheel: Malleable iron, bronze.

2.14 IRON GLOBE VALVES

A. Class 250, Iron Globe Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

a. Crane Co.; Crane Valve Group; Crane Valves
b. Milwaukee Valve Company
c. NIBCO INC.
d. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Description:

a. Standard: MSS SP-85, Type I.
b. CWP Rating: 500 psig.
c. Body Material: ASTM A 126, gray iron with bolted bonnet.
d. Ends: Flanged.
e. Trim: Bronze.
f. Packing and Gasket: Asbestos free.

2.15 CHAINWHEELS

A. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

1. Babbitt Steam Specialty Co.
2. Roto Hammer Industries
3. Trumbull Industries

B. Description: Valve actuation assembly with sprocket rim, brackets, and chain.

1. Brackets: Type, number, size, and fasteners required to mount actuator on valve.
2. Attachment: For connection to ball valve stems.
3. Sprocket Rim with Chain Guides: Ductile iron of type and size required for valve. Include zinc coating.
4. Chain: Hot-dip, galvanized steel, of size required to fit sprocket rim.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine valve interior for cleanliness, freedom from foreign matter, and corrosion. Remove special packing materials, such as blocks, used to prevent disc movement during shipping and handling.

B. Operate valves in positions from fully open to fully closed. Examine guides and seats made accessible by such operations.

C. Examine threads on valve and mating pipe for form and cleanliness.

D. Examine mating flange faces for conditions that might cause leakage. Check bolting for proper size, length, and material. Verify that gasket is of proper size, that its material composition is suitable for service, and that it is free from defects and damage.

E. Do not attempt to repair defective valves; replace with new valves.

F. Examine grooved ends for conditions that might cause leakage. Ends should be free from indentations or projections in the area from valve end to groove.

3.2 VALVE INSTALLATION

A. Install valves with unions, grooved-joint mechanical couplings or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.

B. Locate valves for easy access and provide separate support where necessary.

C. Install valves in horizontal piping with stem at or above center of pipe.

D. Install valves in position to allow full stem movement.

E. Install chainwheels on operators for ball, butterfly, gate and globe valves, NPS 4 (DN 100) and larger and more than 96 inches above floor. Extend chains to 60 inches above finished floor.

F. Install check valves for proper direction of flow and as follows:

1. Swing Check Valves: In horizontal position with hinge pin level.
2. Center-Guided Check Valves: In horizontal or vertical position, between flanges.

3.3 ADJUSTING

A. Adjust or replace valve packing after piping systems have been tested and put into service but before final adjusting and balancing. Replace valves if persistent leaking occurs.

3.4 GENERAL REQUIREMENTS FOR VALVE APPLICATIONS

A. If valve applications are not indicated, use the following:

1. Shutoff Service: Ball, butterfly, or ball valves.
2. Butterfly Valve Dead-End Service: Single-flange (lug) type.
3. Throttling Service except Steam: Globe valves.
4. Pump-Discharge Check Valves:

a. NPS 2 (DN 50) and Smaller: Bronze swing check valves with bronze disc.
b. NPS 2-1/2 (DN 65) and Larger: Iron swing check valves with lever and weight or with spring or iron, center-guided, resilient-seat check valves.

B. If valves with specified SWP classes or CWP ratings are not available, the same types of valves with higher SWP classes or CWP ratings may be substituted.

C. Select valves, except wafer types, with the following end connections:

1. For Copper Tubing, NPS 2 (DN 50) and Smaller: Threaded ends except where solder-joint valve-end option is indicated in valve schedules below.
2. For Steel Piping, NPS 2-1/2 to NPS 4 (DN 65 to DN 100): Flanged ends.
3. For Steel Piping NPS 5 (DN125) and Larger: Flanged ends.
4. For Grooved-End Copper Tubing and Steel Piping except Steam and Steam Condensate Piping: Valve ends may be grooved.

3.5 HEATING-WATER VALVE SCHEDULE

A. Pipe NPS 2 (DN 50) and Smaller:

1. Bronze Valves: May be provided with solder-joint ends instead of threaded ends.
2. Bronze Angle Valves: Class 150, bronze disc.
3. Ball Valves: Two-piece, full port, bronze with bronze trim.
4. Bronze Swing Check Valves: Class 150, bronze disc.
5. Bronze Gate Valves: Class 150, RS.
6. Bronze Globe Valves: Class 150, bronze disc.

B. Pipe NPS 2-1/2 (DN 65) and Larger:

1. Iron Valves, NPS 2-1/2 to NPS 4 (DN 65 to DN 100): flanged ends.
2. Iron, Grooved-end Butterfly Valves NPS 2 and larger: 300 PSI CWP
3. Iron Ball Valves, NPS 2-1/2 to NPS 10 (DN 65 to DN 250): Class 150.
4. Iron Swing Check Valves: Class 250, metal seats.
5. Iron, Grooved-end Swing Check Valves NPS 2 to NPS 12: 300 PSI CWP

END OF SECTION 230523

SECTION 230529 - HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Metal pipe hangers and supports.
2. Trapeze pipe hangers.
3. Metal framing systems.
4. Thermal-hanger shield inserts.
5. Fastener systems.
6. Pipe stands.
7. Equipment supports.

B. Related Sections:

1. Section 055000 "Metal Fabrications" for structural-steel shapes and plates for trapeze hangers for pipe and equipment supports.
2. Section 230548 "Vibration and Seismic Controls for HVAC Piping and Equipment" for vibration isolation devices.
3. Section 233113 “Metal Ducts” for duct hangers and supports.

1.3 DEFINITIONS

A. MSS: Manufacturers Standardization Society of The Valve and Fittings Industry Inc.

1.4 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design trapeze pipe hangers and equipment supports, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

B. Structural Performance: Hangers and supports for HVAC piping and equipment shall withstand the effects of gravity loads and stresses within limits and under conditions indicated according to ASCE/SEI 7.

1. Design supports for multiple pipes, including pipe stands, capable of supporting combined weight of supported systems, system contents, and test water.
2. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.
3. Design seismic-restraint hangers and supports for piping and equipment and obtain approval from authorities having jurisdiction.

1.5 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Signed and sealed by a qualified professional engineer. Show fabrication and installation details and include calculations for the following:

1. Trapeze pipe hangers.
2. Metal framing systems.
3. Pipe stands.
4. Equipment supports.

C. Delegated-Design Submittal: For trapeze hangers indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation. The Engineer shall be licensed in the State of Connecticut.

1. Detail fabrication and assembly of trapeze hangers.
2. Design Calculations: Calculate requirements for designing trapeze hangers.

D. Welding certificates.

1.6 QUALITY ASSURANCE

A. Structural Steel Welding Qualifications: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code - Steel."

B. Pipe Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.

PART 2 - PRODUCTS

2.1 METAL PIPE HANGERS AND SUPPORTS

A. Carbon-Steel Pipe Hangers and Supports:

1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
2. Galvanized Metallic Coatings: Pregalvanized or hot dipped.
3. Nonmetallic Coatings: Plastic coating, jacket, or liner.
4. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.
5. Hanger Rods: Continuous-thread rod, nuts, and washer made of carbon steel.

B. Copper Pipe Hangers:

1. Description: MSS SP-58, Types 1 through 58, copper-coated-steel, factory-fabricated components.
2. Hanger Rods: Continuous-thread rod, nuts, and washer made of copper-coated steel.

2.2 TRAPEZE PIPE HANGERS

A. Description: MSS SP-69, Type 59, shop- or field-fabricated pipe-support assembly made from structural carbon-steel shapes with MSS SP-58 carbon-steel hanger rods, nuts, saddles, and U-bolts.

2.3 METAL FRAMING SYSTEMS

A. MFMA Manufacturer Metal Framing Systems:

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

    a. Flex-Strut Inc.
    b. Unistrut Corporation; Tyco International, Ltd.
    c. Wesanco, Inc.
    d. GS Metals Corp.

2. Description: Shop- or field-fabricated pipe-support assembly for supporting multiple parallel pipes.
3. Standard: MFMA-4.
4. Channels: Continuous slotted steel channel with inturned lips.
5. Channel Nuts: Formed or stamped steel nuts or other devices designed to fit into channel slot and, when tightened, prevent slipping along channel.
6. Hanger Rods: Continuous-thread rod, nuts, and washer made of carbon steel.
7. Metallic Coating: Electroplated zinc.

B. Non-MFMA Manufacturer Metal Framing Systems:

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

    a. Anvil International; a subsidiary of Mueller Water Products Inc.
    b. Empire Industries, Inc.
    c. ERICO International Corporation

2. Description: Shop- or field-fabricated pipe-support assembly made of steel channels, accessories, fittings, and other components for supporting multiple parallel pipes.
3. Standard: Comply with MFMA-4.
4. Channels: Continuous slotted steel channel with inturned lips.
5. Channel Nuts: Formed or stamped steel nuts or other devices designed to fit into channel slot and, when tightened, prevent slipping along channel.
6. Hanger Rods: Continuous-thread rod, nuts, and washer made of carbon steel.
7. Coating: Zinc.

2.4 THERMAL-HANGER SHIELD INSERTS

A. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

1. Carpenter & Paterson, Inc.
2. Clement Support Services
3. ERICO International Corporation
4. National Pipe Hanger Corporation
5. PHS Industries, Inc.

B. Insulation-Insert Material for Cold Piping: ASTM C 591, Type VI, Grade 1 polyisocyanurate with 125-psig minimum compressive strength and vapor barrier.

C. Insulation-Insert Material for Hot Piping ASTM C 591, Type VI, Grade 1 polyisocyanurate with 125-psig minimum compressive strength.

D. For Trapeze or Clamped Systems: Insert and shield shall cover entire circumference of pipe.

E. For Clevis or Band Hangers: Insert and shield shall cover lower 180 degrees of pipe.

F. Insert Length: Extend 2 inches beyond sheet metal shield for piping operating below ambient air temperature.

2.5 FASTENER SYSTEMS

A. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened Portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

B. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated steel anchors, for use in hardened Portland cement concrete; with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

2.6 PIPE STANDS

A. General Requirements for Pipe Stands: Shop- or field-fabricated assemblies made of manufactured corrosion-resistant components to support roof-mounted piping.

B. Compact Pipe Stand: One-piece plastic unit with integral-rod roller, pipe clamps, or V-shaped cradle to support pipe, for roof installation without membrane penetration.

C. Low-Type, Single-Pipe Stand: One-piece plastic base unit with plastic roller, for roof installation without membrane penetration.

D. High-Type, Multiple-Pipe Stand:

1. Description: Assembly of bases, vertical and horizontal members, and pipe supports, for roof installation without membrane penetration.
2. Bases: One (1) or more; plastic.
3. Vertical Members: Two (2) or more protective-coated-steel channels.
4. Horizontal Member: Protective-coated-steel channel.
5. Pipe Supports: Galvanized-steel, clevis-type pipe hangers.

E. Curb-Mounted-Type Pipe Stands: Shop- or field-fabricated pipe supports made from structural-steel shapes, continuous-thread rods, and rollers, for mounting on permanent stationary roof curb.

2.7 EQUIPMENT SUPPORTS

A. Description: Welded, shop- or field-fabricated equipment support made from structural carbon-steel shapes.

2.8 MISCELLANEOUS MATERIALS

A. Structural Steel: ASTM A 36, carbon-steel plates, shapes, and bars; black and galvanized.

B. Grout: ASTM C 1107, factory-mixed and -packaged, dry, hydraulic-cement, non-shrink and nonmetallic grout; suitable for interior and exterior applications.

1. Properties: Non-staining, noncorrosive, and nongaseous.
2. Design Mix: 5000-psi, 28-day compressive strength.

PART 3 - EXECUTION

3.1 HANGER AND SUPPORT INSTALLATION

A. Metal Pipe-Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from the building structure.

B. Metal Trapeze Pipe-Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Arrange for grouping of parallel runs of horizontal piping and support together on field-fabricated trapeze pipe hangers.

1. Pipes of Various Sizes: Support together and space trapezes for smallest pipe size or install intermediate supports for smaller diameter pipes as specified for individual pipe hangers.
2. Field fabricate from ASTM A 36, carbon-steel shapes selected for loads being supported. Weld steel according to AWS D1.1.

C. Metal Framing System Installation: Arrange for grouping of parallel runs of piping and support together on field-assembled metal framing systems.

D. Thermal-Hanger Shield Installation: Install in pipe hanger or shield for insulated piping.

E. Fastener System Installation:

1. Install powder-actuated fasteners for use in lightweight concrete or concrete slabs less than 4 inches thick in concrete after concrete is placed and completely cured. Use operators that are licensed by powder-actuated tool manufacturer. Install fasteners according to powder-actuated tool manufacturer's operating manual.
2. Install mechanical-expansion anchors in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.

F. Pipe Stand Installation:

1. Pipe Stand Types except Curb-Mounted Type: Assemble components and mount on smooth roof surface. Do not penetrate roof membrane.
2. Curb-Mounted-Type Pipe Stands: Assemble components or fabricate pipe stand and mount on permanent, stationary roof curb. See Section 077200 "Roof Accessories" for curbs.

G. Install hangers and supports complete with necessary attachments, inserts, bolts, rods, nuts, washers, and other accessories.

H. Equipment Support Installation: Fabricate from welded-structural-steel shapes.

I. Install hangers and supports to allow controlled thermal and seismic movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.

J. Install lateral bracing with pipe hangers and supports to prevent swaying.

K. Install building attachments within concrete slabs or attach to structural steel. Install additional attachments at concentrated loads, including valves, flanges, and strainers, NPS 2-1/2 (DN 65) and larger and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten inserts to forms and install reinforcing bars through openings at top of inserts.

L. Load Distribution: Install hangers and supports so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.

M. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and to not exceed maximum pipe deflections allowed by ASME B31.9 for building services piping.

N. Insulated Piping:

1. Attach clamps and spacers to piping.

   a. Piping Operating Above Ambient Air Temperature: Clamp may project through insulation.
   b. Piping Operating Below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.
   c. Do not exceed pipe stress limits allowed by ASME B31.9 for building services piping.

2. Install MSS SP-58, Type 39, protection saddles if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.

3. Install MSS SP-58, Type 40, protective shields on cold piping with vapor barrier. Shields shall span an arc of 180 degrees.

4. Shield Dimensions for Pipe: Not less than the following:

   a. NPS 1/4 to NPS 3-1/2 (DN 8 to DN 90): 12 inches long and 0.048-inch-thick.
   b. NPS 4 (DN 100): 12 inches long and 0.06-inch-thick.

5. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.

3.2 PIPE HANGERS AND SUPPORT SPACING

A. Support horizontal steel and copper as follows:

1. ½-Inch to 1¼-inch Pipe Size: 6’-0” maximum hanger spacing.
2. 1½-Inch to 2-Inch Pipe Size: 10’-0” maximum hanger spacing.
3. 2½-Inch to 3-Inch Pipe Size: 10’-0” maximum hanger spacing.
4. 3½-Inch to 6-Inch Pipe Size: 10’-0” maximum hanger spacing.

B. Pre-Insulated PEX Piping:

1. Support in accordance with the manufacturer’s requirements but with spacing not exceeding every 3.5 feet.
2. Minimum rod diameter shall be 3/8-inch for pipe sizes 2-inch and less, ½-inch for 2½-3 inches, 5/8-inch for 4-inch pipe size, and ¾-inch for pipe sizes larger that 4 inches.

3.3 EQUIPMENT SUPPORTS

A. Fabricate structural-steel stands to suspend equipment from structure overhead or to support equipment above floor.

B. Grouting: Place grout under supports for equipment and make bearing surface smooth.

C. Provide lateral bracing, to prevent swaying, for equipment supports.

3.4 METAL FABRICATIONS

A. Cut, drill, and fit miscellaneous metal fabrications for trapeze pipe hangers and equipment supports.

B. Fit exposed connections together to form hairline joints. Field weld connections that cannot be shop welded because of shipping size limitations.

C. Field Welding: Comply with AWS D1.1 procedures for shielded, metal arc welding; appearance and quality of welds; and methods used in correcting welding work; and with the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. Finish welds at exposed connections so no roughness shows after finishing and so contours of welded surfaces match adjacent contours.

3.5 ADJUSTING

A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.

B. Trim excess length of continuous-thread hanger and support rods to 1½ inches.

3.6 PAINTING

A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.

1. Apply paint by brush or spray to provide a minimum dry film thickness of 2.0 mils.

B. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

3.7 HANGER AND SUPPORT SCHEDULE

A. Specific hanger and support requirements are in Sections specifying piping systems and equipment.

B. Comply with MSS SP-69 for pipe-hanger selections and applications that are not specified in piping system Sections.

C. Use hangers and supports with galvanized metallic coatings for piping and equipment that will not have field-applied finish.

D. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.

E. Use carbon-steel pipe hangers and supports, metal trapeze pipe hangers and metal framing systems and attachments for general service applications.

F. Use copper-plated pipe hangers and copper attachments for copper piping and tubing.

G. Use padded hangers for piping that is subject to scratching.

H. Use thermal-hanger shield inserts for insulated piping and tubing.

I. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Adjustable, Steel Clevis Hangers (MSS Type 1): For suspension of non-insulated or insulated, stationary pipes NPS 1/2 to NPS 30 (DN 15 to DN 750).
2. Yoke-Type Pipe Clamps (MSS Type 2): For suspension of up to 1050 deg F (566 deg C), pipes NPS 4 to NPS 24 (DN 100 to DN 600), requiring up to 4 inches of insulation.
3. Carbon- or Alloy-Steel, Double-Bolt Pipe Clamps (MSS Type 3): For suspension of pipes NPS 3/4 to NPS 36 (DN 20 to DN 900), requiring clamp flexibility and up to 4 inches of insulation.
4. Steel Pipe Clamps (MSS Type 4): For suspension of cold and hot pipes NPS 1/2 to NPS 24 (DN 15 to DN 600) if little or no insulation is required.
5. Pipe Hangers (MSS Type 5): For suspension of pipes NPS 1/2 to NPS 4 (DN 15 to DN 100), to allow off-center closure for hanger installation before pipe erection.
6. Adjustable, Swivel Split- or Solid-Ring Hangers (MSS Type 6): For suspension of non-insulated, stationary pipes NPS 3/4 to NPS 8 (DN 20 to DN 200).
7. Adjustable, Steel Band Hangers (MSS Type 7): For suspension of non-insulated, stationary pipes NPS 1/2 to NPS 8 (DN 15 to DN 200).
8. Adjustable Band Hangers (MSS Type 9): For suspension of non-insulated, stationary pipes NPS 1/2 to NPS 8 (DN 15 to DN 200).
9. Adjustable, Swivel-Ring Band Hangers (MSS Type 10): For suspension of non-insulated, stationary pipes NPS 1/2 to NPS 8 (DN 15 to DN 200).
10. Split Pipe Ring with or without Turnbuckle Hangers (MSS Type 11): For suspension of non-insulated, stationary pipes NPS 3/8 to NPS 8 (DN 10 to DN 200).
11. Extension Hinged or Two-Bolt Split Pipe Clamps (MSS Type 12): For suspension of non-insulated, stationary pipes NPS 3/8 to NPS 3 (DN 10 to DN 80).
12. U-Bolts (MSS Type 24): For support of heavy pipes NPS 1/2 to NPS 30 (DN 15 to DN 750).
13. Clips (MSS Type 26): For support of insulated pipes not subject to expansion or contraction.
14. Pipe Saddle Supports (MSS Type 36): For support of pipes NPS 4 to NPS 36 (DN 100 to DN 900), with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate.
15. Pipe Stanchion Saddles (MSS Type 37): For support of pipes NPS 4 to NPS 36 (DN 100 to DN 900), with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate, and with U-bolt to retain pipe.
16. Adjustable Pipe Saddle Supports (MSS Type 38): For stanchion-type support for pipes NPS 2-1/2 to NPS 36 (DN 65 to DN 900) if vertical adjustment is required, with steel-pipe base stanchion support and cast-iron floor flange.
17. Single-Pipe Rolls (MSS Type 41): For suspension of pipes NPS 1 to NPS 30 (DN 25 to DN 750), from two (2) rods if longitudinal movement caused by expansion and contraction might occur.
18. Adjustable Roller Hangers (MSS Type 43): For suspension of pipes NPS 2-1/2 to NPS 24 (DN 65 to DN 600), from single rod if horizontal movement caused by expansion and contraction might occur.
19. Complete Pipe Rolls (MSS Type 44): For support of pipes NPS 2 to NPS 42 (DN 50 to DN 1050) if longitudinal movement caused by expansion and contraction might occur but vertical adjustment is not necessary.
20. Pipe Roll and Plate Units (MSS Type 45): For support of pipes NPS 2 to NPS 24 (DN 50 to DN 600) if small horizontal movement caused by expansion and contraction might occur and vertical adjustment is not necessary.

21. Adjustable Pipe Roll and Base Units (MSS Type 46): For support of pipes NPS 2 to NPS 30 (DN 50 to DN 750) if vertical and lateral adjustment during installation might be required in addition to expansion and contraction.

J. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers NPS 3/4 to NPS 24 (DN 24 to DN 600).
2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers NPS 3/4 to NPS 24 (DN 20 to DN 600) if longer ends are required for riser clamps.

K. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel Turnbuckles (MSS Type 13): For adjustment up to 6 inches for heavy loads.
2. Steel Clevises (MSS Type 14): For 120 to 450 deg F (49 to 232 deg C) piping installations.
3. Swivel Turnbuckles (MSS Type 15): For use with MSS Type 11, split pipe rings.
4. Malleable-Iron Sockets (MSS Type 16): For attaching hanger rods to various types of building attachments.
5. Steel Weldless Eye Nuts (MSS Type 17): For 120 to 450 deg F (49 to 232 deg C) piping installations.

L. Building Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel or Malleable Concrete Inserts (MSS Type 18): For upper attachment to suspend pipe hangers from concrete ceiling.
2. Top-Beam C-Clamps (MSS Type 19): For use under roof installations with bar-joist construction, to attach to top flange of structural shape.
3. Side-Beam or Channel Clamps (MSS Type 20): For attaching to bottom flange of beams, channels, or angles.
4. Center-Beam Clamps (MSS Type 21): For attaching to center of bottom flange of beams.
5. Welded Beam Attachments (MSS Type 22): For attaching to bottom of beams if loads are considerable and rod sizes are large.
6. C-Clamps (MSS Type 23): For structural shapes.
7. Top-Beam Clamps (MSS Type 25): For top of beams if hanger rod is required tangent to flange edge.
8. Side-Beam Clamps (MSS Type 27): For bottom of steel I-beams.
9. Steel-Beam Clamps with Eye Nuts (MSS Type 28): For attaching to bottom of steel I-beams for heavy loads.
10. Linked-Steel Clamps with Eye Nuts (MSS Type 29): For attaching to bottom of steel I-beams for heavy loads, with link extensions.
11. Malleable-Beam Clamps with Extension Pieces (MSS Type 30): For attaching to structural steel.
12. Welded-Steel Brackets: For support of pipes from below or for suspending from above by using clip and rod. Use one of the following for indicated loads:

    a. Light (MSS Type 31): 750 lb.
    b. Medium (MSS Type 32): 1500 lb.
    c. Heavy (MSS Type 33): 3000 lb.

13. Side-Beam Brackets (MSS Type 34): For sides of steel or wooden beams.
14. Plate Lugs (MSS Type 57): For attaching to steel beams if flexibility at beam is required.

15. Horizontal Travelers (MSS Type 58): For supporting piping systems subject to linear horizontal movement where headroom is limited.

M. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel-Pipe-Covering Protection Saddles (MSS Type 39): To fill interior voids with insulation that matches adjoining insulation.
2. Protection Shields (MSS Type 40): Of length recommended in writing by manufacturer to prevent crushing insulation.
3. Thermal-Hanger Shield Inserts: For supporting insulated pipe.

N. Spring Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Restraint-Control Devices (MSS Type 47): Where indicated to control piping movement.
2. Spring Cushions (MSS Type 48): For light loads if vertical movement does not exceed 1¼ inches.
3. Spring-Cushion Roll Hangers (MSS Type 49): For equipping Type 41, roll hanger with springs.
4. Spring Sway Braces (MSS Type 50): To retard sway, shock, vibration, or thermal expansion in piping systems.
5. Variable-Spring Hangers (MSS Type 51): Preset to indicated load and limit variability factor to twenty-five percent (25%) to allow expansion and contraction of piping system from hanger.
6. Variable-Spring Base Supports (MSS Type 52): Preset to indicated load and limit variability factor to twenty-five percent (25%) to allow expansion and contraction of piping system from base support.
7. Variable-Spring Trapeze Hangers (MSS Type 53): Preset to indicated load and limit variability factor to twenty-five percent (25%) to allow expansion and contraction of piping system from trapeze support.
8. Constant Supports: For critical piping stress and if necessary, to avoid transfer of stress from one (1) support to another support, critical terminal, or connected equipment. Include auxiliary stops for erection, hydrostatic test, and load-adjustment capability. These supports include the following types:

    a. Horizontal (MSS Type 54): Mounted horizontally.
    b. Vertical (MSS Type 55): Mounted vertically.
    c. Trapeze (MSS Type 56): Two (2) vertical-type supports and one trapeze member.

O. Comply with MSS SP-69 for trapeze pipe-hanger selections and applications that are not specified in piping system Sections.

P. Comply with MFMA-103 for metal framing system selections and applications that are not specified in piping system Sections.

Q. Use powder-actuated fasteners or mechanical-expansion anchors instead of building attachments where required in concrete construction.

END OF SECTION 230529

SECTION 230548 - VIBRATION AND SEISMIC CONTROLS FOR HVAC PIPING AND EQUIMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Isolation Pads.
2. Isolation mounts.
3. Restrained elastomeric isolation mounts.
4. Restrained spring isolators.
5. Housed spring mounts.
6. Elastomeric hangers.
7. Spring hangers with vertical-limit stops.
8. Pipe riser resilient supports.
9. Resilient pipe guides.
10. Restrained vibration isolation roof-curbs.
11. Seismic snubbers.
12. Restraining braces and cables.
13. Steel vibration isolation equipment bases.
14. Restrained isolation roof curb rails.

1.3 DEFINITIONS

A. IBC: International Building Code.

B. ICC-ES: ICC-Evaluation Service.

C. OSHPD: Office of Statewide Health Planning and Development for the State of California.

1.4 PERFORMANCE REQUIREMENTS

A. Provide wind and seismic restraints in accordance with the requirements of the Connecticut State Building Code.

1.5 ACTION SUBMITTALS

A. Product Data: For the following:

1. Include rated load, rated deflection, and overload capacity for each vibration isolation device.
2. Illustrate and indicate style, material, strength, fastening provision, and finish for each type and size of seismic-restraint component used.

B. Delegated-Design Submittal: For vibration isolation and seismic-restraint details indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1. Design Calculations: Calculate static and dynamic loading due to equipment weight and operation, seismic and wind forces required to select vibration isolators, seismic and wind restraints, and for designing vibration isolation bases.

    a. Coordinate design calculations with wind load calculations required for equipment mounted outdoors. Comply with requirements in other Division 22 Sections for equipment mounted outdoors.

2. Riser Supports: Include riser diagrams and calculations showing anticipated expansion and contraction at each support point, initial and final loads on building structure, spring deflection changes, and seismic loads. Include certification that riser system has been examined for excessive stress and that none will exist.
3. Vibration Isolation Base Details: Detail overall dimensions, including anchorages and attachments to structure and to supported equipment. Include auxiliary motor slides and rails, base weights, equipment static loads, power transmission, component misalignment, and cantilever loads.
4. Seismic and Wind-Restraint Details:

    a. Design Analysis: To support selection and arrangement of seismic and wind restraints. Include calculations of combined tensile and shear loads.
    b. Details: Indicate fabrication and arrangement. Detail attachments of restraints to the restrained items and to the structure. Show attachment locations, methods, and spacings. Identify components, list their strengths, and indicate directions and values of forces transmitted to the structure during seismic events. Indicate association with vibration isolation devices.
    c. Coordinate seismic-restraint and vibration isolation details with wind-restraint details required for equipment mounted outdoors. Comply with requirements in other Division 22 Sections for equipment mounted outdoors.

C. Coordination Drawings: Show coordination of seismic bracing for HVAC piping and equipment with other systems and equipment in the vicinity, including other supports and seismic restraints.

D. Welding certificates. Contractor to have the latest certificates for each welder involved on the project.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For professional engineer and testing agency.

B. Welding certificates.

C. Field quality-control test reports.

1.7 QUALITY ASSURANCE

A. Testing Agency Qualifications: An independent agency, with the experience and capability to conduct the testing indicated, that is a nationally recognized testing laboratory (NRTL) as defined by OSHA in 29 CFR 1910.7, and that is acceptable to authorities having jurisdiction.

B. Comply with seismic-restraint requirements in the IBC unless requirements in this Section are more stringent.

C. Welding: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code - Steel."

D. Seismic-restraint devices shall have horizontal and vertical load testing and analysis and shall bear anchorage preapproval OPA number from OSHPD, preapproval by ICC-ES, or preapproval by another agency acceptable to authorities having jurisdiction, showing maximum seismic-restraint ratings. Ratings based on independent testing are preferred to ratings based on calculations. If preapproved ratings are not available, submittals based on independent testing are preferred. Calculations (including combining shear and tensile loads) to support seismic-restraint designs must be signed and sealed by a qualified professional engineer.

PART 2 - PRODUCTS

2.1 ISOLATION PADS

A. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

1. Mason Industries
2. Vibro-Acoustics
3. Kinetics Noise Control

B. Arranged in single or multiple layers of sufficient stiffness for uniform loading over pad area, molded with a nonslip pattern and galvanized-steel baseplates, and factory cut to sizes that match requirements of supported equipment.

C. Size: Factory or field cut to match requirements of supported equipment.

1. Pad Material: Oil and water resistant with elastomeric properties.
2. Surface Pattern: Waffle pattern.
3. Infused nonwoven cotton or synthetic fibers.
4. Load-bearing metal plates adhered to pads.
5. Sandwich-Core Material: Resilient and elastomeric.

a. Surface Pattern: Waffle pattern.
b. Infused nonwoven cotton or synthetic fibers.

6. Resilient Material: Oil- and water-resistant neoprene.

2.2 ELASTOMERIC ISOLATION MOUNTS (Double Deflection)

A. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

1. Mason Industries
2. Vibro-Acoustics
3. Kinetics Noise Control
4. Vibration Eliminator Co., Inc.
5. Vibration Isolation

B. Mounting Plates:

1. Top Plate: Encapsulated steel load transfer top plates, factory drilled and threaded with threaded studs or bolts.
2. Baseplate: Encapsulated steel bottom plates with holes provided for anchoring to support structure.

C. Elastomeric Material: Molded, oil-resistant rubber, neoprene, or other elastomeric material.

2.3 RESTRAINED ELASTOMERIC ISOLATION MOUNTS

A. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

1. Mason Industries
2. Vibro-Acoustics
3. Kinetics Noise Control
4. Vibration Eliminator Co., Inc.
5. Vibration Isolation

B. Description: All-directional isolator with restraints containing two (2) separate and opposing elastomeric elements that prevent central threaded element and attachment hardware from contacting the housing during normal operation.

1. Housing: Cast-ductile iron or welded steel.
2. Elastomeric Material: Molded, oil-resistant rubber, neoprene, or other elastomeric material.

2.4 RESTRAINED SPRING ISOLATORS

A. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

1. Mason Industries
2. Vibro-Acoustics
3. Kinetics Noise Control
4. Vibration Eliminator Co., Inc.
5. Vibration Isolation

B. Description: Freestanding, steel, open-spring isolators with seismic or limit-stop restraint.

1. Housing: Steel with resilient vertical-limit stops to prevent spring extension due to weight being removed; factory-drilled baseplate bonded to ¼-inch-thick, neoprene or rubber isolator pad attached to baseplate underside; and adjustable equipment mounting and internal leveling bolt that acts as blocking during installation.
2. Restraint: Seismic or limit stop as required for equipment and authorities having jurisdiction.
3. Outside Spring Diameter: Not less than eighty percent (80%) of the compressed height of the spring at rated load.
4. Minimum Additional Travel: Fifty percent (50%) of the required deflection at rated load.
5. Lateral Stiffness: More than eighty percent (80%) of rated vertical stiffness.
6. Overload Capacity: Support two hundred percent (200%) of rated load, fully compressed, without deformation or failure.

2.5 HOUSED-RESTRAINED-SPRING ISOLATORS

A. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

1. Mason Industries
2. Vibro-Acoustics
3. Kinetics Noise Control

4. Vibration Eliminator Co., Inc.
5. Vibration Isolation

B. Two-Part Telescoping Housing: A steel top and bottom frame separated by an elastomeric material and enclosing the spring isolators. Housings are equipped with adjustable snubbers to limit vertical movement.

1. Drilled base housing for bolting to structure with an elastomeric isolator pad attached to the underside. Bases shall limit floor load to 500 psig.
2. Threaded top housing with adjustment bolt and cap screw to fasten and level equipment.
3. Outside Spring Diameter: Not less than eighty percent (80%) of the compressed height of the spring at rated load.
4. Minimum Additional Travel: Fifty percent (50%) of the required deflection at rated load.
5. Lateral Stiffness: More than eighty percent (80%) of rated vertical stiffness.
6. Overload Capacity: Support two hundred percent (200%) of rated load, fully compressed, without deformation or failure.

2.6 PIPE-RISER RESILIENT SUPPORT

A. Description: All-directional, acoustical pipe anchor consisting of two (2) steel tubes separated by a minimum of ½-inch-thick neoprene. Include steel and neoprene vertical-limit stops arranged to prevent vertical travel in both directions. Design support for a maximum load on the isolation material of 500 psig and for equal resistance in all directions.

2.7 RESILIENT PIPE GUIDES

A. Description: Telescopic arrangement of two (2) steel tubes or post and sleeve arrangement separated by a minimum of ½-inch-thick neoprene. Where clearances are not readily visible, a factory-set guide height with a shear pin to allow vertical motion due to pipe expansion and contraction shall be fitted. Shear pin shall be removable and reinsertable to allow for selection of pipe movement. Guides shall be capable of motion to meet location requirements.

2.8 SPRING HANGERS

A. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

1. Mason Industries
2. Vibro-Acoustics
3. Kinetics Noise Control
4. Vibration Eliminator Co., Inc.
5. Vibration Isolation

B. Description: Combination Coil-Spring and Elastomeric-Insert Hanger with Spring and Insert in Compression:

1. Frame: Steel, fabricated for connection to threaded hanger rods and to allow for a maximum of 30 degrees of angular hanger-rod misalignment without binding or reducing isolation efficiency.
2. Outside Spring Diameter: Not less than eighty percent (80%) of the compressed height of the spring at rated load.
3. Minimum Additional Travel: Fifty percent (50%) of the required deflection at rated load.
4. Lateral Stiffness: More than eighty percent (80%) of rated vertical stiffness.
5. Overload Capacity: Support two hundred percent (200%) of rated load, fully compressed, without deformation or failure.

6. Elastomeric Element: Molded, oil-resistant rubber or neoprene. Steel-washer-reinforced cup to support spring and bushing projecting through bottom of frame.
7. Adjustable Vertical Stop: Steel washer with neoprene washer "up-stop" on lower threaded rod.
8. Self-centering hanger rod cap to ensure concentricity between hanger rod and support spring coil.

2.9 VIBRATION ISOLATION EQUIPMENT BASES

A. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

1. Mason Industries
2. Vibro-Acoustics
3. Kinetics Noise Control
4. Vibration Eliminator Co., Inc.
5. Vibration Isolation

B. Steel Rails: Factory-fabricated, welded, structural-steel rails.

1. Design Requirements: Lowest possible mounting height with not less than 1-inch clearance above the floor. Include equipment anchor bolts and auxiliary motor slide rails.

a. Include supports for suction and discharge elbows for pumps.

2. Structural Steel: Steel shapes, plates, and bars complying with ASTM A 36. Rails shall have shape to accommodate supported equipment.
3. Support Brackets: Factory-welded steel brackets on frame for outrigger isolation mountings and to provide for anchor bolts and equipment support.

C. Steel Bases: Factory-fabricated, welded, structural-steel bases and rails.

1. Design Requirements: Lowest possible mounting height with not less than 1-inch clearance above the floor. Include equipment anchor bolts and auxiliary motor slide bases or rails.

a. Include supports for suction and discharge elbows for pumps.

2. Structural Steel: Steel shapes, plates, and bars complying with ASTM A 36. Bases shall have shape to accommodate supported equipment.
3. Support Brackets: Factory-welded steel brackets on frame for outrigger isolation mountings and to provide for anchor bolts and equipment support.

D. Concrete Inertia Base: Factory-fabricated, welded, structural-steel bases and rails ready for placement of cast-in-place concrete.

1. Design Requirements: Lowest possible mounting height with not less than 1-inch clearance above the floor. Include equipment anchor bolts and auxiliary motor slide bases or rails.

a. Include supports for suction and discharge elbows for pumps.

2. Structural Steel: Steel shapes, plates, and bars complying with ASTM A 36. Bases shall have shape to accommodate supported equipment.

3. Support Brackets: Factory-welded steel brackets on frame for outrigger isolation mountings and to provide for anchor bolts and equipment support.
4. Fabrication: Fabricate steel templates to hold equipment anchor-bolt sleeves and anchors in place during placement of concrete. Obtain anchor-bolt templates from supported equipment manufacturer.

2.10 RESTRAINED VIBRATION ISOLATION ROOF-CURBS

A. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

1. Mason Industries
2. Isolaton Technology, Inc.
3. Kinetics Noise Control
4. Thybar Corporation
5. Vibration Eliminator Co., Inc.
6. Vibration Isolation

B. General Requirements for Restrained Vibration Isolation Roof-Curb: Factory-assembled, fully enclosed, insulated, air- and watertight curb designed to resiliently support equipment and to withstand seismic and wind forces.

C. Lower Support Assembly: Formed sheet-metal “Z” section containing adjustable and removable steel springs that support upper floating frame. Upper frame shall provide continuous support for equipment and shall be captive to resiliently resist seismic and wind forces. Lower support assembly shall have a means for attaching to building structure and a wood nailer for attaching roof materials and shall be insulated with a minimum of 2 inches of rigid, glass-fiber insulation on inside of assembly.

D. The curb shall be built to seismically contain the roof top unit. The unit must be solidly fastened to the top floating rail and the lower section anchored to the roof structure.

E. Spring Isolators: Adjustable, restrained spring isolators shall be mounted on ¼-inch-thick, elastomeric vibration isolation pads and shall have access ports, for level adjustment, with removable waterproof covers at all isolator locations. Isolators shall be located so they are accessible for adjustment at any time during the life of the installation without interfering with the integrity of the roof.

1. Restrained Spring Isolators: Freestanding, steel, open-spring isolators with seismic and wind restraint.

a. Housing: Steel with resilient vertical-limit stops and adjustable equipment mounting and leveling bolt.
b. Outside Spring Diameter: Not less than eighty percent (80%) of the compressed height of the spring at rated load.
c. Minimum Additional Travel: Fifty percent (50%) of the required deflection at rated load.
d. Lateral Stiffness: More than eighty percent (80%) of rated vertical stiffness.
e. Overload Capacity: Support two hundred percent (200%) of rated load, fully compressed, without deformation or failure.

2. Pads: Arranged in single or multiple layers of sufficient stiffness for uniform loading over pad area, molded with a nonslip pattern and galvanized-steel baseplates, and factory cut to sizes that match requirements of supported equipment.

a. Resilient Material: Oil- and water-resistant natural rubber.

F. Snubber Bushings: All-directional, elastomeric snubber bushings at least ¼-inch-thick.

G. Water Seal: Galvanized sheet metal with EPDM seals at corners, attached to upper support frame, extending down past wood nailer of lower support assembly, and counterflashed over roof materials.

H. Acoustic Barrier Package: The package shall consist of high transmission loss 2-inch-thick panel assembly. The panel shall be constructed of two (2) sheets of 16-gauge galvanized steel, filled with insulation, 2-inch-thick, 1.25 lbs/cu ft minimum density.

2.11 SEISMIC-RESTRAINT DEVICES

A. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

1. Mason Industries
2. Cooper B-Line, Inc.; a division of Cooper Industries
3. Hilti, Inc.
4. Kinetics Noise Control
5. Loos & Co.; Cableware Division
6. TOLCO Incorporated; a brand of NIBCO INC.
7. Unistrut; Tyco International, Ltd.

B. General Requirements for Restraint Components: Rated strengths, features, and applications shall be as defined in reports by an agency acceptable to authorities having jurisdiction.

1. Structural Safety Factor: Allowable strength in tension, shear, and pullout force of components shall be at least four (4) times the maximum seismic forces to which they will be subjected.

C. Snubbers: Factory fabricated using welded structural-steel shapes and plates, anchor bolts, and replaceable resilient isolation washers and bushings.

1. Anchor bolts for attaching to concrete shall be seismic-rated, drill-in, and stud-wedge or female-wedge type.
2. Resilient Isolation Washers and Bushings: Oil- and water-resistant neoprene.
3. Maximum ¼-inch air gap, and minimum ¼-inch-thick resilient cushion.

D. Channel Support System: MFMA-3, shop- or field-fabricated support assembly made of slotted steel channels with accessories for attachment to braced component at one (1) end and to building structure at the other end and other matching components and with corrosion-resistant coating; and rated in tension, compression, and torsion forces.

E. Restraint Cables: ASTM A 603 galvanized steel cables with end connections made of steel assemblies with thimbles, brackets, swivel, and bolts designed for restraining cable service; and with a minimum of two (2) clamping bolts for cable engagement.

F. Hanger Rod Stiffener: Steel tube or steel slotted-support-system sleeve with internally bolted connections to hanger rod.

G. Bushings for Floor-Mounted Equipment Anchor Bolts: Neoprene bushings designed for rigid equipment mountings and matched to type and size of anchor bolts and studs.

H. Bushing Assemblies for Wall-Mounted Equipment Anchorage: Assemblies of neoprene elements and steel sleeves designed for rigid equipment mountings and matched to type and size of attachment devices used.

I. Resilient Isolation Washers and Bushings: One-piece, molded, oil- and water-resistant neoprene, with a flat washer face.

J. Mechanical Anchor Bolts: Drilled-in and stud-wedge or female-wedge type in zinc-coated steel for interior applications and stainless-steel for exterior applications. Select anchor bolts with strength required for anchor and as tested according to ASTM E 488. Minimum length of eight (8) times diameter.

K. Adhesive Anchor Bolts: Drilled-in and capsule anchor system containing polyvinyl or urethane methacrylate-based resin and accelerator, or injected polymer or hybrid mortar adhesive. Provide anchor bolts and hardware with zinc-coated steel for interior applications and stainless-steel for exterior applications. Select anchor bolts with strength required for anchor and as tested according to ASTM E 488.

2.12 FACTORY FINISHES

A. Finish: Manufacturer's standard paint applied to factory-assembled and -tested equipment before shipping.

1. Powder coating on springs and housings.
2. All hardware shall be galvanized. Hot-dip galvanized metal components for exterior use.
3. Baked enamel or powder coat for metal components on isolators for interior use.
4. Color-code or otherwise mark vibration isolation and seismic- and wind-control devices to indicate capacity range.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and equipment to receive vibration isolation and seismic and wind control devices for compliance with requirements for installation tolerances and other conditions affecting performance.

B. Examine roughing-in of reinforcement and cast-in-place anchors to verify actual locations before installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 APPLICATIONS

A. Hanger Rod Stiffeners: Install hanger rod stiffeners where indicated or scheduled on Drawings to receive them and where required to prevent buckling of hanger rods due to seismic forces.

B. Strength of Support and Seismic-Restraint Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static and seismic loads within specified loading limits.

3.3 VIBRATION-CONTROL AND SEISMIC-RESTRAINT DEVICE INSTALLATION

A. Comply with requirements in Section 077200 "Roof Accessories" for installation of roof curbs, equipment supports, and roof penetrations.

B. Coordinate the location of embedded connection hardware with supported equipment attachment and mounting points and with requirements for concrete reinforcement and formwork specified in Section 033000 “Cast-In-Place Concrete”.

C. Installation of vibration isolators must not cause any change of position of equipment, piping, or ductwork resulting in stresses or misalignment.

D. Equipment Restraints:

1. Install seismic snubbers on HVAC equipment mounted on vibration isolators. Locate snubbers as close as possible to vibration isolators and bolt to equipment base and supporting structure.
2. Install resilient bolt isolation washers on equipment anchor bolts where clearance between anchor and adjacent surface exceeds 0.125-inch.
3. Install seismic-restraint devices using methods approved by an agency acceptable to authorities having jurisdiction providing required submittals for component.

E. Piping Restraints:

1. Comply with requirements in MSS SP-127.
2. Space lateral supports a maximum of 40 feet o.c., and longitudinal supports a maximum of 80 feet o.c.
3. Brace a change of direction longer than 12 feet.

F. Install cables so they do not bend across edges of adjacent equipment or building structure.

G. Install seismic-restraint devices using methods approved by an agency acceptable to authorities having jurisdiction providing required submittals for component.

H. Install bushing assemblies for anchor bolts for floor-mounted equipment, arranged to provide resilient media between anchor bolt and mounting hole in concrete base.

I. Install bushing assemblies for mounting bolts for wall-mounted equipment, arranged to provide resilient media where equipment or equipment-mounting channels are attached to wall.

J. Attachment to Structure: If specific attachment is not indicated, anchor bracing to structure at flanges of beams, at upper truss chords of bar joists, or at concrete members.

K. Drilled-in Anchors:

1. Identify position of reinforcing steel and other embedded items prior to drilling holes for anchors. Do not damage existing reinforcing or embedded items during coring or drilling. Notify the Structural Engineer if reinforcing steel or other embedded items are encountered during drilling. Locate and avoid prestressed tendons, electrical and telecommunications conduit, and gas lines.
2. Do not drill holes in concrete or masonry until concrete, mortar, or grout has achieved full design strength.
3. Wedge Anchors: Protect threads from damage during anchor installation. Heavy-duty sleeve anchors shall be installed with sleeve fully engaged in the structural element to which anchor is to be fastened.

4. Adhesive Anchors: Clean holes to remove loose material and drilling dust prior to installation of adhesive. Place adhesive in holes proceeding from the bottom of the hole and progressing toward the surface in such a manner as to avoid introduction of air pockets in the adhesive.
5. Set anchors to manufacturer's recommended torque, using a torque wrench.
6. Install zinc-coated steel anchors for interior and stainless-steel anchors for exterior applications.

3.4 VIBRATION ISOLATION AND SEISMIC RESTRAINT OF DUCTWORK

A. Vibration Isolation of Ductwork

1. All discharge runs for a distance of 50 feet from the connected equipment shall be isolated from the building structure by means of specification 10 hangers or specification 5 floor isolators. Spring deflection shall be a minimum of 0.75-inch.
2. All duct runs having air velocity of 1000 fpm or more shall be isolated from the building structure by specification 11 hangers or 5 floor supports. Spring deflection shall be a minimum of 0.75-inch.

B. Seismic Restraint of Ductwork

1. Restrain rectangular ducts with cross sectional area of 6 sq. ft. or larger.
2. Restrain round ducts with diameters of 28 inches or larger.
3. Restrain flat oval ducts the same as rectangular ducts of the same nominal size.
4. Transverse restraints shall occur at 30-foot intervals or at both ends of the duct run if less than the specified interval. Transverse restraints shall be installed at each duct turn and at each end of a duct run.
5. Longitudinal restraints shall occur at 60-foot intervals with at least one (1) restraint per duct run. Transverse restraints for one (1) duct section may also act as a longitudinal restraint for a duct section connected perpendicular to it if the restraints are installed within 4 feet of the intersection of the ducts and if the restraints are sized for the larger duct. Duct joints shall conform to SMACNA duct construction standards.
6. The ductwork must be reinforced at the restraint locations. Reinforcement shall consist of an additional angle on top of the ductwork that is attached to the support hanger rods. Ductwork is to be attached to both upper angle and lower trapeze.
7. A group of ducts may be combined in a larger frame so that the combined weights and dimensions of the ducts are less than or equal to the maximum weight and dimensions of the duct for which bracing details are selected.
8. Walls, including gypsum board non-bearing partitions, which have ducts running through them, may replace a typical transverse brace. Provide channel framing around ducts and solid blocking between the duct and frame.
9. Connection to the structure must be made with a non-friction connection.

C. Ductwork Exclusions

1. Rectangular and square and ducts that are less than 6 square feet in cross sectional area.
2. All trapezed ductwork where the distance from the suspension point to the trapeze member is 12 inches or less.
3. Ductwork hung with straps where the top of the duct is 12 inches or less from the suspension point and the strap has two (2) #10 sheet metal screws within 2 inches of the top of the duct.
4. If any suspension location in the run exceeds the above, the entire run must be braced.

3.5 ACCOMMODATION OF DIFFERENTIAL SEISMIC MOTION

A. Install flexible connections in piping where they cross seismic joints, where adjacent sections or branches are supported by different structural elements, and where the connections terminate with connection to equipment that is anchored to a different structural element from the one supporting the connections as they approach equipment.

3.6 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Tests and Inspections:

1. Provide evidence of recent calibration of test equipment by a testing agency acceptable to authorities having jurisdiction.
2. Schedule test with Owner, through Architect, before connecting anchorage device to restrained component (unless post connection testing has been approved), and with at least seven (7) days advance notice.
3. Obtain Architect's approval before transmitting test loads to structure. Provide temporary load-spreading members.
4. Test at least four of each type and size of installed anchors and fasteners selected by Architect.
5. Test to ninety percent (90%) of rated proof load of device.
6. Measure isolator restraint clearance.
7. Measure isolator deflection.
8. Verify snubber minimum clearances.

C. Remove and replace malfunctioning units and retest as specified above.

D. Prepare test and inspection reports.

3.7 ADJUSTING

A. Adjust isolators after piping system is at operating weight.

B. Adjust limit stops on restrained spring isolators to mount equipment at normal operating height. After equipment installation is complete, adjust limit stops so they are out of contact during normal operation.

C. Adjust active height of spring isolators.

D. Adjust restraints to permit free movement of equipment within normal mode of operation.

END OF SECTION 230548

SECTION 230553 - IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Equipment labels.
2. Warning signs and labels.
3. Pipe labels.
4. Duct labels.
5. Stencils.
6. Valve tags.
7. Warning tags.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Samples: For color, letter style, and graphic representation required for each identification material and device.

C. Equipment Label Schedule: Include a listing of all equipment to be labeled with the proposed content for each label.

D. Valve numbering scheme.

E. Valve Schedules: For each piping system to include in maintenance manuals.

1.4 COORDINATION

A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.

B. Coordinate installation of identifying devices with locations of access panels and doors.

C. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2 - PRODUCTS

2.1 EQUIPMENT LABELS

A. Plastic Labels for Equipment:

1. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/16-inch-thick, and having predrilled holes for attachment hardware.

2. Letter Color: White.
3. Background Color: Black.
4. Maximum Temperature: Able to withstand temperatures up to 160 deg F (71 deg C).
5. Minimum Label Size: Length and width vary for required label content, but not less than 2½-by-¾-inch.
6. Minimum Letter Size: ¼-inch for name of units if viewing distance is less than 24 inches, ½-inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
7. Fasteners: Stainless-steel rivets or self-tapping screws.
8. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

B. Label Content: Include equipment's Drawing designation or unique equipment number, Drawing numbers where equipment is indicated (plans, details, and schedules), plus the Specification Section number and title where equipment is specified.

C. Equipment Label Schedule: For each item of equipment to be labeled, on 8½-by-11-inch (A4) bond paper. Tabulate equipment identification number and identify Drawing numbers where equipment is indicated (plans, details, and schedules), plus the Specification Section number and title where equipment is specified. Equipment schedule shall be included in operation and maintenance data.

2.2 WARNING SIGNS AND LABELS

A. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/16-inch-thick, and having predrilled holes for attachment hardware.

B. Letter Color: Black

C. Background Color: Yellow.

D. Maximum Temperature: Able to withstand temperatures up to 160 deg F (71 deg C).

E. Minimum Label Size: Length and width vary for required label content, but not less than 2½-by-¾-inch.

F. Minimum Letter Size: ¼-inch for name of units if viewing distance is less than 24 inches, ½-inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.

G. Fasteners: Stainless-steel rivets or self-tapping screws.

H. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

I. Label Content: Include caution and warning information, plus emergency notification instructions.

2.3 PIPE LABELS

A. General Requirements for Manufactured Pipe Labels: Preprinted, color-coded, with lettering indicating service, and showing flow direction.

B. Pretensioned Pipe Labels: Precoiled, semi-rigid plastic formed to partially cover circumference of pipe and to attach to pipe without fasteners or adhesive.

C. Self-Adhesive Pipe Labels: Printed plastic with contact-type, permanent-adhesive backing.

D. Pipe Label Contents: Include identification of piping service using same designations or abbreviations as used on Drawings, pipe size, and an arrow indicating flow direction.

1. Flow-Direction Arrows: Integral with piping system service lettering to accommodate both directions, or as separate unit on each pipe label to indicate flow direction.
2. Lettering Size: At least 1½ inches high.

2.4 DUCT LABELS

A. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/16-inch-thick, and having predrilled holes for attachment hardware.

B. Maximum Temperature: Able to withstand temperatures up to 160 deg F (71 deg C).

C. Minimum Label Size: Length and width vary for required label content, but not less than 2½-by-¾-inch.

D. Minimum Letter Size: ¼-inch for name of units if viewing distance is less than 24 inches, ½-inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.

E. Fasteners: Stainless-steel rivets or self-tapping screws.

F. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

G. Duct Label Contents: Include identification of duct service using same designations or abbreviations as used on Drawings, duct size, and an arrow indicating flow direction.

1. Flow-Direction Arrows: Integral with duct system service lettering to accommodate both directions, or as separate unit on each duct label to indicate flow direction.
2. Lettering Size: At least 1½ inches high.

2.5 STENCILS

A. Stencils: Prepared with letter sizes according to ASME A13.1 for piping; minimum letter height of 1¼ inches for ducts; and minimum letter height of ¾-inch for access panel and door labels, equipment labels, and similar operational instructions.

1. Stencil Material: Brass.
2. Stencil Paint: Exterior, gloss, alkyd enamel black unless otherwise indicated.
3. Identification Paint: Exterior, alkyd enamel in colors according to ASME A13.1 unless otherwise indicated.

2.6 VALVE TAGS

A. Valve Tags: Stamped or engraved with ¼-inch letters for piping system abbreviation and ½-inch numbers.

1. Tag Material: Brass, 0.032-inch minimum thickness, and having predrilled or stamped holes for attachment hardware.
2. Fasteners: Brass wire-link chain.

B. Valve Schedules: For each piping system, on 8½-by-11-inch (A4) bond paper. Tabulate valve number, piping system, system abbreviation (as shown on valve tag), location of valve (room or space), normal-operating position (open, closed, or modulating), and variations for identification. Mark valves for emergency shutoff and similar special uses.

1. Valve-tag schedule shall be included in operation and maintenance data.

C. Valve Schedule Frames: Glazed display frame for removable mounting on masonry walls for each page of valve schedule. Included mounting screws.

1. Frame: Extruded aluminum.
2. Glazing: ASTM C1036, Type I, Class I, Glazing Quality B, 2.5-mm, single thickness glass.

2.7 WARNING TAGS

A. Warning Tags: Preprinted or partially preprinted, accident-prevention tags, of plasticized card stock with matte finish suitable for writing.

1. Size: 3-by-5¼ inches minimum.
2. Fasteners: Reinforced grommet and wire or string.
3. Nomenclature: Large-size primary caption such as "DANGER," "CAUTION," or "DO NOT OPERATE."
4. Color: Yellow background with black lettering.

2.8 ACCESS PANEL AND DOOR MARKERS: 1/16-inch-thick, engraved laminated plastic with abbreviated terms and numbers corresponding to identification. Provide 1/8-inch center hole for attachment. Fasteners: Self-tapping, stainless steel screws or contact type, permanent adhesive.

PART 3 - EXECUTION

3.1 PREPARATION

A. Clean piping and equipment surfaces of substances that could impair bond of identification devices, including dirt, oil, grease, release agents, and incompatible primers, paints, and encapsulants.

3.2 EQUIPMENT LABEL INSTALLATION

A. Install or permanently fasten labels on each major item of mechanical equipment.

B. Locate equipment labels where accessible and visible.

3.3 PIPE LABEL INSTALLATION

A. Piping Color-Coding: Refer to Division 09 in project manual.

B. Stenciled Pipe Label Option: Stenciled labels may be provided instead of manufactured pipe labels, at Installer's option. Install stenciled pipe labels**,** with painted color-coded bands, complying with ASME A13.1, on each piping system.

1. Identification Paint: Use for contrasting background.
2. Stencil Paint: Use for pipe marking.

C. Locate pipe labels where piping is exposed or above accessible ceilings in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior exposed locations as follows:

1. Near each valve and control device.
2. Near each branch connection, excluding short takeoffs for fixtures and terminal units. Where flow pattern is not obvious, mark each pipe at branch.
3. Near penetrations through walls, floors, ceilings, and inaccessible enclosures.
4. At access doors, manholes, and similar access points that permit view of concealed piping.
5. Near major equipment items and other points of origination and termination.
6. Spaced at maximum intervals of 20 feet along each run. Reduce intervals to 25 feet in areas of congested piping and equipment.
7. On piping above removable acoustical ceilings. Omit intermediately spaced labels.

D. Pipe Label Color Schedule:

1. Hot Water:

a. Band Color: Red.
b. Background Color: Red.
c. Letter Color: White.

3.4 DUCT LABEL INSTALLATION

A. Install self-adhesive duct labels with permanent adhesive on air ducts in the following color codes:

1. Blue: For cold-air supply ducts.
2. Yellow: For hot-air supply ducts.
3. Green: For exhaust-, outside-, relief-, return-, and mixed-air ducts.
4. ASME A13.1 Colors and Designs: For hazardous material exhaust.

B. Stenciled Duct Label Option: Stenciled labels, showing service and flow direction, may be provided instead of plastic-laminated duct labels, at Installer's option, if lettering larger than 1-inch-high is needed for proper identification because of distance from normal location of required identification.

C. Locate labels near points where ducts enter into concealed spaces and at maximum intervals of 10 feet in each space where ducts are exposed or concealed by removable ceiling system.

3.5 VALVE-TAG INSTALLATION

A. Install tags on valves and control devices in piping systems, except check valves; valves within factory-fabricated equipment units; shutoff valves; faucets; convenience and lawn-watering hose connections; and HVAC terminal devices and similar roughing-in connections of end-use fixtures and units. List tagged valves in a valve schedule.

B. Valve-Tag Application Schedule: Tag valves according to size, shape, and color scheme and with captions similar to those indicated in the following subparagraphs:

1. Valve-Tag Size and Shape:

a. Hot Water: 1½ inches round.
b. Chilled Water: 1½ inches round.

2. Valve Tag Color:

   a. Hot Water: Natural.
   b. Chilled Water: Natural.

3. Letter Color:

   a. Hot Water: Black.
   b. Chilled Water: Black.

3.6 VALVE SCHEDULE INSTALLATION

A. Mount valve schedule on wall in accessible location in each major equipment room.

3.7 WARNING-TAG INSTALLATION

A. Write required message on, and attach warning tags to, equipment and other items where required.

END OF SECTION 230553

SECTION 230593 - TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Balancing Air Systems:

a. Constant-volume air systems.
b. Induction unit systems.
c. Variable-volume air systems

2. Balancing Hydronic Piping Systems:

a. Variable-flow hydronic systems.

1.3 DEFINITIONS

A. AABC: Associated Air Balance Council.

B. NEBB: National Environmental Balancing Bureau.

C. TAB: Testing, adjusting, and balancing.

D. TABB: Testing, Adjusting, and Balancing Bureau.

E. TAB Specialist: An entity engaged to perform TAB Work.

1.4 ACTION SUBMITTAL

A. High Performance Building: Documentation of work performed for ASHRAE 62.1, Section 7.2.2 – “Air Balancing”

B. TAB Report: Documentation of work performed for ASHRAE 90.1 Section 6.7.2.3- “System Balancing”.

1.5 INFORMATION SUBMITTALS

A. Qualification Data: Within fifteen (15) days of Contractor's Notice to Proceed, submit documentation that the TAB contractor and this Project's TAB team members meet the qualifications specified in "Quality Assurance" Article.

B. Contract Documents Examination Report: Within fifteen (15) days of Contractor's Notice to Proceed, submit the Contract Documents review report as specified in Part 3.

C. Strategies and Procedures Plan: Within thirty (30) days of Contractor's Notice to Proceed, submit TAB strategies and step-by-step procedures as specified in "Preparation" Article.

D. Certified TAB reports.

E. Instrument calibration reports, to include the following:

1. Instrument type and make.
2. Serial number.
3. Application.
4. Dates of use.
5. Dates of calibration.

1.6 QUALITY ASSURANCE

A. TAB Contractor Qualifications: Engage a TAB entity certified by AABC or NEBB.

1. TAB Field Supervisor: Employee of the TAB contractor and certified by AABC or NEBB.
2. TAB Technician: Employee of the TAB contractor and who is certified by AABC or NEBB as a TAB technician.

B. TAB Conference: Meet with Commissioning Authority on approval of the TAB strategies and procedures plan to develop a mutual understanding of the details. Require the participation of the TAB field supervisor and technicians. Provide seven days' advance notice of scheduled meeting time and location.

1. Agenda Items:

a. The Contract Documents examination report.
b. The TAB plan.
c. Coordination and cooperation of trades and subcontractors.
d. Coordination of documentation and communication flow.

C. Certify TAB field data reports and perform the following:

1. Review field data reports to validate accuracy of data and to prepare certified TAB reports.
2. Certify that the TAB team complied with the approved TAB plan and the procedures specified and referenced in this Specification.

D. TAB Report Forms: Use standard TAB contractor's forms approved by Commissioning Authority.

E. Instrumentation Type, Quantity, Accuracy, and Calibration: As described in ASHRAE 111, Section 5, "Instrumentation."

F. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 7.22 - “Air Balancing.”

G. ASHRAE/IESNA Compliance: Applicable requirements in ASHRAE/IESNA 90.1, Section 6.7.2.3 - “System Balancing.”

1.7 PROJECT CONDITIONS

A. Partial Owner Occupancy: Owner may occupy completed areas of building before Substantial Completion. Cooperate with Owner during TAB operations to minimize conflicts with Owner's operations.

B. Owner Occupancy for Multiple Construction Phases: Owner will occupy the building at the completion of each construction phase. Coordinate with the construction phasing plan.

C. Contractor shall balance the areas at completion of phasing and may have to re-balance the area after final construction is complete. Contractor shall coordinate with the Construction Manager prior to the start of any and all work.

1.8 COORDINATION

A. Notice: Provide seven (7) days' advance notice for each test. Include scheduled test dates and times.

B. A factory-authorized service representative and the BAS Contractor shall be present when balancing and testing major equipment.

C. Perform TAB after leakage and pressure tests on air and water distribution systems have been satisfactorily completed.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 COMMISSIONING OF SYSTEMS AND EQUIPMENT

A. Engage a factory-authorized service representative or technician who is familiar with this project to participate and assist, if necessary, in the functional performance testing of the equipment include in this Division with the Commissioning Agent.

3.2 EXAMINATION

A. Examine the Contract Documents to become familiar with Project requirements and to discover conditions in systems' designs that may preclude proper TAB of systems and equipment.

B. Examine the Contract Documents to become familiar with Project phasing plan and to become familiar with the TAB requirements at the end of each construction phase.

C. Examine systems for installed balancing devices, such as test ports, gage cocks, thermometer wells, flow-control devices, balancing valves and fittings, and manual volume dampers. Verify that locations of these balancing devices are accessible.

D. Examine the approved submittals for HVAC systems and equipment.

E. Examine design data including HVAC system descriptions, statements of design assumptions for environmental conditions and systems' output, and statements of philosophies and assumptions about HVAC system and equipment controls.

F. Examine ceiling plenums and underfloor air plenums used for supply, return, or relief air to verify that they meet the leakage class of connected ducts as specified in Section 233113 "Metal Ducts" and are properly separated from adjacent areas. Verify that penetrations in plenum walls are sealed and fire-stopped if required.

G. Examine equipment performance data including fan and pump curves.

1. Relate performance data to Project conditions and requirements, including system effects that can create undesired or unpredicted conditions that cause reduced capacities in all or part of a system.
2. Calculate system-effect factors to reduce performance ratings of HVAC equipment when installed under conditions different from the conditions used to rate equipment performance. To calculate system effects for air systems, use tables and charts found in AMCA 201, "Fans and Systems," or in SMACNA's "HVAC Systems - Duct Design." Compare results with the design data and installed conditions.

H. Examine system and equipment installations and verify that field quality-control testing, cleaning, and adjusting specified in individual Sections have been performed.

I. Examine test reports specified in individual system and equipment Sections.

J. Examine HVAC equipment and filters and verify that bearings are greased, belts are aligned and tight, and equipment with functioning controls is ready for operation.

K. Examine terminal units, such as variable-air-volume boxes, and verify that they are accessible and their controls are connected and functioning.

L. Examine strainers. Verify that startup screens are replaced by permanent screens with indicated perforations.

M. Examine three-way valves for proper installation for their intended function of diverting or mixing fluid flows.

N. Examine heat-transfer coils for correct piping connections and for clean and straight fins.

O. Examine system pumps to ensure absence of entrained air in the suction piping.

P. Examine operating safety interlocks and controls on HVAC equipment.

Q. Report deficiencies discovered before and during performance of TAB procedures. Observe and record system reactions to changes in conditions. Record default set points if different from indicated values.

3.3 PREPARATION

A. Prepare a TAB plan that includes strategies and step-by-step procedures.

B. Complete system-readiness checks and prepare reports. Verify the following:

1. Permanent electrical-power wiring is complete.
2. Hydronic systems are filled, clean, and free of air.
3. Automatic temperature-control systems are operational.
4. Equipment and duct access doors are securely closed.
5. Balance, smoke, and fire dampers are open.
6. Isolating and balancing valves are open and control valves are operational.

7. Ceilings are installed in critical areas where air-pattern adjustments are required and access to balancing devices is provided.
8. Windows and doors can be closed so indicated conditions for system operations can be met.

3.4 GENERAL PROCEDURES FOR TESTING AND BALANCING

A. Perform testing and balancing procedures on each system according to the procedures contained in AABC's "National Standards for Total System Balance" or NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems" and in this Section.

1. Comply with requirements in ASHRAE 62.1-2004, Section 7.2.2, "Air Balancing."
2. Contractor shall verify that calibration of all measuring devices is current.

B. Cut insulation, ducts, pipes, and equipment cabinets for installation of test probes to the minimum extent necessary for TAB procedures.

1. After testing and balancing, patch probe holes in ducts with same material and thickness as used to construct ducts.
2. After testing and balancing, install test ports and duct access doors that comply with requirements in Section 233300 "Air Duct Accessories."
3. Install and join new insulation that matches removed materials. Restore insulation, coverings, vapor barrier, and finish according to Sections 230719 "HVAC Piping Insulation" and 230713 "Duct Insulation."

C. Mark equipment and balancing devices, including damper-control positions, valve position indicators, fan-speed-control levers, and similar controls and devices, with paint or other suitable, permanent identification material to show final settings.

D. Take and report testing and balancing measurements in inch-pound (IP) units.

3.5 GENERAL PROCEDURES FOR BALANCING AIR SYSTEMS

A. Prepare test reports for both fans and outlets. Obtain manufacturer's outlet factors and recommended testing procedures. Crosscheck the summation of required outlet volumes with required fan volumes.

B. Prepare schematic diagrams of systems' "as-built" duct layouts.

C. Determine the best locations in main and branch ducts for accurate duct-airflow measurements.

D. Check airflow patterns from the outdoor-air louvers and dampers and the return- and exhaust-air dampers through the supply-fan discharge and mixing dampers.

E. Locate start-stop and disconnect switches, electrical interlocks, and motor starters.

F. Verify that motor starters are equipped with properly sized thermal protection.

G. Check dampers for proper position to achieve desired airflow path.

H. Check for airflow blockages.

I. Check condensate drains for proper connections and functioning.

J. Check for proper sealing of air-handling-unit components.

K. Verify that air duct system is sealed as specified in Section 233113 "Metal Ducts."

3.6 PROCEDURES FOR CONSTANT-VOLUME AIR SYSTEMS

A. Adjust fans to deliver total indicated airflows within the maximum allowable fan speed listed by fan manufacturer.

1. Measure total airflow.

a. Where sufficient space in ducts is unavailable for Pitot-tube traverse measurements, measure airflow at terminal outlets and inlets and calculate the total airflow.

2. Measure fan static pressures as follows to determine actual static pressure:

a. Measure outlet static pressure as far downstream from the fan as practical and upstream from restrictions in ducts such as elbows and transitions.
b. Measure static pressure directly at the fan outlet or through the flexible connection.
c. Measure inlet static pressure of single-inlet fans in the inlet duct as near the fan as possible, upstream from the flexible connection, and downstream from duct restrictions.
d. Measure inlet static pressure of double-inlet fans through the wall of the plenum that houses the fan.

3. Measure static pressure across each component that makes up an air-handling unit, rooftop unit, and other air-handling and -treating equipment.

a. Report the cleanliness status of filters and the time static pressures are measured.

4. Measure static pressures entering and leaving other devices, such as sound traps, heat-recovery equipment, and air washers, under final balanced conditions.
5. Review Record Documents to determine variations in design static pressures versus actual static pressures. Calculate actual system-effect factors. Recommend adjustments to accommodate actual conditions.
6. Obtain approval from Commissioning Authority for adjustment of fan speed higher or lower than indicated speed. Comply with requirements in Division 23 Sections for air-handling units for adjustment of fans, belts, and pulley sizes to achieve indicated air-handling-unit performance.
7. Do not make fan-speed adjustments that result in motor overload. Consult equipment manufacturers about fan-speed safety factors. Modulate dampers and measure fan-motor amperage to ensure that no overload will occur. Measure amperage in full-cooling, full-heating, economizer, and any other operating mode to determine the maximum required brake horsepower.

B. Adjust volume dampers for main duct, submain ducts, and major branch ducts to indicated airflows within specified tolerances.

1. Measure airflow of submain and branch ducts.

a. Where sufficient space in submain and branch ducts is unavailable for Pitot-tube traverse measurements, measure airflow at terminal outlets and inlets and calculate the total airflow for that zone.

2. Measure static pressure at a point downstream from the balancing damper and adjust volume dampers until the proper static pressure is achieved.

3. Remeasure each submain and branch duct after all have been adjusted. Continue to adjust submain and branch ducts to indicated airflows within specified tolerances.

C. Measure air outlets and inlets without making adjustments.

1. Measure terminal outlets using a direct-reading hood or outlet manufacturer's written instructions and calculating factors.

D. Adjust air outlets and inlets for each space to indicated airflows within specified tolerances of indicated values. Make adjustments using branch volume dampers rather than extractors and the dampers at air terminals.

1. Adjust each outlet in same room or space to within specified tolerances of indicated quantities without generating noise levels above the limitations prescribed by the Contract Documents.
2. Adjust patterns of adjustable outlets for proper distribution without drafts.

3.7 PROCEDURES FOR INDUCTION-UNIT SYSTEMS

A. Balance primary-air risers by measuring static pressure at the nozzles of the top and bottom units of each riser to determine which risers must be throttled. Adjust risers to indicated airflow within specified tolerances.

B. Adjust each induction unit.

3.8 GENERAL PROCEDURES FOR HYDRONIC SYSTEMS

A. Prepare test reports with pertinent design data, and number in sequence starting at pump to end of system. Check the sum of branch-circuit flows against the approved pump flow rate. Correct variations that exceed plus or minus five percent (+/-5%).

B. Prepare schematic diagrams of systems' "as-built" piping layouts.

C. Prepare hydronic systems for testing and balancing according to the following, in addition to the general preparation procedures specified above:

1. Open all manual valves for maximum flow.
2. Check liquid level in expansion tank.
3. Check makeup water-station pressure gage for adequate pressure for highest vent.
4. Check flow-control valves for specified sequence of operation and set at indicated flow.
5. Set differential-pressure control valves at the specified differential pressure. Do not set at fully closed position when pump is positive-displacement type unless several terminal valves are kept open.
6. Set system controls so automatic valves are wide open to heat exchangers.
7. Check pump-motor load. If motor is overloaded, throttle main flow-balancing device so motor nameplate rating is not exceeded.
8. Check air vents for a forceful liquid flow exiting from vents when manually operated.

3.9 PROCEDURES FOR VARIABLE-FLOW HYDRONIC SYSTEMS

A. Balance systems with automatic two- and three-way control valves by setting systems at maximum flow through heat-exchange terminals and proceed as specified above for hydronic systems.

3.10 PROCEDURES FOR MOTORS

A. Motors, 1/2 HP and Larger: Test at final balanced conditions and record the following data:

1. Manufacturer's name, model number, and serial number.
2. Motor horsepower rating.
3. Motor rpm.
4. Efficiency rating.
5. Nameplate and measured voltage, each phase.
6. Nameplate and measured amperage, each phase.
7. Starter thermal-protection-element rating.

B. Motors Driven by Variable-Frequency Controllers: Test for proper operation at speeds varying from minimum to maximum. Test the manual bypass of the controller to prove proper operation. Record observations including name of controller manufacturer, model number, serial number, and nameplate data.

3.11 PROCEDURES FOR CHILLERS

A. Balance water flow through each evaporator and condenser to within specified tolerances of indicated flow with all pumps operating. With only one (1) chiller operation in a multiple chiller installation, do not exceed the flow for the maximum tube velocity recommended by the chiller manufacturer. Measure and record the following data with each chill operating at design conditions:

1. Evaporator-water entering and leaving temperatures, pressure drop, and water flow.
2. Capacity: Calculate in tons of cooling.
3. Power factor if factory-installed instrumentation is furnished for measuring kilowatts.
4. Kilowatt input if factory-installed instrumentation is furnished for measuring kilowatts.

3.12 PROCEDURES FOR BOILERS

A. Hydronic Boilers: Measure and record entering- and leaving-water temperatures and water flow.

3.13 PROCEDURES FOR HEAT-TRANSFER COILS

A. Measure, adjust, and record the following data for each water coil:

1. Entering- and leaving-water temperature.
2. Water flow rate.
3. Water pressure drop.
4. Dry-bulb temperature of entering and leaving air.
5. Wet-bulb temperature of entering and leaving air for cooling coils.
6. Airflow.
7. Air pressure drop.

B. Measure, adjust, and record the following data for each electric heating coil:

1. Nameplate data.
2. Airflow.
3. Entering- and leaving-air temperature at full load.
4. Voltage and amperage input of each phase at full load and at each incremental stage.
5. Calculated kilowatt at full load.
6. Fuse or circuit-breaker rating for overload protection.

C. Measure, adjust, and record the following data for each steam coil:

1. Dry-bulb temperature of entering and leaving air.
2. Airflow.
3. Air pressure drop.
4. Inlet steam pressure.

D. Measure, adjust, and record the following data for each refrigerant coil:

1. Dry-bulb temperature of entering and leaving air.
2. Wet-bulb temperature of entering and leaving air.
3. Airflow.
4. Air pressure drop.
5. Refrigerant suction pressure and temperature.

3.14 TOLERANCES

A. Set HVAC system's air flow rates and water flow rates within the following tolerances:

1. Supply, Return, and Exhaust Fans and Equipment with Fans: Plus or minus ten percent (+/-10%).
2. Air Outlets and Inlets: Plus or minus ten percent (+/-10%).
3. Heating-Water Flow Rate: Plus or minus ten percent (+/-10%).
4. Cooling-Water Flow Rate: Plus or minus ten percent (+/-10%).

3.15 REPORTING

A. Initial Construction-Phase Report: Based on examination of the Contract Documents as specified in "Examination" Article, prepare a report on the adequacy of design for systems' balancing devices. Recommend changes and additions to systems' balancing devices to facilitate proper performance measuring and balancing. Recommend changes and additions to HVAC systems and general construction to allow access for performance measuring and balancing devices.

B. Status Reports: Prepare progress reports to describe completed procedures, procedures in progress, and scheduled procedures. Include a list of deficiencies and problems found in systems being tested and balanced. Prepare a separate report for each system and each building floor for systems serving multiple floors.

3.16 FINAL REPORT

A. General: Prepare a certified written report; tabulate and divide the report into separate sections for tested systems and balanced systems.

1. Include a certification sheet at the front of the report's binder, signed and sealed by the certified testing and balancing engineer.
2. Include a list of instruments used for procedures, along with proof of calibration.

B. Final Report Contents: In addition to certified field-report data, include the following:

1. Pump curves.
2. Fan curves.
3. Manufacturers' test data.
4. Field test reports prepared by system and equipment installers.

5. Other information relative to equipment performance; do not include Shop Drawings and product data.

C. General Report Data: In addition to form titles and entries, include the following data:

1. Title page.
2. Name and address of the TAB contractor.
3. Project name.
4. Project location.
5. Architect's name and address.
6. Engineer's name and address.
7. Contractor's name and address.
8. Report date.
9. Signature of TAB supervisor who certifies the report.
10. Table of Contents with the total number of pages defined for each section of the report. Number each page in the report.
11. Summary of contents including the following:

    a. Indicated versus final performance.
    b. Notable characteristics of systems.
    c. Description of system operation sequence if it varies from the Contract Documents.

12. Nomenclature sheets for each item of equipment.
13. Data for terminal units, including manufacturer's name, type, size, and fittings.
14. Notes to explain why certain final data in the body of reports vary from indicated values.
15. Test conditions for fans and pump performance forms including the following:

    a. Settings for outdoor-, return-, and exhaust-air dampers.
    b. Conditions of filters.
    c. Cooling coil, wet- and dry-bulb conditions.
    d. Face and bypass damper settings at coils.
    e. Fan drive settings including settings and percentage of maximum pitch diameter.
    f. Inlet vane settings for variable-air-volume systems.
    g. Settings for supply-air, static-pressure controller.
    h. Other system operating conditions that affect performance.

D. System Diagrams: Include schematic layouts of air and hydronic distribution systems. Present each system with single-line diagram and include the following:

1. Quantities of outdoor, supply, return, and exhaust airflows.
2. Water and steam flow rates.
3. Duct, outlet, and inlet sizes.
4. Pipe and valve sizes and locations.
5. Terminal units.
6. Balancing stations.
7. Position of balancing devices.

E. Air-Handling-Unit Test Reports: For air-handling units with coils, include the following:

1. Unit Data:

    a. Unit identification.
    b. Location.
    c. Make and type.

d. Model number and unit size.
e. Manufacturer's serial number.
f. Unit arrangement and class.
g. Discharge arrangement.
h. Sheave make, size in inches, and bore.
i. Center-to-center dimensions of sheave, and amount of adjustments in inches.
j. Number, make, and size of belts.
k. Number, type, and size of filters.

2. Motor Data:

a. Motor make, frame type and size.
b. Horsepower and rpm.
c. Volts, phase, and hertz.
d. Full-load amperage and service factor.
e. Sheave make, size in inches, and bore.
f. Center-to-center dimensions of sheave, and amount of adjustments in inches.

3. Test Data (Indicated and Actual Values):

a. Total air flow rate in cfm.
b. Total system static pressure in inches wg.
c. Fan rpm.
d. Discharge static pressure in inches wg.
e. Filter static-pressure differential in inches wg.
f. Preheat-coil static-pressure differential in inches wg.
g. Cooling-coil static-pressure differential in inches wg.
h. Heating-coil static-pressure differential in inches wg.
i. Outdoor airflow in cfm.
j. Return airflow in cfm.
k. Outdoor-air damper position.
l. Return-air damper position.
m. Vortex damper position.

F. Apparatus-Coil Test Reports:

1. Coil Data:

a. System identification.
b. Location.
c. Coil type.
d. Number of rows.
e. Fin spacing in fins per inch o.c.
f. Make and model number.
g. Face area in sq. ft.
h. Tube size in NPS (DN).
i. Tube and fin materials.
j. Circuiting arrangement.

2. Test Data (Indicated and Actual Values):

a. Air flow rate in cfm.
b. Average face velocity in fpm.
c. Air pressure drop in inches wg.
d. Outdoor-air, wet- and dry-bulb temperatures in deg F (deg C).

e. Return-air, wet- and dry-bulb temperatures in deg F (deg C).
f. Entering-air, wet- and dry-bulb temperatures in deg F (deg C).
g. Leaving-air, wet- and dry-bulb temperatures in deg F (deg C).
h. Water flow rate in gpm.
i. Water pressure differential in feet of head or psig.
j. Entering-water temperature in deg F (deg C).
k. Leaving-water temperature in deg F (deg C).
l. Refrigerant expansion valve and refrigerant types.
m. Refrigerant suction pressure in psig.
n. Refrigerant suction temperature in deg F (deg C).
o. Inlet steam pressure in psig.

G. Gas Fired Heat Apparatus Test Reports: In addition to manufacturer's factory startup equipment reports, include the following:

1. Unit Data:

a. System identification.
b. Location.
c. Make and type.
d. Model number and unit size.
e. Manufacturer's serial number.
f. Fuel type in input data.
g. Output capacity in Btu/h.
h. Ignition type.
i. Burner-control types.
j. Motor horsepower and rpm.
k. Motor volts, phase, and hertz.
l. Motor full-load amperage and service factor.
m. Sheave make, size in inches, and bore.
n. Center-to-center dimensions of sheave, and amount of adjustments in inches.

2. Test Data (Indicated and Actual Values):

a. Total air flow rate in cfm.
b. Entering-air temperature in deg F (deg C).
c. Leaving-air temperature in deg F (deg C).
d. Air temperature differential in deg F (deg C).
e. Entering-air static pressure in inches wg.
f. Leaving-air static pressure in inches wg.
g. Air static-pressure differential in inches wg.
h. Low-fire fuel input in Btu/h.
i. High-fire fuel input in Btu/h.
j. Manifold pressure in psig.
k. High-temperature-limit setting in deg F (deg C).
l. Operating set point in Btu/h.
m. Motor voltage at each connection.
n. Motor amperage for each phase.
o. Heating value of fuel in Btu/h.

H. Fan Test Reports: For supply, return, and exhaust fans, include the following:

1. Fan Data:

a. System identification.
b. Location.

c. Make and type.
d. Model number and size.
e. Manufacturer's serial number.
f. Arrangement and class.
g. Sheave make, size in inches, and bore.
h. Center-to-center dimensions of sheave, and amount of adjustments in inches.

2. Motor Data:

a. Motor make, and frame type and size.
b. Horsepower and rpm.
c. Volts, phase, and hertz.
d. Full-load amperage and service factor.
e. Sheave make, size in inches, and bore.
f. Center-to-center dimensions of sheave, and amount of adjustments in inches.
g. Number, make, and size of belts.

3. Test Data (Indicated and Actual Values):

a. Total airflow rate in cfm.
b. Total system static pressure in inches wg.
c. Fan rpm.
d. Discharge static pressure in inches wg.
e. Suction static pressure in inches wg.

I. Round, Flat-Oval, and Rectangular Duct Traverse Reports: Include a diagram with a grid representing the duct cross-section and record the following:

1. Report Data:

a. System and air-handling-unit number.
b. Location and zone.
c. Traverse air temperature in deg F (deg C).
d. Duct static pressure in inches wg.
e. Duct size in inches.
f. Duct area in sq. ft.
g. Indicated air flow rate in cfm.
h. Indicated velocity in fpm.
i. Actual air flow rate in cfm.
j. Actual average velocity in fpm.
k. Barometric pressure in psig.

J. Air-Terminal-Device Reports:

1. Unit Data:

a. System and air-handling unit identification.
b. Location and zone.
c. Apparatus used for test.
d. Area served.
e. Make.
f. Number from system diagram.
g. Type and model number.
h. Size.
i. Effective area in sq. ft.

2. Test Data (Indicated and Actual Values):

    a. Air flow rate in cfm.
    b. Air velocity in fpm.
    c. Preliminary air flow rate as needed in cfm.
    d. Preliminary velocity as needed in fpm.
    e. Final air flow rate in cfm.
    f. Final velocity in fpm.
    g. Space temperature in deg F (deg C).

K. System-Coil Reports: For reheat coils and water coils of terminal units, include the following:

1. Unit Data:

    a. System and air-handling-unit identification.
    b. Location and zone.
    c. Room or riser served.
    d. Coil make and size.
    e. Flowmeter type.

2. Test Data (Indicated and Actual Values):

    a. Air flow rate in cfm.
    b. Entering-water temperature in deg F (deg C).
    c. Leaving-water temperature in deg F (deg C).
    d. Water pressure drop in feet of head or psig.
    e. Entering-air temperature in deg F (deg C).
    f. Leaving-air temperature in deg F (deg C).

L. Pump Test Reports: Calculate impeller size by plotting the shutoff head on pump curves and include the following:

1. Unit Data:

    a. Unit identification.
    b. Location.
    c. Service.
    d. Make and size.
    e. Model number and serial number.
    f. Water flow rate in gpm.
    g. Water pressure differential in feet of head or psig.
    h. Required net positive suction head in feet of head or psig.
    i. Pump rpm.
    j. Impeller diameter in inches.
    k. Motor make and frame size.
    l. Motor horsepower and rpm.
    m. Voltage at each connection.
    n. Amperage for each phase.
    o. Full-load amperage and service factor.
    p. Seal type.

2. Test Data (Indicated and Actual Values):

    a. Static head in feet of head or psig.
    b. Pump shutoff pressure in feet of head or psig.

c. Actual impeller size in inches.
d. Full-open flow rate in gpm.
e. Full-open pressure in feet of head or psig.
f. Final discharge pressure in feet of head or psig.
g. Final suction pressure in feet of head or psig.
h. Final total pressure in feet of head or psig.
i. Final water flow rate in gpm.
j. Voltage at each connection.
k. Amperage for each phase.

M. Instrument Calibration Reports:

1. Report Data:

a. Instrument type and make.
b. Serial number.
c. Application.
d. Dates of use.
e. Dates of calibration.

3.17 INSPECTIONS

A. Initial Inspection:

1. After testing and balancing are complete, operate each system and randomly check measurements to verify that the system is operating according to the final test and balance readings documented in the final report.
2. Check the following for each system:

a. Measure airflow of at least ten percent (10%) of air outlets.
b. Measure water flow of at least five percent (5%) of terminals.
c. Measure room temperature at each thermostat/temperature sensor. Compare the reading to the set point.
d. Verify that balancing devices are marked with final balance position.
e. Note deviations from the Contract Documents in the final report.

B. Final Inspection:

1. After initial inspection is complete and documentation by random checks verifies that testing and balancing are complete and accurately documented in the final report, request that a final inspection be made by Commissioning Authority.
2. The TAB contractor's test and balance engineer shall conduct the inspection in the presence of Commissioning Authority.
3. Commissioning Authority shall randomly select measurements, documented in the final report, to be rechecked. Rechecking shall be limited to either ten percent (10%) of the total measurements recorded or the extent of measurements that can be accomplished in a normal 8-hour business day.
4. If rechecks yield measurements that differ from the measurements documented in the final report by more than the tolerances allowed, the measurements shall be noted as "FAILED."
5. If the number of "FAILED" measurements is greater than ten percent (>10%) of the total measurements checked during the final inspection, the testing and balancing shall be considered incomplete and shall be rejected.

C. TAB Work will be considered defective if it does not pass final inspections. If TAB Work fails, proceed as follows:

1. Recheck all measurements and make adjustments. Revise the final report and balancing device settings to include all changes; resubmit the final report and request a second final inspection.
2. If the second final inspection also fails, Owner may contract the services of another TAB contractor to complete TAB Work according to the Contract Documents and deduct the cost of the services from the original TAB contractor's final payment.

D. Prepare test and inspection reports.

3.18 ADDITIONAL TESTS

A. Within ninety (90) days of completing TAB, perform additional TAB to verify that balanced conditions are being maintained throughout and to correct unusual conditions.

B. Seasonal Periods: If initial TAB procedures were not performed during near-peak summer and winter conditions, perform additional TAB during near-peak summer and winter conditions.

3.19 FOLLOW-UP SERVICES

A. Allow for three (3) scheduled visits during the six-month period following substantial completion to adjust system parameters based on Owner's observations.

END OF SECTION 230593

SECTION 230713 - DUCT INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes insulating the following duct services:

1. Indoor, concealed supply and outdoor air.
2. Indoor, exposed supply and outdoor air.
3. Indoor, concealed return located in unconditioned space.
4. Indoor, exposed return located in unconditioned space.
5. Indoor, concealed exhaust between fan and penetration of building exterior.
6. Indoor, exposed exhaust between fan and penetration of building exterior.
7. Outdoor, concealed supply and return.
8. Outdoor, exposed supply and return.
9. Indoor, concealed and exposed outdoor air plenum ducts.

B. Related Sections:

1. Section 230719 "HVAC Piping Insulation."
2. Section 233113 "Metal Ducts" for duct liners.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated. Include thermal conductivity, water-vapor permeance thickness, and jackets (both factory- and field-applied if any).

B. HPBS Submittals:

1. Product Data for Section 16a-38k-5(d): For adhesives and sealants, documentation including printed statement of VOC content and chemical components.

C. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

1. Detail application of protective shields, saddles, and inserts at hangers for each type of insulation and hanger.
2. Detail insulation application at elbows, fittings, dampers, specialties, and flanges for each type of insulation.
3. Detail application of field-applied jackets.
4. Detail application at linkages of control devices.

D. Samples: For each type of insulation and jacket indicated. Identify each Sample, describing product and intended use. Sample sizes are as follows:

1. Sheet Form Insulation Materials: 12 inches square.
2. Sheet Jacket Materials: 12 inches square.

3. Manufacturer's Color Charts: For products where color is specified, show the full range of colors available for each type of finish material.

E. Qualification Data: For qualified Installer.

F. Material Test Reports: From a qualified testing agency acceptable to authorities having jurisdiction indicating, interpreting, and certifying test results for compliance of insulation materials, sealers, attachments, cements, and jackets, with requirements indicated. Include dates of tests and test methods employed.

G. Field quality-control reports.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Skilled mechanics who have successfully completed an apprenticeship program or another craft training program certified by the Department of Labor, Bureau of Apprenticeship and Training.

B. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products according to ASTM E 84, by a testing agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing agency.

1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.
3. Insulation adhesive and or glues: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Packaging: Insulation material containers shall be marked by manufacturer with appropriate ASTM standard designation, type and grade, and maximum use temperature.

1.6 COORDINATION

A. Coordinate sizes and locations of supports, hangers, and insulation shields specified in Section 230529 "Hangers and Supports for HVAC Piping and Equipment."

B. Coordinate clearance requirements with duct Installer for duct insulation application. Before preparing ductwork Shop Drawings, establish and maintain clearance requirements for installation of insulation and field-applied jackets and finishes and for space required for maintenance.

C. Coordinate installation and testing of heat tracing.

1.7 SCHEDULING

A. Schedule insulation application after pressure testing systems and, where required, after installing and testing heat tracing. Insulation application may begin on segments that have satisfactory test results.

B. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

PART 2 - PRODUCTS

2.1 INSULATION MATERIALS

A. Comply with requirements in "Duct Insulation Schedule, General," "Indoor Duct and Plenum Insulation Schedule," and "Aboveground, Outdoor Duct and Plenum Insulation Schedule" articles for where insulating materials shall be applied.

B. Products shall not contain asbestos, lead, mercury, or mercury compounds.

C. Products that come in contact with stainless-steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.

D. Insulation materials for use on austenitic stainless-steel shall be qualified as acceptable according to ASTM C 795.

E. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.

F. Mineral-Fiber Blanket Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 553, Type II and ASTM C 1290, Type III with factory-applied FSK jacket. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

1. Products: Subject to compliance with requirements, provide one (1) of the following:

a. CertainTeed Corp.; **SoftTouch Duct Wrap**
b. Johns Manville; **Microlite**
c. Knauf Insulation; **Friendly Feel Duct Wrap**
d. Manson Insulation Inc.; **Alley Wrap**
e. Owens Corning; **SOFTR All-Service Duct Wrap**

G. Mineral-Fiber Board Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 612, Type IA or Type IB. For duct and plenum applications, provide insulation with factory-applied FSK jacket. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

1. Products: Subject to compliance with requirements, provide one (1) of the following:

a. CertainTeed Corp.; **Commercial Board**
b. Fibrex Insulations Inc.; **FBX**
c. Johns Manville; **800 Series Spin-Glas**
d. Knauf Insulation; **Insulation Board**
e. Manson Insulation Inc.; **AK Board**
f. Owens Corning; Fiberglas **700 Series**

2.2 FIRE-RATED INSULATION SYSTEMS

A. Fire-Rated Blanket: High-temperature, flexible, blanket insulation with FSK jacket that is tested and certified to provide a 2-hour fire rating by an NRTL acceptable to authorities having jurisdiction.

1. Products: Subject to compliance with requirements, provide one (1) of the following:

a. CertainTeed Corp.; **FlameChek**
b. Johns Manville; **Firetemp Wrap**

c. Nelson Fire Stop Products; **Nelson FSB Flameshield Blanket**
d. Thermal Ceramics; **FireMaster Duct Wrap**
e. 3M; **Fire Barrier Wrap Products**
f. Unifrax Corporation; **FyreWrap**

2.3 ADHESIVES

A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated unless otherwise indicated.

B. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.

1. Products: Subject to compliance with requirements, provide one (1) of the following:

a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; **CP-127**
b. Eagle Bridges - Marathon Industries; **225**
c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; **85-60/85-70**
d. Mon-Eco Industries, Inc.; **22-25**

2. For indoor applications, adhesive shall have a VOC content of 80 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

C. FSK Jacket Adhesive: Comply with MIL-A-3316C, Class 2, Grade A for bonding insulation jacket lap seams and joints.

1. Products: Subject to compliance with requirements, provide one (1) of the following:

a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; **CP-82**
b. Eagle Bridges - Marathon Industries; **225**
c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; **85-50**
d. Mon-Eco Industries, Inc.; **22-25**

2. For indoor applications, adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

D. PVC Jacket Adhesive: Compatible with PVC jacket.

1. Products: Subject to compliance with requirements, provide one (1) of the following:

a. Dow Corning Corporation; **739 Dow Silicone**
b. Johns Manville; **Zeston Perma-Weld, CEEL-TITE Solvent Welding Adhesive**
c. P.I.C. Plastice Inc.; **Welding Adhesive**
d. Speedline Corporation; **Polyco VP Adhesive**

2. For indoor applications, adhesive shall have a VOC content of 50g/L or less when calculated according to 40CFR 59, Subpart D (EPA Method 24).

2.4 MASTICS

A. Materials shall be compatible with insulation materials, jackets, and substrates; comply with MIL-PRF-19565C, Type II.

1. For indoor applications, use mastics that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

B. Vapor-Barrier Mastic: Water based; suitable for indoor use on below ambient services.

1. Products: Subject to compliance with requirements, provide one (1) of the following:

a. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; **30-80/30-90**
b. Vimasco Corporation; **749**

2. Water-Vapor Permeance: ASTM E 96, Procedure B, 0.013 perm at 43-mil dry film thickness.
3. Service Temperature Range: Minus 20 to plus 180 deg F (Minus 29 to plus 82 deg C).
4. Solids Content: ASTM D 1644, fifty-eight percent (58%) by volume and seventy percent (70%) by weight.
5. Color: White.

C. Breather Mastic: Water based; suitable for indoor and outdoor use on above ambient services.

1. Products: Subject to compliance with requirements, provide one (1) of the following:

a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; **CP-10**
b. Eagle Bridges - Marathon Industries; **550**
c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; **46-50**
d. Mon-Eco Industries, Inc.; **55-50**
e. Vimasco Corporation; **WC-1/WC-5**

2. Water-Vapor Permeance: ASTM F 1249, 1.8 perms at 0.0625-inch dry film thickness.
3. Service Temperature Range: Minus 20 to plus 180 deg F (Minus 29 to plus 82 deg C).
4. Solids Content: Sixty percent (60%) by volume and sixty-six percent (66%) by weight.
5. Color: White.

2.5 LAGGING ADHESIVES

A. Description: Comply with MIL-A-3316C, Class I, Grade A and shall be compatible with insulation materials, jackets, and substrates.

1. For indoor applications, use lagging adhesives that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
2. Products: Subject to compliance with requirements, provide one (1) of the following:

a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; **CP-50 AHV2**
b. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; **30-36**
c. Vimasco Corporation; **713** and **714**

3. Fire-resistant, water-based lagging adhesive and coating for use indoors to adhere fire-resistant lagging cloths over duct insulation.
4. Service Temperature Range: 0 to plus 180 deg F (Minus 18 to plus 82 deg C).
5. Color: White.

2.6 SEALANTS

A. FSK and Metal Jacket Flashing Sealants:

1. Products: Subject to compliance with requirements, provide one (1) of the following:

a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; **CP-76**
b. Eagle Bridges - Marathon Industries; **405**
c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; **95-44**
d. Mon-Eco Industries, Inc.; **44-05**

2. Materials shall be compatible with insulation materials, jackets, and substrates.
3. Fire- and water-resistant, flexible, elastomeric sealant.
4. Service Temperature Range: Minus 40 to plus 250 deg F (Minus 40 to plus 121 deg C).
5. Color: Aluminum.
6. For indoor applications, sealants shall have a VOC content of 420 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.7 FIELD-APPLIED FABRIC-REINFORCING MESH

A. Woven Glass-Fiber Fabric: Approximately 6 oz./sq. yd. with a thread count of 5 strands by 5 strands/sq. in. for covering ducts.

1. Products: Subject to compliance with requirements, provide the following:

a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; **Chil-Glas No. 5**

2.8 FACTORY-APPLIED JACKETS

A. Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:

1. FSK Jacket: Aluminum-foil, fiberglass-reinforced scrim with Kraft-paper backing; complying with ASTM C 1136, Type II.
2. FSP Jacket: Aluminum-foil, fiberglass-reinforced scrim with polyethylene backing; complying with ASTM C 1136, Type II.

2.9 FIELD-APPLIED JACKETS

A. Field-applied jackets shall comply with ASTM C 921, Type I, unless otherwise indicated.

B. FSK Jacket: Aluminum-foil-face, fiberglass-reinforced scrim with Kraft-paper backing.

C. PVC Jacket: High-impact-resistant, UV-resistant PVC complying with ASTM D 1784, Class 16354-c.

1. Products: Subject to compliance with requirements, provide one (1) of the following:

a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; **Metal Jacketing Systems**
b. ITW Insulation Systems; **Aluminum and Stainless-Steel Jacketing**
c. RPR Products, Inc.; **Insul-Mate**

2. Aluminum Jacket: Comply with ASTM B 209, Alloy 3003, 3005, 3105, or 5005, Temper H-14.

   a. Sheet and roll stock ready for shop or field sizing.
   b. Finish and thickness are indicated in field-applied jacket schedules.
   c. Moisture Barrier for Indoor Applications: 1-mil-thick, heat-bonded polyethylene and Kraft paper.
   d. Moisture Barrier for Outdoor Applications: 2.5-mil-thick polysurlyn.

2.10 TAPES

A. ASJ Tape: White vapor-retarder tape matching factory-applied jacket with acrylic adhesive, complying with ASTM C 1136.

1. Products: Subject to compliance with requirements, provide one (1) of the following:

   a. ABI, Ideal Tape Division; **428 AWF ASJ**
   b. Avery Dennison Corporation, Specialty Tapes Division; **Fasson 0836**
   c. Compac Corporation; **104** and **105**
   d. Venture Tape; **1540 CW Plus**, **1542 CW Plus**, and **1542 CW Plus/SQ**

2. Width: 3 inches.
3. Thickness: 11.5 mils.
4. Adhesion: 90 ounces force/inch in width.
5. Elongation: Two percent (2%).
6. Tensile Strength: 40 lbf/inch in width.
7. ASJ Tape Disks and Squares: Precut disks or squares of ASJ tape.

B. FSK Tape: Foil-face, vapor-retarder tape matching factory-applied jacket with acrylic adhesive; complying with ASTM C 1136.

1. Products: Subject to compliance with requirements, provide one (1) of the following:

   a. ABI, Ideal Tape Division; **491 AWF FSK**
   b. Avery Dennison Corporation, Specialty Tapes Division; **Fasson 0827**
   c. Compac Corporation; **110** and **111**
   d. Venture Tape; **1525 CW NT**, **1528 CW**, and **1528 CW/SQ**

2. Width: 3 inches.
3. Thickness: 6.5 mils.
4. Adhesion: 90 ounces force/inch in width.
5. Elongation: Two percent (2%).
6. Tensile Strength: 40 lbf/inch in width.
7. FSK Tape Disks and Squares: Precut disks or squares of FSK tape.

C. PVC Tape: White vapor-retarder tape matching field-applied PVC jacket with acrylic adhesive; suitable for indoor and outdoor applications

1. Product: Subject to compliance with requirements, provide one (1) of the following:

   a. ABI, Ideal Tape Division; **370 White PVC tape**
   b. Compac Corporation; **130**
   c. Venture Tape; **1506 CW NS**

2. Width: 2 inches.

3. Thickness: 6 mils.
4. Adhesion 64 ounces force/inch in width.
5. Elongation: Five hundred percent (500%).
6. Tensile Strength: 181bf/inch in width.

2.11 SECUREMENTS

A. Bands:

1. Products: Subject to compliance with requirements, provide one (1) of the following:

a. ITW Insulation Systems; **Gerrard Strapping and Seals**
b. RPR Products, Inc.; **Insul-Mate Strapping, Seals, and Springs**

2. Stainless-Steel: ASTM A 167 or ASTM A 240, Type 304; 0.015-inch-thick, ¾-inch-wide with wing seal.
3. Springs: Twin spring set constructed of stainless steel with ends flat and slotted to accept metal bands. Spring size determined by manufacturer for application.

B. Insulation Pins and Hangers:

1. Cupped-Head, Capacitor-Discharge-Weld Pins: Copper- or zinc-coated steel pin, fully annealed for capacitor-discharge welding, 0.135-inch-diameter shank, length to suit depth of insulation indicated with integral 1½-inch galvanized carbon-steel washer.

a. Products: Subject to compliance with requirements, provide one (1) of the following:

1) AGM Industries, Inc.; **CHP-1**
2) GEMCO; **Cupped Head Weld Pin**
3) Midwest Fasteners, Inc.; **Cupped Head**
4) Nelson Stud Welding; **CHP**

2. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch-thick, aluminum sheet, with beveled edge sized as required to hold insulation securely in place but not less than 1½ inches in diameter.

a. Products: Subject to compliance with requirements, provide one (1) of the following:

1) AGM Industries, Inc.; **RC-150**
2) GEMCO; **R-150**
3) Midwest Fasteners, Inc.; **WA-150**
4) Nelson Stud Welding; **Speed Clips**

b. Protect ends with capped self-locking washers incorporating a spring steel insert to ensure permanent retention of cap in exposed locations.

C. Staples: Outward-clinching insulation staples, nominal ¾-inch-wide, stainless-steel or Monel.

D. Wire: 0.062-inch soft-annealed, stainless-steel.

1. Manufacturers: Subject to compliance with requirements available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. C & F Wire

2.12 CORNER ANGLES

A. Aluminum Corner Angles: 0.040-inch-thick, minimum 1-by-1-inch, aluminum according to ASTM B 209, Alloy 3003, 3005, 3105, or 5005; Temper H-14.

B. PVC Corner Angles: 30-mil-thick, minimum 1-by-1-inch, PVC according to ASTM B 209, Alloy 3003, 3005, 3105, or 5005 Temper H-14.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of insulation application.

1. Verify that systems to be insulated have been tested and are free of defects.
2. Verify that surfaces to be insulated are clean and dry.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

3.3 GENERAL INSTALLATION REQUIREMENTS

A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces, free of voids throughout the length of ducts and fittings.

B. Install insulation materials, vapor barriers or retarders, jackets, and thicknesses required for each item of duct system as specified in insulation system schedules.

C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.

D. Install insulation with longitudinal seams at top and bottom of horizontal runs.

E. Install multiple layers of insulation with longitudinal and end seams staggered.

F. Keep insulation materials dry during application and finishing.

G. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.

H. Install insulation with least number of joints practical.

I. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.

1. Install insulation continuously through hangers and around anchor attachments.

2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.

J. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.

K. Install insulation with factory-applied jackets as follows:

1. Draw jacket tight and smooth.
2. Cover circumferential joints with 3-inch-wide strips of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches o.c.
3. Overlap jacket longitudinal seams at least 1½ inches. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 2 inches o.c.

    a. For below ambient services, apply vapor-barrier mastic over staples.

4. Cover joints and seams with tape, according to insulation material manufacturer's written instructions, to maintain vapor seal.
5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to duct flanges and fittings.

L. Cut insulation in a manner to avoid compressing insulation more than seventy-five percent (75%) of its nominal thickness.

M. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.

N. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.

3.4 PENETRATIONS

A. Insulation Installation at Roof Penetrations: Install insulation continuously through roof penetrations.

1. Seal penetrations with flashing sealant.
2. For applications requiring only indoor insulation, terminate insulation above roof surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
3. Extend jacket of outdoor insulation outside roof flashing at least 2 inches below top of roof flashing.
4. Seal jacket to roof flashing with flashing sealant.

B. Insulation Installation at Aboveground Exterior Wall Penetrations: Install insulation continuously through wall penetrations.

1. Seal penetrations with flashing sealant.

2. For applications requiring only indoor insulation, terminate insulation inside wall surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
3. Extend jacket of outdoor insulation outside wall flashing and overlap wall flashing at least 2 inches.
4. Seal jacket to wall flashing with flashing sealant.

C. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.

D. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Terminate insulation at fire damper sleeves for fire-rated wall and partition penetrations. Externally insulate damper sleeves to match adjacent insulation and overlap duct insulation at least 2 inches.

1. Comply with requirements in Section 078413 “Penetration Firestopping”.

E. Insulation Installation at Floor Penetrations:

1. Duct: For penetrations through fire-rated assemblies, terminate insulation at fire damper sleeves and externally insulate damper sleeve beyond floor to match adjacent duct insulation. Overlap damper sleeve and duct insulation at least 2 inches.
2. Seal penetrations through fire-rated assemblies. Refer to Section 078413 “Penetration Firestopping”.

3.5 INSTALLATION OF MINERAL-FIBER INSULATION

A. Blanket Insulation Installation on Ducts and Plenums: Install per manufacturers recommendations. Secure with adhesive and insulation pins.

1. Apply adhesives according to manufacturer's recommended coverage rates per unit area, for one hundred percent (100%) coverage of duct and plenum surfaces.
2. Apply adhesive to entire circumference of ducts and to all surfaces of fittings and transitions.
3. Install either capacitor-discharge-weld pins and speed washers or cupped-head, capacitor-discharge-weld pins on sides and bottom of horizontal ducts and sides of vertical ducts as follows or to the manufacturer’s recommendations for its insulation:

    a. On duct sides with dimensions 18 inches and smaller, place pins along longitudinal centerline of duct. Space 3 inches maximum from insulation end joints, and 16 inches o.c.
    b. On duct sides with dimensions larger than 18 inches, place pins 16 inches o.c. each way, and 3 inches maximum from insulation joints. Install additional pins to hold insulation tightly against surface at cross bracing.
    c. Pins may be omitted from top surface of horizontal, rectangular ducts and plenums.
    d. Do not overcompress insulation during installation.
    e. Impale insulation over pins and attach speed washers.
    f. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.

4. For ducts and plenums with surface temperatures below ambient, install a continuous unbroken vapor barrier. Create a facing lap for longitudinal seams and end joints with insulation by removing 2 inches from one (1) edge and one (1) end of insulation segment.

Secure laps to adjacent insulation section with ½-inch outward-clinching staples, 1-inch o.c. Install vapor barrier consisting of factory- or field-applied jacket, adhesive, vapor-barrier mastic, and sealant at joints, seams, and protrusions.

a. Repair punctures, tears, and penetrations with tape or mastic to maintain vapor-barrier seal.
b. Install vapor stops for ductwork and plenums operating below 50 deg F (10 deg C) at 18-foot intervals. Vapor stops shall consist of vapor-barrier mastic applied in a Z-shaped pattern over insulation face, along butt end of insulation, and over the surface. Cover insulation face and surface to be insulated a width equal to two (2) times the insulation thickness, but not less than 3 inches.

5. Overlap unfaced blankets a minimum of 2 inches on longitudinal seams and end joints. At end joints, secure with steel bands spaced a maximum of 18 inches o.c.
6. Install insulation on rectangular duct elbows and transitions with a full insulation section for each surface. Install insulation on round and flat-oval duct elbows with individually mitered gores cut to fit the elbow.
7. Insulate duct stiffeners, hangers, and flanges that protrude beyond insulation surface with 6-inch-wide strips of same material used to insulate duct. Secure on alternating sides of stiffener, hanger, and flange with pins spaced per manufactures recommendations.

B. Board Insulation Installation on Ducts and Plenums: Secure with adhesive and insulation pins.

1. Apply adhesives according to manufacturer's recommended coverage rates per unit area, for one hundred percent (100%) coverage of duct and plenum surfaces.
2. Apply adhesive to entire circumference of ducts and to all surfaces of fittings and transitions.
3. Install either capacitor-discharge-weld pins and speed washers or cupped-head, capacitor-discharge-weld pins on sides and bottom of horizontal ducts and sides of vertical ducts as follows:

a. On duct sides with dimensions 18 inches and smaller, place pins along longitudinal centerline of duct. Space 3 inches maximum from insulation end joints, and 16 inches o.c.
b. On duct sides with dimensions larger than 18 inches, space pins 16 inches o.c. each way, and 3 inches maximum from insulation joints. Install additional pins to hold insulation tightly against surface at cross bracing.
c. Pins may be omitted from top surface of horizontal, rectangular ducts and plenums.
d. Do not overcompress insulation during installation.
e. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.

4. For ducts and plenums with surface temperatures below ambient, install a continuous unbroken vapor barrier. Create a facing lap for longitudinal seams and end joints with insulation by removing 2 inches from one (1) edge and one (1) end of insulation segment. Secure laps to adjacent insulation section with ½-inch outward-clinching staples, 1-inch o.c. Install vapor barrier consisting of factory- or field-applied jacket, adhesive, vapor-barrier mastic, and sealant at joints, seams, and protrusions.

a. Repair punctures, tears, and penetrations with tape or mastic to maintain vapor-barrier seal.
b. Install vapor stops for ductwork and plenums operating below 50 deg F (10 deg C) at 18-foot intervals. Vapor stops shall consist of vapor-barrier mastic applied in a Z-shaped pattern over insulation face, along butt end of insulation, and over the

surface. Cover insulation face and surface to be insulated a width equal to two (2) times the insulation thickness, but not less than 3 inches.

5. Install insulation on rectangular duct elbows and transitions with a full insulation section for each surface. Groove and score insulation to fit as closely as possible to outside and inside radius of elbows. Install insulation on round and flat-oval duct elbows with individually mitered gores cut to fit the elbow.
6. Insulate duct stiffeners, hangers, and flanges that protrude beyond insulation surface with 6-inch-wide strips of same material used to insulate duct. Secure on alternating sides of stiffener, hanger, and flange with pins spaced 6 inches o.c.

3.6 FIELD-APPLIED JACKET INSTALLATION

A. Where FSK jackets are indicated, install as follows:

1. Draw jacket material smooth and tight.
2. Install lap or joint strips with same material as jacket.
3. Secure jacket to insulation with manufacturer's recommended adhesive.
4. Install jacket with 1½-inch laps at longitudinal seams and 3-inch-wide joint strips at end joints.
5. Seal openings, punctures, and breaks in vapor-retarder jackets and exposed insulation with vapor-barrier mastic.

B. Where metal jackets are indicated, install with 2-inch overlap at longitudinal seams and end joints. Overlap longitudinal seams arranged to shed water. Seal end joints with weatherproof sealant recommended by insulation manufacturer. Secure jacket with stainless-steel bands 12 inches o.c. and at end joints.

C. Where PVC jackets are indicated install with 1-inch overlap at longitudinal seams and end joints: for horizontal applications, install with longitudinal seams along top and bottom of tanks and vessels. Seal with manufacturer’s recommended adhesive.

1. Apply two (2) continuous beads of adhesive to seams and joints, one (1) bead under lap and the finish bead along seam and joint edge.

3.7 FIRE-RATED INSULATION SYSTEM INSTALLATION

A. Where fire-rated insulation system is indicated, secure system to ducts and duct hangers and supports to maintain a continuous fire rating.

B. Insulate duct access panels and doors to achieve same fire rating as duct.

C. Install firestopping at penetrations through fire-rated assemblies. Fire-stop systems are specified in Section 078413 “Penetration Firestopping”.

3.8 FINISHES

A. Insulation with ASJ, Glass-Cloth, or Other Paintable Jacket Material: Paint jacket with paint system identified below.

1. Flat Acrylic Finish: Two (2) finish coats over a primer that is compatible with jacket material and finish coat paint. Add fungicidal agent to render fabric mildew proof.

a. Finish Coat Material: Interior, flat, latex-emulsion size.

B. Color: Final color as selected by Architect and Owner from manufacturer's entire range. Vary first and second coats to allow visual inspection of the completed Work.

3.9 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Tests and Inspections:

1. Inspect ductwork, randomly selected by Architect, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection shall be limited to two (2) locations for each duct system defined in the "Duct Insulation Schedule, General" Article.

C. All insulation applications will be considered defective Work if sample inspection reveals noncompliance with requirements.

3.10 DUCT INSULATION SCHEDULE, GENERAL

A. Plenums and Ducts Requiring Insulation:

1. Indoor, concealed supply and outdoor air.
2. Indoor, exposed supply and outdoor air.
3. Indoor, concealed return located in unconditioned space.
4. Indoor, exposed return located in unconditioned space.
5. Indoor, concealed exhaust between ceiling mounted fan and penetration of building exterior.
6. Indoor, exposed exhaust between ceiling mounted fan and penetration of building exterior.
7. Outdoor, concealed supply and return.
8. Outdoor, exposed supply and return
9. Supply and return ductwork inside of roof mounted equipment, if applicable.
10. Indoor, concealed exhaust between isolation damper and penetration of building exterior.
11. Indoor, exposed exhaust between isolation damper and penetration of building exterior.

B. Items Not Insulated:

1. Fibrous-glass ducts.
2. Metal ducts with duct liner of sufficient thickness to comply with energy code and ASHRAE/IESNA 90.1.
3. Factory-insulated flexible ducts.
4. Factory-insulated plenums and casings.
5. Insulated flexible connectors.
6. Vibration-control devices.
7. Factory-insulated access panels and doors.

3.11 INDOOR DUCT AND PLENUM INSULATION SCHEDULE

A. Concealed, round and flat-oval, supply-air duct insulation shall be:

1. Mineral-Fiber Blanket: Minimum installed R Value of 5 and a nominal density to achieve this R value.

B. Concealed, round and flat-oval, return-air duct insulation shall be:

1. Mineral-Fiber Blanket: Minimum installed R Value of 5 and a nominal density to achieve this R value.

C. Concealed, round and flat-oval, outdoor-air duct insulation shall be:

1. Mineral-Fiber Blanket: Minimum installed R Value of 5 and a nominal density to achieve this R value.

D. Concealed, round and flat-oval, exhaust-air duct insulation shall be:

1. Mineral-Fiber Blanket: Minimum installed R Value of 5 and a nominal density to achieve this R value.

E. Concealed, rectangular, supply-air duct insulation shall be:

1. Mineral-Fiber Blanket: Minimum installed R Value of 5 and a nominal density to achieve this R value.

F. Concealed, rectangular, return-air duct insulation shall be:

1. Mineral-Fiber Blanket: Minimum installed R Value of 5 and a nominal density to achieve this R value.

G. Concealed, rectangular, outdoor-air duct insulation shall be:

1. Mineral-Fiber Blanket: Minimum installed R Value of 5 and a nominal density to achieve this R value.

H. Concealed, rectangular, exhaust-air duct insulation shall be one of the following:

1. Mineral-Fiber Blanket: Minimum installed R Value of 5 and a nominal density to achieve this R value.

I. Concealed, supply-air plenum insulation shall be:

1. Mineral-Fiber Blanket: Minimum installed R Value of 5 and a nominal density to achieve this R value.

J. Concealed, return-air plenum insulation shall be:

1. Mineral-Fiber Blanket: Minimum installed R Value of 5 and a nominal density to achieve this R value.

K. Concealed, outdoor-air plenum insulation shall be:

1. Mineral-Fiber Blanket: Minimum installed R Value of 5 and a nominal density to achieve this R value.

L. Concealed, exhaust-air plenum insulation shall be:

1. Mineral-Fiber Blanket: Minimum installed R Value of 5 and a nominal density to achieve this R value.

M. Exposed, rectangular, supply-air duct insulation shall be:

1. Mineral-Fiber Board: Minimum installed R Value of 8 and a 3-lb/cu. ft. nominal density.

N. Exposed, rectangular, return-air duct insulation shall be:

1. Mineral-Fiber Board: Minimum installed R Value of 8 and a 3-lb/cu. ft. nominal density.

O. Exposed, rectangular, outdoor-air duct insulation shall be:

1. Mineral-Fiber Board: Minimum installed R Value of 8 and a 3-lb/cu. ft. nominal density.

P. Exposed, rectangular, exhaust-air duct insulation shall be:

1. Mineral-Fiber Board: Minimum installed R Value of 8 and a 3-lb/cu. ft. nominal density.

Q. Exposed, Type I, Commercial, Kitchen Hood Exhaust Duct and Plenum Insulation: Fire-rated board; thickness as required to achieve 2-hour fire rating.

R. Exposed, supply-air plenum insulation shall be:

1. Mineral-Fiber Board: Minimum installed R Value of 8 and a3-lb/cu. ft. nominal density.

S. Exposed, return-air plenum insulation shall be:

1. Mineral-Fiber Board: Minimum installed R Value of 8 and a 3-lb/cu. ft. nominal density.

T. Exposed, outdoor-air plenum insulation shall be:

1. Mineral-Fiber Board: Minimum installed R Value of 8 and a 3-lb/cu. ft. nominal density.

U. Exposed, exhaust-air plenum insulation shall be:

1. Mineral-Fiber Board: Minimum installed R Value of 8 and a 3-lb/cu. ft. nominal density.

V. Concealed and Exposed, supply, return, exhaust and outdoor-air ductwork and plenum located outside the building envelop insulation shall be:

1. Mineral-Fiber Board: Minimum installed R Value of 8 and a 3-lb/cu. ft. nominal density.

3.12 ABOVEGROUND, OUTDOOR DUCT AND PLENUM INSULATION SCHEDULE

A. Concealed, rectangular, supply-air duct insulation shall be:

1. Mineral-Fiber Board: Minimum installed R Value of 8 and a 3-lb/cu. ft. nominal density.

B. Concealed, rectangular, return-air duct insulation shall be:

1. Mineral-Fiber Board: Minimum installed R Value of 8 and a 3-lb/cu. ft. nominal density.

C. Concealed, supply-air plenum insulation shall be:

1. Mineral-Fiber Board: Minimum installed R Value of 8 and a 3-lb/cu. ft. nominal density.

D. Concealed, return-air plenum insulation shall be:

1. Mineral-Fiber Board: Minimum installed R Value of 8 and a 3-lb/cu. ft. nominal density.

E. Exposed, rectangular, supply-air duct insulation shall be:

1. Mineral-Fiber Board: Minimum installed R Value of 8 and a 3-lb/cu. ft. nominal density.

F. Exposed, rectangular, return-air duct insulation shall be:

1. Mineral-Fiber Board: Minimum installed R Value of 8 and a 3-lb/cu. ft. nominal density.

G. Exposed, supply-air plenum insulation shall be:

1. Mineral-Fiber Board: Minimum installed R Value of 8 and a 3-lb/cu. ft. nominal density.

H. Exposed, return-air plenum insulation shall be:

1. Mineral-Fiber Board: Minimum installed R Value of 8 and a 3-lb/cu. ft. nominal density.

3.13 INDOOR, FIELD-APPLIED JACKET SCHEDULE

A. Install jacket over insulation material. For insulation with factory-applied jacket, install the field-applied jacket over the factory-applied jacket. If more than one (1) material is listed, selection from materials listed is Contractor's option.

B. Ducts and Plenums, Concealed:

1. None.

C. Ducts and Plenums, Exposed:

1. None.

3.14 OUTDOOR, FIELD-APPLIED JACKET SCHEDULE

A. Install aluminized UV resistant flexible jacket over the insulation material. Duct insulation and outdoor jacket shall be installed per manufactures recommendations.

END OF SECTION 230713

SECTION 230719 - HVAC PIPING INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes insulating the following HVAC piping systems:

1. Chilled water piping.
2. Heating hot water piping.
3. Refrigerant suction piping.

B. Related Sections:

1. Section 230713 "Duct Insulation."

1.3 SUBMITTALS

A. Product Data: For each type of product indicated. Include thermal conductivity, water-vapor permeance thickness, and jackets (both factory and field applied if any).

B. HPBS Submittals:

1. Product Data for Section 16a-38k-5(d): For adhesives and sealants, documentation including printed statement of VOC content and chemical components.

C. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

1. Detail application of protective shields, saddles, and inserts at hangers for each type of insulation and hanger.
2. Detail attachment and covering of heat tracing inside insulation.
3. Detail insulation application at pipe expansion joints for each type of insulation.
4. Detail insulation application at elbows, fittings, flanges, valves, and specialties for each type of insulation.
5. Detail removable insulation at piping specialties.
6. Detail application of field-applied jackets.
7. Detail application at linkages of control devices.

D. Samples: For each type of insulation and jacket indicated. Identify each Sample, describing product and intended use.

1. Preformed Pipe Insulation Materials: 12 inches long by NPS 2 (DN 50).
2. Sheet Form Insulation Materials: 12 inches square.
3. Jacket Materials for Pipe: 12 inches long by NPS 2 (DN 50).
4. Sheet Jacket Materials: 12 inches square.
5. Manufacturer's Color Charts: For products where color is specified, show the full range of colors available for each type of finish material.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Installer.

B. Material Test Reports: From a qualified testing agency acceptable to authorities having jurisdiction indicating, interpreting, and certifying test results for compliance of insulation materials, sealers, attachments, cements, and jackets, with requirements indicated. Include dates of tests and test methods employed.

C. Field quality-control reports.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Skilled mechanics who have successfully completed an apprenticeship program or another craft training program certified by the Department of Labor, Bureau of Apprenticeship and Training.

B. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products according to ASTM E 84, by a testing and inspecting agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing agency.

1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Packaging: Insulation material containers shall be marked by manufacturer with appropriate ASTM standard designation, type and grade, and maximum use temperature.

1.7 COORDINATION

A. Coordinate sizes and locations of supports, hangers, and insulation shields specified in Section 230529 "Hangers and Supports for HVAC Piping and Equipment."

B. Coordinate clearance requirements with piping Installer for piping insulation application. Before preparing piping Shop Drawings, establish and maintain clearance requirements for installation of insulation and field-applied jackets and finishes and for space required for maintenance.

C. Coordinate installation and testing of heat tracing.

1.8 SCHEDULING

A. Schedule insulation application after pressure testing systems. Insulation application may begin on segments that have satisfactory test results.

B. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

PART 2 - PRODUCTS

2.1 INSULATION MATERIALS

A. Comply with requirements in "Piping Insulation Schedule, General," "Indoor Piping Insulation Schedule," "Outdoor, Aboveground Piping Insulation Schedule," and "Outdoor, Underground Piping Insulation Schedule" articles for where insulating materials shall be applied.

B. Products shall not contain asbestos, lead, mercury, or mercury compounds.

C. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.

D. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.

E. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.

F. Calcium Silicate:

1. Products: Subject to compliance with requirements, provide the following:

a. Industrial Insulation Group (IIG); **Thermo-12 Gold**

2. Preformed Pipe Sections: Flat-, curved-, and grooved-block sections of noncombustible, inorganic, hydrous calcium silicate with a non-asbestos fibrous reinforcement. Comply with ASTM C 533, Type I.
3. Flat-, curved-, and grooved-block sections of noncombustible, inorganic, hydrous calcium silicate with a non-asbestos fibrous reinforcement. Comply with ASTM C 533, Type I.
4. Prefabricated Fitting Covers: Comply with ASTM C 450 and ASTM C 585 for dimensions used in preforming insulation to cover valves, elbows, tees, and flanges.

G. Cellular Glass: Inorganic, incombustible, foamed or cellulated glass with annealed, rigid, hermetically sealed cells. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

1. Products: Subject to compliance with requirements, provide one (1) of the following:

a. Pittsburgh Corning Corporation; **Foamglass**

2. Block Insulation: ASTM C 552, Type I.
3. Special-Shaped Insulation: ASTM C 552, Type III.
4. Board Insulation: ASTM C 552, Type IV.
5. Preformed Pipe Insulation without Jacket: Comply with ASTM C 552, Type II, Class 1.
6. Preformed Pipe Insulation with Factory-Applied ASJ: Comply with ASTM C 552, Type II, Class 2.
7. Factory fabricate shapes according to ASTM C 450 and ASTM C 585.

H. Mineral-Fiber Blanket Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 553, Type II and ASTM C 1290, Type III with factory-applied FSP jacket. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

1. Products: Subject to compliance with requirements, provide one (1) of the following:

a. CertainTeed Corp.; **SoftTouch Duct Wrap**
b. Johns Manville; **Microlite**
c. Knauf Insulation; **Friendly Feel Duct Wrap**
d. Manson Insulation Inc.; **Alley Wrap**
e. Owens Corning; **SOFTR All-Service Duct Wrap**

I. Mineral-Fiber, Preformed Pipe Insulation:

1. Products: Subject to compliance with requirements, provide one (1) of the following:

a. Johns Manville; **Micro-Lok**
b. Knauf Insulation; **1000-Degree Pipe Insulation**
c. Manson Insulation Inc.; **Alley-K**
d. Owens Corning; **Fiberglas Pipe Insulation**

2. Type I, 850 deg F (454 deg C) Materials: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 547, Type I, Grade A, with factory-applied ASJ-SSL. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

2.2 INSULATING CEMENTS

A. Mineral-Fiber Insulating Cement: Comply with ASTM C 195.

1. Products: Subject to compliance with requirements, provide the following:

a. Ramco Insulation, Inc.; **Super-Stik**

B. Expanded or Exfoliated Vermiculite Insulating Cement: Comply with ASTM C 196.

1. Products: Subject to compliance with requirements, provide the following:

a. Ramco Insulation, Inc.; **Thermokote V**

C. Mineral-Fiber, Hydraulic-Setting Insulating and Finishing Cement: Comply with ASTM C 449.

1. Products: Subject to compliance with requirements, provide the following:

a. Ramco Insulation, Inc.; **Ramcote 1200** and **Quik-Cote**

2.3 ADHESIVES

A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated unless otherwise indicated.

B. Calcium Silicate Adhesive: Fibrous, sodium-silicate-based adhesive with a service temperature range of 50 to 800 deg F.

1. Products: Subject to compliance with requirements, provide one (1) of the following:

a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; **CP-97**
b. Eagle Bridges - Marathon Industries; **290**
c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; **81-27**

d. Mon-Eco Industries, Inc.; **22-30**
e. Vimasco Corporation; **760**

2. For indoor applications, adhesive shall have a VOC content of 80 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

C. Cellular-Glass Adhesive: Two-component, thermosetting urethane adhesive containing no flammable solvents, with a service temperature range of minus 100 to plus 200 deg F (minus 73 to plus 93 deg C).

1. Products: Subject to compliance with requirements, provide the following:

a. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; **81-84**

2. For indoor applications, adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

D. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.

1. Products: Subject to compliance with requirements, provide one (1) of the following:

a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; **CP-127**
b. Eagle Bridges - Marathon Industries; **225**
c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; **85-60/85-70**
d. Mon-Eco Industries, Inc.; **22-25**

2. For indoor applications, adhesive shall have a VOC content of 80 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

E. ASJ Adhesive, and FSK and PVDC Jacket Adhesive: Comply with MIL-A-3316C, Class 2, Grade A for bonding insulation jacket lap seams and joints.

1. Products: Subject to compliance with requirements provide one (1) of the following:

a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; **CP-82**
b. Eagle Bridges - Marathon Industries; **225**
c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; **85-50**
d. Mon-Eco Industries, Inc.; **22-25**

2. For indoor applications, adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

F. PVC Jacket Adhesive: Compatible with PVC jacket.

1. Products: Subject to compliance with requirements, provide one (1) of the following:

a. Dow Corning Corporation; **739, Dow Silicone**
b. Johns Manville; **Zeston Perma-Weld, CEEL-TITE Solvent Welding Adhesive**
c. P.I.C. Plastics, Inc.; **Welding Adhesive**
d. Speedline Corporation; **Polyco VP Adhesive**

2. For indoor applications, adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.4 MASTICS

A. Materials shall be compatible with insulation materials, jackets, and substrates; comply with MIL-PRF-19565C, Type II.

1. For indoor applications, use mastics that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

B. Vapor-Barrier Mastic: Solvent based; suitable for outdoor use on below-ambient services.

1. Products: Subject to compliance with requirements, provide one (1) of the following:

a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; **Encacel**
b. Eagle Bridges - Marathon Industries; **570**
c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; **60-95/60-96**

2. Water-Vapor Permeance: ASTM F 1249, 0.05 perm at 30-mil dry film thickness.
3. Service Temperature Range: Minus 50 to plus 220 deg F (Minus 46 to plus 104 deg C).
4. Solids Content: ASTM D 1644, thirty-three percent (33%) by volume and forty-six percent (46%) by weight.
5. Color: White.

C. Breather Mastic: Water based; suitable for indoor and outdoor use on above-ambient services.

1. Products: Subject to compliance with requirements, provide one (1) of the following:

a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; **CP-10**
b. Eagle Bridges - Marathon Industries; **550**
c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; **46-50**
d. Mon-Eco Industries, Inc.; **55-50**
e. Vimasco Corporation; **WC-1/WC-5**

2. Water-Vapor Permeance: ASTM F 1249, 1.8 perms at 0.0625-inch dry film thickness.
3. Service Temperature Range: Minus 20 to plus 180 deg F (Minus 29 to plus 82 deg C).
4. Solids Content: Sixty percent (60%) by volume and sixty-six percent (66%) by weight.
5. Color: White.

2.5 LAGGING ADHESIVES

A. Description: Comply with MIL-A-3316C, Class I, Grade A and shall be compatible with insulation materials, jackets, and substrates.

1. For indoor applications, use lagging adhesives that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
2. Products: Subject to compliance with requirements, provide one (1) of the following:

a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; **CP-50 AHV2**

b. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; **30-36**
c. Vimasco Corporation; **713** and **714**

3. Fire-resistant, water-based lagging adhesive and coating for use indoors to adhere fire-resistant lagging cloths over pipe insulation.
4. Service Temperature Range: 0 to plus 180 deg F (Minus 18 to plus 82 deg C).
5. Color: White.

2.6 SEALANTS

A. Joint Sealants:

1. Joint Sealants for Cellular-Glass, Phenolic, and Polyisocyanurate Products: Subject to compliance with requirements, provide one (1) of the following:

a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; **CP-76**
b. Eagle Bridges - Marathon Industries; **405**
c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; **30-45**
d. Mon-Eco Industries, Inc.; **44-05**
e. Pittsburgh Corning Corporation; **Pittseal 444**

2. Joint Sealants for Polystyrene Products: Subject to compliance with requirements, provide one of the following:

a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; **CP-70**
b. Eagle Bridges - Marathon Industries; **405**
c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; **30-45**
d. Mon-Eco Industries, Inc.; **44-05**

3. Materials shall be compatible with insulation materials, jackets, and substrates.
4. Permanently flexible, elastomeric sealant.
5. Service Temperature Range: Minus 100 to plus 300 deg F (Minus 73 to plus 149 deg C).
6. Color: White or gray.
7. For indoor applications, sealants shall have a VOC content of 420 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

B. Metal Jacket Flashing Sealants:

1. Products: Subject to compliance with requirements, provide one (1) of the following:

a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; **CP-76**
b. Eagle Bridges - Marathon Industries; **405**
c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; **95-44**
d. Mon-Eco Industries, Inc.; **44-05**

2. Materials shall be compatible with insulation materials, jackets, and substrates.
3. Fire- and water-resistant, flexible, elastomeric sealant.
4. Service Temperature Range: Minus 40 to plus 250 deg F (Minus 40 to plus 121 deg C).

5. Color: Aluminum.
6. For indoor applications, sealants shall have a VOC content of 420 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

C. ASJ Flashing Sealants, and PVC Jacket Flashing Sealants:

1. Products: Subject to compliance with requirements, provide one (1) of the following:

   a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; **CP-76**

2. Materials shall be compatible with insulation materials, jackets, and substrates.
3. Fire- and water-resistant, flexible, elastomeric sealant.
4. Service Temperature Range: Minus 40 to plus 250 deg F (Minus 40 to plus 121 deg C).
5. Color: White.
6. For indoor applications, sealants shall have a VOC content of 420 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.7 FACTORY-APPLIED JACKETS

A. Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:

1. ASJ: White, Kraft-paper, fiberglass-reinforced scrim with aluminum-foil backing; complying with ASTM C 1136, Type I.
2. ASJ-SSL: ASJ with self-sealing, pressure-sensitive, acrylic-based adhesive covered by a removable protective strip; complying with ASTM C 1136, Type I.

2.8 FIELD-APPLIED JACKETS

A. Field-applied jackets shall comply with ASTM C 921, Type I, unless otherwise indicated.

B. PVC Jacket: High-impact-resistant, UV-resistant PVC complying with ASTM D 1784, Class 16354-C; thickness as scheduled; roll stock ready for shop or field cutting and forming. Thickness is indicated in field-applied jacket schedules.

1. Products: Subject to compliance with requirements, provide one (1) of the following:

   a. Johns Manville; **Zeston**
   b. P.I.C. Plastics, Inc.; **FG Series**
   c. Proto Corporation; **LoSmoke**
   d. Speedline Corporation; **SmokeSafe**

2. Adhesive: As recommended by jacket material manufacturer.
3. Color: Color-code jackets based on system. Color as selected by Architect.
4. Factory-fabricated fitting covers to match jacket if available; otherwise, field fabricate.

   a. Shapes: 45- and 90-degree, short- and long-radius elbows, tees, valves, flanges, unions, reducers, end caps, soil-pipe hubs, traps, mechanical joints, and P-trap and supply covers for lavatories.

C. Metal Jacket:

1. Products: Subject to compliance with requirements, provide one (1) of the following:

a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; **Metal Jacketing Systems**
b. ITW Insulation Systems; **Aluminum and Stainless-Steel Jacketing**
c. RPR Products, Inc.; **Insul-Mate**

2. Aluminum Jacket: Comply with ASTM B 209, Alloy 3003, 3005, 3105, or 5005, Temper H-14.

a. Factory cut and rolled to size.
b. Finish and thickness are indicated in field-applied jacket schedules.
c. Moisture Barrier for Indoor Applications: 1-mil-thick, heat-bonded polyethylene and Kraft paper.
d. Moisture Barrier for Outdoor Applications: 2.5-mil-thick polysurlyn.
e. Factory-Fabricated Fitting Covers:

1) Same material, finish, and thickness as jacket.
2) Preformed 2-piece or gore, 45- and 90-degree, short- and long-radius elbows.
3) Tee covers.
4) Flange and union covers.
5) End caps.
6) Beveled collars.
7) Valve covers.
8) Field fabricate fitting covers only if factory-fabricated fitting covers are not available.

D. Underground Direct-Buried Jacket: 125-mil-thick vapor barrier and waterproofing membrane consisting of a rubberized bituminous resin reinforced with a woven-glass fiber or polyester scrim and laminated aluminum foil.

1. Products: Subject to compliance with requirements, provide one (1) of the following:

a. Pittsburgh Corning Corporation; **Pittwrap**
b. Polyguard Products, Inc.; **Insulrap No Torch 125**

2.9 TAPES

A. ASJ Tape: White vapor-retarder tape matching factory-applied jacket with acrylic adhesive, complying with ASTM C 1136.

1. Products: Subject to compliance with requirements, provide one (1) of the following:

a. ABI, Ideal Tape Division; **428 AWF ASJ**
b. Avery Dennison Corporation, Specialty Tapes Division; **Fasson 0836**
c. Compac Corporation; **104** and **105**
d. Venture Tape; **1540 CW Plus**, **1542 CW Plus**, and **1542 CW Plus/SQ**

2. Width: 3 inches.
3. Thickness: 11.5 mils.
4. Adhesion: 90 ounces force/inch in width.
5. Elongation: Two percent (2%).
6. Tensile Strength: 40 lbf/inch in width.
7. ASJ Tape Disks and Squares: Precut disks or squares of ASJ tape.

B. PVC Tape: White vapor-retarder tape matching field-applied PVC jacket with acrylic adhesive; suitable for indoor and outdoor applications.

1. Products: Subject to compliance with requirements, provide one (1) of the following:

a. Compac Corporation; **130**
b. Venture Tape; **1506 CW NS**

2. Width: 2 inches.
3. Thickness: 6 mils.
4. Adhesion: 64 ounces force/inch in width.
5. Elongation: Five hundred percent (500%).
6. Tensile Strength: 18 lbf/inch in width.

C. Aluminum-Foil Tape: Vapor-retarder tape with acrylic adhesive.

1. Products: Subject to compliance with requirements, provide one (1) of the following:

a. ABI, Ideal Tape Division; **488 AWF**
b. Avery Dennison Corporation, Specialty Tapes Division; **Fasson 0800**
c. Compac Corporation; **120**
d. Venture Tape; **3520 CW**

2. Width: 2 inches.
3. Thickness: 3.7 mils.
4. Adhesion: 100 ounces force/inch in width.
5. Elongation: Five percent (5%).
6. Tensile Strength: 34 lbf/inch in width.

D. PVDC Tape for Outdoor Applications: White vapor-retarder PVDC tape with acrylic adhesive.

1. Products: Subject to compliance with requirements, provide one (1) of the following:

a. Dow Chemical Company (The); **Saran 560 Vapor Retarder Tape**

2. Width: 3 inches.
3. Film Thickness: 6 mils.
4. Adhesive Thickness: 1.5 mils.
5. Elongation at Break: One hundred forty-five percent (145%).
6. Tensile Strength: 55 lbf/inch in width.

2.10 SECUREMENTS

A. Bands:

1. Products: Subject to compliance with requirements, provide one (1) of the following:

a. ITW Insulation Systems; **Gerrard Strapping and Seals**
b. RPR Products, Inc.; **Insul-Mate Strapping, Seals, and Springs**

2. Stainless-Steel: ASTM A 167 or ASTM A 240, Type 304 ½-inch-wide with wing seal.

B. Wire: 0.062-inch soft-annealed, stainless steel.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. C & F Wire

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of insulation application.

1. Verify that systems to be insulated have been tested and are free of defects.
2. Verify that surfaces to be insulated are clean and dry.
3. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

B. Mix insulating cements with clean potable water; if insulating cements are to be in contact with stainless-steel surfaces, use demineralized water.

3.3 GENERAL INSTALLATION REQUIREMENTS

A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of piping including fittings, valves, and specialties.

B. Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item of pipe system as specified in insulation system schedules.

C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.

D. Install insulation with longitudinal seams at top and bottom of horizontal runs.

E. Install multiple layers of insulation with longitudinal and end seams staggered.

F. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.

G. Keep insulation materials dry during application and finishing.

H. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.

I. Install insulation with least number of joints practical.

J. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.

1. Install insulation continuously through hangers and around anchor attachments.

2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
4. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect jacket from tear or puncture by hanger, support, and shield.

K. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.

L. Install insulation with factory-applied jackets as follows:

1. Draw jacket tight and smooth.
2. Cover circumferential joints with 3-inch-wide strips of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches o.c.
3. Overlap jacket longitudinal seams at least 1½ inches. Install insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 2 inches o.c.

    a. For below-ambient services, apply vapor-barrier mastic over staples.

4. Cover joints and seams with tape, according to insulation material manufacturer's written instructions, to maintain vapor seal.
5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to pipe flanges and fittings.

M. Cut insulation in a manner to avoid compressing insulation more than seventy-five percent (75%) of its nominal thickness.

N. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.

O. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.

P. For above-ambient services, do not install insulation to the following:

1. Vibration-control devices.
2. Testing agency labels and stamps.
3. Nameplates and data plates.
4. Manholes.
5. Handholes.
6. Cleanouts.

3.4 PENETRATIONS

A. Insulation Installation at Roof Penetrations: Install insulation continuously through roof penetrations.

1. Seal penetrations with flashing sealant.

2. For applications requiring only indoor insulation, terminate insulation above roof surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
3. Extend jacket of outdoor insulation outside roof flashing at least 2 inches below top of roof flashing.
4. Seal jacket to roof flashing with flashing sealant.

B. Insulation Installation at Underground Exterior Wall Penetrations: Terminate insulation flush with sleeve seal. Seal terminations with flashing sealant.

C. Insulation Installation at Aboveground Exterior Wall Penetrations: Install insulation continuously through wall penetrations.

1. Seal penetrations with flashing sealant.
2. For applications requiring only indoor insulation, terminate insulation inside wall surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
3. Extend jacket of outdoor insulation outside wall flashing and overlap wall flashing at least 2 inches.
4. Seal jacket to wall flashing with flashing sealant.

D. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.

E. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Install insulation continuously through penetrations of fire-rated walls and partitions.

1. Comply with requirements in Section 078413 "Penetration Firestopping" for firestopping and fire-resistive joint sealers.

F. Insulation Installation at Floor Penetrations:

1. Pipe: Install insulation continuously through floor penetrations.
2. Seal penetrations through fire-rated assemblies. Refer to Section 078413 “Penetration Firestopping”.

3.5 GENERAL PIPE INSULATION INSTALLATION

A. Requirements in this article generally apply to all insulation materials except where more specific requirements are specified in various pipe insulation material installation articles.

B. Insulation Installation on Fittings, Valves, Strainers, Flanges, and Unions:

1. Install insulation over fittings, valves, strainers, flanges, unions, and other specialties with continuous thermal and vapor-retarder integrity unless otherwise indicated.
2. Insulate pipe elbows using preformed fitting insulation or mitered fittings made from same material and density as adjacent pipe insulation. Each piece shall be butted tightly against adjoining piece and bonded with adhesive. Fill joints, seams, voids, and irregular surfaces with insulating cement finished to a smooth, hard, and uniform contour that is uniform with adjoining pipe insulation.
3. Insulate tee fittings with preformed fitting insulation or sectional pipe insulation of same material and thickness as used for adjacent pipe. Cut sectional pipe insulation to fit. Butt

each section closely to the next and hold in place with tie wire. Bond pieces with adhesive.

4. Insulate valves using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two (2) times the thickness of pipe insulation, or one (1) pipe diameter, whichever is thicker. For valves, insulate up to and including the bonnets, valve stuffing-box studs, bolts, and nuts. Fill joints, seams, and irregular surfaces with insulating cement.
5. Insulate strainers using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two (2) times the thickness of pipe insulation, or one (1) pipe diameter, whichever is thicker. Fill joints, seams, and irregular surfaces with insulating cement. Insulate strainers so strainer basket flange or plug can be easily removed and replaced without damaging the insulation and jacket. Provide a removable reusable insulation cover. For below-ambient services, provide a design that maintains vapor barrier.
6. Insulate flanges and unions using a section of oversized preformed pipe insulation. Overlap adjoining pipe insulation by not less than two (2) times the thickness of pipe insulation, or one (1) pipe diameter, whichever is thicker.
7. Cover segmented insulated surfaces with a layer of finishing cement and coat with a mastic. Install vapor-barrier mastic for below-ambient services and a breather mastic for above-ambient services. Reinforce the mastic with fabric-reinforcing mesh. Trowel the mastic to a smooth and well-shaped contour.
8. For services not specified to receive a field-applied jacket except for flexible elastomeric and polyolefin, install fitted PVC cover over elbows, tees, strainers, valves, flanges, and unions. Terminate ends with PVC end caps. Tape PVC covers to adjoining insulation facing using PVC tape.
9. Stencil or label the outside insulation jacket of each union with the word "union." Match size and color of pipe labels.

C. Insulate instrument connections for thermometers, pressure gages, pressure temperature taps, test connections, flow meters, sensors, switches, and transmitters on insulated pipes. Shape insulation at these connections by tapering it to and around the connection with insulating cement and finish with finishing cement, mastic, and flashing sealant.

D. Install removable insulation covers at locations indicated. Installation shall conform to the following:

1. Make removable flange and union insulation from sectional pipe insulation of same thickness as that on adjoining pipe. Install same insulation jacket as adjoining pipe insulation.
2. When flange and union covers are made from sectional pipe insulation, extend insulation from flanges or union long at least two (2) times the insulation thickness over adjacent pipe insulation on each side of flange or union. Secure flange cover in place with stainless-steel or aluminum bands. Select band material compatible with insulation and jacket.
3. Construct removable valve insulation covers in same manner as for flanges, except divide the two-part section on the vertical center line of valve body.
4. When covers are made from block insulation, make two (2) halves, each consisting of mitered blocks wired to stainless-steel fabric. Secure this wire frame, with its attached insulation, to flanges with tie wire. Extend insulation at least 2 inches over adjacent pipe insulation on each side of valve. Fill space between flange or union cover and pipe insulation with insulating cement. Finish cover assembly with insulating cement applied in two (2) coats. After first coat is dry, apply and trowel second coat to a smooth finish.
5. Unless a PVC jacket is indicated in field-applied jacket schedules, finish exposed surfaces with a metal jacket.

3.6 INSTALLATION OF CALCIUM SILICATE INSULATION

A. Insulation Installation on Straight Pipes and Tubes:

1. Secure single-layer insulation with stainless-steel bands at 12-inch intervals and tighten bands without deforming insulation materials.
2. Install two-layer insulation with joints tightly butted and staggered at least 3 inches. Secure inner layer with wire spaced at 12-inch intervals. Secure outer layer with stainless-steel bands at 12-inch intervals.
3. Apply a skim coat of mineral-fiber, hydraulic-setting cement to insulation surface. When cement is dry, apply flood coat of lagging adhesive and press on one (1) layer of glass cloth or tape. Overlap edges at least 1-inch. Apply finish coat of lagging adhesive over glass cloth or tape. Thin finish coat to achieve smooth, uniform finish.

B. Insulation Installation on Pipe Flanges:

1. Install preformed pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of block insulation of same material and thickness as pipe insulation.
4. Finish flange insulation same as pipe insulation.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install preformed sections of same material as straight segments of pipe insulation when available. Secure according to manufacturer's written instructions.
2. When preformed insulation sections of insulation are not available, install mitered sections of calcium silicate insulation. Secure insulation materials with wire or bands.
3. Finish fittings insulation same as pipe insulation.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install mitered segments of calcium silicate insulation to valve body. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
2. Install insulation to flanges as specified for flange insulation application.
3. Finish valve and specialty insulation same as pipe insulation.

3.7 INSTALLATION OF CELLULAR-GLASS INSULATION

A. Insulation Installation on Straight Pipes and Tubes:

1. Secure each layer of insulation to pipe with wire or bands and tighten bands without deforming insulation materials.
2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
3. For insulation with factory-applied jackets on above-ambient services, secure laps with outward-clinched staples at 6 inches o.c.
4. For insulation with factory-applied jackets on below-ambient services, do not staple longitudinal tabs. Instead, secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.

B. Insulation Installation on Pipe Flanges:

1. Install preformed pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of cellular-glass block insulation of same thickness as pipe insulation.
4. Install jacket material with manufacturer's recommended adhesive, overlap seams at least 1-inch, and seal joints with flashing sealant.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install preformed sections of same material as straight segments of pipe insulation when available. Secure according to manufacturer's written instructions.
2. When preformed sections of insulation are not available, install mitered sections of cellular-glass insulation. Secure insulation materials with wire or bands.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed sections of cellular-glass insulation to valve body.
2. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
3. Install insulation to flanges as specified for flange insulation application.

3.8 INSTALLATION OF FLEXIBLE ELASTOMERIC INSULATION

A. Seal longitudinal seams and end joints with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

B. Insulation Installation on Pipe Flanges:

1. Install pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of sheet insulation of same thickness as pipe insulation.
4. Secure insulation to flanges and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install mitered sections of pipe insulation.
2. Secure insulation materials and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed valve covers manufactured of same material as pipe insulation when available.
2. When preformed valve covers are not available, install cut sections of pipe and sheet insulation to valve body. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
3. Install insulation to flanges as specified for flange insulation application.

4. Secure insulation to valves and specialties and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

3.9 INSTALLATION OF MINERAL-FIBER INSULATION

A. Insulation Installation on Straight Pipes and Tubes:

1. Secure each layer of preformed pipe insulation to pipe in accordance to manufacturers recommended procedure.
2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
3. For insulation with factory-applied jackets on above-ambient surfaces, secure laps with outward-clinched staples at 6 inches o.c.
4. For insulation with factory-applied jackets on below-ambient surfaces, do not staple longitudinal tabs. Instead, secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.

B. Insulation Installation on Pipe Flanges:

1. Install preformed pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with mineral-fiber blanket insulation.
4. Install jacket material with manufacturer's recommended adhesive, overlap seams at least 1-inch, and seal joints with flashing sealant.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install preformed sections of same material as straight segments of pipe insulation when available.
2. When preformed insulation elbows and fittings are not available, install mitered sections of pipe insulation, to a thickness equal to adjoining pipe insulation. Secure insulation materials with wire or bands.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed sections of same material as straight segments of pipe insulation when available.
2. When preformed sections are not available, install mitered sections of pipe insulation to valve body.
3. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
4. Install insulation to flanges as specified for flange insulation application.

3.10 FIELD-APPLIED JACKET INSTALLATION

A. Where glass-cloth jackets are indicated, install directly over bare insulation or insulation with factory-applied jackets.

1. Draw jacket smooth and tight to surface with 2-inch overlap at seams and joints.
2. Embed glass cloth between two (2) 0.062-inch-thick coats of lagging adhesive.
3. Completely encapsulate insulation with coating, leaving no exposed insulation.

B. Where FSK jackets are indicated, install as follows:

1. Draw jacket material smooth and tight.
2. Install lap or joint strips with same material as jacket.
3. Secure jacket to insulation with manufacturer's recommended adhesive.
4. Install jacket with 1½-inch laps at longitudinal seams and 3-inch-wide joint strips at end joints.
5. Seal openings, punctures, and breaks in vapor-retarder jackets and exposed insulation with vapor-barrier mastic.

C. Where PVC jackets are indicated, install with 1-inch overlap at longitudinal seams and end joints; for horizontal applications. Seal with manufacturer's recommended adhesive.

1. Apply two (2) continuous beads of adhesive to seams and joints, one bead under lap and the finish bead along seam and joint edge.

D. Where metal jackets are indicated, install with 2-inch overlap at longitudinal seams and end joints. Overlap longitudinal seams arranged to shed water. Seal end joints with weatherproof sealant recommended by insulation manufacturer. Secure jacket with stainless-steel bands 12 inches o.c. and at end joints.

3.11 FINISHES

A. Pipe Insulation with ASJ, Glass-Cloth, or Other Paintable Jacket Material: Paint jacket with paint system identified below.

1. Flat Acrylic Finish: Two (2) finish coats over a primer that is compatible with jacket material and finish coat paint. Add fungicidal agent to render fabric mildew proof.

a. Finish Coat Material: Interior, flat, latex-emulsion size.

B. Flexible Elastomeric Thermal Insulation: After adhesive has fully cured, apply two (2) coats of insulation manufacturer's recommended protective coating.

C. Color: Final color as selected by Architect and Owner from manufacturer’s entire range. Vary first and second coats to allow visual inspection of the completed Work.

D. Do not field paint aluminum or stainless-steel jackets.

3.12 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Tests and Inspections:

1. Inspect pipe, fittings, strainers, and valves, randomly selected by Architect, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection shall be limited to three (3) locations of straight pipe, three (3) locations of threaded fittings, three (3) locations of welded fittings, two (2) locations of threaded strainers, two (2) locations of welded strainers, three (3) locations of threaded valves, and three (3) locations of flanged valves for each pipe service defined in the "Piping Insulation Schedule, General" Article.

C. All insulation applications will be considered defective Work if sample inspection reveals noncompliance with requirements.

3.13 PIPING INSULATION SCHEDULE, GENERAL

A. Acceptable preformed pipe and tubular insulation materials and thicknesses are identified for each piping system and pipe size range. If more than one (1) material is listed for a piping system, selection from materials listed is Contractor's option.

B. Items Not Insulated: Unless otherwise indicated, do not install insulation on the following:

1. Drainage piping located in crawl spaces.
2. Chrome-plated pipes and fittings unless there is a potential for personnel injury.

3.14 INDOOR PIPING INSULATION SCHEDULE

A. Condensate and Equipment Drain Water below 60 Deg F (16 Deg C):

1. All Pipe Sizes: Insulation shall be one (1) of the following:

a. Cellular Glass: ½-inch-thick.
b. Mineral-Fiber, Preformed Pipe Insulation, Type I, ½-inch-thick.

B. Chilled Water, above 40 Deg F (5 Deg C):

1. NPS 1-1/2 and Smaller: Insulation shall be:

a. Mineral-Fiber, Preformed Pipe Insulation, Type I, 1½-inch-thick.

2. NPS 1-3/4 and Larger: Insulation shall be:

a. Mineral-Fiber, Preformed Pipe Insulation, Type I, 1½-inch-thick.

C. Heating-Hot-Water Supply and Return, 200 Deg F (93 Deg C) and Below:

1. NPS 1 1/2 and Smaller: Insulation shall be:

a. Mineral-Fiber, Preformed Pipe, Type I: 1½-inch-thick.

2. NPS 1 3/4 and Larger: Insulation shall be:

a. Mineral-Fiber, Preformed Pipe, Type I: 2 inches thick.

D. Refrigerant Suction and Hot-Gas Piping:

1. NPS 1 1/2 and Smaller: Insulation shall be:

a. Cellular Glass: 1½-inch-thick.
b. Mineral-Fiber, Preformed Pipe Insulation, Type I, 1½-inch-thick.

2. NPS 2 and Larger: Insulation shall be:

a. Cellular Glass: 1½-inch-thick.
b. Mineral-Fiber, Preformed Pipe Insulation, Type I, 1½-inch-thick.

3.15 OUTDOOR, ABOVEGROUND PIPING INSULATION SCHEDULE

A. Refrigerant Suction and Hot-Gas Piping:

1. NPS 1 1/2 and Smaller: Insulation shall be:

   a. Cellular Glass: 2 inches thick.
   b. Mineral-Fiber, Preformed Pipe Insulation, Type I, 2 inches thick.

2. NPS 2 and Larger: Insulation shall be:

   a. Cellular Glass: 2 inches thick.
   b. Mineral-Fiber, Preformed Pipe Insulation, Type I, 2 inches thick.

B. Heating Hot Water and Chilled Water Piping:

1. NPS 1 1/2 and Smaller: Insulation shall be:

   a. Cellular Glass: 2 inches thick.
   b. Mineral-Fiber, Preformed Pipe Insulation, Type I, 2 inches thick.

2. NPS 1 1/2 and Larger: Insulation shall be:

   a. Cellular Glass: 2 inches thick.
   b. Mineral-Fiber, Preformed Pipe Insulation, Type I, 2 inches thick.

3.16 OUTDOOR, UNDERGROUND PIPING INSULATION SCHEDULE

A. Rigid cellular polyurethane pipe insulation.

B. Heating-Hot-Water Supply and Return, All Sizes, 200 Deg F (93 Deg C) and Below: Cellular glass, 3 inches thick.

3.17 INDOOR, FIELD-APPLIED JACKET SCHEDULE

A. Install jacket over insulation material. For insulation with factory-applied jacket, install the field-applied jacket over the factory-applied jacket. If more than one (1) material is listed, selection from materials listed is Contractor's option.

B. Piping, Concealed:

1. None.

C. Piping, Exposed:

1. PVC, Color-Coded by System: 20 mils thick.

3.18 OUTDOOR, FIELD-APPLIED JACKET SCHEDULE

A. Install jacket over insulation material. For insulation with factory-applied jacket, use the factory supplied jacket.

B. Piping, Concealed:

1. None.

C. Piping, Exposed:

1. Painted Aluminum, Smooth with Z-Shaped Locking Seam: 0.024-inch.

3.19 UNDERGROUND, FIELD-INSTALLED INSULATION JACKET

A. For underground direct-buried piping applications, refer to appropriate specification.

END OF SECTION 230719

SECTION 230800 – COMMISSIONING OF HVAC SYSTEMS

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS – NEED TO MAKEA RECOMMENDATION FOR WHEN THIS WORK SHOULD BE FIGURED DUE TO MULTI PHASED PROJECT. And ADJUST FOR ANY EXISTING SOLE SOURCE WE ARE TYING TO EXISTING BMS SYSTEM FROM THE TOWN FOR INSTRANCE, SOMETHING TO CHECK INTO WITH DESIGN TEAM

A. Work under this contract shall conform under requirements of Division 019100, Division 230000, General Requirements, Conditions of the Contract, and Supplementary Conditions. This specification covers commissioning of mechanical systems which are part of this project.

B. Furnish labor and material to accomplish complete HVAC commissioning as specified herein. Complete interim commissioning if HVAC systems during initial season operation and follow-up commissioning of required HVAC systems during additional season operation.

C. All trades must adhere to the applicable commissioning and testing guidelines and best practices.

1.2 SECTION INCLUDES

A. This specification section provides a general overview of the HVAC commissioning process and must be read in conjunction with the following related sections:

1. Construction Documents for affected building systems.
2. Section includes the commissioning process requirements for HVAC equipment.
3. HVAC trade specific commissioning sections in Division 230000.
4. Applicable Pre-Purchased Equipment Specifications.
5. This project is pursuing LEED Certification. See related specifications for sustainable design requirements affecting work of this Section.

1.3 INTRODUCTION

A. Commissioning is a process, and its purpose includes the below:

1. To clearly document the design intent.
2. To verify that the systems installation and performance is in accordance with the plans, specifications and design intent.
3. To train the owner's operators so that they fully understand the design intent and the operation and maintenance requirements of the equipment.
4. To witness & verify all systems are integrated & operating as intended by the Basis of Design (BOD).
5. Coordinate a warranty phase transition through close-out of the project.

B. Definitions

1. Commissioning: the process of ensuring that systems are designed, installed functionally tested and capable of being operated and maintained to perform in conformity with the design intent. The commissioning begins with planning and includes design, construction, start-up, acceptance, and training, and can be applied throughout the life of the building.
2. Commissioning authority: the designated person, company, or agent who implements the overall commissioning process.
3. Commissioning Plan: A document defining the commissioning process, which is developed in increasing detail as the project progresses through its various phases.

4. Commissioning report: the document that records the results of the commissioning process, including the as-built performance of the HVAC system and unresolved issues.
5. Commissioning specification: the contract document that details the objective, scope, and implementation of the construction and acceptance phases of the commissioning process as developed in the design-phase Commissioning Plan.
6. Commissioning team: those people responsible for working together in carrying out the commissioning process.
7. Design intent: a detailed explanation of the ideas, concepts, and criteria that are defined by the owner to be important. This typically is an expansion of the information provided in the Owner's Program.
8. Design intent document: a detailed written document, evolving throughout the commissioning process, clearly defining items and criteria of the design intent.
9. Functional Performance Testing (FPT): the process of determining the ability of the HVAC system to deliver heating, ventilating, and air-conditioning services in accordance with the final design intent.
10. Systems Manual: a composite document that expands the scope of the operation manual and maintenance manual by including the additional information gathered by the commissioning process.
11. Verification: that full range of checks and tests carried out to determine if all components, subsystems, systems, and interfaces between systems operate in accordance with the contract documents. In this context, “operate” includes all modes and sequences of control operation, interlocks and conditional control responses, and specified responses to abnormal or emergency conditions.

C. Scope of Work during Design Development Phase SINCE THIS SPEC IS FOR BID SET DO WE NEED TO LIST DD SCOPE

1. The CxA reviews the Owner Project Requirements (OPR) and Basis of Design (BoD) documentation.
2. The CxA conducts an initial review of the design prior to the construction documents phase.
3. The CxA conducts a focused review of the construction documents when close to completion. This review should be conducted prior to issuing the construction documents for bid and captured in the commissioning report.
4. Prepare a pre-construction phase commissioning plan.
5. Review and comment on submittals from each Contractor for compliance with the OPR, BoD, Contract Documents, and construction-phase commissioning plan. Review and comment on performance expectations of systems and equipment and interfaces between systems relating to the OPR and BoD.

D. Scope of Work during Construction Phase

1. Review required submittals and test data
2. Help finalize details of the Commissioning Plan
3. Organize/facilitate periodic commissioning team meetings
4. Review start-up and testing and balancing reports
5. Participate in O&M training
6. Review revised Owner’s Project Requirements (OPR)
7. Review revised Basis Of Design (BOD)
8. Provide revised commissioning plan
9. Integrate Cx tasks into construction schedule
10. Coordinate a construction phase commissioning kick-off meeting
11. Provide submittal review and comments
12. Review of test and balance report.
13. Perform a controls point-to-point check report review
14. Coordinate a controls integration coordination meeting (FA, FP, P, HVAC, ELEC)
15. Provide a master commissioned equipment list
16. Review start-up reports.
17. Provide pre-functional procedures & test data forms

18. Provide functional testing procedures & test data forms
19. Coordinate test procedure & review with the GC and the Engineer
20. Review contractor test reports
21. Draft commissioning meeting agenda and minutes
22. Execute fire & smoke inspections and testing
23. Maintain a commissioning issues log

E. Scope of work during Acceptance Testing Phase

1. Verify approved sequences of operations
2. Coordinate test procedure & review with the GC and the Engineer.
3. Draft commissioning meeting agenda and minutes
4. Review training agendas, materials, and schedule
5. Review contractor test reports
6. Coordinate, witness, and document functional performance tests
7. Verify that the system complies with the contract documents,
8. Perform functional performance testing,
9. Conduct O&M staff walkthrough of systems
10. Conduct Operations & Maintenance review
11. Submit final test report,
12. Assemble a systems manual
13. Identify and document deficiencies,
14. Execute an issue resolution log
15. Remedy deficiencies and retest,

F. Scope of Work during Post-Occupancy Phase

1. Establish an as-built record of the system performance,
2. Complete the as-built records,
3. Complete the Systems Manual
4. Confirm training plan has been implemented
5. Compile final systems manual
6. Compile operations and maintenance plan
7. Turn over all required close out documentation and warranties.
8. Perform seasonal testing
9. Submit final commissioning report
10. Perform 10-month review
11. Develop ongoing Cx plan

G. Systems to be Included in Commissioning Process

All HVAC systems, sub-systems, and equipment installed, interconnected, and integrated under Division 230000 shall be commissioned. This includes but is not limited to:

1. Electric Duct Heater
2. Outside Air Fan
3. Transfer Exhaust Fan
4. Electric Unit Heater
5. Fan Powered Box
6. Variable Air Volume Box
7. BMS Controls and Integration (temporary and permanent)
8. Kitchen Exhaust System
9. Pre-Purchased Packaged AC Unit (Mammoth)
10. Pre-Purchased CRAC Unit

1.4 QUALITY ASSURANCE

A. The Contractor will provide qualified point person throughout the commissioning process.

1. The point person will attend all commissioning team meeting and provide all required documentation requested by the CxA.
2. Contractor to provide onsite technician for functional performance test activities support, as required by the CxA.
3. Contractors will comply with tests that follow manufacturer's calibration procedures and intervals. Recalibrate test instruments immediately after instruments have been repaired resulting from being dropped or damaged. Affix calibration tags to test instruments. Furnish calibration records to CxA upon request.

B. Related Requirements

1. Section 019100 - General Commissioning Requirements.
2. LEED Sustainable Design Requirements.
3. Contractor shall adhere to all requirements of Division 230000.

C. References:

1. ASHRAE Standard 202-2018: Commissioning Process for Buildings and Systems.
2. ASHRAE Application Handbook – 2019: Chapter 44 – HVAC Commissioning (Building Commissioning).
3. ASHRAE Guideline 4-2019: Preparation of Operating and Maintenance Documentation for Building Systems.
4. ASHRAE Guideline 0-2019: The Commissioning Process.
5. ASHRAE Guideline 1.3-2018: Building Operations and Maintenance Training for the HVAC&R Commissioning Process
6. LEED V4: Energy and Atmosphere Prerequisite Fundamental Commissioning and Verification
7. LEED V4: Energy and Atmosphere Credit Enhanced Commissioning
8. Associated testing guidelines.

1.5 RESPONSIBILITES

A. Mechanical Contractor

1. Include cost of commissioning requirements in the contract price.
2. Include requirements for submittal data, O&M data, and training in each purchase order or sub-contract written.
3. Updated Submittals: Keep the CxA informed of all changes to control system documentation made during programming and setup; revise and resubmit when substantial changes are made.
4. Ensure cooperation and participation of specialty sub-contractors such as sheet metal, piping, refrigeration, water treatment, and TAB.
5. Ensure all HVAC systems meet all construction, inspections, installation, and pre-functional testing. Submit all documents verifying completion to the CxA meets all requirements in accordance with Division 230000.
6. Prepare preliminary schedule for mechanical system orientations and inspections, O&M manual submissions, training sessions, pipe testing, flushing and cleaning, equipment start-up, TAB and task completion for use by the CxA. Update schedule as appropriate throughout the construction period.
7. Include all hydrostatic testing and pressure tests for HVAC systems specified in Division 230000 and local codes.
8. Include all duct leakage testing for HVAC systems specified in Division 230000 and local codes.
9. Include all air barrier testing for HVAC systems specified in Division 230000 and local codes.
10. Include all static tests / integrity tests specified in Division 230000 and local codes.
11. CxA will develop and submit pre-functional forms for distribute. Contractor to complete forms. Startup Reports, Pre-functional Checklists, and Trend Logs: Submit for approval of CxA.

12. Ensure temperature controls installer performs assigned commissioning responsibilities.
13. Ensure TAB agency performs assigned commissioning responsibilities.
14. Ensure subcontractors perform assigned commissioning responsibilities.
15. Provide manufacturer's representatives to execute starting of equipment. Ensure representatives are available and present during agreed upon schedules and are in attendance for duration to complete TAB work.
16. Notify the Commissioning Authority a minimum of two weeks in advance of the time for start of the TAB work. Attend the initial TAB meeting for review of the official TAB procedures.
17. Ensure participation of equipment manufacturers in appropriate start-up, testing, and training activities when required by individual equipment specifications.
18. Perform and document completed startup and system operational checkout procedures, providing copy to Commissioning Authority (CxA).
19. Notify the Commissioning Authority a minimum of two weeks in advance, so that the witnessing equipment and system start-up and testing can begin.
20. Provide factory supervised startup services for equipment and systems where specified. Coordinate work with manufacturer and CxA.
21. Coordinate with equipment manufacturers to determine specific requirements to maintain validity of warranties.
22. Attend Construction Phase coordination meeting scheduled by the Commissioning Authority.
23. Assist the CxA in all verification and functional performance tests.
24. Provide personnel to assist CxA during equipment or system verification checks, and functional performance tests as needed.
25. Assist the Commissioning Authority in all verification and functional performance tests. Prepare preliminary schedule for HVAC system orientations and inspections, O&M manual submission, training session, piping/HVAC system testing, flushing, cleaning, equipment start-up, TAB and task completion for use by the Commissioning Authority (CxA). Update schedule as appropriate throughout the construction period.
26. Conduct HVAC system orientation and inspection at the equipment placement completion stage.
27. Ensure participation of major equipment manufacturers in appropriate training and testing activities.
28. Participate in, and schedule vendors and Contractors to participate in the training sessions as set up by the Commissioning Authority.
29. Attend initial training session.
30. Update drawings to the record condition to date, and review with the Commissioning Authority.
31. Gather O&M data on all equipment and assemble in binders as required by the Commissioning Specification. Submit to Commissioning Authority prior to the completion of construction. The O&Ms shall include the following:

    a. Specific step-by-step instructions on how to perform and apply all functions, features, modes, etc. mentioned in the controls training sections of this specification and other features of this system. Provide an index and clear table of contents. Include the detailed technical manual for programming and customizing control loops and algorithms.
    b. Full as-built set of control drawings.
    c. Full as-built sequence of operations for each piece of equipment.
    d. Full points list; in addition to the information on the original points list submittal, include a listing of all rooms with the following information for each room:

        1) Floor.
        2) Room number.
        3) Room name.
        4) Air handler unit ID.
        5) Reference drawing number.
        6) Air terminal unit tag ID.
        7) Heating and/or cooling valve tag ID.

8) Minimum air flow rate.
9) Maximum air flow rate.

e. Full print out of all schedules and set points after testing and acceptance of the system.
f. Full as-built print out of software program.
g. Electronic copy on disk of the entire program for this facility.
h. Marking of all system sensors and thermostats on the as-built floor plan and HVAC drawings with their control system designations.
i. Maintenance instructions, including sensor calibration requirements and methods by sensor type, etc.
j. Control equipment component submittals, parts lists, etc.
k. Warranty requirements.
l. Copies of all checkout tests and calibrations performed by the Contractor (not commissioning tests).
m. Organize and subdivide the manual with permanently labeled tabs for each of the following data in the given order:

1) Sequences of operation.
2) Control drawings.
3) Points lists.
4) Controller and/or module data.
5) Thermostats and timers.
6) Sensors and DP switches.
7) Valves and valve actuators.
8) Program setups (software program printouts).

n. Submit updated version of control system documentation, for inclusion with operation and maintenance data.
o. Show actual locations of all static and differential pressure sensors (water pressure) on project record drawings.
p. Submit reviewed O&M manuals available prior to scheduling of training sessions.
q. Provide written notification to the General Contractor and Commissioning Authority that the following work has been completed in accordance with the contract documents, and that the equipment, systems, and sub-system are operating as required.

1) HVAC equipment including all Division 230800 equipment.
2) Verify building control systems are functioning to control HVAC equipment.

B. Test, Adjust, and Balance Contractor

1. Include cost for commissioning requirements in the contract price.
2. Attend initial commissioning coordination meeting scheduled by the Commissioning Authority.
3. Submit the TAB procedures to the Commissioning Authority and Design Professional for review and acceptance.
4. Attend the TAB review meeting scheduled by the Commissioning Authority. Be prepared to discuss the procedures that shall be followed in testing, adjusting, and balancing the HVAC system.
5. Notify CxA 10 days in advance of TAB work and provide access for the CxA to witness TAB work.
6. TAB contractor will provide their own tools, & instruments for balancing HVAC&R:

a. The TAB contractor will use same tools & instruments when original data was collected.
b. Failure of more than 10% of items in a TAB report will result in a failed TAB report.
c. TAB contractor will remedy the deficiency and notify the CxA so the verification of failed portions can be performed.

7. Submit contactor, supervisor, & technician's certifications.
8. TAB contractor will ensure the HVAC&R systems balanced follows all requirements in accordance with applicable articles in Divisions 230000.
9. Participate in training sessions as scheduled by the Commissioning Authority.
10. At the completion of TAB work, and the submittal of the final TAB report, notify the Mechanical Contractor and the General Contractor.
11. Participate in verification of the TAB report, which will consist of repeating any selected measurement contained in the TAB where required by the Commissioning Authority for verification or diagnostic purposes.

C. Automatic Controls and Building Automation System Contractors

1. Include cost for commissioning requirements in the contract price.
2. Ensure all HVAC&R systems meet all requirements in accordance with Division 230000.
3. Review design for controllability with respect to selected manufacturer's equipment.
4. Verify proper hardware specification exists for functional performance required by specification and sequence of operation.
5. Verify proper safeties and interlocks are included in design.
6. Verify proper sizing of control valves and actuators based on design pressure drops.
7. Verify control valve authority to control coil properly.
8. Verify proper sizing of control dampers.
9. Verify damper authority to control air stream.
10. Verify proper damper positioning for mixing to prevent stratification.
11. Verify actuator vs. damper sections for smooth operation.
12. Verify proper selection of sensor ranges.
13. Clarify all questions of operation.
14. Attend initial commissioning coordination meeting scheduled by the Commissioning Authority.
15. Provide the following submittals to the Commissioning Authority.

    a. Hardware and software submittals
    b. Control panel construction shop drawings.
    c. Narrative description of each control sequence for each piece of equipment controlled.
    d. Diagrams showing all; control points, sensor locations, point names, actuators, controls, and where necessary points of access superimposed on diagrams of the physical equipment.
    e. Logic diagrams showing the logic flow of the system.
    f. A list of all control points, including analog inputs, analog outputs, digital inputs, and digital outputs. Include the values of all parameters for each system point. Provide a separate list for each stand alone control unit.
    g. A complete control language program listing including all software routines employed in operating the control system. Also provide a program write-up, organized in the same manner as the control software. This narrative shall describe the logic flow of the software and the functions of each routine and sub-routine. It should explain individual math or logic operations that are not clear from reading the software listing.
    h. Hardware operation and maintenance manuals.
    i. Application software and project applications code manuals.

16. Verify proper installation and performance of controls/BAS hardware and software provided by others.
17. Integrate installation and programming schedule with construction and commissioning schedules.
18. Provide thorough training operating professionals on hardware operations and programming, and the application program for the system.
19. Demonstrate system performance to Commissioning Authority including all modes of system operation (e.g. normal, abnormal, emergency)

20. Provide control system technician for use during system verification and functional performance testing.
21. Provide systems modifications as required.
22. Provide support and coordination with TAB contractors on all interfaces between their scopes of work. Provide all devices, such as portable operator terminals, for TAB use in completing TAB procedures.
23. Set-up required trend logs to facilitate the commissioning process.
24. Verify metering tie-in points via load testing where applicable
25. Controls contractor shall furnish required equipment for commissioning of metering points
26. Verify BACNET connections to Landlord systems as applicable.
27. The functional testing of equipment with respect to the building automation system shall include both commissioning of any temporary network and re-commissioning of the systems after migrating to the permanent network. Re-commissioning activities may consist of a re-verification of safeties and confirmation of any IP address updates.

D. Equipment Suppliers and Miscellaneous Contractors.

1. Include cost for commissioning requirements in the contract price.
2. Provide submittals, and appropriate O&M manual section(s).
3. Attend initial commissioning coordination meeting scheduled by the Commissioning Authority.
4. Provide factory supervised startup services for equipment and systems where specified. Coordinate work with manufacturer and CxA.
5. Participate in training sessions as scheduled by the Commissioning Authority.
6. Demonstrate performance of equipment as applicable.

1.6 DOCUMENTATION

A. The Commissioning Authority shall oversee and maintain the development of commissioning documentation. The commissioning documentation shall be kept in three ring binders, and organized by system and sub-system when practical. All pages shall be numbered, and a table of contents page(s) shall be provided. The commissioning documentation shall include, but not be limited to, the following:

1. A detailed description of the design intent for the project, listing operating parameters, control sequences, occupancy conditions etc.
2. A complete description of how the HVAC system is intended to operate.
3. Approved final test and balance report for the HVAC being commissioned.
4. All accepted shop drawings of HVAC equipment. Shop drawings shall be full size sheets folded as required to fit in binders.
5. Final Commissioning Plan
6. All pre-functional performance test checklists, signed by indicating personnel, organized by system and sub-system.
7. All verification and functional performance test checklists/results, signed by indicated personnel, organized by system and sub-system.
8. Start-Up reports, test & inspection reports and certificates.
9. Gasket, flange, welding, fittings inspection and testing checklist, signed by indicating personnel.
10. Issues Log with corrective action verification.
11. Trend data & off-season functional performance testing.
12. Final Commissioning Report
13. Three copies of the operation and maintenance (O&M) manuals specified in other sections of these specifications shall be included with the commissioning documentation. The manuals shall be incorporated in the commissioning documentation prior to commencement of O&M training required in this and other sections of the specification. Preparation of O&M manuals shall be as specified in these specifications.

PART 2 - PRODUCTS

2.1 TEST EQUIPMENT

A. The appropriate Contractor(s) shall furnish all special tools and equipment required during the commissioning process. A list of all tools and equipment to be used during commissioning shall be submitted to the Commissioning Authority for approval. The owner shall furnish necessary utilities for the commissioning process.

B. All testing equipment used on jobsite will require a valid and non-expired calibration certificate.

C. Provide all standard testing equipment required to perform startup and initial checkout and required functional performance testing; unless otherwise noted such testing equipment will NOT become the property of Owner.

D. Equipment-Specific Tools: Where special testing equipment, tools and instruments are specific to a piece of equipment, are only available from the vendor, and are required to accomplish startup or Functional Testing, provide such equipment, tools, and instruments as part of the work at no extra cost to Owner; such equipment, tools, and instruments are to become the property of Owner.

2.2 TEST EQUIPMENT-PROPRIETARY

A. Proprietary test equipment and software required by any equipment manufacturer for programming and/or start-up, whether specified or not, shall be provided by the manufacturer of the equipment. Manufacturer shall provide the test equipment, demonstrate it's use, and assist in the commissioning process as needed. Proprietary test equipment (and software) shall become the property of the owner upon completion of the commissioning process.

PART 3 - EXECUTION

3.1 GENERAL

A. A pre-construction meeting of all commissioning team members shall be held at a time and place designated by the owner. The purpose shall be to familiarize all parties with the commissioning process, and to ensure that the responsibilities of each party are clearly understood.

B. The Contractor shall complete all phases of work so the systems can be started, tested, balanced, and acceptance procedures undertaken. This includes the complete installation of all equipment, materials, pipe, duct, wire, insulation, controls, etc. per the contract documents and related directives, clarifications, and change orders.

C. A Commissioning Plan shall be developed by the Commissioning Authority. The Contractor shall assist the Commissioning Authority in preparing the Commissioning Plan by providing all necessary information pertaining to the actual equipment and installation. If contractor initiated system changes have been made that alter the commissioning process, the commissioning Authority shall notify the Contracting Officer.

D. Acceptance procedures are normally intended to begin prior to completion of a system and/or sub-systems, and shall be coordinated with the Division 230000 contractor. Start of acceptance procedures before system completion does not relieve the contractor from completing those systems as per the schedule.

3.2 PREPARATION

A. The Construction Manager and subcontractors are to cooperate with the CxA in development of the Pre-Functional Checklists and Functional Test Procedures.

B. Contractors to submit startup plans, startup reports, and Pre-Functional Checklists for each item of equipment or other assembly to be commissioned.

C. The Construction Manager and subcontractors are to furnish additional information requested by the CxA.

D. The Construction Manager and subcontractors are to prepare a preliminary schedule for HVAC pipe and duct system testing, flushing and cleaning, equipment start-up and testing, adjusting, and balancing start and completion for use by the CxA; update the schedule as appropriate.

E. Notify the CxA forty-eight (48) hours in advance when pipe and duct system testing, flushing, cleaning, startup of each piece of equipment and testing, adjusting, and balancing will occur; when commissioning activities not yet performed or not yet scheduled will delay construction notify ahead of time and be proactive in seeing that the CxA has the scheduling information needed to efficiently execute the commissioning process.

F. Put all HVAC equipment and systems into operation and continue operation during each working day of testing, adjusting, and balancing and commissioning, as required.

G. Provide test holes in ducts and plenums, where directed, to allow air measurements and air balancing, close with an approved plug.

H. Provide temperature and pressure taps in accordance with Contract Documents.

I. Mechanical Contractor to complete Valve/Damper Stroke Setup and Check:

1. For all valve/damper actuator positions checked, verify the actual position against the control system readout.
2. Set pump/fan to normal operating mode.
3. Command valve/damper closed; visually verify that valve/damper is closed and adjust output zero signal as required.
4. Command valve/damper open; verify position is full open and adjust output signal as required.
5. Command valve/damper to a few intermediate positions.
6. If actual valve/damper position does not reasonably correspond, replace actuator or add pilot positioner (for pneumatics).

J. Mechanical Contractor to complete Isolation Valve or System Valve Leak Check: For valves not by coils.

1. With full pressure in the system, command valve closed.
2. Use an ultra-sonic flow meter to detect flow or leakage.

3.3 PARTICIPATION IN ACCEPTANCE PROCEDURES

A. The Contractor shall provide skilled technicians to start-up and debug all systems within Division 230000. These same technicians shall be made available to assist the Commissioning Authority in completing the commissioning program. Work schedules, time required for testing, etc. shall be requested by the Commissioning Authority and coordinated by the contractor. Contractor shall ensure that the qualified technician(s) are available and present during the agreed upon schedules and of sufficient duration to complete the necessary tests, adjustments, and/or problem resolutions.

B. System performance problems and discrepancies may require additional technician time, Commissioning Authority time, reconstruction of systems, and/or replacement of system components. The additional technician time shall be made available for subsequent commissioning periods until the required system performance is obtained.

C. The Commissioning Authority reserves the right to question the appropriateness and qualifications of the technicians relative to each item of equipment, system, and/or sub-system. Qualifications of technicians shall include expert knowledge relative to the specific equipment involved and a willingness to work with the Commissioning Authority. Contractor shall provide adequate documentation and tools to start-up and test the equipment, system, and/or sub-system.

3.4 DEFICIENCY RESOLUTION

A. In some systems, improper adjustments, misapplied equipment, and/or deficient performance under varying loads will result in additional work being required to commission the systems. This work shall be completed under the direction of the Contracting Officer, with input from the contractor, equipment supplier, and Commissioning Authority. Whereas all members shall have input and the opportunity to discuss, debate, and work out problems, the Contracting Officer shall have final jurisdiction over any additional work done to achieve performance.

B. Corrective work shall be completed in a timely fashion to permit the completion of the commissioning process. Experimentation to demonstrate system performance may be permitted. If the Commissioning Authority deems the experimentation work to be ineffective or untimely as it relates to the commissioning process, the Commissioning Authority shall notify the Contracting Officer, indicating the nature of the problem, expected steps to be taken, and suggested deadline(s) for completion of activities. If the deadline(s) pass without resolution of the problem, the Contracting Officer reserves the right to obtain supplementary services and/or equipment to resolve the problem. Costs incurred to solve the problems in an expeditious manner shall be the contractor's responsibility.

3.5 ADDITIONAL COMISSIONING AGAIN WHAT WOULD WE ASSUME?

A. Additional commissioning activities may be required after system adjustments, replacements, etc., are completed. The contractor (s), suppliers and Commissioning Authority shall include a reasonable reserve to complete this work as part of their contractual obligations.

3.6 SEASONAL COMMISIONING

A. Seasonal commissioning pertains to testing under full load conditions during peak heating and peak cooling seasons, as well as part load conditions in the spring and fall. Initial commissioning shall be done as soon as contract work is completed, regardless of season. Subsequent commissioning may be undertaken at any time thereafter to ascertain adequate performance during the different seasons.

B. Heating equipment shall be tested during winter design extremes. Cooling equipment shall be tested during summer design extremes with a fully occupied building. Each contractor and supplier shall be responsible to participate in the initial and the alternate peak season tests of the systems as required & demonstrate performance.

3.7 TAB COORDINATION

A. TAB: Testing, adjusting, and balancing of HVAC.

B. Coordinate commissioning schedule with TAB schedule.

C. Develop a TAB plan for review by the CxA.

D. Provide all necessary unique instruments and instruct the TAB technicians in their use; such as handheld control system interface for setting terminal unit boxes, etc.

E. Have all required Pre-Functional Checklists, calibrations, startup and component Functional Tests of the system completed and approved by the CxA prior to starting TAB.

F. Provide a qualified control system technician to operate the controls to assist the TAB technicians or provide sufficient training for the TAB technicians to operate the system without assistance.

3.8 CONTROL SYSTEM FUNCTIONAL TESTING

A. Pre-Functional Checklists for control system components will require a signed and dated certification that all system programming is complete as required to accomplish the requirements of Contract Documents and the detailed Sequences of Operation documentation submittal.

B. Functional Testing shall be not started until all controlled components have themselves been successfully Functionally Tested in accordance with Contract Documents.

C. Using a skilled technician who is familiar with this building, execute the Functional Testing of the control system as required by the CxA.

D. Functional Testing of the control system constitutes demonstration and trend logging of control points monitored by the control system.

1. Perform all trend logging specified in Division 230000, Pre-Functional Checklists and Functional Test procedures.

E. Functionally Test integral or stand-alone controls in conjunction with the Functional Tests of the equipment they are attached to, including any interlocks with other equipment or systems; further testing during control system Functional Test is not required unless specifically indicated below.

F. Demonstrate the following to the CxA during testing of controlled equipment; coordinate with commissioning of equipment.

1. Setpoint changing features and functions.
2. Sensor calibrations.

G. Demonstrate to the CxA:

1. That all specified functions and features are set up, debugged and fully operable.
2. That scheduling features are fully functional and setup, including holidays.
3. That all graphic screens and value readouts are completed.
4. Correct date and time setting in central computer.
5. That field panels read the same time as the central computer; sample 10 percent of field panels; if any of those fail, sample another 10 percent; if any of those fail test all remaining units at no extra cost to Owner.
6. Functionality of field panels using local operator keypads and local ports (plug-ins) using portable computer/keypad; demonstrate 100 percent of panels and 10 percent of ports; if any ports fail, sample another 10 percent; if any of those fail, test all remaining units at no extra cost to Owner.
7. Power failure and battery backup and power-up restart functions.
8. Global commands features.
9. Security and access codes.
10. Occupant over-rides (manual, telephone, key, keypad, etc.).
11. O&M schedules and alarms.
12. Occupancy sensors and controls.

13. All control strategies and sequences not tested during controlled equipment testing.

H. If the control system, integral control components, or related equipment do not respond to changing conditions and parameters appropriately as expected, as specified and according to acceptable operating practice, under any of the conditions, sequences, or modes tested, correct all systems, equipment, components, and software required at no additional cost to Owner.

3.9 ACCEPTANCE PROCEDURES

A. Verification Tests

1. Scope of verification tests

a. Operating tests and checks to verify that all components, equipment, systems, sub-systems, and interfaces between systems, operate in accordance with contract documents. These tests are to include all operating modes, interlocks, specified control responses, specific responses to abnormal or emergency conditions and verifications of the proper response of the building automation system controllers and sensors.
b. All functional testing will ensure that the HVAC&R systems meet the following requirements of Division 23.
c. Verify HAVC&R has been installed, calibrated, started, and operating according to contract documents.
d. Verify HVAC&R instrumentation and controls systems have been completed and calibrated according to contract documents.
e. Verify the validity of the TAB report.
f. Set systems, subsystems, and equipment into an operating mode to be tested.
g. Inspect and verify the position of each device and interlock is identified on the checklists.
h. Check all safety cutouts, alarms, and interlocks with smoke control and life-safety systems during each mode of operation.

2. Participants in verification tests

a. The Commissioning Authority shall be responsible for preparing the scope of these tests. The Commissioning Authority shall schedule the tests and assemble the commissioning team members who shall be responsible for the tests. Participating contractors, manufacturers, suppliers, etc. shall include all costs to do the work involved in these tests in their proposals. Following is a list of tasks and supporting information that shall be required.
b. Mechanical contractor – provide the services of a technician(s) who is (are) familiar with the construction and operation of this system. Provide access to the contract plans, shop drawings, and equipment cut sheets of all installed equipment.
c. Controls contractor – provide the services of a controls engineer who is familiar with the details of the project. Provide details of the control system, schematics, and a narrative description of control sequences of operation.

3. Documentation and Reporting Requirements.

a. Provide checklists for each component, piece of equipment, system, and sub-system, including all interfaces, interlocks, etc. Each item to be tested shall have a different entry line with space provided for comments. Separate checklists shall be prepared for each mode of operation. Provide space to indicate whether the mode under test responded as required or not. Also, provide space for all necessary parties to sign off on each checklist. Contractor to submit completed pre-functional checklists & start-up reports to CxA.
b. Data sheets used in verification of the proper operation of the control system shall include each controller to be verified, and its location. For each controller, provide space for recording the readout of the controller, the reading at the controller's

sensor(s), and any comments. Also, provide space for all necessary parties to sign off on each checklist.

c. All test procedures and data sheets shall be submitted to the design professional for review and acceptance.

4. Instrumentation

a. The Commissioning Authority shall verify all measurement instrumentation for the verification tests. All instruments will have calibrated within the six month period prior to these tests.

5. Verification Procedures

a. The Commissioning Authority shall direct and witness the verification operating tests and checks for all equipment and systems.

1) Set the system equipment (i.e., chiller, boiler, pumps, fans) into the operating mode to be tested, i.e. normal shut down, normal auto position, normal manual position, unoccupied cycle, emergency power, and alarm conditions. A sampling rate shall not be utilized for the HVAC&R Systems.
2) The Commissioning Authority shall inspect and verify the position of each device and interlock identified on the checklist. Each item shall be signed off as acceptable (yes), or failed (no).
3) This test shall be repeated for each operating cycle that applies to the mechanical system being tested.
4) Operating checks shall include all safety cutouts, alarms and interlocks with smoke control and life safety systems during all modes of operation of the mechanical system.
5) If during a test an operating deficiency is observed, appropriate comments shall be added to the checklist data sheet, then transferred to an issues log with corrective actions verified and tracked until final commissioning report is submitted.
6) Review hydrostatic test reports.
7) Verify welding certificates have been submitted & reviewed.
8) Verification of the interface of the monitoring and control system, and the TAB criteria shall include the following:

a) Verify supply and return flow rates for VAV and constant volume systems in all modes of operation of the HVAC system.
b) Verify operation of the terminal units in both heating and cooling cycles.
c) Verify minimum outdoor air intake air all modes of operation and at minimum and maximum total air flow rates.
d) Verify building pressurization.
e) Verity total exhaust air flow, and total outdoor air intake.

b. Verification of the proper responses of monitoring and control system controllers and sensors shall be as follows:

1) For each controller or sensor, record the indicated monitoring and control system reading, and the test instrument reading.
2) If the initial test indicates that the test reading is outside of the control range of the installed device, the calibration of the installed device shall be checked and adjusted as required. The deficient device shall be re-tested and the results recorded on the checklist data sheet.

c. The Commissioning Authority shall direct and witness the field verification of the final TAB report.

1) The Commissioning Authority shall select, at random, 10 percent of the report data for verifications.
2) The TAB contractor shall be given sufficient advance notice of the date of field verification. However, they shall not be informed in advance of the data points to be verified. The TAB contractor must use the same instruments (by model and serial number) that were used when the original data were collected.

d. If the deficiencies are identified during verification, the General Contractor must be notified, and action taken to remedy the deficiency. The final tabulated checklist data sheets shall be reviewed by the Design Professional and the Commissioning Authority, to determine if verification is complete, and the operating system is functioning in accordance with the contract documents.

B. Functional Performance Testing

1. Scope of Functional Testing

a. Functional performance tests shall determine if the HVAC system is providing the required cooling and heating services in accordance with the final design intent. They shall also determine the installed capacity of the cooling and heating plant, and heat transfer component. Following is a list of test examples:

1) Determine is VAVs actuate based on cooling and heating needs.
2) Determine the steam PRV deliver the correct pressure to the AHU's for heating services.
3) Determine the ability of the HVAC unit of deliver the cooling and/or heating services to the distribution system, at the design supply air temperature, required static pressure, and proper outside air ventilation rate.

b. See attached Functional Performance Test samples in the Commissioning Plan.

2. Submittals

a. Detailed procedures for each series of tests shall be submitted to the Commissioning Authority for review and acceptance. The procedures shall include samples of the data sheets that will be part of the reports.

3. Participants in Functional Performance Tests

a. Participants in the functional performance tests shall be the same as those listed in the verification tests.

4. Instrumentation

a. In addition to the instrumentation requirements detailed under verification, the Commissioning Authority may need to provide data acquisition equipment to record data for the complete range of testing.

5. Functional Performance Test Procedures

a. The Commissioning Authority shall supervise and direct all functional performance tests.
b. For each test, the Commissioning Authority shall install the measuring instruments and logging devices to record test data for the required test period. The instrumentation shall monitor and record all operating conditions to allow for complete evaluation of the test results.
c. Measurement will be required to allow for calculation of total capacity of the system for each mode of operation under test.

6. Documentation and Reporting Requirements

a. All measured data, data sheets, and a comprehensive summary, describing the operation of the HVAC system at the time of testing shall be submitted to the Commissioning Authority.
b. A preliminary functional performance test report shall be prepared by the Commissioning Authority and submitted to the Design Professional or review. Any identified deficiencies need to be evaluated by the Design Professional and Construction Manager to determine if they are part of the contractor's contractual obligations. Construction deficiencies shall be corrected by the responsible contractor(s) and the specific functional performance test repeated.
c. If it is determined that the HVAC system is constructed in accordance with the contract documents, and the performance deficiencies are not part of the contract documents, the Contracting Officer must decide whether any required modifications needed to bring the performance of the HVAC system up to the finalized design intent shall be implemented, or if the test shall be accepted as submitted. If corrective work is performed, the Contracting Officer shall determine if a portion or all required functional performance tests should be repeated, and a revised report submitted.

3.10 OPERATING AND MAINTENANCE MANUAL

A. Refer to project specifications for complete O&M manual requirements that will be submitted to the CxA within 30 days of each accepted submittal.

1. System Descriptions

a. Each major system shall be described, typewritten, in general terms, including major components, interconnections, theory of operation, theory of controls, unusual features and major safety precautions. This information should correlate with information provided in the manufacturer's instruction book. This section shall include, but not limited to, the following data:

1) Detailed description of each system and each of its components showing piping, valves, controls, and other components, with diagrams and illustrations where applicable.
2) Wiring and control diagrams with data to explain detailed operation and control of each component.
3) Control sequences describing start-up, all modes of operation, shutdown, & emergency shutdown.
4) Corrected shop drawings.
5) Approved products data including all performance curves and rating data.
6) Copies of approved certifications, start-up reports, inspections, tests, and laboratory test reports (where applicable).
7) Copies of warranties.

b. System diagrams or drawings shall be incorporated in the appropriate systems descriptions including systems boundaries for testing for the CxA, will be highlighted. These diagrams or drawings should be reduced in size or folded to usefully fit into the manual.

2. Operating Instructions:

a. Condensed, typewritten, suitable for posting, instructions shall be provided for each major piece of equipment. Where more than one (1) common unit is installed, one instruction is adequate. The instructions shall provide procedures for:

1) Starting up the equipment/system.

2) Shutting down the equipment/system.
3) Emergency shutdown of the equipment/system.
4) Operating the equipment in emergency or unusual conditions.
5) Safety precautions.
6) Trouble shooting suggestions.
7) Local controls.
8) Status indicators.
9) Other pertinent data applicable to the operation of particular systems or equipment.

b. The instructions shall be suitable for posting adjacent to the equipment concerned.

c. The contractor shall provide instructions for all installed systems.

3. Ongoing and preventative Maintenance

a. Condensed, typewritten procedures for recommended ongoing and preventative maintenance actions shall be provided for each category of equipment/system. This information shall include, but not be limited to the following:

1) Maintenance and overhaul instructions.
2) Lubricating schedule including type, grade, temperature, and frequency range.
3) Part list, including source of supply and recommended spare parts.
4) Name, address, and 24 hour telephone number of each subcontractor wo installed equipment and systems, and local representative for each type of system.
5) Other pertinent data applicable to the maintenance of particular systems or equipment.

b. These recommended preventative maintenance actions shall be categorized by the following recommended frequencies:

1) Weekly
2) Monthly
3) Quarterly
4) Semi-Annual
5) Annual
6) Other

3.11 OPERATING AND MAINTENANCE TRAINING

A. The Mechanical Contractor, and appropriate sub-contractors, shall provide comprehensive operating and maintenance instruction on building systems prior to delivery. The instruction shall include classroom instruction deliver by competent instructors based upon the contents of the operating manual. Emphasis shall be placed upon overall systems diagrams and descriptions, and why systems were designed as they were. This overall system's instructions shall preferably be delivered by the consulting engineers. The classroom instructions shall also include detailed equipment instruction by qualified manufacturer representatives for all equipment for which operating instructions are provided. The manufacturer representative training shall emphasize operating instructions, and preventive maintenance as described in the operating manual. Training must session must be submitted to the CxA one week prior to a training session. At a minimum, the training sessions shall cover the following items:

1. Types of installed systems.
2. Theory of operation

a. Design intent
b. Occupied vs. unoccupied or partial occupancy

c. Seasonal modes of operation
d. Emergency conditions and procedures
e. Comfort conditions
f. Indoor air quality
g. Energy efficiency
h. Other issues important to facility operation.

3. System operations.
4. Use of control system.

a. Sequence of operation
b. Problem indicators
c. Diagnostics
d. Corrective actions

5. Service, maintenance, diagnostics and repair.
6. Use of reports and logs
7. Troubleshooting, investigation of malfunctions, and determining reasons for the problems

B. Each classroom training period shall be followed by an inspection, explanation and demonstration of the system concerned by the instructors.

C. The contractor shall be responsible for organizing, arranging, and delivering a schedule of system training agreeable with the facility manager.

D. The contractor shall provide two (2) training sessions if required to accommodate operating shifts.

E. The contractor shall provide, at or before substantial completion, a proposed agenda for each system and schedule of the above training for approval by the Commissioning Authority (CxA).

END OF SECTION 2308000

SECTION 230900 - INSTRUMENTATION AND CONTROL FOR HVAC

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Building Management System (BMS), utilizing direct digital controls.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Products Supplied But Not Installed Under This Section:
   1. Control valves.
   2. Flow switches.
   3. Wells, sockets and other inline hardware for water sensors (temperature, pressure, flow).

B. Products Installed But Not Supplied Under This Section:
   1. None.

C. Work Required Under Other Divisions Related to This Section:
   1. Power wiring to line side of motor starters, disconnects or variable frequency drives.
   2. Provision and wiring of smoke detectors and other devices relating to fire alarm system.
   3. Campus LAN (Ethernet) connection adjacent to JACE network management controller.

1.3 RELATED SECTIONS

A. Section 23 05 00 - Basic Mechanical Materials and Methods: Performance and reference standards for products and materials required for the Project.

1.4 SYSTEM DESCRIPTION

A. This project requires the installation of a new Integrated Automation System constructed using with BACnet Field Level Devices.

B. The Contractor will be required to perform the following:

1. Furnish, install, configure and commission a new BACnet fully programmable controllers for the equipment shown including all components, software and applications required to meet the sequence of operation and the design/performance intent of the systems.

2. Provide fully programmable field controllers as specified herein and as indicated on the drawings. Provide I/O and ancillary devices as specified herein, as indicated on the drawings, and as necessary to perform the sequences of operation.

3. Application Specific or “Configurable” controllers will not be accepted.

4. Provide BACnet BTL AWS (Advanced Work Station) certification for the Control System Server (CSS). All Network Controllers (NCs) shall be BTL BBC certified.

5. Furnish and install all low voltage step-down transformers with associated low voltage connections, power supplies and power/communication/input/output cabling necessary for the control system.

6. Furnish and install conduit, junction boxes, fittings, panels, enclosures, and hardware as specified in these specifications, on the drawings and as required by Code.

7. Provide Graphical User Interface Development for all of the devices identified above.

8. It is the contractor's responsibility to review all of the design documents and specifications and report any discrepancies to the owner.

1.5 SUBMITTALS

A. Submit under provisions of Section 01 30 00.

B. Product Data: Manufacturer's data sheets on each product to be used, including:
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.
   3. Installation methods.

C. Submit documentation of contractor qualifications, including those indicated in "Quality Assurance" if requested by the A-E.

D. 4 copies of shop drawings of the entire control system shall be submitted and shall consist of a complete list of equipment and materials, including manufacturers' catalog data sheets and installation instructions. Submit in printed electronic format. Samples of written Controller Checkout Sheets and Performance Verification Procedures for applications similar in scope shall be included for approval.

E. Shop drawings shall also contain complete wiring and schematic diagrams, sequences of operation, control system bus layout and any other details required to demonstrate that the system has been coordinated and will properly function as a system. Terminal identification for all control wiring shall be shown on the shop drawings.

F. Upon completion of the work, provide x complete sets of ' as-built' drawings and other project-specific documentation in 3-ring hard-backed binders and on Flash media.

G. Any deviations from these specifications or the work indicated on the drawings shall be clearly identified in the Submittals.

1.6 QUALITY ASSURANCE

A. The Control System Contractor shall have a full service DDC office within 75 miles of the job site. This office shall be staffed with sales engineering and support, applications engineers, software engineers and field technicians. This office shall maintain parts inventory and shall have all testing and diagnostic equipment necessary to support this work, as well as staff trained in the use of this equipment. BMS vendors that do not utilize local engineering and sales support personnel for this project in a branch office within 75 miles of the jobsite shall not be acceptable under any circumstances.

B. Single Source Responsibility of Supplier: The Control System Contractor shall be responsible for the complete installation and proper operation of the control system. The Control System Contractor shall exclusively be in the regular and customary business of design, installation and service of computerized building management systems similar in size and complexity to the system specified. The Control System Contractor shall be the manufacturer of the primary DDC system components or shall have been the authorized representative for the primary DDC components manufacturer for at least 5 years.

C. Equipment and Materials: Equipment and materials shall be cataloged products of manufacturers regularly engaged in the production and installation of HVAC control systems. Products shall be manufacturer's latest standard design and have been tested and proven in

actual use.

1.7 DELIVERY, STORAGE AND HANDLING

A. Maintain integrity of shipping cartons for each piece of equipment and control device through shipping, storage and handling as required to prevent equipment damage. Store equipment and materials inside and protected from weather.

1.8 JOB CONDITIONS

A. Cooperation with Other Trades: Coordinate the Work of this section with that of other sections to ensure that the Work will be carried out in an orderly fashion. It shall be this Contractor's responsibility to check the Contract Documents for possible conflicts between his Work and that of other crafts in equipment location, pipe, duct and conduit runs, electrical outlets and fixtures, air diffusers and structural and architectural features.

1.9 SEQUENCING

A. Ensure that products of this section are supplied to affected trades in time to prevent interruption of construction progress.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Base Bid: Alerton provided by Automated Building Systems – Glastonbury – Drew Appleton (860) 657-9257 or dappleton@absddc.com

B. Substitutions: Not permitted.

2.2 GENERAL

A. The Building Management System (BMS) shall be comprised of a network of interoperable, stand-alone digital controllers, a network area controller, graphics and programming and other control devices for a complete system as specified herein.

B. The installed system shall provide secure password access to all features, functions and data contained in the overall BMS.

2.3 OPEN, INTEROPERABLE, INTEGRATED ARCHITECTURE

A. The system provided shall incorporate hardware and software resources sufficient to meet the functional requirements of these Specifications. The Facility Local Area Network (FAC LAN) and Device Level Network (DLN) shall be based on industry standard open platforms as specified herein and utilize commonly available operation, management and application software. All software packages and databases shall be licensed to the Owner to allow unrestricted maintenance and operation of the IAS. Contractor shall include all items not specifically itemized in these Specifications that are necessary to implement, maintain, and operate the system in compliance with the functional intent of these Specifications.

B. The system architecture shall implement a new building IAS Framework and consists of an Ethernet-based, wide area network (WAN), a single Local Area Network (LAN) that supports NCs, PCUs, ASCs, Operator Workstations (OWS), Smart Devices (SD), and Remote Communication Devices (RCDs) as applicable.

C. Facility Local Area Network (FAC LAN): The FAC LAN shall be an Ethernet-based, 10/100/1000 Ethernet LAN connecting Local NCs, IAS Server and OWSs. The FAC LAN serves as the backbone for the NCs communications path. Contractor shall provide a FAC LAN as a dedicated LAN for the control system. LAN shall be IEEE 802.3 Ethernet over Fiber or Category 6 cable with switches and routers that support 1000base-T gigabit Ethernet throughput.

D. Device Level Network (DLN): Network used to connect PCUs and ASCs. These shall be Peer to Peer devices as defined in the BTL standard. Network speed shall be 78K bits per second.

E. ARCnet and/or Token-Ring based FAC LANs and DLNs shall not be acceptable.

F. Remote Data Access: The system shall support the Internet Browser-based remote access to the building data. The IAS contractor shall coordinate with the Owner's IT department to insure all remote browser access (if desired by the owner) is protected with the latest Software updates and a VPN (Virtual Private Network) must be installed to protect the owner's network from cyber attacks.

G. Browser-based access: A remote/local user using a standard browser will be able access all control system facilities and graphics via the WAN or direct connection, with proper username and password. Only native Internet browser-based user interfaces (HTML5 , XML, CCS3, etc.) that do not require plug-ins (thin clients) are acceptable. The system shall be capable of supporting an unlimited number of clients using a standard Web browser such as Internet Explorer™, Firefox™ or Chrome™.

H. The communication speed between the controllers, LAN interface devices, CSS, and operator interface devices shall be sufficient to ensure fast system response time under any loading condition.

I. Systems Configuration Database: The system architecture shall support maintaining the systems configuration database on a server that resides on the FAC LAN. User tools for DLN and FAC LAN management shall be provided and licensed to the Owner and shall allow unrestricted configuring, updating, maintaining, and expanding of all current devices, configurations and settings.

J. Database Schema shall be published and provided to the Owner to facilitate easy access to DLN and FAC LAN data.

2.4 OPERATOR WORKSTATION (COMPASS)

A. Structure of Workstation Interaction: Client/server relationship. Embedded web server for browser access. Server to archive data and store system. Operator Workstations to support operation. Virtualized server environment. Web clients may access archive server data.
   1. Single Server License Shall:
      a. Maximum Devices to be Connected: 3000.
      b. Maximum Devices to be Connected: As indicated on Drawings.
      c. Not restrict system size based on point count (BACnet or Integration).

B. Operator Workstation: General purpose, commercially available, personal computer.
   1. Processor: Minimum speed of 2.5 GHz.
      a. Quad core processor.
      b. Eight core processor.
      c. Processor core as indicated on Drawings.
      d. RAM: 4 GB.
      e. RAM: 16 GB.

f. RAM: As indicated on Drawings.
g. Hard Drive: Minimum of 1 TB.
h. Network Interface Card: 10 Mbs.
i. Network Interface Card: 100 Mbs.
j. Network Interface Card: 1000 Mbs.
k. Provide more memory and/or a faster processor if necessary to perform the functions described in this specification.

C. Sufficient storage to accommodate fully configured point databases, application databases, graphics files, user-defined reports, and historical data archived as specified.

D. Graphic Based Displays: For each system.
1. Operator Workstation: Point data for each system. Update every 30 seconds.
2. Dynamically update data any action by user.
3. Graphic Displays: Iconic graphic representations of mechanical equipment. Display graphic files, text, trendlog, and dynamic object data displays including animation.
4. Graphic Displays: "Drill Down" capability from main display to more specific system displays or navigation tree for building equipment and system diagnostic centric display organization.
a. Tree Navigation Contents: Customizable per-user and per-group basis.
5. Systems with Terminal Unit Controls: Building floor plan with dynamic temperatures, drillable for more specific terminal information.
6. Points on graphics allow user to change field-resident Operator Workstation functions associated with project, including setpoints, weekly and exception schedules, from any screen, whether screen shows text or graphic display. Do without reference to object addresses or other numeric/mnemonic indications.
7. Protect display views unless operator credentials have proper access level. Assign access levels to each display/system object. Menu labels not to appear on graphic if operator does not have appropriate security level.
8. Analog objects: Displayed with operator modifiable units. Input objects may be displayed as graphic items on display screen as an overlay to the system graphic.
9. Information: Labeled with descriptors and shown with appropriate engineering units.
10. DDCs system must provide graphic displays and files. Systems requiring graphics development or logic programming are prohibited. Graphic Files: JPG, GIF or PNG.
11. Submit graphic displays to Owner for review and approval. Approved graphics to be in place prior to commissioning.
12. Operator Workstation: Supply graphics library, to use unaltered or modified. Include library to assemble custom graphics. System to allow creation of new graphics.
13. Data Displays: Ability to link to content outside of BAS system. Content to include, but not limited to launching external files in their native applications.

E. Omnigraphics: Graphics with custom geometry offering color gradient shading and variable opacity in scale to system variables; analog and digital, and color range settings.
1. Omnigraphics Must Support:
a. Displaying current values in the geometric shapes.
b. Geometric shapes to be clickable allowing another graphic display.
c. Color Scale: Support using AV's to define the color scale ranges.

F. The Operator Interface: Support the following functions.
1. Mouse-over tooltip information of graphic items or data points; can be turned off.
2. Right click capability to access system functionality such as Schedule, Trendlogs, and Alarms associated with display object selected.
3. Automatic zooming to screen size to maximize display to display area. Can be enabled or disabled. Background color, flood fills remaining screen background.
4. Support user configurable embedded Data Viewer for a persistent trend log data view to accompany system data and graphic information on a single display.

G. Password Protection: Preventing unauthorized use unless operator is logged on.
   1. Limits operator to assigned functions when logged on. Includes displays as outlined.
   2. Users: Individual User IDs, User Names, and Passwords. Case sensitive alphanumeric character entry except for User ID. User ID, User Name, and Password will enforce minimum of 8 characters and stored in encrypted format.
   3. Each user to be allowed individual assignment of control functions, menu items, navigation tree, and user-specific system start display, and restricted access to discrete BACnet devices to which user requires access.
   4. Passwords, user names, and access assignments: Adjustable via Compass. Password adjustable via web client.
   5. Users to have set access levels, which define access to displays and individual objects user may control. System to have 10 distinct access levels for assignment.
   6. Operator Workstation and Web Client: Auto logout feature when no keyboard or mouse activity is detected for time period, adjustable by system administrator. Enabled and disabled by system administrator. Screen message notifying log out.
   7. Permit effective date range, and effective time of day, User are permitted access.
   8. Operator Workstation: Support LDAP integration enforcing strong password policies.

H. Operator Activity Log: Tracks operator changes and activities.
   1. Included in Operator Workstation. A log of what changed, who made the change, date and time of system activity, and value of change before and after. Operator may display activity, sort changes by user or operation and print Operator Activity Log.
   2. Activity log to be gathered and archived to MSDB as needed. Log to be able to exportable for spreadsheet display and sorting.
   3. User option to record commenting in Operator Activity Log upon system point change.
   4. Accessible via Web Client for viewing, sorting, filtering, and printing.

I. Scheduling:
   1. Information to be in easy-to-read daily format including calendar of this month and next. Schedules to show actual ON/OFF times for day based on scheduling priority. Priority for Scheduling: Events, holidays and daily, with events being the highest.
   2. Holiday and Special Event Schedules: Display data in calendar format. Be able to schedule holidays and special events directly from these calendars.
   3. Operator to be able to change information for a given weekly or exception schedule if logged on with appropriate access privileges.
   4. Schedule Wizard for schedules set up. Walks user through schedule generation. Have its own pull-down selection for startup or may be started by right-clicking on value displayed on graphic and then selecting Schedule.
   5. Scheduling: Include optimum start based on outside air temperature, current heating/cooling setpoints, indoor temperature and previous starts history. Individual zones to have optimum start time calculated based on parameters listed. Operators to input schedules to set time that occupied setpoint is to be attained. Optimum start feature must calculate the startup time needed to match zone temperature to setpoint. Operators to be able to set a limit for maximum startup time allowed.
   6. List show currently defined schedules. Includes standard, holiday and event schedules. User to be able to select a list showing scheduled points and zones.
   7. Display of schedules must show ON times for standard, holiday and event schedules in different colors on a given day. OFF times must also be shown in additional colors. Operators may select from a calendar what days are to be scheduled and show points and zones affected. Operators may set time for one day and then match it to days of the week to be affected as a recurrence of same schedule.
   8. Any displayed data that is changeable by operator may be selected using the right mouse button and schedule selectable on screen. Selection of schedule using this method allows viewing of assigned schedule and allows the point to be scheduled.
   9. Schedule Support Functions: Drag-n-drop events and holidays on schedule calendar.
      a. Drag-n-drop events default to two-hour period; can operator adjusted.

b. Drag-n-drop holidays default for OFF all day; edit for multiple-day holidays.
c. View affected zones when adding or editing timed events of a schedule.

10. Web Client: A search list of scheduled points and zones to access schedule calendar.
11. Schedule Time Blocks: Present schedule detail via mouse-over information.

J. Advanced Scheduling:
1. Each resource shall have its own unique schedule object.
2. Both analog and binary points shall be scheduled.
3. Holiday schedules shall support perpetual holidays
4. Calendar Events Set to be Reoccurring Events: Daily, weekly, monthly and annually as well as a non-pattern occurrence by selecting groups of days so they can be edited on one occurrence.

K. Alarm Indication and Handling: Visual, printed, and email means of alarm indication.
1. Printout of Alarms: Sent to assigned terminal and port. May be filtered based on User ID's authorization level.
2. Web Client: Display persistent alarm state for system regardless of data view including points in alarm but not acknowledged, and points that have gone into alarm and returned to normal without being acknowledged.
3. Recorded and archive at the Operator Workstation:
a. Description of event and equipment initiating alarm. 256 characters in length.
b. Time and date of alarm occurrence.
c. Time and date of object state return to normal.
d. Time and date of alarm acknowledgment
e. Identification of operator acknowledging alarm.
4. Alarm messages: User-definable text, English or other specified language, and delivered to operator's terminal, client, or remote communication using email; authenticated SMTP supported.
5. Allow for set up of alarms. User interface will walk user through steps necessary.
6. Alarm annunciation includes navigation link to a user-selected display or URL.
7. Displayed data changeable by operator is right mouse button selectable. Alarm is then selectable on screen allowing view of alarm history or allow new alarm creation.

L. Trendlog Information: Display trendlog records in standard engineering units.
1. Periodically gather data stored in building controllers and store information in system database. Append stored records with new data. Overwriting records is not allowed unless file size is limited. System database capable of storing 50 million records before archiving data. Samples viewable at Web Client.
a. Capable of trending on interval determined by polling rate, or change-of-value.
2. Add and edit trendlogs and setup information including the following:
a. The interval at which it is to be logged.
b. Operations shall be password protected.
c. Accessed directly from graphics on which a trended object is displayed.
3. Trendlog Wizard: Setup of multiple trend logs simultaneously. Walk users through necessary steps. Have a pull-down selection for startup, or by right-clicking on value displayed on graphic, and then selecting Trendlogs from displayed menu.
4. Trendlog Data: Viewable on Datalogger accessible via Web Browser. Trend logs of any point on a graphic must be initiated by performing a right mouse click on the point.

M. DataViewer access via Web Browser: Capable of graphing trend-logged object data.
1. Access and ability to create, edit and view are restricted by user account credentials
2. Specific and repeatable URL defines trendlog views for browser bookmarking and email compatibility.
3. Call out of trendlog value at intersection of trend line and mouse-over vertical axis.
4. Trendlog or Energy log and companion logs configurable to display on one of two independent vertical scales embedded in display.

5. Click zoom for control of data set viewed along either graph axis.
6. User-specifiable start and end dates and fast scroll features supporting click zoom of macro scale view of data for quickly finding data set based on visual signature.
7. User export of the viewed data set to MS Excel.
8. Optional min/max ranges (Upper Control Limits, Lower Control Limits) for each value.

N. Energy Log Information: Display information in standard engineering units.
1. Periodically gather energy log data in field controller and archive information. Append files with new data. Overwriting archived data is not allowed unless file size is limited.
2. Store data in database format for use by third-party programs. System operation to stay online during graphing operations.
3. Operators to be able to change energy log setup information. Includes meters, meter pulse value, and type of energy units. Meters monitored by system may be logged. Support using flow and temperature sensors for BTU monitoring.
4. Web Client: Display data in tabular and graphical formats. Display in hourly, daily, weekly, monthly and yearly formats. Be able to select specific data periods to view.

O. Demand Limiting: Sheds and restores equipment based on energy usage when compared to shed and restore settings.
1. Shedding: Implemented independently on each zone or piece of system equipment.
2. Binary Shedding: 5 priority levels. Loads in a given priority level to be shed before any loads in a higher priority level are shed. Load shedding within a given priority level includes two methods; a "first off-first on" mode, and a "first off-last on" linear mode.
3. Analog Shedding: Program generated ramp used by individual zones or control algorithm to raise and lower cooling and heating settings reducing energy usage.
4. Status of each program to be displayed with description of each load on Web Client.

P. Tenant Activity: A program monitoring after-hours overrides by tenants, logs data, and generates bill based on usage and rate charged for each tenant space.
1. Tenant after-hours override usage is logged in Operator Workstation database.
2. Include entry of following information for use in logging and billing.
    a. Tenant's contact name and address.
    b. One or multiple tenant zones making up a total tenant space, including separate billing rate for each separate zone.
    c. Minimum and maximum values an event duration and event limit.
    d. Property management information.
    e. Overall billing rate.
    f. Seasonal adjustments or surcharge to billing rate.
    g. Billing notification type including, but not limited to printer, file and email.
    h. Billing form template.
3. Logging: Include recording the following information for each and every tenant event.
    a. Zone description.
    b. Time the event begins.
    c. Total override time.
    d. Limits shall be applied to override time.
4. A Tenant Bill: Generated for a specific period using entered configuration data and logged data. User with appropriate security level will be able to view and override billing information. User to be able to select a billing period to view and be able to delete events from billing and edit a selected tenant activity event's override time.

Q. Reports: Capable of producing the following reports. Deliverable Format: CSV.
1. Trendlog configurations.
2. Alarm configurations.
3. Tenant activity configurations.
4. Device summary.
5. Energy log configurations.

6. Schedule configurations.
7. Deliverable Format: CSV files.

R. Field Engineering Tools: For programming controllers supplied.
1. Database Application Manager: Include controller logic files and associated graphics.
2. Device Manager: Detect devices connected on BACnet network by scanning. Display device instance, network ID, model, and description. Record and display software file loaded in each controller. Store file copies in project folder on computer's hard drive.
3. Audit when device not in database is added to network.
4. Backup/restore function for system to selected medium. System to be capable of restoring systems and creating a backup for instantiating a new client PC.
5. A means to scan, detect, interrogate, and edit third-party BACnet devices and BACnet objects within those devices.

S. Web Interface: System software based upon server/thin client architecture, designed around open standards of web technology.
1. Communicate using Ethernet and TCP. Access server using a web browser across Owner’s intranet and remotely via the Internet. Support 200 users with single license.
2. Web Browser: Microsoft Internet Explorer v11 or later, Firefox 70 or later, Chrome 78 or later, and Safari 13 or later. No special vendor-supplied software to be required. Display data in real-time. Update automatically without user interaction.
3. Web Pages: Automatically generated with HTML5 from data display files on Operator Workstation. Do not use systems requiring an HTML editor for web page generation.
4. Launching Web Browser on Operator Workstation presents a login page requiring a login name and password. Navigation and system adjustments dependent upon operators assigned privileges. User activity reports will show activity of operators, whether changes were made using a web client or Operator Workstation.
5. User Session Management including ability to view connected user sessions to the web client, see how long they have been active/inactive for each unique session, and force log-out for any or all sessions.

T. Context Menu Navigation: Web Browser: Support Context Menu Navigation via a right mouse click on a data point.
1. Operations to be dependent upon logged in user privileges and include:
    a. View and setup Alarms.
    b. View and setup Trend Logs.
    c. Display the BACnet properties for the selected Object.
    d. View and setup Schedules.
    e. View System activity for the selected Object.

U. Summary Pages:
1. Present system data in tabular form. Data to be from multiple devices. Points presented horizontally and devices listed on left side of table.
2. Built using spreadsheet that can be imported into Operator Workstation.
3. Data in summary pages to be live. Configure each object to be read only or writeable.
4. Both analog and binary data shall be supported.
5. Summary page, when populated, captured for archiving and review for analysis.
6. The data shall be sortable by clicking on the column headings.

V. Advance Scheduling (EASE): Managed and arranged in multi-tier hierarchy.
1. Access through hierarchy to be controlled via login credentials.
2. Configured for MS SQL 2014/17/19 Enterprise.
3. The Advanced Schedule Application:
    a. Apply conflict resolution logic for effective scheduling.
    b. Assign Work, Week and Holiday schedules for multiple resources.
    c. Create schedules with analog and binary resources.
    d. Create events for parent resources or children using inheritance.

e. Customize event recurrence.
f. Use Resource Picker to search and select resources.
g. Create custom templates to hold the resource and event time.
h. Schedule Operations Status: Use notification banner. Verify changes in resource tree.
i. Verify event type applied to resource with indication given by resource hierarchy/tree.

2.6 BUILDING CONTROLLER (ACM)

A. General Requirements:
1. BACnet Conformance: Approved by BTL as meeting BACnet Building Controller requirements.
   a. Refer to ANSI/ASHREA 135, for a complete list of the services that must be directly supported to provide each of the functional groups listed above.
   b. Proprietary services, if used, document and provide as part of submittal data. Provide tools for working with proprietary information.
2. Scalable: Number of trunks and protocols selectable to fit project requirements
3. Capable of panel-mounting on DIN rail and/or mounting screws.
4. Global control strategies based on information from any objects in system, regardless if object is directly monitored by building controller module or by another controller.
5. Capable of running 6 independent control strategies simultaneously. Modification of one control strategy does not interrupt function or runtime others.
6. Software implementing DDC strategies to be completely flexible and user-definable.
7. Software Programming Tools: Provide as part of project software. Factory pre-programmed global strategies not modifiable by field personnel are not acceptable. Changing global strategies via firmware changes is also unacceptable.
8. Programming: Object-oriented control function blocks and support DDC functions. Flowcharts: Generated and automatically downloaded to controller. Programming tool to be resident on workstation. used same tool for controllers.
9. Graphically view inputs and outputs to each program block in real-time as program is executing. Function may be performed using operator's workstation or field computer.
10. Controller: 6,000 Analog Values and 6,000 Binary Values.
11. Controller IP configuration: Via direct USB connect or field computer.
12. Quad Core 996 Ghz processor to ensure fast processing speeds.
13. Execute control algorithms and automated control functions with 64-bit processor.
14. Minimum of 1 GB of DDR3 SDRAM on a 533 Mhz bus to ensure high speed data recording, large data storage capacity and reliability.
15. Support 2 on-board EIA-485 ports capable of supporting various EIA-485 protocols including, but not limited to BACnet MS/TP and Modbus. Ports capable of supporting EIA-485 protocols including, to BACnet MS/TP and Modbus.
16. Support 2 ports-each of gigabit speed-Ethernet (10/100/1000) ports. Ports are capable of supporting Ethernet protocols including, BACnet IP, FOX, and Modbus.
17. Ports capable of having protocols assigned to utilize port's physical connection.
18. Minimum 4 onboard inputs, 2 universal inputs and 2 binary inputs.
19. Schedules:
   a. Normal seven-day scheduling, holiday scheduling and event scheduling.
   b. Support 380 BACnet Schedule Objects and 380 BACnet Calendar Objects.
20. Logging Capabilities:
   a. Log 2,000 objects at 15-minute intervals. Any object in system may be logged. Sample time interval adjustable at operator's workstation.
   b. Viewed logs on-site or off-site using WAN or remote communication.
   c. Periodically upload trended data to operator's workstation for archiving. Archived data available for use in spreadsheet or database programs.
21. Alarm Generation: Within the system for any object change of value or state, includes analog and binary object state changes, and controller communication failures.

a. Each alarm may be dialed out as noted elsewhere.
b. Provide alarm log for alarm viewing. Log may be viewed on-site at operator's terminal or off-site using remote communications.
c. Handle up to 2,000 alarm setups stored as BACnet event enrollment objects, with system destination and actions individually configurable.

22. Demand Limiting of Energy: Built-in, user-configurable function.
    a. Controller modules support shedding up to 1,200 loads.
    b. Load shedding programs to operate as defined herein.
23. Tenant Activity Logging: Supported by a building controller module. Each independent module to support a 380 zones.
    a. Tenant Activity logging to function as defined herein.

B. BACnet MS/TP:
1. BACnet MS/TP LAN must be software-configurable from 9.6 to 115.4 Kbps
    a. Each BACnet MS/TP LAN shall support 64 BACnet devices at a minimum.
    b. Proprietary object types, if used in the system, shall be thoroughly documented and provided as part of the submittal data. Necessary tools shall be supplied for working with proprietary information.

C. BACnet IP:
1. The building controller shall comply with Annex J of the BACnet specification for IP connections. This device shall use Ethernet to connect to the IP internetwork, while using the same Ethernet LAN for non-IP communications to other BACnet devices on the local area network (LAN).
2. Must support interoperability on WANs and campus area networks (CANs), and function as a BACnet Broadcast Management Device (BBMD).
3. Each controller shall support at a minimum 128 BBMD entries.
4. BBMD management architecture shall support 3,000 subnets at a minimum.
5. Shall support BACnet Network Address Translation.
6. Proprietary object types, if used in the system, shall be thoroughly documented and provided as part of the submittal data. Necessary tools shall be supplied for working with proprietary information.

D. Expansion Ports:
1. Controller shall support two (2) expansion ports.
    a. Combining the two on-board EIA-458 ports with fully loaded expansion ports, the controller shall support six (6) EIA-485 trunks simultaneously.
2. Expansion Cards: Mate to the expansion ports, shall include the following.
    a. Dual port EIA-485 card.
    b. 78 kbps FTT10A LON network card.

E. Modbus Protocol Support:
1. Controller shall support reading from and writing to TCP Slaves and Serial Connections (RTU or ASCI over either EIA-485 or EIA-232).
    a. Shall be capable of mapping Modbus register coil data to BACnet AV, BV, MV, AI, BI, and MI object types.
    b. Support a minimum of 6000 Mapped Modbus points.
2. Support up to 384 virtual groupings of Modbus points where each grouping is represented as a single virtual BACnet device.
    a. Virtual BACnet devices support BACnet Change Of Value (COV) notifications
    b. Each Virtual device has diagnostic information for troubleshooting Modbus point mapping. Diagnostic point should include the following.
        1) Number of points mapped.
        2) Number of messages Transmitted and Received.
        3) Modbus Exception Counts.
        4) Display of last exception message.

5) Serial Setting (Baud rate, Parity, Stop Bits).

3. Integration Performance: Data age of integrated point shall be capable of 1 second for 5000 points.

F. Power Supply:
1. Input for power: Accept between 17 and 30 VAC, 47 and 63 Hz.
2. Rechargeable Battery: For controller shutdown including flash memory data storage.
3. On-board capacitor ensuring continuous operation of real-time clocks for 14 days.

G. Controller: Shall be in compliance with the following.
1. UL 916 for open energy management.
2. FCC Class B.
3. RoHS Compliant.
4. IEC 60703.
5. C-Tick Listed.
6. CE(EN 60730-1).

H. Controller: Operate in the following environmental conditions.
1. Without Battery: Minus 4 to 149 degrees F (Minus 20 to 65 degrees C).
2. With Battery: 32 to 122 degrees F (0 to 50 degrees C).
3. Relative Humidity: 0 to 95 percent, non-condensing.

2.7 CENTRAL PLANT AND AIR HANDLER APPLICATION CONTROLLERS

A. Provide one or more native BACnet application controllers for each air handler and provide native BACnet application controllers as needed for central plant control that adequately cover all objects listed in object list. All controllers shall interface to building controller through either MS/TP LAN using BACnet protocol, or Ethernet LAN using BACnet over Ethernet or BACnet TCP/IP. No gateways shall be used. Controllers shall include input, output and self-contained logic program as needed for complete control of units. Controllers shall be fully programmable using graphical programming blocks. Programming tool shall be resident on operator workstation and be the same tool as used for the building controller. No auxiliary or non-BACnet controllers shall be used.

B. BACnet Conformance

1. Application controllers shall be approved by the BTL as meeting the BACnet Advanced Application Controller requirements.
2. Please refer to section 22.2, BACnet Functional Groups, in the BACnet standard, for a complete list of the services that must be directly supported to provide each of the functional groups listed above. All proprietary services, if used in the system, shall be thoroughly documented and provided as part of the submittal data. All necessary tools shall be supplied for working with proprietary information.
3. Standard BACnet object types supported shall include, as a minimum, Analog Input, Analog Output, Analog Value, Binary Input, Binary Output, Binary Value, Multi-state Values, Device, File, and Program object types. All proprietary object types, if used in the system, shall be thoroughly documented and provided as part of the submittal data. All necessary tools shall be supplied for working with proprietary information.

C. Application controllers shall include universal inputs with 12-bit resolution that accept 3K and 10K thermistors, 0–10VDC, Platinum 1000 ohm RTD, 0–5VDC, 4–20mA and dry contact signals. Any input on a controller may be either analog or digital with a minimum of three inputs that accept pulses. Controller shall also include support and modifiable programming for interface to intelligent room sensor with digital display. Controller shall include binary and analog outputs on board. Analog outputs with 12-bit resolution shall support either 0–10VDC or 0–20mA. Binary outputs shall have LED indication of status. Software shall include scaling features for analog outputs. Application controller shall include 20VDC voltage supply for use

as power supply to external sensors.

1. All outputs must have onboard Hand-Off-Auto (HOA) switches and a status indicator light. HOA switch position shall be monitored. Each analog output shall include a potentiometer for manually adjusting the output when the HOA switch is in the Hand position.
2. The position of each and every HOA switch shall be available system wide as a BACnet object property.

D. All program sequences shall be stored on board application controller in EEPROM. No batteries shall be needed to retain logic program. All program sequences shall be executed by controller up to 20 times per second (minimum of 10 times per second) and capable of multiple PID loops for control of multiple devices. All calculations shall be completed using floating-point math and system shall support display of all information in floating-point nomenclature at operator's terminal.

1. The following control blocks shall be supported:
   a. Natural Log
   b. Exponential
   c. Log base 10
   d. X to the power of Y
   e. Nth square root of X
   f. 5th Order Polynomial Equations
   g. Astronomical Clock (sunrise/sunset calculation)
   h. Time based schedules

E. Programming of application controller shall be completely modifiable in the field over installed BACnet LANs or remotely using modem interface. Operator shall program logic sequences by graphically moving function blocks on screen and tying blocks together on screen. Application controller shall be programmed using programming tools as described in operator's terminal section.

F. Application controller shall include support for intelligent room sensor (see Section 2.10.B.) Display on intelligent room sensor shall be programmable at application controller and include an operating mode and a field service mode. All button functions and display data shall be programmable to show specific controller data in each mode, based on which button is pressed on the sensor. See sequence of operation for specific display requirements at intelligent room sensor.

G. Schedules

1. The controller shall support a minimum of 3 BACnet Schedule Objects and have a real time clock on board with battery backup to maintain time through a power loss.

H. Logging Capabilities

1. Controller shall support a minimum of 50 trendlogs. Any object in the controller (real or calculated) may be logged. Sample time interval shall be adjustable at the operator's workstation.
2. Controller shall periodically upload trended data to system server for long-term archiving if desired. Archived data stored in (MS Jet Database or SQL) database form and shall be available for use in third-party spreadsheet or database programs.

I. Alarm Generation

1. Alarms may be generated within the controller for any object change of value or state (either real or calculated). This includes things such as analog object value changes, and binary object state changes.
2. Alarm log shall be provided for alarm viewing. Log may be viewed on-site at the operator's terminal or off-site using remote communications.
3. Controller must be able to handle up to 25 alarm setups stored as BACnet event

enrollment objects, with system destination and actions individually configurable.

J. The controller processor shall be a 32-bit processor.

K. The packaging of the controller shall provide operable doors to cover the terminals once installation is complete. The housing of the controller shall provide for DIN rail mounting and also fully enclose circuit board.2.5 TERMINAL UNIT APPLICATION CONTROLLERS

A. Provide one native BACnet fully programmable field controller for each piece of unitary mechanical equipment that adequately covers all objects listed in object list for unit. All controllers shall interface to building controller through MS/TP LAN using BACnet protocol. No gateways shall be used. Controllers shall include input, output and self-contained logic program as needed for complete control of unit.

B. BACnet Conformance

1. Application controllers shall, as a minimum, support MS/TP BACnet LAN types. They shall communicate directly using this BACnet LAN at 9.6, 19.2, 38.4 and 76.8 Kbps, as a native BACnet device. Application controllers shall be approved by the BTL as meeting the BACnet Application Specific Controller requirements and support all BACnet services necessary to provide the following BACnet functional groups:
   a. Files Functional Group
   b. Reinitialize Functional Group
   c. Device Communications Functional Group
2. Please refer to Section 22.2, BACnet Functional Groups in the BACnet standard, for a complete list of the services that must be directly supported to provide each of the functional groups listed above. All proprietary services, if used in the system, shall be thoroughly documented and provided as part of the submittal data. All necessary tools shall be supplied for working with proprietary information.
3. Standard BACnet object types supported shall include, as a minimum, Analog Input, Analog Output, Analog Value, Binary Input, Binary Output, Binary Value, Device, File, and Program Object Types. All proprietary object types, if used in the system, shall be thoroughly documented and provided as part of the submittal data. All necessary tools shall be supplied for working with proprietary information.

C. Application controllers shall include universal inputs with 10-bit resolution that can accept 3K and 10K thermistors, 0–5VDC, 4–20mA, dry contact signals and a minimum of 3 pulse inputs. Any input on controller may be either analog or digital. Controller shall also include support and modifiable programming for interface to intelligent room sensor. Controller shall include binary outputs on board with analog outputs as needed.

D. All program sequences shall be stored on board controller in EEPROM. No batteries shall be needed to retain logic program. All program sequences shall be executed by controller 10 times per second and shall be capable of multiple PID loops for control of multiple devices. Programming of application controller shall be completely modifiable in the field over installed BACnet LANs or remotely through modem interface. Operator shall program logic sequences by graphically moving function blocks on screen and tying blocks together on screen. Application controller shall be programmed using same programming tools as building controller and as described in operator workstation section. All programming tools shall be provided and installed as part of system.

E. Application controller shall include support for intelligent room sensor (see Section 2.10.B.) Display on room sensor shall be programmable at controller and include an operating mode and a field service mode. All button functions and display data shall be programmable to show specific controller data in each mode based on which button is pressed on the sensor. See sequence of operation for specific display requirements at intelligent room sensor.

2.8 OTHER CONTROL SYSTEM HARDWARE

A. Motorized control dampers that will not be integral to the equipment shall be furnished by the Control System Contractor. Control damper frames shall be constructed of galvanized steel, formed into changes and welded or riveted. Dampers shall be galvanized, with nylon bearings. Blade edge seals shall be vinyl. Blade edge and tip seals shall be included for all dampers. Blades shall be 16-gauge minimum and 6 inches wide maximum and frame shall be of welded channel iron. Damper leakage shall not exceed 10 CFM per square foot, at 1.5 inches water gauge static pressure.

B. Control damper actuators shall be furnished by the Control System Contractor. Two-position or proportional electric actuators shall be direct-mount type sized to provide a minimum of 5 in-lb torque per square foot of damper area. Damper actuators shall be spring return type. Operators shall be heavy-duty electronic type for positioning automatic dampers in response to a control signal. Motor shall be of sufficient size to operate damper positively and smoothly to obtain correct sequence as indicated. All applications requiring proportional operation shall utilize truly proportional electric actuators.

C. Control Valves: Control valves shall be 2-way or 3-way pattern as shown and constructed for tight shutoff at the pump shut-off head or steam relief valve pressure. Control valves shall operate satisfactorily against system pressures and differentials. Two-position valves shall be ' line' size. Proportional control valves shall be sized for a maximum pressure drop of 5.0 psi at rated flow (unless otherwise noted or scheduled on the drawings). Valves with sizes up to and including 2 inches (51 mm) shall be "screwed" configuration and 2-1/2 inches (63.5 mm) and larger valves shall be "flanged" configuration. All control valves, including terminal unit valves, less than 2 inches (51 mm) shall be globe valves. Electrically-actuated control valves shall include spring return type actuators sized for tight shut-off against system pressures (as specified above) and, when specified, shall be furnished with integral switches for indication of valve position (open-closed).

D. Control Valve Actuators: Actuators for VAV terminal unit heating coils shall be "drive-open; drive-closed" type. All actuators shall have inherent current limiting motor protection. Valve actuators shall be 24-volt, electronic type, modulating or two-position as required for the correct operating sequence. Actuators on valves needing ' fail-safe' operation shall have spring return to Normal position. Modulating valves shall be positive positioning in response to the signal. All valve actuators shall be UL listed.

E. All control valves 2-1/2 inches (63.5 mm) or larger shall have position indication. All hot water control valves shall be Normally-Open arrangement; all chilled water control valves shall be Normally-Closed arrangement.

F. Wall Mount Room Temperature sensors: Each room temperature sensor shall provide temperature indication to the digital controller, provide the capability for a software-limited occupant set point adjustment (warmer-cooler slider bar or switch) and limited operation override capability. Room Temperature Sensors shall be 10,000-ohm thermistor type with a temperature range of -40 to 140 degrees F (-38 to 60 degrees C). The sensor shall be complete with a decorative cover and suitable for mounting over a standard electrical utility box. These devices shall have an accuracy of 0.5 degrees F (.024 degrees C) over the entire range.

G. Duct-mounted and Outside Air Temperature Sensors: 10,000-ohm thermistor temperature sensors with an accuracy of ± 0.2 degrees C. Outside air sensors shall include an integral sun shield. Duct-mounted sensors shall have an insertion measuring probe of a length appropriate for the duct size, with a temperature range of -40 to 160 degrees F(-38 to 71 degrees C) The sensor shall include a utility box and a gasket to prevent air leakage and vibration noise. For all mixed air and preheat air applications, install bendable averaging duct sensors with a minimum 8 feet (2438 mm) long sensor element. These devices shall have

accuracy of 0.5 degrees F (.024 degrees C) over the entire range.

H. Humidity sensors shall be thin-film capacitive type sensor with on-board nonvolatile memory, accuracy to plus or minus two percent (2%) at 0 to 90% RH, 12 - 30 VDC input voltage, analog output (0 - 10 VDC or 4 - 20mA output). Operating range shall be 0 to 100% RH and 32 to 140 degrees F (0 to 60 degrees C). Sensors shall be selected for wall, duct or outdoor type installation as appropriate.

I. Carbon Dioxide Sensors (CO2): Sensors shall utilize Non-dispersive infrared technology (N.D.I.R.), repeatable to plus or minus 20 PPM. Sensor range shall be 0 - 2000 PPM. Accuracy shall be plus or minus five percent (5%) or 75 PPM, whichever is greater. Response shall be less than one minute. Input voltage shall be 20 to 30 VAC or DC. Output shall be 0 - 10 VDC. Sensor shall be wall or duct mounted type, as appropriate for the application, housed in a high impact plastic enclosure.

J. Current Sensitive Switches: Solid state, split core current switch that operates when the current level (sensed by the internal current transformer) exceeds the adjustable trip point. Current switch to include an integral LED for indication of trip condition and a current level below trip set point.

K. Differential Analog (duct) Static Pressure Transmitters Provide a pressure transmitter with integral capacitance type sensing and solid-state circuitry. Accuracy shall be plus or minus 1% of full range; range shall be selected for the specific application. Provide zero and span adjustment capability. Device shall have integral static pickup tube.

L. Differential Air Pressure Switches: Provide SPDT type, UL-approved, and selected for the appropriate operating range where applied. Switches shall have adjustable setpoints and barbed pressure tips.

M. Water Flow Switches: Provide a SPST type contact switch with bronze paddle blade, sized for the actual pipe size at the location. If installed outdoors, provide a NEMA-4 enclosure. Flow switch shall be UL listed.

N. Temperature Control Panels: Furnish temperature control panels of code gauge steel with locking doors for mounting all devices as shown. All electrical devices within a control panel shall be factory wired. A complete set of ' as-built' control drawings (relating to the controls within that panel) shall be furnished within each control panel.

O. Pipe and Duct Temperature sensing elements: 10,000-ohm thermistor temperature sensors with and accuracy of ±1% accuracy. Their range shall be -5 to 250 degrees F (-20 to 121 degrees C). Limited range sensors shall be acceptable provided they are capable of sensing the range expected for the point at the specified accuracy. Thermal wells with heat conductive gel shall be included.

P. Low Air Temperature Sensors: Provide SPST type switch, with 15 to 55 degrees F (-9 to 13 degrees C), range, vapor-charged temperature sensor. Honeywell model L482A, or approved equivalent.

Q. Relays: Start/stop relay model shall provide either momentary or maintained switching action as appropriate for the motor being started. All relays shall be plugged in, interchangeable, mounted on a subbase and wired to numbered terminals strips. Relays installed in panels shall all be DPDT with indicating lamp. Relays installed outside of controlled devices shall be enclosed in a NEMA enclosure suitable for the location. Relays shall be labeled with UR symbol. RIB-style relays are acceptable for remote enable/disable.

R. Transducers: Differential pressure transducers shall be electronic with a 4-20 mA output signal compatible to the Direct Digital Controller. Wetted parts shall be stainless steel. Unit

shall be designed to operate in the pressure ranges involved.

S. Control Power Transformers: Provide step-down transformers for all DDC controllers and devices as required. Transformers shall be sized for the load, but shall be sized for 50 watts, minimum. Transformers shall be UL listed Class 2 type, for 120 VAC/24 VAC operation.

T. Water Flow Metering:

a. Inline Electromagnetic

b. Carbon Steel body, PTFE liner, ANSI Class 150 flange

c. Pressure rating: 580 psig minimum

d. Temp Rating: 400 deg. Minimum

e. Display: remote mounted electronics, visual instantaneous rate of flow (GPM)

f. Accuracy: +/- 2-1/2 percent

Subject to compliance with requirements by one of the following.

1) ONICON Incorporate, F-3100 series
2) SeaMetrics Inc.
3) Thermo Measurement Ltd.
4) Venture Measurement.

U. Air Flow Monitoring: Provide combination airflow and air temperature devices where indicated on the plans.

a. Each measuring device shall consist of multi-point sensors in one or more probe assemblies per location, and a single remotely mounted microprocessor-based transmitter for each measurement location. Each transmitter shall operate on 24 VAC and be fused and protected from over voltage, over current and power surges. All integrated circuitry shall be temperature rated as 'industrial-grade'. No electronic components other than the sensor elements shall be located at the sensing node. Each ducted sensor probe shall have an integral, U.L. Listed, plenum rated cable. Conductor insulation for internal probe wiring shall be made from Kynar.

b. Each sensing point shall independently determine the airflow rate and temperature at each node, which shall be equally weighted in calculations by the transmitter prior to output as the cross-sectional average. Devices which average multiple non-linear variables are not acceptable. Pitot arrays are not acceptable. Devices using chip-in-glass, epoxy-coated or diode-case chip thermistors are not acceptable. Vortex-shedding devices are not acceptable.

c. Each independent airflow sensor node shall have a laboratory accuracy of +/-2% of Reading over the entire calibrated airflow range of 0 to 5,000 fpm (25.4 m/s) for ducted or plenum mounted probes, or not less than 0 to 10,000 fpm (50.8 m/s) for fan inlet mounted sensors. All sensor nodes shall be wind tunnel calibrated or field-verified against air velocity standards that are traceable to NIST.

d. Devices whose accuracy is the combined and independent accuracy of the transmitter and sensor probes must demonstrate that the total accuracy meets the performance requirements of this specification throughout the calibrated range.

e. Each independent temperature sensor node shall have a calibrated accuracy of +/- 0.14° F (0.08° C) over the entire operating temperature range of -20° F to 160° F (-28.9° C to 71° C).and be calibrated or field-verified against temperature standards that are traceable to NIST.

f. Airflow/Temperature measuring devices shall be UL Listed as an entire assembly. Devices in UL-labeled enclosures are not equivalent and are not acceptable without a UL Listing.
g. Where fan inlet measurement is required, mounting styles shall be indicated on the plans as either “face mounting” or “throat mounting.” Face mounting shall provide no mechanical fastening in the throat or on the surface of the inlet cone and shall be used on all performance-sensitive plenum-type or plug fans.
h. Acceptable Manufacturers: EBTRON, Inc. (basis of design) or equal by Air Monitor Corporation.

2.9 WEB BROWSER GRAPHICAL USER INTERFACE

A. Web Browser Navigation: The web browser GUI shall provide a comprehensive user interface. Using a collection of web pages, it shall be constructed to "feel" like a single application, and provide a complete and intuitive mouse/menu driven operator interface. It shall be possible to navigate through the system using a web browser to accomplish requirements of this specification. The Web Browser GUI shall (as a minimum) provide for navigation, and for display of animated graphics, schedules, alarms/events, live graphic programs, active graphic setpoint controls, configuration menus for operator access, reports and reporting actions for events.

B. Login: On launching the web browser and selecting the appropriate domain name or IP address, the operator shall be presented with a login page that will require a login name and password. Navigation in the system shall be dependent on the operator's role privileges and geographic area of responsibility.

C. Navigation: Navigation through the GUI shall be accomplished by clicking on appropriate level of a navigation tree (consisting of expandable and collapsible tree control like Microsoft's Explorer program) and/or by selecting dynamic links to other system graphics. Both the navigation tree and action pane shall be displayed simultaneously, enabling the operator to select a specific system or equipment and view the corresponding graphic. The navigation tree shall as a minimum provide the following views: Geographic, Network, Groups and Configuration.
1. Geographic View shall display a logical geographic hierarchy of the system including: cities, sites, buildings, building systems, floors, equipment and objects.
2. Groups View shall display Scheduled Groups and custom reports.
3. Configuration View shall display all the configuration categories (Operators, Schedule, Event, Reporting and Roles).

D. Action Pane: The Action Pane shall provide several functional views for each HVAC or mechanical/electrical subsystem specified. A functional view shall be accessed by clicking on the corresponding button:
1. Graphics: Using graphical format suitable for display in a web browser, graphics shall include aerial building/campus views, color building floor-plans, equipment drawings, active graphic setpoint controls, web content and other valid HTML elements. The data on each graphic page shall automatically refresh.
2. Properties: Shall include graphic controls and text for the following: Locking or overriding objects, demand strategies, and any other valid data required for setup. Changes made to the properties pages shall require the operator to depress an ' accept/cancel' button.
3. Schedules: Shall be used to create, modify/edit and view schedules based on the systems geographical hierarchy (using the navigation tree).
4. Alarms: Shall be used to view alarm information geographically (using the navigation tree), acknowledge alarms, sort alarms by category, actions and verify reporting actions.
5. Trends: Shall be used to display associated trend and historical data, modify colors,

date range, axis and scaling.

6. Logic - Live Graphic Programs: Shall be used to display' live' graphic programs of the control algorithm, (micro block programming) for the mechanical/electrical system selected in the navigation tree.
7. Other actions such as Print, Help, Command, and Logout shall be available via a drop-down window.

E. Color Graphics: The Web Browser GUI shall make extensive use of color in the graphic pane to communicate information related to set points and comfort. Animated.gifs or .jpg, vector scalable, active setpoint graphic controls shall be used to enhance usability. Graphics tools used to create Web Browser graphics shall be non-proprietary and conform to the following basic criteria:
   1. Display Size: The GUI workstation software shall graphically display in a minimum of 1024 by 768 pixels 24 bit True Color.
   2. General Graphic: General area maps shall show locations of controlled buildings in relation to local landmarks.
   3. Color Floor Plans: Floor plan graphics shall show heating and cooling zones throughout the buildings in a range of colors, as selected by Owner. Provide a visual display of temperature relative to their respective set points. The colors shall be updated dynamically as a zone's actual comfort condition changes.
   4. Mechanical Components: Mechanical system graphics shall show the type of mechanical system components serving any zone through the use of a pictorial representation of components. Selected I/O points being controlled or monitored for each piece of equipment shall be displayed with the appropriate engineering units. Animation shall be used for rotation or moving mechanical components to enhance usability. .
   5. Minimum System Color Graphics: Color graphics shall be selected and displayed via a web browser for the following:
      a. Each piece of equipment monitored or controlled including each terminal unit.
      b. Each building.
      c. Each floor and zone controlled.

F. Hierarchical Schedules: Utilizing the Navigation Tree displayed in the web browser GUI, an operator (with password access) shall be able to define a Normal, Holiday or Override schedule for an individual piece of equipment or room, or choose to apply a hierarchical schedule to the entire system, site or floor area. For example, Independence Day ' Holiday' for every level in the system would be created by clicking at the top of the geographic hierarchy defined in the Navigation Tree. No further operator intervention would be required and every control module in the system with would be automatically downloaded with the ' Independence Day' Holiday. All schedules that affect the system/area/equipment highlighted in the Navigation Tree shall be shown in a summary schedule table and graph.
   1. Schedules: Schedules shall comply with BACnet standards, (Schedule Object, Calendar Object, Weekly Schedule property and Exception Schedule property) and shall allow events to be scheduled based on:
      a. Types of schedule shall be Normal, Holiday or Override.
      b. A specific date,.
      c. A range of dates,.
      d. Any combination of Month of Year (1-12, any), Week of Month (1-5, last, any), Day of Week (M-Sun, Any).
      e. Wildcard (example, allow combinations like second Tuesday of every month).
   2. Schedule Categories: The system shall allow operators to define and edit scheduling categories (different types of "things" to be scheduled; for example, lighting, HVAC occupancy, etc.). The categories shall include: name, description, icon (to display in the hierarchy tree when icon option is selected) and type of value to be scheduled.
   3. Schedule Groups: In addition to hierarchical scheduling, operators shall be able to define functional Schedule Groups, comprised of an arbitrary group of

areas/rooms/equipment scattered throughout the facility and site. For example, the operator shall be able to define an ' individual tenant' group - who may occupy different areas within a building or buildings. Schedules applied to the ' tenant group' shall automatically be downloaded to control modules affecting spaces occupied by the ' tenant group'.

4. Intelligent Scheduling: The control system shall be intelligent enough to automatically turn on any supporting equipment needed to control the environment in an occupied space. If the operator schedules an individual room in a VAV system for occupancy, for example, the control logic shall automatically turn on the VAV air handling unit, chiller, boiler and/or any other equipment required to maintain the specified comfort and environmental conditions within the room.
5. Partial Day Exceptions: Schedule events shall be able to accommodate a time range specified by the operator (ex: board meeting from 6 pm to 9 pm overrides Normal schedule for conference room).
6. Schedule Summary Graph: The schedule summary graph shall clearly show Normal versus Holiday versus Override Schedules and the net operating schedule that results from all contributing schedules. Note: In case of priority conflict between schedules at the different geographic hierarchy, the schedule for the more detailed geographic level shall apply.

G. Alarms: Alarms associated with a specific system, area, or equipment selected in the Navigation Tree, shall be displayed in the Action Pane by selecting an ' Alarms' view. Alarms, and reporting actions shall have the following capabilities:
   1. Alarms View: Each Alarm shall display an Alarms Category (using a different icon for each alarm category), date/time of occurrence, current status, alarm report and a bold URL link to the associated graphic for the selected system, area or equipment. The URL link shall indicate the system location, address and other pertinent information. An operator shall easily be able to sort events, edit event templates and categories, acknowledge or force a return to normal in the Events View as specified in this section.
   2. Alarm Categories: The operator shall be able to create, edit or delete alarm categories such as HVAC, Maintenance, Fire, or Generator. An icon shall be associated with each alarm category, enabling the operator to easily sort through multiple events displayed.
   3. Alarm Templates: Alarm template shall define different types of alarms and their associated properties. As a minimum, properties shall include a reference name, verbose description, severity of alarm, acknowledgement requirements, and high/low limit and out of range information.
   4. Alarm Areas: Alarm Areas enable an operator to assign specific Alarm Categories to specific Alarm Reporting Actions. For example, it shall be possible for an operator to assign all HVAC Maintenance Alarm on the 1st floor of a building to email the technician responsible for maintenance. The Navigation Tree shall be used to setup Alarm Areas in the Graphic Pane.
   5. Alarm Time/Date Stamp: All events shall be generated at the DDC control module level and comprise the Time/Date Stamp using the standalone control module time and date.
   6. Alarm Configuration: Operators shall be able to define the type of Alarm generated per object. A ' network' view of the Navigation Tree shall expose all objects and their respective Alarm Configuration. Configuration shall include assignment of Alarm, type of Acknowledgement and notification for return to normal or fault status.
   7. Alarm Summary Counter: The view of Alarm in the Graphic Pane shall provide a numeric counter, indicating how many Alarms are active (in alarm), require acknowledgement and total number of Alarms in the BAS Server database.
   8. Alarm Auto-Deletion: Alarms that are acknowledged and closed shall be auto-deleted from the database and archived to a text file after an operator defined period.
   9. Alarm Reporting Actions: Alarm Reporting Actions specified shall be automatically

launched (under certain conditions) after an Alarm is received by the BAS server software. Operators shall be able to easily define these Reporting Actions using the Navigation Tree and Graphic Pane through the web browser GUI. Reporting Actions shall be as follows:

a. Print: Alarm information shall be printed to the BAS server's PC or a networked printer.
b. Email: Email shall be sent via any POP3-compatible e-mail server (most Internet Service Providers use POP3). Email messages may be copied to several email accounts. Note: Email reporting action shall also be used to support alphanumeric paging services, where email servers support pagers.
c. File Write: The ASCII File write reporting action shall enable the operator to append operator defined alarm information to any alarm through a text file. The alarm information that is written to the file shall be completely definable by the operator. The operator may enter text or attach other data point information (such as AHU discharge temperature and fan condition upon a high room temperature alarm).
d. Write Property: The write property reporting action updates a property value in a hardware module.
e. SNMP: The Simple Network Management Protocol (SNMP) reporting action sends an SNMP trap to a network in response to receiving an alarm.
f. Run External Program: The Run External Program reporting action launches specified program in response to an event.

H. Trends: As system is engineered, all points shall be enabled to trend. Trends shall both be displayed and user configurable through the Web Browser GUI. Trends shall comprise analog, digital or calculated points simultaneously. A trend log's properties shall be editable using the Navigation Tree and Graphic Pane.

1. Viewing Trends: The operator shall have the ability to view trends by using the Navigation Tree and selecting a Trends button in the Graphic Pane. The system shall allow y- and x-axis maximum ranges to be specified and shall be able to simultaneously graphically display multiple trends per graph.
2. Local Trends: Trend data shall be collected locally by Multi-Equipment/Single Equipment general-purpose controllers, and periodically uploaded to the BAS server if historical trending is enabled for the object. Trend data, including run time hours and start time date shall be retained in non-volatile module memory. Systems that rely on a gateway/router to run trends are NOT acceptable.
3. Resolution. Sample intervals shall be as small as one second. Each trended point will have the ability to be trended at a different trend interval. When multiple points are selected for displays that have different trend intervals, the system will automatically scale the axis.
4. Dynamic Update. Trends shall be able to dynamically update at operator-defined intervals.
5. Zoom/Pan. It shall be possible to zoom-in on a particular section of a trend for more detailed examination and ' pan through' historical data by simply scrolling the mouse.
6. Numeric Value Display. It shall be possible to pick any sample on a trend and have the numerical value displayed.
7. Copy/Paste. The operator shall have the ability to pan through a historical trend and copy the data viewed to the clipboard using standard keystrokes (i.e. CTRL+C, CTRL+V).
8. Trending data shall include the following features:
   a. Software that is capable of graphing the trend-logged object data shall be included.
   b. Access and ability to create, edit and view are restricted to users by user account credentials
   c. Specific and repeatable URL defines the trendlog(s) views for browser bookmarking and email compatibility.

d. Call out of trendlog value at intersection of trend line and mouse-over vertical axis.
e. Trendlog or Energy log and companion logs can be configured to display on one of two independent vertical scales embedded in the display.
f. Click zoom for control of data set viewed along either graph axis.
g. User-specifiable start and end dates as well as a fast scroll features that supports click zoom of macro scale view of the data for quickly finding data set based on visual signature.
h. User export of the viewed data set to MS Excel.
i. Web browser-based help.
j. Optional min/max ranges (Upper Control Limits, Lower Control Limits) for each value.

I. Energy Log Information
1. AWS shall be capable of periodically gathering energy log data stored in the field equipment and archive the information. Archive files shall be appended with new data, allowing data to be accumulated. Systems that write over archived data shall not be allowed unless limited file size is specified. Display all energy log information in standard engineering units.
2. All data shall be stored in database file format for direct use by third-party programs. Operation of system shall stay completely online during all graphing operations.
3. AWS operator shall be able to change the energy log setup information as well. This includes the meters to be logged, meter pulse value, and the type of energy units to be logged. All meters monitored by the system may be logged. System shall support using flow and temperature sensors for BTU monitoring.
4. AWS shall display data in tabular format form for both consumption and peak values. Data shall be shown in hourly, daily, weekly, monthly and yearly formats. In each format, the user shall be able to select a specific period of data to view.
5. Web client shall display data in tabular format and graphical format. Data shall be shown in hourly, daily, weekly, monthly and yearly formats. In each format, the user shall be able to select a specific period of data to view.

J. Demand Limiting
1. AWS shall include demand limiting program that includes two types of load shedding. One type of load shedding shall shed/restore equipment in binary fashion based on energy usage when compared to shed and restore settings. The other type of shedding shall adjust operator-selected control setpoints in an analog fashion based on energy usage when compared to shed and restore settings. Shedding may be implemented independently on each and every zone or piece of equipment connected to system.
2. Binary shedding shall include minimum of five (5) priority levels of equipment shedding. All loads in a given priority level shall be shed before any loads in a higher priority level are shed. Load shedding within a given priority level shall include two methods. In one, the loads shall be shed/restored in a “first off-first on” mode, and in the other the loads are just shed/restored in a “first off-last on” (linear) fashion.
3. Analog shed program shall generate a ramp that is independently used by each individual zone or individual control algorithm to raise the appropriate cooling setting and lower appropriate heating setting to reduce energy usage.
4. AWS shall be able to display the status of each and every load shed program. Status of each load assigned to an individual shed program shall be displayed along with English description of each load.

K. Reports
1. AWS shall be capable of periodically producing reports of trendlogs, alarm history, tenant activities, device summary, energy logs, and override points. The frequency,

content, and delivery are to be user adjustable.

2. All reports shall be capable of being delivered in multiple formats including text- and comma-separated value (CSV) files. The files can be printed, emailed, or saved to a folder, either on the server hard drive or on any network drive location.

L. Security Access: Systems that Security access from the web browser GUI to BAS server shall require a Login Name and Password. Access to different areas of the BAS system shall be defined in terms of Roles, Privileges and geographic area of responsibility as specified:
   1. Roles: Roles shall reflect the actual roles of different types of operators. Each role shall comprise a set of ' easily understood English language' privileges. Roles shall be defined in terms of View, Edit and Function Privileges.
      a. View Privileges shall comprise: Navigation, Network, and Configuration Trees, Operators, Roles and Privileges, Alarm/Event Template and Reporting Action.
      b. Edit Privileges shall comprise: Setpoint, Tuning and Logic, Manual Override, and Point Assignment Parameters.
      c. Function Privileges shall comprise: Alarm/Event Acknowledgement, Control Module Memory Download, Upload, Schedules, Schedule Groups, Manual Commands, Print and Alarm/Event Maintenance.
   2. Geographic Assignment of Roles: Roles shall be geographically assigned using a similar expandable/collapsible navigation tree. For example, it shall be possible to assign two HVAC Technicians with similar competencies (and the same operator defined HVAC Role) to different areas of the system.

M. Workstation Hardware and Accessories:
   1. Provide one (1) operator’s workstation in Boiler Room or other location(s) noted on the plans.
   2. AWS Server Minimum Requirements
      a. 64-bit OS
      b. Windows 10 or Windows Server 2012
      c. 2 GHz (or better), eight-core processors
      d. 4 GB RAM or higher
      e. 32 GB of hard drive space required for base installation without application data
      f. Minimum 1 TB hard drive (also see criteria in Part 3 - Execution below).
      g. Network interface card (10/100/1000 Mbps)
      h. Wireless keyboard and mouse
      i. 27” LCD monitor.
      j. Wireless network card.
   3. Printer
      a. A separate Laser jet type printer shall be provided for hard copy data and alarm printouts. All change of state reporting system logs, information summaries, system malfunctions and alarms shall be printed at this terminal.
      b. The minimum acceptable print speed shall be 300 characters per second. The printer shall have a line length of at least 80 characters and the character set shall be the standard 191 character ASCII upper case subset.
      c. The printer shall be interfaced to the system by standard USB port.

N. Software
   1. At the conclusion of the project, contractor shall leave with owner an electronic copy that includes the complete software operation system and project graphics, setpoints, system parameters, etc. This backup shall allow the owner to completely restore the system in the case of a computer malfunction.

O.

PART 3 EXECUTION

3.1 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.3 GENERAL

A. Install system and materials in accordance with manufacturer's instructions, and as detailed on the project drawing set.

B. Line and low voltage electrical connections to control equipment shown specified or shown on the control diagrams shall be furnished and installed by the Control System Contractor in accordance with these specifications.

C. Equipment furnished by the Mechanical Contractor that is normally wired before installation shall be furnished completely wired. Control wiring normally performed in the field will be furnished and installed by the Control System Contractor.

D. All control devices mounted on the face of control panels shall be clearly identified as to function and system served with permanently engraved phenolic labels.

3.4 WIRING

A. All electrical control wiring to the control panels shall be the responsibility of the Control System Contractor.

B. All wiring shall be in accordance with the Project Electrical Specifications (Division 16), the National Electrical Code and any applicable local codes. All control wiring shall be installed in raceways.

C. Excess wire shall not be looped or coiled in the controller cabinet.

D. Incorporate electrical noise suppression techniques in relay control circuits.

E. There shall be no drilling on the controller cabinet after the controls are mounted inside.

F. Careful stripping of wire while inside the cabinet is required to ensure that no wire strand fragments land on circuit boards.

G. Use manufacturer-specified wire for all network connections.

H. Use approved optical isolation and lightning protection when penetrating building envelope.

I. Read installation instructions carefully. Any unavoidable deviations shall be approved by owner's rep prior to installation.

3.5 ACCEPTANCE TESTING

A. Upon completion of the installation, the Control System Contractor shall load all system software and start-up the system. The Control System Contractor shall perform all necessary calibration, testing and de-bugging and perform all required operational checks to insure that the system is functioning in full accordance with these specifications.

B. The Control System Contractor shall perform tests to verify proper performance of components, routines and points. Repeat tests until proper performance results. This testing shall include a point-by-point log to validate 100% of the input and output points of the DDC system operation.

C. System Acceptance: Satisfactory completion is when the Control System Contractor has performed successfully all the required testing to show performance compliance with the requirements of the Contract Documents to the satisfaction of the Owner's Representative. System acceptance shall be contingent upon completion and review of all corrected deficiencies.

3.6 OPERATOR TRAINING

A. During system commissioning and at such time acceptable performance of the Control System hardware and software has been established, the Control System Contractor shall provide on-site operator instruction to the owner's operating personnel. Operator instruction shall be done during normal working hours and shall be performed by a competent representative familiar with the system hardware, software and accessories.

B. The Control System Contractor shall provide 16 total hours of comprehensive training for system orientation, product maintenance and troubleshooting, programming and engineering, if not provided under a previous contract at the site using the same brand and type of controllers within the previous 3 years.

3.7 WARRANTY PERIOD SERVICES

A. Equipment, materials and workmanship incorporated into the work shall be warranted for a period of one year from the time of system acceptance.

B. Within this period, upon notice by the Owner, any defects in the BMS due to faulty materials, methods of installation or workmanship shall be promptly repaired or replaced by the Control System Contractor at no expense to the Owner.

C. Maintenance of Computer Software Programs: The Control System Contractor shall maintain all software during the warranty period. In addition, all factory or sub-vendor upgrades to software shall be added to the systems, when they become available, at no additional cost. New products are not considered upgrades in this context.

D. Maintenance of Control Hardware: The Control System Contractor shall inspect, repair, replace, adjust, and calibrate, as required, the controllers, control devices and associated peripheral units during the warranty period. The Control System Contractor shall then furnish a report describing the status of the equipment, problem areas (if any) noticed during service work, and description of the corrective actions taken. The report shall clearly certify that all software is functioning correctly.

E. Service Period: Calls for service by the Owner shall be honored within 24 hours and are not to be considered as part of routine maintenance.

F. Service Documentation: A copy of the service report associated with each owner-initiated service call shall be provided to the owner.

3.8 WARRANTY ACCESS

A. The Owner shall grant to the Control System Contractor reasonable access to the BMS during the warranty period. Remote access to the BMS (for the purpose of diagnostics and troubleshooting, via the Internet, during the warranty period) will be allowed.

3.9 OPERATION & MAINTENANCE MANUALS

A. See Division 1 for requirements. O&M manuals shall include the following elements, as a minimum:
   1. As-built control drawings for all equipment.
   2. As-built Network Communications Diagram.
   3. General description and specifications for all components.
   4. Completed Performance Verification sheets.
   5. Completed Controller Checkout/Calibration Sheets.

3.10 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

SECTION 230993 - SEQUENCE OF OPERATION

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes control sequences for DDC for HVAC systems, subsystems, and equipment.

1. General
2. Heating System Central Plant.
3. Dedicated Outdoor Air Handling Units (DOAS)
4. Air Handling Units
5. Roof Top Unit
6. Energy Recovery Unit
7. Electric Duct Heater
8. Kitchen Make-Up Air Unit (MUA-1)
9. Kitchen Exhaust Fan
10. Variable Refrigerant System
11. Exhaust Fans
12. Split System Air Conditioning Units

1.3 DEFINITIONS

A. Analog Output: Proportional output signal (zero- to 10-V dc, 4 to 20 mA).
B. Binary Output: On/off output signal or contact closure.
C. DDC: Direct digital control.
D. Digital Output: Data output that must be interpreted digitally.

PART 2 - PRODUCTS

2.1 GENERAL

A. All damper positions will be monitored. Two position dampers will be monitored by end switches, and modulating dampers will be monitored utilizing damper actuator feedback. Damper position feedback will be hard wired to the DDC field controllers.

B. All modulating valves will be monitored for valve position utilizing valve actuator position feedback hard wired to the DDC field controller.

C. Variable Frequency Drives: BMS shall control start/stop of each VFD and shall monitor the run contact at the VFD. If the VFD is not running when it is

commanded to, an alarm shall be activated at the central PC. BMS shall control speed of each VFD.

D. Alarm Contacts: BMS shall monitor alarm contacts as shown on the drawings. If a device is in alarm mode, an alarm shall be activated at the central PC.

E. Fire Alarm: If fire alarm system is in alarm mode, BMS shall disengage controls associated with all fan system (in addition to hard wire shutdowns). When signal is received from the fire alarm system that all alarms are “cleared”; BMS shall restart all fan system incrementally.

F. Filter Differential Pressure Transmitters: BMS shall monitor DPT’s and alarm if the differential pressure is above setpoint.

G. Space Differential Pressure Sensors: BMS shall monitor space sensors as shown on the drawings.

H. Carbon Monoxide: BMS shall monitor and display alarms. If levels rise above setpoint, respective exhaust fan shall start as described below. At the boiler room, boilers, chiller and water heater shall be shut down.

I. Carbon Dioxide at Exterior of the Building: BMS shall monitor and record carbon dioxide levels.

J. Leak Detector: If a detector is in alarm mode, the BMS shall shut down the respect fan, AC unit, etc. and an alarm shall be activated at the central PC.

K. Setpoints and values listed in the sequence of controls shall be adjustable by the Owner thru the Building Automation System (BAS). The Building Automation System (BAS) or direct digital controls (DDC) or Building Management System (BMS) are used interchangeably and share the same meaning.

L. Other than utility rooms and corridors, space temperature sensor shall be capable of placing the associated systems into the occupied mode for a period of two hours (adj.).

M. There shall be independent interfaces for each global setting. Global groups and associated properties shall include schedule intervals and temperature setpoint.

2.2 DOMESTIC HOT WATER AND PUMPS

A. Water Heater Scheduling: Water heater on-off shall be controlled per a time of day schedule and shall be activated during occupied modes.

B. Domestic Hot Water Recirculating Pump: Pump shall be controlled per a time of day schedule and shall be activated during occupied modes.

C. If the activated pump fails to operate and alarm will be generated at the operator workstation.

D. The domestic hot water supply temperature and hot water return temperature will be monitored.

2.3 BUILDING KWH

A. The Building KWH meter will be provided by Division 26.

B. A BACnet interface to the power monitoring panel will be provided by the ATC. All KWH branches will be displayed at the operator workstation on a single graphic.

2.4 GENERATOR/TRANSFER SWITCH

A. The generator will be monitored for all available data

B. The stand by transfer switch will be monitored for “Normal” and “Emergency” status

2.5 HEATING SYSTEM CENTRAL PLANT

A. The hydronic gas fired boilers/burners shall be controlled by a microprocessor based pre-engineered and programmed control system furnished by the boiler manufacturer. The Building Automation System will communicate with boiler provided controls via BACnet. All boiler/burner control wiring from burner control panels to multiple boiler control system shall be provided by the Automatic Temperature Control Contractor per manufacturer's instructions. The factory boiler control system shall be furnished with supply water temperature sensor, outdoor air sensors, and automatic isolation valve will be wired directly to the factory panel by the Automatic Temperature Control Contractor. Primary hot water pumps will be enabled and controlled by the controller furnished by the boiler manufacturer

B. Boiler controller shall be set to achieve supply water temperature reset indicated below while optimizing the energy consumption of the plant. Boiler controller shall initiate respective boiler automatic isolation valve prior to firing respective boiler.

C. The DDC shall monitor the boilers via BACnet, but as a minimum interface must allow user to view all operating points, firing rates, energy consumptions, etc.

D. The BAS shall index boiler plant to heating mode when outdoor air temperature decreases below 65 ˚F. BAS unit controller to operate if all of the following devices are not activated.

1. Internal safety devices.
2. Low flow.
3. Low water level

E. The BAS will communicate with Boiler Manufacturer Supplied Control Panels via BACnet and write supply water temperature setpoint to boiler manufacturer supplied controller.

F. BAS shall reset hot water supply temperature based on outdoor air temp as follows:

1. Below 20˚F OAT: 145˚F
2. From 20˚F to 45˚F OAT: 135˚F
3. From 45˚F OAT and higher: 125˚F

G. ATC shall wire boiler manufacturer supplied control end-devices and primary pumps so as to provide a complete and operational system.

H. Boiler manufacturer onboard controls system shall enable and command the primary hot water pumps to operate.

I. Boiler manufacturer master controller shall operate each boiler on board integral controls system to utilizing a cascading parallel firing operation sequence as required to maintain hot water supply temperature.

J. BMS shall monitor carbon monoxide in boiler room.

K. BMS shall monitor ATC supplied hot water supply and hot water return temperature sensors at each boiler.

L. Hot water system common supply water temperature and common return water temperature sensors will be provided.

M. BAS shall enable the hot water pumping system into heating mode and command the pump control sequence as follows:

1. Start the lead pump in sequence. The BAS shall monitor pump status. The lead pump shall be rotated based upon runtime and a pre-determined time range. When pumps swap lead/stand-by, the pumps staging on and off should slowly ramp up and down in speed to maintain pressure control. If either primary pump fails to operate, the third pump will be enabled and operate in the sequence to replace the failed pump.
2. The hot water system shall be controlled to maintain the design differential pressure setpoint for the system as determined by the TAB. The differential pressure will be calculated from an independent supply pressure transmitter minus the independent return pressure transmitter As the system pressure drop increases, the BAS will command the pump VFD to decrease its output. As the system pressure drop decreases, the BAS will command the pump VFD to increase its output.
3. If the primary hot water pump cannot maintain the system pressure setpoint, the second hot water pump will be enabled to run. The second primary pump will modulate to maintain the system pressure setpoint. Both pumps will operate at the same speed.
4. The hot water system bypass valve will modulate to maintain boiler minimum flow. The hot water valve position will be monitored
5. Provide two (2) remote shutoff switches for the boiler room. One (1) switch shall be located just outside the interior door to the boiler room. Switch must be located in a break glass or equal tamper resistant enclosure properly labeled. The second switch should be located just inside the boiler room exterior door properly labeled as to its service. Switches must be wired and programmed so that when either switch is placed in the off position a disable signal shall be immediately sent to all the heating boilers and domestic hot water heaters.

N. Limits and Alarms:

1. If boiler enable status does not match command, alarm shall be generated at the operator workstation.
2. Boiler fault code input from Boiler BACnet interface. Alarm shall be generated at operator workstation. Alarm shall identify code and brief verbal description.

3. If lead pump status does not match the commanded value, an alarm shall be generated at the Operator Workstation, the lead pump shall be commanded off, and the stand-by pump shall be commanded on.
4. If stand-by pump status does not match the commanded value, an alarm shall be generated at the Operator Workstation, the standby pump shall be commanded off, and the lead pump shall be commanded on.
5. If hot water supply temperature does not match setpoint for a predetermined time period, alarm shall be generated at the operator workstation.
6. If water flow rate via water flow meter is less than minimum flow rate set point, BMS shall enable the following control sequence:

    a. Disable boilers from operating.
    b. Issue alarm to operator workstation

2.6 DEDICATED OUTDOOR AIR SEQUENCE OF OPERATIONS

A. General:

1. Control dampers and actuators are provided with the unit
2. All air flow stations will be provided by the ATC contractor. Air flow will be monitored at the operator workstation.
3. Static pressure sensor to be installed 2/3 of the distance in the effectively longest duct run downstream from the supply fan.
4. Upon detection of smoke by any of the duct mount smoke detectors or by any other signal from the fire alarm system, the supply fan and the exhaust fan shall be shut off, the energy recovery wheel shall be shut off, the outside air dampers shall close, the exhaust air dampers shall close, and the control valves shall close.
5. Alarms

    a. Low supply air temperature: 32□F (adj.)
    b. Freezestat shall be able to adjust down to 20°F.
    c. If either the low supply air temperature alarm or freezestat is in alarm, the unit will shut off and the hot water control valve will open 100%.
    d. High filter static pressure drop: 0.50” wg.

6. Hardware Points (in addition to those required by the sequence of control)

    a. Analog In: Filter differential pressure.

A. Enabling: DOAS will be controlled by the building automation system (BAS) field controllers as provided by the ATC. BAS unit controller to operate in occupied mode or unoccupied mode if any of the following devices are not activated.

1. Internal safety devices.

    a. Fans shall be off
    b. OA and EA dampers shall be closed
    c. Issue an alarm at the operator workstation.

2. Fire Alarm Control Panel

a. Fans shall be off
b. OA and EA dampers shall be closed
c. Issue an alarm at the operator workstation

3. Low Temperature Limit

a. Fans shall be off
b. Gas valves shall be modulated open.
c. Reversing Valve to position to heating
d. OA and EA dampers shall be closed.
e. Issue alarm to operator's work station.

4. High Static

a. Fans shall be off
b. OA and EA dampers shall be closed
c. Issue an alarm at the operator workstation

B. Supply Air Temperature Reset:

1. Supply air temperature reset shall be enabled when the supply fan is operating.
2. When enabled, initial discharge air temperature set point shall be 60 F.
3. Discharge air temperature range shall be between 65 F and 54 F. (adj.)
4. If any space temperature zone is in heating mode and none are in cooling mode, the discharge air temperature set point shall be reset 2 degrees higher every 15 minutes until the heating zone temperature set point is achieved or the upper discharge air temperature set point is reached.
5. If any space temperature zone is in cooling mode and none are in heating mode, the discharge air temperature set point shall be reset 2 degrees lower every 15 minutes until the cooling zone temperature set point is achieved or the lower discharge air temperature set point is reached.

C. Un-Occupied Fan Control:

1. The Supply and Exhaust Fan shall be Off.
2. If the VRF system fails, or if the zone temperatures drop below the night setback temperature setpoint, the fans will be enabled and maintain the duct static pressure setpoint.

D. Un-Occupied Damper Control and Energy Recovery Wheel Control:

1. Outside air damper shall be fully closed unless unoccupied economizer mode is enabled.
2. Exhaust air damper shall be fully closed unless unoccupied economizer mode is enabled.
3. Re-Circulation damper shall be open
4. Supply air and exhaust air energy wheel by-pass dampers shall be fully closed unless unoccupied economizer mode is enabled.
5. Energy wheel shall be off.

E. Unoccupied Economizer Cooling Control:
1. BMS will allow economizer cycles to be activated based on outside air conditions if the average space temperature and enthalpy is greater than the outside air temperature and enthalpy with a hysteresis of 5□F, the outside air enthalpy is less than 22 Btu/lb with a hysteresis of 2 Btu/lb, the outside air temperature is less than 65□F with a hysteresis of 2□F, and the outside air readings are valid.

2. When economizer mode is enabled:

    a. Outside air and exhaust air damper will be fully open
    b. Supply and Exhaust Energy Wheel by-pass damper will be fully open.

F. Unoccupied Heating

1. The units will be off during this mode. Heating will be provided by the hot water system.
2. The outdoor air and exhaust air dampers will be closed.
3. The Re-Circulation air damper will be open
4. If the VRF system fails to maintain space temperature setpoint in any zone associated with the DOAS, heating mode will be enabled and run until all zones are 2 degree above night set back setpoint.

G. Unoccupied Mechanical Cooling:

1. The units will be off during this mode.
2. The outdoor air and exhaust air dampers will be closed.
3. The Re-Circulation air damper will be open
4. If the VRF system fails to maintain the Un-Occupied temperature setpoint for 30 minutes, (adj.) the Mechanical cooling will be enabled to operate until the space temperature is 2 degrees below setpoint.

H. Unoccupied Dehumidification:

1. When the space dew point temperature rises above dew point unoccupied set point, BAS will initiate dehumidification unoccupied mode as follows:

    a. Supply fan will cycle on.
    b. Initiate compressor to maintain unoccupied space dehumidification setpoint. Compressor shall not operate if supply fan current relay is activated.
    c. Modulate hot gas reheat coil to maintain discharge air temperature setpoint (68 F) adj.)
    d. If the VRF system fails to maintain the space humidity setpoint for 15 minutes (adj.) the Dehumidification mode will be enabled to operate until the space humidity in all zones are 5% below setpoint.

I. Occupied Damper Control

1. Outside air damper shall open 100%
2. Exhaust air damper shall open 100%
3. Recirculation air damper shall be closed
4. Supply air energy wheel bypass damper shall be fully closed unless in Economizer mode.
5. Exhaust air energy wheel bypass damper shall be fully closed unless in Economizer mode.
6. Damper positions shall be monitored via hard wired feedback from the damper actuators to the DDC field controller.

J. Occupied Economizer Cooling Control:

1. BMS will allow economizer cycles to be activated based on outside air conditions if the average space temperature and enthalpy is greater than the outside air temperature and enthalpy with a hysteresis of 5□F, the outside air

enthalpy is less than 22 Btu/lb with a hysteresis of 2 Btu/lb, the outside air temperature is less than 65□F with a hysteresis of 2□F, and the outside air readings are valid.

2. If the supply air temperature remains lower than 45□F for 5 minutes with a 5□F hysteresis and alarm will be generated. This alarm will not be enabled until the supply fan has been running for 30 minutes.
3. DX cooling and dehumidification mode shall be locked out.
4. Energy wheel bypass dampers will be open
5. Energy wheel will be off
6. Relief air fan shall be enabled
7. The relief fan VFD speed shall modulate to maintain the relief CFM offset setpoint from the Outdoor air CFM

K. Occupied Energy Wheel Control:

1. Energy wheel shall operate unless in economizer mode or defrost mode.
2. In economizer or defrost mode, energy wheel shall not rotate
3. If the wheel is enabled and rotation is not sensed an alarm will be generated at the operator workstaion.

L. Defrost Control:

1. When the differential pressure across the wheel exceeds the recommended setpoint, the wheel will be stopped to defrost a portion of the wheel. The wheel will then be jogged ON and the stopped at another section, the defrost cycle will continue until the differential pressures indicate the wheel has been defrosted.

M. Occupied Fan Control:

1. Supply fan VFD shall modulate the supply fan speed to maintain “reset” duct static pressure setpoint. As the system pressure increases, the BAS will command the supply fan VFD to decrease its output. As the system pressure drop decreases, the BAS will command the supply fan VFD to increase its output. VFD output will be monitored by the BAS.
2. The relief fan will be on whenever the supply fan is running. The relief fan VFD speed shall track the supply fan speed with a ten percent (10%) or as set by the balancer.

N. Occupied Heat Control

1. The heat pump reversing valve will fail to the heating position
2. When the discharge air temperature drops below set point, the first stage compressor will be enabled and modulate. If the discharge air temperature setpoint is not met, the second stage will be enabled maintain the discharge air temperature setpoint.
3. Compressors, once enabled, will be on until the minimum run time has elapsed. Compressor shall not operate if supply fan current relay is not activated or condensate pan water detection is activated or compressor high pressure is activated. Roof top equipment manufacture shall take control of the condenser fan operation.
4. If the discharge air temperature cannot be maintained by the heat pump, the gas heating will be enabled and modulate to maintain the setpoint.
5. If the outdoor air temperature to 20 degrees (adj.) the gas heat will be the primary method of heating.

O. Occupied DX Cooling Control

1. When discharge air temperature increases above set point and the outdoor enthalpy is above 25 degrees BTUH, DX cooling mode shall be enabled.
2. Dehumidification mode and economizer mode shall be locked out
3. Reset outside air and mixed air damper to minimum position
4. Reversing valve will be energized to the cooling position.
5. Initiate DX compressor(s). Modulating compressors shall operate as the first cooling stage. If the modulating compressor cannot maintain the discharge air temperature setpoint, the second modulating compressor will be enabled and modulated to maintain the discharge air temperature setpoint. Compressors, once enabled will be on until the minimum run time has elapsed. Compressor shall not operate if supply fan current relay is not activated or condensate pan water detection is activated or compressor high pressure is activated. Roof top equipment manufacture shall take control of the condenser fan operation.
6. The suction pressure transmitter will be monitored for the modulating compressor

P. Occupied Dehumidification Control

1. When the discharge dewpoint temperature rises above the set point and cooling mode is not enabled, dehumidification mode shall be enabled.
2. The suction pressure transmitter will be monitored for the modulating compressor
3. Initiate DX compressor(s). Modulating compressors shall operate as the first dehumidification stage and run at 100% capacity. Compressor shall not operate if supply fan current relay is not activated or condensate pan water detection is activated or compressor high pressure is activated. Roof top equipment manufacture shall take control of the condenser fan operation.
4. Enable and Modulate the hot gas reheat valve (Dehumidification coil) to maintain the last discharge air temperature setpoint.
5. Additional Control Points:

    a. Refer to Control Diagram on Mechanical Drawings.
    b. All control point shown shall be provided.

2.7 AIR HANDLING UNIT-1 (Heat Pump, HGRH, Electric Heat)

A. General: General: BMS shall command zone into morning warmup mode, unoccupied mode and occupied mode if any of the following devices are not activated.

1. Internal safety devices.
2. Fire Alarm Control Panel.
3. High Static

B. ATC shall be responsible for providing all controls on air handling unit. Intent is to have ATC provide and field mount all controllers and end-devices unless otherwise noted.

C. Dampers and Damper Actuators are provided by the unit manufacturer.

D. Unoccupied Mode:

1. Outside air, exhaust air and relief air dampers shall be closed.
2. Return air dampers shall be open.
3. When unit is signaled to stop, the supply fan VFD will be disabled and all dampers will go to their fail safe position.
4. BMS shall raise the zone temperature cooling setpoint to 85□F and drop the zone temperature heating setpoint of 65□F. On a call for unoccupied heating or cooling the supply fans will start and run at minimum reset fan speed. The heating or cooling will modulate to maintain the current supply air reset setpoint.

E. Occupied Mode:

1. The zone will calculate how long it will take to return from its unoccupied state to its occupied setpoint based on the heating or cooling capacity and the outside air temperature. The zone will then adjust its effective setpoint at the time necessary in order to ensure the desired zone conditions at occupancy.
2. The system will not start more than 4 hours before a scheduled occupancy.
3. During morning warmup the AHU supply air setpoint will be fixed at 85°F (adj). The cooling and outside air dampers will be disabled.
4. BMS shall track the supply fan's accumulated runtime. When runtime exceeds 10,000 hours, the controller will generate a runtime expiration message.
5. Fans shall operate continuously. Speed of duplex fans shall operate in unison.
6. Outside air and relief air dampers shall be at minimum open positions. Coordinate setpoints of motorized dampers serving outside air and relief air dampers with air balancer.

F. Occupied Heat Control:

1. The heat pump reversing valve fails to the heating position
2. If the outdoor air is 20 degrees or below, the Electric Heat modulates to maintain the discharge air temperature setpoint.
3. If the outdoor air temperature is above 20 degrees, and the discharge air temperature drops below the discharge air setpoint, the first stage compressor will be enabled and modulate. If the discharge air temperature setpoint is not met, the second stage will be enabled maintain the discharge air temperature setpoint.
   a. Compressors, once enabled will be on until the minimum run time has elapsed. Compressors shall not operate if the supply fan current relay is not activated or condensate pan water detection is activated or compressor high pressure is activated. Roof top equipment manufacture shall take control of the condenser fan operation.

G. Occupied Cooling Control:

1. When discharge air temperature increases ab above set point and the outdoor enthalpy is above 25 degrees BTUH, DX cooling mode shall be enabled.
2. Dehumidification mode and economizer mode will be locked out.
3. Reset outside air and mixed air dampers to minimum position
4. Initiate DX compressor(s). Modulating compressors shall operate as the first cooling stage. If the modulating compressor cannot maintain

the discharge air temperature setpoint, the second modulating compressor will be enabled and modulated to maintain the discharge air temperature setpoint. Compressors, once enabled will be on until the minimum run time has elapsed. Compressor shall not operate if supply fan current relay is not activated or condensate pan water detection is activated or compressor high pressure is activated. Roof top equipment manufacture shall take control of the condenser fan operation.

5. If the first stage cannot maintain the setpoint, the second modulating compressor will be enabled and modulated to maintain the discharge air temperature setpoint. Compressors, once enabled will be on until the minimum run time has elapsed. Compressor shall not operate if supply fan current relay is not activated or condensate pan water detection is activated or compressor high pressure is activated. Roof top equipment manufacture shall take control of the condenser fan operation.
6. Suction pressure will be monitored for modulating compressors

H. Occupied Dehumidification Mode:

1. When the discharge dewpoint temperature rises above the set point and cooling mode is not enabled, dehumidification mode shall be enabled.
2. Initiate DX compressor(s). Modulating compressors shall operate as the first dehumidification stage and run at 100% capacity. Compressor shall not operate if supply fan current relay is not activated or condensate pan water detection is activated or compressor high pressure is activated. Roof top equipment manufacture shall take control of the condenser fan operation.
3. Enable and modulate the hot gas reheat valve to maintain the last discharge air temperature setpoint.

I. Single zone VAV control.

1. In spaces with multiple sensors, the user will be able to select an individual sensor or highest/lowest/average to control the zone.
2. A heating and cooling PID loop will first reset the air handlers supply air temperature setpoint. Once the setpoint has reached its highest (heating) / lowest (cooling) limit, then the supply fans speed will be reset from its minimum to its maximum speed as determined by the balancer.
3. All reset schedules will be fully adjustable.
4. The DX cooling, Hot Gas Reheat, Electric Heat and economizer dampers will modulate without overlap to maintain the supply air setpoint.
5. In economizer mode if the outside air dampers are at 100% open, then the DX cooling will be enabled to modulate and the dampers will be locked at 100% until the cooling is satisfied.
6. If heating is required and the outdoor air temperature is 20 degrees or lower, the Electric Heat will modulate to maintain the supply air temperature setpoint. If the outdoor air temperature is above 20 degrees, the heat pump will be in heating mode and modulate to maintain the supply air temperature setpoint.
7. Electric Heat will not be allowed to operate if the fan status in not “On” or the pressure safety switch status is not On”

J. Alarm Conditions:

1. Current sensing relays/VFD feedback: If fan has been signaled to start and feedback from respective relay or VFD does not indicate the fan has started after 30 seconds, an alarm shall be activated at the Operator Workstation.
2. The BMS will monitor the damper position feedback signal and alarm if the damper is not in its commanded position by +/- 20%.
3. Duct mounted smoke detectors: When a detector is in alarm mode the fire alarm system shall be notified, respective fans shall be de-energized and an alarm shall be activated at the Operator Workstation.
4. The controller will generate an alarm if the zone temperature remains 4□F higher than its cooling setpoint for 5 minutes. This alarm will not be enabled until the zone has been running for 30 minutes.
5. The controller will generate an alarm if the zone temperature remains 4□F lower than its heating setpoint for 5 minutes. This alarm will not be enabled until the zone has been running for 30 minutes.
6. The controller will generate an alarm if the discharge air temperature remains higher than 120□F with a hysteresis of 5□F for 5 minutes. This alarm will not be enabled until the zone has been running for 30 minutes.
7. The controller will generate an alarm if the discharge air temperature remains lower than 45□F with a hysteresis of 5□F for 5 minutes. This alarm will not be enabled until the zone has been running for 30 minutes.
8. The controller will generate an alarm if the return air CO2 level rises above 1500 ppm.

K. Economizer Control

1. BMS will allow economizer cycles to be activated based on outside air conditions if the return air temperature and enthalpy is greater than the outside air temperature and enthalpy with a hysteresis of 5□F, the outside air enthalpy is less than 22 Btu/lb with a hysteresis of 2 Btu/lb, the outside air temperature is less than 65□F with a hysteresis of 2□F, and the outside air readings are valid.
2. If the mixed air temperature drops below 48□F, the AHU controller will begin to close the economizer to protect the coil. The controller will continue to close the damper linearly until the temperature drops to 40□F, when the economizer/ventilation damper will be 100% closed.
3. If the AHU loses air flow, the AHU controller will close the economizer dampers.
4. The AHU controller will generate an alarm if the mixed air temperature remains lower than 45□F for 5 minutes with a 5□F hysteresis. This alarm will not be enabled until the supply fan has been running for 30 minutes.
5. The AHU controller will generate an alarm if the mixed air temperature remains higher than 90□F for 5 minutes with a 5□F hysteresis. This alarm will not be enabled until the supply fan has been running for 30 minutes.

L. Air Flow Monitoring Stations (AFMS)

1. Outdoor air, Supply air and return air will be monitored.
2. Calibration of flow rates at all AFMS shall be based on values determined during Testing, Adjusting and Balancing (TAB).
3. All AFMS shall be monitored and data recorded independently.
4. Supply air flow will be determined by measuring air flow directly, not by

measuring and accumulative data from field controllers or VAVs

M. Outside Air – Demand Control Ventilation (DCV)

1. If economizer mode is not enabled, the mixed air dampers minimum outside air position will be reset from minimum to maximum as the selected CO2 sensor goes from 700ppm to 900 ppm.(Adj)
2. In spaces with multiple CO2 sensors the user will be able to select an individual sensor or the highest/average sensor to use for DCV control.
3. If any space CO2 level rises above 1500 ppm at the controlling sensor, an alarm shall be sent to the central workstation.

N. Limits and Alarms:

1. If discharge air temperature does not match setpoint for a predetermined time period, alarm shall be generated at the operator workstation.
2. If space temperature does not match setpoint for a predetermined time period, alarm shall be generated at the operator workstation.
3. If fan command does not match fan operating status, BMS shall enable the following control sequence:

   a. Command fan to not operate.
   b. Close damper
   c. alarm shall be generated at the operator workstation

4. If fan VFD fault in activated, BMS shall enable the following control sequence:

   a. alarm shall be generated at the operator workstation

5. If damper command does not match damper position status, BMS shall enable the following control sequence:

   a. Command fan to not operate.
   b. alarm shall be generated at the operator workstation

6. If clog filter condition is activated, alarm shall be generated at the operator workstation.

2.8 AIR HANDLING UNIT-2,3,4 (Heat Pump, HGRH, Hot Water Heat)

A. General: General: BMS shall command zone into morning warmup mode, unoccupied mode and occupied mode if any of the following devices are not activated.

1. Internal safety devices.
2. Fire Alarm Control Panel.
3. Low temperature limit.
4. High Static

B. ATC shall be responsible for providing all controls on air handling unit. Intent is to have ATC provide and field mount all controllers and end-devices unless otherwise noted.

C. Dampers and Damper Actuators are provided by the unit manufacturer.

D. Unoccupied Mode:

1. Outside air, exhaust air and relief air dampers shall be closed.
2. Return air dampers shall be open.
3. When unit is signaled to stop, the supply fan VFD will be disabled, and all dampers will go to their fail safe position.
4. BMS shall raise the zone temperature cooling setpoint to 85□F and drop the zone temperature heating setpoint of 65□F. On a call for unoccupied heating or cooling the supply fans will start and run at minimum reset fan speed. The heating or cooling will modulate to maintain the current supply air reset setpoint.

E. Occupied Mode:

1. The zone will calculate how long it will take to return from its unoccupied state to its occupied setpoint based on the heating or cooling capacity and the outside air temperature. The zone will then adjust its effective setpoint at the time necessary in order to ensure the desired zone conditions at occupancy.
2. The system will not start more than 4 hours before a scheduled occupancy.
3. During morning warmup, the AHU supply air setpoint will be fixed at 85°F (adj). The cooling and outside air dampers will be disabled.
4. BMS shall track the supply fan's accumulated runtime. When runtime exceeds 10,000 hours, the controller will generate a runtime expiration message.
5. Fans shall operate continuously.
6. Outside air and relief air dampers shall be at minimum open positions. Coordinate setpoints of motorized dampers serving outside air and relief air dampers with air balancer.

F. Occupied Heat Control:

1. The heat pump reversing valve fails to the heating position
2. If the outdoor air is 20 degrees or below, the hot water valve modulates to maintain the discharge air temperature setpoint.
3. If the outdoor air temperature is above 20 degrees, and the discharge air temperature drops below the discharge air setpoint, the first stage compressor will be enabled and modulate. If the discharge air temperature setpoint is not met, the second stage will be enabled maintain the discharge air temperature setpoint.
   a. Compressors, once enabled, will be on until the minimum run time has elapsed. Compressors shall not operate if the supply fan current relay is not activated, or condensate pan water detection is activated or compressor high pressure is activated. Roof top equipment manufacture shall take control of the condenser fan operation.

G. Occupied Cooling Control:

1. When discharge air temperature increases above set point and the outdoor enthalpy is above 25 degrees BTUH, DX cooling mode shall be enabled.
2. Dehumidification mode and economizer mode will be locked out.
3. Reset outside air and mixed air dampers to minimum position

4. Initiate DX compressor(s). Modulating compressors shall operate as the first cooling stage. If the modulating compressor cannot maintain the discharge air temperature setpoint, the second modulating compressor will be enabled and modulated to maintain the discharge air temperature setpoint. Compressors, once enabled, will be on until the minimum run time has elapsed. Compressor shall not operate if supply fan current relay is not activated, or condensate pan water detection is activated or compressor high pressure is activated. Roof top equipment manufacture shall take control of the condenser fan operation.
5. If the first stage cannot maintain the setpoint, the second modulating compressor will be enabled and modulated to maintain the discharge air temperature setpoint. Compressors, once enabled, will be on until the minimum run time has elapsed. Compressor shall not operate if supply fan current relay is not activated, or condensate pan water detection is activated or compressor high pressure is activated. Roof top equipment manufacture shall take control of the condenser fan operation.
6. Suction pressure will be monitored for modulating compressors

H. Occupied Dehumidification Mode:

1. When the discharge dewpoint temperature rises above the set point and cooling mode is not enabled, dehumidification mode shall be enabled.
2. Initiate DX compressor(s). Modulating compressors shall operate as the first dehumidification stage and run at 100% capacity. Compressor shall not operate if supply fan current relay is not activated, or condensate pan water detection is activated or compressor high pressure is activated. Roof top equipment manufacture shall take control of the condenser fan operation.
3. Enable and modulate the hot gas reheat valve to maintain the last discharge air temperature setpoint.

I. Single zone VAV control.

1. In spaces with multiple sensors, the user will be able to select an individual sensor or highest/lowest/average to control the zone.
2. A heating and cooling PID loop will first reset the air handlers supply air temperature setpoint. Once the setpoint has reached its highest (heating) / lowest (cooling) limit, then the supply fans speed will be reset from its minimum to its maximum speed as determined by the balancer.
3. All reset schedules will be fully adjustable.
4. The DX cooling, Hot Gas Reheat, Hot Water Heat and economizer dampers will modulate without overlap to maintain the supply air setpoint.
5. In economizer mode if the outside air dampers are at 100% open, then the DX cooling will be enabled to modulate and the dampers will be locked at 100% until the cooling is satisfied.
6. If heating is required and the outdoor air temperature is 20 degrees or lower, the Electric Heat will modulate to maintain the supply air temperature setpoint. If the outdoor air temperature is above 20 degrees, the heat pump will be in heating mode and modulate to maintain the supply air temperature setpoint.
7. Electric Heat will not be allowed to operate if the fan status in not “On” or the

pressure safety switch status is not On”

J. Alarm Conditions:

1. Current sensing relays/VFD feedback: If fan has been signaled to start and feedback from respective relay or VFD does not indicate the fan has started after 30 seconds, an alarm shall be activated at the Operator Workstation.
2. The BMS will monitor the damper position feedback signal and alarm if the damper is not in its commanded position by +/- 20%.
3. Low Limit Thermostat. If the temperature drops below setpoint.
4. Duct mounted smoke detectors: When a detector is in alarm mode the fire alarm system shall be notified, respective fans shall be de-energized and an alarm shall be activated at the Operator Workstation.
5. The controller will generate an alarm if the zone temperature remains 4□F higher than its cooling setpoint for 5 minutes. This alarm will not be enabled until the zone has been running for 30 minutes.
6. The controller will generate an alarm if the zone temperature remains 4□F lower than its heating setpoint for 5 minutes. This alarm will not be enabled until the zone has been running for 30 minutes.
7. The controller will generate an alarm if the discharge air temperature remains higher than 120□F with a hysteresis of 5□F for 5 minutes. This alarm will not be enabled until the zone has been running for 30 minutes.
8. The controller will generate an alarm if the discharge air temperature remains lower than 45□F with a hysteresis of 5□F for 5 minutes. This alarm will not be enabled until the zone has been running for 30 minutes.
9. The controller will generate an alarm if the return air CO2 level rises above 1500 ppm.

K. Economizer Control

1. BMS will allow economizer cycles to be activated based on outside air conditions if the return air temperature and enthalpy is greater than the outside air temperature and enthalpy with a hysteresis of 5□F, the outside air enthalpy is less than 22 Btu/lb with a hysteresis of 2 Btu/lb, the outside air temperature is less than 65□F with a hysteresis of 2□F, and the outside air readings are valid.
2. If the mixed air temperature drops below 48□F, the AHU controller will begin to close the economizer to protect the coil. The controller will continue to close the damper linearly until the temperature drops to 40□F, when the economizer/ventilation damper will be 100% closed.
3. If the AHU loses air flow or the freezestat trips, the AHU controller will close the economizer dampers.
4. The AHU controller will generate an alarm if the mixed air temperature remains lower than 45□F for 5 minutes with a 5□F hysteresis. This alarm will not be enabled until the supply fan has been running for 30 minutes.
5. The AHU controller will generate an alarm if the mixed air temperature remains higher than 90□F for 5 minutes with a 5□F hysteresis. This alarm will not be enabled until the supply fan has been running for 30 minutes.

L. Air Flow Monitoring Stations (AFMS)

1. Outdoor air, Supply air and return air will be monitored.
2. Calibration of flow rates at all AFMS shall be based on values determined

during Testing, Adjusting and Balancing (TAB).

3. All AFMS shall be monitored, and data recorded independently.
4. Supply air flow will be determined by measuring air flow directly, not by measuring and accumulative data from field controllers or VAVs

M. Outside Air – Demand Control Ventilation (DCV)

1. If economizer mode is not enabled, the mixed air dampers minimum outside air position will be reset from minimum to maximum as the selected CO2 sensor goes from 700ppm to 900 ppm.(Adj)
2. In spaces with multiple CO2 sensors the user will be able to select an individual sensor or the highest/average sensor to use for DCV control.
3. If any space CO2 level rises above 1500 ppm at the controlling sensor, an alarm shall be sent to the central workstation.

N. Limits and Alarms:

1. If discharge air temperature does not match setpoint for a predetermined time period, alarm shall be generated at the operator workstation.
2. If space temperature does not match setpoint for a predetermined time period, alarm shall be generated at the operator workstation.
3. If fan command does not match fan operating status, BMS shall enable the following control sequence:

    a. Command fan to not operate.
    b. Close damper
    c. alarm shall be generated at the operator workstation

4. If fan VFD fault in activated, BMS shall enable the following control sequence:

    a. alarm shall be generated at the operator workstation

5. If low limit freeze-stat is activated, BMS shall enable the following control sequence:

    a. Command fan to not operate
    b. Command mixed air damper to fully open, OA damper and exhaust air damper to close
    c. Fully open Hot water control valve.
    d. Alarm shall be generated at the operator workstation

6. If valve command does not match valve position status, BMS shall enable the following control sequence:

    a. alarm shall be generated at the operator workstation

7. If damper command does not match damper position status, BMS shall enable the following control sequence:

    a. Command fan to not operate.
    b. alarm shall be generated at the operator workstation

8. If clog filter condition is activated, alarm shall be generated at the operator workstation.

2.9 ROOF TOP UNIT (RTU single zone heat pump with electric heat)

A. General: This unit will be provided by the unit manufacturer with a BACnet interface. BMS shall command zone into morning warmup mode, unoccupied mode, occupied mode and demand control ventilation mode if any of the following devices are not activated.

1. Internal safety devices.
2. Fire Alarm Control Panel.
3. Low temperature limit.

B. Zone consists of the following:

1. Roof Top Unit (RTU) control
2. Economizer Control
3. Demand control ventilation

C. Unoccupied and Morning Warm-Up Control:

1. Unoccupied damper actuator control:

a. Outside air damper shall be fully closed.
b. Exhaust air damper shall be fully closed.
c. Mixed air damper fully opened.

4. Unoccupied and Morning Warm-Up Fan Control:

a. Supply fan VFD shall be off unless unoccupied heating mode or unoccupied cooling mode is activated.

5. Unoccupied Heating Mode Control:

a. BAS shall enable unoccupied heating mode when the unit is scheduled accordingly and the heating plant is enabled.
b. When space temperature decreases below setpoint, BMS shall command the following control sequence.

1) Stage 1 Heating:

a) Unit reversing valve will switchover to heating mode.

2) Stage 2 Heating:

3) Electric heat shall modulate as required to maintain discharge air temperature setpoint.

6. Unoccupied Cooling Mode Control:

a. BAS shall enable unoccupied cooling mode when the unit is scheduled accordingly and either the chiller plant is enabled, or outdoor air temperature is consistent with economizer operations.
b. When space temperature increases above setpoint, BMS shall command the following control sequence.

1) Supply fan shall start
2) DX cooling will stage and compressors shall modulate as required to maintain discharge air temperature setpoint.

D. Occupied Control:

1. Occupied damper actuator control:

a. Outside air damper shall open to minimum ventilation damper position.
b. Exhaust air damper shall open to minimum ventilation damper position.
c. Mixed air damper shall open to minimum ventilation damper position.
d. Minimum damper position shall be determined by TAB contractor.

2. Occupied Fan Control:

a. Supply fan VFD shall modulate the supply fan between minimum and maximum predetermined frequency setpoints as required to maintain space temperature set point.
b. Predetermined VFD fan speed shall be determined by TAB contactor

E. Single zone VAV control.

1. In spaces with multiple sensors, the user will be able to select an individual sensor or highest/lowest/average to control the zone.
2. A heating and cooling PID loop will first reset the air handlers supply air setpoint. Once the setpoint has reached its highest (heating) / lowest (cooling) limit, then the supply fans speed will be reset from its minimum to its maximum speed as determined by the balancer.
3. All reset schedules will be fully adjustable.
4. The DX cooling, DX heating, Electric Heat and economizer dampers will modulate without overlap to maintain the supply air setpoint.

5. Occupied Heating Mode Control:

a. BAS shall enable occupied heating mode when the unit is scheduled accordingly and the heating plant is enabled.
b. When space temperature decreases below setpoint, BMS shall command the following control sequence.

1) If the outdoor air temperature is above 20 degrees, the reversing valve will switch to heating mode.

2) If the outdoor air temperature is 20 degrees or below, the electric duct heater will modulate to maintain the discharge air temperature reset setpoint.

6. Occupied Cooling Mode Control:

a. The compressors will not be allowed to operate if the fan status has not been proven to be On.

b. A minimum compressor On time and Off time of 5 minutes will be set for each compressor.
c. When space temperature increases above setpoint, BMS shall command the following control sequence.

1) Economizer cooling mode: When all of the outdoor air conditions are true as stated in the economizer cooling description section, Economizer cooling shall enable.
2) When space temperature increases above setpoint and economizer mode is enabled, BMS shall command the following control sequence.

    a) Exhaust air damper shall fully open.
    b) Modulate outdoor air damper and mixed air damper as required to maintain discharge air temperature set point.
3) Mechanical cooling mode: When any of the outdoor air conditions are not true as stated in the economizer cooling description section, Mechanical cooling shall be enabled.
4) When space temperature increases above setpoint and mechanical mode is enabled, BMS shall command the following control sequence.

    a) Reset air dampers to normal operating mode.
    b) Stage DX cooling and modulate compressors as required to maintain discharge air temperature setpoint.

F. Demand control ventilation:

1. BAS shall enable demand control ventilation (DCV) shall be enabled during occupied mode. DCV shall be locked out from operating when economizer cooling is enabled. DCV shall be allowed to operate simultaneously with cooling and heating control sequence.
2. When space CO2 level decrease below setpoint, BAS shall command the following control sequence:

    a. Exhaust air damper shall fully open.
    b. Modulate outdoor air damper and mixed air damper as required to maintain space CO2 setpoint.

G. Limits and Alarms:

1. If discharge air temperature does not match setpoint for a predetermined time period, alarm shall be generated at the operator workstation.
2. If space temperature does not match setpoint for a predetermined time period, alarm shall be generated at the operator workstation.
3. If space CO2 does not match setpoint for a predetermined time period, alarm shall be generated at the operator workstation.
4. If fan command does not match fan operating status, BMS shall enable the following control sequence:

    a. Command fan to not operate.
    b. Close damper
    c. DX compressors will be locked out
    d. Electric heat will be locked out.
    e. alarm shall be generated at the operator workstation

5. If fan VFD fault in activated, BMS shall enable the following control sequence:

    a. DX compressors will be locked out
    b. Electric Heat will be locked out
    c. alarm shall be generated at the operator workstation

6. If damper command does not match damper position status, BMS shall enable the following control sequence:

    a. alarm shall be generated at the operator workstation

7. If clog filter condition is activated, alarm shall be generated at the operator workstation.

2.10 UNIT VENTILATORS (DX Cooling / Hot Water Heating)

A. The Unit Ventilators will be controlled by the BAS system and operate based on a time of day schedule. Units will be disabled if one of the following:

1. Internal safety devices.
2. Fire Alarm Control Panel.
3. Low temperature limit.

B. Un-Occupied Mode:

1. Outdoor air damper will be closed
2. Fan will be off
3. Heating space temperature setpoint will be 64 degrees (adj.)
4. Cooling setpoint will be 80 degrees (adj.)

7. Unoccupied Mode Control:

    a. BAS shall enable unoccupied heating mode when the unit is scheduled accordingly and the heating plant is enabled.
    b. Outdoor air damper will be closed
    c. Fan will be off
    d. Heating setpoint will be 60 degrees (adj.)
    e. Cooling setpoint will be 80 degrees (adj.)
    f. When space temperature decreases below setpoint, and the outdoor air temperature is above 20 deg. BMS shall command the following control sequence.

        1) Stage 1 Heating: Unit reversing valve will switchover to heating mode and modulate to maintain space temperature setpoint.

    g. When the space temperature decrease below setpoint and the outdoor air temperature is 20 or below.
        1) Hot Water valve shall modulate as required to maintain space temperature

8. Unoccupied Cooling Mode Control:

    a. When space temperature increases above the Un-Occupied setpoint, BMS shall command the following control sequence.

1) Supply fan shall start
2) DX cooling will be enabled.
3) Cooling will stay enabled until the space temperature reaches 1 degree below the Un-Occupied temperature setpoint.

C. Occupied Control:

1. Occupied damper actuator control:

a. Outside air damper shall open to minimum ventilation damper position.
b. Mixed air damper shall open to minimum ventilation damper position.
c. Minimum damper position shall be determined by TAB contractor.

2. Occupied fan control

a. Occupied Fan Control:
b. Predetermined ECM fan speed shall be determined by TAB contactor

3. Occupied Cooling Mode Control:

a. When the space temperature is above the space temperature setpoint, and economizer cooling is not available the BMS will Enable cooling mode.
b. The outdoor air damper will be at minimum position.
c. The cooling will operate until the space temperature setpoint is one degree below setpoint.
d. If Economizer is available:

1) Economizer cooling mode: When all of the outdoor air conditions are true as stated in the economizer cooling description section, Economizer cooling shall enable.
2) When space temperature increases above setpoint and economizer mode is enabled, BMS shall command the following control sequence.
a) Modulate outdoor air damper and mixed air damper as required to maintain discharge air temperature set point.

D. Demand control ventilation:

1. BAS shall enable demand control ventilation (DCV) shall be enabled during occupied mode. DCV shall be locked out from operating when economizer cooling is enabled. DCV shall be allowed to operate simultaneously with cooling and heating control sequence.
2. When space CO2 level decrease below setpoint, BAS shall command the following control sequence:

a. Modulate outdoor air damper and mixed air damper as required to maintain space CO2 setpoint.

E. Limits and Alarms:

1. If space temperature does not match setpoint for a predetermined time

period, alarm shall be generated at the operator workstation.

2. If space CO2 does not match setpoint for a predetermined time period, alarm shall be generated at the operator workstation.
3. If the low limit thermostat senses a temperature 38 degrees or below

    a. Command fan to not operate
    b. Close outdoor air damper
    c. Face and bypass damper will open to the coil
    d. Unit will fail to heating mode
    e. Hot water valve will open
    f. alarm shall be generated at the operator workstation

4. If fan command does not match fan operating status, BMS shall enable the following control sequence:

    a. Command fan to not operate.
    b. Close outdoor air damper
    c. Hot water valve will open
    d. alarm shall be generated at the operator workstation

5. If damper command does not match damper position status, BMS shall enable the following control sequence:

    a. alarm shall be generated at the operator workstation

6. If clog filter condition is activated, alarm shall be generated at the operator workstation.

2.11 ENERGY RECOVERY VENTILATOR / EDH-1

A. The ERV will be controlled by the BAS system
B. The damper positions will be monitored by the BAS system.
C. The fans will be enabled. If the fans fail to operate based on a current switch, an alarm will be generated.
D. The energy recovery wheel will be started. If the wheel fails to operate based on a rotation switch, an alarm will be generated.
E. The discharge air temperature will be monitored. If the heater is enabled, and the discharge air temperature does not increase to the setpoint, an alarm will be generated.
F. If the space temperature drops below 65 degrees (adj.) the duct mounted electric heater will be enabled and modulate to maintain the space temperature setpoint. The duct heater operating safeties will be provided by the Duct heater manufacturer and be wired by the ATC contractor.

2.12 KITCHEN MAKE-UP AIR UNIT (MUA-1 / KEF-1): Gas heating / DX Cooling

A. General: BMS shall command MAU to operate in conjunction with kitchen hood operation if any of the following device are not activated.

    1. Internal safety devices.
    2. Fire Alarm Control Panel.
    3. Low temperature limit.

B. Kitchen Exhaust Fan -1:

1. Fan shall be interlocked to associated Make Up Air Unit (MAU-1). Provide and install a wall mount momentary type push button switch in accordance with Electrical Plans (intent is to provide a single switch on wall, not two (by this division and 26). Upon activation of the switch, the exhaust fan shall operate. If switch is depressed while the exhaust fan is operating, the exhaust fan shall shut- off.

C. ATC shall be responsible for providing all controls on make-up air unit. Intent is to have ATC provide and field mount all controllers and end-devices unless otherwise noted.

D. Control Sequence:

1. Occupied damper actuator control:

a. Outside air damper shall open to ventilation damper position.
b. Damper position shall be verified by damper end switch

2. Fan Control:

a. Supply fan VFD shall modulate the supply fan to predetermined frequency setpoints.
b. Predetermined VFD fan speed shall be determined by TAB contractor.
c. Fan will not be allowed to operate if OA damper not proven to be open.

3. Occupied Heating Mode Control:

a. When OA temperature decreases below setpoint, BMS shall command the following control sequence.

1) Gas Heating shall modulate as required to maintain discharge air temperature setpoint.
2) A space temperature sensor shall be installed. The discharge air temperature setpoint shall reset based on the space temperature setpoint.

E. Limits and Alarms:

1. If discharge air temperature does not match setpoint for a predetermined time period, alarm shall be generated at the operator workstation.

2. If fan command does not match fan operating status, BMS shall enable the following control sequence:

a. Command fan to not operate.
b. Close damper
c. alarm shall be generated at the operator workstation.

3. If damper command does not match damper position status, BMS shall enable the following control sequence:

a. Command fan to not operate.

b. alarm shall be generated at the operator workstation.

4. If clog filter condition is activated, alarm shall be generated at the operator workstation.
5. If space temperature does not match setpoint for a predetermined time period, alarm shall be generated at the operator workstation.

2.13 VARIABLE REFRIGERANT SYSTEM

A. The BAS will communicate to the VRF system global controller via BACnet.

B. The VRF system will be used for heating and cooling. The VRF modes will be controlled by the BMS system through a BACnet interface.

C. Each Room will be provided with a space temperature, humidity and CO2 level transmitter as provided by and monitored by the ATC contractor. If the space temperature, relative humidity or CO2 level increases above the alarm setpoint, alarms will be generated at the operator workstation.

D. A space temperature reference will be provided by the VRF system manufacturer and be wired by the ATC contractor to the VRF controller.

E. The room setpoint will be locally adjustable through the ATC provided wall sensor only. The VRF system sensor will only provide a reference to the VRF operating system.

F. The space temperature setpoint will be limited to +/- 3 degrees at the wall mounted sensor.

G. If the zone requires cooling, as sensed by the BAS provided temperature sensor, the BAS will request the VRF system to be in cooling mode. The VRF controller will compare the BAS setpoint to the VRF supplied temperature sensor reference and control to maintain the zone temperature setpoint.

H. If the zone requires heating, as sensed by the BAS provided temperature sensor, the BAS will request the VRF system to be in heating mode. The VRF controller will compare the BAS setpoint to the VRF supplied temperature sensor reference and control to maintain the zone temperature setpoint.

I. The BMS system will send the space temperature setpoints to the VRF system controller based on time of day schedules, Occupied setpoints and night setback setpoints.

J. A secondary condensate pan will be monitored by the BMS system directly. The condensate switch will be provided by and directly (hardwired) to the BMS system. If condensate is detected, the unit will be shut down and an alarm will be generated at the operator workstation.

K. All communications wiring will be provided by the ATC contractor.

L. The communications wiring to the branch selectors will be provided by the ATC contractor

M. The communication wiring to the outdoor condensing unit will be provided by the ATC contractor.

2.14 EXHAUST FANS

A. Exhaust Fans will be scheduled by the BMS system.

B. The associated damper will be opened.

C. When the damper is established to be open via hardwired end switch, the fan will start.

D. The fan will be monitored for run status. I the fan status does not match the fan On/Off command, an alarm will be generated at the Operated Workstation.

2.15 REFRIGERATOR / FEREEZER MONITORING

A. All refrigerator and freezer temperatures will be monitored.
B. If any temperatures rise above alarm setpoint for more than 5 minutes, an alarm will be generated at the operator workstation.

PART 3 - EXECUTION (Not Applicable)

END OF SECTION

SECTION 232113 - HYDRONIC PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes pipe and fitting materials, joining methods, special-duty valves, and specialties for the following:

1. Hot-water heating piping.
2. Makeup-water piping.
3. Air control devices.
4. Safety-valve-inlet and -outlet piping.

B. Related Sections include the following:

1. Division 232123 Section "Hydronic Pumps" for pumps, motors, and accessories for hydronic piping.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of the following:

1. Valves. Include flow and pressure drop curves based on manufacturer's testing for calibrated-orifice balancing valves and automatic flow-control valves.
2. Air control devices.
3. Chemical treatment.
4. Hydronic specialties.

B. Shop Drawings: Detail, at ¼ (1:50) scale, the piping layout, fabrication of pipe anchors, hangers, supports for multiple pipes, alignment guides, expansion joints and loops, and attachments of the same to the building structure. Detail location of anchors, alignment guides, and expansion joints and loops.

C. Welding certificates.

D. Qualification Data: For Installer.

E. Field quality-control test reports.

F. Operation and Maintenance Data: For air control devices, hydronic specialties, and special-duty valves to include in emergency, operation, and maintenance manuals.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Welding certificates.

C. Field quality-control test reports.

D. Water Analysis: Submit a copy of the water analysis to illustrate water quality available at Project site.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For air control devices, hydronic specialties, and special-duty valves to include in emergency, operation, and maintenance manuals.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Water-Treatment Chemicals: Furnish enough chemicals for initial system startup and for preventive maintenance for one (1) year from date of Substantial Completion.

B. Differential Pressure Meter: For each type of balancing valve and automatic flow control valve, include flowmeter, probes, hoses, flow charts, and carrying case.

1.7 QUALITY ASSURANCE

A. Steel Support Welding: Qualify processes and operators according to AWS D1.1, "Structural Welding Code - Steel."

B. Welding: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX.

1. Comply with provisions in ASME B31 Series, "Code for Pressure Piping."
2. Certify that each welder has passed AWS qualification tests for welding processes involved and that certification is current.

C. ASME Compliance: Comply with ASME B31.9, "Building Services Piping," for materials, products, and installation. Safety valves and pressure vessels shall bear the appropriate ASME label. Fabricate and stamp air separators and expansion tanks to comply with ASME Boiler and Pressure Vessel Code: Section VIII, Division 01.

PART 2 - PRODUCTS

2.1 COPPER TUBE AND FITTINGS

A. Annealed-Temper Copper Tubing: ASTM B 88, Type K.

B. Wrought-Copper Fittings: ASME B16.22.

C. Wrought-Copper Unions: ASME B16.22.

2.2 STEEL PIPE AND FITTINGS

A. Steel Pipe: ASTM A 53, black steel with plain ends; type, grade, and wall thickness as indicated in Part 3 "Piping Applications" Article.

B. Cast-Iron Threaded Fittings: ASME B16.4; Classes 125 and 250 as indicated in Part 3 "Piping Applications" Article.

C. Malleable-Iron Unions: ASME B16.39; Classes 150, 250, and 300 as indicated in Part 3 "Piping Applications" Article.

D. Wrought-Steel Fittings: ASTM A 234, wall thickness to match adjoining pipe.

E. Wrought Cast- and Forged-Steel Flanges and Flanged Fittings: ASME B16.5, including bolts, nuts, and gaskets of the following material group, end connections, and facings:

1. Material Group: 1.1.
2. End Connections: Butt welding.
3. Facings: Raised face.

F. Steel Pipe Nipples: ASTM A 733, made of same materials and wall thicknesses as pipe in which they are installed.

G. Flexible Connectors: Stainless-steel bellows with woven, flexible, bronze, wire-reinforcing protective jacket; 150-psig minimum working pressure and 250 deg F (121 deg C) maximum operating temperature. Connectors shall have flanged connections to match equipment connected and shall be capable of ¾-inch misalignment.

2.3 PLASTIC PIPE AND FITTINGS (Chemical Water Treatment only)

A. PVC Plastic Pipe: ASTM D 1785, 80, plain ends as indicated in Part 3 "Piping Applications" Article.

2.4 JOINING MATERIALS

A. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.

1. ASME B16.21, nonmetallic, flat, asbestos free, 1/8-inch maximum thickness unless thickness or specific material is indicated.

a. Full-Face Type: For flat-face, Class 125, cast-iron and cast-bronze flanges.
b. Narrow-Face Type: For raised-face, Class 250, cast-iron and steel flanges.

B. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.

C. Brazing Filler Metals: AWS A5.8, BCuP Series, copper-phosphorus alloys for joining copper with copper; or BAg-1, silver alloy for joining copper with bronze or steel.

D. Welding Filler Metals: Comply with AWS D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

E. Gasket Material: Thickness, material, and type suitable for fluid to be handled and working temperatures and pressures.

F. Solvent Cements for Joining Plastic Piping: (Chemical water treatment only)

1. PVC Piping: ASTM D 2564. Include primer according to ASTM F 656.

a. PVC solvent cement shall have a VOC content of 510 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
b. Adhesive primer shall have a VOC content of 550 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.5 DIELECTRIC FITTINGS

A. Description: Combination fitting of copper-alloy and ferrous materials with threaded, solder-joint, plain, or weld-neck end connections that match piping system materials.

B. Insulating Material: Suitable for system fluid, pressure, and temperature.

C. Dielectric Unions:

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

a. Capitol Manufacturing Company
b. Central Plastics Company
c. Hart Industries International, Inc.
d. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
e. Zurn Plumbing Products Group; AquaSpec Commercial Products Division

2. Factory-fabricated union assembly, for 250-psig minimum working pressure at 180 deg F (82 deg C).

D. Dielectric Flanges:

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

a. Capitol Manufacturing Company
b. Central Plastics Company
c. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Factory-fabricated companion-flange assembly, for 150- or 300-psig minimum working pressure as required to suit system pressures.

E. Dielectric-Flange Kits:

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

a. Advance Products & Systems, Inc.
b. Calpico, Inc.
c. Central Plastics Company
d. Pipeline Seal and Insulator, Inc.

2. Companion-flange assembly for field assembly. Include flanges, full-face- or ring-type neoprene or phenolic gasket, phenolic or polyethylene bolt sleeves, phenolic washers, and steel backing washers.
3. Separate companion flanges and steel bolts and nuts shall have 150- or 300-psig minimum working pressure where required to suit system pressures.

F. Dielectric Couplings:

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

a. Calpico, Inc.

b. Lochinvar Corporation

2. Galvanized-steel coupling with inert and noncorrosive thermoplastic lining; threaded ends; and 300-psig minimum working pressure at 225 deg F (107 deg C).

G. Dielectric Nipples:

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

a. Perfection Corporation; a subsidiary of American Meter Company
b. Precision Plumbing Products, Inc.
c. Sioux Chief Manufacturing Company, Inc.
d. Victaulic Company of America

2. Electroplated steel nipple with inert and noncorrosive, thermoplastic lining; plain, threaded, or grooved ends; and 300-psig minimum working pressure at 225 deg F (107 deg C).

2.6 VALVES

A. Automatic Temperature-Control Valves, Actuators, and Sensors: Comply with requirements specified in Section 230900 "Instrumentation and Control for HVAC."

B. Bronze, Calibrated-Orifice, Balancing Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

a. Bell & Gossett Domestic Pump; a division of ITT Industries
b. Flow Design Inc.
c. Griswold Controls
d. Taco

2. Body: Bronze, ball or plug type with calibrated orifice or venturi.
3. Ball: Brass or stainless-steel.
4. Plug: Resin.
5. Seat: PTFE.
6. End Connections: Threaded or socket.
7. Pressure Gage Connections: Integral seals for portable differential pressure meter.
8. Handle Style: Lever, with memory stop to retain set position.
9. CWP Rating: Minimum 125 psig.
10. Maximum Operating Temperature: 250 deg F (121 deg C).

C. Cast-Iron or Steel, Calibrated-Orifice, Balancing Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

a. Bell & Gossett Domestic Pump; a division of ITT Industries
b. Flow Design Inc.
c. Gerand Engineering Co.
d. Griswold Controls
e. Taco

2. Body: Cast-iron or steel body, ball, plug, or globe pattern with calibrated orifice or venturi.
3. Ball: Brass or stainless-steel.
4. Stem Seals: EPDM O-rings.
5. Disc: Glass and carbon-filled PTFE.
6. Seat: PTFE.
7. End Connections: Flanged or grooved.
8. Pressure Gage Connections: Integral seals for portable differential pressure meter.
9. Handle Style: Lever, with memory stop to retain set position.
10. CWP Rating: Minimum 125 psig.
11. Maximum Operating Temperature: 250 deg F.

D. Automatic Flow-Control Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

   a. Flow Design Inc.
   b. Griswold Controls

2. Body: Brass or ferrous metal.
3. Piston and Spring Assembly: Stainless-steel, tamper proof, self-cleaning, and removable.
4. Combination Assemblies: Include bonze or brass-alloy ball valve.
5. Identification Tag: Marked with zone identification, valve number, and flow rate.
6. Size: Same as pipe in which installed.
7. Performance: Maintain constant flow, plus or minus five percent (+/-5%) over system pressure fluctuations.
8. Minimum CWP Rating: 175 psig.
9. Maximum Operating Temperature: 200 deg F (93 deg C).

2.7 AIR CONTROL DEVICES

A. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

1. Amtrol, Inc.
2. Bell & Gossett Domestic Pump; a division of ITT Industries
3. Taco

B. Manual Air Vents:

1. Body: Bronze.
2. Internal Parts: Nonferrous.
3. Operator: Screwdriver or thumbscrew.
4. Inlet Connection: NPS 1/2 (DN 15).
5. Discharge Connection: NPS 1/8 (DN 6).
6. CWP Rating: 150 psig.
7. Maximum Operating Temperature: 225 deg F (107 deg C).

C. Automatic Air Vents:

1. Body: Bronze or cast iron.
2. Internal Parts: Nonferrous.
3. Operator: Noncorrosive metal float.
4. Inlet Connection: NPS 1/2 (DN 15).

5. Discharge Connection: NPS 1/4 (DN 8).
6. CWP Rating: 150 psig.
7. Maximum Operating Temperature: 240 deg F (116 deg C).

D. Expansion Tanks:

1. Tank: Welded steel, rated for 125-psig working pressure and 375 deg F (191 deg C) maximum operating temperature, with taps in bottom of tank for tank fitting and taps in end of tank for gage glass. Tanks shall be factory tested with taps fabricated and labeled according to ASME Boiler and Pressure Vessel Code: Section VIII, Division 1.
2. Air-Control Tank Fitting: Cast-iron body, copper-plated tube, brass vent tube plug, and stainless-steel ball check, 100-gal. unit only; sized for compression-tank diameter. Provide tank fittings for 125-psig working pressure and 250 deg F (121 deg C) maximum operating temperature.
3. Tank Drain Fitting: Brass body, nonferrous internal parts; 125-psig working pressure and 240 deg F (116 deg C) maximum operating temperature; constructed to admit air to compression tank, drain water, and close off system.
4. Gage Glass: Full height with dual manual shutoff valves, ¾-inch-diameter gage glass, and slotted-metal glass guard.

E. Replaceable Bladder-Type Expansion Tanks:

1. Tank: Welded steel, rated for 125-psig working pressure and 375 deg F (191 deg C) maximum operating temperature. Factory test with taps fabricated and supports installed and labeled according to ASME Boiler and Pressure Vessel Code: Section VIII, Division 1.
2. Bladder: Replaceable heavy duty Butyl rubber. Securely sealed into tank to separate air charge from system water to maintain required expansion capacity.
3. Air-Charge Fittings: Schrader valve, stainless-steel with EPDM seats.

F. Tangential-Type Air Separators:

1. Tank: Welded steel; ASME constructed and labeled for 125-psig minimum working pressure and 375 deg F (191 deg C) maximum operating temperature.
2. Air Collector Tube: Perforated stainless-steel, constructed to direct released air into expansion tank.
3. Tangential Inlet and Outlet Connections: Threaded for NPS 2 (DN 50) and smaller; flanged connections for NPS 2-1/2 (DN 65) and larger.
4. Blowdown Connection: Threaded.
5. Size: Match system flow capacity.

G. Air Purgers:

1. Body: Cast iron with internal baffles that slow the water velocity to separate the air from solution and divert it to the vent for quick removal.
2. Maximum Working Pressure: 150 psig.
3. Maximum Operating Temperature: 250 deg F (121 deg C).

2.8 HYDRONIC PIPING SPECIALTIES

A. Y-Pattern Strainers:

1. Body: ASTM A 126, Class B, cast iron with bolted cover and bottom drain connection.
2. End Connections: Threaded ends for NPS 2 (DN 50) and smaller; flanged ends for NPS 2-1/2 (DN 65) and larger.

3. Strainer Screen: 60-mesh startup strainer and perforated stainless-steel basket with fifty percent (50%) free area.
4. CWP Rating: 125 psig.

B. Basket Strainers:

1. Body: ASTM A 126, Class B, high-tensile cast iron with bolted cover and bottom drain connection.
2. End Connections: Threaded ends for NPS 2 (DN 50) and smaller; flanged ends for NPS 2-1/2 (DN 65) and larger.
3. Strainer Screen: 60-mesh startup strainer and perforated stainless-steel basket with fifty percent (50%) free area.
4. CWP Rating: 125 psig.

C. Stainless-Steel Bellow, Flexible Connectors:

1. Body: Stainless-steel bellows with woven, flexible, bronze, wire-reinforcing protective jacket.
2. End Connections: Threaded or flanged to match equipment connected.
3. Performance: Capable of ¾-inch misalignment.
4. CWP Rating: 150 psig.
5. Maximum Operating Temperature: 250 deg F (121 deg C).

D. Spherical, Rubber, Flexible Connectors:

1. Body: Fiber-reinforced rubber body.
2. End Connections: Steel flanges drilled to align with Classes 150 and 300 steel flanges.
3. Performance: Capable of misalignment.
4. CWP Rating: 150 psig.
5. Maximum Operating Temperature: 250 deg F (121 deg C).

E. Expansion fittings are specified in Section 230516 "Expansion Fittings and Loops for HVAC Piping."

PART 3 - EXECUTION

3.1 PIPING APPLICATIONS

A. Hot-water heating piping, aboveground, NPS 2 (DN 50) and smaller shall be the following:

1. Type L drawn-temper copper tubing, wrought-copper fittings, and brazed joints.
2. Schedule 40 steel pipe, wrought-steel fittings and wrought-cast or forged-steel flanges and flange fittings, and welded and flanged joints.

B. Hot-water heating piping, aboveground, NPS 2-1/2 (DN 65) and larger, shall be the following:

1. Schedule 40 steel pipe, wrought-steel fittings and wrought-cast or forged-steel flanges and flange fittings, and welded and flanged joints.

C. Pipe Sleeve for in ground piping shall be the following:

1. Schedule 40 steel pipe.

D. Makeup-water piping installed aboveground shall be the following:

1. Type L drawn-temper copper tubing, wrought-copper fittings, and brazed joints.

E. Air-Vent Piping:

1. Inlet: Same as service where installed with metal-to-plastic transition fittings for plastic piping systems according to the piping manufacturer's written instructions.
2. Outlet: Type K, annealed-temper copper tubing with soldered or flared joints.

F. Safety-Valve-Inlet and -Outlet Piping for Hot-Water Piping: Same materials and joining methods as for piping specified for the service in which safety valve is installed with metal-to-plastic transition fittings for plastic piping systems according to the piping manufacturer's written instructions.

G. Chemical Water Treatment:

1. Schedule 80 PVC plastic pipe and fittings and solvent welded joints.

3.2 VALVE APPLICATIONS

A. Install shutoff-duty valves at each branch connection to supply mains, and at supply connection to each piece of equipment.

B. Install calibrated-orifice, balancing valves at each branch connection to return main.

C. Install calibrated-orifice, balancing valves in the return pipe of each heating or cooling terminal.

D. Install check valves at each pump discharge and elsewhere as required to control flow direction.

E. Install safety valves at hot-water generators and elsewhere as required by ASME Boiler and Pressure Vessel Code. Install drip-pan elbow on safety-valve outlet and pipe without valves to the outdoors; and pipe drain to nearest floor drain or as indicated on Drawings. Comply with ASME Boiler and Pressure Vessel Code: Section VIII, Division 1, for installation requirements.

F. Install pressure-reducing valves at makeup-water connection to regulate system fill pressure.

3.3 PIPING INSTALLATIONS

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicate piping locations and arrangements. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.

B. Install piping in concealed locations, unless otherwise indicated and except in equipment rooms and service areas.

C. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

D. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

E. Install piping to permit valve servicing.

F. Install piping at indicated slopes.

G. Install piping free of sags and bends.

H. Install fittings for changes in direction and branch connections.

I. Install piping to allow application of insulation.

J. Select system components with pressure rating equal to or greater than system operating pressure.

K. Install groups of pipes parallel to each other, spaced to permit applying insulation and servicing of valves.

L. Install drains, consisting of a tee fitting, NPS 3/4 (DN 20) ball valve, and short NPS 3/4 (DN 20) threaded nipple with cap, at low points in piping system mains and elsewhere as required for system drainage.

M. Install piping at a uniform grade of 0.2 percent upward in direction of flow.

N. Reduce pipe sizes using eccentric reducer fitting installed with level side up.

O. Install branch connections to mains using tee fittings in main pipe, with the branch connected to the bottom of the main pipe. For up-feed risers, connect the branch to the top of the main pipe.

P. Install unions in piping**,** NPS 2 (DN 50) and smaller, adjacent to valves, at final connections of equipment, and elsewhere as indicated.

Q. Install flanges in piping, NPS 2-1/2 (DN 65) and larger, at final connections of equipment and elsewhere as indicated.

R. Install strainers on inlet side of each control valve, pressure-reducing valve, solenoid valve, in-line pump, and elsewhere as indicated. Install NPS 3/4 (DN 20) nipple and ball valve in blowdown connection of strainers NPS 2 (DN 50) and larger. Match size of strainer blowoff connection for strainers smaller than NPS 2 (DN 50).

S. Install expansion loops, expansion joints, anchors, and pipe alignment guides as specified in Section 230516 "Expansion Fittings and Loops for HVAC Piping."

T. Identify piping as specified in Section 260553 "Identification for HVAC Piping and Equipment."

U. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 230517 "Sleeves and Sleeve Seals for HVAC Piping."

V. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Section 230517 "Sleeves and Sleeve Seals for HVAC Piping."

W. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 230517 “Sleeves and Sleeve Seals for HVAC Piping”.

3.4 HANGERS AND SUPPORTS

A. Hanger, support, and anchor devices are specified in Section 230529 "Hangers and Supports for HVAC Piping and Equipment." Comply with the following requirements for maximum spacing of supports.

B. Seismic restraints are specified in Section 230548 "Vibration and Seismic Controls for HVAC Piping and Equipment."

C. Install the following pipe attachments:

1. Adjustable steel clevis hangers for individual horizontal piping less than 20 feet long.
2. Adjustable roller hangers and spring hangers for individual horizontal piping 20 feet or longer.
3. Pipe Roller: MSS SP-58, Type 44 for multiple horizontal piping 20 feet or longer, supported on a trapeze.
4. Spring hangers to support vertical runs.
5. Provide copper-clad hangers and supports for hangers and supports in direct contact with copper pipe.
6. On plastic pipe, install pads or cushions on bearing surfaces to prevent hanger from scratching pipe.

D. Install hangers for steel piping with the following maximum spacing and minimum rod sizes:

1. NPS 3/4 (DN 20): Maximum span, 6 feet; minimum rod size, ¼-inch.
2. NPS 1 (DN 25): Maximum span, 6 feet; minimum rod size, ¼-inch.
3. NPS 1-1/2 (DN 40): Maximum span, 6 feet; minimum rod size, 3/8-inch.
4. NPS 2 (DN 50): Maximum span, 10 feet; minimum rod size, 3/8-inch.
5. NPS 2-1/2 (DN 65): Maximum span, 11 feet; minimum rod size, 3/8-inch.
6. NPS 3 (DN 80): Maximum span, 10 feet; minimum rod size, 3/8-inch.
7. NPS 4 (DN 100) and larger: Maximum span, 10feet; minimum rod size, ½-inch.

E. Install hangers for drawn-temper copper piping with the following maximum spacing and minimum rod sizes:

1. NPS 3/4 (DN 20): Maximum span, 5 feet; minimum rod size, ¼-inch.
2. NPS 1 (DN 25): Maximum span, 6 feet; minimum rod size, ¼-inch.
3. NPS 1-1/2 (DN 40): Maximum span, 6 feet; minimum rod size, 3/8-inch.
4. NPS 2 (DN 50): Maximum span, 8 feet; minimum rod size, 3/8-inch.
5. NPS 2-1/2 (DN 65): Maximum span, 8 feet; minimum rod size, 3/8-inch.
6. NPS 3 (DN 80) and larger: Maximum span, 10 feet; minimum rod size, 3/8-inch.

F. PEX and Plastic Piping Hanger Spacing: Space hangers according to pipe manufacturer's written instructions for service conditions. Avoid point loading. Space and install hangers with the fewest practical rigid anchor points.(for Chemical Water Treatment only)

G. Support vertical runs at roof, at each floor, and at 10-foot intervals between floors.

3.5 PIPE JOINT CONSTRUCTION

A. Join pipe and fittings according to the following requirements and Division 23 Sections specifying piping systems.

B. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

C. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

D. Soldered Joints: Apply ASTM B 813, water-flushable flux, unless otherwise indicated, to tube end. Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook," using lead-free solder alloy complying with ASTM B 32.

E. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter, using copper-phosphorus brazing filler metal complying with AWS A5.8.

F. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

G. Welded Joints: Construct joints according to AWS D10.12, using qualified processes and welding operators according to Part 1 "Quality Assurance" Article.

H. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.

I. Plastic Piping Solvent-Cemented Joints (Chemical Water Treatment): Clean and dry joining surfaces. Join pipe and fittings according to the following:

1. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements.
2. PVC Non-Pressure Piping: Join according to ASTM D 2855.

J. Pressure-Sealed Joints: Use manufacturer-recommended tool and procedure. Leave insertion marks on pipe after assembly.

K. Heat Fused Joints: Use manufacturer-recommended tool and procedure.

3.6 HYDRONIC SPECIALTIES INSTALLATION

A. Install manual air vents at high points in piping, at heat-transfer coils, and elsewhere as required for system air venting.

B. Install automatic air vents at high points of system piping in mechanical equipment rooms only. Manual vents at heat-transfer coils and elsewhere as required for air venting.

C. Install piping from boiler air outlet, air separator, or air purger to expansion tank with a two percent (2%) upward slope toward tank.

D. Install in-line air separators in pump suction. Install drain valve on air separators NPS 2 (DN 50) and larger.

E. Install tangential air separator in pump suction. Install blowdown piping with gate or full-port ball valve; extend full size to nearest floor drain.

F. Install bypass chemical feeders in hydronic system where indicated, in upright position with top of funnel not more than 48 inches above the floor. Install feeder in minimum NPS 3/4 (DN 20) bypass line, from main with full-size, full-port, ball valve in the main between bypass connections. Install NPS 3/4 (DN 20) pipe from chemical feeder drain, to nearest equipment drain and include a full-size, full-port, ball valve.

G. Install expansion tanks on the floor. Vent and purge air from hydronic system, and ensure tank is properly charged with air to suit system Project requirements.

1. Install tank fittings that are shipped loose.
2. Support tank from floor or structure above with sufficient strength to carry weight of tank, piping connections, fittings, plus tank full of water. Do not overload building components and structural members.

3.7 TERMINAL EQUIPMENT CONNECTIONS

A. Sizes for supply and return piping connections shall be the same as or larger than equipment connections.

B. Install control valves in accessible locations close to connected equipment.

C. Install bypass piping with globe valve around control valve. If parallel control valves are installed, only one (1) bypass is required.

D. Install ports for pressure gages and thermometers at coil inlet and outlet connections according to Section 230519 "Meters and Gages for HVAC Piping."

3.8 FIELD QUALITY CONTROL

A. Prepare hydronic piping according to ASME B31.9 and as follows:

1. Leave joints, including welds, uninsulated and exposed for examination during test.
2. Provide temporary restraints for expansion joints that cannot sustain reactions due to test pressure. If temporary restraints are impractical, isolate expansion joints from testing.
3. Flush hydronic piping systems with clean water; then remove and clean or replace strainer screens.
4. Isolate equipment from piping. If a valve is used to isolate equipment, its closure shall be capable of sealing against test pressure without damage to valve. Install blinds in flanged joints to isolate equipment.
5. Install safety valve, set at a pressure no more than one-third higher than test pressure, to protect against damage by expanding liquid or other source of overpressure during test.

B. Perform the following tests on hydronic piping:

1. Use ambient temperature water as a testing medium unless there is risk of damage due to freezing. Another liquid that is safe for workers and compatible with piping may be used.
2. While filling system, use vents installed at high points of system to release air. Use drains installed at low points for complete draining of test liquid.
3. Isolate expansion tanks and determine that hydronic system is full of water.
4. Subject piping system to hydrostatic test pressure that is not less than 1.5 times the system's working pressure. Test pressure shall not exceed maximum pressure for any vessel, pump, valve, or other component in system under test. Verify that stress due to pressure at bottom of vertical runs does not exceed ninety percent (90%) of specified minimum yield strength or 1.7 times "SE" value in Appendix A in ASME B31.9, "Building Services Piping."
5. After hydrostatic test pressure has been applied for at least 10 minutes, examine piping, joints, and connections for leakage. Eliminate leaks by tightening, repairing, or replacing components and repeat hydrostatic test until there are no leaks.
6. Prepare written report of testing.

C. Perform the following before operating the system:

1. Open manual valves fully.

2. Inspect pumps for proper rotation.
3. Set makeup pressure-reducing valves for required system pressure.
4. Inspect air vents at high points of system and determine if all are installed and operating freely (automatic type), or bleed air completely (manual type).
5. Set temperature controls so all coils are calling for full flow.
6. Inspect and set operating temperatures of hydronic equipment, such as boilers, chillers, cooling towers, to specified values.
7. Verify lubrication of motors and bearings.

3.9 ADJUSTING

A. Mark calibrated nameplates of pump discharge valves after hydronic system balancing has been completed, to permanently indicate final balanced position.

B. Perform these adjustments before operating the system:

1. Open valves to fully open position. Close coil bypass valves.
2. Check pump for proper direction of rotation.
3. Set automatic fill valves for required system pressure.
4. Check air vents at high points of system and determine if all are installed and operating freely (automatic type), or bleed air completely (manual type).
5. Set temperature controls so all coils are calling for full flow.
6. Check operation of automatic bypass valves.
7. Check and set operating temperatures of boilers, chillers, and cooling towers to design requirements.
8. Lubricate motors and bearings.

3.10 CLEANING

A. Flush hydronic-piping systems with clean water after each phase is completed and prior to turnover to the Owner. Remove and clean or replace strainer screens. After cleaning and flushing hydronic-piping systems, but before balancing, remove disposable fine-mesh strainers in pump suction diffusers.

3.11 PIPE PRESSURE TEST

A. Perform at the end of each phase before connecting to existing piping.

B. Preparation for Testing: Prepare hydronic piping in accordance with ASME 1331.a and as follows:

1. Leave joints including welds uninsulated and exposed for examination during test.
2. Provide temporary restraints for expansion joints, which cannot sustain the reactions due to test pressure. If temporary restraints are not practical, isolate expansion joints from testing.
3. Flush system with clean water. Clean strainers.
4. Isolate equipment that is not to be subjected to the test pressure from the piping. If a valve is used to isolate the equipment, its closure shall be capable of sealing against the test pressure without damage to the valve. Flanged joints at which blinds are inserted to isolate equipment need not be tested.
5. Install relief valve set at a pressure no more than 1/3 higher than the test pressure, to protect against damage by expansion of liquid or other source of overpressure during the test.

C. Testing: Test hydronic piping as follows:

1. Use ambient temperature water as the testing medium, except where there is a risk of damage due to freezing. Another liquid may be used if it is safe for workmen and compatible with the piping system components.
2. Use vents installed at high points in the system to release trapped air while filling the system. Use drains installed at low points for complete removal of the liquid.
3. Examine system to see that equipment and parts that cannot withstand test pressures are properly isolated. Examine test equipment to ensure that it is tight and that low-pressure filling lines are disconnected.
4. Subject piping system to a hydrostatic test pressure which at every point in the system is not less than 1.5 times the design pressure. The test pressure shall not exceed the maximum pressure for any vessel, pump, valve, or other component in the system under test. Make a check to verify that the stress due to pressure at the bottom of vertical runs does not exceed either ninety percent (90%) of specified minimum yield strength, or 1.7 times the "SE" value in Appendix A of ASME B31.9, Code for Pressure Piping, Building Services Piping.
5. After the hydrostatic test pressure has been applied for at least 10 minutes, examine piping, joints, and connections for leakage. Eliminate leaks by tightening, repairing, or replacing components as appropriate, and repeat hydrostatic test until there are no leaks.

END OF SECTION 232113

SECTION 232123 - HYDRONIC PUMPS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

B. Division 01, Section 019113 “General Commissioning Requirements” for commissioning and testing requirements related to this section.

1.2 SUMMARY

A. This Section includes the following:

1. Close-coupled, end suction, centrifugal pumps.
2. Close-coupled, in-line, centrifugal pumps.
3. Separately coupled, base mounted, end suction centrifugal pumps.

1.3 DEFINITIONS

A. Buna-N: Nitrile rubber.

B. EPT: Ethylene propylene terpolymer.

1.4 SUBMITTALS

A. Product Data: Include certified performance curves and rated capacities, operating characteristics, furnished specialties, final impeller dimensions, and accessories for each type of product indicated. Indicate pump's operating point on curves.

B. Complete Package Information Product Data including:

1. System summary sheet (where applicable).
2. Sequence of Operation.
3. Shop drawing indicating dimensions, required clearances and location and size of each field connection.
4. Power and control wiring diagram.
5. System profile analysis including pump curves, system curve, and variable speed pump curves (where applicable).
6. Pump data sheets - Rated capacities of selected models and indication of pump’s operating point on curves.
7. Submittals on furnished specialties and accessories.
8. Submittals must be specific to this project. Generic submittals will not be accepted.
9. Hanging and support requirements should follow the recommendations in the manufacturer’s installation instructions.

C. Shop Drawings:
1. Show pump layout and connections. Include setting drawings with templates for installing foundation and anchor bolts and other anchorages.
2. Wiring Diagrams: Power, signal, and control wiring.

D. Operation and Maintenance Data: For pumps to include in emergency, operation, and maintenance manuals.

1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain hydronic pumps through one (1) source from a single manufacturer.

B. Product Options: Drawings indicate size, profiles, and dimensional requirements of hydronic pumps and are based on the specific system indicated. Refer to Section 016000 "Product Requirements."

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

D. UL Compliance: Comply with UL 778 for motor-operated water pumps.

E. All equipment or components of this specification section shall meet or exceed the requirements and quality of the items herein specified, or as denoted on the drawings.

F. Ensure pump operation at specified system fluid temperatures without vapor binding and cavitation, are non-overloading in parallel or individual operation, and operate to ANSI/HI 9.6.3.1 standard for Preferred Operating Region (POR) unless otherwise approved by the engineer. The pump NPSH shall confirm to the ANSI/HI 9.6.1-1997 standards for *Centrifugal and Vertical Pumps for NPSH Margin*.

G. Ensure pump pressure ratings are at least equal to system’s maximum operating pressure at point where installed, but not less than specified.

H. Equipment manufacturer shall be a company specializing in manufacture, assembly, and field performance of provided equipment with a minimum of twenty (20) years experience.

I. Equipment provider shall be responsible for providing certified equipment start-up and, when noted, an in the field certified training session. New pump start-up shall be for the purpose of determining pump alignment, lubrication, voltage, and amperage readings. All proper electrical connections, pump’s balance, discharge and suction gauge readings, and adjustment of head, if required. A copy of the start-up report shall be made and sent to both the Contractor and to the Engineer.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Manufacturer's Preparation for Shipping: Clean flanges and exposed machined metal surfaces and treat with anticorrosion compound after assembly and testing. Protect flanges, pipe openings, and nozzles with wooden flange covers or with screwed-in plugs.

B. Store pumps in dry location.

C. Retain protective covers for flanges and protective coatings during storage.

D. Protect bearings and couplings against damage from sand, grit, and other foreign matter.

E. Comply with pump manufacturer's written rigging instructions.

1.7 COORDINATION

A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 03.

1.8 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Mechanical Seals: One (1) mechanical seal for each model type of pump scheduled.

PART 2 - PRODUCTS

2.1 CLOSE-COUPLED, END-SUCTION CENTRIFUGAL PUMPS

A. Manufacturers:

1. Taco, Inc.
2. Bell & Gossett; Div. of ITT Industries
3. Armstrong Pumps
4. Grundfos

B. Description: Factory-assembled and -tested, centrifugal, overhung-impeller, close-coupled, end-suction pump as defined in HI 1.1-1.2 and HI 1.3; designed for installation with pump and motor shafts mounted horizontally.

C. Pump Construction:

1. Casing: Radially split, cast iron, with replaceable bronze wear rings, drain plug at bottom and air vent at top of volute, threaded gage tappings at inlet and outlet, and flanged connections.
2. Impeller: ASTM B 584, cast bronze; statically and dynamically balanced, keyed to shaft, and secured with a locking cap screw.
3. Pump Shaft: Stainless-steel.
4. Mechanical Seal: Carbon rotating ring against a ceramic seat held by a stainless-steel spring, and EPT bellows and gasket. Include water slinger on shaft between motor and seal.
5. Pump Bearings: Permanently lubricated ball bearings.

D. Motor: Motors shall meet scheduled horsepower, speed, voltage, and enclosure design. Motors shall have heavy-duty grease lubricated ball bearings to offset the additional bearing loads associated with the closed coupled pump design. Motors shall be non-overloading at any point on the pump curve and shall meet NEMA specifications.

1. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
2. Comply with NEMA designation, temperature rating, service factor, and efficiency requirements for motors specified in Section 230513 "Common Motor Requirements for HVAC Equipment."

E. Capacities and Characteristics: Refer to Schedules.

2.2 CLOSE-COUPLED, IN-LINE CENTRIFUGAL PUMPS

A. Manufacturers:

1. Taco, Inc.
2. Bell & Gossett; Div. of ITT Industries
3. Grundfos
4. Armstrong Pumps

B. Description: Factory-assembled and -tested, centrifugal, overhung-impeller, close-coupled, in-line pump as defined in HI 1.1-1.2 and HI 1.3; designed for installation with pump and motor shafts mounted horizontally or vertically. Rate pump for 125-psig minimum working pressure and a continuous water temperature of 200 deg F (93 deg C).

C. Pump Construction:

1. Casing: Radially split, cast iron, with replaceable bronze wear rings, threaded gage tappings at inlet and outlet, and threaded companion-flange connections.
2. Impeller: ASTM B 584, cast bronze; statically and dynamically balanced, keyed to shaft, and secured with a locking cap screw. Trim impeller to match specified performance.
3. Pump Shaft: Steel, with copper-alloy shaft sleeve.
4. Mechanical Seal: Carbon rotating ring against a ceramic seat held by a stainless-steel spring, and EPT bellows and gasket. Include water slinger on shaft between motor and seal.
5. Packing Seal: Stuffing box, with a minimum of four (4) rings of graphite-impregnated braided yarn with bronze lantern ring between center two (2) graphite rings, and bronze packing gland.
6. Pump Bearings: Oil lubricated; bronze-journal or thrust type.

D. Motor: Single speed, with permanently lubricated ball bearings, unless otherwise indicated; and rigidly mounted to pump casing. Comply with requirements in Section 230513 "Common Motor Requirements for HVAC Equipment."

E. Capacities and Characteristics: Refer to Schedules.

2.3 SEPARATELY COUPLED, BASE-MOUNTED, END-SUCTION CENTRIFUGAL PUMPS

A. Manufacturers:

1. Taco, Inc.
2. Bell & Gossett; Div. of ITT Industries
3. Grundfos
4. Armstrong Pumps

B. Description: Factory-assembled and -tested, centrifugal, overhung-impeller, separately coupled, end-suction pump as defined in HI 1.1-1.2 and HI 1.3; designed for base mounting, with pump and motor shafts horizontal. Rate pump for 125-psig minimum working pressure and a continuous water temperature of 200 deg F (93 deg C).

C. Pump Construction:

1. Casing: Radially split, cast iron, with replaceable bronze wear rings, threaded gage tappings at inlet and outlet, drain plug at bottom and air vent at top of volute, and flanged connections. Provide integral mount on volute to support the casing, and attached piping

to allow removal and replacement of impeller without disconnecting piping or requiring the realignment of pump and motor shaft.

2. Impeller: ASTM B 584, cast bronze; statically and dynamically balanced, keyed to shaft, and secured with a locking cap screw. Trim impeller to match specified performance.
3. Pump Shaft: Stainless-steel.
4. Mechanical Seal: Carbon rotating ring against a ceramic seat held by a stainless-steel spring, and EPT bellows and gasket.
5. Packing Seal: Stuffing box, with a minimum of four (4) rings of graphite-impregnated braided yarn with bronze lantern ring between center two (2) graphite rings, and bronze packing gland.
6. Pump Bearings: Grease-lubricated ball bearings contained in cast-iron housing with grease fittings.

D. Shaft Coupling: Molded rubber insert and interlocking spider capable of absorbing vibration. EPDM coupling sleeve for variable-speed applications.

E. Coupling Guard: Dual rated; ANSI B15.1, Section 8; OSHA 1910.219 approved; steel; removable; attached to mounting frame.

F. Mounting Frame: Welded-steel frame and cross members, factory fabricated from ASTM A 36 channels and angles. Fabricate to mount pump casing, coupling guard, and motor.

G. Motor: Single speed, with permanently lubricated ball bearings, unless otherwise indicated; secured to mounting frame, with adjustable alignment. Comply with requirements in Section 230513 "Common Motor Requirements for HVAC Equipment."

H. Capacities and Characteristics: Refer to Schedules.

2.4 PUMP SPECIALTY FITTINGS

A. Suction Diffuser:

1. Angle pattern, 175-psig pressure rating, cast -iron body and end cap, pump-inlet fitting; with bronze startup and bronze or stainless-steel permanent strainers; bronze or stainless-steel straightening vanes; drain plug; and factory-fabricated support.
2. Angle pattern, flanged pump inlet connections, 300-psig pressure rating, ductile-iron body, 304 stainless-steel frame and sheet diffuser with 5/32-inch-diameter holes 3-inch through 12-inch inlet sizes, and 3/16-inch-diameter holes 14-inch through 24-inch inlet sizes. Removable 20 mesh 304 stainless-steel start-up prefilter, outlets for pressure/temperature drain connections, and base support boss.

B. Triple-Duty Valve: Angle or straight pattern, 175-psig pressure rating, cast-iron body, pump-discharge fitting; with drain plug and bronze-fitted shutoff, balancing, and check valve features. Brass gage ports with integral check valve, and orifice for flow measurement.

C. Tri-Service Valve Assembly: Straight pattern, 300-psig pressure rating, combination shut-off, throttling, and non-slam check service in one (1) unit. Straight pattern, 230-psig pressure rating combination shut-off, throttling, and non-slam check service in one (1) unit.

D. Suction diffusers shall be insulated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine equipment foundations and anchor-bolt locations for compliance with requirements for installation tolerances and other conditions affecting performance of work.

B. Examine roughing-in for piping systems to verify actual locations of piping connections before pump installation.

C. Examine foundations and inertia bases for suitable conditions where pumps are to be installed.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 CONCRETE BASES

A. Install concrete bases of dimensions indicated for pumps and controllers.

1. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around full perimeter of base.
2. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete floor.
3. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
4. Install anchor bolts to elevations required for proper attachment to supported equipment.

B. Cast-in-place concrete materials and placement requirements are specified in Division 03.

3.3 PUMP INSTALLATION

A. Install pumps with access for periodic maintenance including removal of motors, impellers, couplings, and accessories.

B. Independently support pumps and piping so weight of piping is not supported by pumps and weight of pumps is not supported by piping.

C. Install continuous-thread hanger rods and spring hangers with vertical-limit stop of sufficient size to support pump weight. Vibration isolation devices are specified in Section 230548 "Vibration and Seismic Controls for HVAC Piping and Equipment." Fabricate brackets or supports as required. Hanger and support materials are specified in Section 230529 "Hangers and Supports for HVAC Piping and Equipment."

D. Suspend vertically mounted, in-line centrifugal pumps independent of piping. Install pumps with motor and pump shafts vertical. Use continuous-thread hanger rods and elastomeric spring hangers with vertical-limit stop of sufficient size to support pump weight. Vibration isolation devices are specified in Section 210548 "Vibration and Seismic Controls for Fire-Suppression Piping and Equipment." Hanger and support materials are specified in Sections 220529 "Hangers and Supports for Plumbing Piping and Equipment" and 230529 “Hangers and Supports for HVAC Piping and Equipment."

E. Set base-mounted pumps on concrete foundation. Disconnect coupling before setting. Do not reconnect couplings until alignment procedure is complete.

1. Support pump baseplate on rectangular metal blocks and shims, or on metal wedges with small taper, at points near foundation bolts to provide a gap of ¾ to 1½ inches between pump base and foundation for grouting.
2. Adjust metal supports or wedges until pump and driver shafts are level. Check coupling faces and suction and discharge flanges of pump to verify that they are level and plumb.

3.4 ALIGNMENT

A. Align pump and motor shafts and piping connections after setting on foundation, grout has been set and foundation bolts have been tightened, and piping connections have been made.

B. Comply with pump and coupling manufacturers' written instructions.

C. Adjust pump and motor shafts for angular and offset alignment by methods specified in HI 1.1-1.5, "Centrifugal Pumps for Nomenclature, Definitions, Application and Operation

D. After alignment is correct, tighten foundation bolts evenly but not too firmly. Completely fill baseplate with non-shrink, nonmetallic grout while metal blocks and shims or wedges are in place. After grout, has cured, fully tighten foundation bolts.

3.5 CONNECTIONS

A. Piping installation requirements are specified in other Division 23 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to machine to allow service and maintenance.

C. Connect piping to pumps. Install valves that are same size as piping connected to pumps.

D. Reduction from line size to pump connection size shall be made with eccentric reducers attached to the pump with tops flat to allow continuity of flow.

E. Install suction and discharge pipe sizes equal to or greater than diameter of pump nozzles.

F. Furnish and install triple duty valves or tri-service assemblies on the discharge side of all pumps and furnish and install a line size shut-off valve on the suction side of all pumps. Anywhere that five (5) straight pipe diameters of pipe cannot be provided on the inlet side of a pump a suction diffuser shall be used to provide appropriate flow distribution into the eye of the pump’s impeller.

G. Install suction diffuser and shutoff valve on suction side of pumps.

H. Provide temperature and pressure gauges at suction and discharge side of pumps.

I. Install flexible connectors on suction and discharge sides of base-mounted pumps between pump casing and valves. Couplings shall be placed in close proximity to the vibrating source in accordance with published guidelines.

J. Install pressure gages on pump suction and discharge, at integral pressure-gage tapping, or install single gage with multiple input selector valve.

K. Install check valve and gate or ball valve on each condensate pump unit discharge.

L. On systems where pump seals require flushing water or cooling water for a heat exchanger kit. Provide cooling water supply piping and connections and well as the return piping, if required. Piping should be of adequate size to pass required flow rate.

M. Proper access space around a device should be left for servicing the component. No less than the minimum recommended by the manufacturer.

N. Provide an adequate number of isolation valves for service and maintenance of the system and its components.

O. On systems where the final balancing procedure requires the triple duty valve to be throttled more than twenty-five percent (25%) to attain design flow (on a constant speed pumping system), and no future capacity has been built in to the pump the pump impeller must be trimmed to represent actual system head resistance. The pump provider and engineer of record, based on the balancing contractor's reports, shall determine the final impeller trim diameter.

P. On systems with variable speed pumping system, the pump impeller shall not be trimmed. The pump provider, based on the balancing contractor's reports, shall determine the final speed of pump.

Q. Install foot mounted and base mounted pumps on vibration isolation pad or, via anchor bolts. Set and level and grout in place.

R. All piping shall be brought to equipment and pump connections in such a manner so as to prevent the possibility of any loads or stresses being applied to the connections or piping. All piping shall be fitted to the pumps even though piping adjustments may be required after the pipe is installed.

S. On components that require draining, contractor must provide piping to and discharging into appropriate drains.

T. Provide drains for bases and seals, piped to and discharging into floor drains.

U. Power wiring, as required, shall be the responsibility of the electrical contractor. All wiring shall be performed per manufacturers instruction and applicable state, federal, and local codes.

V. Control wiring for remote mounted switches and sensor/transmitters shall be the responsibility of the controls contractor. All wiring shall be performed per manufacturers instructions and applicable state, federal, and local codes.

W. Ground equipment according to Section 260526 "Grounding and Bonding for Electrical Systems."

3.6 STARTUP SERVICE

A. Engage a factory-authorized service representative to perform startup service.

1. Complete installation and startup checks according to manufacturer's written instructions.
2. Check piping connections for tightness.
3. Clean strainers on suction piping.
4. Perform the following startup checks for each pump before starting:

    a. Verify bearing lubrication.
    b. Verify that pump is free to rotate by hand and that pump for handling hot liquid is free to rotate with pump hot and cold. If pump is bound or drags, do not operate until cause of trouble is determined and corrected.
    c. Verify that pump is rotating in the correct direction.

5. Prime pump by opening suction valves and closing drains, and prepare pump for operation.
6. Start motor.
7. Open discharge valve slowly.

3.7 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain hydronic pumps. Refer to Section 017900 "Demonstration and Training."

END OF SECTION 232123

SECTION 232300 - REFRIGERANT PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes refrigerant piping used for air-conditioning applications.

1.3 PERFORMANCE REQUIREMENTS

A. Line Test Pressure for Refrigerant R-407C:

1. Suction Lines for Air-Conditioning Applications: 230 psig.
2. Suction Lines for Heat-Pump Applications: 380 psig.
3. Hot-Gas and Liquid Lines: 380 psig.

B. Line Test Pressure for Refrigerant R-410A:

1. Suction Lines for Air-Conditioning Applications: 300 psig.
2. Suction Lines for Heat-Pump Applications: 535 psig.
3. Hot-Gas and Liquid Lines: 535 psig.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of valve and refrigerant piping specialty indicated. Include pressure drop, based on manufacturer's test data, for the following:

1. Thermostatic expansion valves.
2. Solenoid valves.
3. Hot-gas bypass valves.
4. Filter dryers.
5. Strainers.
6. Pressure-regulating valves.

B. Shop Drawings: Show layout of refrigerant piping, refrigerant relief piping and specialties, including pipe, tube, and fitting sizes, flow capacities, valve arrangements and locations, slopes of horizontal runs, oil traps, double risers, wall and floor penetrations, and equipment connection details. Show interface and spatial relationships between piping and equipment.

1. Shop Drawing Scale: ¼-inch equals 1 foot (1:50).
2. Refrigerant piping indicated on Drawings is schematic only. Size piping and design actual piping layout, including oil traps, double risers, specialties, and pipe and tube sizes to accommodate, as a minimum, equipment provided, elevation difference between compressor and evaporator, and length of piping to ensure proper operation and compliance with warranties of connected equipment. Contractor shall verify routing, lift, pipe size per manufacturers requirements.

1.5 INFORMATIONAL SUBMITTALS

A. Welding certificates.

B. Field quality-control test reports.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For refrigerant valves and piping specialties to include in maintenance manuals.

1.7 QUALITY ASSURANCE

A. Welding: Qualify procedures and personnel according to ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."

B. Comply with ASHRAE 15, "Safety Code for Refrigeration Systems."

C. Comply with ASME B31.5, "Refrigeration Piping and Heat Transfer Components."

1.8 PRODUCT STORAGE AND HANDLING

A. Store piping in a clean and protected area with end caps in place to ensure that piping interior and exterior are clean when installed.

1.9 COORDINATION

A. Coordinate size and location of roof curbs, equipment supports, and roof penetrations. These items are specified in Section 077200 "Roof Accessories."

PART 2 - PRODUCTS

2.1 COPPER TUBE AND FITTINGS

A. Copper Tube: ASTM B 280, Type ACR.

B. Wrought-Copper Fittings: ASME B16.22.

C. Wrought-Copper Unions: ASME B16.22.

D. Solder Filler Metals: ASTM B 32. Use 95-5 tin antimony or alloy HB solder to join copper socket fittings on copper pipe.

E. Brazing Filler Metals: AWS A5.8.

F. Flexible Connectors:

1. Body: Tin-bronze bellows with woven, flexible, tinned-bronze-wire-reinforced protective jacket.
2. End Connections: Socket ends.
3. Offset Performance: Capable of minimum ¾-inch misalignment in minimum 7-inch-long assembly.
4. Pressure Rating: Factory test at minimum 500 psig.
5. Maximum Operating Temperature: 250 deg F (121 deg C).

2.2 STEEL PIPE AND FITTINGS

A. Steel Pipe: ASTM A 53, black steel with plain ends; Type, Grade, and wall thickness as selected in Part 3 piping applications articles.

B. Wrought-Steel Fittings: ASTM A 234, for welded joints.

C. Steel Flanges and Flanged Fittings: ASME B16.5, steel, including bolts, nuts, and gaskets, bevel-welded end connection, and raised face.

D. Welding Filler Metals: Comply with AWS D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

E. Flanged Unions:

1. Body: Forged-steel flanges for NPS 1 to NPS 1-1/2 (DN 25 to DN 40) and ductile iron for NPS 2 to NPS 3 (DN 50 to DN 80). Apply rust-resistant finish at factory.
2. Gasket: Fiber asbestos free.
3. Fasteners: Four (4) plated-steel bolts, with silicon bronze nuts. Apply rust-resistant finish at factory.
4. End Connections: Brass tailpiece adapters for solder-end connections to copper tubing.
5. Offset Performance: Capable of minimum ¾-inch misalignment in minimum 7-inch- long assembly.
6. Pressure Rating: Factory test at minimum 400 psig.
7. Maximum Operating Temperature: 330 deg F (165 deg C).

F. Flexible Connectors:

1. Body: Stainless-steel bellows with woven, flexible, stainless-steel-wire-reinforced protective jacket
2. End Connections:

    a. NPS 2 (DN 50) and Smaller: With threaded-end connections.
    b. NPS 2-1/2 (DN 65) and Larger: With flanged-end connections.

3. Offset Performance: Capable of minimum ¾-inch misalignment in minimum 7-inch-long assembly.
4. Pressure Rating: Factory test at minimum 500 psig.
5. Maximum Operating Temperature: 250 deg F (121 deg C).

2.3 VALVES AND SPECIALTIES

A. Diaphragm Packless Valves:

1. Body and Bonnet: Forged brass or cast bronze; globe design with straight-through or angle pattern.
2. Diaphragm: Phosphor bronze and stainless-steel with stainless-steel spring.
3. Operator: Rising stem and hand wheel.
4. Seat: Nylon.
5. End Connections: Socket, union, or flanged.
6. Working Pressure Rating: 500 psig.
7. Maximum Operating Temperature: 275 deg F (135 deg C).

B. Packed-Angle Valves:

1. Body and Bonnet: Forged brass or cast bronze.
2. Packing: Molded stem, back seating, and replaceable under pressure.
3. Operator: Rising stem.
4. Seat: Nonrotating, self-aligning polytetrafluoroethylene.
5. Seal Cap: Forged-brass or valox hex cap.
6. End Connections: Socket, union, threaded, or flanged.
7. Working Pressure Rating: 500 psig.
8. Maximum Operating Temperature: 275 deg F (135 deg C).

C. Check Valves:

1. Body: Ductile iron, forged brass, or cast bronze; globe pattern.
2. Bonnet: Bolted ductile iron, forged brass, or cast bronze; or brass hex plug.
3. Piston: Removable polytetrafluoroethylene seat.
4. Closing Spring: Stainless-steel.
5. Manual Opening Stem: Seal cap, plated-steel stem, and graphite seal.
6. End Connections: Socket, union, threaded, or flanged.
7. Maximum Opening Pressure: 0.50 psig.
8. Working Pressure Rating: 500 psig.
9. Maximum Operating Temperature: 275 deg F (135 deg C).

D. Service Valves:

1. Body: Forged brass with brass cap including key end to remove core.
2. Core: Removable ball-type check valve with stainless-steel spring.
3. Seat: Polytetrafluoroethylene.
4. End Connections: Copper spring.
5. Working Pressure Rating: 500 psig.

E. Solenoid Valves: Comply with ARI 760 and UL 429; listed and labeled by an NRTL.

1. Body and Bonnet: Plated steel.
2. Solenoid Tube, Plunger, Closing Spring, and Seat Orifice: Stainless-steel.
3. Seat: Polytetrafluoroethylene.
4. End Connections: Threaded.
5. Electrical: Molded, watertight coil in NEMA 250 enclosure of type required by location with ½-inch (16-GRC) conduit adapter, and 24 115 208-V ac coil.
6. Working Pressure Rating: 400 psig.
7. Maximum Operating Temperature: 240 deg F (116 deg C).
8. Manual operator.

F. Safety Relief Valves: Comply with ASME Boiler and Pressure Vessel Code; listed and labeled by an NRTL.

1. Body and Bonnet: Ductile iron and steel, with neoprene O-ring seal.
2. Piston, Closing Spring, and Seat Insert: Stainless-steel.
3. Seat Disc: Polytetrafluoroethylene.
4. End Connections: Threaded.
5. Working Pressure Rating: 400 psig.
6. Maximum Operating Temperature: 240 deg F (116 deg C).

G. Thermostatic Expansion Valves: Comply with ARI 750.

1. Body, Bonnet, and Seal Cap: Forged brass or steel.
2. Diaphragm, Piston, Closing Spring, and Seat Insert: Stainless-steel.

3. Packing and Gaskets: Non-asbestos.
4. Capillary and Bulb: Copper tubing filled with refrigerant charge.
5. Suction Temperature: 40 deg F (4.4 deg C).
6. Superheat: Adjustable.
7. Reverse-flow option (for heat-pump applications).
8. End Connections: Socket, flare, or threaded union.
9. Working Pressure Rating: 450 psig.

H. Straight-Type Strainers:

1. Body: Welded steel with corrosion-resistant coating.
2. Screen: 100-mesh stainless-steel.
3. End Connections: Socket or flare.
4. Working Pressure Rating: 500 psig.
5. Maximum Operating Temperature: 275 deg F (135 deg C).

I. Angle-Type Strainers:

1. Body: Forged brass or cast bronze.
2. Drain Plug: Brass hex plug.
3. Screen: 100-mesh monel.
4. End Connections: Socket or flare.
5. Working Pressure Rating: 500 psig.
6. Maximum Operating Temperature: 275 deg F (135 deg C).

J. Moisture/Liquid Indicators:

1. Body: Forged brass.
2. Window: Replaceable, clear, fused glass window with indicating element protected by filter screen.
3. Indicator: Color coded to show moisture content in ppm.
4. Minimum Moisture Indicator Sensitivity: Indicate moisture above 60 ppm.
5. End Connections: Socket or flare.
6. Working Pressure Rating: 500 psig.
7. Maximum Operating Temperature: 240 deg F (116 deg C).

K. Replaceable-Core Filter Dryers: Comply with ARI 730.

1. Body and Cover: Painted-steel shell with ductile-iron cover, stainless-steel screws, and neoprene gaskets.
2. Filter Media: 10 micron, pleated with integral end rings; stainless-steel support.
3. Desiccant Media: Activated alumina charcoal.
4. Designed for reverse flow (for heat-pump applications).
5. End Connections: Socket.
6. Access Ports: NPS 1/4 (DN 8) connections at entering and leaving sides for pressure differential measurement.
7. Maximum Pressure Loss: 2 psig.
8. Working Pressure Rating: 500 psig.
9. Maximum Operating Temperature: 240 deg F (116 deg C).

L. Receivers: Comply with ARI 495.

1. Comply with ASME Boiler and Pressure Vessel Code; listed and labeled by an NRTL.
2. Comply with UL 207; listed and labeled by an NRTL.
3. Body: Welded steel with corrosion-resistant coating.

4. Tappings: Inlet, outlet, liquid level indicator, and safety relief valve.
5. End Connections: Socket or threaded.
6. Working Pressure Rating: 500 psig.
7. Maximum Operating Temperature: 275 deg F (135 deg C).

M. Liquid Accumulators: Comply with ARI 495.

1. Body: Welded steel with corrosion-resistant coating.
2. End Connections: Socket or threaded.
3. Working Pressure Rating: 500 psig.
4. Maximum Operating Temperature: 275 deg F (135 deg C).

2.4 REFRIGERANTS

A. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

1. Atofina Chemicals, Inc.
2. DuPont Company; Fluorochemicals Div.
3. Honeywell, Inc.; Genetron Refrigerants
4. INEOS Fluor Americas LLC

B. ASHRAE 34, R-407C: Difluoromethane/Pentafluoroethane/1,1,1,2-Tetrafluoroethane.

C. ASHRAE 34, R-410A: Pentafluoroethane/Difluoromethane.

PART 3 - EXECUTION

3.1 PIPING APPLICATIONS FOR REFRIGERANT R-407C

A. Suction Lines NPS 1-1/2 (DN 40) and Smaller for Conventional Air-Conditioning Applications: Copper, Type ACR, annealed-temper tubing and wrought-copper fittings with brazed joints.

B. Hot-Gas and Liquid Lines: Copper, Type ACR, annealed-temper tubing and wrought-copper fittings with brazed joints.

C. Safety-Relief-Valve Discharge Piping: Copper, Type ACR, drawn-temper tubing and wrought-copper fittings with soldered joints.

3.2 PIPING APPLICATIONS FOR REFRIGERANT R-410A

A. Suction Lines NPS 1-1/2 (DN 40) and Smaller for Conventional Air-Conditioning Applications: Copper, Type ACR, annealed-temper tubing and wrought-copper fittings with brazed joints.

B. Hot-Gas and Liquid Lines: Copper, Type ACR annealed- or drawn-temper tubing and wrought-copper fittings with brazed joints.

C. Safety-Relief-Valve Discharge Piping NPS 2 to NPS 4 (DN 50 to DN 100): Schedule 40, black-steel and wrought-steel fittings with welded joints.

3.3 VALVE AND SPECIALTY APPLICATIONS

A. Install diaphragm packless valves in suction and discharge lines of compressor.

B. Install service valves for gage taps at inlet and outlet of hot-gas bypass valves and strainers if they are not an integral part of valves and strainers.

C. Install a check valve at the compressor discharge and a liquid accumulator at the compressor suction connection.

D. Except as otherwise indicated, install diaphragm packless valves on inlet and outlet side of filter dryers.

E. Install a full-sized, three-valve bypass around filter dryers.

F. Install solenoid valves upstream from each expansion valve and hot-gas bypass valve. Install solenoid valves in horizontal lines with coil at top.

G. Install thermostatic expansion valves as close as possible to distributors on evaporators.

1. Install valve so diaphragm case is warmer than bulb.
2. Secure bulb to clean, straight, horizontal section of suction line using two (2) bulb straps. Do not mount bulb in a trap or at bottom of the line.
3. If external equalizer lines are required, make connection where it will reflect suction-line pressure at bulb location.

H. Install safety relief valves where required by ASME Boiler and Pressure Vessel Code. Pipe safety-relief-valve discharge line to outside according to ASHRAE 15.

I. Install moisture/liquid indicators in liquid line at the inlet of the thermostatic expansion valve or at the inlet of the evaporator coil capillary tube.

J. Install strainers upstream from and adjacent to the following unless they are furnished as an integral assembly for device being protected:

1. Solenoid valves.
2. Thermostatic expansion valves.
3. Hot-gas bypass valves.
4. Compressor.

K. Install filter dryers in liquid line between compressor and thermostatic expansion valve, and in the suction line at the compressor.

L. Install receivers sized to accommodate pump-down charge.

M. Install flexible connectors at compressors.

3.4 PIPING INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems; indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Shop Drawings.

B. Install refrigerant piping according to ASHRAE 15.

C. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.

D. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

E. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

F. Install piping adjacent to machines to allow service and maintenance.

G. Install piping free of sags and bends.

H. Install fittings for changes in direction and branch connections.

I. Select system components with pressure rating equal to or greater than system operating pressure.

J. Refer to Section 230900 "Instrumentation and Control for HVAC" and Section 230993 "Sequence of Operation" for solenoid valve controllers, control wiring, and sequence of operation.

K. Install piping as short and direct as possible, with a minimum number of joints, elbows, and fittings.

L. Arrange piping to allow inspection and service of refrigeration equipment. Install valves and specialties in accessible locations to allow for service and inspection. Install access doors or panels as specified in Section 083113 "Access Doors and Frames" if valves or equipment requiring maintenance is concealed behind finished surfaces.

M. Install refrigerant piping in protective conduit where installed belowground.

N. Install refrigerant piping in rigid or flexible conduit in locations where exposed to mechanical injury.

O. Slope refrigerant piping as follows:

1. Install horizontal hot-gas discharge piping with a uniform slope downward away from compressor.
2. Install horizontal suction lines with a uniform slope downward to compressor.
3. Install traps and double risers to entrain oil in vertical runs.
4. Liquid lines may be installed level.

P. When brazing or soldering, remove solenoid-valve coils and sight glasses; also remove valve stems, seats, and packing, and accessible internal parts of refrigerant specialties. Do not apply heat near expansion-valve bulb.

Q. Before installation of steel refrigerant piping, clean pipe and fittings using the following procedures:

1. Shot blast the interior of piping.
2. Remove coarse particles of dirt and dust by drawing a clean, lintless cloth through tubing by means of a wire or electrician's tape.
3. Draw a clean, lintless cloth saturated with trichloroethylene through the tube or pipe. Continue this procedure until cloth is not discolored by dirt.
4. Draw a clean, lintless cloth, saturated with compressor oil, squeezed dry, through the tube or pipe to remove remaining lint. Inspect tube or pipe visually for remaining dirt and lint.

5. Finally, draw a clean, dry, lintless cloth through the tube or pipe.
6. Safety-relief-valve discharge piping is not required to be cleaned but is required to be open to allow unrestricted flow.

R. Install piping with adequate clearance between pipe and adjacent walls and hangers or between pipes for insulation installation.

S. Identify refrigerant piping and valves according to Section 230553 "Identification for HVAC Piping and Equipment."

T. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 230517 "Sleeves and Sleeve Seals for HVAC Piping."

U. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Section 230517 "Sleeves and Sleeve Seals for HVAC Piping."

V. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 230517 “Sleeves and Sleeve Seals for HVAC Piping".

3.5 PIPE JOINT CONSTRUCTION

A. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

B. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

C. Fill pipe and fittings with an inert gas (nitrogen or carbon dioxide), during brazing or welding, to prevent scale formation.

D. Soldered Joints: Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook."

E. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," Chapter "Pipe and Tube."

1. Use Type BcuP, copper-phosphorus alloy for joining copper socket fittings with copper pipe.
2. Use Type BAg, cadmium-free silver alloy for joining copper with bronze or steel.

F. Threaded Joints: Thread steel pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

1. Apply appropriate tape or thread compound to external pipe threads unless dry-seal threading is specified.
2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

G. Steel pipe can be threaded, but threaded joints must be seal brazed or seal welded.

H. Welded Joints: Construct joints according to AWS D10.12.

I. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.

3.6 HANGERS AND SUPPORTS

A. Hanger, support, and anchor products are specified in Section 230529 "Hangers and Supports for HVAC Piping and Equipment."

B. Install the following pipe attachments:

1. Adjustable steel clevis hangers for individual horizontal runs less than 20 feet long.
2. Roller hangers and spring hangers for individual horizontal runs 20 feet or longer.
3. Pipe Roller: MSS SP-58, Type 44 for multiple horizontal piping 20 feet or longer, supported on a trapeze.
4. Spring hangers to support vertical runs.
5. Copper-clad hangers and supports for hangers and supports in direct contact with copper pipe.

C. Install hangers for copper tubing with the following maximum spacing and minimum rod sizes:

1. NPS 1/2 (DN 15): Maximum span, 60 inches; minimum rod size, ¼-inch.
2. NPS 5/8 (DN 18): Maximum span, 60 inches; minimum rod size, ¼-inch.
3. NPS 1 (DN 25): Maximum span, 72 inches; minimum rod size, ¼-inch.
4. NPS 1-1/4 (DN 32): Maximum span, 96 inches; minimum rod size, 3/8-inch.
5. NPS 1-1/2 (DN 40): Maximum span, 96 inches; minimum rod size, 3/8-inch.
6. NPS 2 (DN 50): Maximum span, 96 inches; minimum rod size, 3/8-inch.

D. Install hangers for steel piping with the following maximum spacing and minimum rod sizes:

1. NPS 2 (DN 50): Maximum span, 10 feet; minimum rod size, 3/8-inch.
2. NPS 2-1/2 (DN 65): Maximum span, 11 feet; minimum rod size, 3/8-inch.

E. Support multi-floor vertical runs at least at each floor.

3.7 FIELD QUALITY CONTROL

A. Perform tests and inspections and prepare test reports.

B. Tests and Inspections:

1. Comply with ASME B31.5, Chapter VI.
2. Test refrigerant piping, specialties, and receivers. Isolate compressor, condenser, evaporator, and safety devices from test pressure if they are not rated above the test pressure.
3. Test high- and low-pressure side piping of each system separately at not less than the pressures indicated in Part 1 "Performance Requirements" Article.

a. Fill system with nitrogen to the required test pressure.
b. System shall maintain test pressure at the manifold gage throughout duration of test.
c. Test joints and fittings with electronic leak detector or by brushing a small amount of soap and glycerin solution over joints.
d. Remake leaking joints using new materials, and retest until satisfactory results are achieved.

3.8 SYSTEM CHARGING

A. Charge system using the following procedures:

1. Install core in filter dryers after leak test but before evacuation.
2. Evacuate entire refrigerant system with a vacuum pump to 500 micrometers. If vacuum holds for 12 hours, system is ready for charging.
3. Break vacuum with refrigerant gas, allowing pressure to build up to 2 psig.
4. Charge system with a new filter-dryer core in charging line.

3.9 ADJUSTING

A. Adjust thermostatic expansion valve to obtain proper evaporator superheat.

B. Adjust high- and low-pressure switch settings to avoid short cycling in response to fluctuating suction pressure.

C. Adjust set-point temperature of air-conditioning or chilled-water controllers to the system design temperature.

D. Perform the following adjustments before operating the refrigeration system, in accordance to manufacturer's written instructions:

1. Open shutoff valves in condenser water circuit.
2. Verify that compressor oil level is correct.
3. Open compressor suction and discharge valves.
4. Open refrigerant valves except bypass valves that are used for other purposes.
5. Check open compressor-motor alignment and verify lubrication for motors and bearings.

E. Replace core of replaceable filter dryer after system has been adjusted and after design flow rates and pressures are established.

END OF SECTION 232300

SECTION 233113 - METAL DUCTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Single-wall rectangular ducts and fittings.
2. Single-wall round ducts and fittings.
3. Double-wall round ducts and fittings.
4. Sheet metal materials.
5. Duct lagging material.
6. Sealants and gaskets.
7. Hangers and supports.
8. Seismic-restraint devices.

B. Related Sections:

1. Section 230593 "Testing, Adjusting, and Balancing for HVAC" for testing, adjusting, and balancing requirements for metal ducts.
2. Section 233300 "Air Duct Accessories" for dampers, sound-control devices, duct-mounting access doors and panels, turning vanes, and flexible ducts.

1.3 PERFORMANCE REQUIREMENTS

A. Structural Performance: Duct hangers and supports and seismic restraints shall withstand the effects of gravity and seismic loads and stresses within limits and under conditions described in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" SMACNA's "Seismic Restraint Manual: Guidelines for Mechanical Systems."

B. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1-2004.

1.4 SUBMITTALS

A. Product Data: For each type of the following products:

1. Liners and adhesives.
2. Sealants and gaskets.
3. Seismic-restraint devices.

B. HPBS Submittals:

1. Product Data for Section 16a-38k-5(d): For adhesives and sealants, documentation including printed statement of VOC content and chemical components.

C. Shop Drawings:

1. Fabrication, assembly, and installation, including plans, elevations, sections, components, and attachments to other work.
2. Factory- and shop-fabricated ducts and fittings.
3. Duct layout indicating sizes, configuration, liner material, and static-pressure classes.
4. Elevation of top of ducts.
5. Dimensions of main duct runs from building grid lines.
6. Fittings.
7. Reinforcement and spacing.
8. Seam and joint construction.
9. Penetrations through fire-rated and other partitions.
10. Equipment installation based on equipment being used on Project.
11. Locations for duct accessories, including dampers, turning vanes, and access doors and panels.
12. Hangers and supports, including methods for duct and building attachment, seismic restraints, and vibration isolation.
13. Preparation for selecting hangers and supports and seismic restraints.

D. Coordination Drawings: Plans, drawn to ¼-inch scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Duct installation in congested spaces, indicating coordination with general construction, building components, and other building services. Indicate proposed changes to duct layout.
2. Suspended ceiling components.
3. Structural members to which duct will be attached.
4. Size and location of initial access modules for acoustical tile.
5. Penetrations of smoke barriers and fire-rated construction.

E. Welding certificates.

F. Field quality-control reports.

1.5 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.1, "Structural Welding Code - Steel," for hangers and supports.
2. AWS D1.2, "Structural Welding Code - Aluminum," for aluminum supports.
3. AWS D9.1, "Sheet Metal Welding Code," for duct joint and seam welding.

B. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 5 - "Systems and Equipment" and Section 7 - "Construction and System Start-up."

C. ASHRAE/IESNA Compliance: Applicable requirements in ASHRAE/IESNA 90.1, Section 6.4.4 - "HVAC System Construction and Insulation."

PART 2 - PRODUCTS

2.1 SINGLE-WALL RECTANGULAR DUCTS AND FITTINGS

A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" based on indicated static-pressure class unless otherwise indicated.

B. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 1-4, "Transverse (Girth) Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

C. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 1-5, "Longitudinal Seams - Rectangular Ducts," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

D. Elbows, Transitions, Offsets, Branch Connections, and Other Duct Construction: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 2, "Fittings and Other Construction," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

2.2 SINGLE-WALL ROUND DUCTS AND FITTINGS

A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 3, "Round, Oval, and Flexible Duct," based on indicated static-pressure class unless otherwise indicated.

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

a. Lindab Inc.
b. McGill AirFlow LLC
c. SEMCO Incorporated.
d. Sheet Metal Connectors, Inc.
e. Spiral Manufacturing Co., Inc.

B. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-2, "Transverse Joints - Round Duct," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

C. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-1, "Seams - Round Duct and Fittings," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

D. Tees and Laterals: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-4, "90 Degree Tees and Laterals," and Figure 3-5, "Conical Tees," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

2.3 DOUBLE-WALL SPIRAL ROUND DUCTS AND FITTINGS

A. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

1. Lindab Inc.
2. McGill AirFlow LLC
3. SEMCO Incorporated
4. Sheet Metal Connectors, Inc.

B. Outer Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 3, "Round, Oval, and Flexible Duct," based on static-pressure class unless otherwise indicated.

1. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-2, "Transverse Joints - Round Duct," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
2. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-1, "Seams - Round Duct and Fittings," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
3. Tees and Laterals: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-4, "90 Degree Tees and Laterals," and Figure 3-5, "Conical Tees," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

C. Inner Duct: Minimum 0.028-inch solid sheet steel.

D. Interstitial Insulation: Fibrous-glass liner complying with ASTM C 1071, NFPA 90A, or NFPA 90B; and with NAIMA AH124, "Fibrous Glass Duct Liner Standard."

1. Maximum Thermal Conductivity: 0.13 Btu x in./h x sq. ft. x deg F at 75 deg F (24 deg C) mean temperature.
2. Insulation Thickness: 2 inches.
3. Install spacers that position the inner duct at uniform distance from outer duct without compressing insulation.
4. Coat insulation with antimicrobial coating.
5. Cover insulation with polyester film complying with UL 181, Class 1.

2.4 SHEET METAL MATERIALS

A. General Material Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.

B. Galvanized Sheet Steel: Comply with ASTM A 653.

1. Galvanized Coating Designation: G90.
2. Finishes for Surfaces Exposed to View: Mill phosphatized.

C. Carbon-Steel Sheets: Comply with ASTM A 1008, with oiled, matte finish for exposed ducts.

D. Aluminum Sheets: Comply with ASTM B 209 Alloy 3003, H14 temper; with mill finish for concealed ducts, and standard, one-side bright finish for duct surfaces exposed to view.

E. Reinforcement Shapes and Plates: ASTM A 36, steel plates, shapes, and bars; black and galvanized.

1. Where black- and galvanized-steel shapes and plates are used to reinforce aluminum ducts, isolate the different metals with butyl rubber, neoprene, or EPDM gasket materials.

F. Tie Rods: Galvanized steel, ¼-inch minimum diameter for lengths 36 inches or less; 3/8-inch minimum diameter for lengths longer than 36 inches.

2.5 DUCT LAGGING MATERIAL

A. General: Flexible barrier material for wrapping ducts to lower break-out noise from turbulent air.

B. Nominal Density: 1 lb/sq. ft.

C. Thickness: 0.10-inch.

D. The barrier is barium loaded high mass, limp vinyl bonded to a reinforced aluminum foil facing one side, Under Industries model DL-10-LAG or equivalent.

E. Sound Transmission Loss: dB

Hz	125250	500	1000	2000	4000	STC
dB	15	19	21	29	33	37	27

2.6 SEALANT AND GASKETS

A. General Sealant and Gasket Requirements: Surface-burning characteristics for sealants and gaskets shall be a maximum flame-spread index of 25 and a maximum smoke-developed index of 50 when tested according to UL 723; certified by an NRTL.

B. Two-Part Tape Sealing System:

1. Tape: Woven cotton fiber impregnated with mineral gypsum and modified acrylic/silicone activator to react exothermically with tape to form hard, durable, airtight seal.
2. Tape Width: 4 inches.
3. Sealant: Modified styrene acrylic.
4. Water resistant.
5. Mold and mildew resistant.
6. Maximum Static-Pressure Class: 10-inch wg, positive and negative.
7. Service: Indoor and outdoor.
8. Service Temperature: Minus 40 to plus 200 deg F (Minus 40 to plus 93 deg C).
9. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless-steel, or aluminum.

C. Water-Based Joint and Seam Sealant:

1. Application Method: Brush on.
2. Solids Content: Minimum sixty-five percent (65%).
3. Shore A Hardness: Minimum 20.
4. Water resistant.
5. Mold and mildew resistant.
6. VOC: Maximum 75 g/L (less water).
7. Maximum Static-Pressure Class: 10-inch wg, positive and negative.
8. Service: Indoor or outdoor.

9. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless-steel, or aluminum sheets.

D. Solvent-Based Joint and Seam Sealant:

1. Application Method: Brush on.
2. Base: Synthetic rubber resin.
3. Solvent: Toluene and heptane.
4. Solids Content: Minimum sixty percent (60%).
5. Shore A Hardness: Minimum 60.
6. Water resistant.
7. Mold and mildew resistant.

E. Flanged Joint Sealant: Comply with ASTM C 920.

1. General: Single-component, acid-curing, silicone, elastomeric.
2. Type: S.
3. Grade: NS.
4. Class: 25.
5. Use: O.

F. Flange Gaskets: Butyl rubber, neoprene, or EPDM polymer with polyisobutylene plasticizer.

G. Round Duct Joint O-Ring Seals:

1. Seal shall provide maximum leakage class of 3 cfm/100 sq. ft. at 1-inch wg and shall be rated for 10-inch wg static-pressure class, positive or negative.
2. EPDM O-ring to seal in concave bead in coupling or fitting spigot.
3. Double-lipped, EPDM O-ring seal, mechanically fastened to factory-fabricated couplings and fitting spigots.

H. Dissimilar Duct Metals:

1. EPDM O-ring and gaskets are to be used for dissimilar duct material.

2.7 HANGERS AND SUPPORTS

A. Hanger Rods for Noncorrosive Environments: Cadmium-plated steel rods and nuts.

B. Hanger Rods for Corrosive Environments: Electrogalvanized, all-thread rods or galvanized rods with threads painted with zinc-chromate primer after installation.

C. Strap and Rod Sizes: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 4-1, "Rectangular Duct Hangers Minimum Size," and Table 4-2, "Minimum Hanger Sizes for Round Duct."

D. Steel Cables for Galvanized-Steel Ducts: Galvanized steel complying with ASTM A 603.

E. Steel Cables for Stainless-Steel Ducts: Stainless-steel complying with ASTM A 492.

F. Steel Cable End Connections: Cadmium-plated steel assemblies with brackets, swivel, and bolts designed for duct hanger service; with an automatic-locking and clamping device.

G. Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.

H. Trapeze and Riser Supports:

1. Supports for Galvanized-Steel Ducts: Galvanized-steel shapes and plates.
2. Supports for Stainless-Steel Ducts: Stainless-steel shapes and plates.
3. Supports for Aluminum Ducts: Aluminum or galvanized steel coated with zinc chromate.

2.8 SEISMIC-RESTRAINT DEVICES

A. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

1. Cooper B-Line, Inc.; a division of Cooper Industries
2. Ductmate Industries, Inc.
3. Hilti Corp.
4. Kinetics Noise Control
5. Loos & Co.; Cableware Division
6. Mason Industries
7. TOLCO; a brand of NIBCO INC.
8. Unistrut Corporation; Tyco International, Ltd.

B. Channel Support System: Shop- or field-fabricated support assembly made of slotted steel channels rated in tension, compression, and torsion forces and with accessories for attachment to braced component at one end and to building structure at the other end. Include matching components and corrosion-resistant coating.

C. Restraint Cables ASTM A 492, stainless-steel cables with end connections made of cadmium-plated steel assemblies with brackets, swivel, and bolts designed for restraining cable service; and with an automatic-locking and clamping device or double-cable clips.

D. Hanger Rod Stiffener: Reinforcing steel angle clamped to hanger rod.

E. Mechanical Anchor Bolts: Drilled-in and stud-wedge or female-wedge type. Select anchor bolts with strength required for anchor and as tested according to ASTM E 488.

PART 3 - EXECUTION

3.1 DUCT APPLICATIONS

A. All ductwork shall be galvanized steel except as follows:

1. Toilet Area: Aluminum.
2. Kitchen Hood Exhaust: Engineered exhaust system.
3. Kiln Exhaust: Stainless-steel.
4. Clothes Dryer Exhaust: Aluminum duct with semi-rigid, UL listed, dryer to vent exhaust hose.
5. Janitors Closet: Aluminum.
6. Dishwasher Exhaust: Aluminum.

3.2 DUCT INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of duct system. Indicated duct locations, configurations, and arrangements were used to size ducts and calculate friction loss for air-handling equipment sizing and for other design considerations.

Install duct systems as indicated unless deviations to layout are approved on Shop Drawings and Coordination Drawings.

B. Install ducts according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" unless otherwise indicated.

C. Install round ducts in maximum practical lengths.

D. Install ducts with fewest possible joints.

E. Install factory- or shop-fabricated fittings for changes in direction, size, and shape and for branch connections.

F. Unless otherwise indicated, install ducts vertically and horizontally, and parallel and perpendicular to building lines.

G. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building.

H. Install ducts with a clearance of 1-inch, plus allowance for insulation thickness.

I. Route ducts to avoid passing through transformer vaults and electrical equipment rooms and enclosures.

J. Where ducts pass through non-fire-rated interior partitions and exterior walls and are exposed to view, cover the opening between the partition and duct or duct insulation with sheet metal flanges of same metal thickness as the duct. Overlap openings on four (4) sides by at least 1½ inches.

K. Where ducts pass through fire-rated interior partitions and exterior walls, install fire dampers. Comply with requirements in Section 233300 "Air Duct Accessories" for fire and smoke dampers.

L. Protect duct interiors from moisture, construction debris and dust, and other foreign materials. Comply with SMACNA's "Duct Cleanliness for New Construction Guidelines."

M. Install acoustic lagging material where indicated on Drawings.

3.3 INSTALLATION OF EXPOSED DUCTWORK

A. Protect ducts exposed in finished spaces from being dented, scratched, or damaged.

B. Trim duct sealants flush with metal. Create a smooth and uniform exposed bead. Do not use two-part tape sealing system.

C. Grind welds to provide smooth surface free of burrs, sharp edges, and weld splatter. When welding stainless-steel with a No. 3 or 4 finish, grind the welds flush, polish the exposed welds, and treat the welds to remove discoloration caused by welding.

D. Maintain consistency, symmetry, and uniformity in the arrangement and fabrication of fittings, hangers and supports, duct accessories, and air outlets.

E. Repair or replace damaged sections and finished work that does not comply with these requirements.

3.4 DUCT SEALING

A. Seal ducts for duct static-pressure, seal classes, and leakage classes specified in "Duct Schedule" Article according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

B. Seal ducts to the following seal classes according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible":

1. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
2. Outdoor, Supply-Air Ducts: Seal Class A.
3. Outdoor, Exhaust Ducts: Seal Class C.
4. Outdoor, Return-Air Ducts: Seal Class C.
5. Unconditioned Space, Supply-Air Ducts in Pressure Classes 2-Inch wg and Lower: Seal Class B.
6. Unconditioned Space, Supply-Air Ducts in Pressure Classes Higher Than 2-Inch wg Seal Class A.
7. Unconditioned Space, Exhaust Ducts: Seal Class C.
8. Unconditioned Space, Return-Air Ducts: Seal Class B.
9. Conditioned Space, Supply-Air Ducts in Pressure Classes 2-Inch wg and Lower: Seal Class C.
10. Conditioned Space, Supply-Air Ducts in Pressure Classes Higher Than 2-Inch wg: Seal Class B.
11. Conditioned Space, Exhaust Ducts: Seal Class B.
12. Conditioned Space, Return-Air Ducts: Seal Class C.

3.5 HANGER AND SUPPORT INSTALLATION

A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 4, "Hangers and Supports."

B. Building Attachments: Concrete inserts, powder-actuated fasteners, or structural-steel fasteners appropriate for construction materials to which hangers are being attached.

1. Where practical, install concrete inserts before placing concrete.
2. Install powder-actuated concrete fasteners after concrete is placed and completely cured.
3. Use powder-actuated concrete fasteners for standard-weight aggregate concretes or for slabs more than 4 inches thick.
4. Do not use powder-actuated concrete fasteners for lightweight-aggregate concretes or for slabs less than 4 inches thick.
5. Do not use powder-actuated concrete fasteners for seismic restraints.

C. Hanger Spacing: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 4-1, "Rectangular Duct Hangers Minimum Size," and Table 4-2, "Minimum Hanger Sizes for Round Duct," for maximum hanger spacing; install hangers and supports within 24 inches of each elbow and within 48 inches of each branch intersection.

D. Hangers Exposed to View: Threaded rod and angle or channel supports.

E. Support vertical ducts with steel angles or channel secured to the sides of the duct with welds, bolts, sheet metal screws, or blind rivets; support at each floor and at a maximum interval of 16 feet.

F. Install upper attachments to structures. Select and size upper attachments with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

3.6 SEISMIC-RESTRAINT-DEVICE INSTALLATION

A. Install ducts with hangers and braces designed to support the duct and to restrain against seismic forces required by applicable building codes.

B. Select seismic-restraint devices with capacities adequate to carry present and future static and seismic loads.

C. Install cables so they do not bend across edges of adjacent equipment or building structure.

D. Install cable restraints on ducts that are suspended with vibration isolators.

E. Install seismic-restraint devices using methods approved by an agency acceptable to authorities having jurisdiction.

F. Attachment to Structure: If specific attachment is not indicated, anchor bracing and restraints to structure, to flanges of beams, to upper truss chords of bar joists, or to concrete members.

G. Drilling for and Setting Anchors:

1. Identify position of reinforcing steel and other embedded items prior to drilling holes for anchors. Do not damage existing reinforcement or embedded items during drilling. Notify the Architect if reinforcing steel or other embedded items are encountered during drilling. Locate and avoid prestressed tendons, electrical and telecommunications conduit, and gas lines.
2. Do not drill holes in concrete or masonry until concrete, mortar, or grout has achieved full design strength.
3. Wedge Anchors: Protect threads from damage during anchor installation. Heavy-duty sleeve anchors shall be installed with sleeve fully engaged in the structural element to which anchor is to be fastened.
4. Set anchors to manufacturer's recommended torque, using a torque wrench.
5. Install zinc-coated steel anchors for interior applications and stainless-steel anchors for applications exposed to weather.

3.7 CONNECTIONS

A. Make connections to equipment with flexible connectors complying with Section 233300 "Air Duct Accessories."

B. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for branch, outlet and inlet, and terminal unit connections.

3.8 PAINTING

A. Paint interior of metal ducts that are visible through registers and grilles and that do not have duct liner. Apply one (1) coat of flat, latex paint over a compatible galvanized-steel primer. Paint materials and application requirements are specified in Division 09 painting Sections. Color as selected by Architect and Owner from manufacturer’s entire range.

3.9 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Leakage Tests:

1. Comply with SMACNA's "HVAC Air Duct Leakage Test Manual." Submit a test report for each test.
2. Test the following systems:

a. Supply Ducts with a Pressure Class of 3-Inch wg or Higher: Test representative duct sections, selected by Architect from sections installed, totaling no less than fifty percent (50%) of total installed duct area for each designated pressure class.
b. Return Ducts with a Pressure Class of 3-Inch wg or Higher: Test representative duct sections, selected by Architect from sections installed, totaling no less than fifty percent (50%) of total installed duct area for each designated pressure class.
c. Exhaust Ducts with a Pressure Class of 2-Inch wg or Higher: Test representative duct sections, selected by Architect from sections installed, totaling no less than fifty percent (50%) of total installed duct area for each designated pressure class.
d. Outdoor Air Ducts with a Pressure Class of 3-Inch wg: Test representative duct sections, selected by Architect from sections installed, totaling no less than fifty percent (50%) of total installed duct area for each designated pressure class.

3. Disassemble, reassemble, and seal segments of systems to accommodate leakage testing and for compliance with test requirements.
4. Test for leaks before applying external insulation.
5. Conduct tests at static pressures equal to maximum design pressure of system or section being tested. If static-pressure classes are not indicated, test system at maximum system design pressure. Do not pressurize systems above maximum design operating pressure.
6. Give seven days' advance notice for testing.

3.10 START UP

A. Air Balance: Comply with requirements in Section 230593 "Testing, Adjusting, and Balancing for HVAC."

3.11 DUCT SCHEDULE

A. Fabricate ducts with galvanized sheet steel except as otherwise indicated and as follows:

B. Supply Ducts:

1. Ducts Connected to Fan Coil Units:

a. Pressure Class: Positive 1-inch wg.

2. Ducts Connected to Constant-Volume Air-Handling Units:

a. Pressure Class: Positive 3-inch wg.

C. Return Ducts:

1. Ducts Connected to Fan Coil Units:

a. Pressure Class: Positive or negative 1-inch wg.

2. Ducts Connected to Air-Handling Units Pressure Class: Positive or negative 3-inch wg.

D. Exhaust Ducts:

1. Ducts Connected to Fans Exhausting (ASHRAE 62.1, Class 1 and 2) Air:

a. Pressure Class: Negative 2-inch wg.

2. Ducts Connected to Dust Collection System:

a. Pressure Class: Negative 8-inch wg.

3. Ducts Connected to Fans Exhausting Laboratory and Process (ASHRAE 62.1, Class 3 and 4) Air:

a. Type 304 stainless-steel sheet.

E. Outdoor-Air (Not Filtered, Heated, or Cooled) Ducts:

1. Ducts Connected to Air-Handling Units:

a. Pressure Class: Positive or negative 3-inch wg.

F. Intermediate Reinforcement:

1. Galvanized-Steel Ducts: Galvanized steel.
2. Aluminum Ducts: Aluminum.

G. Liner:

1. Supply Air Ducts within the Building Envelop: Fibrous glass, Type I, 2 inches thick.
2. Return Air Ducts within the Building Envelop: Fibrous glass, Type I, 2 inches thick.
3. Transfer Ducts: Fibrous glass, Type I, 2 inches thick.
4. Supply Air Ducts Outside of the Building Envelop: Fibrous glass, Type I, 3 inches thick.
5. Return Air Ducts Outside of the Building Envelop: Fibrous glass, Type I, 3 inches thick.

H. Elbow Configuration:

1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-2, "Rectangular Elbows."

a. Velocity 1000 fpm or Lower:

1) Radius Type RE 1 with minimum 0.5 radius-to-diameter ratio.
2) Mitered Type RE 4 without vanes.

b. Velocity 1000 to 1500 fpm:

1) Radius Type RE 1 with minimum 1.0 radius-to-diameter ratio.
2) Radius Type RE 3 with minimum 0.5 radius-to-diameter ratio and two (2) vanes.

3) Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-3, "Vanes and Vane Runners," and Figure 2-4, "Vane Support in Elbows."

c. Velocity 1500 fpm or Higher:

1) Radius Type RE 1 with minimum 1.5 radius-to-diameter ratio.
2) Radius Type RE 3 with minimum 1.0 radius-to-diameter ratio and two (2) vanes.
3) Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-3, "Vanes and Vane Runners," and Figure 2-4, "Vane Support in Elbows."

2. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-2, "Rectangular Elbows."

a. Radius Type RE 1 with minimum 1.5 radius-to-diameter ratio.
b. Radius Type RE 3 with minimum 1.0 radius-to-diameter ratio and two vanes.
c. Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-3, "Vanes and Vane Runners," and Figure 2-4, "Vane Support in Elbows."

3. Round Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-3, "Round Duct Elbows."

a. Minimum Radius-to-Diameter Ratio and Elbow Segments: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 3-1, "Mitered Elbows." Elbows with less than 90-degree change of direction have proportionately fewer segments.

1) Velocity 1000 fpm or Lower: 0.5 radius-to-diameter ratio and three (3) segments for 90-degree elbow.
2) Velocity 1000 to 1500 fpm: 1.0 radius-to-diameter ratio and four (4) segments for 90-degree elbow.
3) Velocity 1500 fpm or Higher: 1.5 radius-to-diameter ratio and five (5) segments for 90-degree elbow.
4) Radius-to Diameter Ratio: 1.5.

b. Round Elbows, 12 Inches and Smaller in Diameter: Stamped or pleated.
c. Round Elbows, 14 Inches and Larger in Diameter: Welded.

I. Branch Configuration:

1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-6, "Branch Connections."

a. Rectangular Main to Rectangular Branch: 45-degree entry.
b. Rectangular Main to Round Branch: Spin in.

2. Round and Flat Oval: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-4, "90 Degree Tees and Laterals," and Figure 3-5, "Conical Tees." Saddle taps are permitted in existing duct.

a. Velocity 1000 fpm or Lower: 90-degree tap.
b. Velocity 1000 to 1500 fpm: Conical tap.

c. Velocity 1500 fpm or Higher: 45-degree lateral.

END OF SECTION 233113

SECTION 233423 - HVAC POWER VENTILATORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Centrifugal roof ventilators.
2. Ceiling-mounted ventilators.
3. In-line centrifugal fans.
4. Utility set fans

1.3 PERFORMANCE REQUIREMENTS

A. Project Altitude: Base fan-performance ratings on actual Project site elevations.

B. Operating Limits: Classify according to AMCA 99.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, and furnished specialties and accessories. Also include the following:

1. Certified fan performance curves with system operating conditions indicated.
2. Certified fan sound-power ratings.
3. Motor ratings and electrical characteristics, plus motor and electrical accessories.
4. Material thickness and finishes, including color charts.
5. Dampers, including housings, linkages, and operators.
6. Roof curbs.
7. Fan speed controllers.

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
2. Wiring Diagrams: For power, signal, and control wiring.
3. Vibration Isolation Base Details: Detail fabrication including anchorages and attachments to structure and to supported equipment. Include adjustable motor bases, rails, and frames for equipment mounting.

1.5 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Reflected ceiling plans and other details, drawn to scale, on which the following items are shown and coordinated with each other, using input from Installers of the items involved:

1. Roof framing and support members relative to duct penetrations.
2. Ceiling suspension assembly members.
3. Size and location of initial access modules for acoustical tile.
4. Ceiling-mounted items including light fixtures, diffusers, grilles, speakers, sprinklers, access panels, and special moldings.

B. Field quality-control reports.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For power ventilators to include in emergency, operation, and maintenance manuals.

1.7 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. AMCA Compliance: Fans shall have AMCA-Certified performance ratings and shall bear the AMCA-Certified Ratings Seal.

1.8 COORDINATION

A. Coordinate size and location of structural-steel support members.

B. Coordinate sizes and locations of concrete bases with actual equipment provided.

C. Coordinate sizes and locations of roof curbs, equipment supports, and roof penetrations with actual equipment provided.

1.9 EXTRA MATERIALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Belts: One (1) set for each belt-driven unit.

1.10 DELIVERY, STORAGE, AND HANDLING

A. Deliver fans as factory-assembled unit, to the extent allowable by shipping limitations, with protective crating and covering.

B. Disassemble and reassemble units, as required for moving to final location, according to manufacturer's written instructions.

C. Lift and support units with manufacturer's designated lifting or supporting points.

PART 2 - PRODUCTS

2.1 CENTRIFUGAL ROOF VENTILATORS

A. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

1. Cook, Loren Company
2. Greenheck Fan Corp.
3. ACME Engineering

B. Housing: Removable, spun-aluminum, dome top and outlet baffle; square, one-piece, aluminum base with venturi inlet cone.

C. Fan Wheels: Aluminum hub and wheel with backward-inclined blades.

D. Belt Drives:

1. Resiliently mounted to housing.
2. Fan Shaft: Turned, ground, and polished steel; keyed to wheel hub.
3. Shaft Bearings: Permanently lubricated, permanently sealed, self-aligning ball bearings.
4. Pulleys: Cast-iron, adjustable-pitch motor pulley.
5. Fan and motor isolated from exhaust airstream.

E. Accessories:

1. Disconnect Switch: Non-fusible type, with thermal-overload protection mounted inside fan housing, factory wired through an internal aluminum conduit.
2. Bird Screens: Removable, ½-inch mesh, aluminum or brass wire.
3. Motorized Dampers: Parallel-blade dampers mounted in curb base with electric actuator; wired to close when fan stops.

F. Roof Curbs: Galvanized steel; mitered and welded corners; 1½-inch-thick, rigid, fiberglass insulation adhered to inside walls; and 1½-inch wood nailer. Size as required to suit roof opening and fan base.

1. Configuration: Built-in raised cant and mounting flange.
2. Overall Height: 18 inches.
3. Sound Curb: Curb with sound-absorbing insulation.
4. Metal Liner: Galvanized steel.

G. Capacities and Characteristics: See Schedule on Drawings.

2.2 CENTRIFUGAL UPBLAST ROOF VENTILATORS

A. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

1. Greenheck Fan Corp.
2. Cook, Loren Company
3. ACME Engineering

B. Housing: Removable, spun-aluminum, dome top and outlet baffle; square, one-piece, aluminum base with venturi inlet cone.

1. Upblast Units: Provide spun-aluminum discharge baffle to direct discharge air upward, with rain and snow drains and grease collector.
2. Hinged Subbase: Galvanized-steel hinged arrangement permitting service and maintenance.

C. Fan Wheels: Aluminum hub and wheel with backward-inclined blades.

D. Belt Drives:

1. Resiliently mounted to housing.
2. Fan Shaft: Turned, ground, and polished steel; keyed to wheel hub.
3. Shaft Bearings: Permanently lubricated, permanently sealed, self-aligning ball bearings.
4. Pulleys: Cast-iron, adjustable-pitch motor pulley.
5. Fan and motor isolated from exhaust airstream.

E. Accessories:
1. Disconnect Switch: Non-fusible type, with thermal-overload protection mounted inside fan housing, factory wired through an internal aluminum conduit.
2. Bird Screens: Removable, ½-inch mesh, aluminum or brass wire.
3. Motorized Dampers: Parallel-blade dampers mounted in curb base with electric actuator; wired to close when fan stops.

F. Roof Curbs: Galvanized steel; mitered and welded corners; 1½-inch-thick, rigid, fiberglass insulation adhered to inside walls; and 1½-inch wood nailer. Size as required to suit roof opening and fan base.

1. Configuration: Built-in raised cant and mounting flange.
2. Overall Height: 18 inches.
3. Sound Curb: Curb with sound-absorbing insulation.
4. Metal Liner: Galvanized steel.
5. Vented Curb: Unlined with louvered vents in vertical sides.

G. Capacities and Characteristics: See Schedule on Drawings.

H. UL 762 listed.

2.3 CEILING-MOUNTED VENTILATORS

A. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

1. Greenheck Fan Corp.
2. Cook, Loren Company

B. Housing: Steel, lined with acoustical insulation.

C. Fan Wheel: Centrifugal wheels directly mounted on motor shaft. Fan shrouds, motor, and fan wheel shall be removable for service.

D. Grille: Painted aluminum, louvered grille with flange on intake and thumbscrew attachment to fan housing.

E. Electrical Requirements: Junction box for electrical connection on housing and receptacle for motor plug-in.

F. Accessories:

1. Variable-Speed Controller: Solid-state control to reduce speed from one hundred to less than fifty percent (100-<50%).
2. Isolation: Rubber-in-shear vibration isolators.
3. Manufacturer's standard roof jack or wall cap, and transition fittings.

G. Capacities and Characteristics: See Schedule on Drawings.

2.4 IN-LINE CENTRIFUGAL FANS

A. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

1. Greenheck Fan Corp.
2. Cook, Loren Company

B. Housing: Split, spun aluminum with aluminum straightening vanes, inlet and outlet flanges, and support bracket adaptable to floor, side wall, or ceiling mounting.

C. Belt-Driven Units: Motor mounted on adjustable base, with adjustable sheaves, enclosure around belts within fan housing, and lubricating tubes from fan bearings extended to outside of fan housing.

D. Fan Wheels: Aluminum, airfoil blades welded to aluminum hub.

E. Accessories:

1. Volume-Control Damper: Manually operated with quadrant lock, located in fan outlet.
2. Companion Flanges: For inlet and outlet duct connections.
3. Fan Guards: ½- by 1-inch mesh of galvanized steel in removable frame. Provide guard for inlet or outlet for units not connected to ductwork.
4. Motor and Drive Cover (Belt Guard): Epoxy-coated steel.
5. Isolation: Spring isolators.
6. Motorized Dampers: Parallel-blade dampers mounted in curb base with electric actuator; wired to close when fan stops.

F. Capacities and Characteristics: See Schedule on Drawings.

2.5 UTILITY SET FANS

A. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

1. Greenheck Fan Corp.
2. Cook, Loren Company
3. ACME Engineering

B. Housing: Fabricated of steel with side sheets fastened with a deep lock seam or welded to scroll sheets.

1. Housing Discharge Arrangement: Adjustable to eight (8) standard positions.

C. Fan Wheels: Single-width, single inlet; welded to cast-iron or cast-steel hub and spun-steel inlet cone, with hub keyed to shaft.

1. Blade Materials: Steel.
2. Blade Type: Forward curved.
3. Spark-Resistant Construction: AMCA 99, Type A.

D. Belt Drives:

1. Factory mounted, with final alignment and belt adjustment made after installation.
2. Service Factor Based on Fan Motor Size: 1.2.
3. Motor Pulleys: Adjustable pitch for use with motors through 5 hp; fixed pitch for use with larger motors. Select pulley so pitch adjustment is at the middle of adjustment range at fan design conditions.
4. Belts: Oil resistant, non-sparking, and non-static; matched sets for multiple belt drives.
5. Belt Guards: Fabricate of steel for motors mounted on outside of fan cabinet.

E. Accessories:

1. Disconnect Switch: Non-fusible type, with thermal-overload protection mounted inside fan housing, factory wired through an internal aluminum conduit.
2. Bird Screens: Removable, ½-inch mesh, aluminum or brass wire.
3. Motorized Dampers: Parallel-blade dampers mounted in curb base with electric actuator; wired to close when fan stops.

F. Roof Curbs: Galvanized steel; mitered and welded corners; 1½-inch-thick, rigid, fiberglass insulation adhered to inside walls; and 1½-inch wood nailer. Size as required to suit roof opening and fan base.

1. Configuration: Built-in raised cant and mounting flange.
2. Overall Height: 18 inches.
3. Sound Curb: Curb with sound-absorbing insulation.
4. Metal Liner: Galvanized steel.

G. Capacities and Characteristics: See Schedule on Drawings.

2.6 MOTORS

A. Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements for motors specified in Section 230513 "Common Motor Requirements for HVAC Equipment."

1. Motor Sizes: Minimum size as indicated. If not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.
2. Controllers, Electrical Devices, and Wiring: Comply with requirements for electrical devices and connections specified in Division 26 Sections.

B. Enclosure Type: Totally enclosed, fan cooled.

2.7 SOURCE QUALITY CONTROL

A. Certify sound-power level ratings according to AMCA 301, "Methods for Calculating Fan Sound Ratings from Laboratory Test Data." Factory test fans according to AMCA 300, "Reverberant Room Method for Sound Testing of Fans." Label fans with the AMCA-Certified Ratings Seal.

B. Certify fan performance ratings, including flow rate, pressure, power, air density, speed of rotation, and efficiency by factory tests according to AMCA 210, "Laboratory Methods of Testing Fans for Aerodynamic Performance Rating." Label fans with the AMCA-Certified Ratings Seal.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install power ventilators level and plumb.

B. Support units using restrained spring isolators. Refer to Vibration- and seismic-control devices are specified in Section 230548 "Vibration and Seismic Controls for HVAC Piping and Equipment."

C. Secure roof-mounted fans to roof curbs with cadmium-plated hardware. See Section 077200 "Roof Accessories" for installation of roof curbs.

D. Ceiling Units: Suspend units from structure; use steel wire or metal straps.

E. Install units with clearances for service and maintenance.

F. Label units according to requirements specified in Section 230553 "Identification for HVAC Piping and Equipment."

3.2 CONNECTIONS

A. Duct installation and connection requirements are specified in other Division 23 Sections. Drawings indicate general arrangement of ducts and duct accessories. Make final duct connections with flexible connectors. Flexible connectors are specified in Section 233300 "Air Duct Accessories."

B. Install ducts adjacent to power ventilators to allow service and maintenance.

C. Ground equipment according to Section 260526 "Grounding and Bonding for Electrical Systems."

D. Connect wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

3.3 FIELD QUALITY CONTROL

A. Perform tests and inspections.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

B. Tests and Inspections:

1. Verify that shipping, blocking, and bracing are removed.
2. Verify that unit is secure on mountings and supporting devices and that connections to ducts and electrical components are complete. Verify that proper thermal-overload protection is installed in motors, starters, and disconnect switches.
3. Verify that cleaning and adjusting are complete.
4. Disconnect fan drive from motor, verify proper motor rotation direction, and verify fan wheel free rotation and smooth bearing operation. Reconnect fan drive system, align and adjust belts, and install belt guards.
5. Adjust belt tension.
6. Adjust damper linkages for proper damper operation.

7. Verify lubrication for bearings and other moving parts.
8. Verify that manual and automatic volume control and fire and smoke dampers in connected ductwork systems are in fully open position.
9. Disable automatic temperature-control operators, energize motor and adjust fan to indicated rpm, and measure and record motor voltage and amperage.
10. Shut unit down and reconnect automatic temperature-control operators.
11. Remove and replace malfunctioning units and retest as specified above.

C. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

D. Prepare test and inspection reports.

3.4 ADJUSTING

A. Adjust damper linkages for proper damper operation.

B. Adjust belt tension.

C. Comply with requirements in Section 230593 "Testing, Adjusting, and Balancing for HVAC" for testing, adjusting, and balancing procedures.

D. Replace fan and motor pulleys as required to achieve design airflow.

E. Lubricate bearings.

3.5 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain units for a minimum of 4 hours. Refer to Section 017900 "Demonstration and Training."

END OF SECTION 233423

SECTION 233713 - DIFFUSERS, REGISTERS, AND GRILLES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Square ceiling diffusers.
2. Louver face diffuser.
3. Sidewall registers.
4. Spiral duct mounted grills.
5. Duct mounted grills.

B. Related Sections:

1. Section 233300 "Air Duct Accessories" for fire and smoke dampers and volume-control dampers not integral to diffusers, registers, and grilles.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated, include the following:

1. Data Sheet: Indicate materials of construction, finish, and mounting details; and performance data including throw and drop, static-pressure drop, and noise ratings.
2. Diffuser, Register, and Grille Schedule: Indicate drawing designation, room location, quantity, model number, size, and accessories furnished.

B. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from Installers of the items involved:

1. Ceiling suspension assembly members.
2. Method of attaching hangers to building structure.
3. Size and location of initial access modules for acoustical tile.
4. Ceiling-mounted items including lighting fixtures, diffusers, grilles, speakers, sprinklers, access panels, and special moldings.
5. Duct access panels.

C. Source quality-control reports.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Handle air terminal units and components carefully to prevent damage.

B. Store air terminal units and components in clean dry place off the ground. Protect from weather, water, and physical damage.

PART 2 - PRODUCTS

2.1 FINISHES

A. Except where otherwise specified, surface finish will be selected by the Architect. Interior finish shall be flat black.

2.2 ACCESSORIES

A. Each grille, register, and diffuser shall have the accessories required to perform satisfactorily and be fully adjustable. This includes opposed blade volume dampers, air deflectors, vanes, blanking quadrants, etc.

B. Dampers shall be omitted from the following:

1. Single exhaust grilles, transfer grilles.

2.3 CEILING DIFFUSERS

A. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

1. Krueger
2. Price Industries
3. Titus

B. Material: Aluminum.

C. Finish: Powder coat.

D. Face Size: See Schedule on Drawings.

E. Mounting: Surface and T-bar. See Schedule on Drawings.

F. Pattern: Adjustable.

G. Dampers: Radial opposed blade.

2.4 SIDEWALL REGISTERS

A. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

1. Krueger
2. Price Industries
3. Titus

B. Material: Extruded aluminum.

C. Finish: Powder coat.

D. Face Blade Arrangement: Vertical spaced ¾-inch apart.

E. Core Construction: Integral.

F. Rear-Blade Arrangement: Horizontal spaced ¾-inch apart.

G. Frame: 1-inch-wide.

H. Mounting: Countersunk screw.

2.5 SPIRAL DUCT MOUNTED GRILLS

A. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

1. Krueger
2. Price Industries
3. Titus

B. Material: Heavy gauge extruded aluminum.

C. Finish: Powder coat.

D. Grill Rotation: Minimum 25-degree up and down from centerline of grille. Constructed with radiused end cap and foam gaskets.

E. Blades: Heavy duty, individually adjustable.

F. Universal end cap.

G. Mounting: Countersunk screw holes and curved border.

H. Air Scoop Damper/Extractor: Heavy duty aluminum operable from the face with screwdriver.

2.6 LIGHT TROFFER DIFFUSER

A. Acceptable Manufacturers

1. Krueger
2. Price Industries
3. Titus

B. Provide all materials and equipment required for a complete installation of all troffer slot type diffusers air distribution systems as shown on Drawings. The system shall be complete in every respect and shall include all required appurtenances. Mechanical contractor shall provide all plenums, hoods, blank-offs, and associated sheet metal components including all duct connections.

C. Extruded aluminum continuous linear and modular slot diffuser as shown on Drawings. The slot diffuser shall integrate into the ceiling system.

D. Pattern controllers shall be one-piece extruded aluminum positioned between spring loaded spacers. Pattern controller shall allow the airstream to be directed flat against the ceiling or downward, as well as allowing throw reduction every 2 feet along the entire slot diffusers.

E. Number of Slots: Refer to Schedules on Drawings.

F. Provide ends as required.

G. Provide clips compatible to the ceiling system.

H. Flanges exposed to view shall be factory painted. Coordinate color with Architect.

2.7 DUCT MOUNTED GRILLES

A. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

1. Krueger
2. Price Industries
3. Titus

B. Material: Aluminum.

C. Finish: Powder coat.

D. Face Blade Arrangement: Vertical or horizontal spaced ¾-inch apart.

E. Core Construction: Integral.

F. Frame: 1¼-inch-wide.

G. Mounting: Surface with countersunk screw and lay-in. See Schedule on Drawings.

2.8 SOURCE QUALITY CONTROL

A. Verification of Performance: Rate diffusers, registers, and grilles according to ASHRAE 70, "Method of Testing for Rating the Performance of Air Outlets and Inlets."

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas where diffusers, registers, and grilles are to be installed for compliance with requirements for installation tolerances and other conditions affecting performance of equipment.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install diffusers, registers, and grilles level and plumb.

B. Ceiling-Mounted Outlets and Inlets: Drawings indicate general arrangement of ducts, fittings, and accessories. Air outlet and inlet locations have been indicated to achieve design requirements for air volume, noise criteria, airflow pattern, throw, and pressure drop. Make final locations where indicated, as much as practical. For units installed in lay-in ceiling panels, locate units in the center of panel. Where architectural features or other items conflict with installation, notify Architect for a determination of final location.

C. Install diffusers, registers, and grilles with airtight connections to ducts and to allow service and maintenance of dampers, air extractors, and fire dampers.

3.3 ADJUSTING

A. After installation, adjust diffusers, registers, and grilles to air patterns indicated, or as directed, before starting air balancing.

B. Provide balancing dampers on duct take-off to diffusers, grilles, and registers, regardless of whether dampers are specified as part of the diffuser, or grille and register assembly.

C. Paint ductwork visible behind air outlets and inlets matte black. Refer to Division 09.

END OF SECTION 233713

SECTION 235100 - BREECHINGS, CHIMNEYS, AND STACKS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Listed double-wall vents and chimney.

1.3 SUBMITTALS

A. Product Data: For the following:

1. Special gas vents.
2. Listed building heating appliance chimney.
3. Combustion air intakes.

B. Shop Drawings: For vents, breechings, chimneys, and stacks. Include plans, elevations, sections, details, and attachments to other work.

1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, methods of field assembly, components, hangers and seismic restraints, and location and size of each field connection.
2. For installed products indicated to comply with design loads, include calculations required for selecting seismic restraints and structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.4 INFORMATIONAL SUBMITTALS

A. Welding certificates.

B. Manufacturer Seismic Qualification Certification: Submit certification that factory-fabricated breeching, chimneys, and stacks; accessories; and components will withstand seismic forces defined in Section 230548 "Vibration and Seismic Controls for HVAC Piping and Equipment." Include the following:

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.

a. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."

2. Dimensioned Outline Drawings of Breeching, Chimneys, and Stacks: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of anchorage devices on which the certification is based and their installation requirements.

C. Warranty: Special warranty specified in this Section.

1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain listed system components through one (1) source from a single manufacturer.

B. Welding: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code--Steel," for hangers and supports and AWS D9.1, "Sheet Metal Welding Code," for shop and field welding of joints and seams in vents, breechings, and stacks.

C. Certified Sizing Calculations: Manufacturer shall certify venting system sizing calculations.

1.6 COORDINATION

A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Section 033000 “Cast-In-Place Concrete”.

B. Coordinate installation of roof curbs, equipment supports, and roof penetrations. These items are specified in Section 077200 "Roof Accessories."

1.7 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of venting system that fail in materials or workmanship within specified warranty period. Failures include, but are not limited to, structural failures caused by expansion and contraction.

PART 2 - PRODUCTS

2.1 LISTED SPECIAL GAS VENTS

A. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

1. Jeremis
2. Metal-Fab, Inc.
3. Selkirk Inc.; Selkirk Metalbestos and Air Mate
4. Van-Packer Company

B. Description: Double-wall metal vents tested according to UL 1738 and rated for 480 deg F continuously, 550 deg F Maximum with positive or negative flue pressure complying with NFPA 211.

C. Construction: Inner shell and outer jacket separated by at least a 1-inch annular space.

D. Inner Shell: ASTM A 959, Type 29-4C stainless-steel.

E. Outer Jacket: 441 stainless-steel.

F. Connection System: Non-silicone construction, self-sealing O-ring system.

G. Locking System: Built-in clasp type allowing for assembly, disassembly, and reassembly.

1. Warranty Period: Fifteen (15) years from date of Substantial Completion.

H. Accessories: Tees, elbows, increasers, draft-hood connectors, terminations, adjustable roof flashings, storm collars, support assemblies, thimbles, firestop spacers, and fasteners; fabricated from similar materials and designs as vent-pipe straight sections; all listed for same assembly.

1. Termination: Round chimney top designed to exclude minimum ninety-eight percent (98%) of rainfall.

2.2 LISTED BUILDING-HEATING-APPLIANCE CHIMNEYS

A. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

1. Security Chimneys
2. Metal-Fab, Inc.
3. Selkirk Inc.; Selkirk Metalbestos and Air Mate
4. Van-Packer Company
5. Jeremias

B. Description: Double-wall metal vents tested according to UL 103 and rated for 1000 deg F continuously, or 1400 deg F for 10 minutes; with neutral or negative flue pressure complying with NFPA 211.

C. Construction: Inner shell and outer jacket separated by at least a 2-inch annular space filled with high-temperature, ceramic-fiber insulation.

D. Inner Shell: ASTM A 666, Type 316 stainless-steel.

E. Outer Jacket: 316 stainless-steel.

F. Connection System: Self centering system.

G. Locking System: Single outer band.

1. Warranty Period: Limited Lifetime.

H. Accessories: Tees, elbows, increasers, draft-hood connectors, terminations, adjustable side wall flashings, storm collars, support assemblies, thimbles, firestop spacers, and fasteners; fabricated from similar materials and designs as vent-pipe straight sections; all listed for same assembly.

1. Termination: Wall cap.

2.3 COMBUSTION AIR INTAKES

A. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

1. Duravent
2. Centrotherm

B. Description: Single-wall Polypropylene vents tested according to UL 1738/S636 and rated for 230 deg F continuously with neutral or negative flue pressure complying with NFPA 211.

C. Construction: Single-wall 2.2 mm in thickness.

D. Connection System: Factory gasketed.

1. Warranty Period: Ten (10) years.

E. Accessories: Tees, elbows, increasers, terminations, adjustable roof flashings, storm collars, support assemblies, thimbles, firestop spacers, and fasteners; fabricated from similar materials and designs as vent-pipe straight sections; all listed for same assembly.

1. Termination: Wall cap.

2.4 GUYING AND BRACING MATERIALS (Contractor to Verify If Required)

A. Cable: Four (4) galvanized, stranded wires of the following thickness:

1. Minimum Size: ¼-inch in diameter.
2. For ID Sizes 4 to 15 Inches: 5/16-inch.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of work.

1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 APPLICATION

A. Listed Special Gas Vent: Condensing gas appliances.

B. Listed Heating Building Appliance Chimney: Category I appliance.

3.3 INSTALLATION OF LISTED VENTS AND CHIMNEYS

A. Locate to comply with minimum clearances from combustibles and minimum termination heights according to product listing or NFPA 211, whichever is most stringent.

B. Seal between sections of positive-pressure vents and grease exhaust ducts according to manufacturer's written installation instructions, using sealants recommended by manufacturer.

C. Support vents at intervals recommended by manufacturer to support weight of vents and all accessories, without exceeding appliance loading.

D. Slope breechings down in direction of appliance, with condensate drain connection at lowest point piped to nearest drain.

E. Lap joints in direction of flow.

F. Connect base section to foundation using anchor lugs of size and number recommended by manufacturer.

G. Join sections with acid-resistant joint cement to provide continuous joint and smooth interior finish.

H. Erect stacks plumb to finished tolerance of no more than 1-inch out of plumb from top to bottom.

3.4 CLEANING

A. After completing system installation, including outlet fittings and devices, inspect exposed finish. Remove burrs, dirt, and construction debris and repair damaged finishes.

B. Clean breechings internally, during and after installation, to remove dust and debris. Clean external surfaces to remove welding slag and mill film. Grind welds smooth and apply touchup finish to match factory or shop finish.

C. Provide temporary closures at ends of breechings, chimneys, and stacks that are not completed or connected to equipment.

END OF SECTION 235100

SECTION 235216 - CONDENSING BOILERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes packaged, factory-fabricated and -assembled, gas-fired, condensing boilers, trim, and accessories for generating hot water.

1.3 SUBMITTALS

A. Product Data: Include performance data, operating characteristics, furnished specialties, and accessories.

B. Efficiency Curves: At a minimum, submit efficiency curves for one hundred percent, fifty percent, and seven percent (100%, 50% and 7%) input firing rates at incoming water temperatures ranging from 80°F to 160°F.

C. Pressure Drop Curve. Submit pressure drop curve for flows ranging from 0 GPM to 375 gpm.

1. If submitted material is different from that of the design basis, boiler manufacture shall incur all costs associated with reselection of necessary pumps. Possible differences include, but are not limited to, the pump type, pump pad size, electrical characteristics, and piping changes.

D. Shop Drawings: For boilers, boiler trim, and accessories include:

1. Plans, elevations, sections, details, and attachments to other work.
2. Wiring diagrams for power, signal, and control wiring.

E. Source Quality Control Test Reports: Reports shall be included in submittals.

F. Field Quality Control Test Reports: Reports shall be included in submittals.

G. Operation and Maintenance Data: Data to be included in boiler emergency, operation, and maintenance manuals.

H. Warranty: Special warranty specified in this Section.

I. Other Informational Submittals:

1. ASME Stamp Certification and Report: Submit "A," "S," or "PP" stamp certificate of authorization, as required by authorities having jurisdiction, and document hydrostatic testing of piping external to boiler.

1.4 QUALITY ASSURANCE

A. Electrical Components, Devices and Accessories: Boilers must be listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. I=B=R Performance Compliance: Condensing boilers must be rated in accordance with applicable federal testing methods and verified by AHRI as capable of achieving the energy efficiency and performance ratings as tested within prescribed tolerances.

C. ASME Compliance: Condensing boilers must be constructed in accordance with ASME Boiler and Pressure Vessel Code, Section IV “Heating Boilers”.

D. ASHRAE/IESNA 90.1 Compliance: Boilers shall have minimum efficiency according to "Gas and Oil-Fired Boilers - Minimum Efficiency Requirements."

E. DOE Compliance: Minimum efficiency shall comply with 10 CFR 430, Subpart B, Appendix N, "Uniform Test Method for Measuring the Energy Consumption of Furnaces and Boilers."

F. UL Compliance: Boilers must be tested for compliance with UL 795, "Commercial-Industrial Gas Heating Equipment." Boilers shall be listed and labeled by a testing agency acceptable to authorities having jurisdiction.

G. NOx Emission Standards: When installed and operated in accordance with manufacturer’s instructions, condensing boilers shall comply with the NOx emission standards outlined in South Coast Air Quality Management District (SCAQMD), Rule 1146.1; and the Texas Commission on Environmental Quality (TCEQ), Title 30, Chapter 117, and Rule 117.465.

1.5 COORDINATION

A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Section 033000 “Cast-In-Place Concrete”.

1.6 WARRANTY

A. Standard Warranty: Boilers shall include manufacturer's standard form in which manufacturer agrees to repair or replace components of boilers that fail in materials or workmanship within specified warranty period.

1. Warranty Period for Fire-Tube Condensing Boilers:

a. The pressure vessel/heat exchanger shall carry a 10-year from date of Substantial Completion, non-prorated, limited warranty against any failure due to condensate corrosion, thermal stress, mechanical defects, or workmanship.
b. Manufacturer labeled control panels are conditionally warranted against failure for two (2) years from date of Substantial Completion.
c. All other components, with the exception of the igniter and flame detector, are conditionally guaranteed against any failure for eighteen (18) months from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

1. Thermal Solutions
2. Cleaver Brooks - ClearFire-CE (CFC-E) Series to meet or exceed.
3. Aerco Benchmark Series to meet or exceed.

2.2 CONSTRUCTION

A. Description: Boiler shall be natural gas fired, fully condensing, fire tube design. Power burner shall have full modulation (the minimum firing rate shall not exceed 170,000 BTU/HR input; boilers that have an input greater than 170,000 BTU/Hr at minimum fire will not be considered) and discharge into a positive pressure vent. Boiler efficiency shall increase with decreasing load (output), while maintaining setpoint. Boiler shall be factory-fabricated, factory-assembled, and factory-tested, fire-tube condensing boiler with heat exchanger sealed pressure-tight, built on a steel base, including insulated jacket, flue-gas vent, combustion-air intake connections, water supply, return and condensate drain connections, and controls.

B. Heat Exchanger: The heat exchanger shall be constructed of 439 stainless-steel fire tubes and tubesheets, with a one-pass combustion gas flow design. The fire tubes shall be 5/8-inch OD, with no less than 0.049-inch wall thickness. The upper and lower stainless-steel tube-sheet shall be no less than 0.25-inch thick. The pressure vessel/heat exchanger shall be welded construction. The heat exchanger shall be ASME stamped for a working pressure not less than 160 psig. Access to the tubesheets and heat exchanger shall be available by burner and exhaust manifold removal. Minimum access opening shall be no less than 10-inch diameter.

C. Pressure Vessel: The pressure vessel shall have a maximum water volume of 58 gallons. The boiler water pressure drop shall not exceed 3 psig at 218 gpm. The boiler water connections shall be 4-inch flanged 150-pound, ANSI rated. The pressure vessel shall be constructed of SA53 carbon steel, with a 0.25-inch-thick wall and 0.50-inch-thick upper head. Inspection openings in the pressure vessel shall be in accordance with ASME Section IV pressure vessel code. The boiler shall be designed so that the thermal efficiency increases as the boiler firing rate decreases.

D. Modulating Air/Fuel Valve and Burner: The boiler burner shall be capable of a 15-to-1 turndown ratio of the firing rate without loss of combustion efficiency or staging of gas valves. The burner shall produce less than 30 ppm of NOx corrected to three percent (3%) excess oxygen. The burner shall be metal-fiber mesh covering a stainless-steel body with spark ignition and flame rectification. All burner material exposed to the combustion zone shall be of stainless-steel construction. There shall be no moving parts within the burner itself. A modulating air/fuel valve shall meter the air and fuel input. The modulating motor must be linked to both the gas valve body and air valve body with a single linkage. The linkage shall not require any field adjustment. A variable frequency drive (VFD), controlled cast aluminum pre-mix blower shall be used to ensure the optimum mixing of air and fuel between the air/fuel valve and the burner.

E. Minimum boiler efficiencies shall be as follows at a 20-degree delta-T:

EWT	**100% Fire**	**50% Fire**	**7% Fire**
160 °F	87%	87%	87%
140 °F	88%	88%	88%
120 °F	89%	90%	90.5%

100 °F	93.7%	95%	95%
80 °F	96%	98%	98.6%

F. Exhaust Manifold: The exhaust manifold shall be of corrosion resistant cast aluminum or 316 stainless-steel with an 8-inch-diameter flue connection. The exhaust manifold shall have a collecting reservoir and a gravity drain for the elimination of condensation.

G. Blower: The boiler shall include a variable-speed, DC centrifugal fan to operate during the burner firing sequence and pre-purge the combustion chamber.

1. Motors: Blower motors shall comply with requirements specified in Section 230513 "Common Motor Requirements for HVAC Equipment."

a. Motor Sizes: Minimum size as indicated. If not indicated, large enough so driven load will not require a motor to operate in the service factor range above 1.0.

H. Ignition: Ignition shall be via spark ignition with one hundred percent (100%) main-valve shutoff and electronic flame supervision.

I. The boiler's manufacturer recommended annual replacement parts shall cost no more than Two Hundred Dollars ($200) to the end customer.

J. The boiler shall be designed such that the combustion air is drawn from the outside of the boiler enclosure, decoupling it from the combustion air supply and preheating the air to increase efficiency.

K. Enclosure: The sheet metal enclosure shall be fully removable, allowing for easy access during servicing.

L. Boilers shall be factory assembled and fire tested before shipping to job site. Field assembled boilers are not acceptable.

2.3 CONTROLS

A. Refer to Section 230900 "Instrumentation and Control of HVAC."

B. The boiler control system shall be segregated into three (3) components: "C-More" Control Panel, Power Box, and Input/Output Connection Box. The entire system shall be Underwriters Laboratories recognized.

C. The control panel shall consist of six (6) individual circuit boards using state-of-the-art surface-mount technology in a single enclosure. These circuit boards shall include:

1. A display board incorporating LED display to indicate temperature and a vacuum fluorescent display module for all message enunciation.
2. A CPU board housing all control functions.
3. An electric low-water cutoff board with test and manual reset functions.
4. A power supply board.
5. An ignition/stepper board incorporating flame safeguard control.
6. A connector board.

Each board shall be individually field replaceable.

D. The combustion safeguard/flame monitoring system shall use spark ignition and a rectification-type flame sensor.

E. The control panel hardware shall support both RS-232 and RS-485 remote communications.

F. The controls shall annunciate boiler and sensor status and include extensive self-diagnostic capabilities that incorporate a minimum of eight (8) separate status messages and thirty-four (34) separate fault messages.

G. The control panel shall incorporate three (3) self-governing features designed to enhance operation in modes where it receives an external control signal by eliminating nuisance faults due to over-temperature, improper external signal, or loss of external signal. These features include:

1. Setpoint High Limit: Setpoint high limit allows for a selectable maximum boiler outlet temperature and acts as temperature limiting governor. Setpoint limit is based on a PID function that automatically limits firing rate to maintain outlet temperature within a 0-to-10-degree selectable band from the desired maximum boiler outlet temperature.
2. Setpoint Low Limit: Allow for a selectable minimum operating temperature.
3. Failsafe Mode: Failsafe mode allows the boiler to switch its mode to operate from an internal setpoint if its external control signal is lost, rather than shut off. This is a selectable mode, enabling the control can shut off the unit upon loss of external signal, if so desired.

H. The boiler control system shall incorporate the following additional features for enhanced external system interface:

1. System start temperature feature.
2. Pump delay timer.
3. Auxiliary start delay timer.
4. Auxiliary temperature sensor.
5. Analog output feature to enable simple monitoring of temperature setpoint, outlet temperature, or fire rate.
6. Remote interlock circuit.
7. Delayed interlock circuit.
8. Fault relay for remote fault alarm.

I. Each boiler shall include an electric, single-seated combination safety shutoff valve/regulator with proof of closure switch in its gas train. Each boiler shall incorporate dual over-temperature protection with manual reset, in accordance with ASME Section IV and CSD-1.

J. The Boiler Manufacturer shall supply as part of the boiler package a completely integrated controller to control all operation and energy input of the multiple boiler heating plant. The controller shall be comprised of a microprocessor-based control utilizing the MODBUS protocol to communicate with the Boilers via the RS-485 port. The controller shall have the ability to operate up to six (6) boilers.

K. The controller shall have the ability to vary the firing rate and energy input of each individual boiler throughout its full modulating range to maximize the condensing capability and thermal efficiency output of the entire heating plant. The ACS shall control the boiler outlet header temperature within $\pm$2ºF. The controller shall be a PID type controller and uses Ramp Up/Ramp Down control algorithm for accurate temperature control with excellent variable load response. The ACS controller shall provide contact closure for auxiliary equipment such as system pumps and combustion air inlet dampers based upon outdoor air temperature.

L. The ACS shall have the following anti-cycling features:

1. Manual designation of lead boiler and last boiler.

2. Lead boiler rotation at user-specified time interval.
3. Delay the firing/shutting down of boilers when header temperature within a predefined deadband.

M. When set on Internal Setpoint Mode, temperature control setpoint on the controller shall be fully field adjustable from 50ºF to 190ºF in operation. When set on Indoor/Outdoor Reset Mode, the controller will operate on an adjustable inverse ratio in response to outdoor temperature to control the main header temperature. Reset ratio shall be fully field adjustable from 0.3 to 3.0 in operation. When set on 4ma to 20ma Temperature Control Mode, the ACS will operate the plant to vary header temperature setpoint linearly as an externally applied 4-20 ma signal is supplied.

N. When set on MODBUS Temperature Control Mode, the controller will operate the plant to vary header temperature setpoint as an external communication utilizing the MODBUS protocol is supplied via the RS-232 port. The controller shall have a vacuum fluorescent display for monitoring of all sensors and interlocks. Non-volatile memory backup of all control parameters shall be internally provided as standard. The controller will automatically balance the sequence of operating time on each boiler by a first-on first-off mode and provide for setback and remote alarm contacts. Connection between central controller system and individual boilers shall be twisted pair low voltage wiring, with the boilers ‘daisy-chained’ for ease of installation.

2.4 ELECTRICAL POWER

A. Controllers, Electrical Devices, and Wiring: Electrical devices and connections are specified in Division 26 sections.

B. Single-Point Field Power Connection: Factory-installed and factory-wired switches, motor controllers, transformers, and other electrical devices shall provide a single-point field power connection to the boiler.

C. Electrical Characteristics:

1. Voltage: 460 V.
2. Phase: Three.
3. Frequency: 60 Hz.
4. Full-Load Current: 5.0 Amps.

2.5 VENTING

A. The exhaust vent must be UL Listed for use with Category II, III, and IV appliances and compatible with operating temperatures up to 230°F, condensing flue gas service. UL-listed vents Al 29-4C stainless-steel must be used with boilers. PVC is not allowed for exhaust.

B. The minimum exhaust vent duct size for each boiler is 8-inch-diameter.

C. Combustion-Air Intake: Boilers shall be capable of drawing combustion air from the outdoors via a metal or PVC duct connected between the boiler and the outdoors.

D. The minimum sealed combustion air duct size for each boiler is 8-inch-diameter.

E. Common vent and common combustion air must be an available option for boiler installation. Consult manufacturer for common vent and combustion air sizing.

F. Follow guidelines specified in manufacturer’s venting guide and all applicable codes and standards.

2.6 BOILER VALVE CONTROL PANEL

A. The Boiler Manufacturer shall supply as part of the boiler package a completely integrated Boiler Valve Controller (BVC) to automatically sequence each factory supplied motor operated valve. The BVC shall operate independently from the Boiler Management System to sequence supplied motorized valves.

B. The BVC valve controller shall have the ability to operate four (4) boilers with 24V motorized valves. The controller must have a time delay function, programmable to 30 minutes.

1. The BVC shall have the following characteristics:

a. 120VAC/60Hz, 15 Amp power supply.
b. BVC contacts rated for maximum of 2 Amps.
c. Non-metallic (fiberglass) NEMA Type 4X enclosure.
d. 3-inch-high contrast digital display/touchscreen.
e. Manual Valve positioning with internal safeguard to assure that if a boiler is firing, the corresponding valve cannot be moved to the “CLOSED” position to avoid temperature overshoot.

C. BVC shall carry the UL listing.

2.7 MOTORIZED BOILER ISOLATION VALVES

A. Boiler manufacturer supplied 4-inch butterfly 2-way lug body valves are to meet HVAC standards, and commercial applications requiring 50 psi bubble tight shut-off for liquids. The valves shall have a long stem for 2-inch insulation. Valves shall be completely assembled and tested, ready for installation.

B. The Valves shall have the following characteristics:

1. Service: Hot water.
2. Action: 90-degree rotation.
3. Fitting: For use w/ANSI Class 125/150 flanges.
4. Media Temp. Range: -22 deg F to 250 deg F.
5. Maximum Velocity: 12 FPS.

C. Valve Materials:

1. Body: Ductile iron, ASTM A 536.
2. Finish: Epoxy powder coat.
3. Disc: 304 stainless-steel.
4. Seat: EPDM.
5. Shaft: 416 stainless-steel.
6. O-Ring: EPDM.
7. Upper, Middle, Lower Bushings: RPTFE.

D. Actuator Power Requirements shall be 24V, 1 Phase. Actuator shall be Open/Fail Open Power Close. Cycle time shall be 90 seconds. Valves shall have (180, 360, 720) in-lbs of Torque. Actuators shall have a manual override button, and reversible cw/ccw switch.

E. The Actuators shall have the following characteristics:

1. Overload Protection: Electronic throughout rotation.
2. Actuator Housing: NEMA 2.

3. Actuator Ambient Temp. Range: -22 deg F to 122 deg F.
4. Actuator shall carry cULus Listing.
5. Actuator shall have proof of open-end switch.
6. Maximum GPM: 4-inch, 470.
7. Cv: 4-inch, 600.

F. Single-Point Field Power Connection: Factory-installed and factory-wired switches, motor controllers, transformers, and other electrical devices shall provide a single-point field power connection to the boiler.

G. Electrical Characteristics:

1. Voltage: 460 V.
2. Phase: Three.
3. Frequency: 60 Hz.
4. Full-Load Current 8.0 Amps.

2.8 CONDENSATE NEUTRALIZERS

A. The Contractor shall supply and install fireside condensate neutralizing tubes for each condensate drain and flue pipe condensate drain.

B. The neutralizer tubes shall be sized to meet the boiler capacity.

C. The installing contractor shall supply all boilers and vent condensate drains with factory provided float traps, and unions before the neutralizing tubes.

D. All piping shall be PVC and supplied/installed by Contractor. Plastic tubing is acceptable alternative when used with barbed fittings and hose clamps. All PVC joints shall be glued, and all barbed fittings shall be secured with hose clamps.

E. The boiler and flue condensate drains shall not be combined into one (1) neutralizer. All piping shall be per manufacturer’s piping diagrams and directions. All neutralizing tubes shall be secured to the floor or wall so as not to be exposed to damage or within a normal walkway. The Contactor shall fill all “P-traps” and neutralizing tubes with tap water before the firing of any boiler.

2.9 SOURCE QUALITY CONTROL

A. Burner and Hydrostatic Test: Factory adjust burner to eliminate excess oxygen, carbon dioxide, oxides of nitrogen emissions, and carbon monoxide in flue gas, and to achieve combustion efficiency. Perform hydrostatic testing.

B. Test and inspect factory-assembled boilers, before shipping, according to ASME Boiler and Pressure Vessel Code.

1. If boilers are not factory assembled and fire-tested, the local vendor is responsible for all field assembly and testing.

C. Allow Owner access to source quality-control testing of boilers. Notify Architect fourteen (14) days in advance of testing.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Before boiler installation, examine roughing-in for concrete equipment bases, anchor-bolt sizes and locations, and piping and electrical connections to verify actual locations, sizes, and other conditions affecting boiler performance, maintenance, and operations.

1. Final boiler locations indicated on Drawings are approximate. Determine exact locations before roughing-in for piping and electrical connections.

B. Examine mechanical spaces for suitable conditions where boilers will be installed.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 BOILER INSTALLATION

A. Install boilers level on concrete bases. Concrete base is specified in Section 230000 “Basic Mechanical Requirements”, and concrete materials and installation requirements are specified in Section 033000 “Cast-In-Place Concrete”.

B. Install gas-fired boilers according to NFPA 54.

C. Assemble and install boiler trim.

D. Install electrical devices furnished with boiler but not specified to be factory mounted.

E. Install control wiring to field-mounted electrical devices.

3.3 CONNECTIONS

A. Piping installation requirements are specified in other Division 23 sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to boiler to permit service and maintenance.

C. Install piping from equipment drain connection to nearest floor drain. Piping shall be at least full size of connection. Provide an isolation valve if required.

D. Connect gas piping to boiler gas-train inlet with unions. Piping shall be at least full-size gas of train connection. Provide a reducer if required.

E. Connect hot-water piping to supply and return boiler tapings with shutoff valve and union or flange at each connection.

F. Install piping from safety relief valves to nearest floor drain.

G. Boiler Venting:

1. Install flue venting kit and combustion-air intake per manufacturing requirements.
2. Connect venting full size to boiler connections. Comply with requirements in Section 235100 "Breechings, Chimneys, and Stacks."

H. Ground equipment according to Section 260526 "Grounding and Bonding for Electrical Systems."

I. Connect wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

3.4 FIELD QUALITY CONTROL

A. Perform tests and inspections and prepare test reports.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

B. Tests and Inspections

1. Perform installation and startup checks according to manufacturer's written instructions.
2. Perform hydrostatic test. Repair leaks and retest until no leaks exist.
3. Start units to confirm proper motor rotation and unit operation. Adjust air-fuel ratio and combustion.
4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

a. Check and adjust initial operating set points and high- and low-limit safety set points of fuel supply, water level, and water temperature.
b. Set field-adjustable switches and circuit-breaker trip ranges as indicated.

C. Remove and replace malfunctioning units and retest as specified above.

D. Occupancy Adjustments: When requested within two (2) months of date of Substantial Completion, provide on-site assistance adjusting system to suit actual occupied conditions. Provide up to two (2) visits to Project during other than normal occupancy hours for this purpose.

E. Performance Tests:

1. The boiler manufacturer is expected to provide partial load thermal efficiency curves. These thermal efficiency curves must include at least three (3) separate curves at various BTU input levels. If these curves are not available, it is the responsibility of the boiler manufacturer to complete the performance tests.
2. Boilers shall comply with performance requirements indicated, as determined by field performance tests. Adjust, modify, or replace equipment to comply.
3. Perform field performance tests to determine capacity and efficiency of boilers.

a. Test for full capacity.
b. Test for boiler efficiency at low fire twenty, forty, sixty, eighty, one hundred, eighty, sixty, forty, and twenty percent (20, 40, 60, 80, 100, 80, 60, 40 and 20%) of full capacity. Determine efficiency at each test point.

4. Repeat tests until results comply with requirements indicated.
5. Provide analysis equipment required to determine performance.
6. Provide temporary equipment and system modifications necessary to dissipate the heat produced during tests if building systems are not adequate.
7. Notify Architect in advance of test dates.
8. Document test results in a report and submit to Architect.
9. Manufacturers Training: The Owner and Owner representative shall be trained by a factory authorized person for a period of 4 hours.

END OF SECTION 235216

SECTION 237416.13 - PACKAGED ROOFTOP AIR-CONDITIONING UNITS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes packaged, large-capacity, rooftop air-conditioning units (RTUs) with the following components and accessories:

1. Casings.
2. Fans.
3. Motors.
4. Coils.
5. Refrigerant circuit components.
6. Air filtration.
7. Gas furnaces.
8. Dampers.
9. Electrical power connections.
10. Controls.
11. Accessories
12. Roof curbs.

1.3 DEFINITIONS

A. DDC: Direct-digital controls.

B. ECM: Electronically commutated motor.

C. Outdoor-Air Refrigerant Coil: Refrigerant coil in the outdoor-air stream to reject heat during cooling operations and to absorb heat during heating operations. "Outdoor air" is defined as the air outside the building or taken from outdoors and not previously circulated through the system.

D. RTU: Rooftop unit. As used in this Section, this abbreviation means packaged, large-capacity, rooftop air-conditioning units. This abbreviation is used regardless of whether the unit is mounted on the roof or on a concrete base on ground.

E. Supply-Air Fan: The fan providing supply air to conditioned space. "Supply air" is defined as the air entering a space from air-conditioning, heating, or ventilating apparatus.

F. Supply-Air Refrigerant Coil: Refrigerant coil in the supply-air stream to absorb heat (provide cooling) during cooling operations and to reject heat (provide heating) during heating operations. "Supply air" is defined as the air entering a space from air-conditioning, heating, or ventilating apparatus.

1.4 ACTION SUBMITTALS

A. Product Data: Include manufacturer's technical data for each RTU, including rated capacities, dimensions, required clearances, characteristics, furnished specialties, and accessories.

B. Shop Drawings:

1. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
2. Include diagrams for power, signal, and control wiring.

C. Delegated-Design Submittal: For RTU supports indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1. Design Calculations: Calculate requirements for selecting vibration isolators and for designing vibration isolation bases.
2. Detail mounting, securing, and flashing of roof curb to roof structure. Indicate coordinating requirements with roof membrane system.

1.5 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Plans and other details, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Structural members to which RTUs will be attached.
2. Roof openings.
3. Roof curbs and flashing.

B. High Performance Building Design Submittals:

1. Product Data for 16a-38k-3(l): Documentation indicating that units comply with ASHRAE 62.1, Section 5 - "Systems and Equipment."

C. Product Certificates: Submit certification that specified equipment will withstand wind forces identified in "Performance Requirements" Article and in Section 230548 "Vibration and Seismic Controls for HVAC Piping and Equipment."

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculations.
2. Dimensioned Outline Drawings of Equipment Unit: Identify center of wind force and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

D. Seismic Qualification Data: Certificates, for RTUs, accessories, and components, from manufacturer.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
4. Restraint of internal components, including fans, coils, and refrigeration components.

E. Coordination Drawings: Floor plans and other details, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Mechanical-room layout and relationships between components and adjacent structural and mechanical elements.
2. Support location, type, and weight.
3. Field measurements.

F. Field quality-control reports.

G. Sample Warranty: For special warranty.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For RTUs to include in emergency, operation, and maintenance manuals.

1.7 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Fan Belts: Two (2) sets for each belt-driven fan.
2. Filters: Two (2) sets of filters for each unit.

1.8 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of RTUs that fail in materials or workmanship within specified warranty period.

1. Warranty Period for Compressors: Manufacturer's standard, but not less than ten (10) years from date of Substantial Completion.
2. Warranty Period for Gas Furnace Heat Exchangers: Manufacturer's standard, but not less than twenty (20) years from date of Substantial Completion.
3. Warranty Period for Solid-State Ignition Modules: Manufacturer's standard, but not less than three (3) years from date of Substantial Completion.
4. Warranty Period for Control Boards: Manufacturer's standard, but not less than three (3) years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

A. AHRI Compliance:

1. Comply with AHRI 340/360 for testing and rating energy efficiencies for RTUs.
2. Comply with AHRI 270 for testing and rating sound performance for RTUs.
3. Comply with AHRI 1060 for testing and rating performance for air-to-air exchanger.
4. Comply with AHRI 210/240 for testing and rating energy efficiencies for RTUs.

B. AMCA Compliance:

1. Comply with AMCA 11 and bear the AMCA-Certified Ratings Seal for air and sound performance according to AMCA 211 and AMCA 311.
2. Damper leakage tested in accordance with AMCA 500-D.
3. Operating Limits: Classify according to AMCA 99.

C. ASHRAE Compliance:

1. Comply with ASHRAE 15 for refrigeration system safety.
2. Comply with ASHRAE 33 for methods of testing cooling and heating coils.
3. Comply with applicable requirements in ASHRAE 62.1, Section 5 - "Systems and Equipment" and Section 7 - "Construction and Startup."

D. ASHRAE/IES 90.1 Compliance: Applicable requirements in ASHRAE/IES 90.1, Section 6 - "Heating, Ventilating, and Air-Conditioning."

E. NFPA Compliance: Comply with NFPA 90A or NFPA 90B.

F. UL Compliance: Comply with UL 1995.

G. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.2 MANUFACTURERS

A. Trane

B. AAON

C. McQuay

2.3 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design mounting and restraints for RTUs, including comprehensive engineering analysis.

1. Design RTU supports to comply with wind and seismic performance requirements.

B. Wind-Restraint Performance:

1. Refer to Connecticut Requirement.

C. Seismic Performance: RTUs shall withstand the effects of earthquake motions determined according to ASCE 7.

1. The term "withstand" means "the unit will remain in place without separation of any parts when subjected to the seismic forces specified" and the unit will be fully operational after the seismic event.

2.4 CAPACITIES AND CHARACTERISTICS

A. Exterior Casing Thickness: 0.0626-inch-thick.

B. Supply-Air Fan:

1. Fan Type: Belt-driven, double width, forward curved backward inclined, centrifugal.
2. Fan Type: Double width, forward curved, centrifugal.
3. Airflow: Refer to Schedule on Drawings.
4. External Static Pressure: Refer to Schedule on Drawings.
5. Fan Speed: Refer to Schedule on Drawings.

6. Motor Horsepower: Refer to Schedule on Drawings.

C. Relief (Exhaust)-Air Fan:

1. Airflow: Refer to Schedule on Drawings.
2. External Static Pressure: Refer to Schedule on Drawings.
3. Fan Speed: Refer to Schedule on Drawings.
4. Motor Horsepower: Refer to Schedule on Drawings.
5. Motor Speed: Refer to Schedule on Drawings.

D. Motors:

1. Service Factor: 1.15.
2. Motor Bearings: L10.
3. Efficiency: Premium efficient.

E. Supply-Air Refrigerant Coil:

1. Total Cooling Capacity: Refer to Schedule on Drawings.
2. Sensible Cooling Capacity: Refer to Schedule on Drawings.
3. Entering-Air Dry-Bulb Temperature: Refer to Schedule on Drawings.
4. Entering-Air Wet-Bulb Temperature: Refer to Schedule on Drawings.

F. Compressors:

1. Power Input: Refer to Schedule on Drawings.

G. Gas Furnace:

1. Airflow: Refer to Schedule on Drawings.
2. Input: Refer to Schedule on Drawings.
3. Output Refer to Schedule on Drawings.
4. Entering-Air Temperature: Refer to Schedule on Drawings.
5. Air-Temperature Rise: Refer to Schedule on Drawings.

H. Electrical Characteristics for Single-Point Connection:

1. Voltage: Refer to Schedule on Drawings.
2. Phase: Refer to Schedule on Drawings.
3. Hertz: Refer to Schedule on Drawings.
4. Full-Load Amperes: Refer to Schedule on Drawings.
5. Minimum Circuit Ampacity: Refer to Schedule on Drawings.
6. Maximum Overcurrent Protection: Refer to Schedule on Drawings.

2.5 CASINGS

A. General Fabrication Requirements for Casings: Formed and reinforced double-wall insulated panels, fabricated to allow removal for access to internal parts and components, with joints between sections sealed.

B. Double-Wall Construction: Fill space between walls with 2-inch foam insulation and seal moisture tight for R-7 performance.

C. Exterior Casing Material: Galvanized steel with factory-painted finish, with pitched roof panels and knockouts with grommet seals for electrical and piping connections and lifting lugs.

D. Inner Casing Fabrication Requirements:

1. Inside Casing: G-90-coated galvanized steel, 0.034-inch-thick.

E. Corrosion-Resistant Coating: Apply a corrosion-resistant coating capable of withstanding a 3,000-hour salt-spray test according to ASTM B 117.

1. Standards:

a. ASTM B 117 for salt spray.
b. ASTM D 2794 for minimum impact resistance of 100 in-lb.
c. ASTM B 3359 for cross-hatch adhesion of 5B.

F. Casing Insulation and Adhesive: Comply with NFPA 90A or NFPA 90B.

1. Materials: ASTM C 1071, Type I.
2. Thickness: 1-inch.
3. Liner materials shall have air-stream surface coated with an erosion- and temperature-resistant coating or faced with a plain or coated fibrous mat or fabric.
4. Liner Adhesive: Comply with ASTM C 916, Type I.

G. Condensate Drain Pans: Fabricated using stainless 0.025-inch-thick steel sheet, a minimum of 2 inches deep, and complying with ASHRAE 62.1 for design and construction of drain pans.

1. Double-Wall Construction: Fill space between walls with foam insulation and seal moisture tight.
2. Drain Connections: Threaded nipple.

H. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.

2.6 FANS

A. Supply-Air Fans: Aluminum or painted-steel wheels, and galvanized- or painted-steel fan scrolls.

1. Direct-Driven Supply-Air Fans: Motor shall be resiliently mounted in the fan inlet.
2. Belt-Driven Supply-Air Fans: Motors shall be installed on an adjustable fan base resiliently mounted in the casing.

B. Condenser-Coil Fan: Variable-speed propeller, mounted on shaft of permanently lubricated multispeed or ECM motors.

C. Relief-Air Fan: Forward curved or Backward inclined, shaft mounted on permanently lubricated motor.

D. Seismic Fabrication Requirements: Fabricate fan section, internal mounting frame and attachment to fans, fan housings, motors, casings, accessories, and other fan section components with reinforcement strong enough to withstand seismic forces defined in Section 230548 "Vibration and Seismic Controls for HVAC Piping and Equipment" when fan-mounted frame and RTU-mounted frame are anchored to building structure.

2.7 MOTORS

A. Comply with Section 230513 "Common Motor Requirements for HVAC Equipment" and the requirements of this Article.

B. Motor Sizes: Minimum size as indicated. If not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.

C. Service Factor: 1.15.

D. Motor Bearings: L10.

E. Efficiency: Premium efficient.

2.8 COILS

A. Supply-Air Refrigerant Coil:

1. Aluminum copper-plate fin and seamless internally grooved copper tube in steel casing with equalizing-type vertical distributor.
2. Polymer strip shall prevent all copper coil from contacting steel coil frame or condensate pan.
3. Coil Split: Interlaced.
4. Corrosion-Resistant Coating: Apply a corrosion-resistant coating capable of withstanding a 3,000-hour salt-spray test according to ASTM B 117 to base, frame, and casing coils.

    a. Standards:

        1) ASTM B 117 for salt spray.
        2) ASTM D 2794 for minimum impact resistance of 100 in-lb
        3) ASTM B 3359 for cross-hatch adhesion of 5B.

    b. Gloss: Minimum of 50 gloss units on a single-angle, 60-degree meter.

5. Condensate Drain Pan: Stainless-steel formed with pitch and drain connections complying with ASHRAE 62.1.

2.9 REFRIGERANT CIRCUIT COMPONENTS

A. Number of Refrigerant Circuits: As required to meet scheduled capacities.

B. Compressor: Hermetic, variable speed scroll, mounted on vibration isolators; with internal overcurrent and high-temperature protection, internal pressure relief, and crankcase heater.

C. Refrigeration Specialties:

1. Refrigerant: R-410A.
2. Expansion valve with replaceable thermostatic element.
3. Refrigerant filter/dryer.
4. Manual-reset high-pressure safety switch.
5. Automatic-reset low-pressure safety switch.
6. Minimum off-time relay.
7. Automatic-reset compressor motor thermal overload.
8. Brass service valves installed in compressor suction and liquid lines.
9. Low-ambient kit high-pressure sensor.

10. Hot-gas reheat solenoid valve modulating with a replaceable magnetic coil.
11. Hot-gas bypass solenoid valve with a replaceable magnetic coil.
12. Four-way reversing valve with a replaceable magnetic coil, thermostatic expansion valves with bypass check valves, and a suction line accumulator.

2.10 AIR FILTRATION

A. Minimum arrestance and a minimum efficiency reporting value according to ASHRAE 52.2.

B. Flat Panel Filters:

1. Description: Factory-fabricated, self-supported, flat, non-pleated, panel-type, disposable air filters with holding frames.
2. Filter Unit Class: UL 900, Class 1.
3. Media: Interlaced glass or synthetic fibers coated with nonflammable adhesive.

a. Adhesive: As recommended by air-filter manufacturer and with a VOC content of 80 g/L or less.
b. Media shall be coated with an antimicrobial agent.
c. Metal Retainer: Upstream side and downstream side.

2.11 GAS FURNACES

A. Description: Factory assembled, piped, and wired; complying with ANSI Z21.47/CSA 2.3 and NFPA 54.

1. CSA Approval: Designed and certified by and bearing label of CSA.

B. Burners: Stainless-steel.

1. Fuel: Natural gas.
2. Ignition: Electronically controlled electric spark or hot-surface igniter with flame sensor.

C. Heat-Exchanger and Drain Pan: Stainless-steel.

D. Venting: Gravity vented with vertical extension.

E. Power Vent: Integral, motorized centrifugal fan interlocked with gas valve with vertical extension.

F. Safety Controls:

1. Gas Control Valve: Modulating.
2. Gas Train: Single-body, regulated, redundant, 24-V ac gas valve assembly containing pilot solenoid valve, pilot filter, pressure regulator, pilot shutoff, and manual shutoff.

2.12 DAMPERS (MODULATING)

A. Outdoor-Air Damper: Linked damper blades, with motorized damper filter.

B. Outdoor- and Return-Air Mixing Dampers: Opposed-blade galvanized-steel dampers mechanically fastened to cadmium plated for galvanized-steel operating rod in reinforced cabinet. Connect operating rods with common linkage or gears and interconnect so dampers operate simultaneously.

1. Leakage Rate: As required by ASHRAE/IES 90.1.
2. Damper Motor: Modulating with adjustable minimum position.
3. Relief-Air Damper: Gravity actuated or motorized, as required by ASHRAE/IES 90.1, with bird screen and hood.

C. Barometric relief dampers.

2.13 ELECTRICAL POWER CONNECTIONS

A. RTU shall have a single connection of power to unit with unit-mounted disconnect switch accessible from outside unit and control-circuit transformer with built-in overcurrent protection.

2.14 ACCESSORIES

A. Duplex, 115-V, ground-fault-interrupter outlet with 15-A overcurrent protection. Include transformer if required. Outlet shall be energized even if the unit main disconnect is open**.**

B. Low-ambient kit using variable-speed condenser fans for operation down to 30 deg F.

C. Filter differential pressure switch with sensor tubing on either side of filter. Set for final filter pressure loss.

D. Remote potentiometer to adjust minimum economizer damper position.

E. Return-air bypass damper.

F. Factory- or field-installed demand-controlled ventilation.

G. Safeties:

1. Smoke detector.
2. Condensate overflow switch.
3. Phase-loss reversal protection.
4. High- and low-pressure control.
5. Gas furnace airflow-proving switch.

H. Coil guards of painted, galvanized-steel wire.

I. Hail guards of galvanized steel, painted to match casing.

J. Concentric diffuser with white louvers and polished aluminum return grilles, insulated diffuser box with mounting flanges, and interior transition.

K. Vertical vent extensions to increase the separation between the outdoor-air intake and the flue-gas outlet.

L. Door switches to disable heating or reset set point when open.

M. Outdoor air intake weather hood with moisture eliminator.

2.15 ROOF CURBS

A. Roof curbs with vibration isolators and wind or seismic restraints are specified in Section 230548 "Vibration and Seismic Controls for HVAC Piping and Equipment."

B. Wind and Seismic Restraints: Metal brackets compatible with the curb and casing, painted to match RTU, used to anchor unit to the curb, and designed for loads at Project site. Comply with requirements in Section 230548 "Vibration and Seismic Controls for HVAC for Piping and Equipment" for wind-load requirements.

C. Materials: Galvanized steel with corrosion-protection coating, watertight gaskets, and factory-installed wood nailer; complying with NRCA standards.

1. Curb Insulation and Adhesive: Comply with NFPA 90A or NFPA 90B.

a. Materials: ASTM C 1071, Type I or II.
b. Thickness: 2 inches.

2. Application: Factory applied with adhesive and mechanical fasteners to the internal surface of curb.

a. Liner Adhesive: Comply with ASTM C 916, Type I.
b. Mechanical Fasteners: Galvanized steel, suitable for adhesive attachment, mechanical attachment, or welding attachment to duct without damaging liner when applied as recommended by manufacturer and without causing leakage in cabinet.
c. Liner materials applied in this location shall have air-stream surface coated with a temperature-resistant coating or faced with a plain or coated fibrous mat or fabric depending on service air velocity.
d. Liner Adhesive: Comply with ASTM C 916, Type I.

D. Curb Dimensions: Height of 24 inches.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of RTUs.

B. Examine roughing-in for RTUs to verify actual locations of piping and duct connections before equipment installation.

C. Examine roofs for suitable conditions where RTUs will be installed.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Roof Curb: Install on roof structure or concrete base, level and secure, according to NRCA's "NRCA Roofing Manual: Membrane Roof Systems." Install RTUs on curbs and coordinate roof penetrations and flashing with roof construction specified in Section 077200 "Roof Accessories." Secure RTUs to upper curb rail, and secure curb base to roof framing or concrete base with anchor bolts.

B. Unit Support: Install unit level on structural curbs. Coordinate wall penetrations and flashing with wall construction. Secure RTUs to structural support with anchor bolts.

3.3 CONNECTIONS

A. Install condensate drain, minimum connection size, with trap and indirect connection to nearest roof drain or area drain.

B. Install piping adjacent to RTUs to allow service and maintenance.

1. Gas Piping: Comply with applicable requirements in Section 221623 "Natural-Gas Piping." Connect gas piping to burner, full size of gas train inlet, and connect with union and shutoff valve with sufficient clearance for burner removal and service.

C. Duct installation requirements are specified in other HVAC Sections. Drawings indicate the general arrangement of ducts. The following are specific connection requirements:

1. Install ducts to termination at top of roof curb.
2. Remove roof decking only as required for passage of ducts. Do not cut out decking under entire roof curb.
3. Connect supply ducts to RTUs with flexible duct connectors specified in Section 233300 "Air Duct Accessories."
4. Install return-air duct continuously through roof structure.

D. Connect electrical wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

E. Ground equipment according to Section 260526 "Grounding and Bonding for Electrical Systems."

F. Install nameplate for each electrical connection, indicating electrical equipment designation and circuit number feeding connection.

1. Nameplate shall be laminated acrylic or melamine plastic signs as specified in Section 260553 "Identification for Electrical Systems."
2. Nameplate shall be laminated acrylic or melamine plastic signs as layers of black with engraved white letters at least ½-inch-high.
3. Locate nameplate where easily visible.

3.4 FIELD QUALITY CONTROL

A. Perform the following tests and inspections with the assistance of a factory-authorized service representative:

1. After installing RTUs and after electrical circuitry has been energized, test units for compliance with requirements.
2. Inspect for and remove shipping bolts, blocks, and tie-down straps.
3. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

B. RTU will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports.

3.5 STARTUP SERVICE

A. Engage a factory-authorized service representative to perform startup service. Contractor shall not perform startup services.

B. Complete installation and startup checks according to manufacturer's written instructions.

1. Inspect for visible damage to unit casing.
2. Inspect for visible damage to furnace combustion chamber.
3. Inspect for visible damage to compressor, coils, and fans.
4. Inspect internal insulation.
5. Verify that labels are clearly visible.
6. Verify that clearances have been provided for servicing.
7. Verify that controls are connected and operable.
8. Verify that filters are installed.
9. Clean condenser coil and inspect for construction debris.
10. Clean furnace flue and inspect for construction debris.
11. Connect and purge gas line.
12. Remove packing from vibration isolators.
13. Inspect operation of barometric relief dampers.
14. Verify lubrication on fan and motor bearings.
15. Inspect fan-wheel rotation for movement in correct direction without vibration and binding.
16. Adjust fan belts to proper alignment and tension.
17. Start unit according to manufacturer's written instructions.

    a. Start refrigeration system.
    b. Do not operate below recommended low-ambient temperature.
    c. Complete startup sheets and attach copy with Contractor's startup report.

18. Inspect and record performance of interlocks and protective devices; verify sequences.
19. Operate unit for an initial period as recommended or required by manufacturer.
20. Perform the following operations for both minimum and maximum firing. Adjust burner for peak efficiency.

    a. Measure gas pressure on manifold.
    b. Inspect operation of power vents.
    c. Measure combustion-air temperature at inlet to combustion chamber.
    d. Measure flue-gas temperature at furnace discharge.
    e. Perform flue-gas analysis. Measure and record flue-gas carbon dioxide and oxygen concentration.
    f. Measure supply-air temperature and volume when burner is at maximum firing rate and when burner is off. Calculate useful heat to supply air.

21. Calibrate thermostats.
22. Adjust and inspect high-temperature limits.
23. Inspect outdoor-air dampers for proper stroke and interlock with return-air dampers.
24. Start refrigeration system and measure and record the following when ambient is a minimum of 15 deg F above return-air temperature:

    a. Coil leaving-air, dry- and wet-bulb temperatures.
    b. Coil entering-air, dry- and wet-bulb temperatures.
    c. Outdoor-air, dry-bulb temperature.
    d. Outdoor-air-coil, discharge-air, dry-bulb temperature.

25. Inspect controls for correct sequencing of heating, mixing dampers, refrigeration, and normal and emergency shutdown.
26. Measure and record the following minimum and maximum airflows. Plot fan volumes on fan curve.

    a. Supply-air volume.
    b. Return-air volume.
    c. Relief-air volume.
    d. Outdoor-air intake volume.

27. Simulate maximum cooling demand and inspect the following:

    a. Compressor refrigerant suction and hot-gas pressures.
    b. Short circuiting of air through condenser coil or from condenser fans to outdoor-air intake.

28. Verify operation of remote panel including pilot-light operation and failure modes. Inspect the following:

    a. High-temperature limit on gas-fired heat exchanger.
    b. Low-temperature safety operation.
    c. Filter high-pressure differential alarm.
    d. Economizer to minimum outdoor-air changeover.
    e. Relief-air fan operation.
    f. Smoke and firestat alarms.

29. After startup and performance testing and prior to Substantial Completion, replace existing filters with new filters.

3.6 CLEANING AND ADJUSTING

A. Occupancy Adjustments: When requested within twelve (12) months from date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to two (2) visits to Project during other-than-normal occupancy hours for this purpose.

B. After completing system installation and testing, adjusting, and balancing RTU and air-distribution systems, clean filter housings and install new filters.

3.7 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain RTUs for a minimum of 8 hours.

END OF SECTION 237416.13

SECTION 237423 - INDIRECT-FUEL-FIRED, OUTDOOR, HEATING-ONLY MAKE-UP AIR UNITS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes indirect-fired makeup-air units.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product. Include rated capacities, operating characteristics, and furnished specialties and accessories.

B. HPBS Submittals:

1. Product Data for 16a-38k-3(c): Documentation indicating that units comply with applicable requirements in ASHRAE/IESNA 90.1.
2. Product Data for 16a-38k-3(l): Documentation indicating that units comply with ASHRAE 62.1, Section 5 - "Systems and Equipment."
3. Product Data for 16a-38k-6(b)(1): Documentation indicating that units are equipped with a direct outdoor airflow-measuring device capable of measuring the minimum outdoor airflow with accuracy within fifteen percent (15%) of the design minimum airflow rate, as defined by ASHRAE 62.1.
4. Product Data for 16a-38k-3(e): Documentation indicating that units include MERV 13 filters rated according to ASHRAE 52.2.

C. Shop Drawings:

1. Include plans, elevations, sections, and attachment details.
2. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
3. Prepare the following by or under the supervision of a qualified professional engineer:

    a. Mounting Details: For securing and flashing roof curb to roof structure. Indicate coordinating requirements with roof membrane system.
    b. Include diagrams for power, signal, and control wiring.

D. Delegated-Design Submittal: For design of vibration isolation seismic restraints and wind restraints, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1. Unit fabrication and assembly details.
2. Vibration Isolation Base Details: Detail fabrication including anchorages and attachments to structure and to supported equipment. Include adjustable motor bases, rails, and frames for equipment mounting.
3. Design Calculations:

a. Calculate requirements for selecting vibration isolators, seismic restraints, and wind restraints and for designing vibration isolation bases.
b. Indicate compliance with "Performance Requirements" article.

1.4 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Roof-curb mounting details, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Size and location of unit-mounted rails and anchor points and methods for anchoring units to roof curb.
2. Required roof penetrations for ducts, pipes, and electrical raceways, including size and location of each penetration.

B. Seismic Qualification Certificates: For dedicated outdoor-air units, accessories, and components, from manufacturer.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

C. Startup service reports.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For units to include in emergency, operation, and maintenance manuals.

1.6 QUALITY ASSURANCE

A. Product Options: Drawings indicate size, profiles, and dimensional requirements of indirect-fired H&V units and are based on the specific system indicated. Refer to Section 016000 "Product Requirements."

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

C. Comply with NFPA 70.

D. ASHRAE Compliance:
1. Applicable requirements in ASHRAE 62.1-2004, Section 5 - "Systems and Equipment" and Section 7 - "Construction and Startup."
2. Comply with ASHRAE 52.1 for arrestance and ASHRAE 52.2 for MERV for methods of testing and rating air-filter units.

E. ASHRAE/IESNA 90.1-2004 Compliance: Applicable requirements in ASHRAE/IESNA 90.1-2004, Section 6 - "Heating, Ventilating, and Air-Conditioning."

1.7 COORDINATION

A. Coordinate size, location, installation, and structural capacity of roof curbs, equipment supports, and roof penetrations. These items are specified in Section 077200 "Roof Accessories."

B. Coordinate size, location and installation of unit manufacturer's roof curbs and equipment supports with roof Installer.

1. Coordinate installation of restrained vibration isolation roof-curb rails, which are specified in Section 230548 "Vibration and Seismic Controls for HVAC Piping and Equipment."

C. The make-up air unit manufacturer representative shall purchase the Variable Frequency Drives including start up from the local variable frequency drive manufacturer representative. The VFD shall be shipped to the air handling unit manufacturer for factory installation and wiring. The air handling unit manufacturer representative shall coordinate startup of variable frequency drives in field.

1.8 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to replace components listed below of indirect-fired H&V units that fail in materials or workmanship within specified warranty period.

1. Warranty Period for Heat Exchangers: Manufacturer's standard, but not less than five (5) years from date of Substantial Completion.

B. Extended Warranty: One (1) year after final stage Certificate of Occupancy.

1.9 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Filters: One (1) set for each unit.
2. Fan Belts: One (1) set for each unit.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

1. Captive Air System (Basis-of-Design)
2. Ruup Air
3. Greenheck

2.2 SYSTEM DESCRIPTION

A. Factory-assembled, prewired, self-contained unit consisting of cabinet, supply fan, filters indirect-fired gas furnace to be installed outside the building.

B. Unit(s) assembly shall be tested in accordance with Standard, ANSI Z83.8-2006 and CSA 2.6-2006 and shall bear the ETL label. The duct furnace shall be certified by the American Gas Association and approved by the Canadian Gas Association.

2.3 CABINET

A. Unit housing shall be constructed of 20-gauge G-90 galvanized steel. The wall panels and roof panels shall be fabricated by forming double-standing, self-locking seams that require no additional support. The floor and wall panels shall be caulked airtight with a silicone caulk. All casing panels shall be attached with sheet-metal screws or rivets, which can be removed to field service large components. The unit base shall be suitable for curb or flat mount. The base shall be constructed of galvanized steel for improved rigidity. Base shall be structurally reinforced to accommodate the blower assembly and burner. Housing construction should be suitable for outdoor installation.

B. All doors and at least one (1) side of every sheet metal surface of the unit separating two (2) air-masses of different air temperatures shall be faced with properly secured 1-inch aluminum-faced insulation for condensation prevention.

C. The discharge of the unit (Down) shall be internal to the heating module containing the furnaces.

D. All internal electrical components shall be prewired for single point power connection. All electrical components shall be UL listed, recognized or classified where applicable, and wired in compliance with the National Electrical Code. Control center shall include motor starter, control circuit fusing, control transformer for 24 VAC circuit, integral door interlocking disconnect switch, and terminal strip. Contactors, Class 20 adjustable overload protection, and single-phase protection shall be standard.

E. All gas valves and electrical safety-limits shall be mounted within the burner vestibule; wiring to these components shall be properly secured and away from all high temperature metal surfaces. The burner vestibule shall be an integral part of the unit and not extend outside the exterior casing of the unit and not exposed to the main air stream.

F. The vestibule full-size door shall provide easy access to controls and gas-train components. Blower door shall provide easy access to blower, motor, and drives. Access doors shall be provided on both front and back side of unit providing full access to every part of the unit.

G. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1-2004.

2.4 BLOWERS

A. Blower(s) shall be forward-curved, centrifugal, double width, double inlet, constructed G-90 galvanized steel. Unit shall have a heavy-duty, solid-steel shaft. Wheels shall be balanced in two (2) planes and done in accordance with AMCA standard 204-96, Balance Quality and Vibration Levels for Fans. The wheel blades shall be aerodynamically designed to minimize turbulence, increase efficiency, and reduce noise. The wheel blades shall be securely attached to the wheel inlet ring. The wheel shall be firmly attached to the fan shaft with set screws and keys. The blower assembly shall be isolated from the fan structure with vibration isolators.

B. Motors shall be heavy duty ball bearing type and furnished at the specified voltage, phase, and enclosure. Motor mounting plate shall be constructed of heavy gauge galvanized steel and shall be designed to provide easy adjustment of belt tension. Blower motor shall be suitable for operation on 460 volts, 60Hz cycle, 3 phase power.

C. Motor: Premium efficiency, VFD compatible.

1. Variable frequency drives shall be furnished by a single source manufacturer and shall be ABB. Variable frequency drive shall be in accordance with Division 26. The air handling unit manufacturer representative shall purchase the variable frequency drives including the start up from the local variable frequency drive manufacturer representative. The VFD shall be shipped to the air handling unit manufacturer for factory installation and wiring.

D. Shafts shall be precision ground and polished. Heavy duty, pre-lubricated bearings shall be selected for a minimum (L50) life in excess of 200,000 hours of operation at maximum cataloged operating speed. They shall be designed for, and individually tested specifically for use in air handling applications.

E. Belts shall be oil and heat resistant, non-static, grip-notch type. Drives shall be cast type, precision machined and keyed and secured attached to the fan and motor shafts. Fan operating speed shall be factory set using adjustable pitch motor pulleys; motors over 3 HP will come standard with double groove pulleys.

2.5 OUTDOOR-AIR INTAKE

A. Outdoor-Air Hood: Galvanized steel with rain baffles, bird screen complying with ASHRAE 62.1-2004, and finish to match cabinet; and sized to supply maximum one hundred percent (100%) outdoor air.

2.6 AIR FILTERS

A. Comply with UL 900.

B. Comply with NFPA 90A.

C. Filters: MERV 13.

2.7 DAMPERS

A. Outdoor-Air Damper: Galvanized-steel, opposed-blade dampers with vinyl blade seals and stainless-steel jamb seals, having a maximum leakage of 10 cfm/sq. ft. of damper area, at differential pressure of 2-inch wg.

B. Damper Operator: Direct coupled, electronic with spring return or fully modulating as required by the control sequence. Operator shall be manufactured by Belimo.

2.8 INDIRECT-FIRED GAS FURNACE

A. The gas burner shall be an indirect-fired, push-through type, sized to provide as scheduled using (natural) gas at an inlet-supply pressure to the unit of 7 to 14 inches water column.

B. The burner shall be capable of heating the entire air supply from -10F° to 70F° (80 degrees F temperature rise). Burner shall be a tubular in-shot fired design capable of using natural gas. Each burner ignition shall be of the direct-spark design with remote flame sensing at inlet of the last firing tube of the gas manifold. Each burner ignition module shall be pre-programmed with an ignition sequence comprised of a 1-minute pre-purge, 1-minute inter-purge, 2-minute post-purge, 15-second ignition, three (3) trials for ignition, and 60-minute lockout.

C. Direct-sparking sequence shall last through the complete during of the trial for ignition period for guaranteed light-off. Burner shall always be lit at maximum gas flow and combustion airflow for

guaranteed light-off. Each burner ignition module shall have LED indicators for troubleshooting and a set of exposed prongs for testing flame indication signal.

D. All furnaces shall be controlled by an electronic vernier-type fully modulating control system capable of achieving eighty percent (80%) combustion efficiency over the entire gas firing range of the unit.

E. Each furnace shall have:

1. A minimum turndown ratio of 6:1 for natural gas and 5:1 for LP gas.
2. Each furnace heat exchanger shall be a bent-tube style design made entirely of type 409 stainless-steel.
3. Each furnace shall include a blocked vent safety airflow switch with high temperature silicone tubing operating off absolute pressure measured inside of the power-vent blower housing.
4. Each furnace shall include a high temperature auto-recycling limit with a maximum non-adjustable set-point of 200F.
5. Each furnace shall include a manual reset high temperature flame roll out switch with a non-adjustable set-point of 325F.
6. Each furnace shall be accessible from both sides of unit.
7. Each furnace shall include a power-vent assembly for exhausting flue gases with a type PSC type motor that is securely mounted with rubber vibration isolators and easily accessible/removable for service.
8. Every heat-exchanger shall have a manufacturer-backed ten (10) year pro-rated warranty, with optional upgrade to ten (10) year full heat exchanger warranty.
9. Every power-vent blower motor and housing shall have a standard one (1) year manufacturer-backed warranty.
10. Each furnace module gas inlet shall be equipped with a 0-35” w.c. gas pressure gauge. A 0-10” w.c. gas pressure gauge shall be installed on the gas manifold of each furnace.

F. All gas equipment shall conform to local-code requirements.

1. Components:

a. Modulating-gas valve.
b. On/Off redundant gas valve.
c. Burner.
d. Main-gas shut-off valve.
e. Main-gas regulator.
f. Two (2) solenoid valves.
g. All gas manifold components shall be piped and wired at the factory.

G. Safety Controls:

1. Vent Flow Verification: Flame rollout switch.
2. Control Transformer: 24-V ac.
3. High Limit: Thermal switch or fuse to stop burner.
4. Gas Train: Regulated, redundant, 24-V ac gas valve assembly containing pilot solenoid valve, electronic-modulating temperature control valve, pilot filter, pressure regulator, pilot shutoff, and manual shutoff all in one (1) body.
5. Purge-period timer shall automatically delay burner ignition and bypass low-limit control.
6. Gas Manifold: Safety switches and controls to comply with ANSI standards and IRI.
7. Airflow Proving Switch: Differential pressure switch senses correct airflow before energizing pilot.

8. Automatic-Reset, High-Limit Control Device: Stops burner and closes main gas valve if high-limit temperature is exceeded.
9. Safety Lockout Switch: Locks out ignition sequence if burner fails to light after three (3) tries. Controls are reset manually by turning the unit off and on.
10. Electronic flame safety relay.
11. Main airflow safety switch.
12. Flame roll-out switch.

2.9 CONTROLS

A. Fan Control: Interlock fan to start with exhaust fan(s). Refer to Sections 233423 “HVAC Power Ventilators” and 230993 “Sequence of Operations for HVAC Controls" for exhaust fan controls.

B. Fan Control: Interlock fan to start with exhaust fan(s) to which this heating and ventilating unit is associated for makeup air.

2.10 MOTORS

A. Comply with requirements in Section 230513 "Common Motor Requirements for HVAC Equipment."

2.11 CAPACITIES AND CHARACTERISTICS: Refer to Schedule on Drawings.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting installation of indirect-fired H&V units.

B. Examine roughing-in for piping, ducts, and electrical systems to verify actual locations of connections before equipment installation.

C. Examine roof curbs and equipment supports for suitable conditions where rooftop replacement-air units will be installed.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install gas-fired units according to NFPA 54, "National Fuel Gas Code."

B. Install restrained vibration isolation roof-curb rails on roof structure according to NRCA's "Low-Slope Membrane Roofing Construction Details Manual," Illustration "Raised Curb Detail for Rooftop Air Handling Units and Ducts." Install and secure indirect-fired H&V units on rails, and coordinate roof penetrations and flashing with roof construction. Restrained isolation roof-curb rails are specified in Section 230548 "Vibration and Seismic Controls for HVAC Piping and Equipment."

C. Install suspended units from spring hangers with minimum 1-inch static deflection; refer to Section 230548 "Vibration and Seismic Controls for HVAC Piping and Equipment."

3.3 CONNECTIONS

A. Piping Connections: Drawings indicate general arrangement of piping, fittings, and specialties. Install piping adjacent to machine to allow service and maintenance.

1. Gas Piping: Comply with requirements in Section 221623 "Natural-Gas Piping". Connect gas piping with shutoff valve and union and with sufficient clearance for burner removal and service. Provide AGA-approved flexible connectors.

B. Duct Connections: Duct installation requirements are specified in Section 233113 "Metal Ducts." Drawings indicate the general arrangement of ducts. Connect supply and return ducts to indirect-fired H&V units with flexible duct connectors. Flexible duct connectors are specified in Section 233300 "Air Duct Accessories."

C. Ground equipment according to Section 260526 "Grounding and Bonding for Electrical Systems."

D. Connect wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

3.4 STARTUP SERVICE

A. Engage a factory-authorized service representative to perform startup service.

B. Complete installation and startup checks according to manufacturer's written instructions and perform the following:

1. Inspect for visible damage to furnace combustion chamber.
2. Inspect casing insulation for integrity, moisture content, and adhesion.
3. Verify that clearances have been provided for servicing.
4. Verify that controls are connected and operable.
5. Verify that filters are installed.
6. Purge gas line.
7. Inspect and adjust vibration isolators and seismic restraints.
8. Verify bearing lubrication.
9. Inspect fan-wheel rotation for movement in correct direction without vibration and binding.
10. Adjust fan belts to proper alignment and tension.
11. Start unit according to manufacturer's written instructions.
12. Complete startup sheets and attach copy with Contractor's startup report.
13. Inspect and record performance of interlocks and protective devices; verify sequences.
14. Operate unit for run-in period recommended by manufacturer.
15. Perform the following operations for both minimum and maximum firing and adjust burner for peak efficiency:

    a. Gas Burner:

        1) Measure gas pressure at manifold.
        2) Measure combustion-air temperature at inlet to combustion chamber.
        3) Measure supply-air temperature and volume when burner is at maximum firing rate and when burner is off. Calculate useful heat to supply air.

16. Calibrate thermostats.
17. Adjust and inspect high-temperature limits.
18. Inspect dampers, if any, for proper stroke and interlock with return-air dampers.

19. Start evaporative cooler system and measure and record the following:

    a. Leaving-air, dry- and wet-bulb temperatures.
    b. Entering-air, dry- and wet-bulb temperatures.

20. Inspect controls for correct sequencing of heating, mixing dampers, refrigeration, and normal and emergency shutdown.
21. Measure and record airflow. Plot fan volumes on fan curve.
22. Verify operation of remote panel, including pilot-operation and failure modes. Inspect the following:

    a. High-limit heat.
    b. Alarms.

23. After startup and performance testing, change filters, verify bearing lubrication, and adjust belt tension.

C. Remove and replace malfunctioning components that do not pass tests and inspections and retest as specified above.

D. Prepare written report of the results of startup services.

3.5 ADJUSTING

A. Adjust initial temperature set points.

B. Set field-adjustable switches and circuit-breaker trip ranges as indicated.

C. Occupancy Adjustments: When requested within twelve (12) months of date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to two (2) visits to Project during other-than-normal occupancy hours for this purpose.

3.6 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain indirect-fired H&V units. Refer to Section 017900 "Demonstration and Training."

B. Video record training sessions for a minimum of 4 hours.

END OF SECTION 237334

SECTION 238126 - SPLIT-SYSTEM AIR-CONDITIONERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 DESIGN REQUIREMENTS

A. The environmental control system shall be a self-contained factory assembled unit. The refrigeration system shall be split, with the compressor located in a remote condensing unit. The evaporator section shall be specifically designed for floor mounted installation and serviceable from the front of the system. Condensing units shall be designed for outdoor.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, and furnished specialties and accessories. Include performance data in terms of capacities, outlet velocities, static pressures, sound power characteristics, motor requirements, and electrical characteristics.

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
2. Wiring Diagrams: For power, signal, and control wiring.

1.4 INFORMATION SUBMITTALS

A. Field quality-control reports.

B. Warranty: Sample of special warranty.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For split-system air-conditioning units to include in emergency, operation, and maintenance manuals.

1.6 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. The specified system shall be factory tested before shipment. Testing shall include but shall not be limited to: Quality Control Checks, “HiPot” Test (two (2) times rated voltage plus 1000 volts, per NRTL agency requirements), and Metering Calibration Tests. The system shall be designed and manufactured according to world class quality standards. The manufacturer shall be ISO 9001 certified.

C. ASHRAE Compliance:

1. Fabricate and label refrigeration system to comply with ASHRAE 15, "Safety Standard for Refrigeration Systems."
2. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1-2004, Section 4 - "Outdoor Air Quality," Section 5 - "Systems and Equipment," Section 6 - " Procedures," and Section 7 - "Construction and System Start-Up."

D. ASHRAE/IESNA Compliance: Applicable requirements in ASHRAE/IESNA 90.1-2004.

1.7 COORDINATION

A. Coordinate sizes and locations of roof curbs, equipment supports, and roof penetrations with actual equipment provided.

1.8 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of split-system air-conditioning units that fail in materials or workmanship within specified warranty period.

1. Warranty Period:

a. For Units: One (1) year from date of substantial completion.
b. For Compressor: Five (5) years from date of Substantial Completion.

1.9 EXTRA MATERIALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Filters: One (1) set for each indoor unit.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

1. Mitsubishi
2. LG
3. Hitachi

2.2 EXTERIOR CONDENSING UNIT

A. The air-conditioner system shall consist of a horizontal discharge. Unit shall have a variable speed compressor.

2.3 INTERIOR MOUNTED UNIT

A. The indoor unit shall be factory assembled, wired, and tested. Contained within the unit shall be all factory wiring and internal piping, control circuit board, and fan motor. The unit, in conjunction with the wired wall-mounted controller, wireless wall-mounted controller, or wireless handheld controller, shall have a self-diagnostic function, 3-minute time delay mechanism, an auto restart function, and a test run switch. Indoor unit and refrigerant pipes shall be purged

with dry nitrogen before shipment from the factory. Unit shall be equipped with a factory installed internal condensate pump, evaporator frost control, auto reset, low ambient cooling with wind baffle (0 deg. F). The controller shall be a wired wall mounted remote.

B. Unit Cabinet:

1. The cabinet shall be formed from high strength molded plastic with smooth finish, flat front panel design with access for filter. Cabinet color shall be white. The unit shall be wall mounted by means of a factory supplied, pre-drilled, mounting plate.

C. Fan:

1. The indoor unit fan shall be high performance, double inlet, forward curve, direct drive sirocco fan with a single motor. The fans shall be statically and dynamically balanced and run on a motor with permanently lubricated bearings. The indoor fan shall consist of three (3) speeds: Low, Mid, and Hi and Auto. The fan shall have a selectable Auto fan setting that will adjust the fan speed based on the difference between controller set-point and space temperature.

D. Vane:

1. There shall be a motorized horizontal vane to automatically direct air flow in a horizontal and downward direction for uniform air distribution. The horizontal vane shall significantly decrease downward air resistance for lower sound levels and shall close the outlet port when operation is stopped. There shall also be a set of vertical vanes to provide horizontal swing airflow movement.

E. Filter: Return air shall be filtered by means of an easily removable washable filter.

F. Coil:

1. The evaporator coil shall be of nonferrous construction with pre-coated aluminum strake fins on copper tubing. The multi-angled heat exchanger shall have a modified fin shape that reduces air resistance for a smoother, quieter airflow. All tube joints shall be brazed with PhosCopper or silver alloy. The coils shall be pressure tested at the factory. A condensate pan and drain shall be provided under the coil. An optional drain pan level switch (DPLS1), designed to connect to the control board, shall be provided if required, and installed on the condensate pan to prevent condensate from overflowing. [Option: A condensate mini-pump shall be provided to provide a means of condensate disposal when a gravity drain is not available.]

G. Electrical:

1. The electrical power of the unit shall be 208 volts or 230 volts, 1 phase, 60 hertz. The system shall be capable of satisfactory operation within voltage limits of 187 volts to 253 volts. The power to the indoor unit shall be supplied from the outdoor unit.

H. Performance:

1. Each system shall perform in accordance to the ratings shown on the Schedules on the Drawings. Cooling performance shall be based on 80°F DB, 67°F WB (26.7°C DB, 19.4°C WB) for the indoor unit and 95°F DB, 75°F WB (35°C DB, 29.3°C WB) for the outdoor unit.

I. System Controller:

1. The control system shall be a LG Programmable Thermostat **#PREMTB10U**. The unit shall have backlit LCD display, Auto/Cool/Dry/Heat/Fan only operation, four (4) different fan speeds, controller lock function, system error code display, time of day scheduling, five (5) events per day with control of occ/unocc, on/off, mode, setpoints, and fan speed. Controller shall communicate by one (1) channel/rs-485 v-net.

2.4 OUTDOOR UNIT

A. The outdoor unit shall be compatible with all the different types of interior units. The connected indoor unit shall be of the same capacity as the outdoor unit.

B. The outdoor unit shall be equipped with an electronic control board that interfaces with the indoor unit to perform all necessary operation functions.

C. The outdoor unit shall be capable of operating at one hundred percent (100%) capacity at 0°F (-18°C) ambient temperature without additional low ambient controls (optional wind baffle is required).

D. Cabinet:

1. The casing shall be constructed from galvanized steel plate, finished with an electrostatically applied, thermally fused acrylic or polyester powder coating for corrosion protection and have a Munsell 3Y 7.8/1.1 finish.
2. Mounting feet shall be provided and shall be welded to the base of the cabinet and be of sufficient size to afford reliable equipment mount and stability.
3. Easy access shall be afforded to all serviceable parts by means of removable panel sections.
4. Cabinet mounting and construction shall be sufficient to withstand 155 MPH wind speed conditions for use in hurricane condition areas. Mounting, base support, and other installation to meet hurricane code conditions shall be by others.

E. Fan:

1. The fan blade(s) shall be of aerodynamic design for quiet operation, and the fan motor bearings shall be permanently lubricated.
2. The outdoor unit shall have horizontal discharge airflow. The fan shall be mounted in front of the coil, pulling air across it from the rear and dispelling it through the front. The fan shall be provided with a raised guard to prevent external contact with moving parts.

F. Coil:

1. The L-shaped condenser coil shall be of copper tubing with flat aluminum fins to reduce debris build up and allow maximum airflow. The coil shall be protected with an integral metal guard.
2. Refrigerant flow from the condenser shall be controlled by means of an electronic linear expansion valve (LEV) metering device. The LEV shall be controlled by a microprocessor-controlled step motor.
3. All refrigerant lines between outdoor and indoor units shall be of annealed, refrigeration grade copper tubing, ARC Type, meeting ASTM B 280 requirements, individually insulated in twin-tube, flexible, closed-cell, CFC-free (ozone depletion potential of zero), elastomeric material for the insulation of refrigerant pipes and tubes with thermal conductivity equal to or better than 0.27 BTU-inch/hour per sq. ft./°F, a water vapor transmission equal to or better than 0.08 Perm-inch and superior fire ratings such that insulation will not contribute significantly to fire and up to 1-inch-thick insulation shall

have a Flame-Spread Index of less than 25 and a Smoke-Development Index of less than 50 as tested by ASTM E 84 and CAN/ULC S-102.

G. Compressor:

1. The compressor for models **PUY-A12/18/24/30/36NHA4** shall be a DC twin-rotor rotary compressor with Variable Speed Inverter Drive Technology. The compressor for model **PUY-A42NHA4** shall be a frame compliant scroll compressor with Variable Speed Inverter Drive Technology.
2. The compressor shall be driven by inverter circuit to control compressor speed. The compressor speed shall dynamically vary to match the room load for significantly increasing the efficiency of the system which shall result in significant energy savings.
3. To prevent liquid from accumulating in the compressor during the off cycle, a minimal amount of current shall be automatically, intermittently applied to the compressor motor windings to maintain sufficient heat to vaporize any refrigerant. No crankcase heater is to be used.
4. The outdoor unit shall have an accumulator and high-pressure safety switch. The compressor shall be mounted to avoid the transmission of vibration.

H. Electrical:

1. The electrical power of the unit shall be 208 or 230 volts, single phase, 60 hertz. The unit shall be capable of satisfactory operation within voltage limits of 187 volts to 253 volts.
2. Power for the indoor unit shall be supplied from the outdoor unit.
3. The outdoor unit shall be controlled by the microprocessor located in the indoor unit. The control signal between the indoor unit and the outdoor unit shall be pulse signal 24 volts DC.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install units level and plumb.

B. Install evaporator-fan components using manufacturer's standard mounting devices securely fastened to building structure.

C. Install roof-mounted, compressor-condenser components on equipment supports specified in Section 077200 "Roof Accessories." Anchor units to supports with removable, cadmium-plated fasteners.

D. Install seismic restraints.

E. Install compressor-condenser components on restrained, spring isolators with a minimum static deflection of 1-inch. See Section 230548 "Vibration and Seismic Controls for HVAC Piping and Equipment."

F. Install and connect pre-charged refrigerant tubing to component's quick-connect fittings. Install tubing to allow access to unit.

3.2 CONNECTIONS

A. Coordinate piping installations and specialty arrangements with schematics on Drawings and with requirements specified in piping systems. If Drawings are explicit enough, these requirements may be reduced or omitted.

B. Piping installation requirements are specified in other Division 23 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

C. Where piping is installed adjacent to unit, allow space for service and maintenance of unit.

3.3 FIELD QUALITY CONTROL

A. Perform tests and inspections.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

B. Test and Inspections:

1. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest unit no leaks exist.
2. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
4. Remove and replace malfunctioning units and retest as specified above.
5. Prepare test and inspection reports.

3.4 STARTUP SERVICE

A. Engage a factory-authorized service representative to perform **s**tartup service.

B. Complete installation and startup checks according to manufacturer's written instructions.

3.5 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain units for a minimum of 2 hours. Refer to Section 017900 "Demonstration and Training."

END OF SECTION 238126

SECTION 260500 - COMMON WORK RESULTS FOR ELECTRICAL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Electrical equipment coordination and installation.
2. Sleeves for raceways and cables.
3. Sleeve seals.
4. Grout.
5. Common electrical installation requirements.

1.3 DEFINITIONS

A. EPDM: Ethylene-propylene-diene terpolymer rubber.

B. NBR: Acrylonitrile-butadiene rubber.

1.4 SUBMITTALS

A. Product Data: For sleeve seals.

1.5 COORDINATION

A. Coordinate arrangement, mounting, and support of electrical equipment:

1. To allow maximum possible headroom unless specific mounting heights that reduce headroom are indicated.
2. To provide for ease of disconnecting the equipment with minimum interference to other installations.
3. To allow right of way for piping and conduit installed at required slope.
4. So connecting raceways, cables, wireways, cable trays, and busways will be clear of obstructions and of the working and access space of other equipment.

B. Coordinate installation of required supporting devices and set sleeves in cast-in-place concrete, masonry walls, and other structural components as they are constructed.

C. Coordinate location of access panels and doors for electrical items that are behind finished surfaces or otherwise concealed. Access doors and panels are specified in Section 083113 "Access Doors and Frames."

D. Coordinate sleeve selection and application with selection and application of firestopping specified in Section 078413 "Penetration Firestopping."

PART 2 - PRODUCTS

2.1 SLEEVES FOR RACEWAYS AND CABLES

A. Steel Pipe Sleeves: ASTM A 53, Type E, Grade B, Schedule 40, galvanized steel, plain ends.

B. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral water stop, unless otherwise indicated.

C. Sleeves for Rectangular Openings: Galvanized sheet steel.

1. Minimum Metal Thickness:

a. For sleeve cross-section rectangle perimeter less than 50 inches and no side more than 16 inches, thickness shall be 0.052-inch.
b. For sleeve cross-section rectangle perimeter equal to, or more than, 50 inches and one (1) or more sides equal to, or more than, 16 inches, thickness shall be 0.138-inch.

2.2 SLEEVE SEALS

A. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and raceway or cable.

1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one (1) of the following:

a. Advance Products & Systems, Inc.
b. Calpico, Inc.
c. Metraflex Co.
d. Pipeline Seal and Insulator, Inc.

2. Sealing Elements: EPDM and/or NBR interlocking links shaped to fit surface of cable or conduit. Include type and number required for material and size of raceway or cable.
3. Pressure Plates: Stainless steel. Include two (2) for each sealing element.
4. Connecting Bolts and Nuts: Stainless steel of length required to secure pressure plates to sealing elements. Include one (1) for each sealing element.

2.3 GROUT

A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, nonmetallic aggregate grout, noncorrosive, non-staining, mixed with water to consistency suitable for application and a 30-minute working time.

PART 3 - EXECUTION

3.1 COMMON REQUIREMENTS FOR ELECTRICAL INSTALLATION

A. Comply with NECA 1.

B. Measure indicated mounting heights to bottom of unit for suspended items and to center of unit for wall-mounting items.

C. Headroom Maintenance: If mounting heights or other location criteria are not indicated, arrange and install components and equipment to provide maximum possible headroom consistent with these requirements.

D. Equipment: Install to facilitate service, maintenance, and repair or replacement of components of both electrical equipment and other nearby installations. Connect in such a way as to facilitate future disconnecting with minimum interference with other items in the vicinity.

E. Right of Way: Give to piping systems installed at a required slope.

3.2 SLEEVE INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Electrical penetrations occur when raceways, cables, wireways, cable trays, or busways penetrate concrete slabs, concrete or masonry walls, or fire-rated floor and wall assemblies.

B. Concrete Slabs and Walls: Install sleeves for penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of slabs and walls.

C. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.

D. Fire-Rated Assemblies: Install sleeves for penetrations of fire-rated floor and wall assemblies unless openings compatible with firestop system used are fabricated during construction of floor or wall.

E. Cut sleeves to length for mounting flush with both surfaces of walls.

F. Extend sleeves installed in floors 2 inches above finished floor level.

G. Size pipe sleeves to provide ½-inch annular clear space between sleeve and raceway or cable, unless indicated otherwise.

H. Seal space outside of sleeves with grout for penetrations of concrete and masonry

1. Promptly pack grout solidly between sleeve and wall so no voids remain. Tool exposed surfaces smooth; protect grout while curing.

I. Interior Penetrations of Non-Fire-Rated Walls and Floors: Seal annular space between sleeve and raceway or cable, using joint sealant appropriate for size, depth, and location of joint. Comply with requirements in Section 079200 "Joint Sealants."

J. Fire-Rated-Assembly Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at raceway and cable penetrations. Install sleeves and seal raceway and cable penetration sleeves with firestop materials. Comply with requirements in Section 078413 "Penetration Firestopping."

K. Roof-Penetration Sleeves: Seal penetration of individual raceways and cables with flexible boot-type flashing units applied in coordination with roofing work.

L. Aboveground, Exterior-Wall Penetrations: Seal penetrations using steel pipe sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.

M. Underground, Exterior-Wall Penetrations: Install cast-iron pipe sleeves. Size sleeves to allow for 1-inch annular clear space between raceway and sleeve for installing mechanical sleeve seals.

3.3 SLEEVE-SEAL INSTALLATION

A. Install to seal exterior wall penetrations.

B. Use type and number of sealing elements recommended by manufacturer for raceway or cable material and size. Position raceway or cable in center of sleeve. Assemble mechanical sleeve seals and install them in annular space between raceway or cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

3.4 FIRESTOPPING

A. Apply firestopping to penetrations of fire-rated floor and wall assemblies for electrical installations to restore original fire-resistance rating of assembly. Firestopping materials and installation requirements are specified in Section 078413 "Penetration Firestopping."

3.5 COMISSIONING OF EQUIPMENT

A. Engage a factory authorized service representative, who is familiar with this project, to participate and assist, if necessary, in the functional performance testing of the equipment included in this Division with the Commissioning Agent.

END OF SECTION 260500

SECTION 260509 - ELECTRICAL DEMOLITION REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Demolition involving electrical system as described in Contract Documents.

B. Related Sections:

1. Section 260500 “Common Work Results for Electrical”
2. New and replacement work specified in appropriate specification sections.

1.3 SCHEDULING

A. Include on Construction Schedule sequence of individual electrical demolition operations.

B. Coordinate with Owner for equipment and materials to be removed by Owner.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 EXAMINATION

A. All relocations, reconnections and removals are not necessarily indicated on Drawings. All such work shall be included without additional cost to the Owner.

3.2 PREPARATION

A. Disconnect equipment that is to be removed or relocated. Carefully remove, disassemble, or dismantle as required, and store in approved location on site, existing items to be reused in completed work.

B. Where affected by demolition or new construction, relocate, extend, or repair raceways, conductors, outlets, and apparatus to allow continued use of electrical system. Use methods and materials as specified for new construction.

3.3 PERFORMANCE

A. Perform drilling, cutting, block-offs and demolition work required for removal of necessary portions of electrical system. Do not cut joists, beams, girders, trusses, or columns without prior written permission from the Architect.

B. Remove concealed wiring abandoned due to demolition or new construction. Remove circuits, conduits and conductors that are not to be re-used back to next active fixture, device or junction box.

C. Patch, repair, and finish surfaces affected by electrical demolition work, unless work is specifically called for under other Sections of the specifications.

3.4 CLEANING

A. Remove obsolete raceways, conductors, apparatus, and lighting fixtures promptly from site and dispose of legally.

END OF SECTION 260509

SECTION 260519 - LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Building wires and cables rated 600 V and less.
2. Connectors, splices, and terminations rated 600 V and less.
3. Sleeves and sleeve seals for cables.

B. Related Sections include the following:

1. Section 271500 "Communications Horizontal Cabling" for cabling used for voice and data circuits.

1.3 DEFINITIONS

A. EPDM: Ethylene-propylene-diene terpolymer rubber.

B. NBR: Acrylonitrile-butadiene rubber.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Qualification Data: For testing agency.

C. Field quality-control test reports.

1.5 QUALITY ASSURANCE

A. Testing Agency Qualifications: An independent agency, with the experience and capability to conduct the testing indicated, that is a member company of the InterNational Electrical Testing Association or is a nationally recognized testing laboratory (NRTL) as defined by OSHA in 29 CFR 1910.7, and that is acceptable to authorities having jurisdiction.

1. Testing Agency's Field Supervisor: Person currently certified by the InterNational Electrical Testing Association or the National Institute for Certification in Engineering Technologies to supervise on-site testing specified in Part 3.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

C. Comply with NFPA 70.

1.6 COORDINATION

A. Set sleeves in cast-in-place concrete, masonry walls, and other structural components as they are constructed.

PART 2 - PRODUCTS

2.1 CONDUCTORS AND CABLES

A. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

1. Alcan Products Corporation; Alcan Cable Division
2. American Insulated Wire Corp.; a Leviton Company
3. General Cable Corporation
4. Senator Wire & Cable Company
5. Southwire Company
6. Belden

B. Copper Conductors: Comply with NEMA WC 70.

C. Conductor Insulation: Comply with NEMA WC 70 for Types THHN-THWN.

D. Multiconductor Cable: Comply with NEMA WC 70 for metal-clad cable, Type MC, mineral-insulated, and metal-sheathed cable, Type MI with ground wire.

2.2 CONNECTORS AND SPLICES

A. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

1. AFC Cable Systems, Inc.
2. Hubbell Power Systems, Inc.
3. O-Z/Gedney; EGS Electrical Group LLC
4. 3M; Electrical Products Division
5. Tyco Electronics Corp.

B. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.

2.3 SLEEVES FOR CABLES

A. Steel Pipe Sleeves: ASTM A 53, Type E, Grade B, Schedule 40, galvanized steel, plain ends.

B. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral water stop, unless otherwise indicated.

C. Sleeves for Rectangular Openings: Galvanized sheet steel with minimum 0.052- or 0.138-inch thickness as indicated and of length to suit application.

D. Coordinate sleeve selection and application with selection and application of firestopping specified in Section 078413 "Penetration Firestopping."

2.4 SLEEVE SEALS

A. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

1. Advance Products & Systems, Inc.
2. Calpico, Inc.
3. Metraflex Co.
4. Pipeline Seal and Insulator, Inc.

B. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and cable.

1. Sealing Elements: EPDM interlocking links shaped to fit surface of cable or conduit. Include type and number required for material and size of raceway or cable.
2. Pressure Plates: Stainless steel. Include two (2) for each sealing element.
3. Connecting Bolts and Nuts: Stainless steel of length required to secure pressure plates to sealing elements. Include one (1) for each sealing element.

PART 3 - EXECUTION

3.1 CONDUCTOR MATERIAL APPLICATIONS

A. Feeders: Copper for all feeders including service entrance cables. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

B. Branch Circuits: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

3.2 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

A. Service Entrance: Type THHN-THWN, single conductors in raceway.

B. Exposed Feeders: Type THHN-THWN, single conductors in raceway.

C. Feeders Concealed in Ceilings, Walls, Partitions, and Crawlspaces: Type THHN-THWN, single conductors in raceway.

D. Feeders Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN-THWN, single conductors in raceway.

E. Feeders in Cable Tray: Type THHN-THWN, single conductors in raceway and metal-clad cable, Type MC.

F. Exposed Branch Circuits, Including in Crawlspaces: Type THHN-THWN, single conductors in raceway.

G. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Type THHN-THWN, single conductors in raceway and metal-clad cable, Type MC.

H. Branch Circuits Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN-THWN, single conductors in raceway.

I. Branch Circuits Installed Below Raised Flooring: Type THHN-THWN, single conductors in raceway and metal-clad cable, Type MC.

J. Branch Circuits in Cable Tray: Type THHN-THWN, single conductors in raceway and metal-clad cable, Type MC.

K. Cord Drops and Portable Appliance Connections: Type SO, hard service cord with stainless-steel, wire-mesh, strain relief device at terminations to suit application.

L. Class 1 Control Circuits: Type THHN-THWN, in raceway.

M. Class 2 Control Circuits: Type THHN-THWN, in raceway Power-limited cable, concealed in building finishes, Power-limited tray cable, in cable tray.

3.3 INSTALLATION OF CONDUCTORS AND CABLES

A. Conceal cables in finished walls, ceilings, and floors, unless otherwise indicated.

B. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.

C. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.

D. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.

E. Support cables according to Section 260529 "Hangers and Supports for Electrical Systems."

F. Identify and color-code conductors and cables according to Section 260553 "Identification for Electrical Systems."

3.4 CONNECTIONS

A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

B. Make splices and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than un-spliced conductors.

C. Wiring at Outlets: Install conductor at each outlet, with at least 12 inches of slack.

3.5 SLEEVE INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Coordinate sleeve selection and application with selection and application of firestopping specified in Section 078413 "Penetration Firestopping."

B. Concrete Slabs and Walls: Install sleeves for penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of slabs and walls.

C. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.

D. Rectangular Sleeve Minimum Metal Thickness:

1. For sleeve rectangle perimeter less than 50 inches and no side greater than 16 inches, thickness shall be 0.052-inch.
2. For sleeve rectangle perimeter equal to, or greater than, 50 inches and one (1) or more sides equal to, or greater than, 16 inches, thickness shall be 0.138-inch.

E. Fire-Rated Assemblies: Install sleeves for penetrations of fire-rated floor and wall assemblies unless openings compatible with firestop system used are fabricated during construction of floor or wall.

F. Cut sleeves to length for mounting flush with both wall surfaces.

G. Extend sleeves installed in floors 2 inches above finished floor level.

H. Size pipe sleeves to provide ¼-inch annular clear space between sleeve and cable unless sleeve seal is to be installed or unless seismic criteria require different clearance.

I. Seal space outside of sleeves with grout for penetrations of concrete and masonry and with approved joint compound for gypsum board assemblies.

J. Interior Penetrations of Non-Fire-Rated Walls and Floors: Seal annular space between sleeve and cable, using joint sealant appropriate for size, depth, and location of joint according to Section 079200 "Joint Sealants."

K. Fire-Rated-Assembly Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at cable penetrations. Install sleeves and seal with firestop materials according to Section 078413 "Penetration Firestopping."

L. Roof-Penetration Sleeves: Seal penetration of individual cables with flexible boot-type flashing units applied in coordination with roofing work.

M. Aboveground Exterior-Wall Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Size sleeves to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.

N. Underground Exterior-Wall Penetrations: Install cast-iron "wall pipes" for sleeves. Size sleeves to allow for 1-inch annular clear space between cable and sleeve for installing mechanical sleeve seals.

3.6 SLEEVE-SEAL INSTALLATION

A. Install to seal underground exterior-wall penetrations.

B. Use type and number of sealing elements recommended by manufacturer for cable material and size. Position cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

3.7 FIRESTOPPING

A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly according to Section 078413 "Penetration Firestopping."

3.8 FIELD QUALITY CONTROL

A. Perform tests and inspections and prepare test reports.

B. Tests and Inspections:

1. After installing conductors and cables and before electrical circuitry has been energized, test service entrance and feeder conductors for compliance with requirements.
2. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
3. Infrared Scanning: After Substantial Completion, but not more than sixty (60) days after Final Acceptance, perform an infrared scan of each splice in cables and conductors No. 3 AWG and larger. Remove box and equipment covers so splices are accessible to portable scanner.
    a. Instrument: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
    b. Record of Infrared Scanning: Prepare a certified report that identifies splices checked and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

C. Test Reports: Prepare a written report to record the following:

1. Test procedures used.
2. Test results that comply with requirements.
3. Test results that do not comply with requirements and corrective action taken to achieve compliance with requirements.

D. Remove and replace malfunctioning units and retest as specified above.

END OF SECTION 260519

SECTION 260523 - CONTROL-VOLTAGE ELECTRICAL POWER CABLES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. UTP cabling.
2. 50/125 and 62.5/125-micrometer, multimode optical fiber cabling.
3. RS-232 cabling.
4. RS-485 cabling.
5. Low-voltage control cabling.
6. Control-circuit conductors.
7. Identification products.

1.3 DEFINITIONS

A. Basket Cable Tray: A fabricated structure consisting of wire mesh bottom and side rails.

B. Channel Cable Tray: A fabricated structure consisting of a one-piece, ventilated-bottom or solid-bottom channel section.

C. EMI: Electromagnetic interference.

D. IDC: Insulation displacement connector.

E. Ladder Cable Tray: A fabricated structure consisting of two longitudinal side rails connected by individual transverse members (rungs).

F. Low Voltage: As defined in NFPA 70 for circuits and equipment operating at less than 50 V or for remote-control and signaling power-limited circuits.

G. Open Cabling: Passing telecommunications cabling through open space (e.g., between the studs of a wall cavity).

H. RCDD: Registered Communications Distribution Designer.

I. Solid-Bottom or Nonventilated Cable Tray: A fabricated structure consisting of integral or separate longitudinal side rails, and a bottom without ventilation openings.

J. Trough or Ventilated Cable Tray: A fabricated structure consisting of integral or separate longitudinal rails and a bottom having openings sufficient for the passage of air and using seventy-five percent (75%) or less of the plan area of the surface to support cables.

K. UTP: Unshielded twisted pair.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: For cable tray layout, showing cable tray route to scale, with relationship between the tray and adjacent structural, electrical, and mechanical elements. Include the following:

1. Vertical and horizontal offsets and transitions.
2. Clearances for access above and to side of cable trays.
3. Vertical elevation of cable trays above the floor or bottom of ceiling structure.
4. Load calculations to show dead and live loads as not exceeding manufacturer's rating for tray and its support elements.

C. Qualification Data: For qualified layout technician, installation supervisor, and field inspector.

D. Source quality-control reports.

E. Field quality-control reports.

F. Maintenance Data: For wire and cable to include in maintenance manuals.

1.5 QUALITY ASSURANCE

A. Testing Agency Qualifications: Member company of a NRTL.

1. Testing Agency's Field Supervisor: Currently certified by BICSI as an RCDD to supervise on-site testing.

B. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E 84 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Flame-Spread Index: 25 or less.
2. Smoke-Developed Index: 50 or less.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Test cables upon receipt at Project site.

1. Test optical fiber cable to determine the continuity of the strand end to end. Use optical fiber flashlight or optical loss test set.
2. Test optical fiber cable on reels. Use an optical time domain reflectometer to verify the cable length and locate cable defects, splices, and connector; include the loss value of each. Retain test data and include the record in maintenance data.
3. Test each pair of UTP cable for open and short circuits.

1.7 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install UTP and optical fiber cables and connecting materials until wet work in spaces is complete and dry, and temporary HVAC system is

operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

PART 2 - PRODUCTS

2.1 PATHWAYS

A. Support of Open Cabling: NRTL labeled for support of Category 6A and Category 6 cabling, designed to prevent degradation of cable performance and pinch points that could damage cable.

1. Support brackets with cable tie slots for fastening cable ties to brackets.
2. Lacing bars, spools, J-hooks, and D-rings.
3. Straps and other devices.

B. Cable Trays:

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

a. Cable Management Solutions, Inc.
b. Cablofil Inc.
c. Cooper B-Line, Inc.
d. Cope - Tyco/Allied Tube & Conduit
e. GS Metals Corp.

2. Cable Tray Materials: Metal, suitable for indoors and protected against corrosion by electroplated zinc galvanizing, complying with ASTM B 633, Type 1, not less than 0.000472-inch-thick hot-dip galvanizing, complying with ASTM A 123, Grade 0.55, not less than 0.002165-inch-thick.

a. Basket Cable Trays: Minimum 6 inches wide and 2 inches deep. Wire mesh spacing shall not exceed 2 by 4 inches.
b. Trough or Ventilated Cable Trays: Minimum nominally 6 inches wide.
c. Ladder Cable Trays: Nominally 18 inches wide, and a rung spacing of 12 inches.
d. Channel Cable Trays: One-piece construction, nominally 4 inches wide. Slot spacing shall not exceed 4½ inches o.c.
e. Solid-Bottom or Nonventilated Cable Trays: One-piece construction, nominally 12 inches wide. Provide with solid covers.

C. Conduit and Boxes: Comply with requirements in Section 260533 "Raceway and Boxes for Electrical Systems." Flexible metal conduit shall not be used.

1. Outlet boxes shall be no smaller than 2 inches wide, 3 inches high, and 2½ inches deep.

2.2 BACKBOARDS

A. Description: Plywood, fire-retardant treated, ¾ by 48 by 96 inches. Comply with requirements for plywood backing panels in Section 061000 "Rough Carpentry."

2.3 UTP CABLE

A. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

1. Berk-Tek; a Nexans company
2. CommScope, Inc.
3. Mohawk; a division of Belden CDT
4. Superior Essex Inc.

B. Description: 100-ohm, 4-pair UTP, formed into 25-pair, binder groups covered with a blue thermoplastic jacket unless color is otherwise specified in another section.

1. Comply with ICEA S-90-661 for mechanical properties.
2. Comply with TIA/EIA-568-B.1 for performance specifications.
3. Comply with TIA/EIA-568-B.2, Category 6.
4. Listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with UL 444 and NFPA 70 for the following types:

a. Communications, Plenum Rated: Type CMP complying with UL 1685.
b. Communications, Riser Rated: Type CMP or Type CMR in metallic conduit installed per NFPA 70, Article 300.22, "Wiring in Ducts, Plenums, and Other Air-Handling Spaces."

2.4 UTP CABLE HARDWARE

A. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

1. Hubbell Premise Wiring
2. Orthotronics
3. Leviton Voice & Data Division
4. Panduit Corp.

B. UTP Cable Connecting Hardware: IDC type, using modules designed for punch-down caps or tools. Cables shall be terminated with connecting hardware of the same category or higher.

C. Connecting Blocks: 110 style for Category 6. Provide blocks for the number of cables terminated on the block, plus twenty-five percent (25%) spare; integral with connector bodies, including plugs and jacks where indicated.

2.5 OPTICAL FIBER CABLE

A. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

1. Berk-Tek; a Nexans company
2. ADC
3. Corning Cable Systems
4. American Technology Systems Industries, Inc.
5. Dynacom Corporation

B. Description: Unless modified by another section - Multimode, 50/125-micrometer, 12-fiber, nonconductive, tight buffer, optical fiber cable.

1. Comply with ICEA S-83-596 for mechanical properties.
2. Comply with TIA/EIA-568-B.3 for performance specifications.
3. Comply with TIA/EIA-492AAAA-B for detailed specifications.
4. Listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with UL 444, UL 1651, and NFPA 70 for the following types:

a. General Purpose, Nonconductive: Type OFN or OFNG.
b. Riser Rated, Nonconductive: Type OFNR, complying with UL 1666.

5. Maximum Attenuation: 3.50 dB/km at 850 nm; 1.5 dB/km at 1300 nm.
6. Minimum Modal Bandwidth: 160 MHz-km at 850 nm; 500 MHz-km at 1300 nm.
7. Plenum Rated, Nonconductive: Type OFNP, complying with NFPA 262.

C. Jacket:

1. Jacket Color: Aqua for 50/125-micrometer cable.
2. Cable cordage jacket, fiber, unit, and group color shall be according to TIA/EIA-598-B.
3. Imprinted with fiber count, fiber type, and aggregate length at regular intervals not to exceed 40 inches.

2.6 OPTICAL FIBER CABLE HARDWARE

A. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

1. Berk-Tek; a Nexans company
2. Corning Cable Systems
3. Dynacom Corporation
4. CommScope, Inc.
5. Siemon Co. (The)

B. Cable Connecting Hardware: Comply with the Fiber Optic Connector Intermateability Standards (FOCIS) specifications of TIA/EIA-604-2, TIA/EIA-604-3-A, and TIA/EIA-604-12. Comply with TIA/EIA-568-B.3.

1. Quick-connect, simplex and duplex, Type SC, Type ST, Type LC, Type MT-RJ connectors. Insertion loss not more than 0.75 dB.
2. Type SFF connectors may be used in termination racks, panels, and equipment packages.

2.7 RS-232 CABLE

A. Plenum-Rated Cable: NFPA 70, Type CMP.

1. Paired, two (2) pairs, No. 22 AWG, stranded (7x30) tinned-copper conductors.
2. Plastic insulation.
3. Individual aluminum foil-polyester tape shielded pairs with one hundred percent (100%) shield coverage.
4. Plastic jacket.
5. Pairs are cabled on common axis with No. 24 AWG, stranded (7x32) tinned-copper drain wire.
6. Flame Resistance: Comply with NFPA 262.

2.8 RS-485 CABLE

A. Plenum-Rated Cable: NFPA 70, Type CMP.

1. Paired, two (2) pairs, No. 22 AWG, stranded (7x30) tinned-copper conductors.
2. Fluorinated ethylene propylene insulation.
3. Unshielded.
4. Fluorinated ethylene propylene jacket.

5. Flame Resistance: NFPA 262, Flame Test.

2.9 LOW-VOLTAGE CONTROL CABLE

A. Plenum-Rated, Paired Cable: NFPA 70, Type CMP.

1. One (1) pair, twisted, No. 16 AWG, stranded (19x29) tinned-copper conductors.
2. PVC insulation.
3. Unshielded.
4. PVC jacket.
5. Flame Resistance: Comply with NFPA 262.

B. Plenum-Rated, Paired Cable: NFPA 70, Type CMP.

1. One (1) pair, twisted, No. 18 AWG, stranded (19x30) tinned-copper conductors.
2. Fluorinated ethylene propylene insulation.
3. Unshielded.
4. Plastic jacket.
5. Flame Resistance: NFPA 262, Flame Test.

2.10 CONTROL-CIRCUIT CONDUCTORS

A. Class 1 Control Circuits: Stranded copper, Type THHN-THWN, in raceway, complying with UL 83 and/or UL 44.

B. Class 2 Control Circuits: Stranded copper, Type THHN-THWN, in raceway, Type XHHN, in raceway, power-limited cable, concealed in building finishes, power-limited tray cable, in cable tray, complying with UL 83 and/or UL 44.

C. Class 3 Remote-Control and Signal Circuits: Stranded copper, Type TW or Type TF, complying with UL 83.

2.11 IDENTIFICATION PRODUCTS

A. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

1. Brady Corporation
2. HellermannTyton
3. Kroy LLC
4. Panduit Corp.

B. Comply with UL 969 for a system of labeling materials, including label stocks, laminating adhesives, and inks used by label printers.

C. Comply with requirements in Section 260553 "Identification for Electrical Systems."

2.12 SOURCE QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to evaluate cables.

B. Factory test UTP and optical fiber cables on reels according to TIA/EIA-568-B.1.

C. Factory test UTP cables according to TIA/EIA-568-B.2.

D. Factory test multimode optical fiber cables according to TIA/EIA-526-14-A and TIA/EIA-568-B.3.

E. Cable will be considered defective if it does not pass tests and inspections.

F. Prepare test and inspection reports.

PART 3 - EXECUTION

3.1 INSTALLATION OF PATHWAYS

A. Cable Trays: Comply with NEMA VE 2 and TIA/EIA-569-A-7.

B. Comply with TIA/EIA-569-A for pull-box sizing and length of conduit and number of bends between pull points.

C. Comply with requirements in Section 260533 "Raceway and Boxes for Electrical Systems" for installation of conduits and wireways.

D. Install manufactured conduit sweeps and long-radius elbows if possible.

E. Pathway Installation in Equipment Rooms:

1. Position conduit ends adjacent to a corner on backboard if a single piece of plywood is installed or in the corner of room if multiple sheets of plywood are installed around perimeter walls of room.
2. Install cable trays to route cables if conduits cannot be located in these positions.
3. Secure conduits to backboard if entering room from overhead.
4. Extend conduits 3 inches above finished floor.
5. Install metal conduits with grounding bushings and connect with grounding conductor to grounding system.

F. Backboards: Install backboards with 96-inch dimension vertical. Butt adjacent sheets tightly and form smooth gap-free corners and joints.

3.2 INSTALLATION OF CONDUCTORS AND CABLES

A. Comply with NECA 1.

B. General Requirements for Cabling:

1. Comply with TIA/EIA-568-B.1.
2. Comply with BICSI ITSIM, Ch. 6, "Cable Termination Practices."
3. Terminate all conductors; no cable shall contain unterminated elements. Make terminations only at indicated outlets, terminals, and cross-connect and patch panels.
4. Cables may not be spliced. Secure and support cables at intervals not exceeding 30 inches and not more than 6 inches from cabinets, boxes, fittings, outlets, racks, frames, and terminals.
5. Bundle, lace, and train conductors to terminal points without exceeding manufacturer's limitations on bending radii, but not less than radii specified in BICSI ITSIM, "Cabling Termination Practices" Chapter. Install lacing bars and distribution spools.
6. Do not install bruised, kinked, scored, deformed, or abraded cable. Do not splice cable between termination, tap, or junction points. Remove and discard cable if damaged during installation and replace it with new cable.

7. Cold-Weather Installation: Bring cable to room temperature before dereeling. Heat lamps shall not be used for heating.
8. Pulling Cable: Comply with BICSI ITSIM, Ch. 4, "Pulling Cable." Monitor cable pull tensions.

C. UTP Cable Installation:

1. Comply with TIA/EIA-568-B.2.
2. Install 110-style IDC termination hardware unless otherwise indicated.
3. Do not untwist UTP cables more than 1/2 inch from the point of termination to maintain cable geometry.

D. Installation of Control-Circuit Conductors:

1. Install wiring in raceways. Comply with requirements specified in Section 260533 "Raceway and Boxes for Electrical Systems."

E. Optical Fiber Cable Installation:

1. Comply with TIA/EIA-568-B.3.
2. Cable shall be terminated on connecting hardware that is rack or cabinet mounted.

F. Open-Cable Installation:

1. Install cabling with horizontal and vertical cable guides in telecommunications spaces with terminating hardware and interconnection equipment.
2. Suspend copper cable not in a wireway or pathway a minimum of 8 inches above ceilings by cable supports not more than 60 inches apart.
3. Cable shall not be run through structural members or in contact with pipes, ducts, or other potentially damaging items.

G. Installation of Cable Routed Exposed under Raised Floors:

1. Install plenum-rated cable only.
2. Install cabling after the flooring system has been installed in raised floor areas.
3. Coil cable 72 inches long shall be neatly coiled not less than 12 inches in diameter below each feed point.

H. Separation from EMI Sources:

1. Comply with BICSI TDMM and TIA/EIA-569-A recommendations for separating unshielded copper voice and data communication cable from potential EMI sources, including electrical power lines and equipment.
2. Separation between open communications cables or cables in nonmetallic raceways and unshielded power conductors and electrical equipment shall be as follows:

    a. Electrical Equipment Rating Less Than 2 kVA: A minimum of 5 inches.
    b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 12 inches.
    c. Electrical Equipment Rating More Than 5 kVA: A minimum of 24 inches.

3. Separation between communications cables in grounded metallic raceways and unshielded power lines or electrical equipment shall be as follows:

    a. Electrical Equipment Rating Less Than 2 kVA: A minimum of 2½ inches.
    b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 6 inches.

c. Electrical Equipment Rating More Than 5 kVA: A minimum of 12 inches.

4. Separation between communications cables in grounded metallic raceways and power lines and electrical equipment located in grounded metallic conduits or enclosures shall be as follows:

   a. Electrical Equipment Rating Less Than 2 kVA: No requirement.
   b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 3 inches.
   c. Electrical Equipment Rating More Than 5 kVA: A minimum of 6 inches.

5. Separation between Cables and Electrical Motors and Transformers, 5 kVA or HP and Larger: A minimum of 48 inches.
6. Separation between Cables and Fluorescent Fixtures: A minimum of 5 inches.

3.3 REMOVAL OF CONDUCTORS AND CABLES

A. Remove abandoned conductors and cables.

3.4 CONTROL-CIRCUIT CONDUCTORS

A. Minimum Conductor Sizes:

1. Class 1 remote-control and signal circuits, No 14 AWG.
2. Class 2 low-energy, remote-control, and signal circuits, No. 16 AWG.
3. Class 3 low-energy, remote-control, alarm, and signal circuits, No 12 AWG.

3.5 FIRESTOPPING

A. Comply with requirements in Section 078413 "Penetration Firestopping."

B. Comply with TIA/EIA-569-A, Annex A, "Firestopping."

C. Comply with BICSI TDMM, "Firestopping Systems" Article.

3.6 GROUNDING

A. For data communication wiring, comply with ANSI-J-STD-607-A and with BICSI TDMM, "Grounding, Bonding, and Electrical Protection" Chapter.

B. For low-voltage wiring and cabling, comply with requirements in Section 260526 "Grounding and Bonding for Electrical Systems."

3.7 IDENTIFICATION

A. Identify system components, wiring, and cabling according to TIA/EIA-606-A. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

3.8 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Tests and Inspections:

1. Visually inspect UTP and optical fiber cable jacket materials for UL or third-party certification markings. Inspect cabling terminations to confirm color-coding for pin

assignments, and inspect cabling connections to confirm compliance with TIA/EIA-568-B.1.

2. Visually inspect cable placement, cable termination, grounding and bonding, equipment and patch cords, and labeling of all components.
3. Test UTP cabling for DC loop resistance, shorts, opens, intermittent faults, and polarity between conductors. Test operation of shorting bars in connection blocks. Test cables after termination but not after cross connection.

    a. Test instruments shall meet or exceed applicable requirements in TIA/EIA-568-B.2. Perform tests with a tester that complies with performance requirements in "Test Instruments (Normative)" Annex, complying with measurement accuracy specified in "Measurement Accuracy (Informative)" Annex. Use only test cords and adapters that are qualified by test equipment manufacturer for channel or link test configuration.

4. Optical Fiber Cable Tests:

    a. Test instruments shall meet or exceed applicable requirements in TIA/EIA-568-B.1. Use only test cords and adapters that are qualified by test equipment manufacturer for channel or link test configuration.
    b. Link End-to-End Attenuation Tests:

        1) Multimode Link Measurements: Test at 850 or 1300 nm in one direction according to TIA/EIA-526-14-A, Method B, One Reference Jumper.
        2) Attenuation test results for links shall be less than 2.0 dB. Attenuation test results shall be less than that calculated according to equation in TIA/EIA-568-B.1.

C. Document data for each measurement. Print data for submittals in a summary report that is formatted using Table 10.1 in BICSI TDMM as a guide, or transfer the data from the instrument to the computer, save as text files, print, and submit.

D. End-to-end cabling will be considered defective if it does not pass tests and inspections.

E. Prepare test and inspection reports.

END OF SECTION 260523

SECTION 260526 - GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes grounding systems and equipment, plus the following special applications:

1. Underground distribution grounding.
2. Foundation steel electrodes.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. As-Built Data: Plans showing dimensioned as-built locations of grounding features specified in "Field Quality Control" Article, including the following:

1. Test wells.
2. Ground rods.
3. Ground rings.
4. Grounding arrangements and connections for separately derived systems.
5. Grounding for sensitive electronic equipment.

C. Qualification Data: For qualified testing agency and testing agency's field supervisor.

D. Field quality-control reports.

E. Operation and Maintenance Data: For grounding to include in emergency, operation, and maintenance manuals. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:

1. Instructions for periodic testing and inspection of grounding features at test wells, ground rings, and grounding connections for separately derived systems based on NETA MTS and NFPA 70B.

a. Tests shall determine if ground-resistance or impedance values remain within specified maximums, and instructions shall recommend corrective action if values do not.
b. Include recommended testing intervals.

1.4 QUALITY ASSURANCE

A. Testing Agency Qualifications: Member company of NETA or a NRTL.

1. Testing Agency's Field Supervisor: Currently certified by NETA to supervise on-site testing.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. Comply with UL 467 for grounding and bonding materials and equipment.

PART 2 - PRODUCTS

2.1 CONDUCTORS

A. Insulated Conductors: Copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.

B. Bare Copper Conductors:

1. Solid Conductors: ASTM B 3.
2. Stranded Conductors: ASTM B 8.
3. Tinned Conductors: ASTM B 33.
4. Bonding Cable: 28 kcmil, 14 strands of No. 17 AWG conductor, ¼-inch in diameter.
5. Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.
6. Bonding Jumper: Copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches wide and 1/16-inch-thick.
7. Tinned Bonding Jumper: Tinned-copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches wide and 1/16-inch-thick.

C. Grounding Bus: Predrilled rectangular bars of annealed copper, ¼ by 4 inches in cross section, with 9/32-inch holes spaced 1-1/8 inches apart. Stand-off insulators for mounting shall comply with UL 891 for use in switchboards, 600 V. Lexan or PVC, impulse tested at 5000 V.

2.2 CONNECTORS

A. Listed and labeled by an NRTL acceptable to authorities having jurisdiction for applications in which used and for specific types, sizes, and combinations of conductors and other items connected.

B. Bolted Connectors for Conductors and Pipes: Copper or copper alloy, pressure type with at least two (2) bolts.

1. Pipe Connectors: Clamp type, sized for pipe.

C. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.

D. Bus-bar Connectors: Mechanical type, cast silicon bronze, solderless compression and exothermic-type wire terminals, and long-barrel, two-bolt connection to ground bus bar.

2.3 GROUNDING ELECTRODES

A. Ground Rods: Copper-clad, sectional type; ¾ inch in diameter by 10 feet.

B. Chemical-Enhanced Grounding Electrodes: Copper tube, straight or L-shaped, charged with nonhazardous electrolytic chemical salts.

1. Termination: Factory-attached No. 4/0 AWG bare conductor at least 48 inches long.
2. Backfill Material: Electrode manufacturer's recommended material.

PART 3 - EXECUTION

3.1 APPLICATIONS

A. Conductors: Install solid conductor for No. 8 AWG and smaller, and stranded conductors for No. 6 AWG and larger unless otherwise indicated.

B. Underground Grounding Conductors: Install bare tinned-copper conductor, No. 2/0 AWG minimum.

1. Bury at least 24 inches below grade.
2. Duct-Bank Grounding Conductor: Bury 12 inches above duct bank when indicated as part of duct-bank installation.

C. Isolated Grounding Conductors: Green-colored insulation with continuous yellow stripe. On feeders with isolated ground, identify grounding conductor where visible to normal inspection, with alternating bands of green and yellow tape, with at least three (3) bands of green and two (2) bands of yellow.

D. Grounding Bus: Install in electrical and network equipment rooms, in rooms housing service equipment, and elsewhere as indicated.

1. Install bus on insulated spacers 2 inches minimum from wall, 6 inches above finished floor unless otherwise indicated.
2. Where indicated on both sides of doorways, route bus up to top of door frame, across top of doorway, and down to specified height above floor; connect to horizontal bus.

E. Conductor Terminations and Connections:

1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
2. Underground Connections: Welded connectors except at test wells and as otherwise indicated.
3. Connections to Ground Rods at Test Wells: Bolted connectors.
4. Connections to Structural Steel: Welded connectors.

3.2 GROUNDING AT THE SERVICE

A. Equipment grounding conductors and grounding electrode conductors shall be connected to the ground bus. Install a main bonding jumper between the neutral and ground buses.

3.3 GROUNDING SEPARATELY DERIVED SYSTEMS

A. Generator: Install grounding electrode(s) at the generator location. The electrode shall be connected to the equipment grounding conductor and to the frame of the generator.

3.4 GROUNDING UNDERGROUND DISTRIBUTION SYSTEM COMPONENTS

A. Comply with IEEE C2 grounding requirements.

B. Grounding Manholes: Install a driven ground rod through manhole floor, close to wall, and set rod depth so 4 inches will extend above finished floor. If necessary, install ground rod before manhole is placed and provide No. 1/0 AWG bare, tinned-copper conductor from ground rod into manhole through a waterproof sleeve in manhole wall. Protect ground rods passing through concrete floor with a double wrapping of pressure-sensitive insulating tape or heat-

shrunk insulating sleeve from 2 inches above to 6 inches below concrete. Seal floor opening with waterproof, non-shrink grout.

C. Grounding Connections to Manhole Components: Bond exposed-metal parts such as inserts, cable racks, pulling irons, ladders, and cable shields within each manhole, to ground rod or grounding conductor. Make connections with No. 4 AWG minimum, stranded, hard-drawn copper bonding conductor. Train conductors level or plumb around corners and fasten to manhole walls. Connect to cable armor and cable shields according to written instructions by manufacturer of splicing and termination kits.

D. Pad-Mounted Transformers and Switches: Install two ground rods and ground ring around the pad. Ground pad-mounted equipment and noncurrent-carrying metal items associated with substations by connecting them to underground cable and grounding electrodes. Install tinned-copper conductor not less than No. 2 AWG for ground ring and for taps to equipment grounding terminals. Bury ground ring not less than 6 inches from the foundation.

3.5 EQUIPMENT GROUNDING

A. Install insulated equipment grounding conductors with the following items, in addition to those required by NFPA 70:

1. Feeders and branch circuits.
2. Lighting circuits.
3. Receptacle circuits.
4. Single-phase motor and appliance branch circuits.
5. Three-phase motor and appliance branch circuits.
6. Flexible raceway runs.
7. Metal-clad cable runs.
8. Busway Supply Circuits: Install insulated equipment grounding conductor from grounding bus in the switchgear, switchboard, or distribution panel to equipment grounding bar terminal on busway.
9. Computer and Rack-Mounted Electronic Equipment Circuits: Install insulated equipment grounding conductor in branch-circuit runs from equipment-area power panels and power-distribution units.

B. Air-Duct Equipment Circuits: Install insulated equipment grounding conductor to duct-mounted electrical devices operating at 120 V and more, including air cleaners, heaters, dampers, humidifiers, and other duct electrical equipment. Bond conductor to each unit and to air duct and connected metallic piping.

C. Water Heater, Heat-Tracing, and Anti-frost Heating Cables: Install a separate insulated equipment grounding conductor to each electric water heater and heat-tracing cable. Bond conductor to heater units, piping, connected equipment, and components.

D. Isolated Grounding Receptacle Circuits: Install an insulated equipment grounding conductor connected to the receptacle grounding terminal. Isolate conductor from raceway and from panelboard grounding terminals. Terminate at equipment grounding conductor terminal of the applicable derived system or service unless otherwise indicated.

E. Isolated Equipment Enclosure Circuits: For designated equipment supplied by a branch circuit or feeder, isolate equipment enclosure from supply circuit raceway with a nonmetallic raceway fitting listed for the purpose. Install fitting where raceway enters enclosure, and install a separate insulated equipment grounding conductor. Isolate conductor from raceway and from panelboard grounding terminals. Terminate at equipment grounding conductor terminal of the applicable derived system or service unless otherwise indicated.

F. Signal and Communication Equipment: In addition to grounding and bonding required by NFPA 70, provide a separate grounding system complying with requirements in TIA/ATIS J-STD-607-A.

1. For telephone, alarm, voice and data, and other communication equipment, provide No. 4 AWG minimum insulated grounding conductor in raceway from grounding electrode system to each service location, terminal cabinet, wiring closet, and central equipment location.
2. Service and Central Equipment Locations and Wiring Closets: Terminate grounding conductor on a ¼-by-4-by-12-inch grounding bus.
3. Terminal Cabinets: Terminate grounding conductor on cabinet grounding terminal.

G. Metal Poles Supporting Outdoor Lighting Fixtures: Install grounding electrode and a separate insulated equipment grounding conductor in addition to grounding conductor installed with branch-circuit conductors.

3.6 INSTALLATION

A. Grounding Conductors: Route along shortest and straightest paths possible unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.

B. Ground Rods: Drive rods until tops are 2 inches below finished floor or final grade unless otherwise indicated.

1. Interconnect ground rods with grounding electrode conductor below grade and as otherwise indicated. Make connections without exposing steel or damaging coating if any.
2. For grounding electrode system, install at least three (3) rods spaced at least one-rod length from each other and located at least the same distance from other grounding electrodes, and connect to the service grounding electrode conductor.

C. Test Wells: Ground rod driven through drilled hole in bottom of handhole. Handholes are specified in Section 260543 "Underground Ducts and Raceways for Electrical Systems," and shall be at least 12 inches deep, with cover.

1. Test Wells: Install at least one (1) test well for each service unless otherwise indicated. Install at the ground rod electrically closest to service entrance. Set top of test well flush with finished grade or floor.

D. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance except where routed through short lengths of conduit.

1. Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate any adjacent parts.
2. Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install bonding so vibration is not transmitted to rigidly mounted equipment.
3. Use exothermic-welded connectors for outdoor locations; if a disconnect-type connection is required, use a bolted clamp.

E. Grounding and Bonding for Piping:

1. Metal Water Service Pipe: Install insulated copper grounding conductors, in conduit, from building's main service equipment, or grounding bus, to main metal water service entrances to building. Connect grounding conductors to main metal water service pipes;

use a bolted clamp connector or bolt a lug-type connector to a pipe flange by using one (1) of the lug bolts of the flange. Where a dielectric main water fitting is installed, connect grounding conductor on street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.

2. Water Meter Piping: Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with a bolted connector.
3. Bond each aboveground portion of gas piping system downstream from equipment shutoff valve.

F. Bonding Interior Metal Ducts: Bond metal air ducts to equipment grounding conductors of associated fans, blowers, electric heaters, and air cleaners. Install tinned bonding jumper to bond across flexible duct connections to achieve continuity.

G. Grounding for Steel Building Structure: Install a driven ground rod at base of each corner column and at intermediate exterior columns at distances not more than 60 feet apart.

H. Ground Ring: Install a grounding conductor, electrically connected to each building structure ground rod and to each steel column and/or indicated item, extending around the perimeter of building, area, and/or item indicated.

1. Install tinned-copper conductor not less than No. 2/0 AWG for ground ring and for taps to building steel.
2. Bury ground ring not less than 24 inches from building's foundation.

I. Ufer Ground (Concrete-Encased Grounding Electrode): Fabricate according to NFPA 70; use a minimum of 20 feet of bare copper conductor not smaller than No. 4 AWG.

1. If concrete foundation is less than 20 feet long, coil excess conductor within base of foundation.
2. Bond grounding conductor to reinforcing steel in at least four (4) locations and to anchor bolts. Extend grounding conductor below grade and connect to building's grounding grid or to grounding electrode external to concrete.

3.7 LABELING

A. Comply with requirements in Section 260553 "Identification for Electrical Systems" Article for instruction signs. The label or its text shall be green.

B. Install labels at the telecommunications bonding conductor and grounding equalizer and at the grounding electrode conductor where exposed.

1. Label Text: "If this connector or cable is loose or if it must be removed for any reason, notify the facility manager."

3.8 FIELD QUALITY CONTROL

A. Perform tests and inspections.

1. Manufacturer's Field Service: Contractor shall engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

B. Tests and Inspections:

1. After installing grounding system but before permanent electrical circuits have been energized, test for compliance with requirements.
2. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with a calibrated torque wrench according to manufacturer's written instructions.
3. Test completed grounding system at each location where a maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal**,** at ground test wells, and at individual ground rods. Make tests at ground rods before any conductors are connected.

    a. Measure ground resistance no fewer than two (2) full days after last trace of precipitation and without soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance.
    b. Perform tests by fall-of-potential method according to IEEE 81.

4. Prepare dimensioned Drawings locating each test well, ground rod and ground-rod assembly, and other grounding electrodes. Identify each by letter in alphabetical order, and key to the record of tests and observations. Include the number of rods driven and their depth at each location, and include observations of weather and other phenomena that may affect test results. Describe measures taken to improve test results.

C. Grounding system will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

E. Report measured ground resistances that exceed the following values:

1. Power and Lighting Equipment or System with Capacity of 500 kVA and Less: 10 ohms.
2. Power and Lighting Equipment or System with Capacity of 500 to 1000 kVA: 5 ohms.
3. Power and Lighting Equipment or System with Capacity More Than 1000 kVA: 3 ohms.
4. Power Distribution Units or Panelboards Serving Electronic Equipment: 1 ohm.
5. Substations and Pad-Mounted Equipment: 5 ohms.
6. Manhole Grounds: 10 ohms.

F. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Architect promptly and include recommendations to reduce ground resistance.

END OF SECTION 260526

SECTION 260529 - HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Hangers and supports for electrical equipment and systems.
2. Construction requirements for concrete bases.

B. Related Sections include the following:

1. Section 260548 "Vibration and Seismic Controls for Electrical Systems" for products and installation requirements necessary for compliance with seismic criteria.

1.3 DEFINITIONS

A. EMT: Electrical metallic tubing.

B. IMC: Intermediate metal conduit.

C. RMC: Rigid metal conduit.

1.4 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design supports for multiple raceways, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

B. Design supports for multiple raceways capable of supporting combined weight of supported systems and its contents.

C. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.

D. Rated Strength: Adequate in tension, shear, and pullout force to resist maximum loads calculated or imposed for this Project, with a minimum structural safety factor of five (5) times the applied force.

1.5 SUBMITTALS

A. Product Data: For the following:

1. Steel slotted support systems.
2. Nonmetallic slotted support systems.
3. Associated hardware.

B. Shop Drawings: Signed and sealed by a qualified professional engineer. Show fabrication and installation details and include calculations for the following:

1. Trapeze hangers. Include Product Data for components.
2. Steel slotted channel systems. Include Product Data for components.
3. Nonmetallic slotted channel systems. Include Product Data for components.
4. Equipment supports.

C. Welding certificates.

1.6 QUALITY ASSURANCE

A. Welding: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code - Steel."

B. Comply with NFPA 70.

1.7 COORDINATION

A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 03.

B. Coordinate installation of roof curbs, equipment supports, and roof penetrations. These items are specified in Section 077200 "Roof Accessories."

PART 2 - PRODUCTS

2.1 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

A. Steel Slotted Support Systems: Comply with MFMA 4, factory-fabricated components for field assembly.

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Allied Tube & Conduit
b. Cooper B-Line, Inc.; a division of Cooper Industries
c. ERICO International Corporation
d. GS Metals Corp.
e. Thomas & Betts Corporation
f. Unistrut; Tyco International, Ltd.
g. Wesanco, Inc.

2. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.
3. Nonmetallic Coatings: Manufacturer's standard PVC, polyurethane, or polyester coating applied according to MFMA-4.
4. Painted Coatings: Manufacturer's standard painted coating applied according to MFMA-4.
5. Channel Dimensions: Selected for applicable load criteria.

B. Nonmetallic Slotted Support Systems: Structural-grade, factory-formed, glass-fiber-resin channels and angles with 9/16-inch-diameter holes at a maximum of 8 inches o.c., in at least one (1) surface.

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. Allied Tube & Conduit
    b. Cooper B-Line, Inc.; a division of Cooper Industries
    c. Fabco Plastics Wholesale Limited
    d. Seasafe, Inc.

2. Fittings and Accessories: Products of channel and angle manufacturer and designed for use with those items.
3. Fitting and Accessory Materials: Same as channels and angles, except metal items may be stainless steel.
4. Rated Strength: Selected to suit applicable load criteria.

C. Raceway and Cable Supports: As described in NECA 1 and NECA 101.

D. Conduit and Cable Support Devices: Steel and malleable-iron hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.

E. Support for Conductors in Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug or plugs for non-armored electrical conductors or cables in riser conduits. Plugs shall have number, size, and shape of conductor gripping pieces as required to suit individual conductors or cables supported. The body shall be malleable iron.

F. Structural Steel for Fabricated Supports and Restraints: ASTM A 36, steel plates, shapes, and bars; black and galvanized.

G. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:

1. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened Portland cement concrete, steel, or wood, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.

    a. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

        1) Hilti Inc.
        2) ITW Ramset/Red Head; a division of Illinois Tool Works, Inc.
        3) MKT Fastening, LLC
        4) Simpson Strong-Tie Co., Inc.; Masterset Fastening Systems Unit

2. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated and stainless steel, for use in hardened Portland cement concrete with tension, shear, and pullout capacities appropriate for supported loads and building materials in which used.

    a. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

        1) Cooper B-Line, Inc.; a division of Cooper Industries
        2) Empire Tool and Manufacturing Co., Inc.
        3) Hilti Inc.

4) ITW Ramset/Red Head; a division of Illinois Tool Works, Inc.
5) MKT Fastening, LLC

3. Concrete Inserts: Steel or malleable-iron, slotted support system units similar to MSS Type 18; complying with MFMA-4 or MSS SP-58.
4. Clamps for Attachment to Steel Structural Elements: MSS SP-58, type suitable for attached structural element.
5. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM A 325.
6. Toggle Bolts: All-steel springhead type.
7. Hanger Rods: Threaded steel.

2.2 FABRICATED METAL EQUIPMENT SUPPORT ASSEMBLIES

A. Description: Welded or bolted, structural-steel shapes, shop or field fabricated to fit dimensions of supported equipment.

B. Materials: Comply with requirements in Section 055000 "Metal Fabrications" for steel shapes and plates.

PART 3 - EXECUTION

3.1 APPLICATION

A. Comply with NECA 1 and NECA 101 for application of hangers and supports for electrical equipment and systems except if requirements in this Section are stricter.

B. Maximum Support Spacing and Minimum Hanger Rod Size for Raceway: Space supports for EMT, IMC, and RMC as required by scheduled in NECA 1, where its Table 1 lists maximum spacings less than stated in NFPA 70. Minimum rod size shall be ¼-inch in diameter.

C. Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slotted or other support system, sized so capacity can be increased by at least twenty-five percent (25%) in future without exceeding specified design load limits.

1. Secure raceways and cables to these supports with single-bolt conduit clamps using spring friction action for retention in support channel.

D. Spring-steel clamps designed for supporting single conduits without bolts may be used for 1½-inch and smaller raceways serving branch circuits and communication systems above suspended ceilings and for fastening raceways to trapeze supports.

3.2 SUPPORT INSTALLATION

A. Comply with NECA 1 and NECA 101 for installation requirements except as specified in this Article.

B. Raceway Support Methods: In addition to methods described in NECA 1, EMT, IMC, and RMC may be supported by openings through structure members, as permitted in NFPA 70.

C. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. The minimum static design load used for strength determination shall be weight of supported components plus 200 lb.

D. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code:

1. To New Concrete: Bolt to concrete inserts.
2. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
3. To Existing Concrete: Expansion anchor fasteners.
4. Instead of expansion anchors, powder-actuated driven threaded studs provided with lock washers and nuts may be used in existing standard-weight concrete 4 inches thick or greater. Do not use for anchorage to lightweight-aggregate concrete or for slabs less than 4 inches thick.
5. To Steel: Welded threaded studs complying with AWS D1.1, with lock washers and nuts, Beam clamps (MSS Type 19, 21, 23, 25, or 27) complying with MSS SP-69, Spring-tension clamps.
6. To Light Steel: Sheet metal screws.
7. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices on slotted-channel racks attached to substrate by means that meet seismic-restraint strength and anchorage requirements.

E. Drill holes for expansion anchors in concrete at locations and to depths that avoid reinforcing bars.

3.3 INSTALLATION OF FABRICATED METAL SUPPORTS

A. Comply with installation requirements in Section 055000 "Metal Fabrications" for site-fabricated metal supports.

B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor electrical materials and equipment.

C. Field Welding: Comply with AWS D1.1.

3.4 CONCRETE BASES

A. Construct concrete bases of dimensions indicated but not less than 4 inches larger in both directions than supported unit, and so anchors will be a minimum of 10 bolt diameters from edge of the base.

B. Use 3000-psi, twenty-eight (28) day compressive-strength concrete. Concrete materials, reinforcement, and placement requirements are specified in Section 033000 "Cast-in-Place Concrete."

C. Anchor equipment to concrete base.

1. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
2. Install anchor bolts to elevations required for proper attachment to supported equipment.
3. Install anchor bolts according to anchor-bolt manufacturer's written instructions.

3.5 PAINTING

A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.

1. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils.

B. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

END OF SECTION 260529

SECTION 260533 - RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes raceways, fittings, boxes, enclosures, and cabinets for electrical wiring.

B. Related Sections include the following:

1. Section 260543 "Underground Ducts and Raceways for Electrical Systems" for exterior ductbanks, manholes, and underground utility construction.

1.3 DEFINITIONS

A. EMT: Electrical metallic tubing.

B. ENT: Electrical nonmetallic tubing.

C. EPDM: Ethylene-propylene-diene terpolymer rubber.

D. FMC: Flexible metal conduit.

E. IMC: Intermediate metal conduit.

F. LFMC: Liquidtight flexible metal conduit.

G. LFNC: Liquidtight flexible nonmetallic conduit.

H. NBR: Acrylonitrile-butadiene rubber.

I. RMC: Rigid metal conduit.

J. RNC: Rigid nonmetallic conduit.

1.4 SUBMITTALS

A. Product Data: For conduit, surface raceways, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets.

B. Shop Drawings: For the following raceway components. Include plans, elevations, sections, details, and attachments to other work.

1. Custom enclosures and cabinets.
2. For handholes and boxes for underground wiring, including the following:

a. Duct entry provisions, including locations and duct sizes.
b. Frame and cover design.

c. Grounding details.
d. Dimensioned locations of cable rack inserts, and pulling-in and lifting irons.
e. Joint details.

C. Coordination Drawings: Conduit routing plans, drawn to scale, on which the following items are shown and coordinated with each other, based on input from installers of the items involved:

1. Structural members in the paths of conduit groups with common supports.
2. HVAC and plumbing items and architectural features in the paths of conduit groups with common supports.

D. Manufacturer Seismic Qualification Certification: Submit certification that enclosures and cabinets and their mounting provisions, including those for internal components, will withstand seismic forces defined in Section 260548 "Vibration and Seismic Controls for Electrical Systems." Include the following:

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.

a. The term "withstand" means "the cabinet or enclosure will remain in place without separation of any parts when subjected to the seismic forces specified and the unit will retain its enclosure characteristics, including its interior accessibility, after the seismic event."

2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

E. Qualification Data: For professional engineer and testing agency.

F. Source quality-control test reports.

1.5 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 METAL CONDUIT AND TUBING

A. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

1. AFC Cable Systems, Inc.
2. Alflex Inc.
3. Allied Tube & Conduit; a Tyco International Ltd. Co.
4. Anamet Electrical, Inc.; Anaconda Metal Hose
5. Electri-Flex Co.
6. Manhattan/CDT/Cole-Flex

7. Maverick Tube Corporation
8. O-Z Gedney; a unit of General Signal
9. Wheatland Tube Company

B. Rigid Steel Conduit: ANSI C80.1.

C. Aluminum Rigid Conduit: ANSI C80.5.

D. IMC: ANSI C80.6.

E. PVC-Coated Steel Conduit: PVC-coated rigid steel conduit and IMC.

1. Comply with NEMA RN 1.
2. Coating Thickness: 0.040 inch, minimum.

F. EMT: ANSI C80.3.

G. FMC: Zinc-coated steel or aluminum.

H. LFMC: Flexible steel conduit with PVC jacket.

I. Fittings for Conduit (Including all Types and Flexible and Liquidtight), EMT, and Cable: NEMA FB 1; listed for type and size raceway with which used, and for application and environment in which installed.

1. Conduit Fittings for Hazardous (Classified) Locations: Comply with UL 886.
2. Fittings for EMT: Steel or die-cast and set-screw or compression type.
3. Coating for Fittings for PVC-Coated Conduit: Minimum thickness, 0.040-inch, with overlapping sleeves protecting threaded joints.

J. Joint Compound for Rigid Steel Conduit or IMC: Listed for use in cable connector assemblies and compounded for use to lubricate and protect threaded raceway joints from corrosion and enhance their conductivity.

2.2 NONMETALLIC CONDUIT AND TUBING

A. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

1. AFC Cable Systems, Inc.
2. Anamet Electrical, Inc.; Anaconda Metal Hose
3. Arnco Corporation
4. CANTEX Inc.
5. CertainTeed Corp.; Pipe & Plastics Group
6. Condux International, Inc.
7. ElecSYS, Inc.
8. Electri-Flex Co.
9. Lamson & Sessions; Carlon Electrical Products
10. Manhattan/CDT/Cole-Flex
11. RACO; a Hubbell Company
12. Thomas & Betts Corporation

B. ENT: NEMA TC 13.

C. RNC: NEMA TC 2, Type EPC-40-PVC, unless otherwise indicated.

D. LFNC: UL 1660.

E. Fittings for ENT and RNC: NEMA TC 3; match to conduit or tubing type and material.

F. Fittings for LFNC: UL 514B.

2.3 OPTICAL FIBER/COMMUNICATIONS CABLE RACEWAY AND FITTINGS

A. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

1. Arnco Corporation
2. Endot Industries Inc.
3. IPEX Inc.
4. Lamson & Sessions; Carlon Electrical Products

B. Description: Comply with UL 2024; flexible type, approved for plenum, riser, general-use installation.

2.4 METAL WIREWAYS

A. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

1. Cooper B-Line, Inc.
2. Hoffman
3. Square D; Schneider Electric

B. Description: Sheet metal sized and shaped as indicated, NEMA 250, Type 1, unless otherwise indicated.

C. Fittings and Accessories: Include couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.

D. Wireway Covers: Hinged type, Screw-cover type, Flanged-and-gasketed type, or as indicated.

E. Finish: Manufacturer's standard enamel finish.

2.5 NONMETALLIC WIREWAYS

A. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

1. Hoffman
2. Lamson & Sessions; Carlon Electrical Products

B. Description: Fiberglass polyester, extruded and fabricated to size and shape indicated, with no holes or knockouts. Cover is gasketed with oil-resistant gasket material and fastened with captive screws treated for corrosion resistance. Connections are flanged, with stainless-steel screws and oil-resistant gaskets.

C. Fittings and Accessories: Include couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.

2.6 SURFACE RACEWAYS

A. Surface Metal Raceways: Galvanized steel with snap-on covers. Manufacturer's standard enamel finish in color selected by Architect and Owner.

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

a. Thomas & Betts Corporation
b. Walker Systems, Inc.; Wiremold Company (The)
c. Wiremold Company (The); Electrical Sales Division

B. Surface Nonmetallic Raceways: Two-piece construction, manufactured of rigid PVC with texture and color selected by Architect and Owner from manufacturer's entire range.

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

a. Butler Manufacturing Company; Walker Division
b. Enduro Systems, Inc.; Composite Products Division
c. Hubbell Incorporated; Wiring Device-Kellems Division
d. Lamson & Sessions; Carlon Electrical Products
e. Panduit Corp.
f. Walker Systems, Inc.; Wiremold Company (The)
g. Wiremold Company (The); Electrical Sales Division

2.7 BOXES, ENCLOSURES, AND CABINETS

A. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

1. Cooper Crouse-Hinds; Div. of Cooper Industries, Inc.
2. EGS/Appleton Electric
3. Erickson Electrical Equipment Company
4. Hoffman
5. Hubbell Incorporated; Killark Electric Manufacturing Co. Division
6. O-Z/Gedney; a unit of General Signal
7. RACO; a Hubbell Company
8. Robroy Industries, Inc.; Enclosure Division
9. Scott Fetzer Co.; Adalet Division
10. Spring City Electrical Manufacturing Company
11. Thomas & Betts Corporation
12. Walker Systems, Inc.; Wiremold Company (The)
13. Woodhead, Daniel Company; Woodhead Industries, Inc. Subsidiary

B. Sheet Metal Outlet and Device Boxes: NEMA OS 1.

C. Cast-Metal Outlet and Device Boxes: NEMA FB 1, cast feralloy, Type FD, with gasketed cover.

D. Nonmetallic Outlet and Device Boxes: NEMA OS 2.

E. Metal Floor Boxes: Cast iron or sheet metal, fully adjustable, rectangular.

F. Nonmetallic Floor Boxes: Nonadjustable, round.

G. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.

H. Cast-Metal Access, Pull, and Junction Boxes: NEMA FB 1, galvanized cast iron with gasketed cover.

I. Hinged-Cover Enclosures: NEMA 250, Type 1, with continuous-hinge cover with flush latch, unless otherwise indicated.

1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.
2. Nonmetallic Enclosures: Plastic, finished inside with radio-frequency-resistant paint.

J. Cabinets:

1. NEMA 250, Type 1, galvanized-steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel.
2. Hinged door in front cover with flush latch and concealed hinge.
3. Key latch to match panelboards.
4. Metal barriers to separate wiring of different systems and voltage.
5. Accessory feet where required for freestanding equipment.

2.8 HANDHOLES AND BOXES FOR EXTERIOR UNDERGROUND WIRING

A. Description: Comply with SCTE 77.

1. Color of Frame and Cover: Gray.
2. Configuration: Units shall be designed for flush burial and have integral closed bottom, unless otherwise indicated.
3. Cover: Weatherproof, secured by tamper-resistant locking devices and having structural load rating consistent with enclosure.
4. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.
5. Cover Legend: Molded lettering, "ELECTRIC." and "TELEPHONE.", or as indicated for each service.
6. Conduit Entrance Provisions: Conduit-terminating fittings shall mate with entering ducts for secure, fixed installation in enclosure wall.
7. Handholes 2 inches wide by 24 inches long and larger shall have inserts for cable racks and pulling-in irons installed before concrete is poured.

B. Polymer-Concrete Handholes and Boxes with Polymer-Concrete Cover: Molded of sand and aggregate, bound together with polymer resin, and reinforced with steel or fiberglass or a combination of the two (2).

1. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one (1) of the following:

a. Armorcast Products Company
b. Carson Industries LLC
c. CDR Systems Corporation
d. NewBasis

C. Fiberglass Handholes and Boxes with Polymer-Concrete Frame and Cover: Sheet-molded, fiberglass-reinforced, polyester-resin enclosure joined to polymer-concrete top ring or frame.

1. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one (1) of the following:

a. Armorcast Products Company
b. Carson Industries LLC
c. Christy Concrete Products
d. Synertech Moulded Products, Inc.; a division of Oldcastle Precast

D. Fiberglass Handholes and Boxes: Molded of fiberglass-reinforced polyester resin, with covers of polymer concrete.

1. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one (1) of the following:

a. Carson Industries LLC
b. Christy Concrete Products
c. Nordic Fiberglass, Inc.

2.9 SLEEVES FOR RACEWAYS

A. Steel Pipe Sleeves: ASTM A 53, Type E, Grade B, Schedule 40, galvanized steel, plain ends.

B. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.

C. Sleeves for Rectangular Openings: Galvanized sheet steel with minimum 0.052- or 0.138-inch thickness as indicated and of length to suit application.

D. Coordinate sleeve selection and application with selection and application of firestopping.

2.10 SLEEVE SEALS

A. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one (1) of the following:

1. Advance Products & Systems, Inc.
2. Calpico, Inc.
3. Metraflex Co.
4. Pipeline Seal and Insulator, Inc.

B. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and cable.

1. Sealing Elements: EPDM interlocking links shaped to fit surface of cable or conduit. Include type and number required for material and size of raceway or cable.
2. Pressure Plates: Stainless steel. Include two (2) for each sealing element.
3. Connecting Bolts and Nuts: Stainless steel of length required to secure pressure plates to sealing elements. Include one (1) for each sealing element.

2.11 SOURCE QUALITY CONTROL FOR UNDERGROUND ENCLOSURES

A. Handhole and Pull-Box Prototype Test: Test prototypes of handholes and boxes for compliance with SCTE 77. Strength tests shall be for specified tier ratings of products supplied.

1. Strength tests of complete boxes and covers shall be by either an independent testing agency or manufacturer. A qualified registered professional engineer shall certify tests by manufacturer.

2. Testing machine pressure gages shall have current calibration certification complying with ISO 9000 and ISO 10012, and traceable to NIST standards.

PART 3 - EXECUTION

3.1 RACEWAY APPLICATION

A. Outdoors: Apply raceway products as specified below, unless otherwise indicated:

1. Exposed Conduit: Rigid steel conduit, IMC, RNC, Type EPC-40-PVC, RNC, Type EPC-80-PVC.
2. Concealed Conduit, Aboveground: Rigid steel conduit, IMC, RNC, Type EPC-40-PVC, RNC, Type EPC-80-PVC.
3. Underground Conduit: RNC, Type EPC-40-PVC, direct buried unless indicated otherwise.
4. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
5. Boxes and Enclosures, Aboveground: NEMA 250, Type 4.
6. Application of Handholes and Boxes for Underground Wiring:

    a. Handholes and Pull Boxes in Driveway, Parking Lot, and Off-Roadway Locations, Subject to Occasional, Nondeliberate Loading by Heavy Vehicles: Polymer concrete enclosures with polymer-concrete frame and cover, SCTE 77, Tier 15 structural load rating.
    b. Handholes and Pull Boxes in Sidewalk and Similar Applications with a Safety Factor for Nondeliberate Loading by Vehicles: Heavy-duty fiberglass units with polymer-concrete frame and cover, SCTE 77, Tier 8 structural load rating.
    c. Handholes and Pull Boxes Subject to Light-Duty Pedestrian Traffic Only: Fiberglass-reinforced polyester resin, structurally tested according to SCTE 77 with 3000-lbf vertical loading.

B. Comply with the following indoor applications, unless otherwise indicated:

1. Exposed, Not Subject to Physical Damage: EMT, Surface metal raceway, surface nonmetallic raceway (where specifically noted).
2. Exposed, Not Subject to Severe Physical Damage: EMT.
3. Exposed and Subject to Severe Physical Damage: Rigid steel conduit. Includes raceways in the following locations:

    a. Loading dock.
    b. Corridors used for traffic of mechanized carts, forklifts, and pallet-handling units.
    c. Mechanical rooms.
    d. Auto shop.

4. Concealed in Ceilings and Interior Walls and Partitions: EMT.
5. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC, except use LFMC in damp or wet locations.
6. Damp or Wet Locations: Rigid steel conduit.
7. Raceways for Optical Fiber or Communications Cable in Spaces Used for Environmental Air: Plenum-type, optical fiber/communications cable raceway, EMT.
8. Raceways for Optical Fiber or Communications Cable Risers in Vertical Shafts: Riser-type, optical fiber/communications cable raceway, EMT.

9. Raceways for Concealed General-Purpose Distribution of Optical Fiber or Communications Cable: General-use, optical fiber/communications cable raceway, Riser-type, optical fiber/communications cable raceway, Plenum-type, optical fiber/communications cable raceway, EMT.
10. Boxes and Enclosures: NEMA 250, Type 1, except use NEMA 250, Type 4, stainless steel or nonmetallic in damp or wet locations.

C. Minimum Raceway Size: ¾-inch trade size.

D. Raceway Fittings: Compatible with raceways and suitable for use and location.

1. Rigid and Intermediate Steel Conduit: Use threaded rigid steel conduit fittings, unless otherwise indicated.
2. PVC Externally Coated, Rigid Steel Conduits: Use only fittings listed for use with that material. Patch and seal all joints, nicks, and scrapes in PVC coating after installing conduits and fittings. Use sealant recommended by fitting manufacturer.

E. Install nonferrous conduit or tubing for circuits operating above 60 Hz. Where aluminum raceways are installed for such circuits and pass through concrete, install in nonmetallic sleeve.

F. Do not install aluminum conduits in contact with concrete.

3.2 INSTALLATION

A. Comply with NECA 1 for installation requirements applicable to products specified in Part 2 except where requirements on Drawings or in this Article are stricter.

B. Keep raceways at least 6 inches away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.

C. Complete raceway installation before starting conductor installation.

D. Support raceways as specified in Section 260529 "Hangers and Supports for Electrical Systems."

E. Arrange stub-ups so curved portions of bends are not visible above the finished slab.

F. Install no more than the equivalent of three (3) 90-degree bends in any conduit run except for communications conduits, for which fewer bends are allowed.

G. Conceal conduit and EMT within finished walls, ceilings, and floors, unless otherwise indicated.

H. Raceways Embedded in Slabs:

1. Run conduit larger than 1-inch trade size, parallel or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support.
2. Arrange raceways to cross building expansion joints at right angles with expansion fittings.
3. Change from RNC, Type EPC-40-PVC, to rigid steel conduit, or IMC before rising above the floor.

I. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of raceway and fittings before making up joints. Follow compound manufacturer's written instructions.

J. Raceway Terminations at Locations Subject to Moisture or Vibration: Use insulating bushings to protect conductors, including conductors smaller than No. 4 AWG.

K. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb tensile strength. Leave at least 12 inches of slack at each end of pull wire.

L. Raceways for Optical Fiber and Communications Cable: Install raceways, metallic and nonmetallic, rigid and flexible, as follows:

1. ¾-Inch Trade Size and Smaller: Install raceways in maximum lengths of 50 feet.
2. 1-Inch Trade Size and Larger: Install raceways in maximum lengths of 75 feet.
3. Install with a maximum of two (2) 90-degree bends or equivalent for each length of raceway unless Drawings show stricter requirements. Separate lengths with pull or junction boxes or terminations at distribution frames or cabinets where necessary to comply with these requirements.

M. Install raceway sealing fittings at suitable, approved, and accessible locations and fill them with listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings at the following points:

1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
2. Where otherwise required by NFPA 70.

N. Expansion-Joint Fittings for RNC: Install in each run of aboveground conduit that is located where environmental temperature change may exceed 30 deg F (17 deg C), and that has straight-run length that exceeds 25 feet.

1. Install expansion-joint fittings for each of the following locations, and provide type and quantity of fittings that accommodate temperature change listed for location:

   a. Outdoor Locations Not Exposed to Direct Sunlight: 125 deg F (70 deg C) temperature change.
   b. Outdoor Locations Exposed to Direct Sunlight: 155 deg F (86 deg C) temperature change.
   c. Indoor Spaces: Connected with the Outdoors without Physical Separation: 125 deg F (70 deg C) temperature change.
   d. Attics: 135 deg F (75 deg C) temperature change.

2. Install fitting(s) that provide expansion and contraction for at least 0.00041 inch per foot of length of straight run per deg F (0.06 mm per meter of length of straight run per deg C) of temperature change.
3. Install each expansion-joint fitting with position, mounting, and piston setting selected according to manufacturer's written instructions for conditions at specific location at the time of installation.

O. Flexible Conduit Connections: Use maximum of 72 inches of flexible conduit for recessed and semi-recessed lighting fixtures, equipment subject to vibration, noise transmission, or movement; and for transformers and motors.

1. Use LFMC in damp or wet locations subject to severe physical damage.
2. Use LFMC or LFNC in damp or wet locations not subject to severe physical damage.

P. Recessed Boxes in Masonry Walls: Saw-cut opening for box in center of cell of masonry block, and install box flush with surface of wall.

Q. Set metal floor boxes level and flush with finished floor surface.

R. Set nonmetallic floor boxes level. Trim after installation to fit flush with finished floor surface.

3.3 INSTALLATION OF UNDERGROUND CONDUIT

A. Direct-Buried Conduit:

1. Excavate trench bottom to provide firm and uniform support for conduit. Prepare trench bottom as specified in Section 312000 "Earth Moving" for pipe less than 6 inches in nominal diameter.
2. Install backfill as specified in Section 312000 "Earth Moving."
3. After installing conduit, backfill and compact. Start at tie-in point, and work toward end of conduit run, leaving conduit at end of run free to move with expansion and contraction as temperature changes during this process. Firmly hand tamp backfill around conduit to provide maximum supporting strength. After placing controlled backfill to within 12 inches of finished grade, make final conduit connection at end of run and complete backfilling with normal compaction as specified in Section 312000 "Earth Moving."
4. Install manufactured rigid steel conduit elbows for stub-ups at poles and equipment and at building entrances through the floor.

    a. Couple steel conduits to ducts with adapters designed for this purpose and encase coupling with 3 inches of concrete.
    b. For stub-ups at equipment mounted on outdoor concrete bases, extend steel conduit horizontally a minimum of 60 inches from edge of equipment pad or foundation. Install insulated grounding bushings on terminations at equipment.

5. Warning Tape: Bury warning tape approximately 12 inches above direct-buried conduits. Align tape along the width and along the centerline of conduit.

3.4 INSTALLATION OF UNDERGROUND HANDHOLES AND BOXES

A. Install handholes and boxes level and plumb and with orientation and depth coordinated with connecting conduits to minimize bends and deflections required for proper entrances.

B. Unless otherwise indicated, support units on a level bed of crushed stone or gravel, graded from ½-inch sieve to No. 4 sieve and compacted to same density as adjacent undisturbed earth.

C. Elevation: In paved areas, set so cover surface will be flush with finished grade. Set covers of other enclosures 1 inch above finished grade.

D. Install handholes and boxes with bottom below the frost line, below grade.

E. Install removable hardware, including pulling eyes, cable stanchions, cable arms, and insulators, as required for installation and support of cables and conductors and as indicated. Select arm lengths to be long enough to provide spare space for future cables, but short enough to preserve adequate working clearances in the enclosure.

F. Field-cut openings for conduits according to enclosure manufacturer's written instructions. Cut wall of enclosure with a tool designed for material to be cut. Size holes for terminating fittings to be used, and seal around penetrations after fittings are installed.

3.5 SLEEVE INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Coordinate sleeve selection and application with selection and application of firestopping.

B. Concrete Slabs and Walls: Install sleeves for penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of slabs and walls.

C. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.

D. Rectangular Sleeve Minimum Metal Thickness:

1. For sleeve cross-section rectangle perimeter less than 50 inches and no side greater than 16 inches, thickness shall be 0.052-inch.
2. For sleeve cross-section rectangle perimeter equal to, or greater than, 50 inches and one (1) or more sides equal to, or greater than, 16 inches, thickness shall be 0.138-inch.

E. Fire-Rated Assemblies: Install sleeves for penetrations of fire-rated floor and wall assemblies unless openings compatible with firestop system used are fabricated during construction of floor or wall.

F. Cut sleeves to length for mounting flush with both surfaces of walls.

G. Extend sleeves installed in floors 2 inches above finished floor level.

H. Size pipe sleeves to provide ¼-inch annular clear space between sleeve and raceway unless sleeve seal is to be installed or unless seismic criteria require different clearance.

I. Seal space outside of sleeves with grout for penetrations of concrete and masonry and with approved joint compound for gypsum board assemblies.

J. Interior Penetrations of Non-Fire-Rated Walls and Floors: Seal annular space between sleeve and raceway, using joint sealant appropriate for size, depth, and location of joint. Refer to Section 079200 "Joint Sealants" for materials and installation.

K. Fire-Rated-Assembly Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at raceway penetrations. Install sleeves and seal with firestop materials.

L. Roof-Penetration Sleeves: Seal penetration of individual raceways with flexible, boot-type flashing units applied in coordination with roofing work.

M. Aboveground, Exterior-Wall Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.

N. Underground, Exterior-Wall Penetrations: Install cast-iron "wall pipes" for sleeves. Size sleeves to allow for 1-inch annular clear space between raceway and sleeve for installing mechanical sleeve seals.

3.6 SLEEVE-SEAL INSTALLATION

A. Install to seal underground, exterior wall penetrations.

B. Use type and number of sealing elements recommended by manufacturer for raceway material and size. Position raceway in center of sleeve. Assemble mechanical sleeve seals and install

them in annular space between raceway and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

3.7 FIRESTOPPING

A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly.

3.8 PROTECTION

A. Provide final protection and maintain conditions that ensure coatings, finishes, and cabinets are without damage or deterioration at time of Substantial Completion.

1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
2. Repair damage to PVC or paint finishes with matching touchup coating recommended by manufacturer.

END OF SECTION 260533

SECTION 260543 - UNDERGROUND DUCTS AND RACEWAYS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Conduit, ducts, and duct accessories for direct-buried and concrete-encased duct bank, and in single duct runs.
2. Handholes and pull boxes.
3. Manholes.

1.3 DEFINITION

A. RNC: Rigid nonmetallic conduit.

B. Traffic ways: Locations where vehicular or pedestrian traffic is a normal course of events.

1.4 SUBMITTALS

A. Product Data: For the following:

1. Duct-bank materials, including separators and miscellaneous components.
2. Ducts and conduits and their accessories, including elbows, end bells, bends, fittings, and solvent cement.
3. Accessories for manholes, handholes, pull boxes**,** and other utility structures.
4. Warning tape.
5. Warning planks.

B. Shop Drawings for Precast or Factory-Fabricated Underground Utility Structures: Include plans, elevations, sections, details, attachments to other work, and accessories, including the following:

1. Duct entry provisions, including locations and duct sizes.
2. Reinforcement details.
3. Frame and cover design and manhole frame support rings.
4. Ladder and/or step details.
5. Grounding details.
6. Dimensioned locations of cable rack inserts, pulling-in and lifting irons, and sumps.
7. Joint details.

C. Shop Drawings for Factory-Fabricated Handholes and Pull Boxes Other Than Precast Concrete: Include dimensioned plans, sections, and elevations, and fabrication and installation details, including the following:

1. Duct entry provisions, including locations and duct sizes.
2. Cover design.

3. Grounding details.
4. Dimensioned locations of cable rack inserts, and pulling-in and lifting irons.

D. Duct-Bank Coordination Drawings: Show duct profiles and coordination with other utilities and underground structures.

1. Include plans and sections, drawn to scale, and show bends and locations of expansion fittings.
2. Drawings shall be signed and sealed by a qualified professional engineer.

E. Product Certificates: For concrete and steel used in precast concrete manholes, pull boxes, and handholes, comply with ASTM C 858.

F. Qualification Data: For qualified professional engineer and testing agency.

G. Source quality-control reports.

H. Field quality-control reports.

1.5 QUALITY ASSURANCE

A. Comply with IEEE C2.

B. Comply with NFPA 70.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver ducts to Project site with ends capped. Store nonmetallic ducts with supports to prevent bending, warping, and deforming.

B. Store precast concrete and other factory-fabricated underground utility structures at Project site as recommended by manufacturer to prevent physical damage. Arrange so identification markings are visible.

C. Lift and support precast concrete units only at designated lifting or supporting points.

1.7 PROJECT CONDITIONS

A. Interruption of Existing Electrical Service: Do not interrupt electrical service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electrical service according to requirements indicated:

1. Notify Architect and Construction Manager no fewer than two (2) days in advance of proposed interruption of electrical service.
2. Do not proceed with interruption of electrical service without the Architect’s and Construction Manager's written permission.

1.8 COORDINATION

A. Coordinate layout and installation of ducts, manholes, handholes, and pull boxes with final arrangement of other utilities, site grading, and surface features as determined in the field.

B. Coordinate elevations of ducts and duct-bank entrances into manholes, handholes, and pull boxes with final locations and profiles of ducts and duct banks as determined by coordination with other utilities, underground obstructions, and surface features. Revise locations and

elevations from those indicated as required to suit field conditions and to ensure that duct runs drain to manholes and handholes, and as approved by Architect.

1.9 EXTRA MATERIALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

B. Furnish cable-support stanchions, arms, insulators, and associated fasteners in quantities equal to five percent (5%) of quantity of each item installed.

PART 2 - PRODUCTS

2.1 CONDUIT

A. Rigid Steel Conduit: Galvanized. Comply with ANSI C80.1.

B. RNC: NEMA TC 2, Type EPC-40-PVC and Type EPC-80-PVC, UL 651, with matching fittings by same manufacturer as the conduit, complying with NEMA TC 3 and UL 514B.

2.2 NONMETALLIC DUCTS AND DUCT ACCESSORIES

A. Manufacturers: Subject to compliance with requirements, provide available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. AFC Cable Systems
2. ARNCO Corporation
3. Beck Manufacturing
4. Cantex, Inc.
5. CertainTeed Corp.
6. Condux International, Inc.
7. DCX-CHOL Enterprises, Inc.; ELECSYS Division
8. Electri-Flex Company
9. IPEX Inc.
10. Lamson & Sessions; Carlon Electrical Products
11. Manhattan Wire Products; a Belden company

B. Underground Plastic Utilities Duct: NEMA TC 6 & 8, Type EB-20-PVC, ASTM F 512, UL 651A, with matching fittings by the same manufacturer as the duct, complying with NEMA TC 9.

C. Underground Plastic Utilities Duct: NEMA TC 6 & 8, Type DB-60-PVC and Type DB-120-PVC, ASTM F 512, with matching fittings by the same manufacturer as the duct, complying with NEMA TC 9.

D. Duct Accessories:

1. Duct Separators: Factory-fabricated rigid PVC interlocking spacers, sized for type and sizes of ducts with which used, and retained to provide minimum duct spacings indicated while supporting ducts during concreting or backfilling.
2. Warning Tape: Underground-line warning tape specified in Section 260553 "Identification for Electrical Systems."
3. Concrete Warning Planks: Nominal 12 by 24 by 3 inches in size, manufactured from 6000-psi concrete.

a. Color: Red dye added to concrete during batching.
b. Mark each plank with "ELECTRIC" in 2-inch-high, 3/8-inch-deep letters.

2.3 PRECAST CONCRETE HANDHOLES AND PULL BOXES

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Christy Concrete Products
2. Cretex Concrete Products West, Inc.; Riverton Division
3. Elmhurst-Chicago Stone Co.
4. Oldcastle Precast Group
5. Oldcastle Precast Inc.; Utility Vault Division
6. Utility Concrete Products, LLC
7. Wausau Tile Inc.

B. Comply with ASTM C 858 for design and manufacturing processes.

C. Ferrous metal hardware shall be hot-dip galvanized in accordance with ASTM A 153 and ASTM A 123.

D. Description: Factory-fabricated, reinforced-concrete, monolithically poured walls and bottom unless open-bottom enclosures are indicated. Frame and cover shall form top of enclosure and shall have load rating consistent with that of handhole or pull box.

1. Frame and Cover: Weatherproof steel frame, with hinged steel access door assembly with tamper-resistant, captive, cover-securing stainless-steel bolts.

a. Cover Hinges: Concealed, with hold-open ratchet assembly.
b. Cover Handle: Recessed.

2. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.
3. Cover Legend: Molded lettering, "ELECTRIC.", "TELEPHONE.", and as indicated for each service.
4. Configuration: Units shall be designed for flush burial and have integral closed bottom unless otherwise indicated.
5. Extensions and Slabs: Designed to mate with bottom of enclosure. Same material as enclosure.

a. Extension shall provide increased depth of 12 inches.
b. Slab: Same dimensions as bottom of enclosure and arranged to provide closure.

6. Windows: Precast openings in walls, arranged to match dimensions and elevations of approaching ducts and duct banks plus an additional 12 inches vertically and horizontally to accommodate alignment variations.

a. Windows shall be located no less than 6 inches from interior surfaces of walls, floors, or frames and covers of handholes, but close enough to corners to facilitate racking of cables on walls.
b. Window opening shall have cast-in-place, welded wire fabric reinforcement for field cutting and bending to tie into concrete envelopes of duct banks.
c. Window openings shall be framed with at least two (2) additional No. 4 steel reinforcing bars in concrete around each opening.

7. Duct Entrances in Handhole Walls: Cast end-bell or duct-terminating fitting in wall for each entering duct.

    a. Type and size shall match fittings to duct or conduit to be terminated.
    b. Fittings shall align with elevations of approaching ducts and be located near interior corners of handholes to facilitate racking of cable.

8. Handholes 12 inches wide by 24 inches long and larger shall have inserts for cable racks and pulling-in irons installed before concrete is poured.

2.4 HANDHOLES AND PULL BOXES OTHER THAN PRECAST CONCRETE

A. Description: Comply with SCTE 77.

1. Color: Gray.
2. Configuration: Units shall be designed for flush burial and have integral closed bottom unless otherwise indicated.
3. Cover: Weatherproof, secured by tamper-resistant locking devices and having structural load rating consistent with enclosure.
4. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.
5. Cover Legend: Molded lettering,

    a. "ELECTRIC.", "TELEPHONE.", and as indicated for each service.
    b. Tier level number, indicating that the unit complies with the structural load test for that tier according to SCTE 77.

6. Direct-Buried Wiring Entrance Provisions: Knockouts equipped with insulated bushings or end-bell fittings, retained to suit box material, sized for wiring indicated, and arranged for secure, fixed installation in enclosure wall.
7. Duct Entrance Provisions: Duct-terminating fittings shall mate with entering ducts for secure, fixed installation in enclosure wall.
8. Handholes 12 inches wide by 24 inches long and larger shall have factory-installed inserts for cable racks and pulling-in irons.

B. Polymer Concrete Handholes and Pull Boxes with Polymer Concrete Cover: Molded of sand and aggregate, bound together with a polymer resin, and reinforced with steel or fiberglass or a combination of the two (2). Handholes and pull boxes shall comply with the requirements of SCTE 77 Tier 8 and Tier 15 loading.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. Armorcast Products Company
    b. Carson Industries LLC
    c. CDR Systems Corporation
    d. Hubbell Power Systems; Lenoir City Division
    e. NewBasis

C. Fiberglass Handholes and Pull Boxes with Polymer Concrete Frame and Cover: Complying with SCTE 77 Tier 8 and Tier 15 loading. Sheet-molded, fiberglass-reinforced, polyester resin enclosure joined to polymer concrete top ring or frame.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. Armorcast Products Company
    b. Carson Industries LLC
    c. Christy Concrete Products
    d. Synertech Moulded Products, Inc.; a division of Oldcastle Precast

D. Fiberglass Handholes and Pull Boxes: Molded of fiberglass-reinforced polyester resin, with covers of polymer concrete, complying with SCTE 77 Tier 8 and Tier 5 loading.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. Carson Industries LLC
    b. Christy Concrete Products
    c. Nordic Fiberglass, Inc.

E. High-Density Plastic Pull Boxes: Injection molded of high-density polyethylene or copolymer-polypropylene, complying with SCTE 77 Light Duty loading. The cover shall be polymer concrete.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. Carson Industries LLC
    b. Nordic Fiberglass, Inc.
    c. Pencell Plastics

2.5 PRECAST MANHOLES

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Christy Concrete Products
2. Cretex Concrete Products West, Inc.; Riverton Division
3. Elmhurst-Chicago Stone Co.
4. Oldcastle Precast Group
5. Oldcastle Precast Inc.; Utility Vault Division
6. Utility Concrete Products, LLC
7. Wausau Tile Inc.

B. Comply with ASTM C 858, with structural design loading as specified in "Underground Enclosure Application" Article, and with interlocking mating sections, complete with accessories, hardware, and features.

1. Windows: Precast openings in walls, arranged to match dimensions and elevations of approaching ducts and duct banks plus an additional 12 inches vertically and horizontally to accommodate alignment variations.

a. Windows shall be located no less than 6 inches from interior surfaces of walls, floors, or roofs of manholes, but close enough to corners to facilitate racking of cables on walls.
b. Window opening shall have cast-in-place, welded wire fabric reinforcement for field cutting and bending to tie in to concrete envelopes of duct banks.
c. Window openings shall be framed with at least two (2) additional No. 4 steel reinforcing bars in concrete around each opening.

2. Duct Entrances in Manhole Walls: Cast end-bell or duct-terminating fitting in wall for each entering duct.

a. Type and size shall match fittings to duct or conduit to be terminated.
b. Fittings shall align with elevations of approaching ducts and be located near interior corners of manholes to facilitate racking of cable.

C. Concrete Knockout Panels: 1½ to 2 inches thick, for future conduit entrance and sleeve for ground rod.

D. Joint Sealant: Asphaltic-butyl material with adhesion, cohesion, flexibility, and durability properties necessary to withstand maximum hydrostatic pressures at the installation location with the ground-water level at grade.

2.6 CAST-IN-PLACE MANHOLES

A. Description: Underground utility structures, constructed in place, complete with accessories, hardware, and features. Include concrete knockout panels for conduit entrance and sleeve for ground rod.

B. Materials: Comply with ASTM C 858 and with Section 033000 "Cast-in-Place Concrete."

1. Concrete shall have a minimum compressive strength of 3000 psi.

C. Structural Design Loading: As specified in "Underground Enclosure Application" Article.

2.7 UTILITY STRUCTURE ACCESSORIES

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Bilco Company (The)
2. Campbell Foundry Company
3. Christy Concrete Products
4. Cretex Concrete Products West, Inc.; Riverton Division
5. East Jordan Iron Works
6. Elmhurst-Chicago Stone Co.
7. Hubbell Power Systems; Lenoir City Division
8. McKinley Iron Works
9. Neenah Foundry Company
10. NewBasis
11. Oldcastle Precast Group
12. Oldcastle Precast Inc.; Utility Vault Division
13. Osburn Associates, Inc.
14. Pennsylvania Insert Corporation
15. Underground Devices, Inc.
16. Utility Concrete Products, LLC

17. Wausau Tile Inc.

B. Ferrous metal hardware, where indicated, shall be hot-dip galvanized complying with ASTM A 153 and A 123.

C. Manhole Frames, Covers, and Chimney Components: Comply with structural design loading specified for manhole.

1. Frame and Cover: Weatherproof, gray cast iron complying with ASTM A 48, Class 30B with milled cover-to-frame bearing surfaces; diameter, 26 inches.

a. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.
b. Special Covers: Recess in face of cover designed to accept finish material in paved areas.

2. Cover Legend: Cast in. Retained to suit system.

a. Legend: "ELECTRIC-LV" for duct systems with power wires and cables for systems operating at 600 V and less.
b. Legend: "ELECTRIC-HV" for duct systems with medium-voltage cables.
c. Legend: "SIGNAL" for communications, data, and telephone duct systems.

3. Manhole Chimney Components: Precast concrete rings with dimensions matched to those of roof opening.

a. Mortar for Chimney Ring and Frame and Cover Joints: Comply with ASTM C 270, Type M, except for quantities less than 2.0 cu. ft. where packaged mix complying with ASTM C 387, Type M, may be used.

D. Manhole Sump Frame and Grate: ASTM A 48, Class 30B, gray cast iron.

E. Pulling Eyes in Concrete Walls: Eyebolt with reinforcing-bar fastening insert, 2-inch-diameter eye, and 1-by-4-inch bolt.

1. Working Load Embedded in 6-Inch, 4000-psi Concrete: 13,000-lbf minimum tension.

F. Pulling Eyes in Nonconcrete Walls: Eyebolt with reinforced fastening, 1¼-inch-diameter eye, rated 2500-lbf minimum tension.

G. Pulling-In and Lifting Irons in Concrete Floors: 7/8-inch-diameter, hot-dip galvanized, bent steel rod; stress relieved after forming; and fastened to reinforcing rod. Exposed triangular opening.

1. Ultimate Yield Strength: 40,000-lbf shear and 60,000-lbf tension.

H. Bolting Inserts for Concrete Utility Structure Cable Racks and Other Attachments: Flared, threaded inserts of noncorrosive, chemical-resistant, nonconductive thermoplastic material; ½-inch ID by 2¾ inches deep, flared to 1¼ inches minimum at base.

1. Tested Ultimate Pullout Strength: 12,000 lbf minimum.

I. Expansion Anchors for Installation after Concrete Is Cast: Zinc-plated, carbon-steel-wedge type with stainless-steel expander clip with ½-inch bolt, 5300-lbf rated pullout strength, and minimum 6800-lbf rated shear strength.

J. Cable Rack Assembly: Steel, hot-dip galvanized except insulators.

1. Stanchions: T-section or channel; 2¼-inch nominal size; punched with 14 holes on 1½-inch centers for cable-arm attachment.
2. Arms: 1½ inches wide, lengths ranging from 3 inches with 450-lb minimum capacity to 18 inches with 250-lb minimum capacity. Arms shall have slots along full length for cable ties and be arranged for secure mounting in horizontal position at any vertical location on stanchions.
3. Insulators: High-glaze, wet-process porcelain arranged for mounting on cable arms.

K. Cable Rack Assembly: Nonmetallic. Components fabricated from nonconductive, fiberglass-reinforced polymer.

1. Stanchions: Nominal 36 inches high by 4 inches wide, with minimum of nine (9) holes for arm attachment.
2. Arms: Arranged for secure, drop-in attachment in horizontal position at any location on cable stanchions, and capable of being locked in position. Arms shall be available in lengths ranging from 3 inches with 450-lb minimum capacity to 20 inches with 250-lb minimum capacity. Top of arm shall be nominally 4 inches wide, and arm shall have slots along full length for cable ties.

L. Duct-Sealing Compound: Nonhardening, safe for contact with human skin, not deleterious to cable insulation, and workable at temperatures as low as 35 deg F (2 deg C). Capable of withstanding temperatures of 300 deg F (150 deg C) without slump and adhering to clean surfaces of plastic ducts, metallic conduits, conduit coatings, concrete, masonry, lead, cable sheaths, cable jackets, insulation materials, and common metals.

M. Fixed Manhole Ladders: Arranged for attachment to wall of manhole. Ladder and mounting brackets and braces shall be fabricated from nonconductive, structural-grade, fiberglass-reinforced resin.

N. Portable Manhole Ladders: UL-listed, heavy-duty fiberglass specifically designed for portable use for access to electrical manholes. Minimum length equal to distance from deepest manhole floor to grade plus 36 inches. One (1) required.

O. Cover Hooks: Heavy duty, designed for lifts of 60 lbf and greater. Two (2) required.

2.8 SOURCE QUALITY CONTROL

A. Test and inspect precast concrete utility structures according to ASTM C 1037.

B. Nonconcrete Handhole and Pull Box Prototype Test: Test prototypes of manholes and pull boxes for compliance with SCTE 77. Strength tests shall be for specified Tier ratings of products supplied.

1. Testing Agency: Owner will engage a qualified testing agency to evaluate nonconcrete handholes and pull boxes.
2. Testing machine pressure gages shall have current calibration certification complying with ISO 9000 and ISO 10012, and traceable to NIST standards.

PART 3 - EXECUTION

3.1 PREPARATION

A. Coordinate layout and installation of ducts, manholes, handholes, and boxes with final arrangement of other utilities, site grading, and surface features as determined in the field.

Notify Architect if there is a conflict between areas of excavation and existing structures or archaeological sites to remain.

B. Coordinate elevations of ducts and duct-bank entrances into manholes, handholes, and boxes with final locations and profiles of ducts and duct banks, as determined by coordination with other utilities, underground obstructions, and surface features. Revise locations and elevations as required to suit field conditions and to ensure that duct runs drain to manholes and handholes, and as approved by Architect.

C. Clear and grub vegetation to be removed and protect vegetation to remain according to Section 311000 "Site Clearing." Remove and stockpile topsoil for reapplication according to Section 311000 "Site Clearing."

3.2 CORROSION PROTECTION

A. Aluminum shall not be installed in contact with earth or concrete.

3.3 UNDERGROUND DUCT APPLICATION

A. Ducts for Electrical Cables over 600 V: RNC, NEMA Type EPC-40-PVC, in concrete-encased duct bank unless otherwise indicated.

B. Ducts for Electrical Feeders 600 V and Less: RNC, NEMA Type EPC-40 PVC, in direct-buried duct bank unless otherwise indicated.

C. Ducts for Electrical Branch Circuits: RNC, NEMA Type EPC-40-PVC, in direct-buried duct bank unless otherwise indicated.

D. Underground Ducts for Telephone, Communications, or Data Circuits: RNC, NEMA Type EPC-40-PVC, in direct-buried duct bank unless otherwise indicated.

E. Underground Ducts Crossing Driveways, Roadways, and Railroads: RNC, NEMA Type EPC-40-PVC, encased in reinforced concrete.

3.4 UNDERGROUND ENCLOSURE APPLICATION

A. Handholes and Pull Boxes for 600 V and Less, Including Telephone, Communications, and Data Wiring:

1. Units in Roadways and Other Deliberate Traffic Paths: Precast concrete. AASHTO HB 17, H-20 structural load rating.
2. Units in Driveway, Parking Lot, and Off-Roadway Locations, Subject to Occasional, Nondeliberate Loading by Heavy Vehicles: Polymer concrete, SCTE 77, Tier 15 or Tier 22 structural load rating.
3. Units in Sidewalk and Similar Applications with a Safety Factor for Nondeliberate Loading by Vehicles: structural load rating.
4. Units Subject to Light-Duty Pedestrian Traffic Only: Fiberglass-reinforced polyester resin, structurally tested according to SCTE 77 with 3000-lbf "Light-Duty" vertical loading.

B. Manholes: Precast concrete.

1. Units Located in Roadways and Other Deliberate Traffic Paths by Heavy or Medium Vehicles: H-20 structural load rating according to AASHTO HB 17.
2. Units Not Located in Deliberate Traffic Paths by Heavy or Medium Vehicles: H-10 load rating according to AASHTO HB 17.

3.5 EARTHWORK

A. Excavation and Backfill: Comply with Section 312000 "Earth Moving," but do not use heavy-duty, hydraulic-operated, compaction equipment.

B. Restore surface features at areas disturbed by excavation and reestablish original grades unless otherwise indicated. Replace removed sod immediately after backfilling is completed.

C. Restore areas disturbed by trenching, storing of dirt, cable laying, and other work. Restore vegetation and include necessary top soiling, fertilizing, liming, seeding, sodding, sprigging, and mulching. Cut and patch existing pavement in the path of underground ducts and utility structures.

3.6 DUCT INSTALLATION

A. Slope: Pitch ducts a minimum slope of 1:300 down toward manholes and handholes and away from buildings and equipment. Slope ducts from a high point in runs between two (2) manholes to drain in both directions.

B. Curves and Bends: Use 5-degree angle couplings for small changes in direction. Use manufactured long sweep bends with a minimum radius of 25 ft. both horizontally and vertically, at other locations unless otherwise indicated.

C. Joints: Use solvent-cemented joints in ducts and fittings and make watertight according to manufacturer's written instructions. Stagger couplings so those of adjacent ducts do not lie in same plane.

D. Duct Entrances to Manholes and Concrete and Polymer Concrete Handholes: Use end bells, spaced approximately 10 inches o.c. for 5-inch ducts, and vary proportionately for other duct sizes.

1. Begin change from regular spacing to end-bell spacing 10 ft. from the end bell without reducing duct line slope and without forming a trap in the line.
2. Direct-Buried Duct Banks: Install an expansion and deflection fitting in each conduit in the area of disturbed earth adjacent to manhole or handhole.
3. Grout end bells into structure walls from both sides to provide watertight entrances.

E. Building Wall Penetrations: Make a transition from underground duct to rigid steel conduit at least 10 ft. outside the building wall without reducing duct line slope away from the building and without forming a trap in the line. Use fittings manufactured for duct-to-conduit transition. Install conduit penetrations of building walls as specified in Section 260500 "Common Work Results for Electrical."

F. Sealing: Provide temporary closure at terminations of ducts that have cables pulled. Seal spare ducts at terminations. Use sealing compound and plugs to withstand at least 15-psig hydrostatic pressure.

G. Pulling Cord: Install 100-lbf-test nylon cord in ducts, including spares.

H. Concrete-Encased Ducts: Support ducts on duct separators.

1. Separator Installation: Space separators close enough to prevent sagging and deforming of ducts, with not less than five (5) spacers per 20 ft. of duct. Secure separators to earth and to ducts to prevent floating during concreting. Stagger separators approximately 6 inches between tiers. Tie entire assembly together using fabric straps; do not use tie

wires or reinforcing steel that may form conductive or magnetic loops around ducts or duct groups.

2. Concreting Sequence: Pour each run of envelope between manholes or other terminations in one continuous operation.

    a. Start at one end and finish at the other, allowing for expansion and contraction of ducts as their temperature changes during and after the pour. Use expansion fittings installed according to manufacturer's written recommendations or use other specific measures to prevent expansion-contraction damage.
    b. If more than one (1) pour is necessary, terminate each pour in a vertical plane and install ¾-inch reinforcing rod dowels extending 18 inches into concrete on both sides of joint near corners of envelope.

3. Pouring Concrete: Spade concrete carefully during pours to prevent voids under and between conduits and at exterior surface of envelope. Do not allow a heavy mass of concrete to fall directly onto ducts. Use a plank to direct concrete down sides of bank assembly to trench bottom. Allow concrete to flow to center of bank and rise up in middle, uniformly filling all open spaces. Do not use power-driven agitating equipment unless specifically designed for duct-bank application.
4. Reinforcement: Reinforce concrete-encased duct banks where they cross disturbed earth and where indicated. Arrange reinforcing rods and ties without forming conductive or magnetic loops around ducts or duct groups.
5. Forms: Use walls of trench to form side walls of duct bank where soil is self-supporting and concrete envelope can be poured without soil inclusions; otherwise, use forms.
6. Minimum Space between Ducts: 3 inches between ducts and exterior envelope wall, 2 inches between ducts for like services, and 4 inches between power and signal ducts.
7. Depth: Install top of duct bank at least 24 inches below finished grade in areas not subject to deliberate traffic, and at least 30 inches below finished grade in deliberate traffic paths for vehicles unless otherwise indicated.
8. Stub-Ups: Use manufactured duct elbows for stub-ups at poles and equipment and at building entrances through the floor unless otherwise indicated. Extend concrete encasement throughout the length of the elbow.
9. Stub-Ups: Use manufactured rigid steel conduit elbows for stub-ups at poles and equipment and at building entrances through the floor.

    a. Couple steel conduits to ducts with adapters designed for this purpose and encase coupling with 3 inches of concrete.
    b. Stub-Ups to Equipment: For equipment mounted on outdoor concrete bases, extend steel conduit horizontally a minimum of 60 inches from edge of base. Install insulated grounding bushings on terminations at equipment.

10. Warning Tape: Bury warning tape approximately 12 inches above all concrete-encased ducts and duct banks. Align tape parallel to and within 3 inches of the centerline of duct bank. Provide an additional warning tape for each 12-inch increment of duct bank width over a nominal 18 inches. Space additional tapes 12 inches apart, horizontally.

I. Direct-Buried Duct Banks:

1. Support ducts on duct separators coordinated with duct size, duct spacing, and outdoor temperature.
2. Space separators close enough to prevent sagging and deforming of ducts, with not less than five (5) spacers per 20 ft. of duct. Secure separators to earth and to ducts to prevent displacement during backfill and yet permit linear duct movement due to expansion and contraction as temperature changes. Stagger spacers approximately 6 inches between tiers.

3. Excavate trench bottom to provide firm and uniform support for duct bank. Prepare trench bottoms as specified in Section 312000 "Earth Moving" for pipes less than 6 inches in nominal diameter.
4. Install backfill as specified in Section 312000 "Earth Moving."
5. After installing first tier of ducts, backfill and compact. Start at tie-in point and work toward end of duct run, leaving ducts at end of run free to move with expansion and contraction as temperature changes during this process. Repeat procedure after placing each tier. After placing last tier, hand-place backfill to 4 inches over ducts and hand tamp. Firmly tamp backfill around ducts to provide maximum supporting strength. Use hand tamper only. After placing controlled backfill over final tier, make final duct connections at end of run and complete backfilling with normal compaction as specified in Section 312000 "Earth Moving."
6. Install ducts with a minimum of 3 inches between ducts for like services and 6 inches between power and signal ducts.
7. Depth: Install top of duct bank at least 36 inches below finished grade unless otherwise indicated.
8. Set elevation of bottom of duct bank below the frost line.
9. Install manufactured duct elbows for stub-ups at poles and equipment and at building entrances through the floor unless otherwise indicated. Encase elbows for stub-up ducts throughout the length of the elbow.
10. Install manufactured rigid steel conduit elbows for stub-ups at poles and equipment and at building entrances through the floor.

    a. Couple steel conduits to ducts with adapters designed for this purpose and encase coupling with 3 inches of concrete.
    b. For equipment mounted on outdoor concrete bases, extend steel conduit horizontally a minimum of 60 inches from edge of equipment pad or foundation. Install insulated grounding bushings on terminations at equipment.

11. Warning Tape: Bury warning tape approximately 12 inches above all concrete-encased ducts and duct banks. Align tape parallel to and within 3 inches of the centerline of duct bank. Provide an additional warning tape for each 12-inch increment of duct bank width over a nominal 18 inches. Space additional tapes 12 inches apart, horizontally.

3.7 INSTALLATION OF CONCRETE MANHOLES, HANDHOLES, AND PULL BOXES

A. Cast-in-Place Manhole Installation:

1. Finish interior surfaces with a smooth-troweled finish.
2. Windows for Future Duct Connections: Form and pour concrete knockout panels 1½- to 2- inches-thick, arranged as indicated.
3. Cast-in-place concrete, formwork, and reinforcement are specified in Section 033000 "Cast-in-Place Concrete."

B. Precast Concrete Handhole and Manhole Installation:

1. Comply with ASTM C 891 unless otherwise indicated.
2. Install units level and plumb and with orientation and depth coordinated with connecting ducts to minimize bends and deflections required for proper entrances.
3. Unless otherwise indicated, support units on a level bed of crushed stone or gravel, graded from 1-inch sieve to No. 4 sieve and compacted to same density as adjacent undisturbed earth.

C. Elevations:

1. Manhole Roof: Install with rooftop at least 15 inches below finished grade.
2. Manhole Frame: In paved areas and trafficways, set frames flush with finished grade. Set other manhole frames 1 inch above finished grade.
3. Install handholes with bottom below the frost line, below grade.
4. Handhole Covers: In paved areas and trafficways, set surface flush with finished grade. Set covers of other handholes 1 inch above finished grade.
5. Where indicated, cast handhole cover frame integrally with handhole structure.

D. Drainage: Install drains in bottom of manholes where indicated. Coordinate with drainage provisions indicated.

E. Manhole Access: Circular opening in manhole roof; sized to match cover size.

1. Manholes with Fixed Ladders: Offset access opening from manhole centerlines to align with ladder.
2. Install chimney, constructed of precast concrete collars and rings to support frame and cover and to connect cover with manhole roof opening. Provide moisture-tight masonry joints and waterproof grouting for cast-iron frame to chimney.

F. Waterproofing: Apply waterproofing to exterior surfaces of manholes and handholes after concrete has cured at least three (3) days. Waterproofing materials and installation are specified in Division 07. After ducts have been connected and grouted, and before backfilling, waterproof joints and connections and touch up abrasions and scars. Waterproof exterior of manhole chimneys after mortar has cured at least three (3) days.

G. Hardware: Install removable hardware, including pulling eyes, cable stanchions, cable arms, and insulators, as required for installation and support of cables and conductors and as indicated.

H. Fixed Manhole Ladders: Arrange to provide for safe entry with maximum clearance from cables and other items in manholes.

I. Field-Installed Bolting Anchors in Manholes and Concrete Handholes: Do not drill deeper than 3-7/8 inches for manholes and 2 inches for handholes, for anchor bolts installed in the field. Use a minimum of two (2) anchors for each cable stanchion.

J. Warning Sign: Install "Confined Space Hazard" warning sign on the inside surface of each manhole cover.

3.8 INSTALLATION OF HANDHOLES AND PULL BOXES OTHER THAN PRECAST CONCRETE

A. Install handholes and pull boxes level and plumb and with orientation and depth coordinated with connecting ducts to minimize bends and deflections required for proper entrances. Use pull box extension if required to match depths of ducts, and seal joint between box and extension as recommended by the manufacturer.

B. Unless otherwise indicated, support units on a level 6-inch-thick bed of crushed stone or gravel, graded from ½-inch sieve to No. 4 sieve and compacted to same density as adjacent undisturbed earth.

C. Elevation: Set so cover surface will be flush with finished grade.

D. Install handholes and pull boxes with bottom below the frost line, below grade.

E. Install removable hardware, including pulling eyes, cable stanchions, cable arms, and insulators, as required for installation and support of cables and conductors and as indicated. Retain arm lengths to be long enough to provide spare space for future cables, but short enough to preserve adequate working clearances in the enclosure.

F. Field-cut openings for ducts and conduits according to enclosure manufacturer's written instructions. Cut wall of enclosure with a tool designed for material to be cut. Size holes for terminating fittings to be used, and seal around penetrations after fittings are installed.

G. For enclosures installed in asphalt paving and subject to occasional, nondeliberate, heavy-vehicle loading, form and pour a concrete ring encircling, and in contact with, enclosure and with top surface screeded to top of box cover frame. Bottom of ring shall rest on compacted earth.

1. Concrete: 3000 psi, twenty-eight (28) day strength, complying with Section 033000 "Cast-in-Place Concrete," with a troweled finish.
2. Dimensions: 10 inches wide by 12 inches deep.

3.9 GROUNDING

A. Ground underground ducts and utility structures according to Section 260526 "Grounding and Bonding for Electrical Systems."

3.10 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. Demonstrate capability and compliance with requirements on completion of installation of underground ducts and utility structures.
2. Pull aluminum or wood test mandrel through duct to prove joint integrity and test for out-of-round duct. Provide mandrel equal to eighty percent (80%) fill of duct. If obstructions are indicated, remove obstructions and retest.
3. Test manhole and handhole grounding to ensure electrical continuity of grounding and bonding connections. Measure and report ground resistance as specified in Section 260526 "Grounding and Bonding for Electrical Systems."

B. Correct deficiencies and retest as specified above to demonstrate compliance.

C. Prepare test and inspection reports.

3.11 CLEANING

A. Pull leather-washer-type duct cleaner, with graduated washer sizes, through full length of ducts. Follow with rubber duct swab for final cleaning and to assist in spreading lubricant throughout ducts.

B. Clean internal surfaces of manholes, including sump. Remove foreign material.

END OF SECTION 260543

SECTION 260548 - VIBRATION AND SEISMIC CONTROLS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Isolation pads.
2. Spring isolators.
3. Restrained spring isolators.
4. Channel support systems.
5. Restraint cables.
6. Hanger rod stiffeners.
7. Anchorage bushings and washers.

B. Related Sections include the following:

1. Section 260529 "Hangers and Supports for Electrical Systems" for commonly used electrical supports and installation requirements.

1.3 DEFINITIONS

A. The IBC: International Building Code.

B. ICC-ES: ICC-Evaluation Service.

C. OSHPD: Office of Statewide Health Planning and Development for the State of California.

1.4 PERFORMANCE REQUIREMENTS

A. Seismic-Restraint Loading:

1. Site Class as Defined in the IBC: D.
2. Assigned Seismic Use Group or Building Category as Defined in the IBC: III.

a. Component Importance Factor: 1.5.
b. Component Response Modification Factor: 5.5.
c. Component Amplification Factor: 1.0.

3. Design Spectral Response Acceleration at Short Periods (0.2 Second).

1.5 ACTION SUBMITTALS

A. Product Data: For the following:

1. Include rated load, rated deflection, and overload capacity for each vibration isolation device.

2. Illustrate and indicate style, material, strength, fastening provision, and finish for each type and size of seismic-restraint component used.

    a. Tabulate types and sizes of seismic restraints, complete with report numbers and rated strength in tension and shear as evaluated by an agency acceptable to authorities having jurisdiction.
    b. Annotate to indicate application of each product submitted and compliance with requirements.

3. Restrained-Isolation Devices: Include ratings for horizontal, vertical, and combined loads.

B. Delegated-Design Submittal: For vibration isolation and seismic-restraint details indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1. Design Calculations: Calculate static and dynamic loading due to equipment weight and operation, seismic forces required to select vibration isolators and seismic restraints.

    a. Coordinate design calculations with wind-load calculations required for equipment mounted outdoors. Comply with requirements in other electrical Sections for equipment mounted outdoors.

2. Indicate materials and dimensions and identify hardware, including attachment and anchorage devices.
3. Field-fabricated supports.
4. Seismic-Restraint Details:

    a. Design Analysis: To support selection and arrangement of seismic restraints. Include calculations of combined tensile and shear loads.
    b. Details: Indicate fabrication and arrangement. Detail attachments of restraints to the restrained items and to the structure. Show attachment locations, methods, and spacings. Identify components, list their strengths, and indicate directions and values of forces transmitted to the structure during seismic events. Indicate association with vibration isolation devices.
    c. Preapproval and Evaluation Documentation: By an agency acceptable to authorities having jurisdiction, showing maximum ratings of restraint items and the basis for approval (tests or calculations).

1.6 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Show coordination of seismic bracing for electrical components with other systems and equipment in the vicinity, including other supports and seismic restraints.

B. Qualification Data: For professional engineer and testing agency.

C. Welding certificates.

D. Field quality-control test reports.

1.7 QUALITY ASSURANCE

A. Testing Agency Qualifications: An independent agency, with the experience and capability to conduct the testing indicated, that is a nationally recognized testing laboratory (NRTL) as defined by OSHA in 29 CFR 1910.7, and that is acceptable to authorities having jurisdiction.

B. Comply with seismic-restraint requirements in the IBC unless requirements in this Section are more stringent.

C. Welding: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code - Steel."

D. Seismic-restraint devices shall have horizontal and vertical load testing and analysis and shall bear anchorage preapproval OPA number from OSHPD, preapproval by ICC-ES, or preapproval by another agency acceptable to authorities having jurisdiction, showing maximum seismic-restraint ratings. Ratings based on independent testing are preferred to ratings based on calculations. If preapproved ratings are not available, submittals based on independent testing are preferred. Calculations (including combining shear and tensile loads) to support seismic-restraint designs must be signed and sealed by a qualified professional engineer.

E. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 VIBRATION ISOLATORS

A. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

1. Ace Mountings Co., Inc.
2. Amber/Booth Company, Inc.
3. California Dynamics Corporation
4. Isolation Technology, Inc.
5. Kinetics Noise Control
6. Mason Industries
7. Vibration Eliminator Co., Inc.
8. Vibration Isolation
9. Vibration Mountings & Controls, Inc.

B. Pads: Arrange in single or multiple layers of sufficient stiffness for uniform loading over pad area, molded with a nonslip pattern and galvanized-steel baseplates, and factory cut to sizes that match requirements of supported equipment.

1. Resilient Material: Oil- and water-resistant neoprene.

C. Spring Isolators: Freestanding, laterally stable, open-spring isolators.

1. Outside Spring Diameter: Not less than eighty percent (80%) of the compressed height of the spring at rated load.
2. Minimum Additional Travel: Fifty percent (50%) of the required deflection at rated load.
3. Lateral Stiffness: More than eighty percent (80%) of rated vertical stiffness.
4. Overload Capacity: Support two hundred percent (200%) of rated load, fully compressed, without deformation or failure.
5. Baseplates: Factory drilled for bolting to structure and bonded to ¼-inch thick, rubber isolator pad attached to baseplate underside. Baseplates shall limit floor load to 500 psig.
6. Top Plate and Adjustment Bolt: Threaded top plate with adjustment bolt and cap screw to fasten and level equipment.

D. Restrained Spring Isolators: Freestanding, steel, open-spring isolators with seismic or limit-stop restraint.

1. Housing: Steel with resilient vertical-limit stops to prevent spring extension due to weight being removed; factory-drilled baseplate bonded to ¼-inch-thick, neoprene or rubber isolator pad attached to baseplate underside; and adjustable equipment mounting and leveling bolt that acts as blocking during installation.
2. Restraint: Seismic or limit-stop as required for equipment and authorities having jurisdiction.
3. Outside Spring Diameter: Not less than eighty percent (80%) of the compressed height of the spring at rated load.
4. Minimum Additional Travel: Fifty percent (50%) of the required deflection at rated load.
5. Lateral Stiffness: More than eighty percent (80%) of rated vertical stiffness.
6. Overload Capacity: Support two hundred percent (200%) of rated load, fully compressed, without deformation or failure.

2.2 SEISMIC-RESTRAINT DEVICES

A. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

1. Amber/Booth Company, Inc.
2. California Dynamics Corporation
3. Cooper B-Line, Inc.; a division of Cooper Industries
4. Hilti Inc.
5. Loos & Co.; Seismic Earthquake Division
6. Mason Industries
7. TOLCO Incorporated; a brand of NIBCO INC.
8. Unistrut; Tyco International, Ltd.

B. General Requirements for Restraint Components: Rated strengths, features, and application requirements shall be as defined in reports by an agency acceptable to authorities having jurisdiction.

1. Structural Safety Factor: Allowable strength in tension, shear, and pullout force of components shall be at least four (4) times the maximum seismic forces to which they will be subjected.

C. Channel Support System: MFMA-3, shop- or field-fabricated support assembly made of slotted steel channels with accessories for attachment to braced component at one end and to building structure at the other end and other matching components and with corrosion-resistant coating; and rated in tension, compression, and torsion forces.

D. Restraint Cables: ASTM A 603 galvanized-steel cables with end connections made of steel assemblies with thimbles, brackets, swivels, and bolts designed for restraining cable service; and with a minimum of two (2) clamping bolts for cable engagement.

E. Hanger Rod Stiffener: Steel tube or steel slotted-support-system sleeve with internally bolted connections to hanger rod. Do not weld stiffeners to rods.

F. Bushings for Floor-Mounted Equipment Anchor: Neoprene bushings designed for rigid equipment mountings, and matched to type and size of anchors and studs.

G. Bushing Assemblies for Wall-Mounted Equipment Anchorage: Assemblies of neoprene elements and steel sleeves designed for rigid equipment mountings and matched to type and size of attachment devices.

H. Resilient Isolation Washers and Bushings: One-piece, molded, oil- and water-resistant neoprene, with a flat washer face.

I. Mechanical Anchor: Drilled-in and stud-wedge or female-wedge type in zinc-coated steel for interior applications and stainless steel for exterior applications. Select anchors with strength required for anchor and as tested according to ASTM E 488. Minimum length of eight (8) times diameter.

J. Adhesive Anchor: Drilled-in and capsule anchor system containing polyvinyl or urethane methacrylate-based resin and accelerator, or injected polymer or hybrid mortar adhesive. Provide anchor bolts and hardware with zinc-coated steel for interior applications and stainless steel for exterior applications. Select anchor bolts with strength required for anchor and as tested according to ASTM E 488.

2.3 FACTORY FINISHES

A. Finish: Manufacturer's standard paint applied to factory-assembled and -tested equipment before shipping.

1. Powder coating on springs and housings.
2. All hardware shall be galvanized. Hot-dip galvanize metal components for exterior use.
3. Baked enamel or powder coat for metal components on isolators for interior use.
4. Color-code or otherwise mark vibration isolation and seismic-control devices to indicate capacity range.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and equipment to receive vibration isolation and seismic-control devices for compliance with requirements for installation tolerances and other conditions affecting performance.

B. Examine roughing-in of reinforcement and cast-in-place anchors to verify actual locations before installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 APPLICATIONS

A. Multiple Raceways or Cables: Secure raceways and cables to trapeze member with clamps approved for application by an agency acceptable to authorities having jurisdiction.

B. Hanger Rod Stiffeners: Install hanger rod stiffeners where indicated or scheduled on Drawings to receive them and where required to prevent buckling of hanger rods due to seismic forces.

C. Strength of Support and Seismic-Restraint Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static and seismic loads within specified loading limits.

3.3 SEISMIC-RESTRAINT DEVICE INSTALLATION

A. Equipment and Hanger Restraints:

1. Install restrained isolators on electrical equipment.
2. Install resilient, bolt-isolation washers on equipment anchor bolts where clearance between anchor and adjacent surface exceeds 0.125-inch.
3. Install seismic-restraint devices using methods approved by an agency acceptable to authorities having jurisdiction providing required submittals for component.

B. Install bushing assemblies for mounting bolts for wall-mounted equipment, arranged to provide resilient media where equipment or equipment-mounting channels are attached to wall.

C. Attachment to Structure: If specific attachment is not indicated, anchor bracing to structure at flanges of beams, at upper truss chords of bar joists, or at concrete members.

D. Drilled-in Anchors:

1. Identify position of reinforcing steel and other embedded items prior to drilling holes for anchors. Do not damage existing reinforcing or embedded items during coring or drilling. Notify the structural engineer if reinforcing steel or other embedded items are encountered during drilling. Locate and avoid prestressed tendons, electrical and telecommunications conduit, and gas lines.
2. Do not drill holes in concrete or masonry until concrete, mortar, or grout has achieved full design strength.
3. Wedge Anchors: Protect threads from damage during anchor installation. Heavy-duty sleeve anchors shall be installed with sleeve fully engaged in the structural element to which anchor is to be fastened.
4. Adhesive Anchors: Clean holes to remove loose material and drilling dust prior to installation of adhesive. Place adhesive in holes proceeding from the bottom of the hole and progressing toward the surface in such a manner as to avoid introduction of air pockets in the adhesive.
5. Set anchors to manufacturer's recommended torque, using a torque wrench.
6. Install zinc-coated steel anchors for interior and stainless-steel anchors for exterior applications.

3.4 ACCOMMODATION OF DIFFERENTIAL SEISMIC MOTION

A. Install flexible connections in runs of raceways, cables, wireways, cable trays, and busways where they cross seismic joints, where adjacent sections or branches are supported by different structural elements, and where they terminate with connection to equipment that is anchored to a different structural element from the one supporting them as they approach equipment.

3.5 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Tests and Inspections:

1. Provide evidence of recent calibration of test equipment by a testing agency acceptable to authorities having jurisdiction.
2. Schedule test with Owner, through Architect, before connecting anchorage device to restrained component (unless post connection testing has been approved), and with at least seven (7) days' advance notice.

3. Obtain Architect's approval before transmitting test loads to structure. Provide temporary load-spreading members.
4. Test at least four (4) of each type and size of installed anchors and fasteners selected by Architect.
5. Test to ninety percent (90%) of rated proof load of device.
6. Measure isolator restraint clearance.
7. Measure isolator deflection.
8. Verify snubber minimum clearances.
9. If a device fails test, modify all installations of same type and retest until satisfactory results are achieved.

C. Remove and replace malfunctioning units and retest as specified above.

D. Prepare test and inspection reports.

3.6 ADJUSTING

A. Adjust isolators after isolated equipment is at operating weight.

B. Adjust limit stops on restrained spring isolators to mount equipment at normal operating height. After equipment installation is complete, adjust limit stops so they are out of contact during normal operation.

C. Adjust active height of spring isolators.

D. Adjust restraints to permit free movement of equipment within normal mode of operation.

END OF SECTION 260548

SECTION 260553 - IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Identification for raceways.
2. Identification of power and control cables.
3. Identification for conductors.
4. Underground-line warning tape.
5. Warning labels and signs.
6. Instruction signs.
7. Equipment identification labels.
8. Miscellaneous identification products.

1.3 SUBMITTALS

A. Product Data: For each electrical identification product indicated.

B. Samples: For each type of label and sign to illustrate size, colors, lettering style, mounting provisions, and graphic features of identification products.

C. Identification Schedule: An index of nomenclature of electrical equipment and system components used in identification signs and labels.

1.4 QUALITY ASSURANCE

A. Comply with ANSI A13.1 and IEEE C2.

B. Comply with NFPA 70.

C. Comply with 29 CFR 1910.144 and 29 CFR 1910.145.

D. Comply with ANSI Z535.4 for safety signs and labels.

E. Adhesive-attached labeling materials, including label stocks, laminating adhesives, and inks used by label printers, shall comply with UL 969.

1.5 COORDINATION

A. Coordinate identification names, abbreviations, colors, and other features with requirements in other Sections requiring identification applications, Drawings, Shop Drawings, manufacturer's wiring diagrams, and the Operation and Maintenance Manual; and with those required by codes, standards, and 29 CFR 1910.145. Use consistent designations throughout Project.

B. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.

C. Coordinate installation of identifying devices with location of access panels and doors.

D. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2 - PRODUCTS

2.1 POWER RACEWAY IDENTIFICATION MATERIALS

A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each raceway size.

B. Colors for Raceways Carrying Circuits at 600 V or Less:

1. Black letters on an orange field.
2. Legend: Indicate voltage and system or service type.

C. Colors for Raceways Carrying Circuits at More Than 600 V:

1. Black letters on an orange field.
2. Legend: "DANGER CONCEALED HIGH VOLTAGE WIRING" with 3-inch-high letters on 20-inch centers.

D. Self-Adhesive Vinyl Labels for Raceways Carrying Circuits at 600 V or Less: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound adhesive tape for securing ends of legend label.

E. Snap-Around Labels for Raceways Carrying Circuits at 600 V or Less: Slit, pre-tensioned, flexible, preprinted, color-coded acrylic sleeve, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.

F. Snap-Around, Color-Coding Bands for Raceways Carrying Circuits at 600 V or Less: Slit, pre-tensioned, flexible, solid-colored acrylic sleeve, 2 inches long, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.

G. Tape and Stencil for Raceways Carrying Circuits More Than 600 V: 4-inch-wide black stripes on 10-inch centers diagonally over orange background that extends full length of raceway or duct and is 12 inches wide. Stop stripes at legends.

H. Metal Tags: Brass or aluminum, 2 by 2 by 0.05 inch, with stamped legend, punched for use with self-locking cable tie fastener.

I. Write-On Tags: Polyester tag, 0.015-inch-thick, with corrosion-resistant grommet and cable tie for attachment to conductor or cable.

1. Marker for Tags: Machine-printed, permanent, waterproof, black ink marker recommended by printer manufacturer.

2.2 METAL-CLAD CABLE IDENTIFICATION MATERIALS

A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each raceway and cable size.

B. Colors for Raceways Carrying Circuits at 600 V and Less:

1. Black letters on an orange field.
2. Legend: Indicate voltage and system or service type.

C. Colors for Raceways Carrying Circuits at More Than 600 V:

1. Black letters on an orange field.
2. Legend: "DANGER CONCEALED HIGH VOLTAGE WIRING" with 3-inch-high letters on 20-inch centers.

D. Self-Adhesive Vinyl Labels: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound adhesive tape for securing ends of legend label.

2.3 POWER AND CONTROL CABLE IDENTIFICATION MATERIALS

A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each raceway and cable size.

B. Self-Adhesive Vinyl Labels: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound adhesive tape for securing ends of legend label.

C. Metal Tags: Brass or aluminum, 2 by 2 by 0.05 inch, with stamped legend, punched for use with self-locking cable tie fastener.

D. Write-On Tags: Polyester tag, 0.015-inch-thick, with corrosion-resistant grommet and cable tie for attachment to conductor or cable.

1. Marker for Tags: Machine-printed, permanent, waterproof, black ink marker recommended by printer manufacturer.

E. Snap-Around Labels: Slit, pre-tensioned, flexible, preprinted, color-coded acrylic sleeve, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.

F. Snap-Around, Color-Coding Bands: Slit, pre-tensioned, flexible, solid-colored acrylic sleeve, 2 inches long, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.

2.4 CONDUCTOR IDENTIFICATION MATERIALS

A. Color-Coding Conductor Tape: Colored, self-adhesive vinyl tape not less than 3 mils thick by 1 to 2 inches wide.

B. Self-Adhesive Vinyl Labels: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound adhesive tape for securing ends of legend label.

C. Snap-Around Labels: Slit, pre-tensioned, flexible, preprinted, color-coded acrylic sleeve, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.

D. Snap-Around, Color-Coding Bands: Slit, pre-tensioned, flexible, solid-colored acrylic sleeve, 2 inches long, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.

E. Marker Tapes: Vinyl or vinyl-cloth, self-adhesive wraparound type, with circuit identification legend machine printed by thermal transfer or equivalent process.

F. Write-On Tags: Polyester tag, 0.015-inch-thick, with corrosion-resistant grommet and cable tie for attachment to conductor or cable.

1. Marker for Tags: Machine-printed, permanent, waterproof, black ink marker recommended by printer manufacturer.

2.5 FLOOR MARKING TAPE

A. 2-inch-wide, 5-mil pressure-sensitive vinyl tape, with black and white stripes and clear vinyl overlay.

B. Furnish and install tape at location in accordance with NEC 110.26 for all electrical distribution equipment.

2.6 UNDERGROUND-LINE WARNING TAPE

A. Tape:

1. Recommended by manufacturer for the method of installation and suitable to identify and locate underground electrical and communications utility lines.
2. Printing on tape shall be permanent and shall not be damaged by burial operations.
3. Tape material and ink shall be chemically inert, and not subject to degrading when exposed to acids, alkalis, and other destructive substances commonly found in soils.

B. Color and Printing:

1. Comply with ANSI Z535.1 through ANSI Z535.5.
2. Inscriptions for Red-Colored Tapes: ELECTRIC LINE, HIGH VOLTAGE.
3. Inscriptions for Orange-Colored Tapes: TELEPHONE CABLE, CATV CABLE, COMMUNICATIONS CABLE, OPTICAL FIBER CABLE.

C. Tag: Type ID:

1. Detectable three-layer laminate, consisting of a printed pigmented polyolefin film, a solid aluminum-foil core, and a clear protective film that allows inspection of the continuity of the conductive core, bright-colored, continuous-printed on one (1) side with the inscription of the utility, compounded for direct-burial service.
2. Overall Thickness: 5 mils.
3. Foil Core Thickness: 0.35 mil.
4. Weight: 28 lb/1000 sq. ft.
5. 3-Inch Tensile According to ASTM D 882: 70 lbf, and 4600 psi.

2.7 WARNING LABELS AND SIGNS

A. Comply with NFPA 70 and 29 CFR 1910.145.

B. Self-Adhesive Warning Labels: Factory-printed, multicolor, pressure-sensitive adhesive labels, configured for display on front cover, door, or other access to equipment unless otherwise indicated.

C. Baked-Enamel Warning Signs:

1. Preprinted aluminum signs, punched or drilled for fasteners, with colors, legend, and size required for application.
2. ¼-inch grommets in corners for mounting.
3. Nominal size, 7 by 10 inches.

D. Metal-Backed, Butyrate Warning Signs:

1. Weather-resistant, nonfading, preprinted, cellulose-acetate butyrate signs with 0.0396-inch galvanized-steel backing; and with colors, legend, and size required for application.
2. ¼-inch grommets in corners for mounting.
3. Nominal size, 10 by 14 inches.

E. Warning label and sign shall include, but are not limited to, the following legends:

1. Multiple Power Source Warning: "DANGER - ELECTRICAL SHOCK HAZARD - EQUIPMENT HAS MULTIPLE POWER SOURCES."
2. Workspace Clearance Warning: "WARNING - OSHA REGULATION - AREA IN FRONT OF ELECTRICAL EQUIPMENT MUST BE KEPT CLEAR FOR 36 INCHES."

2.8 INSTRUCTION SIGNS

A. Engraved, laminated acrylic or melamine plastic, minimum 1/16-inch-thick for signs up to 20 sq. inches and 1/8-inch-thick for larger sizes.

1. Engraved legend with black letters on white face.
2. Punched or drilled for mechanical fasteners.
3. Framed with mitered acrylic molding and arranged for attachment at applicable equipment.

B. Adhesive Film Label: Machine printed, in black, by thermal transfer or equivalent process. Minimum letter height shall be 3/8-inch.

C. Adhesive Film Label with Clear Protective Overlay: Machine printed, in black, by thermal transfer or equivalent process. Minimum letter height shall be 3/8-inch. Overlay shall provide a weatherproof and UV-resistant seal for label.

2.9 EQUIPMENT IDENTIFICATION LABELS

A. Adhesive Film Label: Machine printed, in black, by thermal transfer or equivalent process. Minimum letter height shall be 3/8-inch.

B. Adhesive Film Label with Clear Protective Overlay: Machine printed, in black, by thermal transfer or equivalent process. Minimum letter height shall be 3/8-inch. Overlay shall provide a weatherproof and UV-resistant seal for label.

C. Self-Adhesive, Engraved, Laminated Acrylic or Melamine Label: Adhesive backed, with white letters on a dark-gray background. Minimum letter height shall be 3/8-inch.

D. Engraved, Laminated Acrylic or Melamine Label: Punched or drilled for screw mounting. White letters on a dark-gray background. Minimum letter height shall be 3/8-inch.

E. Stenciled Legend: In nonfading, waterproof, black ink or paint. Minimum letter height shall be 1-inch.

2.10 CABLE TIES

A. General-Purpose Cable Ties: Fungus inert, self extinguishing, one piece, self locking, Type 6/6 nylon.

1. Minimum Width: 3/16-inch.
2. Tensile Strength at 73 deg F (23 deg C), According to ASTM D 638: 12,000 psi.
3. Temperature Range: Minus 40 to plus 185 deg F (Minus 40 to plus 85 deg C).
4. Color: Black except where used for color-coding.

B. UV-Stabilized Cable Ties: Fungus inert, designed for continuous exposure to exterior sunlight, self extinguishing, one piece, self locking, Type 6/6 nylon.

1. Minimum Width: 3/16-inch.
2. Tensile Strength at 73 deg F (23 deg C), According to ASTM D 638: 12,000 psi.
3. Temperature Range: Minus 40 to plus 185 deg F (Minus 40 to plus 85 deg C).
4. Color: Black.

C. Plenum-Rated Cable Ties: Self extinguishing, UV stabilized, one piece, self locking.

1. Minimum Width: 3/16-inch.
2. Tensile Strength at 73 deg F (23 deg C), According to ASTM D 638: 7000 psi.
3. UL 94 Flame Rating: 94V-0.
4. Temperature Range: Minus 50 to plus 284 deg F (Minus 46 to plus 140 deg C).
5. Color: Black.

2.11 DATA RECEPTACLES

A. Adhesive Film Label: Machine printed, in black, by thermal transfer or equivalent process. It should read “DATA ONLY”. Minimum letter height shall be 3/8-inch.

B. Adhesive Film Label with Clear Protective Overlay: Machine printed, in black, by thermal transfer or equivalent process. Minimum letter height shall be 3/8-inch. Overlay shall provide a weatherproof and UV-resistant seal for label.

C. Self-Adhesive, Engraved, Laminated Acrylic or Melamine Label: Adhesive backed, with white letters on a dark-gray background. Minimum letter height shall be 3/8-inch.

2.12 RECEPTACLES ON EMERGENCY POWER

A. Adhesive Film Label with Clear Protective Overlay: Machine printed, in orange, by thermal transfer or equivalent process. Minimum letter height shall be 3/8-inch. Overlay shall provide a weatherproof and UV-resistant seal for label. Install orange label with receptacle device for identification.

2.13 MISCELLANEOUS IDENTIFICATION PRODUCTS

A. Fasteners for Labels and Signs: Self-tapping, stainless-steel screws or stainless-steel machine screws with nuts and flat and lock washers.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Verify identity of each item before installing identification products.

B. Location: Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment.

C. Apply identification devices to surfaces that require finish after completing finish work.

D. Self-Adhesive Identification Products: Clean surfaces before application, using materials and methods recommended by manufacturer of identification device.

E. Attach signs and plastic labels that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.

F. System Identification Color-Coding Bands for Raceways and Cables: Each color-coding band shall completely encircle cable or conduit. Place adjacent bands of two-color markings in contact, side by side. Locate bands at changes in direction, at penetrations of walls and floors, at 50-foot maximum intervals in straight runs, and at 25-foot maximum intervals in congested areas.

G. Aluminum Wraparound Marker Labels and Metal Tags: Secure tight to surface of conductor or cable at a location with high visibility and accessibility.

H. Cable Ties: For attaching tags. Use general-purpose type, except as listed below:

1. Outdoors: UV-stabilized nylon.
2. In Spaces Handling Environmental Air: Plenum rated.

I. Underground-Line Warning Tape: During backfilling of trenches install continuous underground-line warning tape directly above line at 6 to 8 inches below finished grade. Use multiple tapes where width of multiple lines installed in a common trench or concrete envelope exceeds 16 inches overall.

3.2 IDENTIFICATION SCHEDULE

A. Concealed Raceways, Duct Banks, More Than 600 V, within Buildings: Tape and stencil 4-inch-wide black stripes on 10-inch centers over orange background that extends full length of raceway or duct and is 12 inches wide. Stencil legend "DANGER CONCEALED HIGH VOLTAGE WIRING" with 3-inch-high black letters on 20-inch centers. Stop stripes at legends. Apply to the following finished surfaces:

1. Floor surface directly above conduits running beneath and within 12 inches of a floor that is in contact with earth or is framed above unexcavated space.
2. Wall surfaces directly external to raceways concealed within wall.
3. Accessible surfaces of concrete envelope around raceways in vertical shafts, exposed in the building, or concealed above suspended ceilings.

B. Accessible Raceways, Armored and Metal-Clad Cables, More Than 600 V: Self-adhesive vinyl labels. Install labels at 30-foot maximum intervals.

C. Accessible Raceways and Metal-Clad Cables, 600 V or Less, for Service, Feeder, and Branch Circuits More Than 30 A, and 120 V to ground: Identify with self-adhesive vinyl label. Install labels at 30-foot maximum intervals.

D. Accessible Raceways and Cables within Buildings: Identify the covers of each junction and pull box of the following systems with self-adhesive vinyl labels with the wiring system legend and system voltage. System legends shall be as follows:

1. Emergency Power.
2. Standby Power.
3. Normal Power.

E. Power-Circuit Conductor Identification, 600 V or Less: For conductors in vaults, pull and junction boxes, manholes, and handholes, use color-coding conductor tape to identify the phase.

1. Color-Coding for Phase and Voltage Level Identification, 600 V or Less: Use colors listed below for ungrounded service, feeder, and branch-circuit conductors.

a. Color shall be factory applied or field applied for sizes larger than No. 8 AWG, if authorities having jurisdiction permit.
b. Colors for 208/120-V Circuits:

1) Phase A: Black.
2) Phase B: Red.
3) Phase C: Blue.

c. Colors for 480/277-V Circuits:

1) Phase A: Brown.
2) Phase B: Orange.
3) Phase C: Yellow.

d. Field-Applied, Color-Coding Conductor Tape: Apply in half-lapped turns for a minimum distance of 6 inches from terminal points and in boxes where splices or taps are made. Apply last two (2) turns of tape with no tension to prevent possible unwinding. Locate bands to avoid obscuring factory cable markings.

F. Power-Circuit Conductor Identification, more than 600 V: For conductors in vaults, pull and junction boxes, manholes, and handholes, use write-on tags, nonmetallic plastic tag holder with adhesive-backed phase tags, and a separate tag with the circuit designation.

G. Install instructional sign including the color-code for grounded and ungrounded conductors using adhesive-film-type labels.

H. Conductors to Be Extended in the Future: Attach marker tape to conductors and list source.

I. Auxiliary Electrical Systems Conductor Identification: Identify field-installed alarm, control, and signal connections.

1. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, and pull points. Identify by system and circuit designation.
2. Use system of marker tape designations that is uniform and consistent with system used by manufacturer for factory-installed connections.

3. Coordinate identification with Project Drawings, manufacturer's wiring diagrams, and the Operation and Maintenance Manual.

J. Locations of Underground Lines: Identify with underground-line warning tape for power, lighting, communication, and control wiring and optical fiber cable.

1. Limit use of underground-line warning tape to direct-buried cables.
2. Install underground-line warning tape for both direct-buried cables and cables in raceway.

K. Workspace Indication: Install floor marking tape to show working clearances in the direction of access to live parts. Workspace shall be as required by NFPA 70 and 29 CFR 1926.403 unless otherwise indicated. Do not install at flush-mounted panelboards and similar equipment in finished spaces.

L. Warning Labels for Indoor Cabinets, Boxes, and Enclosures for Power and Lighting: Self-adhesive warning labels.

1. Comply with 29 CFR 1910.145.
2. Identify system voltage with black letters on an orange background.
3. Apply to exterior of door, cover, or other access.
4. For equipment with multiple power or control sources, apply to door or cover of equipment including, but not limited to, the following:

a. Power transfer switches.
b. Controls with external control power connections.

M. Operating Instruction Signs: Install instruction signs to facilitate proper operation and maintenance of electrical systems and items to which they connect. Install instruction signs with approved legend where instructions are needed for system or equipment operation.

N. Emergency Operating Instruction Signs: Install instruction signs with white legend on a red background with minimum 3/8-inch-high letters for emergency instructions at equipment used for power transfer and load shedding.

O. Equipment Identification Labels: On each unit of equipment, install unique designation label that is consistent with wiring diagrams, schedules, and the Operation and Maintenance Manual. Apply labels to disconnect switches and protection equipment, central or master units, control panels, control stations, terminal cabinets, and racks of each system. Systems include power, lighting, control, communication, signal, monitoring, and alarm systems unless equipment is provided with its own identification.

1. Labeling Instructions:

a. Indoor Equipment: Adhesive film label. Unless otherwise indicated, provide a single line of text with ½-inch-high letters on 1½-inch-high label; where two (2) lines of text are required, use labels 2 inches high.
b. Outdoor Equipment: Engraved, laminated acrylic or melamine label. Stenciled legend 4 inches high.
c. Elevated Components: Increase sizes of labels and letters to those appropriate for viewing from the floor.
d. Unless provided with self-adhesive means of attachment, fasten labels with appropriate mechanical fasteners that do not change the NEMA or NRTL rating of the enclosure.

2. Equipment to Be Labeled:

a. Panelboards: Typewritten directory of circuits in the location provided by panelboard manufacturer. Panelboard identification shall be self-adhesive and engraved laminated acrylic or melamine label.
b. Enclosures and electrical cabinets.
c. Access doors and panels for concealed electrical items.
d. Switchgear.
e. Switchboards.
f. Transformers: Label that includes tag designation shown on Drawings for the transformer, feeder, and panelboards or equipment supplied by the secondary.
g. Emergency system boxes and enclosures.
h. Enclosed switches.
i. Enclosed circuit breakers.
j. Enclosed controllers.
k. Variable-speed controllers.
l. Push-button stations.
m. Power transfer equipment.
n. Contactors.
o. Remote-controlled switches, dimmer modules, and control devices.
p. Power-generating units.
q. Monitoring and control equipment.
r. UPS equipment.

END OF SECTION 260553

SECTION 260572 - SHORT-CIRCUIT STUDIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes a computer-based, fault-current study to determine the minimum interrupting capacity of circuit protective devices.

1.3 DEFINITIONS

A. Existing to Remain: Existing items of construction that are not to be removed and that are not otherwise indicated to be removed and salvaged or removed and reinstalled. Existing to remain items shall remain functional throughout the construction period.

B. Field Adjusting Agency: An independent electrical testing agency with full-time employees and the capability to adjust devices and conduct testing indicated and that is a member company of NETA.

C. One-Line Diagram: A diagram that shows, by means of single lines and graphic symbols, the course of an electric circuit or system of circuits and the component devices or parts used therein.

D. Power System Analysis Software Developer: An entity that commercially develops, maintains, and distributes computer software used for power system studies.

E. Power Systems Analysis Specialist: Professional engineer in charge of performing the study and documenting recommendations, licensed in the state where Project is located.

F. Protective Device: A device that senses when an abnormal current flow exists and then removes the affected portion of the circuit from the system.

G. SCCR: Short-circuit current rating.

H. Service: The conductors and equipment for delivering electric energy from the serving utility to the wiring system of the premises served.

I. Single-Line Diagram: See "One-Line Diagram."

1.4 ACTION SUBMITTALS

A. Product Data:

1. For computer software program to be used for studies.

2. Submit the following after the approval of system protective devices submittals. Submittals shall be in digital form.

    a. Short-circuit study input data, including completed computer program input data sheets.
    b. Short-circuit study and equipment evaluation report; signed, dated, and sealed by a qualified professional engineer.

        1) Submit study report for action prior to receiving final approval of distribution equipment submittals. If formal completion of studies will cause delay in equipment manufacturing, obtain approval from Architect for preliminary submittal of sufficient study data to ensure that selection of devices and associated characteristics is satisfactory.
        2) Revised one-line diagram, reflecting field investigation results and results of short-circuit study.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data:

1. For Power Systems Analysis Software Developer.
2. For Power System Analysis Specialist.
3. For Field Adjusting Agency.

B. Product Certificates: For short-circuit study software, certifying compliance with IEEE 399.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data:

1. For overcurrent protective devices to include in emergency, operation, and maintenance manuals.
2. The following are from the Short-Circuit Study Report:

    a. Final one-line diagram.
    b. Final Short-Circuit Study Report.
    c. Short-circuit study data files.
    d. Power system data.

1.7 QUALITY ASSURANCE

A. Study shall be performed using commercially developed and distributed software designed specifically for power system analysis.

B. Software algorithms shall comply with requirements of standards and guides specified in this Section.

C. Manual calculations are unacceptable.

1. Power System Analysis Software Qualifications: Computer program shall be designed to perform short-circuit studies or have a function, component, or add-on module designed to perform short-circuit studies.

2. Computer program shall be developed under the charge of a licensed professional engineer who holds IEEE Computer Society's Certified Software Development Professional certification.

D. Power Systems Analysis Specialist Qualifications: Professional engineer licensed in the state where Project is located. All elements of the study shall be performed under the direct supervision and control of this professional engineer.

E. Short-Circuit Study Certification: Short-Circuit Study Report shall be signed and sealed by Power Systems Analysis Specialist.

F. Field Adjusting Agency Qualifications:

1. Employer of a NETA ETT-Certified Technician Level III or NICET Electrical Power Testing Level III certification responsible for all field adjusting of the Work.
2. A member company of NETA.
3. Acceptable to authorities having jurisdiction.

PART 2 - PRODUCTS

2.1 POWER SYSTEM ANALYSIS SOFTWARE DEVELOPERS

A. Comply with IEEE 399 and IEEE 551.

1. Analytical features of power systems analysis software program shall have capability to calculate "mandatory," "very desirable," and "desirable" features as listed in IEEE 399.

B. Computer software program shall be capable of plotting and diagramming time-current-characteristic curves as part of its output.

2.2 SHORT-CIRCUIT STUDY REPORT CONTENTS

A. Executive summary of study findings.

B. Study descriptions, purpose, basis, and scope. Include case descriptions, definition of terms, and guide for interpretation of results.

C. One-line diagram of modeled power system, showing the following:

1. Protective device designations and ampere ratings.
2. Conductor types, sizes, and lengths.
3. Transformer kilovolt ampere (kVA) and voltage ratings.
4. Motor and generator designations and kVA ratings.
5. Switchgear, switchboard, motor-control center, and panelboard designations and ratings.
6. Derating factors and environmental conditions.
7. Any revisions to electrical equipment required by the study.

D. Comments and recommendations for system improvements or revisions in a written document, separate from one-line diagram.

E. Protective Device Evaluation:

1. Evaluate equipment and protective devices and compare to available short-circuit currents. Verify that equipment withstand ratings exceed available short-circuit current at equipment installation locations.
2. Tabulations of circuit breaker, fuse, and other protective device ratings versus calculated short-circuit duties.
3. For 600-V overcurrent protective devices, ensure that interrupting ratings are equal to or higher than calculated 1/2-cycle symmetrical fault current.
4. For devices and equipment rated for asymmetrical fault current, apply multiplication factors listed in standards to 1/2-cycle symmetrical fault current.
5. Verify adequacy of phase conductors at maximum three-phase bolted fault currents; verify adequacy of equipment grounding conductors and grounding electrode conductors at maximum ground-fault currents. Ensure that short-circuit withstand ratings are equal to or higher than calculated 1/2-cycle symmetrical fault current.

F. Short-Circuit Study Input Data:

1. One-line diagram of system being studied.
2. Power sources available.
3. Manufacturer, model, and interrupting rating of protective devices.
4. Conductors.
5. Transformer data.

G. Short-Circuit Study Output Reports:

1. Low-Voltage Fault Report: Three-phase and unbalanced fault calculations, showing the following for each overcurrent device location:

    a. Voltage.
    b. Calculated fault-current magnitude and angle.
    c. Fault-point X/R ratio.
    d. Equivalent impedance.

2. Momentary Duty Report: Three-phase and unbalanced fault calculations, showing the following for each overcurrent device location:

    a. Voltage.
    b. Calculated symmetrical fault-current magnitude and angle.
    c. Fault-point X/R ratio.
    d. Calculated asymmetrical fault currents:

        1) Based on fault-point X/R ratio.
        2) Based on calculated symmetrical value multiplied by 1.6.
        3) Based on calculated symmetrical value multiplied by 2.7.

3. Interrupting Duty Report: Three-phase and unbalanced fault calculations, showing the following for each overcurrent device location:

    a. Voltage.
    b. Calculated symmetrical fault-current magnitude and angle.
    c. Fault-point X/R ratio.
    d. No AC Decrement (NACD) ratio.
    e. Equivalent impedance.
    f. Multiplying factors for 2-, 3-, 5-, and 8-cycle circuit breakers rated on a symmetrical basis.
    g. Multiplying factors for 2-, 3-, 5-, and 8-cycle circuit breakers rated on a total basis.

PART 3 - EXECUTION

3.1 POWER SYSTEM DATA

A. Obtain all data necessary for conduct of the study.

1. Verify completeness of data supplied on one-line diagram. Call any discrepancies to Architect's attention.
2. For equipment included as Work of this Project, use characteristics submitted under provisions of action submittals and information submittals for this Project.

B. Gather and tabulate the required input data to support the short-circuit study. Comply with requirements in Section 017839 "Project Record Documents" for recording circuit protective device characteristics. Record data on a Record Document copy of one-line diagram. Comply with recommendations in IEEE 551 as to the amount of detail that is required to be acquired in the field. Field data gathering shall be under direct supervision and control of the engineer in charge of performing the study, and shall be by the engineer or its representative who holds NETA ETT-Certified Technician Level III or NICET Electrical Power Testing Level III certification. Data include, but are not limited to, the following:

1. Product Data for Project's overcurrent protective devices involved in overcurrent protective device coordination studies. Use equipment designation tags that are consistent with electrical distribution system diagrams, overcurrent protective device submittals, input and output data, and recommended device settings.
2. Obtain electrical power utility impedance at the service.
3. Power sources and ties.
4. For transformers, include kVA, primary and secondary voltages, connection type, impedance, X/R ratio, taps measured in percent, and phase shift.
5. For reactors, provide manufacturer and model designation, voltage rating, and impedance.
6. For circuit breakers and fuses, provide manufacturer and model designation. List type of breaker, type of trip, SCCR, current rating, and breaker settings.
7. Busway manufacturer and model designation, current rating, impedance, lengths, and conductor material.
8. Motor horsepower and NEMA MG 1 code letter designation.
9. Conductor sizes, lengths, number, conductor material and conduit material (magnetic or nonmagnetic).
10. Derating factors.

3.2 SHORT-CIRCUIT STUDY

A. Perform study following the general study procedures contained in IEEE 399.

B. Calculate short-circuit currents according to IEEE 551.

C. Base study on device characteristics supplied by device manufacturer.

D. Extent of electrical power system to be studied is indicated on Drawings.

E. Begin short-circuit current analysis at the service, extending down to system overcurrent protective devices as follows:

1. To normal system low-voltage load buses where fault current is 10 kA or less.

2. Exclude equipment rated 240 V ac or less when supplied by a single transformer rated less than 125 kVA.

F. Study electrical distribution system from normal and alternate power sources throughout electrical distribution system for Project. Study all cases of system-switching configurations and alternate operations that could result in maximum fault conditions.

G. Include the ac fault-current decay from induction motors, synchronous motors, and asynchronous generators and apply to low- and medium-voltage, three-phase ac systems. Also account for the fault-current dc decrement to address asymmetrical requirements of interrupting equipment.

H. Calculate short-circuit momentary and interrupting duties for a three-phase bolted fault and a single line-to-ground fault at each equipment indicated on one-line diagram.

1. For grounded systems, provide a bolted line-to-ground fault-current study for areas as defined for the three-phase bolted fault short-circuit study.

I. Include in the report identification of any protective device applied outside its capacity.

J. Study is required for main service equipment and panelboards. Where the main equipment feeds downstream distribution that is existing to remain, the study is only required to extend to the first existing device in a string.

END OF SECTION 260573.13

SECTION 260573 - OVERCURRENT PROTECTIVE DEVICE COORDINATION STUDY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes computer-based, fault-current and overcurrent protective device coordination studies. Protective devices shall be set based on results of the protective device coordination study.

1. Coordination of series-rated devices is permitted where indicated on Drawings.

1.3 ACTION SUBMITTALS

A. Product Data: For computer software program to be used for studies.

B. Other Action Submittals: The following submittals shall be made after the approval process for system protective devices has been completed. Submittals may be in digital form.

1. Coordination-study input data, including completed computer program input data sheets.
2. Study and Equipment Evaluation Reports.
3. Coordination-Study Report.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For coordination-study specialist.

B. Product Certificates: For coordination-study and fault-current-study computer software programs, certifying compliance with IEEE 399.

1.5 QUALITY ASSURANCE

A. Studies shall use computer programs that are distributed nationally and are in wide use. Software algorithms shall comply with requirements of standards and guides specified in this Section. Manual calculations are not acceptable.

B. Coordination-Study Specialist Qualifications: An entity experienced in the application of computer software used for studies, having performed successful studies of similar magnitude on electrical distribution systems using similar devices.

1. Professional engineer, licensed in the state where Project is located, shall be responsible for the study. All elements of the study shall be performed under the direct supervision and control of engineer.

C. Comply with IEEE 242 for short-circuit currents and coordination time intervals.

D. Comply with IEEE 399 for general study procedures.

PART 2 - PRODUCTS

2.1 COMPUTER SOFTWARE DEVELOPERS

A. Basis-of-Design Product: Subject to compliance with requirements, provide product by one (1) of the following:

1. CGI CYME
2. EDSA Micro Corporation
3. ESA Inc.
4. Operation Technology, Inc.
5. SKM Systems Analysis, Inc.

2.2 COMPUTER SOFTWARE PROGRAM REQUIREMENTS

A. Comply with IEEE 399.

B. Analytical features of fault-current-study computer software program shall include "mandatory," "very desirable," and "desirable" features as listed in IEEE 399.

C. Computer software program shall be capable of plotting and diagramming time-current-characteristic curves as part of its output. Computer software program shall report device settings and ratings of all overcurrent protective devices and shall demonstrate selective coordination by computer-generated, time-current coordination plots.

1. Optional Features:

a. Arcing faults.
b. Simultaneous faults.
c. Explicit negative sequence.
d. Mutual coupling in zero sequence.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine Project overcurrent protective device submittals for compliance with electrical distribution system coordination requirements and other conditions affecting performance.

1. Proceed with coordination study prior to relevant equipment submittals being assembled. If done after equipment has been submitted and approved, any changes required from the study to overcurrent protective devices will be at the expense of the contractor.

3.2 POWER SYSTEM DATA

A. Gather and tabulate the following input data to support coordination study:

1. Product Data for overcurrent protective devices specified in other electrical Sections and involved in overcurrent protective device coordination studies. Use equipment designation tags that are consistent with electrical distribution system diagrams, overcurrent protective device submittals, input and output data, and recommended device settings.
2. Impedance of utility service entrance.

3. Electrical Distribution System Diagram: In hard-copy and electronic-copy formats, showing the following:

    a. Circuit-breaker and fuse-current ratings and types.
    b. Relays and associated power and current transformer ratings and ratios.
    c. Transformer kilovolt amperes, primary and secondary voltages, connection type, impedance, and X/R ratios.
    d. Generator kilovolt amperes, size, voltage, and source impedance.
    e. Cables: Indicate conduit material, sizes of conductors, conductor material, insulation, and length.
    f. Busway ampacity and impedance.
    g. Motor horsepower and code letter designation according to NEMA MG 1.

4. Data sheets to supplement electrical distribution system diagram, cross-referenced with tag numbers on diagram, showing the following:

    a. Special load considerations, including starting inrush currents and frequent starting and stopping.
    b. Transformer characteristics, including primary protective device, magnetic inrush current, and overload capability.
    c. Motor full-load current, locked rotor current, service factor, starting time, type of start, and thermal-damage curve.
    d. Generator thermal-damage curve.
    e. Ratings, types, and settings of utility company's overcurrent protective devices.
    f. Special overcurrent protective device settings or types stipulated by utility company.
    g. Time-current-characteristic curves of devices indicated to be coordinated.
    h. Manufacturer, frame size, interrupting rating in amperes rms symmetrical, ampere or current sensor rating, long-time adjustment range, short-time adjustment range, and instantaneous adjustment range for circuit breakers.
    i. Manufacturer and type, ampere-tap adjustment range, time-delay adjustment range, instantaneous attachment adjustment range, and current transformer ratio for overcurrent relays.
    j. Panelboards, switchboards, motor-control center ampacity, and interrupting rating in amperes rms symmetrical.

3.3 FAULT-CURRENT STUDY

A. Calculate the maximum available short-circuit current in amperes rms symmetrical at circuit-breaker positions of the electrical power distribution system. The calculation shall be for a current immediately after initiation and for a three-phase bolted short circuit at each of the following:

    1. Switchgear and switchboard bus.
    2. Medium-voltage controller.
    3. Motor-control center.
    4. Distribution panelboard.
    5. Branch circuit panelboard.

B. Study electrical distribution system from normal and alternate power sources throughout electrical distribution system for Project. Include studies of system-switching configurations and alternate operations that could result in maximum fault conditions.

C. Calculate momentary and interrupting duties on the basis of maximum available fault current.

D. Calculations to verify interrupting ratings of overcurrent protective devices shall comply with IEEE 141, IEEE 241 and IEEE 242.

1. Transformers:

a. ANSI C57.12.10.
b. ANSI C57.12.22.
c. ANSI C57.12.40.
d. IEEE C57.12.00.
e. IEEE C57.96.

2. Medium-Voltage Circuit Breakers: IEEE C37.010.
3. Low-Voltage Circuit Breakers: IEEE 1015 and IEEE C37.20.1.
4. Low-Voltage Fuses: IEEE C37.46.

E. Study Report:

1. Show calculated X/R ratios and equipment interrupting rating (½-cycle) fault currents on electrical distribution system diagram.
2. Show interrupting (5-cycle) and time-delayed currents (6 cycles and above) on medium-voltage breakers as needed to set relays and assess the sensitivity of overcurrent relays.

F. Equipment Evaluation Report:

1. For 600-V overcurrent protective devices, ensure that interrupting ratings are equal to or higher than calculated ½-cycle symmetrical fault current.
2. For devices and equipment rated for asymmetrical fault current, apply multiplication factors listed in the standards to ½-cycle symmetrical fault current.
3. Verify adequacy of phase conductors at maximum three-phase bolted fault currents; verify adequacy of equipment grounding conductors and grounding electrode conductors at maximum ground-fault currents. Ensure that short-circuit withstand ratings are equal to or higher than calculated ½-cycle symmetrical fault current.

3.4 COORDINATION STUDY

A. Perform coordination study using approved computer software program. Prepare a written report using results of fault-current study. Comply with IEEE 399.

1. Calculate the maximum and minimum ½-cycle short-circuit currents.
2. Calculate the maximum and minimum interrupting duty (5 cycles to 2 seconds) short-circuit currents.
3. Calculate the maximum and minimum ground-fault currents.

B. Comply with IEEE 141, IEEE 241 and IEEE 242 recommendations for fault currents and time intervals.

C. Transformer Primary Overcurrent Protective Devices:

1. Device shall not operate in response to the following:

a. Inrush current when first energized.
b. Self-cooled, full-load current or forced-air-cooled, full-load current, whichever is specified for that transformer.
c. Permissible transformer overloads according to IEEE C57.96 if required by unusual loading or emergency conditions.

2. Device settings shall protect transformers according to IEEE C57.12.00, for fault currents.

D. Motors served by voltages more than 600 V shall be protected according to IEEE 620.

E. Conductor Protection: Protect cables against damage from fault currents according to ICEA P-32-382, ICEA P-45-482, and conductor melting curves in IEEE 242. Demonstrate that equipment withstands the maximum short-circuit current for a time equivalent to the tripping time of the primary relay protection or total clearing time of the fuse. To determine temperatures that damage insulation, use curves from cable manufacturers or from listed standards indicating conductor size and short-circuit current.

F. Coordination-Study Report: Prepare a written report indicating the following results of coordination study:

1. Tabular Format of Settings Selected for Overcurrent Protective Devices:

a. Device tag.
b. Relay-current transformer ratios; and tap, time-dial, and instantaneous-pickup values.
c. Circuit-breaker sensor rating; and long-time, short-time, and instantaneous settings.
d. Fuse-current rating and type.
e. Ground-fault relay-pickup and time-delay settings.

2. Coordination Curves: Prepared to determine settings of overcurrent protective devices to achieve selective coordination. Graphically illustrate that adequate time separation exists between devices installed in series, including power utility company's upstream devices. Prepare separate sets of curves for the switching schemes and for emergency periods where the power source is local generation. Show the following information:

a. Device tag.
b. Voltage and current ratio for curves.
c. Three-phase and single-phase damage points for each transformer.
d. No damage, melting, and clearing curves for fuses.
e. Cable damage curves.
f. Transformer inrush points.
g. Maximum fault-current cutoff point.

G. Completed data sheets for setting of overcurrent protective devices.

END OF SECTION 260573

SECTION 260574 - OVERCURRENT PROTECTIVE DEVICE ARC-FLASH STUDY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes a computer-based, arc-flash study to determine the arc-flash hazard distance and the incident energy to which personnel could be exposed during work on or near electrical equipment.

1.3 DEFINITIONS

A. Existing to Remain: Existing items of construction that are not to be removed and that are not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled.

B. One-Line Diagram: A diagram which shows, by means of single lines and graphic symbols, the course of an electric circuit or system of circuits and the component devices or parts used therein.

C. Protective Device: A device that senses when an abnormal current flow exists and then removes the affected portion from the system.

D. SCCR: Short-circuit current rating.

E. Service: The conductors and equipment for delivering electric energy from the serving utility to the wiring system of the premises served.

1.4 ACTION SUBMITTALS

A. Product Data: For computer software program to be used for studies.

B. Other Action Submittals: Submit the following submittals after the approval of system protective devices submittals. Submittals may be in digital form.

1. Arc-flash study input data, including completed computer program input data sheets.
2. Arc-flash study report; signed, dated, and sealed by a qualified professional engineer.

    a. Submit study report for action prior to receiving final approval of the distribution equipment submittals. If formal completion of studies will cause delay in equipment manufacturing, obtain approval from Architect for preliminary submittal of sufficient study data to ensure that the selection of devices and associated characteristics is satisfactory.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Arc-Flash Study Specialist.

B. Product Certificates: For arc-flash hazard analysis software, certifying compliance with IEEE 1584 and NFPA 70E.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance procedures according to requirements in NFPA 70E shall be provided in the equipment manuals.

B. Operation and Maintenance Procedures: In addition to items specified in Section 017823 "Operation and Maintenance Data," provide maintenance procedures for use by Owner's personnel that comply with requirements in NFPA 70E.

1.7 QUALITY ASSURANCE

A. Studies shall use computer programs that are distributed nationally and are in wide use. Software algorithms shall comply with requirements of standards and guides specified in this Section. Manual calculations are unacceptable.

B. Arc-Flash Study Software Developer Qualifications: An entity that owns and markets computer software used for studies, having performed successful studies of similar magnitude on electrical distribution systems using similar devices.

1. The computer program shall be developed under the charge of a licensed professional engineer who holds IEEE Computer Society's Certified Software Development Professional certification.

C. Arc-Flash Study Specialist Qualifications: Professional engineer in charge of performing the study, analyzing the arc flash, and documenting recommendations, licensed in the state where Project is located. All elements of the study shall be performed under the direct supervision and control of this professional engineer.

D. Field Adjusting Agency Qualifications: An independent agency, with the experience and capability to adjust overcurrent devices and to conduct the testing indicated, that is a member company of the InterNational Electrical Testing Association or is a nationally recognized testing laboratory (NRTL) as defined by OSHA in 29 CFR 1910.7, and that is acceptable to authorities having jurisdiction.

PART 2 - PRODUCTS

2.1 COMPUTER SOFTWARE DEVELOPERS

A. Software Developers: Subject to compliance with requirements, provide software by one (1) of the following:

1. ESA Inc.
2. Operation Technology, Inc.
3. Power Analytics, Corporation
4. SKM Systems Analysis, Inc.

B. Comply with IEEE 1584 and NFPA 70E.

C. Analytical features of device coordination study computer software program shall have the capability to calculate "mandatory," "very desirable," and "desirable" features as listed in IEEE 399.

2.2 ARC-FLASH STUDY REPORT CONTENT

A. Executive summary.

B. Study descriptions, purpose, basis and scope.

C. One-line diagram, showing the following:

1. Protective device designations and ampere ratings.
2. Cable size and lengths.
3. Transformer kilovolt ampere (kVA) and voltage ratings.
4. Motor and generator designations and kVA ratings.
5. Switchgear, switchboard, motor-control center and panelboard designations.

D. Study Input Data: As described in "Power System Data" Article.

E. Short-Circuit Study Output: As specified in "Fault-Current Study" Paragraph in "Overcurrent Protective Device Coordination Study" Article in Section 260573 "Overcurrent Protective Device Coordination Study."

F. Protective Device Coordination Study Report Contents: As specified in "Protective Device Coordination Study Report Contents" Article in Section 260573 "Overcurrent Protective Device Coordination Study."

G. Arc-Flash Study Output:

1. Interrupting Duty Report: Three-phase and unbalanced fault calculations, showing the following for each overcurrent device location:

a. Voltage.
b. Calculated symmetrical fault-current magnitude and angle.
c. Fault-point X/R ratio.
d. No AC Decrement (NACD) ratio.
e. Equivalent impedance.
f. Multiplying factors for 2-, 3-, 5-, and 8-cycle circuit breakers rated on a symmetrical basis.
g. Multiplying factors for 2-, 3-, 5-, and 8-cycle circuit breakers rated on a total basis.

H. Incident Energy and Flash Protection Boundary Calculations:

1. Arcing fault magnitude.
2. Protective device clearing time.
3. Duration of arc.
4. Arc-flash boundary.
5. Working distance.
6. Incident energy.
7. Hazard risk category.
8. Recommendations for arc-flash energy reduction.

I. Fault study input data, case descriptions, and fault-current calculations including a definition of terms and guide for interpretation of the computer printout.

2.3 ARC-FLASH WARNING LABELS

A. Comply with requirements in Section 260553 "Identification for Electrical Systems." Produce a 3.5-by-5-inch thermal transfer label of high-adhesion polyester for each work location included in the analysis.

B. The label shall have an orange header with the wording, "WARNING, ARC-FLASH HAZARD," and shall include the following information taken directly from the arc-flash hazard analysis:

1. Location designation.
2. Nominal voltage.
3. Flash protection boundary.
4. Hazard risk category.
5. Incident energy.
6. Working distance.
7. Engineering report number, revision number, and issue date.

C. Labels shall be machine printed, with no field-applied markings.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine Project overcurrent protective device submittals. Proceed with arc-flash study only after relevant equipment submittals have been assembled. Overcurrent protective devices that have not been submitted and approved prior to arc-flash study may not be used in study.

3.2 ARC-FLASH HAZARD ANALYSIS

A. Comply with NFPA 70E and its Annex D for hazard analysis study.

B. Study and labeling are required for all distribution equipment, whether new or existing to remain.

C. Preparatory Studies:

1. Short-Circuit Study Output: As specified in "Fault-Current Study" Paragraph in "Overcurrent Protective Device Coordination Study" Article in Section 260573 "Overcurrent Protective Device Coordination Study."
2. Protective Device Coordination Study Report Contents: As specified in "Protective Device Coordination Study Report Contents" Article in Section 260573 "Overcurrent Protective Device Coordination Study."

D. Calculate maximum and minimum contributions of fault-current size.

1. The minimum calculation shall assume that the utility contribution is at a minimum and shall assume no motor load.
2. The maximum calculation shall assume a maximum contribution from the utility and shall assume motors to be operating under full-load conditions.

E. Calculate the arc-flash protection boundary and incident energy at locations in the electrical distribution system where personnel could perform work on energized parts.

F. Include medium- and low-voltage equipment locations, except equipment rated 240-V ac or less fed from transformers less than 125 kVA.

G. Safe working distances shall be specified for calculated fault locations based on the calculated arc-flash boundary, considering incident energy of 1.2 cal/sq.cm.

H. Incident energy calculations shall consider the accumulation of energy over time when performing arc-flash calculations on buses with multiple sources. Iterative calculations shall take into account the changing current contributions, as the sources are interrupted or decremented with time. Fault contribution from motors and generators shall be decremented as follows:

1. Fault contribution from induction motors should not be considered beyond three to five (3-5) cycles.
2. Fault contribution from synchronous motors and generators should be decayed to match the actual decrement of each as closely as possible (e.g., contributions from permanent magnet generators will typically decay from ten (10) per unit to three (3) per unit after ten (10) cycles).

I. Arc-flash computation shall include both line and load side of a circuit breaker as follows:

1. When the circuit breaker is in a separate enclosure.
2. When the line terminals of the circuit breaker are separate from the work location.

J. Base arc-flash calculations on actual overcurrent protective device clearing time. Cap maximum clearing time at two seconds based on IEEE 1584, Section B.1.2.

3.3 POWER SYSTEM DATA

A. Obtain all data necessary for the conduct of the arc-flash hazard analysis.

1. Verify completeness of data supplied on the one-line diagram on Drawings and under "Preparatory Studies" Paragraph in "Arc-Flash Hazard Analysis" Article. Call discrepancies to the attention of Architect.
2. For new equipment, use characteristics submitted under the provisions of action submittals and information submittals for this Project.
3. For existing equipment, whether or not relocated, obtain required electrical distribution system data by field investigation and surveys, conducted by qualified technicians and engineers.

B. Electrical Survey Data: Gather and tabulate the following input data to support study. Comply with recommendations in IEEE 1584 and NFPA 70E as to the amount of detail that is required to be acquired in the field. Field data gathering shall be under the direct supervision and control of the engineer in charge of performing the study, and shall be by the engineer or its representative who holds NETA ETT Level III certification or NICET Electrical Power Testing Level III certification.

1. Product Data for overcurrent protective devices specified in other Sections and involved in overcurrent protective device coordination studies. Use equipment designation tags that are consistent with electrical distribution system diagrams, overcurrent protective device submittals, input and output data, and recommended device settings.
2. Obtain electrical power utility impedance at the service.
3. Power sources and ties.
4. Short-circuit current at each system bus, three phase and line-to-ground.
5. Full-load current of all loads.
6. Voltage level at each bus.
7. For transformers, include kVA, primary and secondary voltages, connection type, impedance, X/R ratio, taps measured in per cent, and phase shift.

8. For reactors, provide manufacturer and model designation, voltage rating and impedance.
9. For circuit breakers and fuses, provide manufacturer and model designation. List type of breaker, type of trip and available range of settings, SCCR, current rating, and breaker settings.
10. Generator short-circuit current contribution data, including short-circuit reactance, rated kVA, rated voltage, and X/R ratio.
11. For relays, provide manufacturer and model designation, current transformer ratios, potential transformer ratios, and relay settings.
12. Busway manufacturer and model designation, current rating, impedance, lengths, and conductor material.
13. Motor horsepower and NEMA MG 1 code letter designation.
14. Low-voltage cable sizes, lengths, number, conductor material and conduit material (magnetic or nonmagnetic).
15. Medium-voltage cable sizes, lengths, conductor material, and cable construction and metallic shield performance parameters.

3.4 LABELING

A. Apply one arc-flash label for 600-V ac, 480-V ac, and applicable 208-V ac panelboards and disconnects and for each of the following locations:

1. Low-voltage switchboard.
2. Switchgear.
3. Medium-voltage switch.
4. Control panel.

3.5 APPLICATION OF WARNING LABELS

A. Install the arc-fault warning labels under the direct supervision and control of the Arc-Flash Study Specialist.

3.6 DEMONSTRATION

A. Engage the Arc-Flash Study Specialist to train Owner's maintenance personnel in the potential arc-flash hazards associated with working on energized equipment and the significance of the arc-flash warning labels.

END OF SECTION 260574

PART 1 - GENERAL PART 1 - NEEDS A SECTION TO HANDLE THE MULTI PHASED ASPECT OF THIS PROJECT AS EACH PHASE REQURIED TO BE SIGNED OFF AND APPROVED AND THEN OWNER TAKING ACCPETANCE OF SYSTEM AS EACH AREA IS TURNED OVER OR WILL A FINAL OVER TEST BE REQUIRED AT END OF LAST PHASE FOR ENTIRE PROJECT. ALSO COMMENTS BELOW.

1.1 GENERAL REQUIREMENTS

A. Work under this contract shall conform under requirements of Division 019100, Division 260000, General Requirements, Conditions of the Contract, and Supplementary Conditions. This specification covers commissioning of electrical systems which are part of this project.

B. Furnish labor and material to accomplish complete electrical systems commissioning as specified herein.

C. All trades must adhere to the applicable commissioning and testing guidelines and best practices.

1.2 SECTION INCLUDES

A. This specification section provides a general overview of the electrical commissioning process and must be read in conjunction with the following related sections:

1. Construction Documents for affected building systems.
2. Section includes the commissioning process requirements for electrical equipment.
3. Electrical trade specific commissioning sections in Division 260000.
4. This project is ~~pursuing LEED Certification~~. See related specifications for sustainable design requirements affecting work of this Section.

1.3 INTRODUCTION

A. Commissioning is a process, and its purpose includes the below:

1. To clearly document the design intent.
2. To verify that the systems installation and performance is in accordance with the plans, specifications and design intent.
3. To train the owner's operators so that they fully understand the design intent and the operation and maintenance requirements of the equipment.
4. To witness & verify all systems are integrated & operating as intended by the Basis of Design (BOD).
5. Coordinate a warranty phase transition through close-out of the project.

B. Definitions

1. Commissioning: the process of ensuring that systems are designed, installed functionally tested and capable of being operated and maintained to perform in conformity with the design intent. The commissioning begins with planning and includes design, construction, start-up, acceptance, and training, and can be applied throughout the life of the building.
2. Commissioning authority: the designated person, company, or agent who implements the overall commissioning process.
3. Commissioning Plan: A document defining the commissioning process, which is developed in increasing detail as the project progresses through its various phases.

4. Commissioning report: the document that records the results of the commissioning process, including the as-built performance of the electrical system and unresolved issues.
5. Commissioning specification: the contract document that details the objective, scope, and implementation of the construction and acceptance phases of the commissioning process as developed in the design-phase Commissioning Plan.
6. Commissioning team: those people responsible for working together in carrying out the commissioning process.
7. Design intent: a detailed explanation of the ideas, concepts, and criteria that are defined by the owner to be important. This typically is an expansion of the information provided in the Owner's Program.
8. Design intent document: a detailed written document, evolving throughout the commissioning process, clearly defining items and criteria of the design intent.
9. Functional Performance Testing (FPT): the process of determining the ability of a system to operate in accordance with the final design intent.
10. Systems Manual: a composite document that expands the scope of the operation manual and maintenance manual by including the additional information gathered by the commissioning process.
11. Verification: that full range of checks and tests carried out to determine if all components, subsystems, systems, and interfaces between systems operate in accordance with the contract documents. In this context, “operate” includes all modes and sequences of control operation, interlocks and conditional control responses, and specified responses to abnormal or emergency conditions.

C. Scope of Work during Design Development Phase SINCE THIS IS FOR BID DOCS IS THERE A NEED TO TALK ABOUT DD PHASE

1. The CxA reviews the Owner Project Requirements (OPR) and Basis of Design (BoD) documentation.
2. The CxA conducts an initial review of the design prior to the construction documents phase.
3. The CxA conducts a focused review of the construction documents when close to completion. This review should be conducted prior to issuing the construction documents for bid and captured in the commissioning report.
4. Prepare a pre-construction phase commissioning plan.
5. Review and comment on submittals from each Contractor for compliance with the OPR, BoD, Contract Documents, and construction-phase commissioning plan. Review and comment on performance expectations of systems and equipment and interfaces between systems relating to the OPR and BoD.

D. Scope of Work during Construction Phase

1. Review required submittals and test data
2. Help finalize details of the Commissioning Plan
3. Organize/facilitate periodic commissioning team meetings
4. Review start-up and testing and balancing reports
5. Participate in O&M training
6. Review revised Owner’s Project Requirements (OPR)
7. Review revised Basis Of Design (BOD)
8. Provide revised commissioning plan
9. Integrate Cx tasks into construction schedule
10. Coordinate a construction phase commissioning kick-off meeting
11. Provide submittal review and comments
12. Review of test and balance report.
13. Perform a controls point-to-point check report review
14. Coordinate a controls integration coordination meeting (FA, FP, P, HVAC, ELEC)
15. Provide a master commissioned equipment list
16. Review start-up reports.
17. Provide pre-functional procedures & test data forms

18. Provide functional testing procedures & test data forms
19. Coordinate test procedure & review with the GC and the Engineer
20. Review contractor test reports
21. Draft commissioning meeting agenda and minutes
22. Execute fire & smoke inspections and testing
23. Maintain a commissioning issues log

E. Scope of work during Acceptance Testing Phase

1. Verify approved sequences of operations
2. Coordinate test procedure & review with the GC and the Engineer.
3. Draft commissioning meeting agenda and minutes
4. Review training agendas, materials, and schedule
5. Review contractor test reports
6. Coordinate, witness, and document functional performance tests
7. Verify that the system complies with the contract documents,
8. Perform functional performance testing,
9. Conduct O&M staff walkthrough of systems
10. Conduct Operations & Maintenance review
11. Submit final test report,
12. Assemble a systems manual
13. Identify and document deficiencies,
14. Execute an issue resolution log
15. Remedy deficiencies and retest,

F. Scope of Work during Post-Occupancy Phase

1. Establish an as-built record of the system performance,
2. Complete the as-built records,
3. Complete the Systems Manual
4. Confirm training plan has been implemented
5. Compile final systems manual
6. Compile operations and maintenance plan
7. Turn over all required close out documentation and warranties.
8. Perform seasonal testing
9. Submit final commissioning report
10. Perform 10-month review
11. Develop ongoing Cx plan

G. Systems to be Included in Commissioning Process

All electrical systems, sub-systems, and equipment installed, interconnected, and integrated under Division 260000 shall be commissioned. This includes but is not limited to:

1. Lighting Controls
2. High Voltage Panel Board
3. Low Voltage Panel Board
4. Bus Duct
5. Digital Meter
6. Fused Disconnect Switch
7. Emergency Lighting
8. Daylight Dimming/Harvesting
9. BMS Integration

1.4 QUALITY ASSURANCE

A. The Contractor will provide qualified point person throughout the commissioning process.

1. The point person will attend all commissioning team meeting and provide all required documentation requested by the CxA.
2. Contractor to provide onsite technician for functional performance test activities support, as required by the CxA.
3. Contractors will comply with tests that follow manufacturer's calibration procedures and intervals. Recalibrate test instruments immediately after instruments have been repaired resulting from being dropped or damaged. Affix calibration tags to test instruments. Furnish calibration records to CxA upon request.

B. Related Requirements

1. Section 019100 - General Commissioning Requirements.
2. LEED Sustainable Design Requirements.
3. Contractor shall adhere to all requirements of Division 260000.

C. References:

1. ASHRAE Standard 202-2018: Commissioning Process for Buildings and Systems.
2. ASHRAE Application Handbook – 2019: Chapter 44 – HVAC Commissioning (Building Commissioning).
3. ASHRAE Guideline 4-2019: Preparation of Operating and Maintenance Documentation for Building Systems.
4. ASHRAE Guideline 0-2019: The Commissioning Process.
5. ASHRAE Guideline 1.3-2018: Building Operations and Maintenance Training for the HVAC&R Commissioning Process
6. ~~LEED V4: Energy and Atmosphere Prerequisite Fundamental Commissioning and Verification~~
7. ~~LEED V4: Energy and Atmosphere Credit Enhanced Commissioning~~ OR CHPS
8. ANSI/NETA Acceptance Testing Specification – 2021
9. Applicable IEEE Standards.
10. Associated testing guidelines.

1.5 RESPONSIBILITIES

A. Electrical Contractor

1. Include cost of commissioning requirements in the contract price.
2. Include requirements for submittal data, O&M data, and training in each purchase order or sub-contract written.
3. Perform insulation resistance testing of low voltage conductors as specified in Division 260000.
4. Include the cost of applicable NETA testing specified within project specifications and Pre-Functional Forms.
5. Prepare preliminary schedule for electrical system orientations and inspections, O&M manual submissions, training sessions, equipment start-up, task completion for use by the Commissioning Authority. Update schedule as appropriate throughout the construction period.
6. Include all static tests / integrity tests specified in Division 260000 and local codes.
7. Ensure all lighting & daylighting controls and Electrical Normal & Emergency Systems that are constructed, inspected, installed, & pre-functional testing & submission of documents are submitted to the CxA verify the systems meets all requirements in accordance with Divisions 260000.
8. Perform all pre-functional testing required & submit documents that verify completion of testing to the CxA in accordance within Divisions 260000.
9. Ensure participation of major equipment manufacturers in appropriate training and testing activities.
10. Ensure subcontractors perform assigned commissioning responsibilities.
11. Ensure cooperation and participation of specialty sub-contractor

12. Ensure participation of equipment manufacturers in appropriate start-up, testing, and training activities when required by individual equipment specifications.
13. Perform and document completed startup and system operational checkout procedures, providing copies to Commissioning Authority (CxA).
14. Provide factory supervised startup services for equipment and systems where specified. Coordinate work with manufacturer and CxA.
15. Notify the Commissioning Authority a minimum of two weeks in advance, so that the witnessing equipment and system start-up and testing can begin.
16. Coordinate with equipment manufacturer's to determine specific requirements to maintain validity of warranties.
17. Provide personnel to assist CxA during equipment or system verification checks, and functional performance tests in accordance with Divisions 260000.
18. Ensure participation of major equipment manufacturers in appropriate training and testing activities.
19. Attend Construction Phase coordination meeting scheduled by the Commissioning Authority.
20. Ensure cooperation and participation of specialty sub-contractors such as fire alarm, power monitoring, generator, etc.
21. Ensure participation of major equipment manufacturers in appropriate training and testing activities.
22. Attend Construction Phase coordination meeting scheduled by the Commissioning Authority.
23. Assist the Commissioning Authority in all verification and functional performance tests as needed.
24. Attend initial training session.
25. Conduct electrical system orientation and inspection at the equipment placement completion stage.
26. Update drawings to the record condition to date, and review with the Commissioning Authority.
27. Gather O&M data on all equipment, and assemble in binders as required by the Commissioning Specification. Submit to Commissioning Authority prior to the completion of construction.
28. Provide a complete set of as-built records to the Commissioning Authority.
29. Provide the following submittals to the Commissioning Authority.

    a. Hardware and software submittals
    b. Control panel construction shop drawings.
    c. Narrative description of each control sequence for each piece of equipment controlled.
    d. Diagrams showing all control points, sensor locations, point names, actuators, controllers and where necessary, points of access superimposed on diagrams of the physical equipment.
    e. Logic diagrams showing the logic flow of the system.
    f. A list of all control points, including analog inputs, analog outputs, digital inputs, and digital outputs. Include the values of all parameters for each system point. Provide a separate list for each stand alone control unit.
    g. A complete control language program listing including all software routines employed in operating the control system. Also provide a program write-up, organized in the same manner as the control software. This narrative shall describe the logic flow of the software and the functions of each routine and sub-routine. It should explain individual math or logic operations that are not clear from reading the software listing.
    h. Hardware operation and maintenance manuals.
    i. Application software and project applications code manuals.

30. Integrate installation and programming schedule with construction and commissioning schedules.
31. Provide thorough training operating professionals on hardware operations and programming, and the application program for the system.

32. Demonstrate system performance to Commissioning Authority including all modes of system operation (e.g. normal, abnormal, emergency)
33. Provide control system technician for use during system verification and functional performance testing of all electrical equipment.
34. Provide systems modifications as required.

B. Automatic Controls and Building Automation System Contractors

1. Include cost for commissioning requirements in the contract price.
2. Ensure all electrical systems meet all requirements in accordance with Division 220000.
3. Review design for controllability with respect to selected manufacturer's equipment.
4. Verify proper hardware specification exists for functional performance required by specification and sequence of operation.
5. Provide a points list of monitoring points within Division 260000.
6. Attend initial commissioning coordination meeting scheduled by the Commissioning Authority.
7. Provide the following submittals to the Commissioning Authority.

    a. Hardware and software submittals
    b. Control panel construction shop drawings.
    c. Narrative description each piece of equipment monitored.
    d. Diagrams showing all; control points, sensor locations, point names, actuators, controls, and where necessary points of access superimposed on diagrams of the physical equipment.
    e. Logic diagrams showing the logic flow of the system.
    f. A list of all control points, including analog inputs, analog outputs, digital inputs, and digital outputs. Include the values of all parameters for each system point. Provide a separate list for each stand alone control unit.
    g. A complete control language program listing including all software routines employed in operating the control system. Also provide a program write-up, organized in the same manner as the control software. This narrative shall describe the logic flow of the software and the functions of each routine and sub-routine. It should explain individual math or logic operations that are not clear from reading the software listing.
    h. Hardware operation and maintenance manuals.
    i. Application software and project applications code manuals.

8. Provide thorough training operating professionals on hardware operations and programming, and the application program for the system.
9. Provide control system technician for use during system verification and functional performance testing.
10. Provide systems modifications as required.
11. Controls contractor shall furnish required equipment for commissioning of metering points
12. Verify BACNET connections to Landlord systems as applicable.
13. Verify metering tie-in points via load testing where applicable with the CxA.

    a. Controls contractor shall furnish required equipment for commissioning of metering points

14. Verify all monitoring points with the CxA associated with Division 260000.

C. Equipment Suppliers and Miscellaneous Contractors.

1. Include cost for commissioning requirements in the contract price.
2. Provide submittals, and appropriate O&M manual section(s).
3. Provide factory supervised startup services for equipment and systems where specified. Coordinate work with manufacturer and CxA.
4. Attend initial commissioning coordination meeting scheduled by the Commissioning Authority.

5. Participate in training sessions as scheduled by the Commissioning Authority.
6. Demonstrate performance of equipment as applicable.

1.6 DOCUMENTATION

A. The Commissioning Authority shall oversee and maintain the development of commissioning documentation. The commissioning documentation shall be kept in three ring binders, and organized by system and sub-system when practical. All pages shall be numbered, and a table of contents page(s) shall be provided. The commissioning documentation shall include, but not be limited to, the following:

1. A detailed description of the design intent for the project, listing operating parameters, control sequences, occupancy conditions etc.
2. A complete description of how the electrical system is intended to operate.
3. Approved final test and balance report for the electrical being commissioned.
4. All accepted shop drawings of electrical equipment. Shop drawings shall be full size sheets folded as required to fit in binders.
5. Final Commissioning Plan
6. All pre-functional performance test checklists, signed by indicating personnel, organized by system and sub-system.
7. All verification and functional performance test checklists/results, signed by indicated personnel, organized by system and sub-system.
8. Start-Up reports, test & inspection reports and certificates.
9. Gasket, flange, welding, fittings inspection and testing checklist, signed by indicating personnel.
10. Issues Log with corrective action verification.
11. Trend data & off-season functional performance testing.
12. Final Commissioning Report
13. Three copies of the operation and maintenance (O&M) manuals specified in other sections of these specifications shall be included with the commissioning documentation. The manuals shall be incorporated in the commissioning documentation prior to commencement of O&M training required in this and other sections of the specification. Preparation of O&M manuals shall be as specified in these specifications.

PART 2 - PRODUCTS

2.1 TEST EQUIPMENT

A. The appropriate Contractor(s) shall furnish all special tools and equipment required during the commissioning process. A list of all tools and equipment to be used during commissioning shall be submitted to the Commissioning Authority for approval. The owner shall furnish necessary utilities for the commissioning process.

B. All testing equipment used on jobsite will require a valid and non-expired calibration certificate.

C. Provide all standard testing equipment required to perform startup and initial checkout and required functional performance testing; unless otherwise noted such testing equipment will NOT become the property of Owner.

D. Equipment-Specific Tools: Where special testing equipment, tools and instruments are specific to a piece of equipment, are only available from the vendor, and are required to accomplish startup or Functional Testing, provide such equipment, tools, and instruments as part of the work at no extra cost to Owner; such equipment, tools, and instruments are to become the property of Owner.

2.2 TEST EQUIPMENT - PROPRIETARY

A. Proprietary test equipment and software required by any equipment manufacturer for programming and/or start-up, whether specified or not, shall be provided by the manufacturer of the equipment. Manufacturer shall provide the test equipment, demonstrate it's use, and assist in the commissioning process as needed. Proprietary test equipment (and software) shall become the property of the owner upon completion of the commissioning process.

PART 3 - EXECUTION

3.1 GENERAL

A. A pre-construction meeting of all commissioning team members shall be held at a time and place designated by the owner. The purpose shall be to familiarize all parties with the commissioning process, and to ensure that the responsibilities of each party are clearly understood.

B. The Contractor shall complete all phases of work so the systems can be started, tested, balanced, and acceptance procedures undertaken. This includes the complete installation of all equipment, materials, pipe, duct, wire, insulation, controls, etc. per the contract documents and related directives, clarifications, and change orders.

C. A Commissioning Plan shall be developed by the Commissioning Authority. The Contractor shall assist the Commissioning Authority in preparing the Commissioning Plan by providing all necessary information pertaining to the actual equipment and installation. If contractor initiated system changes have been made that alter the commissioning process, the commissioning Authority shall notify the Contracting Officer.

D. Acceptance procedures are normally intended to begin prior to completion of a system and/or sub-systems, and shall be coordinated with the Division 260000 contractor. Start of acceptance procedures before system completion does not relieve the contractor from completing those systems as per the schedule.

3.2 PREPARATION

A. The Construction Manager and subcontractors are to cooperate with the CxA in development of the Pre-Functional Checklists and Functional Test Procedures.

B. The Construction Manager and subcontractors are to furnish additional information requested by the CxA.

C. The Construction Manager and subcontractors are to prepare a preliminary schedule for electrical integrity testing including insulation resistance testing and applicable NETA electrical testing for use by the CxA; update the schedule as appropriate.

D. Notify the CxA forty-eight (48) hours in advance when electrical testing or startup of each piece of equipment will occur; when commissioning activities not yet performed or not yet scheduled will delay construction notify ahead of time and be proactive in seeing that the CxA has the scheduling information needed to efficiently execute the commissioning process.

E. Put all electrical equipment and systems into operation and continue operation during each working day of testing and commissioning, as required.

3.3 PARTICIPATION IN ACCEPTANCE PROCEDURES

A. The Contractor shall provide skilled technicians to start-up and debug all systems within Division 260000. These same technicians shall be made available to assist the Commissioning

Authority in completing the commissioning program. Work schedules, time required for testing, etc. shall be requested by the Commissioning Authority and coordinated by the contractor. Contractor shall ensure that the qualified technician(s) are available and present during the agreed upon schedules and of sufficient duration to complete the necessary tests, adjustments, and/or problem resolutions.

B. System performance problems and discrepancies may require additional technician time, Commissioning Authority time, reconstruction of systems, and/or replacement of system components. The additional technician time shall be made available for subsequent commissioning periods until the required system performance is obtained.

C. The Commissioning Authority reserves the right to question the appropriateness and qualifications of the technicians relative to each item of equipment, system, and/or sub-system. Qualifications of technicians shall include expert knowledge relative to the specific equipment involved and a willingness to work with the Commissioning Authority. Contractor shall provide adequate documentation and tools to start-up and test the equipment, system, and/or sub-system.

3.4 PARTICIPATION IN ACCEPTANCE PROCEDURES

A. The Contractor shall provide skilled technicians to start-up and debug all systems within Division 260000. These same technicians shall be made available to assist the Commissioning Authority in completing the commissioning program. Work schedules, time required for testing, etc. shall be requested by the Commissioning Authority and coordinated by the contractor. Contractor shall ensure that the qualified technician(s) are available and present during the agreed upon schedules and of sufficient duration to complete the necessary tests, adjustments, and/or problem resolutions.

B. System performance problems and discrepancies may require additional technician time, Commissioning Authority time, reconstruction of systems, and/or replacement of system components. The additional technician time shall be made available for subsequent commissioning periods until the required system performance is obtained.

C. The Commissioning Authority reserves the right to question the appropriateness and qualifications of the technicians relative to each item of equipment, system, and/or sub-system. Qualifications of technicians shall include expert knowledge relative to the specific equipment involved and a willingness to work with the Commissioning Authority. Contractor shall provide adequate documentation and tools to start-up and test the equipment, system, and/or sub-system.

3.5 DEFICIENCY RESOLUTION

A. In some systems, improper adjustments, misapplied equipment, and/or deficient performance under varying loads will result in additional work being required to commission the systems. This work shall be completed under the direction of the Contracting Officer, with input from the contractor, equipment supplier, and Commissioning Authority. Whereas all members shall have input and the opportunity to discuss, debate, and work out problems, the Contracting Officer shall have final jurisdiction over any additional work done to achieve performance.

B. Corrective work shall be completed in a timely fashion to permit the completion of the commissioning process. Experimentation to demonstrate system performance may be permitted. If the Commissioning Authority deems the experimentation work to be ineffective or untimely as it relates to the commissioning process, the Commissioning Authority shall notify the Contracting Officer, indicating the nature of the problem, expected steps to be taken, and suggested deadline(s) for completion of activities. If the deadline(s) pass without resolution of the problem, the Contracting Officer reserves the right to obtain supplementary services and/or equipment to resolve the problem. Costs incurred to solve the problems in an expeditious manner shall be the contractor’s responsibility.

3.6 ADDITIONAL COMMISSIONING

A. Additional commissioning activities may be required after system adjustments, replacements, etc., are completed. The contractor(s) suppliers and Commissioning Authority shall include a reasonable reserve to complete this work as part of their contractual obligations. WHAT DO YOU ENVISION FOR THIS???

3.7 ACCEPTANCE PROCEDURES

A. Verification Tests

1. Scope of verification tests

   a. Operating tests and checks to verify that all components, equipment, systems, sub-systems, and interfaces between systems, operate in accordance with contract documents. These tests are to include all operating modes, interlocks, specified control responses, specific responses to abnormal or emergency conditions and verifications of the proper response of the building automation system controllers and sensors.
   b. All functional testing will meet all requirements in accordance within Divisions 260000.
   c. Verify electrical systems has been installed, calibrated, started, and operating according to contract documents.
   d. Verify electrical system instrumentation and controls systems have been completed and calibrated according to contract documents.

2. Participants in verification tests

   a. The Commissioning Authority shall be responsible for preparing the scope of these tests. The Commissioning Authority shall schedule the tests and assemble the commissioning team members who shall be responsible for the tests. Participating contractors, manufacturers, suppliers, etc. shall include all costs to do the work involved in these tests in their proposals. Following is a list of tasks and supporting information that shall be required.
   b. Controls contractor – provide the services of a controls engineer who is familiar with the details of the project. Provide details of the control system, schematics, and a narrative description of control sequences of operation.
   c. Electrical contractor – provide a foreman electrician familiar with the electrical interlocks, interfaces with emergency power supply, and interfaces with alarm and life-safety systems. Provide access to the contract plans, and all as-built schematics of sub-systems, interfaces, and interlocks.

3. Documentation and Reporting Requirements

   a. Provide checklists for each component, piece of equipment, system, and sub-system, including all interfaces, interlocks, etc. Each item to be tested shall have a different entry line with space provided for comments. Separate checklists shall be prepared for each mode of operation. Provide space to indicate whether the mode under test responded as required or not. Also, provide space for all necessary parties to sign off on each checklist.
   b. Data sheets used in verification of the proper operation of the control system shall include each controller to be verified, and its location. For each controller, provide space for recording the readout of the controller, the reading at the controller's sensor(s), and any comments. Also, provide space for all necessary parties to sign off on each checklist.
   c. All test procedures and data sheets shall be submitted to the design professional for review and acceptance.

4. Instrumentation

a. The Contractor shall furnish all measurement instrumentation for the verification tests. All instruments will have calibrated within the one year period prior to these tests.

5. Verification Procedures

a. The Commissioning Authority shall direct and witness the verification operating tests and checks for all equipment and systems.

1) Set the system equipment (i.e., switchboard, UPS, meter, panelboard, etc.) into the operating mode to be tested, i.e. manual, auto position, emergency power, and alarm conditions.
2) The Commissioning Authority shall inspect and verify the position of each device and interlock identified on the checklist. Each item shall be signed off as acceptable (yes), or failed (no).
3) Operating checks shall include all safety cutouts, alarms and interlocks, interconnections with life safety systems.
4) Visual verifications of equipment to manufacturer installation guidance, local codes, and applicable standards.
5) If during a test an operating deficiency is observed, appropriate comments shall be added to the checklist data sheet.
6) Verification of the proper responses of monitoring and control system controllers and sensors shall be as follows:

a) For each controller or sensor, record the indicated monitoring and control system reading, and the test instrument reading.
b) If the initial test indicates that the test reading is outside of the control range of the installed device, the calibration of the installed device shall be checked and adjusted as required. The deficient device shall be re-tested and the results recorded on the checklist data sheet.

b. If the deficiencies are identified during verification, the General Contractor must be notified, and action taken to remedy the deficiency. The final tabulated checklist data sheets shall be reviewed by the Design Professional and the Commissioning Authority, to determine if verification is complete, and the operating system is functioning in accordance with the contract documents.

B. Functional Performance Testing

1. Scope of Functional Performance Testing

a. Functional performance tests shall determine if the electrical system is providing the required electrical services in accordance with the final design intent. Following is a list of test examples:

1) Voltage verifications at equipment.
2) Phase rotation verifications at equipment.
3) Verify lighting controls per design intent.
4) Verify emergency lighting operates per design and local codes.

b. See attached Functional Performance Test samples in the Commissioning Plan.

2. Submittals

a. Detailed procedures for each series of tests shall be submitted to the Commissioning Authority for review and acceptance. The procedures shall include samples of the data sheets that will be part of the reports.

3. Participants in Functional Performance Tests

a. Participants in the functional performance tests shall be the same as those listed in the verification tests.

4. Instrumentation

a. In addition to the instrumentation requirements detailed under verification, the Contractor may need to provide data acquisition equipment to record data for the complete range of testing.

5. Functional Performance Test Procedures

a. The Commissioning Authority shall supervise and direct all functional performance tests.
b. For each test, the Commissioning Authority shall install the measuring instruments and logging devices to record test data for the required test period. The instrumentation shall monitor and record all operating conditions to allow for complete evaluation of the test results.
c. Measurement will be required to allow for calculation of total capacity of the system for each mode of operation under test.

6. Documentation and Reporting Requirements

a. All measured data, data sheets, and a comprehensive summary, describing the operation of the electrical system at the time of testing shall be submitted to the Commissioning Authority.
b. A preliminary functional performance test report shall be prepared by the Commissioning Authority and submitted to the Design Professional or review. Any identified deficiencies need to be evaluated by the Design Professional and Construction Manager to determine if they are part of the contractor's contractual obligations. Construction deficiencies shall be corrected by the responsible contractor(s) and the specific functional performance test repeated.
c. If it is determined that the electrical system is constructed in accordance with the contract documents, and the performance deficiencies are not part of the contract documents, the Contracting Officer must decide whether any required modifications needed to bring the performance of the electrical system up to the finalized design intent shall be implemented, or if the test shall be accepted as submitted. If corrective work is performed, the Contracting Officer shall determine if a portion or all required functional performance tests should be repeated, and a revised report submitted.

3.8 OPERATING AND MAINTENANCE MANUAL

A. Refer to project specifications for complete O&M manual requirements & have been submitted 30 days after approval of each submittal.

1. System Descriptions:

a. Each major system shall be described, typewritten, in general terms, including major components, interconnections, theory of operation, theory of controls, unusual features and major safety precautions. This information should correlate with information provided in the manufacturer's instruction book. This section shall include, but not limited to, the following data:

1) Detailed description of each system and each of its components showing piping, valves, controls, and other components, with diagrams and illustrations where applicable.
2) Wiring and control diagrams with data to explain detailed operation and control of each component.

3) Control sequences describing start-up, all modes of operation, and shut down.
4) Corrected shop drawings.
5) Approved products data including all performance curves and rating data.
6) Copies of approved certifications and laboratory test reports (where applicable).
7) Copies of warranties.

b. System diagrams or drawings shall be incorporated in the appropriate systems descriptions including systems boundaries for testing for the CxA highlighted. These diagrams or drawings should be reduced in size or folded to usefully fit into the manual.

2. Operating Instructions

a. Condensed, typewritten, suitable for posting, instructions shall be provided for each major piece of equipment. Where more than one (1) common unit is installed, one instruction is adequate. The instructions shall provide procedures for:

1) Starting up the equipment/system.
2) Shutting down the equipment/system.
3) Operating the equipment in emergency or unusual conditions.
4) Safety precautions.
5) Trouble shooting suggestions.
6) Other pertinent data applicable to the operation of particular systems or equipment.
7) Other pertinent data applicable to the operation of particular systems or equipment.

b. The instructions shall be suitable for posting adjacent to the equipment concerned. The Contractor shall provide instructions for all installed systems.

3. Ongoing and preventative Maintenance

a. Condensed, typewritten procedures for recommended ongoing and preventive maintenance actions shall be provided for each category of equipment/system. This information shall include, but not be limited to the following:

1) Maintenance and overhaul instructions.
2) Lubricating schedule including type, grade, temperature, and frequency range.
3) Part list, including source of supply and recommended spare parts.
4) Name, address, and 24 hour telephone number of each subcontractor who installed equipment and systems, and local representative for each type of system.
5) Other pertinent data applicable to the maintenance of particular systems or equipment.

b. These recommended preventive maintenance actions shall be categorized by the following recommended frequencies:

1) Weekly
2) Monthly
3) Quarterly
4) Semi-Annual
5) Annual
6) Other

3.9 OPERATING AND MAINTENANCE TRAINING

A. The Electrical Contractor, and appropriate sub-contractors, shall provide comprehensive operating and maintenance instruction on building systems prior to delivery. The instruction shall include classroom instruction deliver by competent instructors based upon the contents of the operating manual. Emphasis shall be placed upon overall systems diagrams and descriptions, and why systems were designed as they were. The overall systems instructions shall preferably be delivered by the consulting engineers. The classroom instructions shall also include detailed equipment instruction by qualified manufacturer representatives for all equipment for which operating instructions are provided. The manufacturer representative training shall emphasize operating instructions, and preventive maintenance as described in the operating manual. Provide training agenda to the CxA one week prior to the training session. At a minimum, the training sessions shall cover the following items:

1. Types of Installed systems
2. Theory of operation

    a. Design intent
    b. Occupied vs. unoccupied or partial occupancy
    c. Emergency conditions and procedures
    d. Energy efficiency
    e. Other issues important to facility operation.

3. System operations
4. Use of control systems

    a. Sequence of operation
    b. Problem indicators
    c. Diagnostics
    d. Corrective actions

5. Service, maintenance, diagnostics and repair
6. Use of reports and logs
7. Troubleshooting, investigation of malfunctions, explanation and determining reasons for the problems

B. Each classroom training period shall be followed by an inspection, explanation and demonstration of the system concerned by the instructors.

C. The contractor shall be responsible for organizing, arranging, and delivering a schedule of system training agreeable with the facility manager.

D. The contractor shall provide two (2) training sessions if required to accommodate operating shifts.

E. The contractor shall provide, at or before substantial completion, a proposed agenda for each system and schedule of the above training for approval by the Commissioning Authority (CxA).

END OF SECTION 260800

SECTION 260923 - LIGHTING CONTROL DEVICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following lighting control devices:

1. Time switches.
2. Outdoor and indoor photoelectric switches.
3. Standalone daylight-harvesting switching and dimming controls.
4. Indoor occupancy sensors.
5. Switchbox-mounted occupancy sensors.
6. Outdoor motion sensors.
7. Lighting contactors.
8. Emergency shunt relays.

B. Related Sections include the following:

1. Section 262726 "Wiring Devices" for wall-box dimmers, wall-switch occupancy sensors, and manual light switches.

1.3 DEFINITIONS

A. LED: Light-emitting diode.

B. PIR: Passive infrared.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Show installation details for occupancy and light-level sensors.

1. Interconnection diagrams showing field-installed wiring.

C. Field quality-control test reports.

D. Operation and Maintenance Data: For each type of product to include in emergency, operation, and maintenance manuals.

1.5 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

1.6 COORDINATION

A. Coordinate layout and installation of ceiling-mounted devices with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, smoke detectors, fire-suppression system, and partition assemblies.

PART 2 - PRODUCTS

2.1 TIME SWITCHES

A. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one (1) of the following:

1. Area Lighting Research, Inc.; Tyco Electronics
2. Grasslin Controls Corporation; a GE Industrial Systems Company
3. Intermatic, Inc.
4. Leviton Mfg. Company Inc.
5. Lightolier Controls; a Genlyte Company
6. Lithonia Lighting; Acuity Lighting Group, Inc.
7. Paragon Electric Co.; Invensys Climate Controls
8. Square D; Schneider Electric
9. TORK
10. Touch-Plate, Inc.
11. Watt Stopper (The)

B. Electronic Time Switches: Electronic, solid-state programmable units with alphanumeric display; complying with UL 917.

1. Contact Configuration: SPST, DPST, and DPDT.
2. Contact Rating: 30-A inductive or resistive, 240-V ac, and 20-A ballast load, 120/240-V ac.
3. Program: On-off set points per detail on Drawing E603.
4. Circuitry: Allow connection of a photoelectric relay as substitute for on-off function of a program on selected channels.
5. Astronomic Time: All channels.
6. Battery Backup: For schedules and time clock.

C. Electromechanical-Dial Time Switches: Type complying with UL 917.

1. Contact Configuration: SPST, DPST, SPDT, and DPDT.
2. Contact Rating: 30-A inductive or resistive, 240-V ac, 20-A ballast load, 120/240-V ac.
3. Circuitry: Allow connection of a photoelectric relay as substitute for on-off function of a program.
4. Astronomic time dial.
5. Eight-Day Program: Uniquely programmable for each weekday and holidays.
6. Skip-a-day mode.
7. Wound-spring reserve carryover mechanism to keep time during power failures, minimum of 16 hours.

2.2 OUTDOOR PHOTOELECTRIC SWITCHES

A. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one (1) of the following:

1. Area Lighting Research, Inc.; Tyco Electronics
2. Grasslin Controls Corporation; a GE Industrial Systems Company
3. Intermatic, Inc.
4. Lithonia Lighting; Acuity Lighting Group, Inc.
5. Novitas, Inc.
6. Paragon Electric Co.; Invensys Climate Controls
7. Square D; Schneider Electric
8. TORK
9. Touch-Plate, Inc.
10. Watt Stopper (The)

B. Description: Solid state, with SPST and DPST dry contacts rated for 1800-VA tungsten or 1000-VA inductive, to operate connected relay, contactor coils, or microprocessor input; complying with UL 773A.

1. Light-Level Monitoring Range: 1.5 to 10 fc, with an adjustment for turn-on and turn-off levels within that range, and a directional lens in front of photocell to prevent fixed light sources from causing turn-off.
2. Time Delay: 15-second minimum, to prevent false operation.
3. Surge Protection: Metal-oxide varistor, complying with IEEE C62.41.1, IEEE C62.41.2, and IEEE 62.45 for Category A1 locations.
4. Mounting: Twist lock complying with IEEE C136.10, with base-and-stem mounting or stem-and-swivel mounting accessories as required to direct sensor to the north sky exposure.

C. Description: Solid state, with SPST and DPST dry contacts rated for 1800 VA to operate connected load, relay, or contactor coils; complying with UL 773.

1. Light-Level Monitoring Range: 1.5 to 10 fc, with an adjustment for turn-on and turn-off levels within that range.
2. Time Delay: 30-second minimum, to prevent false operation.
3. Lightning Arrester: Air-gap type.
4. Mounting: Twist lock complying with IEEE C136.10, with base.

2.3 INDOOR PHOTOELECTRIC SWITCHES

A. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one (1) of the following:

1. Allen-Bradley/Rockwell Automation
2. Area Lighting Research, Inc.; Tyco Electronics
3. Eaton Electrical Inc; Cutler-Hammer Products
4. Grasslin Controls Corporation; a GE Industrial Systems Company
5. Intermatic, Inc.
6. Lithonia Lighting; Acuity Lighting Group, Inc.
7. MicroLite Lighting Control Systems
8. Novitas, Inc.
9. Paragon Electric Co.; Invensys Climate Controls
10. Square D; Schneider Electric
11. TORK
12. Touch-Plate, Inc.
13. Watt Stopper (The)

B. Ceiling-Mounted Photoelectric Switch: Solid-state, light-level sensor unit, with separate relay unit mounted on luminaire, to detect changes in lighting levels that are perceived by the eye. Cadmium sulfide photoresistors are not acceptable.

1. Sensor Output: Contacts rated to operate the associated relay, complying with UL 773A. Sensor shall be powered from the relay unit.
2. Relay Unit: Dry contacts rated for 20-A ballast load at 120- and 277-V ac, for 13-A tungsten at 120-V ac, and for 1 hp at 120-V ac. Power supply to sensor shall be 24-V dc, 150-mA, Class 2 power source as defined by NFPA 70.
3. Light-Level Monitoring Range: 10 to 200 fc, with an adjustment for turn-on and turn-off levels within that range.
4. Time Delay: Adjustable from 5 to 300 seconds to prevent cycling, with deadband adjustment.
5. Indicator: Two (1) LEDs to indicate the beginning of on-off cycles.

2.4 DAYLIGHT-HARVESTING DIMMING CONTROLS

A. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one (1) of the following:

1. Bryant Electric
2. Cooper Industries, Inc.
3. Hubbell Building Automation
4. Intermatic, Inc.
5. Leviton Manufacturing Company
6. Lithonia Lighting; Acuity Lighting Group, Inc.
7. Lutron Electronics Co., Inc.
8. NSi Industries LLC
9. Philips Lighting Controls
10. Sensor Switch, Inc.
11. Square D; Schneider Electric
12. Watt Stopper; a Legrand

B. Description: Sensing daylight and electrical lighting levels, the system adjusts the indoor electrical lighting levels. As daylight increases, the lights are dimmed.

1. Lighting control set point is based on two (2) lighting conditions:

    a. When no daylight is present (target level).
    b. When significant daylight is present.

2. System programming is done with two (2) hand-held, remote-control tools.

    a. Initial setup tool.

C. Tool for occupants to adjust the target levels by increasing the set point up to twenty-five percent (25%), or by minimizing the electric lighting level

D. Ceiling-Mounted Dimming Controls: Solid-state, light-level sensor unit, with integrated power pack, to detect changes in indoor lighting levels that are perceived by the eye.

E. Electrical Components, Devices, and Accessories:

1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
2. Sensor Output: 0- to 10-V dc to operate luminaires. Sensor is powered by controller unit.
3. Light-Level Sensor Set-Point Adjustment Range: 20 to 60 fc.

2.5 INDOOR OCCUPANCY SENSORS

A. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one (1) of the following:

1. Hubbell Lighting
2. Leviton Mfg. Company Inc.
3. Lithonia Lighting; Acuity Lighting Group, Inc.
4. Novitas, Inc.
5. RAB Lighting, Inc.
6. Sensor Switch, Inc.
7. TORK
8. Watt Stopper (The)

B. General Description: Wall- or ceiling-mounting, solid-state units with a separate relay unit.

1. Operation: Unless otherwise indicated, turn lights on when covered area is occupied and off when unoccupied; with a time delay for turning lights off, adjustable over a minimum range of 1 to 15 minutes.
2. Sensor Output: Contacts rated to operate the connected relay, complying with UL 773A. Sensor shall be powered from the relay unit.
3. Relay Unit: Dry contacts rated for 20-A ballast load at 120- and 277-V ac, for 13-A tungsten at 120-V ac, and for 1 hp at 120-V ac. Power supply to sensor shall be 24-V dc, 150-mA, Class 2 power source as defined by NFPA 70.
4. Mounting:

    a. Sensor: Suitable for mounting in any position on a standard outlet box.
    b. Relay: Externally mounted through a ½-inch knockout in a standard electrical enclosure.
    c. Time-Delay and Sensitivity Adjustments: Recessed and concealed behind hinged door.

5. Indicator: LED, to show when motion is being detected during testing and normal operation of the sensor.
6. Bypass Switch: Override the on function in case of sensor failure.
7. Automatic Light-Level Sensor: Adjustable from 2 to 200 fc; keep lighting off when selected lighting level is present.

C. PIR Type: Ceiling mounting; detect occupancy by sensing heat and movement in area of coverage.

1. Detector Sensitivity: Detect occurrences of 6-inch-minimum movement of any portion of a human body that presents a target of not less than 36 sq. in.
2. Detection Coverage (Room): Detect occupancy anywhere in a circular area of 1000 sq. ft. when mounted on a 96-inch-high ceiling.
3. Detection Coverage (Corridor): Detect occupancy within 90 feet when mounted on a 10-foot-high ceiling.

D. Ultrasonic Type: Ceiling mounting; detect occupancy by sensing a change in pattern of reflected ultrasonic energy in area of coverage.

1. Detector Sensitivity: Detect a person of average size and weight moving not less than 12 inches in either a horizontal or a vertical manner at an approximate speed of 12 inches/s.
2. Detection Coverage (Small Room): Detect occupancy anywhere within a circular area of 600 sq. ft. when mounted on a 96-inch-high ceiling.

3. Detection Coverage (Standard Room): Detect occupancy anywhere within a circular area of 1000 sq. ft. when mounted on a 96-inch-high ceiling.
4. Detection Coverage (Large Room): Detect occupancy anywhere within a circular area of 2000 sq. ft. when mounted on a 96-inch-high ceiling.
5. Detection Coverage (Corridor): Detect occupancy anywhere within 90 feet when mounted on a 10-foot-high ceiling in a corridor not wider than 14 feet.

E. Dual-Technology Type: Ceiling mounting; detect occupancy by using a combination of PIR and ultrasonic detection methods in area of coverage. Particular technology or combination of technologies that controls on-off functions shall be selectable in the field by operating controls on unit.

1. Sensitivity Adjustment: Separate for each sensing technology.
2. Detector Sensitivity: Detect occurrences of 6-inch-minimum movement of any portion of a human body that presents a target of not less than 36 sq. in., and detect a person of average size and weight moving not less than 12 inches in either a horizontal or a vertical manner at an approximate speed of 12 inches/s.
3. Detection Coverage (Standard Room): Detect occupancy anywhere within a circular area of 1000 sq. ft. when mounted on a 96-inch-high ceiling.

2.6 OUTDOOR MOTION SENSORS (PIR)

A. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one (1) of the following:

1. Bryant Electric; a Hubbell Company
2. Hubbell Lighting
3. Lithonia Lighting; Acuity Lighting Group, Inc.
4. Paragon Electric Co.; Invensys Climate Controls
5. RAB Lighting, Inc.
6. TORK
7. Watt Stopper (The)

B. Performance Requirements: Suitable for operation in ambient temperatures ranging from minus 40 to plus 130 deg F (minus 40 to plus 54 deg C), rated as raintight according to UL 773A.

1. Operation: Turn lights on when sensing infrared energy changes between background and moving body in area of coverage; with a time delay for turning lights off, adjustable over a minimum range of 1 to 15 minutes.
2. Mounting:

    a. Sensor: Suitable for mounting in any position on a standard outdoor junction box.
    b. Relay: Internally mounted in a standard weatherproof electrical enclosure.
    c. Time-Delay and Sensitivity Adjustments: Recessed and concealed behind hinged door.

3. Bypass Switch: Override the on function in case of sensor failure.
4. Automatic Light-Level Sensor: Adjustable from 1 to 20 fc; keep lighting off during daylight hours.

C. Detector Sensitivity: Detect occurrences of 6-inch-minimum movement of any portion of a human body that presents a target of not less than 36 sq. in.

D. Detection Coverage: Up to 35 feet, with a field of view of 90 degrees.

E. Lighting Fixture Mounted Sensor: Suitable for switching 300 W of tungsten load at 120- or 277-V ac.

F. Individually Mounted Sensor: Contacts rated to operate the connected relay, complying with UL 773A. Sensor shall be powered from the relay unit.

1. Relay Unit: Dry contacts rated for 20-A ballast load at 120- and 277-V ac, for 13-A tungsten at 120-V ac, and for 1 hp at 120-V ac. Power supply to sensor shall be 24-V dc, 150-mA, Class 2 power source as defined by NFPA 70.
2. Indicator: LED, to show when motion is being detected during testing and normal operation of the sensor.

2.7 LIGHTING CONTACTORS

A. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one (1) of the following:

1. Allen-Bradley/Rockwell Automation
2. ASCO Power Technologies, LP; a division of Emerson Electric Co.
3. Eaton Electrical Inc.; Cutler-Hammer Products
4. GE Industrial Systems; Total Lighting Control
5. Grasslin Controls Corporation; a GE Industrial Systems Company
6. Hubbell Lighting
7. Lithonia Lighting; Acuity Lighting Group, Inc.
8. MicroLite Lighting Control Systems
9. Square D; Schneider Electric
10. TORK
11. Touch-Plate, Inc.
12. Watt Stopper (The)

B. Description: Electrically operated and electrically held, combination type with non-fused disconnect, complying with NEMA ICS 2 and UL 508.

1. Current Rating for Switching: Listing or rating consistent with type of load served, including tungsten filament, inductive, and high-inrush ballast (ballast with fifteen percent (15%) or less total harmonic distortion of normal load current).
2. Fault Current Withstand Rating: Equal to or exceeding the available fault current at the point of installation.
3. Enclosure: Comply with NEMA 250.
4. Provide with control and pilot devices as indicated on Drawings and schedule, matching the NEMA type specified for the enclosure.

C. BAS Interface: Provide hardware interface to enable the BAS to monitor and control lighting contactors.

1. Monitoring: On-off status.
2. Control: On-off operation.

2.8 EMERGENCY SHUNT RELAY

A. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one (1) of the following:

1. LVS, Inc.
2. Sensor Switch

3. Watt Stopper

B. Description: Normally closed, electrically held relay, arranged for wiring in parallel with manual or automatic switching contacts (dual-contact where required); complying with UL 924.

1. Coil Rating: 120-277 V or as indicated on Drawings.

2.9 CONDUCTORS AND CABLES

A. Power Wiring to Supply Side of Remote-Control Power Sources: Not smaller than No. 12 AWG. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

B. Classes 2 and 3 Control Cable: Multiconductor cable with stranded-copper conductors not smaller than No. 18 AWG. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

C. Class 1 Control Cable: Multiconductor cable with stranded-copper conductors not smaller than No. 14 AWG. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

PART 3 - EXECUTION

3.1 SENSOR INSTALLATION

A. Install and aim sensors in locations to achieve not less than ninety percent (90%) coverage of areas indicated. Do not exceed coverage limits specified in manufacturer's written instructions.

3.2 CONTACTOR INSTALLATION

A. Mount electrically held lighting contactors with elastomeric isolator pads, to eliminate structure-borne vibration, unless contactors are installed in an enclosure with factory-installed vibration isolators.

3.3 WIRING INSTALLATION

A. Wiring Method: Comply with Section 260519 "Low-Voltage Electrical Power Conductors and Cables." Minimum conduit size shall be ½-inch.

B. Wiring within Enclosures: Comply with NECA 1. Separate power-limited and nonpower-limited conductors according to conductor manufacturer's written instructions.

C. Size conductors according to lighting control device manufacturer's written instructions, unless otherwise indicated.

D. Splices, Taps, and Terminations: Make connections only on numbered terminal strips in junction, pull, and outlet boxes; terminal cabinets; and equipment enclosures.

3.4 IDENTIFICATION

A. Identify components and power and control wiring according to Section 260553 "Identification for Electrical Systems."

1. Identify controlled circuits in lighting contactors.

2. Identify circuits or luminaries controlled by photoelectric and occupancy sensors at each sensor.

B. Label time switches and contactors with a unique designation.

3.5 FIELD QUALITY CONTROL

A. Perform the following field tests and inspections and prepare test reports:

1. After installing time switches and sensors, and after electrical circuitry has been energized, adjust and test for compliance with requirements.
2. Operational Test: Verify operation of each lighting control device, and adjust time delays.

B. Lighting control devices that fail tests and inspections are defective work.

3.6 ADJUSTING

A. Occupancy Adjustments: When requested within twelve (12) months of date of Substantial Completion, provide on-site assistance in adjusting sensors to suit occupied conditions. Provide up to two (2) visits to Project during other-than-normal occupancy hours for this purpose.

3.7 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain lighting control devices. Refer to Section 017900 "Demonstration and Training."

END OF SECTION 260923

SECTION 262200 - LOW-VOLTAGE TRANSFORMERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following types of dry-type transformers rated 600 V and less, with capacities up to 1000 kVA:

1. Distribution transformers.
2. Buck-boost transformers.

1.3 ACTION SUBMITTALS

A. Product Data: Include rated nameplate data, capacities, weights, dimensions, minimum clearances, installed devices and features, and performance for each type and size of transformer indicated.

B. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

1. Wiring Diagrams: Power, signal, and control wiring.

1.4 INFORMATIONAL SUBMITTALS

A. Manufacturer Seismic Qualification Certification: Submit certification that transformers, accessories, and components will withstand seismic forces defined in Section 260548 "Vibration and Seismic Controls for Electrical Systems." Include the following:

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.

a. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified."
b. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."

2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

B. Qualification Data: For testing agency.

C. Source quality-control test reports.

D. Field quality-control test reports.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For transformers to include in emergency, operation, and maintenance manuals.

1.6 QUALITY ASSURANCE

A. Testing Agency Qualifications: An independent agency, with the experience and capability to conduct the testing indicated, that is a member company of the InterNational Electrical Testing Association or is a nationally recognized testing laboratory (NRTL) as defined by OSHA in 29 CFR 1910.7, and that is acceptable to authorities having jurisdiction.

1. Testing Agency's Field Supervisor: Person currently certified by the InterNational Electrical Testing Association or the National Institute for Certification in Engineering Technologies to supervise on-site testing specified in Part 3.

B. Testing Agency Qualifications: An independent agency, with the experience and capability to conduct the testing indicated, that is a nationally recognized testing laboratory (NRTL) as defined by OSHA in 29 CFR 1910.7.

C. Source Limitations: Obtain each transformer type through one source from a single manufacturer.

D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

E. Comply with IEEE C57.12.91, "Test Code for Dry-Type Distribution and Power Transformers."

1.7 DELIVERY, STORAGE, AND HANDLING

A. Temporary Heating: Apply temporary heat according to manufacturer's written instructions within the enclosure of each ventilated-type unit, throughout periods during which equipment is not energized and when transformer is not in a space that is continuously under normal control of temperature and humidity.

1.8 COORDINATION

A. Coordinate size and location of concrete bases with actual transformer provided. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified with concrete.

B. Coordinate installation of wall-mounting and structure-hanging supports with actual transformer provided.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

1. ACME Electric Corporation; Power Distribution Products Division
2. Challenger Electrical Equipment Corp.; a division of Eaton Corp.
3. Eaton Electrical Inc.; Cutler-Hammer Products
4. General Electric Company
5. Myers Power Products, Inc.
6. Siemens Energy & Automation, Inc.
7. Square D; Schneider Electric

2.2 GENERAL TRANSFORMER REQUIREMENTS

A. Description: Factory-assembled and -tested, air-cooled units for 60-Hz service.

B. Cores: Grain-oriented, non-aging silicon steel.

C. Coils: Continuous windings without splices except for taps.

1. Internal Coil Connections: Brazed or pressure type.
2. Coil Material: Copper.

2.3 DISTRIBUTION TRANSFORMERS

A. Comply with NEMA ST 20, and list and label as complying with UL 1561.

B. Provide transformers that are constructed to withstand seismic forces specified in Section 260548 "Vibration and Seismic Controls for Electrical Systems."

C. Cores: One (1) leg per phase.

D. Enclosure: Ventilated, NEMA 250, Type 2.

1. Core and coil shall be encapsulated within resin compound, sealing out moisture and air.

E. Transformer Enclosure Finish: Comply with NEMA 250.

1. Finish Color: Gray.

F. Taps for Transformers Smaller Than 3 kVA: None.

G. Taps for Transformers 7.5 to 24 kVA: One (1) five percent (5%) tap above and one (1) five percent (5%) tap below normal full capacity.

H. Taps for Transformers 25 kVA and Larger: Two (2) two one one-half percent (2.5%) taps above and two (2) two and one-half percent (2.5%) taps below normal full capacity.

I. Insulation Class: 220 deg C, UL-component-recognized insulation system with a maximum of 115 deg C rise above 40 deg C ambient temperature.

J. Energy Efficiency for Transformers Rated 15 kVA and Larger:

1. Complying with NEMA TP 1, Class 1 efficiency levels.
2. Tested according to NEMA TP 2.

K. K-Factor Rating: Transformers indicated to be K-factor rated shall comply with UL 1561 requirements for non-sinusoidal load current-handling capability to the degree defined by designated K-factor.

1. Unit shall not overheat when carrying full-load current with harmonic distortion corresponding to designated K-factor.
2. Indicate value of K-factor on transformer nameplate.

L. Electrostatic Shielding: Each winding shall have an independent, single, full-width copper electrostatic shield arranged to minimize interwinding capacitance.

1. Arrange coil leads and terminal strips to minimize capacitive coupling between input and output terminals.
2. Include special terminal for grounding the shield.
3. Shield Effectiveness:

a. Capacitance between Primary and Secondary Windings: Not to exceed 33 picofarads over a frequency range of 20 Hz to 1 MHz.
b. Common-Mode Noise Attenuation: Minimum of minus 120 dBA at 0.5 to 1.5 kHz; minimum of minus 65 dBA at 1.5 to 100 kHz.
c. Normal-Mode Noise Attenuation: Minimum of minus 52 dBA at 1.5 to 10 kHz.

M. Wall Brackets: Manufacturer's standard brackets.

N. Fungus Proofing: Permanent fungicidal treatment for coil and core.

O. Low-Sound-Level Requirements: Minimum of 3 dBA less than NEMA ST 20 standard sound levels when factory tested according to IEEE C57.12.91.

P. Low-Sound-Level Requirements: Maximum sound levels, when factory tested according to IEEE C57.12.91, as follows:

1. 9 kVA and Less: dBA.
2. 30 to 50 kVA: dBA.
3. 51 to 150 kVA: dBA.

2.4 BUCK-BOOST TRANSFORMERS

A. Description: Self-cooled, two-winding dry type, rated for continuous duty and with wiring terminals suitable for connection as autotransformer. Transformers shall comply with NEMA ST 1 and shall be listed and labeled as complying with UL 506 or UL 1561.

B. Enclosure: Ventilated, NEMA 250, Type 2.

1. Finish Color: Gray.

2.5 IDENTIFICATION DEVICES

A. Nameplates: Engraved, laminated-plastic or metal nameplate for each transformer, mounted with corrosion-resistant screws. Nameplates and label products are specified in Section 260553 "Identification for Electrical Systems."

2.6 SOURCE QUALITY CONTROL

A. Test and inspect transformers according to IEEE C57.12.91.

B. Factory Sound-Level Tests: Conduct sound-level tests on equipment for this Project.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine conditions for compliance with enclosure- and ambient-temperature requirements for each transformer.

B. Verify that field measurements are as needed to maintain working clearances required by NFPA 70 and manufacturer's written instructions.

C. Examine walls, floors, roofs, and concrete bases for suitable mounting conditions where transformers will be installed.

D. Verify that ground connections are in place and requirements in Section 260526 "Grounding and Bonding for Electrical Systems" have been met. Maximum ground resistance shall be 5 ohms at location of transformer.

E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install wall-mounting transformers level and plumb with wall brackets fabricated by transformer manufacturer.

1. Brace wall-mounting transformers as specified in Section 260548 "Vibration and Seismic Controls for Electrical Systems."

B. Construct concrete bases and anchor floor-mounting transformers according to manufacturer's written instructions, seismic codes applicable to Project**,** and requirements in Section 260529 "Hangers and Supports for Electrical Systems."

3.3 CONNECTIONS

A. Ground equipment according to Section 260526 "Grounding and Bonding for Electrical Systems."

B. Connect wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

3.4 FIELD QUALITY CONTROL

A. Perform tests and inspections and prepare test reports.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

B. Tests and Inspections:

1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.

C. Remove and replace units that do not pass tests or inspections and retest as specified above.

D. Infrared Scanning: Two (2) months after Substantial Completion, perform an infrared scan of transformer connections.

1. Use an infrared-scanning device designed to measure temperature or detect significant deviations from normal values. Provide documentation of device calibration.
2. Perform two (2) follow-up infrared scans of transformers, one (1) at four (4) months and the other at eleven (11) months after Substantial Completion.
3. Prepare a certified report identifying transformer checked and describing results of scanning. Include notation of deficiencies detected, remedial action taken, and scanning observations after remedial action.

E. Test Labeling: On completion of satisfactory testing of each unit, attach a dated and signed "Satisfactory Test" label to tested component.

3.5 ADJUSTING

A. Record transformer secondary voltage at each unit for at least 48 hours of typical occupancy period. Adjust transformer taps to provide optimum voltage conditions at secondary terminals. Optimum is defined as not exceeding nameplate voltage plus ten percent (+10%) and not being lower than nameplate voltage minus three percent (-3%) at maximum load conditions. Submit recording and tap settings as test results.

B. Connect buck-boost transformers to provide nameplate voltage of equipment being served, plus or minus five percent (+/-5%), at secondary terminals.

C. Output Settings Report: Prepare a written report recording output voltages and tap settings.

3.6 CLEANING

A. Vacuum dirt and debris; do not use compressed air to assist in cleaning.

END OF SECTION 262200

SECTION 262413 - SWITCHBOARDS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Service and distribution switchboards rated 600 V and less.
2. Transient voltage suppression devices.
3. Disconnecting and overcurrent protective devices.
4. Instrumentation.
5. Control power.
6. Accessory components and features.
7. Identification.

1.3 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Switchboards shall withstand the effects of earthquake motions determined according to SEI/ASCE 7.

1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."

1.4 SUBMITTALS

A. Product Data: For each type of switchboard, overcurrent protective device, transient voltage suppression device, ground-fault protector, accessory, and component indicated. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, accessories, and finishes.

B. Shop Drawings: For each switchboard and related equipment.

1. Include dimensioned plans, elevations, sections, and details, including required clearances and service space around equipment. Show tabulations of installed devices, equipment features, and ratings.
2. Detail enclosure types for types other than NEMA 250, Type 1.
3. Detail bus configuration, current, and voltage ratings.
4. Detail short-circuit current rating of switchboards and overcurrent protective devices.
5. Include descriptive documentation of optional barriers specified for electrical insulation and isolation.
6. Detail utility company's metering provisions with indication of approval by utility company.
7. Include evidence of NRTL listing for series rating of installed devices.
8. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.
9. Include time-current coordination curves for each type and rating of overcurrent protective device included in switchboards.

10. Include schematic and wiring diagrams for power, signal, and control wiring.

C. Qualification Data: For qualified Installer and testing agency.

D. Seismic Qualification Certificates: Submit certification that switchboards, overcurrent protective devices, accessories, and components will withstand seismic forces defined in Section 260548 "Vibration and Seismic Controls for Electrical Systems." Include the following:

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

E. Field Quality-Control Reports:

1. Test procedures used.
2. Test results that comply with requirements.
3. Results of failed tests and corrective action taken to achieve test results that comply with requirements.

F. Operation and Maintenance Data: For switchboards and components to include in emergency, operation, and maintenance manuals. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:

1. Routine maintenance requirements for switchboards and all installed components.
2. Manufacturer's written instructions for testing and adjusting overcurrent protective devices.
3. Time-current coordination curves for each type and rating of overcurrent protective device included in switchboards. Submit on translucent log-log graft paper; include selectable ranges for each type of overcurrent protective device.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: An employer of workers qualified as defined in NEMA PB 2.1 and trained in electrical safety as required by NFPA 70E.

B. Testing Agency Qualifications: Member company of NETA or an NRTL.

1. Testing Agency's Field Supervisor: Currently certified by NETA to supervise on-site testing.

C. Source Limitations: Obtain switchboards, overcurrent protective devices, components, and accessories from single source from single manufacturer.

D. Product Selection for Restricted Space: Drawings indicate maximum dimensions for switchboards including clearances between switchboards and adjacent surfaces and other items. Comply with indicated maximum dimensions.

E. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

F. Comply with NEMA PB 2.

G. Comply with NFPA 70.

H. Comply with UL 891.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver switchboards in sections or lengths that can be moved past obstructions in delivery path.

B. Remove loose packing and flammable materials from inside switchboards and connect factory-installed space heaters to temporary electrical service to prevent condensation.

C. Handle and prepare switchboards for installation according to NECA 400 and/or NEMA PB 2.1.

1.7 PROJECT CONDITIONS

A. Installation Pathway: Remove and replace access fencing, doors, lift-out panels, and structures to provide pathway for moving switchboards into place.

B. Environmental Limitations:

1. Do not deliver or install switchboards until spaces are enclosed and weathertight, wet work in spaces is complete and dry, work above switchboards is complete, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.
2. Rate equipment for continuous operation under the following conditions unless otherwise indicated:

    a. Ambient Temperature: Not exceeding 104 deg F (40 deg C).
    b. Altitude: Not exceeding 6600 feet.

C. Service Conditions: NEMA PB 2, usual service conditions, as follows:

1. Ambient temperatures within limits specified.
2. Altitude not exceeding 6600 feet.

D. Interruption of Existing Electric Service: Do not interrupt electric service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electric service according to requirements indicated:

1. Notify Architect and Construction Manager no fewer than seven (7) days in advance of proposed interruption of electric service.
2. Indicate method of providing temporary electric service.
3. Do not proceed with interruption of electric service without the Architect’s and Construction Manager's written permission.
4. Comply with NFPA 70E.

1.8 COORDINATION

A. Coordinate layout and installation of switchboards and components with other construction that penetrates walls or is supported by them, including electrical and other types of equipment, raceways, piping, encumbrances to workspace clearance requirements, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

B. Coordinate sizes and locations of concrete bases with actual equipment provided. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 03.

1.9 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace transient voltage suppression devices that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Five (5) years from date of Substantial Completion not at certification of equipment.

1.10 EXTRA MATERIALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Potential Transformer Fuses: Equal to ten percent (10%) of quantity installed for each size and type, but no fewer than two (2) of each size and type.
2. Control-Power Fuses: Equal to ten percent (10%) of quantity installed for each size and type, but no fewer than two (2) of each size and type.
3. Fuses and Fusible Devices for Fused Circuit Breakers: Equal to ten percent (10%) of quantity installed for each size and type, but no fewer than three (3) of each size and type.
4. Fuses for Fused Switches: Equal to ten percent (10%) of quantity installed for each size and type, but no fewer than three (3) of each size and type.
5. Fuses for Fused Power-Circuit Devices: Equal to ten percent (10%) of quantity installed for each size and type, but no fewer than three (3) of each size and type.
6. Indicating Lights: Equal to ten percent (10%) of quantity installed for each size and type, but no fewer than one (1) of each size and type.

PART 2 - PRODUCTS

2.1 MANUFACTURED UNITS

A. Basis-of-Design Product: Subject to compliance with requirements, provide product from one (1) of the manufacturers listed below:

1. General Electric Company; GE Consumer & Industrial – Electrical Distribution
2. Siemens Energy & Automation, Inc.
3. Eaton Electric, Inc.; Cutler-Hammer Business Unit
4. Square D; a brand of Schneider Electric

B. Front-Connected, Front-Accessible Switchboards:

1. Main Devices: Panel and Fixed, individually mounted.
2. Branch Devices: Panel mounted.
3. Sections front and rear aligned.

C. Nominal System Voltage: 480/277 V.

D. Main-Bus Continuous: As indicated on Drawings.

E. Seismic Requirements: Fabricate and test switchboards according to IEEE 344 to withstand seismic forces defined in Section 260548 "Vibration and Seismic Controls for Electrical Systems."

F. Indoor Enclosures: Steel, NEMA 250, Type 1

G. Enclosure Finish for Indoor Units: Factory-applied finish in manufacturer's standard gray finish over a rust-inhibiting primer on treated metal surface.

1. Power for space heaters, ventilation, lighting, and receptacle are provided by a remote source.

H. Barriers: Between adjacent switchboard sections.

I. Insulation and isolation for main bus of main section and main and vertical buses of feeder sections.

J. Utility Metering Compartment: Fabricated, barrier compartment and section complying with utility company's requirements; hinged sealed door; buses provisioned for mounting utility company's current transformers and potential transformers or potential taps as required by utility company. If separate vertical section is required for utility metering, match and align with basic switchboard. Provide service entrance label and necessary applicable service entrance features.

K. Bus Transition and Incoming Pull Sections: Matched and aligned with basic switchboard.

L. Removable, Hinged Rear Doors and Compartment Covers: Secured by captive thumb screws, for access to rear interior of switchboard.

M. Hinged Front Panels: Allow access to circuit breaker, metering, accessory, and blank compartments.

N. Pull Box on Top of Switchboard (when required):

1. Adequate ventilation to maintain temperature in pull box within same limits as switchboard.
2. Set back from front to clear circuit-breaker removal mechanism.
3. Removable covers shall form top, front, and sides. Top covers at rear shall be easily removable for drilling and cutting.
4. Bottom shall be insulating, fire-resistive material with separate holes for cable drops into switchboard.
5. Cable supports shall be arranged to facilitate cabling and adequate to support cables indicated, including those for future installation.

O. Buses and Connections: Three-phase, four-wire unless otherwise indicated.

1. Phase- and Neutral-Bus Material: Hard-drawn copper of ninety-eight percent (98%) conductivity, silver-plated, with tin-plated aluminum or copper feeder circuit-breaker line connections.
2. Load Terminals: Insulated, rigidly braced, runback bus extensions, of same material as through buses, equipped with compression connectors for outgoing circuit conductors. Provide load terminals for future circuit-breaker positions at full-ampere rating of circuit-breaker position.
3. Ground Bus: ¼-by-2-inch minimum-size required by UL 891, hard-drawn copper of ninety-eight percent (98%) conductivity, equipped with compression connectors for

feeder and branch-circuit ground conductors. For busway feeders, extend insulated equipment grounding cable to busway ground connection and support cable at intervals in vertical run.

4. Main Phase Buses and Equipment Ground Buses: Uniform capacity for entire length of switchboard's main and distribution sections. Provide for future extensions from both ends.
5. Neutral Buses: One hundred percent (100%) of the ampacity of phase buses unless otherwise indicated, equipped with compression connectors for outgoing circuit neutral cables. Brace bus extensions for busway feeder neutral bus.
6. Isolation Barrier Access Provisions: Permit checking of bus-bolt tightness.

P. Future Devices: Equip compartments with mounting brackets, supports, bus connections, and appurtenances at full rating of circuit-breaker compartment.

Q. Bus-Bar Insulation: Factory-applied, flame-retardant, tape wrapping of individual bus bars or flame-retardant, spray-applied insulation. Minimum insulation temperature rating of 105 deg C.

R. Fungus Proofing: Permanent fungicidal treatment for overcurrent protective devices and other components including instruments and instrument transformers.

2.2 TRANSIENT VOLTAGE SUPPRESSION DEVICES

A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one (1) of the following:

1. Eaton Electrical Inc.; Cutler-Hammer Business Unit
2. General Electric Company; GE Consumer & Industrial - Electrical Distribution
3. Siemens Energy & Automation, Inc.
4. Square D; a brand of Schneider Electric

B. Surge Protection Device Description: IEEE C62.41-compliant, integrally mounted, bolt-on, solid-state, parallel-connected, modular (with field-replaceable modules) type, with sine-wave tracking suppression and filtering modules, UL 1449, second edition, short-circuit current rating matching or exceeding the switchboard short-circuit rating, and with the following features and accessories:

1. Fuses, rated at 200-kA interrupting capacity.
2. Fabrication using bolted compression lugs for internal wiring.
3. Integral disconnect switch.
4. Redundant suppression circuits.
5. Redundant replaceable modules.
6. Arrangement with wire connections to phase buses, neutral bus, and ground bus.
7. LED indicator lights for power and protection status.
8. Audible alarm, with silencing switch, to indicate when protection has failed.
9. Form-C contacts rated at 5 A and 250-V ac, one normally open and one normally closed, for remote monitoring of system operation. Contacts shall reverse position on failure of any surge diversion module or on opening of any current-limiting device. Coordinate with building power monitoring and control system.
10. Six-digit, transient-event counter set to totalize transient surges.

C. Peak Single-Impulse Surge Current Rating: 160 kA per mode/320 kA per phase.

D. Withstand Capabilities: 12,000 IEEE C62.41, Category C3 (10 kA), 8-by-20-mic.sec. surges with less than 5 percent change in clamping voltage.

E. Protection modes and UL 1449 SVR for grounded wye circuits with 480Y/277-V, three-phase, four-wire circuits shall be as follows:

1. Line to Neutral: 1200 V for 480Y/277.
2. Line to Ground: 1200 V for 480Y/277.
3. Neutral to Ground: 1200 V for 480Y/277.

2.3 DISCONNECTING AND OVERCURRENT PROTECTIVE DEVICES

A. Molded-Case Circuit Breaker (MCCB): Comply with UL 489, with interrupting capacity to meet available fault currents.

1. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads, and instantaneous magnetic trip element for short circuits. Electronic trip setting for circuit-breaker frame sizes 200 A and larger.
2. Adjustable Instantaneous-Trip Circuit Breakers: Magnetic trip element with front-mounted, field-adjustable trip setting.
3. Electronic trip circuit breakers with rms sensing; field-replaceable rating plug or field-replicable electronic trip; and the following field-adjustable settings:

    a. Instantaneous trip.
    b. Long- and short-time pickup levels.
    c. Long- and short-time time adjustments.
    d. Ground-fault pickup level, time delay, and I^2t response.

4. Current-Limiting Circuit Breakers: Frame sizes 400 A and smaller; let-through ratings less than NEMA FU 1, RK-5.
5. Integrally Fused Circuit Breakers: Thermal-magnetic trip element with integral limiter-style fuse listed for use with circuit breaker; trip activation on fuse opening or on opening of fuse compartment door.
6. GFCI Circuit Breakers: Single- and two-pole configurations with Class A ground-fault protection (6-mA trip).
7. Ground-Fault Equipment Protection (GFEP) Circuit Breakers: Class B ground-fault protection (30-mA trip).
8. Molded-Case Circuit-Breaker (MCCB) Features and Accessories:

    a. Standard frame sizes, trip ratings, and number of poles.
    b. Lugs: Compression style, suitable for number, size, trip ratings, and conductor material.
    c. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HID for feeding fluorescent and high-intensity discharge (HID) lighting circuits.
    d. Ground-Fault Protection: Remote-mounted relay and trip unit with adjustable pickup and time-delay settings, push-to-test feature, and ground-fault indicator.
    e. Zone-Selective Interlocking: Integral with electronic trip unit; for interlocking ground-fault protection function.
    f. Shunt Trip: 120-V trip coil energized from separate circuit, set to trip at seventy-five percent (75%) of rated voltage.
    g. Undervoltage Trip: Set to operate at thirty-five to seventy-five percent (35-75%) of rated voltage without intentional time delay.
    h. Auxiliary Contacts: Two SPDT switches with "a" and "b" contacts; "a" contacts mimic circuit-breaker contacts, "b" contacts operate in reverse of circuit-breaker contacts.
    i. Key Interlock Kit: Externally mounted to prohibit circuit-breaker operation; key shall be removable only when circuit breaker is in off position.

B. Insulated-Case Circuit Breaker (ICCB): One hundred percent (100%) rated, sealed, insulated-case power circuit breaker with interrupting capacity rating to meet available fault current.

1. Fixed circuit-breaker mounting.
2. Two-step, stored-energy closing.
3. Full-function, microprocessor-based trip units with interchangeable rating plug, trip indicators, and the following field-adjustable settings:

    a. Instantaneous trip.
    b. Long- and short-time time adjustments.
    c. Ground-fault pickup level, time delay, and I^2t response.

4. Zone-Selective Interlocking: Integral with electronic trip unit; for interlocking ground-fault protection function.
5. Remote trip indication and control.
6. Key Interlock Kit: Externally mounted to prohibit circuit-breaker operation; key shall be removable only when circuit breaker is in off position.
7. Control Voltage: 40-V dc and/or 120-V ac.

C. Bolted-Pressure Contact Switch: Operating mechanism uses rotary-mechanical-bolting action to produce and maintain high clamping pressure on the switch blade after it engages the stationary contacts.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. Boltswitch, Inc.
    b. Eaton Electrical Inc.; Cutler-Hammer Business Unit
    c. Pringle Electrical Manufacturing Company, Inc.
    d. Siemens Energy & Automation, Inc.
    e. Square D; a brand of Schneider Electric

2. Main-Contact Interrupting Capability: Minimum of twelve (12) times the switch current rating.
3. Operating Mechanism: Manual handle operation to close switch; stores energy in mechanism for opening and closing.

    a. Electrical Trip: Operation of lever or push-button trip switch, or trip signal from ground-fault relay or remote-control device, causes switch to open.
    b. Mechanical Trip: Operation of mechanical lever, push button, or other device causes switch to open.

4. Auxiliary Switches: Factory installed, single pole, double throw, with leads connected to terminal block, and including one (1) set more than quantity required for functional performance indicated.
5. Service-Rated Switches: Labeled for use as service equipment.
6. Ground-Fault Relay: Comply with UL 1053; self-powered type with mechanical ground-fault indicator, test function, tripping relay with internal memory, and three-phase current transformer/sensor.

    a. Configuration: Integrally mounted relay and trip unit with adjustable pickup and time-delay settings, push-to-test feature, and ground-fault indicator.
    b. Internal Memory: Integrates the cumulative value of intermittent arcing ground-fault currents and uses the effect to initiate tripping.

c. No-Trip Relay Test: Permits ground-fault simulation test without tripping switch.
d. Test Control: Simulates ground fault to test relay and switch (or relay only if "no-trip" mode is selected).

7. Open-Fuse Trip Device: Arranged to trip switch open if a phase fuse opens.

D. High-Pressure, Butt-Type Contact Switch: Operating mechanism uses butt-type contacts and a spring-charged mechanism to produce and maintain high-pressure contact when switch is closed.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. General Electric Company; GE Consumer & Industrial - Electrical Distribution

2. Main-Contact Interrupting Capability: Minimum of twelve (12) times the switch current rating.
3. Operating Mechanism: Manual handle operation to close switch; stores energy in mechanism for opening and closing.

a. Electrical Trip: Operation of lever or push-button trip switch, or trip signal from ground-fault relay or remote-control device, causes switch to open.
b. Mechanical Trip: Operation of mechanical lever, push button, or other device causes switch to open.

4. Auxiliary Switches: Factory installed, single pole, double throw, with leads connected to terminal block, and including one set more than quantity required for functional performance indicated.
5. Service-Rated Switches: Labeled for use as service equipment.
6. Ground-Fault Relay: Comply with UL 1053; self-powered type with mechanical ground-fault indicator, test function, tripping relay with internal memory, and three-phase current transformer/sensor.

a. Configuration: Integrally mounted and/or Remote-mounted relay and trip unit with adjustable pickup and time-delay settings, push-to-test feature, and ground-fault indicator.
b. Internal Memory: Integrates the cumulative value of intermittent arcing ground-fault currents and uses the effect to initiate tripping.
c. No-Trip Relay Test: Permits ground-fault simulation test without tripping switch.
d. Test Control: Simulates ground fault to test relay and switch (or relay only if "no-trip" mode is selected).

7. Open-Fuse Trip Device: Arranged to trip switch open if a phase fuse opens.

E. Fused Switch: NEMA KS 1, Type HD; clips to accommodate specified fuses; lockable handle.

F. Fuses are specified in Section 262813 "Fuses."

2.4 INSTRUMENTATION

A. Instrument Transformers: IEEE C57.13, NEMA EI 21.1, and the following:

1. Potential Transformers: IEEE C57.13; 120 V, 60 Hz, tapped secondary; disconnecting type with integral fuse mountings. Burden and accuracy shall be consistent with connected metering and relay devices.
2. Current Transformers: IEEE C57.13; 5 A, 60 Hz, secondary; bar or window type; double secondary winding and secondary shorting device. Burden and accuracy shall be consistent with connected metering and relay devices.
3. Control-Power Transformers: Dry type, mounted in separate compartments for units larger than 3 kVA.
4. Current Transformers for Neutral and Ground-Fault Current Sensing: Connect secondary wiring to ground overcurrent relays, via shorting terminals, to provide selective tripping of main and tie circuit breaker. Coordinate with feeder circuit-breaker, ground-fault protection.

B. Multifunction Digital-Metering Monitor: Microprocessor-based unit suitable for three- or four-wire systems and with the following features:

1. Switch-selectable digital display of the following values with maximum accuracy tolerances as indicated:

   a. Phase Currents, Each Phase: Plus or minus one percent (+/-1%).
   b. Phase-to-Phase Voltages, Three Phase: Plus or minus one percent (+/-1%).
   c. Phase-to-Neutral Voltages, Three Phase: Plus or minus one percent (+/-1%).
   d. Megawatts: Plus or minus two percent (+/-2%).
   e. Megavars: Plus or minus two percent (+/-2%).
   f. Power Factor: Plus or minus two percent (+/-2%).
   g. Frequency: Plus or minus one-half percent (+/-0.5%).
   h. Accumulated Energy, Megawatt Hours: Plus or minus two percent (+/-2%); accumulated values unaffected by power outages up to 72 hours.
   i. Megawatt Demand: Plus or minus two percent (+/-2%); demand interval programmable from 5 to 60 minutes.
   j. Contact devices to operate remote impulse-totalizing demand meter.

2. Mounting: Display and control unit flush or semi-flush mounted in instrument compartment door.

C. Watt-Hour Meters and Wattmeters:

1. Comply with ANSI C12.1.
2. Three-phase induction type with two (2) stators, each with current and potential coil, rated 5 A, 120 V, 60 Hz.
3. Suitable for connection to three- and four-wire circuits.
4. Potential indicating lamps.
5. Adjustments for light and full load, phase balance, and power factor.
6. Four-dial clock register.
7. Integral demand indicator.
8. Contact devices to operate remote impulse-totalizing demand meter.
9. Ratchets to prevent reverse rotation.
10. Removable meter with drawout test plug.
11. Semi-flush mounted case with matching cover.
12. Appropriate multiplier tag.

2.5 CONTROL POWER

A. Control Circuits: 120-V ac, supplied through secondary disconnecting devices from control-power transformer.

B. Electrically Interlocked Main and Tie Circuit Breakers: Two (2) control-power transformers in separate compartments, with interlocking relays, connected to the primary side of each control-power transformer at the line side of the associated main circuit breaker. 120-V secondaries connected through automatic transfer relays to ensure a fail-safe automatic transfer scheme.

C. Control-Power Fuses: Primary and secondary fuses for current-limiting and overload protection of transformer and fuses for protection of control circuits.

D. Control Wiring: Factory installed, with bundling, lacing, and protection included. Provide flexible conductors for No. 8 AWG and smaller, for conductors across hinges, and for conductors for interconnections between shipping units.

2.6 ACCESSORY COMPONENTS AND FEATURES

A. Accessory Set: Include tools and miscellaneous items required for overcurrent protective device test, inspection, maintenance, and operation.

2.7 IDENTIFICATION

A. Nameplate: At least 0.0625-inch-thick laminated plastic (Gravoply), located at eye level on front cover of the switchboard incoming service section.

B. Provide nameplates for section identification and for each output breaker to indicate load served.

C. Service Equipment Label: NRTL labeled for use as service equipment for switchboards with one or more service disconnecting and overcurrent protective devices.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Receive, inspect, handle, and store switchboards according to NECA 400 and NEMA PB 2.1.

B. Examine switchboards before installation. Reject switchboards that are moisture damaged or physically damaged.

C. Examine elements and surfaces to receive switchboards for compliance with installation tolerances and other conditions affecting performance of the Work.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install switchboards and accessories according to NECA 400 and NEMA PB 2.1.

B. Equipment Mounting: Install switchboards on concrete base, 4-inch nominal thickness. Comply with requirements for concrete base specified in Section 033000 "Cast-in-Place Concrete".

1. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of concrete base.
2. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete floor.

3. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
4. Install anchor bolts to elevations required for proper attachment to switchboards.

C. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from switchboard units and components.

D. Comply with mounting and anchoring requirements specified in Section 260548 "Vibration and Seismic Controls for Electrical Systems."

E. Operating Instructions: Frame and mount the printed basic operating instructions for switchboards, including control and key interlocking sequences and emergency procedures. Fabricate frame of finished wood or metal and cover instructions with clear acrylic plastic. Mount on front of switchboards.

F. Install filler plates in unused spaces of panel-mounted sections.

G. Install overcurrent protective devices, transient voltage suppression devices, and instrumentation.

1. Set field-adjustable switches and circuit-breaker trip ranges.

H. Install spare-fuse cabinet.

I. Comply with NECA 1.

3.3 CONNECTIONS

A. Comply with requirements for terminating cable trays specified in Section 270536 "Cable Trays for Electrical Systems." Drawings indicate general arrangement of cable trays, fittings, and specialties.

3.4 IDENTIFICATION

A. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

B. Switchboard Nameplates: Label each switchboard compartment with a nameplate complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

C. Device Nameplates: Label each disconnecting and overcurrent protective device and each meter and control device mounted in compartment doors with a nameplate complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

3.5 FIELD QUALITY CONTROL

A. Perform tests and inspections.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

B. Acceptance Testing Preparation:

1. Test insulation resistance for each switchboard bus, component, connecting supply, feeder, and control circuit.
2. Test continuity of each circuit.

C. Tests and Inspections:

1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
3. Perform the following infrared scan tests and inspections and prepare reports:

    a. Initial Infrared Scanning: After Substantial Completion, but not more than sixty (60) days after Final Acceptance, perform an infrared scan of each switchboard. Remove front and/or rear panels so joints and connections are accessible to portable scanner.
    b. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each switchboard eleven (11) months after date of Substantial Completion.
    c. Instruments and Equipment:
        1) Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.

4. Test and adjust controls, remote monitoring, and safeties. Replace damaged and malfunctioning controls and equipment.

D. Switchboard will be considered defective if it does not pass tests and inspections.

E. Prepare test and inspection reports, including a certified report that identifies switchboards included and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.6 ADJUSTING

A. Adjust moving parts and operable components to function smoothly, and lubricate as recommended by manufacturer.

B. Set field-adjustable circuit-breaker trip ranges as specified in Section 260573 "Overcurrent Protective Device Coordination Study."

3.7 PROTECTION

A. Temporary Heating: Apply temporary heat, to maintain temperature according to manufacturer's written instructions, until switchboard is ready to be energized and placed into service.

3.8 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain switchboards, overcurrent protective devices, instrumentation, and accessories, and to use and reprogram microprocessor-based trip, monitoring, and communication units.

END OF SECTION 262413

SECTION 262416 - PANELBOARDS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Distribution panelboards.
2. Lighting and appliance branch-circuit panelboards.

1.3 DEFINITIONS

A. SVR: Suppressed voltage rating.

B. TVSS: Transient voltage surge suppressor.

1.4 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Panelboards shall withstand the effects of earthquake motions determined according to SEI/ASCE 7.

1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."

1.5 SUBMITTALS

A. Product Data: For each type of panelboard, switching and overcurrent protective device, transient voltage suppression device, accessory, and component indicated. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.

B. Shop Drawings: For each panelboard and related equipment.

1. Include dimensioned plans, elevations, sections, and details. Show tabulations of installed devices, equipment features, and ratings.
2. Detail enclosure types and details for types other than NEMA 250, Type 1.
3. Detail bus configuration, current, and voltage ratings.
4. Short-circuit current rating of panelboards and overcurrent protective devices.
5. Include evidence of NRTL listing for series rating of installed devices.
6. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.
7. Include wiring diagrams for power, signal, and control wiring.
8. Include time-current coordination curves for each type and rating of overcurrent protective device included in panelboards. Submit on translucent log-log graft paper; include selectable ranges for each type of overcurrent protective device.

C. Qualification Data: For qualified testing agency.

D. Seismic Qualification Certificates: Submit certification that panelboards, overcurrent protective devices, accessories, and components will withstand seismic forces defined in Section 260548 "Vibration and Seismic Controls for Electrical Systems." Include the following:

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

E. Field Quality-Control Reports:

1. Test procedures used.
2. Test results that comply with requirements.
3. Results of failed tests and corrective action taken to achieve test results that comply with requirements.

F. Panelboard Schedules: For installation in panelboards. Submit final versions after load balancing.

G. Operation and Maintenance Data: For panelboards and components to include in emergency, operation, and maintenance manuals. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:

1. Manufacturer's written instructions for testing and adjusting overcurrent protective devices.
2. Time-current curves, including selectable ranges for each type of overcurrent protective device that allows adjustments.

1.6 QUALITY ASSURANCE

A. Testing Agency Qualifications: Member company of NETA or an NRTL.

1. Testing Agency's Field Supervisor: Currently certified by NETA to supervise on-site testing.

B. Source Limitations: Obtain panelboards, overcurrent protective devices, components, and accessories from single source from single manufacturer.

C. Product Selection for Restricted Space: Drawings indicate maximum dimensions for panelboards including clearances between panelboards and adjacent surfaces and other items. Comply with indicated maximum dimensions.

D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

E. Comply with NEMA PB 1.

F. Comply with NFPA 70.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Remove loose packing and flammable materials from inside panelboards; install temporary electric heating (250 W per panelboard) to prevent condensation.

B. Handle and prepare panelboards for installation according to NECA 407 and NEMA PB 1.

1.8 PROJECT CONDITIONS

A. Environmental Limitations:

1. Do not deliver or install panelboards until spaces are enclosed and weathertight, wet work in spaces is complete and dry, work above panelboards is complete, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.
2. Rate equipment for continuous operation under the following conditions unless otherwise indicated:

a. Ambient Temperature: Not exceeding minus 22 deg F (minus 30 deg C) 23 deg F (minus 5 deg C) to plus 104 deg F (plus 40 deg C).
b. Altitude: Not exceeding 6600 feet.

B. Service Conditions: NEMA PB 1, usual service conditions, as follows:

1. Ambient temperatures within limits specified.
2. Altitude not exceeding 6600 feet.

C. Interruption of Existing Electric Service: Do not interrupt electric service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electric service according to requirements indicated:

1. Notify Architect and Construction Manager Owner no fewer than two (2) days in advance of proposed interruption of electric service.
2. Do not proceed with interruption of electric service without the Architect’s and Construction Manager's written permission.
3. Comply with NFPA 70E.

1.9 COORDINATION

A. Coordinate layout and installation of panelboards and components with other construction that penetrates walls or is supported by them, including electrical and other types of equipment, raceways, piping, encumbrances to workspace clearance requirements, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

B. Coordinate sizes and locations of concrete bases with actual equipment provided. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 03.

1.10 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace transient voltage suppression devices that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Five (5) years from date of Substantial Completion.

1.11 EXTRA MATERIALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Keys: Two (2) spares for each type of panelboard cabinet lock.
2. Circuit Breakers Including GFCI and Ground Fault Equipment Protection (GFEP) Types: Two (2) spares for each panelboard.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR PANELBOARDS

A. Fabricate and test panelboards according to IEEE 344 to withstand seismic forces defined in Section 260548 "Vibration and Seismic Controls for Electrical Systems."

B. Enclosures: Flush- and surface-mounted cabinets.

1. Rated for environmental conditions at installed location.

a. Indoor Dry and Clean Locations: NEMA 250
b. Outdoor Locations: NEMA 250, Type 3R.
c. Kitchen and Wash-Down Areas: NEMA 250, Type 4X.
d. Other Wet or Damp Indoor Locations: NEMA 250, Type 4.
e. Indoor Locations Subject to Dust, Falling Dirt, and Dripping Noncorrosive Liquids: NEMA 250, Type 5 or Type 12.

2. Front: Secured to box with concealed trim clamps. For surface-mounted fronts, match box dimensions; for flush-mounted fronts, overlap box.
3. Hinged Front Cover: Entire front trim hinged to box and with standard door within hinged trim cover.
4. Skirt for Surface-Mounted Panelboards: Same gage and finish as panelboard front with flanges for attachment to panelboard, wall, and ceiling or floor.
5. Gutter Extension and Barrier: Same gage and finish as panelboard enclosure; integral with enclosure body. Arrange to isolate individual panel sections.
6. Finishes:

a. Panels and Trim: Steel and galvanized steel, factory finished immediately after cleaning and pretreating with manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat.
b. Back Boxes: Same finish as panels and trim.

7. Directory Card: Inside panelboard door, mounted in metal frame with transparent protective cover.

C. Incoming Mains Location: Top and bottom.

D. Phase, Neutral, and Ground Buses:

1. Material: Hard-drawn copper, ninety-eight percent (98%) conductivity.

a. Plating shall run entire length of bus.

b. Bus shall be fully rated the entire length.

2. Interiors shall be factory assembled into a unit. Replacing switching and protective devices shall not disturb adjacent units or require removing the main bus connectors.
3. Equipment Ground Bus: Adequate for feeder and branch-circuit equipment grounding conductors; bonded to box.
4. Full-Sized Neutral: Equipped with full-capacity bonding strap for service entrance applications. Mount electrically isolated from enclosure. Do not mount neutral bus in gutter.

E. Conductor Connectors: Suitable for use with conductor material and sizes.

1. Material: Hard-drawn copper, ninety-eight percent (98%) conductivity.
2. Main and Neutral Lugs: Compression type.
3. Ground Lugs and Bus-Configured Terminators: Compression type.
4. Feed-Through Lugs: Compression type, suitable for use with conductor material. Locate at opposite end of bus from incoming lugs or main device.
5. Subfeed (Double) Lugs: Compression type suitable for use with conductor material. Locate at same end of bus as incoming lugs or main device.
6. Gutter-Tap Lugs: Compression type suitable for use with conductor material. Locate at same end of bus as incoming lugs or main device.

F. Service Equipment Label: NRTL labeled for use as service equipment for panelboards or load centers with one (1) or more main service disconnecting and overcurrent protective devices.

G. Future Devices: Mounting brackets, bus connections, filler plates, and necessary appurtenances required for future installation of devices.

H. Panelboard Short-Circuit Current Rating: Rated for series-connected system with integral or remote upstream overcurrent protective devices and labeled by an NRTL. Include size and type of allowable upstream and branch devices, listed and labeled for series-connected short-circuit rating by an NRTL.

I. Panelboard Short-Circuit Current Rating: Fully rated to interrupt symmetrical short-circuit current available at terminals.

2.2 DISTRIBUTION PANELBOARDS

A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one (1) of the following:

1. Eaton Electrical Inc.; Cutler-Hammer Business Unit
2. General Electric Company; GE Consumer & Industrial - Electrical Distribution
3. Siemens Energy & Automation, Inc.
4. Square D; a brand of Schneider Electric

B. Panelboards: NEMA PB 1, power and feeder distribution type.

C. Doors: Secured with vault-type latch with tumbler lock; keyed alike.

1. For doors more than 36 inches high, provide two (2) latches, keyed alike.

D. Mains: Circuit breaker, Fused switch, and Lugs only.

E. Branch Overcurrent Protective Devices for Circuit-Breaker Frame Sizes 125 A and Smaller: Bolt-on circuit breakers.

F. Branch Overcurrent Protective Devices for Circuit-Breaker Frame Sizes Larger Than 125 A: Bolt-on circuit breakers.

G. Contactors in Main Bus: NEMA ICS 2, Class A, electrically and/or mechanically held, general-purpose controller, with same short-circuit interrupting rating as panelboard.

1. Internal Control-Power Source: Control-power transformer, with fused primary and secondary terminals, connected to main bus ahead of contactor connection.
2. External Control-Power Source: 120-V branch circuit.

2.3 LIGHTING AND APPLIANCE BRANCH-CIRCUIT PANELBOARDS

A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one (1) of the following:

1. Eaton Electrical Inc.; Cutler-Hammer Business Unit
2. General Electric Company; GE Consumer & Industrial - Electrical Distribution
3. Siemens Energy & Automation, Inc.
4. Square D; a brand of Schneider Electric

B. Panelboards: NEMA PB 1, lighting and appliance branch-circuit type.

C. Mains: Circuit breaker or lugs only.

D. Branch Overcurrent Protective Devices: Bolt-on circuit breakers, replaceable without disturbing adjacent units.

E. Contactors in Main Bus: NEMA ICS 2, Class A, electrically and/or mechanically held, general-purpose controller, with same short-circuit interrupting rating as panelboard.

1. Internal Control-Power Source: Control-power transformer, with fused primary and secondary terminals, connected to main bus ahead of contactor connection.
2. External Control-Power Source: 120-V branch circuit.

F. Doors: Concealed hinges; Door-in-door style, secured with flush latch with tumbler lock; keyed alike.

G. Column-Type Panelboards: Narrow gutter extension, with cover, to overhead junction box equipped with ground and neutral terminal buses.

2.4 DISCONNECTING AND OVERCURRENT PROTECTIVE DEVICES

A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one (1) of the following:

1. Eaton Electrical Inc.; Cutler-Hammer Business Unit
2. General Electric Company; GE Consumer & Industrial - Electrical Distribution
3. Siemens Energy & Automation, Inc.
4. Square D; a brand of Schneider Electric

B. Molded-Case Circuit Breaker (MCCB): Comply with UL 489, with interrupting capacity to meet available fault currents.

1. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads, and instantaneous magnetic trip element for short circuits. Electronic trip setting for circuit-breaker frame sizes 200 A and larger.
2. Adjustable Instantaneous-Trip Circuit Breakers: Magnetic trip element with front-mounted, field-adjustable trip setting.
3. Electronic trip circuit breakers with rms sensing; field-replaceable rating plug or field-replicable electronic trip; and the following field-adjustable settings:

    a. Instantaneous trip.
    b. Long- and short-time pickup levels.
    c. Long- and short-time time adjustments.
    d. Ground-fault pickup level, time delay, and I^2t response.

4. Current-Limiting Circuit Breakers: Frame sizes 400 A and smaller; let-through ratings less than NEMA FU 1, RK-5.
5. GFCI Circuit Breakers: Single- and two-pole configurations with Class A ground-fault protection (6-mA trip).
6. Ground-Fault Equipment Protection (GFEP) Circuit Breakers: Class B ground-fault protection (30-mA trip).
7. Arc-Fault Circuit Interrupter (AFCI) Circuit Breakers: Comply with UL 1699; 120/240-V, single-pole configuration.
8. Molded-Case Circuit-Breaker (MCCB) Features and Accessories:

    a. Standard frame sizes, trip ratings, and number of poles.
    b. Lugs: Compression and Mechanical style, suitable for number, size, trip ratings, and conductor materials.
    c. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HID for feeding fluorescent and high-intensity discharge (HID) lighting circuits.
    d. Ground-Fault Protection: Remote-mounted relay and trip unit with adjustable pickup and time-delay settings, push-to-test feature, and ground-fault indicator.
    e. Shunt Trip: 120 and/or 24 V trip coil energized from separate circuit, set to trip at seventy-five percent (75%) of rated voltage.
    f. Undervoltage Trip: Set to operate at thirty-five to seventy-five percent (35-75%) of rated voltage with field-adjustable 0.1- to 0.6-second time delay.
    g. Auxiliary Contacts: One SPDT switch with "a" and "b" contacts; "a" contacts mimic circuit-breaker contacts and "b" contacts operate in reverse of circuit-breaker contacts.
    h. Alarm Switch: Single-pole, normally open contact that actuates only when circuit breaker trips.
    i. Key Interlock Kit: Externally mounted to prohibit circuit-breaker operation; key shall be removable only when circuit breaker is in off position.
    j. Zone-Selective Interlocking: Integral with electronic trip unit; for interlocking ground-fault protection function with other upstream or downstream devices.
    k. Multipole units enclosed in a single housing or factory assembled to operate as a single unit.
    l. Handle Padlocking Device: Fixed attachment, for locking circuit-breaker handle in on or off position.
    m. Handle Clamp: Loose attachment, for holding circuit-breaker handle in on position.

C. Fused Switch: NEMA KS 1, Type HD; clips to accommodate specified fuses; lockable handle.

1. Fuses, and Spare-Fuse Cabinet: Comply with requirements specified in Section 262813 "Fuses."
2. Fused Switch Features and Accessories: Standard ampere ratings and number of poles.

3. Auxiliary Contacts: One normally open and normally closed contact(s) that operate with switch handle operation.

2.5 PANELBOARD SUPPRESSORS (when indicated on Drawings)

A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one (1) of the following:

1. Current Technology; a subsidiary of Danahar Corporation
2. Eaton Electrical Inc.; Cutler-Hammer Business Unit
3. General Electric Company; GE Consumer & Industrial - Electrical Distribution
4. Liebert Corporation
5. Siemens Energy & Automation, Inc.
6. Square D; a brand of Schneider Electric

B. Surge Protection Device: IEEE C62.41-compliant, integrally mounted, solid-state, parallel-connected, non-modular type, with sine-wave tracking suppression and filtering modules, UL 1449, second edition, short-circuit current rating matching or exceeding the panelboard short-circuit rating, and with the following features and accessories:

1. Accessories:

a. LED indicator lights for power and protection status.
b. Audible alarm, with silencing switch, to indicate when protection has failed.
c. One (1) set of dry contacts rated at 5 A and 250-V ac, for remote monitoring of protection status.

2.6 ACCESSORY COMPONENTS AND FEATURES

A. Accessory Set: Include tools and miscellaneous items required for overcurrent protective device test, inspection, maintenance, and operation.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Receive, inspect, handle, and store panelboards according to NECA 407 and/or NEMA PB 1.1.

B. Examine panelboards before installation. Reject panelboards that are damaged or rusted or have been subjected to water saturation.

C. Examine elements and surfaces to receive panelboards for compliance with installation tolerances and other conditions affecting performance of the Work.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install panelboards and accessories according to NECA 407 and/or NEMA PB 1.1.

B. Equipment Mounting: Install panelboards on concrete bases, 4-inch nominal thickness. Comply with requirements for concrete base specified in Section 033000 "Cast-in-Place Concrete."

1. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around full perimeter of base.
2. For panelboards, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete floor.
3. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
4. Install anchor bolts to elevations required for proper attachment to panelboards.
5. Attach panelboard to the vertical finished or structural surface behind the panelboard.

C. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from panelboards.

D. Comply with mounting and anchoring requirements specified in Section 260548 "Vibration and Seismic Controls for Electrical Systems."

E. Mount top of trim 90 inches above finished floor unless otherwise indicated.

F. Mount panelboard cabinet plumb and rigid without distortion of box. Mount recessed panelboards with fronts uniformly flush with wall finish and mating with back box.

G. Install overcurrent protective devices and controllers not already factory installed.

1. Set field-adjustable, circuit-breaker trip ranges.

H. Install filler plates in unused spaces.

I. Stub four (4) 1-inch (27-GRC) empty conduits from panelboard into accessible ceiling space or space designated to be ceiling space in the future. Stub four (4) 1-inch (27-GRC) empty conduits into raised floor space or below slab not on grade.

J. Arrange conductors in gutters into groups and bundle and wrap with wire ties after completing load balancing.

K. Comply with NECA 1.

3.3 IDENTIFICATION

A. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs complying with Section 260553 "Identification for Electrical Systems."

B. Create a directory to indicate installed circuit loads after balancing panelboard loads; incorporate Owner's final room designations. Obtain approval before installing. Use a computer or typewriter to create directory; handwritten directories are not acceptable.

C. Panelboard Nameplates: Label each panelboard with a nameplate complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

D. Device Nameplates: Label each branch circuit device in distribution panelboards with a nameplate complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

3.4 FIELD QUALITY CONTROL

A. Perform tests and inspections.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

B. Acceptance Testing Preparation:

1. Test insulation resistance for each panelboard bus, component, connecting supply, feeder, and control circuit.
2. Test continuity of each circuit.

C. Tests and Inspections:

1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
3. Perform the following infrared scan tests and inspections and prepare reports:

a. Initial Infrared Scanning: After Substantial Completion, but not more than sixty (60) days after Final Acceptance, perform an infrared scan of each panelboard. Remove front panels so joints and connections are accessible to portable scanner.
b. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each panelboard eleven (11) months after date of Substantial Completion.
c. Instruments and Equipment:

1) Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.

D. Panelboards will be considered defective if they do not pass tests and inspections.

E. Prepare test and inspection reports, including a certified report that identifies panelboards included and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.5 ADJUSTING

A. Adjust moving parts and operable component to function smoothly, and lubricate as recommended by manufacturer.

B. Set field-adjustable circuit-breaker trip ranges as specified in Section 260573 "Overcurrent Protective Device Coordination Study."

C. Load Balancing: After Substantial Completion, but not more than sixty (60) days after Final Acceptance, measure load balancing and make circuit changes.

1. Measure as directed during period of normal system loading.
2. Perform load-balancing circuit changes outside normal occupancy/working schedule of the facility and at time directed. Avoid disrupting critical 24-hour services such as fax machines and on-line data processing, computing, transmitting, and receiving equipment.
3. After circuit changes, recheck loads during normal load period. Record all load readings before and after changes and submit test records.
4. Tolerance: Difference exceeding twenty percent (20%) between phase loads, within a panelboard, is not acceptable. Rebalance and recheck as necessary to meet this minimum requirement.

3.6 PROTECTION

A. Temporary Heating: Apply temporary heat to maintain temperature according to manufacturer's written instructions.

END OF SECTION 262416

PROJECT MANUAL

TOWN OF GREENWICH
CONNECTICUT

ADDITIONS & ALTERATION

OLD GREENWICH SCHOOL
285 SOUND BEACH AVENUE
OLD GREENWICH, CT 06870

STATE PROJECT #057-____
S/P+A PROJECT #22.382

VOLUME 4 OF 4
(Section 262713 – Appendices)

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Town Officials

Building Inspector	Fire Marshal
Sanitation/Health Inspector	ADA/504 Coordinator

ADDITIONS & ALTERATION

OLD GREENWICH SCHOOL
285 SOUND BEACH AVENUE
OLD GREENWICH, CT 06870
STATE PROJECT #057-____ __

S/P+A PROJECT #22.382

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PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes equipment for electricity metering by utility company and electricity metering by Owner.

1.3 DEFINITIONS

A. KY Pulse: Term used by the metering industry to describe a method of measuring consumption of electricity that is based on a relay opening and closing in response to the rotation of the disk in the meter.

B. PC: Personal computer.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: For electricity-metering equipment.

1. Dimensioned plans and sections or elevation layouts.
2. Wiring Diagrams: For power, signal, and control wiring. Identify terminals and wiring designations and color-codes to facilitate installation, operation, and maintenance. Indicate recommended types, wire sizes, and circuiting arrangements for field-installed wiring, and show circuit protection features.

C. Field quality-control reports.

D. Operation and Maintenance Data. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:

1. Application and operating software documentation.
2. Software licenses.
3. Software service agreement.
4. Hard copies of manufacturer's operating specifications, design user's guides for software and hardware, and PDF files on CD-ROM of the hard-copy Submittal.

1.5 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Receive, store, and handle modular meter center according to NECA 400.

1.7 PROJECT CONDITIONS

A. Interruption of Existing Electrical Service: Do not interrupt electrical service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electrical service according to requirements indicated:

1. Notify Architect and Construction Manager no fewer than two (2) days in advance of proposed interruption of electrical service.
2. Do not proceed with interruption of electrical service without the Architect’s and Construction Manager's written permission.

1.8 COORDINATION

A. Electrical Service Connections: Coordinate with utility companies and components they furnish as follows:

1. Comply with requirements of utilities providing electrical power services.
2. Coordinate installation and connection of utilities and services, including provision for electricity-metering components.

1.9 SOFTWARE SERVICE AGREEMENT

A. Technical Support: Beginning with Substantial Completion, provide software support for two (2) years.

B. Upgrade Service: Update software to latest version at Project completion. Install and program software upgrades that become available within two (2) years from date of Substantial Completion. Upgrading software shall include operating system. Upgrade shall include new or revised licenses for use of software.

1. Provide thirty (30) days' notice to Owner to allow scheduling and access to system and to allow Owner to upgrade his computer equipment if necessary.

PART 2 - PRODUCTS

2.1 EQUIPMENT FOR ELECTRICITY METERING BY UTILITY COMPANY

A. Meters will be furnished by utility company.

B. Current-Transformer Cabinets: Comply with requirements of electrical-power utility company.

C. Meter Sockets: Comply with requirements of electrical-power utility company.

D. Meter Sockets: Steady-state and short-circuit current ratings shall meet indicated circuit ratings.

2.2 EQUIPMENT FOR ELECTRICITY METERING BY OWNER

A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one (1) of the following:

1. E-Mon; a division of Hunt Power
2. National Meter Industries
3. Osaki Meter Sales, Inc.
4. Square D; a brand of Schneider Electric

B. General Requirements for Owner's Meters:

1. Comply with UL 1244.
2. Meters used for billing shall have an accuracy of one percent (1%) of reading, complying with requirements in ANSI C12.20.
3. Enclosure: NEMA 250, Type 3R minimum, with hasp for padlocking or sealing.
4. Identification: Comply with requirements in Section 260553 "Identification for Electrical Systems."
5. Memory Backup: Self-contained to maintain memory throughout power outages of 72 hours, minimum.
6. Sensors: Current-sensing type, with current or voltage output, selected for optimum range and accuracy for meters indicated for this application.

    a. Type: Split and solid core.

7. Current-Transformer Cabinet: Listed or recommended by metering equipment manufacturer for use with sensors indicated.
8. Building Automation System (BAS) Interface: One (1) digital KY pulse to a user-definable increment of energy measurement. Match signal to BAS input and arrange to convey the instantaneous, integrated, demand level measured by meter to provide data for processing and possible programmed demand control action by destination system.

C. Kilowatt-hour Meter: Electronic single- and three-phase meters, measuring electricity used.

1. Voltage and Phase Configuration: Meter shall be designed for use on circuits with voltage rating and phase configuration indicated for its application.
2. Display: LCD with characters not less than 0.25-inch-high, indicating accumulative kilowatt-hours and current kilowatt load. Retain accumulated kilowatt-hour in a nonvolatile memory, until reset.

D. Kilowatt-hour/Demand Meter: Electronic single- and three-phase meters, measuring electricity use and demand. Demand shall be integrated over a 15-minute interval.

1. Voltage and Phase Configuration: Meter shall be designed for use on circuits with voltage rating and phase configuration indicated for its application.
2. Display: LCD with characters not less than 0.25-inch-high, indicating accumulative kilowatt-hours, current time and date, current demand, and historic peak demand, and time and date of historic peak demand. Retain accumulated kilowatt-hour and historic peak demand in a nonvolatile memory, until reset.

E. Data Transmission Cable: Transmit KY pulse data over Class 1 control-circuit conductors in raceway. Comply with Section 260523 "Control-Voltage Electrical Power Cables."

F. Software: PC based, a product of meter manufacturer, suitable for calculation of utility cost allocation and billing.

1. Utility Cost Allocation: Automatically import energy-usage records to allocate energy costs for the following:

    a. At least fifteen (15) departments.
    b. At least thirty (30) tenants.
    c. At least five (5) processes.
    d. At least five (5) buildings.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with equipment installation requirements in NECA 1.

B. Install meters furnished by utility company. Install raceways and equipment according to utility company's written requirements. Provide empty conduits for metering leads and extend grounding connections as required by utility company.

C. Install modular meter center according to NECA 400 switchboard installation requirements.

3.2 IDENTIFICATION

A. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

1. Series Combination Warning Label: Self-adhesive type, with text as required by NFPA 70.
2. Equipment Identification Labels: Adhesive film labels with clear protective overlay. For residential meters, provide an additional card holder suitable for printed, weather-resistant card with occupant's name.

3.3 FIELD QUALITY CONTROL

A. Perform tests and inspections.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

B. Tests and Inspections:

1. Connect a load of known kilowatt rating, 1.5 kW minimum, to a circuit supplied by metered feeder.
2. Turn off circuits supplied by metered feeder and secure them in off condition.
3. Run test load continuously for eight hours minimum, or longer, to obtain a measurable meter indication. Use test-load placement and setting that ensures continuous, safe operation.
4. Check and record meter reading at end of test period and compare with actual electricity used, based on test-load rating, duration of test, and sample measurements of supply voltage at test-load connection. Record test results.

C. Electricity metering will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

END OF SECTION 262713

SECTION 262726 - WIRING DEVICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Receptacles, receptacles with integral GFCI, and associated device plates.
2. Twist-locking receptacles.
3. Receptacles with integral surge suppression units.
4. Wall-box motion sensors.
5. Isolated-ground receptacles.
6. Snap switches and wall-box dimmers.
7. Solid-state fan speed controls.
8. Wall-switch and exterior occupancy sensors.
9. Communications outlets.
10. Pendant cord-connector devices.
11. Cord and plug sets.
12. Floor service outlets, poke-through assemblies, service poles, and multioutlet assemblies.
13. EPO mushroom switches

B. Related Sections include the following:

1. Section 271500 "Communications Horizontal Cabling" for workstation outlets.

1.3 DEFINITIONS

A. EMI: Electromagnetic interference.

B. GFCI: Ground-fault circuit interrupter.

C. Pigtail: Short lead used to connect a device to a branch-circuit conductor.

D. RFI: Radio-frequency interference.

E. TVSS: Transient voltage surge suppressor.

F. UTP: Unshielded twisted pair.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: List of legends and description of materials and process used for premarking wall plates.

C. Samples: One (1) for each type of device and wall plate specified, in each color specified.

D. Field quality-control test reports.

E. Operation and Maintenance Data: For wiring devices to include in all manufacturers' packing label warnings and instruction manuals that include labeling conditions.

1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain each type of wiring device and associated wall plate through one (1) source from a single manufacturer. Insofar as they are available, obtain all wiring devices and associated wall plates from a single manufacturer and one (1) source.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

C. Comply with NFPA 70.

1.6 COORDINATION

A. Receptacles for Owner-Furnished Equipment: Match plug configurations.

1. Cord and Plug Sets: Match equipment requirements.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers' Names: Shortened versions (shown in parentheses) of the following manufacturers' names are used in other Part 2 articles:

1. Cooper Wiring Devices; a division of Cooper Industries, Inc. (Cooper)
2. Hubbell Incorporated; Wiring Device-Kellems (Hubbell)
3. Leviton Mfg. Company Inc. (Leviton)
4. Pass & Seymour/Legrand; Wiring Devices & Accessories (Pass & Seymour)

2.2 STRAIGHT BLADE RECEPTACLES

A. Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 configuration 5-20R, and UL 498.

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

a. Cooper; **5351** (single), **5352** (duplex)
b. Hubbell; **HBL5351** (single), **CR5352** (duplex)
c. Leviton; **5891** (single), **5352** (duplex)
d. Pass & Seymour; **5381** (single), **5352** (duplex)

B. Isolated-Ground, Duplex Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 configuration 5-20R, and UL 498.

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

    a. Hubbell; **CR 5253IG**
    b. Leviton; **5362-IG**
    c. Pass & Seymour; **IG6300**

2. Description: Straight blade; equipment grounding contacts shall be connected only to the green grounding screw terminal of the device and with inherent electrical isolation from mounting strap. Isolation shall be integral to receptacle construction and not dependent on removable parts.

C. Tamper-Resistant Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 configuration 5-20R, and UL 498.

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

    a. Cooper; **TR8300**
    b. Hubbell; **HBL8300SG**
    c. Leviton; **8300-SGG**
    d. Pass & Seymour; **63H**

2.3 GFCI RECEPTACLES

A. General Description: Straight blade, feed-through type. Comply with NEMA WD 1, NEMA WD 6, UL 498, and UL 943, Class A, and include indicator light that is lighted when device is tripped.

B. Duplex GFCI Convenience Receptacles, 125 V, 20 A:

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

    a. Cooper; **GF20**
    b. Pass & Seymour; **2084**

2.4 TVSS RECEPTACLES

A. General Description: Comply with NEMA WD 1, NEMA WD 6, UL 498, and UL 1449, with integral TVSS in line to ground, line to neutral, and neutral to ground.

1. TVSS Components: Multiple metal-oxide varistors; with a nominal clamp-level rating of 400 volts and minimum single transient pulse energy dissipation of 240 J, according to IEEE C62.41.2 and IEEE C62.45.
2. Active TVSS Indication: Visual and audible, with light visible in face of device to indicate device is "active" or "no longer in service."

B. Duplex TVSS Convenience Receptacles:

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

    a. Cooper; **5362BLS**
    b. Hubbell; **HBL5362SA**

c. Leviton; **5380**

2. Description: Straight blade, 125 V, 20 A; NEMA WD 6 configuration 5-20R.

C. Isolated-Ground, Duplex Convenience Receptacles:

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

a. Cooper; **IG5362BLS**
b. Hubbell; **IG5362SA**
c. Leviton; **5380-IG**

2. Description: Straight blade, 125 V, 20 A; NEMA WD 6 configuration 5-20R. Equipment grounding contacts shall be connected only to the green grounding screw terminal of the device and with inherent electrical isolation from mounting strap. Isolation shall be integral to receptacle construction and not dependent on removable parts.

2.5 TWIST-LOCKING RECEPTACLES

A. Single Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 configuration L5-20R, and UL 498.

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

a. Cooper; **L520R**
b. Hubbell; **HBL2310**
c. Leviton; **2310**
d. Pass & Seymour; **L520-R**

2. Refer to floor plans for other configurations required for project.

B. Isolated-Ground, Single Convenience Receptacles, 125 V, 20 A:

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

a. Hubbell; **IG2310**
b. Leviton; **2310-IG**

2. Description: Comply with NEMA WD 1, NEMA WD 6 configuration L5-20R, and UL 498. Equipment grounding contacts shall be connected only to the green grounding screw terminal of the device and with inherent electrical isolation from mounting strap. Isolation shall be integral to receptacle construction and not dependent on removable parts.

2.6 PENDANT CORD-CONNECTOR DEVICES

A. Description: Matching, locking-type plug and receptacle body connector; NEMA WD 6 configurations L5-20P and L5-20R, heavy-duty grade.

1. Body: Nylon with screw-open cable-gripping jaws and provision for attaching external cable grip.

2. External Cable Grip: Woven wire-mesh type made of high-strength galvanized-steel wire strand, matched to cable diameter, and with attachment provision designed for corresponding connector.

2.7 CORD AND PLUG SETS

A. Description: Match voltage and current ratings and number of conductors to requirements of equipment being connected.

1. Cord: Rubber-insulated, stranded-copper conductors, with Type SOW-A jacket; with green-insulated grounding conductor and equipment-rating ampacity plus a minimum of thirty percent (30%).
2. Plug: Nylon body and integral cable-clamping jaws. Match cord and receptacle type for connection.

2.8 SNAP SWITCHES

A. Comply with NEMA WD 1 and UL 20.

B. Switches, 120/277 V, 20 A:

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

a. Cooper; **2221** (single pole), **2222** (two-pole), **2223** (three-way), **2224** (four-way)
b. Hubbell; **CS1221** (single pole), **CS1222** (two-pole), **CS1223** (three-way), **CS1224** (four-way)
c. Leviton; **1221-2** (single pole), **1222-2** (two-pole), **1223-2** (three-way), **1224-2** (four-way)
d. Pass & Seymour; **20AC1** (single pole), **20AC2** (two-pole), **20AC3** (three-way), **20AC4** (four-way)

C. Pilot Light Switches, 20 A:

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

a. Cooper; **2221PL** for 120 V and 277 V
b. Hubbell; **HPL1221PL** for 120 V and 277 V
c. Leviton; **1221-PLR** for 120 V, **1221-7PLR** for 277 V
d. Pass & Seymour; **PS20AC1-PLR** for 120 V

2. Description: Single pole, with neon-lighted handle, illuminated when switch is "ON."

D. Key-Operated Switches, 120/277 V, 20 A:

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

a. Cooper; **2221L**
b. Hubbell; **HBL1221L**
c. Leviton; **1221-2L**
d. Pass & Seymour; **PS20AC1-L**

2. Description: Single pole, with factory-supplied key in lieu of switch handle.

E. Single-Pole, Double-Throw, Momentary Contact, Center-Off Switches, 120/277 V, 20 A; for use with mechanically held lighting contactors.

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

a. Cooper; **1995**
b. Hubbell; **HBL1557**
c. Leviton; **1257**
d. Pass & Seymour; **1251**

F. Key-Operated, Single-Pole, Double-Throw, Momentary Contact, Center-Off Switches, 120/277 V, 20 A; for use with mechanically held lighting contactors, with factory-supplied key in lieu of switch handle.

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

a. Cooper; **1995L**
b. Hubbell; **HBL1557L**
c. Leviton; **1257L**
d. Pass & Seymour; **1251L**

2.9 WALL-BOX DIMMERS

A. Dimmer Switches: Modular, full-wave, solid-state units with integral, quiet on-off switches, with audible frequency and EMI/RFI suppression filters.

B. Control: Continuously adjustable slider; with single-pole or three-way switching. Comply with UL 1472.

C. LED Lamp Dimmer Switches: Modular; compatible with LED lamps and driver; trim potentiometer to adjust low-end dimming; capable of consistent dimming with low end greater than twenty percent (20%) of full brightness.

2.10 FAN SPEED CONTROLS

A. Modular, 120-V, full-wave, solid-state units with integral, quiet on-off switches and audible frequency and EMI/RFI filters. Comply with UL 1917.

1. Continuously adjustable rotary knob, 5 A.
2. Three-speed adjustable slider, 1.5 A.

2.11 OCCUPANCY SENSORS

A. Wall-Switch Sensors:

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

a. Cooper; **OSD10N**
b. Hubbell; **AD2000W1**
c. Leviton; **OS SMT-MDW**
d. Pass & Seymour; **DW-100**
e. Watt Stopper (The); **DW-100**

2. Description: Dual technology, with both passive-infrared- and ultrasonic-type sensing, 120/277 V, adjustable time delay up to 30 minutes, 180-degree field of view, with a minimum coverage area of 900 sq. ft.

B. Long-Range Wall-Switch Sensors:

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

a. Hubbell; **ATD1600WRP**
b. Leviton; **ODW12-MRW**
c. Watt Stopper (The); **DT-200**

2. Description: Dual technology, with both passive-infrared- and ultrasonic-type sensing, 120/277 V, adjustable time delay up to 30 minutes, 110-degree field of view, and a minimum coverage area of 1200 sq. ft.

C. Wide-Range Wall-Switch Sensors:

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

a. Hubbell; **ATP120HBRP**
b. Leviton; **ODWHB-IRW**
c. Pass & Seymour; **HS1001**
d. Watt Stopper (The); **CX-100-3**

2. Description: Passive-infrared type, 120/277 V, adjustable time delay up to 30 minutes, 150-degree field of view, with a minimum coverage area of 1200 sq. ft.

D. Exterior Occupancy Sensors:

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

a. Leviton; **PS200-10**
b. Watt Stopper (The); **EW-100-120**

2. Description: Passive-infrared type, 120/277 V, weatherproof, adjustable time delay up to 15 minutes, 180-degree field of view, and 110-foot detection range. Minimum switch rating: 1000-W incandescent, 500-VA fluorescent.

2.12 COMMUNICATIONS OUTLETS

A. Refer to Division 27 sections.

2.13 WALL PLATES

A. Single and combination types to match corresponding wiring devices.

1. Plate-Securing Screws: Stainless, tamper resistant with trident pan head matching current building standard.
2. Material for Finished Spaces: Brushed stainless.
3. Material for Unfinished Spaces: Brushed stainless for flush box installations, raised galvanized for surface box installations.

4. Material for Damp Locations: Thermoplastic with spring-loaded lift cover, and listed and labeled for use in wet locations while in use.

B. Wet-Location, Weatherproof Cover Plates: NEMA 250, complying with type 3R weather-resistant, thermoplastic with lockable cover.

2.14 FLOOR SERVICE FITTINGS

A. Type: Modular, flush-type, dual-service units suitable for wiring method used.

B. Compartments: Barrier separates power from voice and data communication cabling.

C. Service Plate: Rectangular, solid brass with satin finish.

D. Power Receptacle: NEMA WD 6 configuration 5-20R, gray finish, unless otherwise indicated.

E. Voice and Data Communication Outlet: Two (2) modular, keyed, color-coded, RJ-45 Category 6 jacks for UTP cable.

2.15 POKE-THROUGH ASSEMBLIES

A. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

1. Hubbell Incorporated; Wiring Device-Kellems
2. Pass & Seymour/Legrand; Wiring Devices & Accessories
3. Square D/ Schneider Electric
4. Thomas & Betts Corporation
5. Wiremold Company (The)

B. Description: Factory-fabricated and -wired assembly of below-floor junction box with multi-channeled, through-floor raceway/firestop unit and detachable matching floor service outlet assembly.

1. Service Outlet Assembly: Flush type with two (2) simplex receptacles and space for two (2) RJ-45 jacks.
2. Size: Selected to fit nominal 3-inch cored holes in floor and matched to floor thickness.
3. Fire Rating: Unit is listed and labeled for fire rating of floor-ceiling assembly.
4. Closure Plug: Arranged to close unused 3-inch cored openings and reestablish fire rating of floor.
5. Wiring Raceways and Compartments: For a minimum of four (4) No. 12 AWG conductors and a minimum of four (4), 4-pair, Category 6 voice and data communication cables.

2.16 MULTIOUTLET ASSEMBLIES

A. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

1. Hubbell Incorporated; Wiring Device-Kellems
2. Wiremold Company (The)

B. Components of Assemblies: Products from a single manufacturer designed for use as a complete, matching assembly of raceways and receptacles.

C. Raceway Material: Metal, with manufacturer's standard finish.

D. Wire: No. 12 AWG.

2.17 EPO MUSHROOM SWITCHES

A. Pushbuttons: NEMA ICS 2; Heavy-duty, oil-tight and dust-tight without boot, chrome-plated bezel, EMERG. STOP in front cover, red mushroom style actuator.

B. Contact Blocks: Stacked mounting with single screw installation, color coded with clear window for contact status. Furnish with two (2) N.O. and two (2) N.C. contacts.

C. Activation: Two-position, push to activate, key to return to normal state.

D. Cover: Clear stopper shield with integral alarm and red label with lettering “EMERG. STOP”.

2.18 FINISHES

A. Color: Wiring device catalog numbers in Section Text do not designate device color.

1. Wiring Devices Connected to Normal Power System: Ivory and/or as selected by Architect and Owner from manufacturer’s entire range, unless otherwise indicated or required by NFPA 70 or device listing.
2. Wiring Devices Connected to Emergency Power System: Red.
3. TVSS Devices: Blue.
4. Isolated-Ground Receptacles: Orange and/or as specified above, with orange triangle on face.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with NECA 1, including the mounting heights listed in that standard, unless otherwise noted.

B. Coordination with Other Trades:

1. Take steps to ensure that devices and their boxes are protected. Do not place wall finish materials over device boxes and do not cut holes for boxes with routers that are guided by riding against outside of the boxes.
2. Keep outlet boxes free of plaster, drywall joint compound, mortar, cement, concrete, dust, paint, and other material that may contaminate the raceway system, conductors, and cables.
3. Install device boxes in brick or block walls so that the cover plate does not cross a joint unless the joint is troweled flush with the face of the wall.
4. Install wiring devices after all wall preparation, including painting, is complete.

C. Conductors:

1. Do not strip insulation from conductors until just before they are spliced or terminated on devices.
2. Strip insulation evenly around the conductor using tools designed for the purpose. Avoid scoring or nicking of solid wire or cutting strands from stranded wire.

3. The length of free conductors at outlets for devices shall meet provisions of NFPA 70, Article 300, without pigtails.
4. Existing Conductors:

    a. Cut back and pigtail, or replace all damaged conductors.
    b. Straighten conductors that remain and remove corrosion and foreign matter.
    c. Pig tailing existing conductors is permitted provided the outlet box is large enough.

D. Device Installation:

1. Replace all devices that have been in temporary use during construction or that show signs that they were installed before building finishing operations were complete.
2. Keep each wiring device in its package or otherwise protected until it is time to connect conductors.
3. Do not remove surface protection, such as plastic film and smudge covers, until the last possible moment.
4. Connect devices to branch circuits using pigtails that are not less than 6 inches in length.
5. When there is a choice, use side wiring with binding-head screw terminals. Wrap solid conductor tightly clockwise, 2/3 to ¾ of the way around terminal screw.
6. Use a torque screwdriver when a torque is recommended or required by the manufacturer.
7. When conductors larger than No. 12 AWG are installed on 15- or 20-A circuits, splice No. 12 AWG pigtails for device connections.
8. Tighten unused terminal screws on the device.
9. When mounting into metal boxes, remove the fiber or plastic washers used to hold device mounting screws in yokes, allowing metal-to-metal contact.
10. Install GFCI devices in all wet locations.

E. Receptacle Orientation:

1. Install ground pin of vertically mounted receptacles up, and on horizontally mounted receptacles to the right.

F. Device Plates: Do not use oversized or extra-deep plates. Repair wall finishes and remount outlet boxes when standard device plates do not fit flush or do not cover rough wall opening.

G. Dimmers:

1. Install dimmers within terms of their listing.
2. Verify that dimmers used for fan speed control are listed for that application.
3. Install unshared neutral conductors on line and load side of dimmers according to manufacturers' device listing conditions in the written instructions.

H. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical and with grounding terminal of receptacles on top. Group adjacent switches under single, multigang wall plates.

I. Adjust locations of floor service outlets and service poles to suit arrangement of partitions and furnishings.

J. EPO Switches: Pressing the EPO switch shall immediately shut down the designated loads by activating the assigned shunt trip or contactor device(s). As part of the EPO circuit, an interface shall also be provided for connecting one (1) or more normally open or normally closed remote EPO switches to the EPO circuit. Reset shall be by key operation.

3.2 IDENTIFICATION

A. Comply with Section 260553 "Identification for Electrical Systems."

1. Receptacles and Switches: Identify panelboard and circuit number from which served. Use self-adhesive labels with black lettering on white field mounted on face of plate, and durable wire markers or tags inside outlet boxes.

3.3 FIELD QUALITY CONTROL

A. Perform tests and inspections and prepare test reports.

1. Test Instruments: Use instruments that comply with UL 1436.
2. Test Instrument for Convenience Receptacles: Digital wiring analyzer with digital readout or illuminated LED indicators of measurement.

B. Tests for Convenience Receptacles:

1. Line Voltage: Acceptable range is 105 to 132 V.
2. Percent Voltage Drop under 15-A Load: A value of six percent (6%) or higher is not acceptable.
3. Ground Impedance: Values of up to 2 ohms are acceptable.
4. GFCI Trip: Test for tripping values specified in UL 1436 and UL 943.
5. Using the test plug, verify that the device and its outlet box are securely mounted.
6. The tests shall be diagnostic, indicating damaged conductors, high resistance at the circuit breaker, poor connections, inadequate fault current path, defective devices, or similar problems. Correct circuit conditions, remove malfunctioning units and replace with new ones, and retest as specified above.

C. Test straight blade convenience outlets in patient-care areas and hospital-grade convenience outlets for the retention force of the grounding blade according to NFPA 99. Retention force shall be not less than 4 oz.

END OF SECTION 262726

SECTION 262813 - FUSES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Cartridge fuses rated 600-V ac and less for use in control circuits, enclosed switches, enclosed controllers and motor-control centers.
2. Plug fuses rated 125-V ac and less for use in plug-fuse-type enclosed switches.
3. Plug-fuse adapters for use in Edison-base, plug-fuse sockets.
4. Spare-fuse cabinets.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material, dimensions, descriptions of individual components, and finishes for spare-fuse cabinets. Include the following for each fuse type indicated:

1. Ambient Temperature Adjustment Information: If ratings of fuses have been adjusted to accommodate ambient temperatures, provide list of fuses with adjusted ratings.

a. For each fuse having adjusted ratings, include location of fuse, original fuse rating, local ambient temperature, and adjusted fuse rating.
b. Provide manufacturer's technical data on which ambient temperature adjustment calculations are based.

2. Dimensions and manufacturer's technical data on features, performance, electrical characteristics, and ratings.
3. Current-limitation curves for fuses with current-limiting characteristics.
4. Fuse sizes for elevator feeders and elevator disconnect switches.

B. Operation and Maintenance Data: For fuses to include in emergency, operation, and maintenance manuals. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:

1. Ambient temperature adjustment information.
2. Current-limitation curves for fuses with current-limiting characteristics.

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain fuses, for use within a specific product or circuit, from single source from single manufacturer.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. Comply with NEMA FU 1 for cartridge fuses.

D. Comply with NFPA 70.

E. Comply with UL 248-11 for plug fuses.

1.5 PROJECT CONDITIONS

A. Where ambient temperature to which fuses are directly exposed is less than 40 deg F or more than 100 deg F, apply manufacturer's ambient temperature adjustment factors to fuse ratings.

1.6 COORDINATION

A. Coordinate fuse ratings with utilization equipment nameplate limitations of maximum fuse size and with system short-circuit current levels.

1.7 EXTRA MATERIALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Fuses: Equal to ten percent (10%) of quantity installed for each size and type, but no fewer than two (2) of each size and type.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Cooper Bussmann, Inc.
2. Edison Fuse, Inc.
3. Ferraz Shawmut, Inc.
4. Littelfuse, Inc.

2.2 CARTRIDGE FUSES

A. Characteristics: NEMA FU 1, nonrenewable cartridge fuses with voltage ratings consistent with circuit voltages.

2.3 PLUG FUSES

A. Characteristics: UL 248-11, nonrenewable plug fuses; 125-V ac.

2.4 PLUG-FUSE ADAPTERS

A. Characteristics: Adapters for using Type S, rejection-base plug fuses in Edison-base fuse holders or sockets; ampere ratings matching fuse ratings; irremovable once installed.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine fuses before installation. Reject fuses that are moisture damaged or physically damaged.

B. Examine holders to receive fuses for compliance with installation tolerances and other conditions affecting performance, such as rejection features.

C. Examine utilization equipment nameplates and installation instructions. Install fuses of sizes and with characteristics appropriate for each piece of equipment.

D. Evaluate ambient temperatures to determine if fuse rating adjustment factors must be applied to fuse ratings.

E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 FUSE APPLICATIONS

A. Cartridge Fuses:

1. Feeders: Class J, fast acting.
2. Motor Branch Circuits: Class RK1, time delay.
3. Other Branch Circuits: Class J, fast acting.
4. Control Circuits: Class CC, fast acting.

B. Plug Fuses:

1. Motor Branch Circuits: Edison-base type, single-element time delay.
2. Other Branch Circuits: Edison-base type, single-element fast acting.

3.3 INSTALLATION

A. Install fuses in fusible devices. Arrange fuses so rating information is readable without removing fuse.

B. Install plug-fuse adapters in Edison-base fuse holders and sockets. Ensure that adapters are irremovable once installed.

C. Install spare-fuse cabinet(s).

3.4 IDENTIFICATION

A. Install labels complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems" and indicating fuse replacement information on inside door of each fused switch and adjacent to each fuse block, socket, and holder.

END OF SECTION 262813

SECTION 262816 - ENCLOSED SWITCHES AND CIRCUIT BREAKERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Fusible switches.
2. Non-Fusible switches.
3. Receptacle switches.
4. Shunt trip switches.
5. Molded-case circuit breakers (MCCBs).
6. Molded-case switches.
7. Enclosures.

1.3 DEFINITIONS

A. NC: Normally closed.

B. NO: Normally open.

C. SPDT: Single pole, double throw.

1.4 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Enclosed switches and circuit breakers shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."

1.5 SUBMITTALS

A. Product Data: For each type of enclosed switch, circuit breaker, accessory, and component indicated. Include dimensioned elevations, sections, weights, and manufacturers' technical data on features, performance, electrical characteristics, ratings, accessories, and finishes.

1. Enclosure types and details for types other than NEMA 250, Type 1.
2. Current and voltage ratings.
3. Short-circuit current ratings (interrupting and withstand, as appropriate).
4. Include evidence of NRTL listing for series rating of installed devices.
5. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices, accessories, and auxiliary components.
6. Include time-current coordination curves (average melt) for each type and rating of overcurrent protective device; include selectable ranges for each type of overcurrent protective device. Submit on translucent log-log graph paper.

B. Shop Drawings: For enclosed switches and circuit breakers. Include plans, elevations, sections, details, and attachments to other work.

1. Wiring Diagrams: For power, signal, and control wiring.

C. Qualification Data: For qualified testing agency.

D. Seismic Qualification Certificates: For enclosed switches and circuit breakers, accessories, and components, from manufacturer.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

E. Field quality-control reports.

1. Test procedures used.
2. Test results that comply with requirements.
3. Results of failed tests and corrective action taken to achieve test results that comply with requirements.

F. Manufacturer's field service report.

G. Operation and Maintenance Data: For enclosed switches and circuit breakers to include in emergency, operation, and maintenance manuals. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:

1. Manufacturer's written instructions for testing and adjusting enclosed switches and circuit breakers.
2. Time-current coordination curves (average melt) for each type and rating of overcurrent protective device; include selectable ranges for each type of overcurrent protective device. Submit on translucent log-log graph paper.

1.6 QUALITY ASSURANCE

A. Testing Agency Qualifications: Member company of NETA or an NRTL.

1. Testing Agency's Field Supervisor: Currently certified by NETA to supervise on-site testing.

B. Source Limitations: Obtain enclosed switches and circuit breakers, overcurrent protective devices, components, and accessories, within same product category, from single source from single manufacturer.

C. Product Selection for Restricted Space: Drawings indicate maximum dimensions for enclosed switches and circuit breakers, including clearances between enclosures, and adjacent surfaces and other items. Comply with indicated maximum dimensions.

D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

E. Comply with NFPA 70.

1.7 PROJECT CONDITIONS

A. Environmental Limitations: Rate equipment for continuous operation under the following conditions unless otherwise indicated:

1. Ambient Temperature: Not less than minus 22 deg F (minus 30 deg C) and not exceeding 104 deg F (40 deg C).
2. Altitude: Not exceeding 6600 feet.

B. Interruption of Existing Electric Service: Do not interrupt electric service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electric service according to requirements indicated:

1. Notify Architect and Construction Manager no fewer than seven (7) days in advance of proposed interruption of electric service.
2. Indicate method of providing temporary electric service.
3. Do not proceed with interruption of electric service without Architect and Construction Manager written permission.
4. Comply with NFPA 70E.

1.8 COORDINATION

A. Coordinate layout and installation of switches, circuit breakers, and components with equipment served and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

1.9 EXTRA MATERIALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Fuses: Equal to ten percent (10%) of quantity installed for each size and type, but no fewer than three (3) of each size and type.
2. Fuse Pullers: Two (2) for each size and type.

PART 2 - PRODUCTS

2.1 FUSIBLE SWITCHES

A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one (1) of the following:

1. Eaton Electrical Inc.; Cutler-Hammer Business Unit
2. General Electric Company; GE Consumer & Industrial - Electrical Distribution
3. Siemens Energy & Automation, Inc.
4. Square D; a brand of Schneider Electric

B. Type HD, Heavy Duty, Single Throw, 600-V ac and 240-V ac, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, with clips or bolt pads to accommodate specified fuses, lockable handle with capability to accept three (3) padlocks and interlocked with cover in closed position.

C. Type HD, Heavy Duty, Six-Pole, Single Throw, 600-V ac and 240-V ac, 200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, with clips or bolt pads to accommodate specified

fuses, lockable handle with capability to accept three (3) padlocks and interlocked with cover in closed position.

D. Type HD, Heavy Duty, Double Throw, 600-V ac and 240-V ac, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, with clips or bolt pads to accommodate specified fuses, lockable handle with capability to accept three (3) padlocks and interlocked with cover in closed position.

E. Accessories:

1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
3. Isolated Ground Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
4. Class R Fuse Kit: Provides rejection of other fuse types when Class R fuses are specified.
5. Auxiliary Contact Kit: Two (2) NO/NC (Form "C") auxiliary contact(s), arranged to activate before switch blades open.
6. Hookstick Handle: Allows use of a hookstick to operate the handle.
7. Lugs: Mechanical and/or Compression type, suitable for number, size, and conductor material.
8. Service-Rated Switches: Labeled for use as service equipment.

2.2 NONFUSIBLE SWITCHES

A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one (1) of the following:

1. Eaton Electrical Inc.; Cutler-Hammer Business Unit
2. General Electric Company; GE Consumer & Industrial - Electrical Distribution
3. Siemens Energy & Automation, Inc.
4. Square D; a brand of Schneider Electric

B. Type HD, Heavy Duty, Single Throw, 600-V ac and 240-V ac, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, lockable handle with capability to accept three (3) padlocks and interlocked with cover in closed position.

C. Type HD, Heavy Duty, Six Pole, Single Throw, 600-V ac and 240-V ac, 200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, lockable handle with capability to accept three (3) padlocks and interlocked with cover in closed position.

D. Type HD, Heavy Duty, Double Throw, 600-V ac and 240-V ac, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, lockable handle with capability to accept three (3) padlocks and interlocked with cover in closed position.

E. Accessories:

1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
3. Isolated Ground Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.

4. Auxiliary Contact Kit: Two (2) NO/NC (Form "C") auxiliary contact(s), arranged to activate before switch blades open.
5. Hookstick Handle: Allows use of a hookstick to operate the handle.
6. Lugs: Mechanical and/or Compression type, suitable for number, size, and conductor material.

2.3 RECEPTACLE SWITCHES

A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one (1) of the following:

1. Eaton Electrical Inc.; Cutler-Hammer Business Unit
2. General Electric Company; GE Consumer & Industrial - Electrical Distribution
3. Siemens Energy & Automation, Inc.
4. Square D; a brand of Schneider Electric

B. Type HD, Heavy-Duty, Single-Throw Fusible Switch: 600-V ac and 240-V ac, 100 A; UL 98 and NEMA KS 1; horsepower rated, with clips or bolt pads to accommodate indicated fuses; lockable handle with capability to accept three (3) padlocks; interlocked with cover in closed position.

C. Type HD, Heavy-Duty, Single-Throw Non-Fusible Switch: 600-V ac and 240-V ac, 100 A; UL 98 and NEMA KS 1; horsepower rated, lockable handle with capability to accept three (3) padlocks; interlocked with cover in closed position.

D. Interlocking Linkage: Provided between the receptacle and switch mechanism to prevent inserting or removing plug while switch is in the on position, inserting any plug other than specified, and turning switch on if an incorrect plug is inserted or correct plug has not been fully inserted into the receptacle.

E. Receptacle: Polarized, three-phase, four-wire receptacle (fourth wire connected to enclosure ground lug).

2.4 SHUNT TRIP SWITCHES

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Cooper Bussmann, Inc.
2. Ferraz Shawmut, Inc.
3. Littelfuse, Inc.

B. General Requirements: Comply with ASME A17.1, UL 50, and UL 98, with 200-kA interrupting and short-circuit current rating when fitted with Class J fuses.

C. Switches: Three-pole, horsepower rated, with integral shunt trip mechanism and Class J fuse block; lockable handle with capability to accept three (3) padlocks; interlocked with cover in closed position.

D. Control Circuit: 120-V ac; obtained from integral control power transformer, with primary and secondary fuses, of enough capacity to operate shunt trip, connected pilot, and indicating and control devices.

E. Accessories:

1. Oil-tight key switch for key-to-test function.
2. Oil-tight green ON pilot light.
3. Isolated neutral lug; two hundred percent (200%) rating.
4. Mechanically interlocked auxiliary contacts that change state when switch is opened and closed.
5. Form C alarm contacts that change state when switch is tripped.
6. Three-pole, double-throw, fire-safety and alarm relay; 120-V ac and/or 24-V dc coil voltage.
7. Three-pole, double-throw, fire-alarm voltage monitoring relay complying with NFPA 72.

2.5 MOLDED-CASE CIRCUIT BREAKERS

A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one (1) of the following:

1. Eaton Electrical Inc.; Cutler-Hammer Business Unit
2. General Electric Company; GE Consumer & Industrial - Electrical Distribution
3. Siemens Energy & Automation, Inc.
4. Square D; a brand of Schneider Electric

B. General Requirements: Comply with UL 489, NEMA AB 1, and NEMA AB 3, with interrupting capacity to comply with available fault currents.

C. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.

D. Adjustable, Instantaneous-Trip Circuit Breakers: Magnetic trip element with front-mounted, field-adjustable trip setting.

E. Electronic Trip Circuit Breakers: Field-replaceable rating plug, rms sensing, with the following field-adjustable settings:

1. Instantaneous trip.
2. Long- and short-time pickup levels.
3. Long- and short-time time adjustments.
4. Ground-fault pickup level, time delay, and I^2t response.

F. Current-Limiting Circuit Breakers: Frame sizes 400 A and smaller, and let-through ratings less than NEMA FU 1, RK-5.

G. Integrally Fused Circuit Breakers: Thermal-magnetic trip element with integral limiter-style fuse listed for use with circuit breaker and trip activation on fuse opening or on opening of fuse compartment door.

H. Ground-Fault, Circuit-Interrupter (GFCI) Circuit Breakers: Single- and two-pole configurations with Class A ground-fault protection (6-mA trip).

I. Ground-Fault, Equipment-Protection (GFEP) Circuit Breakers: With Class B ground-fault protection (30-mA trip).

J. Features and Accessories:

1. Standard frame sizes, trip ratings, and number of poles.

2. Lugs: Mechanical and/or Compression type, suitable for number, size, trip ratings, and conductor material.
3. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HID for feeding fluorescent and high-intensity discharge lighting circuits.
4. Ground-Fault Protection: Comply with UL 1053; remote-mounted and powered type with mechanical ground-fault indicator; relay with adjustable pickup and time-delay settings, push-to-test feature, internal memory, and shunt trip unit; and three-phase, zero-sequence current transformer/sensor.
5. Shunt Trip: Trip coil energized from separate circuit, with coil-clearing contact.
6. Undervoltage Trip: Set to operate at thirty-five to seventy-five percent (35-75%) of rated voltage without intentional time delay.
7. Auxiliary Contacts: Two (2) SPDT switches with "a" and "b" contacts; "a" contacts mimic circuit-breaker contacts, "b" contacts operate in reverse of circuit-breaker contacts.
8. Alarm Switch: One (1) NC contact that operates only when circuit breaker has tripped.
9. Key Interlock Kit: Externally mounted to prohibit circuit-breaker operation; key shall be removable only when circuit breaker is in off position.
10. Zone-Selective Interlocking: Integral with electronic and/or ground-fault trip unit; for interlocking ground-fault protection function.
11. Electrical Operator: Provide remote control for on, off, and reset operations.

2.6 MOLDED-CASE SWITCHES

A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one (1) of the following:

1. Eaton Electrical Inc.; Cutler-Hammer Business Unit
2. General Electric Company; GE Consumer & Industrial - Electrical Distribution
3. Siemens Energy & Automation, Inc.
4. Square D; a brand of Schneider Electric

B. General Requirements: MCCB with fixed, high-set instantaneous trip only, and short-circuit withstand rating equal to equivalent breaker frame size interrupting rating.

C. Features and Accessories:

1. Standard frame sizes and number of poles.
2. Lugs: Mechanical and/or Compression type, suitable for number, size, trip ratings, and conductor material.
3. Ground-Fault Protection: Comply with UL 1053; remote-mounted and powered type with mechanical ground-fault indicator; relay with adjustable pickup and time-delay settings, push-to-test feature, internal memory, and shunt trip unit; and three-phase, zero-sequence current transformer/sensor.
4. Shunt Trip: Trip coil energized from separate circuit, with coil-clearing contact.
5. Undervoltage Trip: Set to operate at thirty-five to seventy-five percent (35-75%) of rated voltage without intentional time delay.
6. Auxiliary Contacts: Two (2) SPDT switches with "a" and "b" contacts; "a" contacts mimic switch contacts, "b" contacts operate in reverse of switch contacts.
7. Alarm Switch: One (1) NC contact that operates only when switch has tripped.
8. Key Interlock Kit: Externally mounted to prohibit switch operation; key shall be removable only when switch is in off position.
9. Zone-Selective Interlocking: Integral with ground-fault shunt trip unit; for interlocking ground-fault protection function.
10. Electrical Operator: Provide remote control for on, off, and reset operations.
11. Accessory Control Power Voltage: Integrally mounted, self-powered; 120-V ac and 24-V dc.

2.7 ENCLOSURES

A. Enclosed Switches and Circuit Breakers: NEMA AB 1, NEMA KS 1, NEMA 250, and UL 50, to comply with environmental conditions at installed location.

1. Indoor, Dry and Clean Locations: NEMA 250, Type 1.
2. Outdoor Locations: NEMA 250, Type 3R.
3. Kitchen and/or Wash-Down Areas: NEMA 250, Type 4X.
4. Other Wet or Damp, Indoor Locations: NEMA 250, Type 4.
5. Indoor Locations Subject to Dust, Falling Dirt, and Dripping Noncorrosive Liquids: NEMA 250, Type 12.
6. Hazardous Areas Indicated on Drawings: NEMA 250, Type 9.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine elements and surfaces to receive enclosed switches and circuit breakers for compliance with installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install individual wall-mounted switches and circuit breakers with tops at uniform height unless otherwise indicated.

B. Comply with mounting and anchoring requirements specified in Section 260548 "Vibration and Seismic Controls for Electrical Systems."

C. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.

D. Install fuses in fusible devices.

E. Comply with NECA 1.

3.3 IDENTIFICATION

A. Comply with requirements in Section 260553 "Identification for Electrical Systems."

1. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs.
2. Label each enclosure with engraved metal or laminated-plastic nameplate.

3.4 FIELD QUALITY CONTROL

A. Perform tests and inspections.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

B. Acceptance Testing Preparation:

1. Test insulation resistance for each enclosed switch and circuit breaker, component, connecting supply, feeder, and control circuit.
2. Test continuity of each circuit.

C. Tests and Inspections:

1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
3. Perform the following infrared scan tests and inspections and prepare reports:

    a. Initial Infrared Scanning: After Substantial Completion, but not more than sixty (60) days after Final Acceptance, perform an infrared scan of each enclosed switch and circuit breaker. Remove front panels so joints and connections are accessible to portable scanner.
    b. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each enclosed switch and circuit breaker eleven (11) months after date of Substantial Completion.
    c. Instruments and Equipment: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.

4. Test and adjust controls, remote monitoring, and safeties. Replace damaged and malfunctioning controls and equipment.

D. Enclosed switches and circuit breakers will be considered defective if they do not pass tests and inspections.

E. Prepare test and inspection reports, including a certified report that identifies enclosed switches and circuit breakers and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.5 ADJUSTING

A. Adjust moving parts and operable components to function smoothly, and lubricate as recommended by manufacturer.

B. Set field-adjustable circuit-breaker trip ranges as specified

END OF SECTION 262816

SECTION 262913 - ENCLOSED CONTROLLERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes the following enclosed controllers rated 600 V and less:

1. Full-voltage manual.
2. Full-voltage magnetic.
3. Reduced-voltage magnetic.
4. Reduced-voltage solid state.
5. Multispeed.

B. Related Section:

1. Section 262923 "Variable-Frequency Motor Controllers" for general-purpose, ac, adjustable-frequency, pulse-width-modulated controllers for use on variable torque loads in ranges up to 200 hp.

1.3 DEFINITIONS

A. CPT: Control power transformer.

B. MCCB: Molded-case circuit breaker.

C. MCP: Motor circuit protector.

D. N.C.: Normally closed.

E. N.O.: Normally open.

F. OCPD: Overcurrent protective device.

G. SCR: Silicon-controlled rectifier.

1.4 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Enclosed controllers shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."

1.5 SUBMITTALS

A. Product Data: For each type of enclosed controller. Include manufacturer's technical data on features, performance, electrical characteristics, ratings, and enclosure types and finishes.

B. Shop Drawings: For each enclosed controller. Include dimensioned plans, elevations, sections, details, and required clearances and service spaces around controller enclosures.

1. Show tabulations of the following:

a. Each installed unit's type and details.
b. Factory-installed devices.
c. Nameplate legends.
d. Short-circuit current rating of integrated unit.
e. Listed and labeled for integrated short-circuit current (withstand) rating of OCPDs in combination controllers by an NRTL acceptable to authorities having jurisdiction.
f. Features, characteristics, ratings, and factory settings of individual OCPDs in combination controllers.

2. Wiring Diagrams: For power, signal, and control wiring.

C. Qualification Data: For qualified testing agency.

D. Seismic Qualification Certificates: For enclosed controllers, accessories, and components, from manufacturer.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

E. Field quality-control reports.

F. Operation and Maintenance Data: For enclosed controllers to include in emergency, operation, and maintenance manuals. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:

1. Routine maintenance requirements for enclosed controllers and installed components.
2. Manufacturer's written instructions for testing and adjusting circuit breaker and MCP trip settings.
3. Manufacturer's written instructions for setting field-adjustable overload relays.
4. Manufacturer's written instructions for testing, adjusting, and reprogramming reduced-voltage solid-state controllers.

G. Load-Current and Overload-Relay Heater List: Compile after motors have been installed, and arrange to demonstrate that selection of heaters suits actual motor nameplate full-load currents.

H. Load-Current and List of Settings of Adjustable Overload Relays: Compile after motors have been installed, and arrange to demonstrate that switch settings for motor running overload protection suit actual motors to be protected.

1.6 QUALITY ASSURANCE

A. Testing Agency Qualifications: Member company of NETA or an NRTL.

1. Testing Agency's Field Supervisor: Currently certified by NETA to supervise on-site testing.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. Comply with NFPA 70.

D. IEEE Compliance: Fabricate and test enclosed controllers according to IEEE 344 to withstand seismic forces defined in Section 260548 "Vibration and Seismic Controls for Electrical Systems."

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store enclosed controllers indoors in clean, dry space with uniform temperature to prevent condensation. Protect enclosed controllers from exposure to dirt, fumes, water, corrosive substances, and physical damage.

B. If stored in areas subject to weather, cover enclosed controllers to protect them from weather, dirt, dust, corrosive substances, and physical damage. Remove loose packing and flammable materials from inside controllers; connect factory-installed space heaters to temporary electrical service.

1.8 PROJECT CONDITIONS

A. Environmental Limitations: Rate equipment for continuous operation under the following conditions unless otherwise indicated:

1. Ambient Temperature: Not less than minus 22 deg F (minus 30 deg C) and not exceeding 104 deg F (40 deg C).
2. Altitude: Not exceeding 6600 feet.

B. Interruption of Existing Electrical Systems: Do not interrupt electrical systems in facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electrical service according to requirements indicated:

1. Notify Architect and Construction Manager no fewer than two (2) days in advance of proposed interruption of electrical systems.
2. Indicate method of providing temporary utilities.
3. Do not proceed with interruption of electrical systems without Architect's and Construction Manager's written permission.
4. Comply with NFPA 70E.

1.9 COORDINATION

A. Coordinate layout and installation of enclosed controllers with other construction including conduit, piping, equipment, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

B. Coordinate sizes and locations of concrete bases with actual equipment provided. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 03.

C. Coordinate installation of roof curbs, equipment supports, and roof penetrations.

1.10 EXTRA MATERIALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Fuses for Fused Switches: Equal to ten percent (10%) of quantity installed for each size and type, but no fewer than three (3) of each size and type.
2. Control Power Fuses: Equal to ten percent (10%) of quantity installed for each size and type, but no fewer than two (2) of each size and type.
3. Indicating Lights: Two (2) of each type and color installed.
4. Auxiliary Contacts: Furnish one (1) spare for each size and type of magnetic controller installed.
5. Power Contacts: Furnish three (3) spares for each size and type of magnetic contactor installed.

PART 2 - PRODUCTS

2.1 FULL-VOLTAGE CONTROLLERS

A. General Requirements for Full-Voltage Controllers: Comply with NEMA ICS 2, general purpose, Class A.

B. Motor-Starting Switches: "Quick-make, quick-break" toggle or push-button action; marked to show whether unit is off or on.

1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawing or comparable product by one (1) of the following:

a. Eaton Electrical Inc.; Cutler-Hammer Business Unit
b. General Electric Company; GE Consumer & Industrial - Electrical Distribution
c. Rockwell Automation, Inc.; Allen-Bradley brand
d. Siemens Energy & Automation, Inc.
e. Square D; a brand of Schneider Electric

2. Configuration: Non-reversing and/or two-speed.
3. Surface mounting.
4. Green pilot light.
5. Additional Nameplates: FORWARD and REVERSE for reversing switches and/or HIGH and LOW for two-speed switches.

C. Fractional Horsepower Manual Controllers: "Quick-make, quick-break" toggle or push-button action; marked to show whether unit is off, on, or tripped.

1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one (1) of the following:

a. Eaton Electrical Inc.; Cutler-Hammer Business Unit
b. General Electric Company; GE Consumer & Industrial - Electrical Distribution

c. Rockwell Automation, Inc.; Allen-Bradley brand
d. Siemens Energy & Automation, Inc.
e. Square D; a brand of Schneider Electric

2. Configuration: Non-reversing and/or two-speed.
3. Overload Relays: Inverse-time-current characteristics; NEMA ICS 2, Class 10 tripping characteristics; heaters matched to nameplate full-load current of actual protected motor; external reset push button melting alloy type.
4. Surface mounting.
5. Green pilot light.
6. Additional Nameplates: HIGH and LOW for two-speed controllers.

D. Integral Horsepower Manual Controllers: "Quick-make, quick-break" toggle or push-button action; marked to show whether unit is off, on, or tripped.

1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one (1) of the following:

a. Eaton Electrical Inc.; Cutler-Hammer Business Unit
b. General Electric Company; GE Consumer & Industrial - Electrical Distribution
c. Rockwell Automation, Inc.; Allen-Bradley brand
d. Siemens Energy & Automation, Inc.
e. Square D; a brand of Schneider Electric

2. Configuration: Non-reversing and/or two-speed.
3. Overload Relays: Inverse-time-current characteristics; NEMA ICS 2, Class 10 tripping characteristics; heaters and sensors in each phase, matched to nameplate full-load current of actual protected motor and having appropriate adjustment for duty cycle; external reset push button melting alloy type.
4. Surface mounting.
5. Green pilot light.
6. Additional Nameplates: FORWARD and REVERSE for reversing switches and/or HIGH and LOW for two-speed switches.
7. N.C. auxiliary contact.

E. Magnetic Controllers: Full voltage, across the line, electrically held.

1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one (1) of the following:

a. Eaton Electrical Inc.; Cutler-Hammer Business Unit
b. General Electric Company; GE Consumer & Industrial - Electrical Distribution
c. Rockwell Automation, Inc.; Allen-Bradley brand
d. Siemens Energy & Automation, Inc.
e. Square D; a brand of Schneider Electric

2. Configuration: Non-reversing.
3. Contactor Coils: Pressure-encapsulated type with coil transient suppressors.

a. Operating Voltage: Depending on contactor NEMA size and line-voltage rating, manufacturer's standard matching control power or line voltage.

4. Power Contacts: Totally enclosed, double-break, silver-cadmium oxide; assembled to allow inspection and replacement without disturbing line or load wiring.

5. Control Circuits: 24 and/or 120-V ac; obtained from integral CPT, with primary and secondary fuses with control power source of sufficient capacity to operate integral devices and remotely located pilot, indicating, and control devices.

    a. CPT Spare Capacity: 100 VA.

6. Melting Alloy Overload Relays:

    a. Inverse-time-current characteristic.
    b. Class 10 tripping characteristic.
    c. Heaters in each phase matched to nameplate full-load current of actual protected motor and with appropriate adjustment for duty cycle.

7. Bimetallic Overload Relays:

    a. Inverse-time-current characteristic.
    b. Class 10tripping characteristic.
    c. Heaters in each phase matched to nameplate full-load current of actual protected motor and with appropriate adjustment for duty cycle.
    d. Ambient compensated.
    e. Automatic resetting.

8. Solid-State Overload Relay:

    a. Switch or dial selectable for motor running overload protection.
    b. Sensors in each phase.
    c. Class 10/20 selectable tripping characteristic selected to protect motor against voltage and current unbalance and single phasing.
    d. Class II ground-fault protection, with start and run delays to prevent nuisance trip on starting.
    e. Analog communication module.

9. N.O., isolated overload alarm contact.
10. External overload reset push button.

F. Combination Magnetic Controller: Factory-assembled combination of magnetic controller, OCPD, and disconnecting means.

1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one (1) of the following:

    a. Eaton Electrical Inc.; Cutler-Hammer Business Unit
    b. General Electric Company; GE Consumer & Industrial - Electrical Distribution
    c. Rockwell Automation, Inc.; Allen-Bradley brand
    d. Siemens Energy & Automation, Inc.
    e. Square D; a brand of Schneider Electric

2. Fusible Disconnecting Means:

    a. NEMA KS 1, heavy-duty, horsepower-rated, fusible switch with clips or bolt pads to accommodate Class J fuses.
    b. Lockable Handle: Accepts three (3) padlocks and interlocks with cover in closed position.
    c. Auxiliary Contacts: N.O./N.C., arranged to activate before switch blades open.

3. Non-Fusible Disconnecting Means:

    a. NEMA KS 1, heavy-duty, horsepower-rated, non-fusible switch.
    b. Lockable Handle: Accepts three (3) padlocks and interlocks with cover in closed position.
    c. Auxiliary Contacts: N.O./N.C., arranged to activate before switch blades open.

4. MCP Disconnecting Means:

    a. UL 489, NEMA AB 1, and NEMA AB 3, with interrupting capacity to comply with available fault currents, instantaneous-only circuit breaker with front-mounted, field-adjustable, short-circuit trip coordinated with motor locked-rotor amperes.
    b. Lockable Handle: Accepts three (3) padlocks and interlocks with cover in closed position.
    c. Auxiliary contacts "a" and "b" arranged to activate with MCP handle.
    d. N.O. alarm contact that operates only when MCP has tripped.
    e. Current-limiting module to increase controller short-circuit current (withstand) rating to 100 kA.

5. MCCB Disconnecting Means:

    a. UL 489, NEMA AB 1, and NEMA AB 3, with interrupting capacity to comply with available fault currents; thermal-magnetic MCCB, with inverse time-current element for low-level overloads and instantaneous magnetic trip element for short circuits.
    b. Front-mounted, adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
    c. Lockable Handle: Accepts three (3) padlocks and interlocks with cover in closed position.
    d. Auxiliary contacts "a" and "b" arranged to activate with MCCB handle.
    e. N.O. alarm contact that operates only when MCCB has tripped.

2.2 REDUCED-VOLTAGE MAGNETIC CONTROLLERS

A. General Requirements for Reduced-Voltage Magnetic Controllers: Comply with NEMA ICS 2, general purpose, Class A; closed-transition; adjustable time delay on transition.

B. Reduced-Voltage Magnetic Controllers: Reduced voltage, electrically held.

1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one (1) of the following:

    a. Eaton Electrical Inc.; Cutler-Hammer Business Unit
    b. General Electric Company; GE Consumer & Industrial - Electrical Distribution
    c. Rockwell Automation, Inc.; Allen-Bradley brand
    d. Siemens Energy & Automation, Inc.
    e. Square D; a brand of Schneider Electric

2. Configuration:

    a. Wye-Delta Controller: Four contactors, with a three-phase starting resistor/reactor bank.
    b. Part-Winding Controller: Separate START and RUN contactors, field-selectable for 1/2- or 2/3-winding start mode, with either six- or nine-lead motors; with separate overload relays for starting and running sequences.

c. Autotransformer Reduced-Voltage Controller: Medium-duty service, with integral overtemperature protection; taps for starting at fifty, sixty-five, and eighty 80 percent (50, 65, and 80%) of line voltage; two (2) START and one (1) RUN contactors.

3. Contactor Coils: Pressure-encapsulated type with coil transient suppressor.

a. Operating Voltage: Depending on contactor NEMA size and line-voltage rating, manufacturer's standard matching control power or line voltage.

4. Power Contacts: Totally enclosed, double-break, silver-cadmium oxide; assembled to allow inspection and replacement without disturbing line or load wiring.
5. Control Circuits: 24 and/or 120-V ac; obtained from integral CPT, with primary and secondary fuses and control power source of sufficient capacity to operate integral devices and remotely located pilot, indicating, and control devices.

a. CPT Spare Capacity: 100 VA.

6. Melting Alloy Overload Relays:

a. Inverse-time-current characteristic.
b. Class 10 tripping characteristic.
c. Heaters in each phase matched to nameplate full-load current of actual protected motor and with appropriate adjustment for duty cycle.

7. Bimetallic Overload Relays:

a. Inverse-time-current characteristic.
b. Class 10 tripping characteristic.
c. Heaters in each phase matched to nameplate full-load current of actual protected motor and with appropriate adjustment for duty cycle.
d. Ambient compensated.
e. Automatic resetting.

8. Solid-State Overload Relay:

a. Switch or dial selectable for motor running overload protection.
b. Sensors in each phase.
c. Class 10/20 selectable tripping characteristic selected to protect motor against voltage and current unbalance and single phasing.
d. Class II ground-fault protection, with start and run delays to prevent nuisance trip on starting.
e. Analog communication module.

9. N.O., isolated overload alarm contact.
10. External overload reset push button.

C. Combination Reduced-Voltage Magnetic Controller: Factory-assembled combination of reduced-voltage magnetic controller, OCPD, and disconnecting means.

1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one (1) of the following:

a. Eaton Electrical Inc.; Cutler-Hammer Business Unit
b. General Electric Company; GE Consumer & Industrial - Electrical Distribution

c. Rockwell Automation, Inc.; Allen-Bradley brand
d. Siemens Energy & Automation, Inc.
e. Square D; a brand of Schneider Electric

2. Fusible Disconnecting Means:

a. NEMA KS 1, heavy-duty, horsepower-rated, fusible switch with clips or bolt pads to accommodate Class J fuses.
b. Lockable Handle: Accepts three (3) padlocks and interlocks with cover in closed position.
c. Auxiliary Contacts: N.O./N.C., arranged to activate before switch blades open.

3. Non-Fusible Disconnecting Means:

a. NEMA KS 1, heavy-duty, horsepower-rated, non-fusible switch.
b. Lockable Handle: Accepts three (3) padlocks and interlocks with cover in closed position.
c. Auxiliary Contacts: N.O./N.C., arranged to activate before switch blades open.

4. MCP Disconnecting Means:

a. UL 489, NEMA AB 1, and NEMA AB 3, with interrupting capacity to comply with available fault currents, instantaneous-only circuit breaker with front-mounted, field-adjustable, short-circuit trip coordinated with motor locked-rotor amperes.
b. Lockable Handle: Accepts three (3) padlocks and interlocks with cover in closed position.
c. Auxiliary contacts "a" and "b" arranged to activate with MCP handle.
d. N.O. alarm contact that operates only when MCP has tripped.
e. Current-limiting module to increase controller short-circuit current (withstand) rating to 100 kA.

5. MCCB Disconnecting Means:

a. UL 489, NEMA AB 1, and NEMA AB 3, with interrupting capacity to comply with available fault currents; thermal-magnetic MCCB, with inverse time-current element for low-level overloads and instantaneous magnetic trip element for short circuits.
b. Front-mounted, adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
c. Lockable Handle: Accepts three (3) padlocks and interlocks with cover in closed position.
d. Auxiliary contacts "a" and "b" arranged to activate with MCCB handle.
e. N.O. alarm contact that operates only when MCCB has tripped.

2.3 REDUCED-VOLTAGE SOLID-STATE CONTROLLERS

A. General Requirements for Reduced-Voltage Solid-State Controllers: Comply with UL 508.

B. Reduced-Voltage Solid-State Controllers: An integrated unit with power SCRs, heat sink, microprocessor logic board, door-mounted digital display and keypad, bypass contactor, and overload relay; suitable for use with NEMA MG 1, Design B, polyphase, medium induction motors.

1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one (1) of the following:

a. Eaton Electrical Inc.; Cutler-Hammer Business Unit
b. General Electric Company; GE Consumer & Industrial - Electrical Distribution
c. Rockwell Automation, Inc.; Allen-Bradley brand
d. Siemens Energy & Automation, Inc.
e. Square D; a brand of Schneider Electric

2. Configuration: Severe duty nonreversible.
3. Starting Mode: Voltage ramping and Torque control with voltage boost; field selectable.
4. Stopping Mode: Coast to stop; field selectable.
5. Shorting (Bypass) Contactor: Operates automatically when full voltage is applied to motor, and bypasses the SCRs. Solid-state controller protective features shall remain active when the shorting contactor is in the bypass mode.
6. Shorting and Input Isolation Contactor Coils: Pressure-encapsulated type; manufacturer's standard operating voltage, matching control power or line voltage, depending on contactor size and line-voltage rating. Provide coil transient suppressors.
7. Logic Board: Identical for all ampere ratings and voltage classes, with environmental protective coating.
8. Control Circuits: 24 and/or 120-V ac; obtained from integral CPT, with primary and secondary fuses, with control power source of sufficient capacity to operate integral devices and remotely located pilot, indicating, and control devices.

    a. CPT Spare Capacity: 100 VA.

9. Adjustable acceleration-rate control using voltage or current ramp, and adjustable starting torque control with up to four hundred percent (400%) current limitation for 20 seconds.
10. SCR bridge shall consist of at least two (2) SCRs per phase, providing stable and smooth acceleration with external feedback from the motor or driven equipment.
11. Keypad, front accessible; for programming the controller parameters, functions, and features; shall be manufacturer's standard and include not less than the following functions:

    a. Adjusting motor full-load amperes, as a percentage of the controller's rating.
    b. Adjusting current limitation on starting, as a percentage of the motor full-load current rating.
    c. Adjusting linear acceleration and deceleration ramps, in seconds.
    d. Initial torque, as a percentage of the nominal motor torque.
    e. Adjusting torque limit, as a percentage of the nominal motor torque.
    f. Adjusting maximum start time, in seconds.
    g. Adjusting voltage boost, as a percentage of the nominal supply voltage.
    h. Selecting stopping mode, and adjusting parameters.
    i. Selecting motor thermal overload protection class between 5 and 30.
    j. Activating and de-activating protection modes.
    k. Selecting or activating communication modes.

12. Digital display, front accessible; for showing motor, controller, and fault status; shall be manufacturer's standard and include not less than the following:

    a. Controller Condition: Ready, starting, running, stopping.
    b. Motor Condition: Amperes, voltage, power factor, power, and thermal state.
    c. Fault Conditions: Controller thermal fault, motor overload alarm and trip, motor underload, overcurrent, shorted SCRs, line or phase loss, phase reversal, and line frequency over or under normal.

13. Controller Diagnostics and Protection:

a. Microprocessor-based thermal protection system for monitoring SCR and motor thermal characteristics, and providing controller overtemperature and motor-overload alarm and trip; settings selectable via the keypad.
b. Protection from line-side reverse phasing; line-side and motor-side phase loss; motor jam, stall, and underload conditions; and line frequency over or under normal.
c. Input isolation contactor that opens when the controller diagnostics detect a faulted solid-state component or when the motor is stopped.
d. Shunt trip that opens the disconnecting means when the controller diagnostics detect a faulted solid-state component.

14. Remote Output Features:

a. All outputs prewired to terminal blocks.
b. Form C status contacts that change state when controller is running.
c. Form C alarm contacts that change state when a fault condition occurs.

15. Optional Features:

a. Analog output for field-selectable assignment of motor operating characteristics; 0 to 10-V dc.
b. Additional field-assignable Form C contacts, as indicated, for alarm outputs.
c. Surge suppressors in solid-state power circuits providing three-phase protection against damage from supply voltage surges ten percent (10%) or more above nominal line voltage.
d. Full-voltage bypass contactor operating automatically. Power contacts shall be totally enclosed, double break, and silver-cadmium oxide; and assembled to allow inspection and replacement without disturbing line or load wiring.
e. Melting Alloy Overload Relays:

1) Inverse-time-current characteristic.
2) Class 10 tripping characteristic.
3) Heaters in each phase matched to nameplate full-load current of actual protected motor and with appropriate adjustment for duty cycle.

f. Bimetallic Overload Relays:

1) Inverse-time-current characteristic.
2) Class 10 tripping characteristic.
3) Heaters in each phase matched to nameplate full-load current of actual protected motor and with appropriate adjustment for duty cycle.
4) Ambient compensated.
5) Automatic resetting.

g. Solid-State Overload Relay:

1) Switch or dial selectable for motor running overload protection.
2) Sensors in each phase.
3) Class 10/20 selectable tripping characteristic selected to protect motor against voltage and current unbalance and single phasing.
4) Class II ground-fault protection, with start and run delays to prevent nuisance trip on starting.
5) Analog communication module.

h. N.O., isolated overload alarm contact.

i. External overload reset push button.

C. Combination Reduced-Voltage Solid-State Controller: Factory-assembled combination of reduced-voltage solid-state controller, OCPD, and disconnecting means.

1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one (1) of the following:

a. Eaton Electrical Inc.; Cutler-Hammer Business Unit
b. General Electric Company; GE Consumer & Industrial - Electrical Distribution
c. Rockwell Automation, Inc.; Allen-Bradley brand
d. Siemens Energy & Automation, Inc.
e. Square D; a brand of Schneider Electric

2. Fusible Disconnecting Means:

a. NEMA KS 1, heavy-duty, horsepower-rated, fusible switch with clips or bolt pads to accommodate Class J fuses.
b. Lockable Handle: Accepts three (3) padlocks and interlocks with cover in closed position.
c. Auxiliary Contacts: N.O./N.C., arranged to activate before switch blades open.

3. MCP Disconnecting Means:

a. UL 489, NEMA AB 1, and NEMA AB 3, with interrupting capacity to comply with available fault currents, instantaneous-only circuit breaker with front-mounted, field-adjustable, short-circuit trip coordinated with motor locked-rotor amperes.
b. Lockable Handle: Accepts three (3) padlocks and interlocks with cover in closed position.
c. Auxiliary contacts "a" and "b" arranged to activate with MCP handle.
d. N.O. alarm contact that operates only when MCP has tripped.
e. Current-limiting module to increase controller short-circuit current (withstand) rating to 100 kA.

4. MCCB Disconnecting Means:

a. UL 489, NEMA AB 1, and NEMA AB 3, with interrupting capacity to comply with available fault currents; thermal-magnetic MCCB, with inverse time-current element for low-level overloads and instantaneous magnetic trip element for short circuits.
b. Front-mounted, adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
c. Lockable Handle: Accepts three (3) padlocks and interlocks with cover in closed position.
d. Auxiliary contacts "a" and "b" arranged to activate with MCCB handle.
e. N.O. alarm contact that operates only when MCCB has tripped.

5. Molded-Case Switch Disconnecting Means:

a. UL 489, NEMA AB 1, and NEMA AB 3, with in-line fuse block for Class J or L power fuses (depending on ampere rating), providing an interrupting capacity to comply with available fault currents; MCCB with fixed, high-set instantaneous trip only.
b. Lockable Handle: Accepts three (3) padlocks and interlocks with cover in closed position.

c. Auxiliary contacts "a" and "b" arranged to activate with molded-case switch handle.
d. N.O. alarm contact that operates only when molded-case switch has tripped.

2.4 MULTISPEED MAGNETIC CONTROLLERS

A. General Requirements for Multispeed Magnetic Controllers: Comply with NEMA ICS 2, general purpose, Class A.

B. Multispeed Magnetic Controllers: Two-speed, full voltage, across the line, electrically held.

1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one (1) of the following:

   a. Eaton Electrical Inc.; Cutler-Hammer Business Unit
   b. General Electric Company; GE Consumer & Industrial - Electrical Distribution
   c. Rockwell Automation, Inc.; Allen-Bradley brand
   d. Siemens Energy & Automation, Inc.
   e. Square D; a brand of Schneider Electric

2. Configuration: Non-reversing.
3. Contactor Coils: Pressure-encapsulated type with coil transient suppressors.

   a. Operating Voltage: Depending on contactor NEMA size and line-voltage rating, manufacturer's standard matching control power or line voltage.

4. Power Contacts: Totally enclosed, double break, silver-cadmium oxide; assembled to allow inspection and replacement without disturbing line or load wiring.
5. Control Circuits: 24 and/or 120-V ac; obtained from integral CPT, with primary and secondary fuses control power source of sufficient capacity to operate integral devices and remotely located pilot, indicating, and control devices.

   a. CPT Spare Capacity: 100 VA.

6. Compelling relays shall ensure that motor will start only at low speed.
7. Accelerating timer relays shall ensure properly timed acceleration through speeds lower than that selected.
8. Decelerating timer relays shall ensure automatically timed deceleration through each speed.
9. Anti-plugging timer relays shall ensure a time delay when transferring from FORWARD to REVERSE and back.
10. Melting Alloy Overload Relays:

    a. Inverse-time-current characteristic.
    b. Class 10 tripping characteristic.
    c. Heaters in each phase matched to nameplate full-load current of actual protected motor and with appropriate adjustment for duty cycle.

11. Bimetallic Overload Relays:

    a. Inverse-time-current characteristic.
    b. Class 10 tripping characteristic.
    c. Heaters in each phase matched to nameplate full-load current of actual protected motor and with appropriate adjustment for duty cycle.
    d. Ambient compensated.
    e. Automatic resetting.

12. Solid-State Overload Relay:

    a. Switch or dial selectable for motor running overload protection.
    b. Sensors in each phase.
    c. Class 10/20 selectable tripping characteristic selected to protect motor against voltage and current unbalance and single phasing.
    d. Class II ground-fault protection, with start and run delays to prevent nuisance trip on starting.
    e. Analog communication module.

13. N.O., isolated overload alarm contact.
14. External overload reset push button.

C. Combination Multispeed Magnetic Controller: Factory-assembled combination of reduced-voltage magnetic controller, OCPD, and disconnecting means.

1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one (1) of the following:

    a. Eaton Electrical Inc.; Cutler-Hammer Business Unit
    b. General Electric Company; GE Consumer & Industrial - Electrical Distribution
    c. Rockwell Automation, Inc.; Allen-Bradley brand
    d. Siemens Energy & Automation, Inc.
    e. Square D; a brand of Schneider Electric

2. Fusible Disconnecting Means:

    a. NEMA KS 1, heavy-duty, horsepower-rated, fusible switch with clips or bolt pads to accommodate Class R fuses.
    b. Lockable Handle: Accepts three (3) padlocks and interlocks with cover in closed position.
    c. Auxiliary Contacts: N.O./N.C., arranged to activate before switch blades open.

3. Non-Fusible Disconnecting Means:

    a. NEMA KS 1, heavy-duty, horsepower-rated, non-fusible switch.
    b. Lockable Handle: Accepts three (3) padlocks and interlocks with cover in closed position.
    c. Auxiliary Contacts: N.O./N.C., arranged to activate before switch blades open.

4. MCP Disconnecting Means:

    a. UL 489, NEMA AB 1, and NEMA AB 3, with interrupting capacity to comply with available fault currents, instantaneous-only circuit breaker with front-mounted, field-adjustable, short-circuit trip coordinated with motor locked-rotor amperes.
    b. Lockable Handle: Accepts three (3) padlocks and interlocks with cover in closed position.
    c. Auxiliary contacts "a" and "b" arranged to activate with MCP handle.
    d. N.O. alarm contact that operates only when MCP has tripped.
    e. Current-limiting module to increase controller short-circuit current (withstand) rating to 100 kA.

5. MCCB Disconnecting Means:

a. UL 489, NEMA AB 1, and NEMA AB 3, with interrupting capacity to comply with available fault currents; thermal-magnetic MCCB, with inverse time-current element for low-level overloads and instantaneous magnetic trip element for short circuits.
b. Front-mounted, adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
c. Lockable Handle: Accepts three (3) padlocks and interlocks with cover in closed position.
d. Auxiliary contacts "a" and "b" arranged to activate with MCCB handle.
e. N.O. alarm contact that operates only when MCCB has tripped.

2.5 ENCLOSURES

A. Enclosed Controllers: NEMA ICS 6, to comply with environmental conditions at installed location.

1. Dry and Clean Indoor Locations: Type 1.
2. Outdoor Locations: Type 3R.
3. Kitchen and/or Wash-Down Areas: Type 4X, stainless steel.
4. Other Wet or Damp Indoor Locations: Type 4.
5. Indoor Locations Subject to Dust, Falling Dirt, and Dripping Noncorrosive Liquids: Type 12.
6. Hazardous Areas Indicated on Drawings: Type 9.

2.6 ACCESSORIES

A. General Requirements for Control Circuit and Pilot Devices: NEMA ICS 5; factory installed in controller enclosure cover unless otherwise indicated.

1. Push Buttons, Pilot Lights, and Selector Switches: Heavy, oil light type.

a. Push Buttons: Recessed types; maintained as indicated.
b. Pilot Lights: LED types; colors as indicated push to test.
c. Selector Switches: Rotary type.

2. Elapsed Time Meters: Heavy duty with digital readout in hours; non-resettable.
3. Meters: Panel type, 2½-inch minimum size with 90- or 120-degree scale and plus or minus two percent (+/-2%) accuracy. Where indicated, provide selector switches with an off position.

B. N.O. auxiliary contact(s).

C. Control Relays: Auxiliary and adjustable solid-state time-delay relays.

D. Phase-Failure, Phase-Reversal, and Undervoltage and Overvoltage Relays: Solid-state sensing circuit with isolated output contacts for hard-wired connections. Provide adjustable undervoltage, overvoltage, and time-delay settings.

E. Breather and drain assemblies, to maintain interior pressure and release condensation in Type 4 and/or Type 4X enclosures installed outdoors or in unconditioned interior spaces subject to humidity and temperature swings.

F. Space heaters, with N.C. auxiliary contacts, to mitigate condensation in Type 3R enclosures installed outdoors or in unconditioned interior spaces subject to humidity and temperature swings.

G. Sun shields installed on fronts, sides, and tops of enclosures installed outdoors and subject to direct and extended sun exposure.

H. Cover gaskets for Type 1 enclosures.

I. Terminals for connecting power factor correction capacitors to the load side of overload relays.

J. Spare control wiring terminal blocks, quantity as indicated; wired.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and surfaces to receive enclosed controllers, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.

B. Examine enclosed controllers before installation. Reject enclosed controllers that are wet, moisture damaged, or mold damaged.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Wall-Mounted Controllers: Install enclosed controllers on walls with tops at uniform height unless otherwise indicated, and by bolting units to wall or mounting on lightweight structural-steel channels bolted to wall. For controllers not at walls, provide freestanding racks complying with Section 260529 "Hangers and Supports for Electrical Systems."

B. Floor-Mounted Controllers: Install enclosed controllers on 4-inch nominal-thickness concrete base. Comply with requirements for concrete base specified in Section 033000 "Cast-in-Place Concrete."

1. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of concrete base.
2. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete floor.
3. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
4. Install anchor bolts to elevations required for proper attachment to supported equipment.

C. Seismic Bracing: Comply with requirements specified in Section 260548 "Vibration and Seismic Controls for Electrical Systems."

D. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.

E. Install fuses in each fusible-switch enclosed controller.

F. Install fuses in control circuits if not factory installed. Comply with requirements in Section 262813 "Fuses."

G. Install heaters in thermal overload relays. Select heaters based on actual nameplate full-load amperes after motors have been installed.

H. Install, connect, and fuse thermal-protector monitoring relays furnished with motor-driven equipment.

I. Install power factor correction capacitors. Connect to the load side of overload relays. If connected to the load side of overload relays, adjust overload heater sizes to accommodate the reduced motor full-load currents.

J. Comply with NECA 1.

3.3 IDENTIFICATION

A. Identify enclosed controllers, components, and control wiring. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

1. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs.
2. Label each enclosure with engraved nameplate.
3. Label each enclosure-mounted control and pilot device.

3.4 CONTROL WIRING INSTALLATION

A. Install wiring between enclosed controllers and remote devices and facility's central control system. Comply with requirements in Section 260523 "Control-Voltage Electrical Power Cables."

B. Bundle, train, and support wiring in enclosures.

C. Connect selector switches and other automatic-control selection devices where applicable.

1. Connect selector switches to bypass only those manual- and automatic-control devices that have no safety functions when switch is in manual-control position.
2. Connect selector switches with enclosed-controller circuit in both manual and automatic positions for safety-type control devices such as low- and high-pressure cutouts, high-temperature cutouts, and motor overload protectors.

3.5 FIELD QUALITY CONTROL

A. Perform tests and inspections.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

B. Acceptance Testing Preparation:

1. Test insulation resistance for each enclosed controller, component, connecting supply, feeder, and control circuit.
2. Test continuity of each circuit.

C. Tests and Inspections:

1. Inspect controllers, wiring, components, connections, and equipment installation. Test and adjust controllers, components, and equipment.
2. Test insulation resistance for each enclosed-controller element, component, connecting motor supply, feeder, and control circuits.

3. Test continuity of each circuit.
4. Verify that voltages at controller locations are within plus or minus ten percent (+/-10%) of motor nameplate rated voltages. If outside this range for any motor, notify Architect and Construction Manager before starting the motor(s).
5. Test each motor for proper phase rotation.
6. Perform each electrical test and visual and mechanical inspection stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
7. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
8. Perform the following infrared (thermographic) scan tests and inspections and prepare reports:

    a. Initial Infrared Scanning: After Substantial Completion, but not more than sixty (60) days after Final Acceptance, perform an infrared scan of each multi-pole enclosed controller. Remove front panels so joints and connections are accessible to portable scanner.
    b. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each multi-pole enclosed controller eleven (11) months after date of Substantial Completion.
    c. Instruments and Equipment: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.

9. Test and adjust controls, remote monitoring, and safeties. Replace damaged and malfunctioning controls and equipment.

D. Enclosed controllers will be considered defective if they do not pass tests and inspections.

E. Prepare test and inspection reports including a certified report that identifies enclosed controllers and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.6 ADJUSTING

A. Set field-adjustable switches, auxiliary relays, time-delay relays, timers, and overload-relay pickup and trip ranges.

B. Adjust overload-relay heaters or settings if power factor correction capacitors are connected to the load side of the overload relays.

C. Adjust the trip settings of MCPs and thermal-magnetic circuit breakers with adjustable instantaneous trip elements. Initially adjust to six times the motor nameplate full-load ampere ratings and attempt to start motors several times, allowing for motor cooldown between starts. If tripping occurs on motor inrush, adjust settings in increments until motors start without tripping. Do not exceed eight (8) times the motor full-load amperes (or eleven (11) times for NEMA Premium Efficient motors if required). Where these maximum settings do not allow starting of a motor, notify Architect and Construction Manager before increasing settings.

D. Set the taps on reduced-voltage autotransformer controllers at eighty percent (80%).

E. Set field-adjustable switches and program microprocessors for required start and stop sequences in reduced-voltage solid-state controllers.

F. Set field-adjustable circuit-breaker trip ranges as specified in Section 260573 "Overcurrent Protective Device Coordination Study."

3.7 PROTECTION

A. Temporary Heating: Apply temporary heat to maintain temperature according to manufacturer's written instructions until enclosed controllers are ready to be energized and placed into service.

B. Replace controllers whose interiors have been exposed to water or other liquids prior to Substantial Completion.

3.8 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain enclosed controllers, and to use and reprogram microprocessor-based, reduced-voltage solid-state controllers.

END OF SECTION 262913

SECTION 263213 - ENGINE GENERATORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Provide labor, materials, services, equipment, and transportation necessary for complete and operational factory tested, electrical generation systems as indicated on Drawings and specified herein, including, but not limited to the following:

1. Battery charger.
2. Engine-generator set.
3. Enclosed muffler.
4. Exhaust piping external to set.
5. System controller.
6. Outdoor sound rated enclosure.
7. Remote annunciator.
8. Remote stop switch.
9. Starting battery.
10. System commissioning.

B. Related Sections include the following:

1. Section 260500 “Common Work Results for Electrical Systems”.
2. Section 263600 "Transfer Switches" for transfer switches including sensors and relays to initiate automatic-starting and -stopping signals for engine-generator sets.

1.3 DEFINITIONS

A. Operational Bandwidth: The total variation from the lowest to highest value of a parameter over the range of conditions indicated, expressed as a percentage of the nominal value of the parameter.

B. Steady-State Voltage Modulation: The uniform cyclical variation of voltage within the operational bandwidth, expressed in Hertz or cycles per second.

1.4 SUBMITTALS

A. Product Data: Include the following:

1. Data on features, components, accessories ratings and performance.
2. Thermal damage curve for generators.
3. Time-current characteristic curves for generator protective device.
4. Certified generator set fuel consumption curve.
5. Evidence of UL2200 Listing.
6. Evidensizece of EPA emissions certification for natural gas configurations.

B. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components and location and size of each field connection.

1. Dimensioned outline plan and elevation drawings of engine-generator set and other components specified.
2. Design Calculations: Signed and sealed by a qualified professional engineer. Calculate requirements for selecting vibration isolators and seismic restraints and for designing vibration isolation bases.
3. Vibration Isolation Base Details: Signed and sealed by a qualified professional engineer. Detail fabrication, including anchorages and attachments to structure and to supported equipment. Include base weights.
4. Wiring Diagrams: Power, signal, and control wiring.

C. Welding certificates.

D. Submit Qualification Data for testing agency, including a sample of a representative Field Quality Control Test Report.

E. Certified summary of prototype-unit test report.

F. Certified Test Reports: For components and accessories that are equivalent, but not identical, to those tested on prototype unit.

G. Certified Summary of Performance Tests: Demonstrate compliance with specified requirement to meet performance criteria for sensitive loads.

H. Test Reports:

1. Report of factory test on units to be shipped for this Project, showing evidence of compliance with specified requirements. Systems not tested in parallel at the factory will not be accepted.
2. Report of sound generation.
3. Report of exhaust emissions showing compliance with EPA and other applicable regulations.
4. Report of UL2200 Listing.
5. Field quality-control test reports.

I. Certification of Torsional Vibration Compatibility: Comply with NFPA 110.

J. Operation and Maintenance Data: For packaged engine generators to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 1 and Division 26, include the following:

1. List of tools and replacement items recommended to be stored at the Project for ready access. Include part and drawing numbers, current unit prices, and source of supply.

K. Warranty: Special warranty specified in this Section.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.

1. Maintenance Proximity: Not more than 4 hours' normal travel time from Installer's place of business to Project site.
2. Engineering Responsibility: Preparation of data for vibration isolators and seismic restraints of engine skid mounts, including Shop Drawings, based on testing and engineering analysis of manufacturer's standard units in assemblies like those indicated for this Project.

B. Manufacturer Qualifications: A qualified manufacturer that has produced and commissioned a minimum of one thousand (1000) integrated paralleled systems. Maintain, within fifty (50) miles of Project site, a service center capable of providing training, parts, and emergency maintenance repairs.

C. Source Limitations: Obtain packaged generator sets and auxiliary components through one (1) source from a single manufacturer.

D. Product Options: Drawings indicate size, profiles, and dimensional requirements of packaged generator sets and are based on the specific system indicated. Refer to Section 016000 "Product Requirements."

E. Welding: Qualify procedures and personnel according to ASME Boiler and Pressure Vessel Code: Section IX for welding exhaust-system piping.

F. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

G. Comply with NFPA 37.

H. Comply with NFPA 70.

I. Comply with NFPA 99.

J. Comply with NFPA 110 requirements for Level 1 emergency power supply system.

K. Engine Exhaust Emissions: Comply with applicable state and local government requirements.

L. Noise Emission: Comply with applicable state and local government requirements for maximum noise level at adjacent property boundaries due to sound emitted by generator set including engine, engine exhaust, engine cooling-air intake and discharge, and other components of installation.

1.6 COORDINATION

A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 3.

1.7 DELIVERY, STORAGE AND HANDLING

A. Deliver engine generator system and auxiliary system components to their final locations in protective wrappings, containers and other protection that will exclude dirt and moisture and prevent damage from construction operations. Remove protection only after equipment is safe from such hazards.

1.8 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of packaged engine generators and associated auxiliary components that fail in materials or workmanship within specified warranty period. Third party warranties will not be accepted.

1. Warranty Period: Five (5) years from date of Substantial Completion.

1.9 MAINTENANCE SERVICE

A. Initial Maintenance Service: Beginning at Substantial Completion, provide twelve (12) months' full maintenance by skilled employees of manufacturer's designated service organization. Include quarterly exercising to check for proper starting, paralleling, load transfer, and running under load. Include routine preventive maintenance as recommended by manufacturer and adjusting as required for proper operation. Maintenance agreements shall include parts and supplies as used in manufacture and installation of original equipment.

1.10 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Fuses: One (1) for every ten (10) of each type and rating, but not less than one (1) of each.
2. Indicator Lamps: Two (2) for every six (6) of each type used, but not less than two (2) of each.
3. Filters: One (1) set each of lubricating oil, fuel, and combustion-air filters.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

1. Generac Modular Power System (MPS)
2. Kohler Power Systems
3. Caterpillar, Engine Div.
4. Cummins Power Generation
5. MTU Detroit Diesel

2.2 ENGINE-GENERATOR SET

A. Packaged engine-generator set shall be a coordinated assembly of compatible components.

B. Power Output Ratings: Nominal ratings as indicated, with capacity as required to operate as a unit as evidenced by records of prototype testing.

C. Output Connections: Three-phase, four-wire.

D. Safety Standard: Comply with ASME B15.1.

E. Nameplates: Each major system component shall be equipped with a nameplate to identify manufacturer's name and address, and model and serial number of components.

F. Fabricate engine-generator-set mounting frame and attachment of components to resist generator-set movement during a seismic event when generator-set mounting frame is anchored to building structure.

G. Mounting Frame: Adequate strength and rigidity to maintain alignment of mounted components without depending on concrete foundation. Mounting frame shall be free from sharp edges and corners and shall have lifting attachments arranged for lifting with slings without damaging components.

1. Rigging Diagram: Inscribed on metal plate permanently attached to mounting frame to indicate location and lifting capacity of each lifting attachment and generator-set center of gravity.

2.3 GENERATOR-SET PERFORMANCE

A. Oversizing generator compared with the rated power output of the engine is permissible to meet specified performance.

1. Nameplate Data for Oversized Generator: Show ratings required by the Contract Documents rather than ratings that would normally be applied to generator size installed.

B. Steady-State Voltage Operational Bandwidth: Two percent (2%) of rated output voltage from no load to full load.

C. Steady-State Voltage Modulation Frequency: Less than 1 Hz.

D. Transient Voltage Performance: Not more than ten percent (10%) variation for fifty percent (50%) step-load increase or decrease. Voltage shall recover and remain within the steady-state operating band within 0.5 second.

E. Steady-State Frequency Operational Bandwidth: Plus or minus one-quarter percent (+/- 0.25%) of rated frequency from no load to full load.

F. Steady-State Frequency Stability: When system is operating at any constant load within the rated load, there shall be no random speed variations outside the steady-state operational band and no hunting or surging of speed.

G. Transient Frequency Performance: Less than 2-Hz variation for a fifty percent (50%) step-load increase or decrease. Frequency shall recover and remain within the steady-state operating band within three seconds.

H. Output Waveform: At no load, harmonic content measured line to neutral shall not exceed two percent (2%) total with no slot ripple. The telephone influence factor, determined according to NEMA MG 1, shall not exceed fifty percent (50%).

I. Sustained Short-Circuit Current: For a 3-phase, bolted short circuit at system output terminals, the system shall supply a minimum of three hundred percent (300%) of rated full-load current for not less than 10 seconds and then clear the fault automatically, without damage to winding insulation or other generator system components.

J. Excitation System: Permanent Magnet Generator. Performance shall be unaffected by voltage distortion caused by nonlinear load.

K. Start Time: Comply with NFPA 110, Type 10, system requirements.

2.4 SERVICE CONDITIONS

A. Environmental Conditions: Engine-generator system shall withstand the following environmental conditions without mechanical or electrical damage or degradation of performance capability:

1. Ambient Temperature: Minus 15 to plus 40 deg C.
2. Relative Humidity: Zero to ninety-five percent (0-95%).
3. Altitude: Sea level to 1000 feet.

2.5 ENGINE

A. Fuel: Natural gas.

B. Rated Engine Speed: 1800 rpm.

C. Maximum Piston Speed for Four-Cycle Engines: 2250 fpm.

D. Lubrication System: The following items are mounted on engine or skid:

1. Filter and Strainer: Rated to remove ninety percent (90%) of particles 5 micrometers and smaller while passing full flow.
2. Thermostatic Control Valve: Control flow in system to maintain optimum oil temperature. Unit shall be capable of full flow and is designed to be fail-safe.
3. Crankcase Drain: Arranged for complete gravity drainage to an easily removable container with no disassembly and without use of pumps, siphons, special tools, or appliances.

E. Engine Fuel System:

1. Designed to operate on natural gas between 12-15” W.C.

F. Coolant Jacket Heater: Electric-immersion type, factory installed in coolant jacket system. Comply with NFPA 110 requirements for Level 1 equipment for heater capacity.

G. Governor: Adjustable isochronous, with speed sensing.

H. Pipe crankcase ventilation fumes directly into engine intake to burn them and reduce unwanted emissions.

I. Engine must meet EPA emissions standards for natural gas engines. Evidence of EPA certification must be submitted prior to engineering acceptance.

2.6 ENGINE COOLING SYSTEM

A. Description: Closed loop, liquid cooled, with radiator factory mounted on engine-generator-set mounting frame and integral engine-driven coolant pump.

B. Radiator: Rated for specified coolant.

C. Coolant: Solution of fifty percent (50%) ethylene-glycol-based antifreeze and fifty percent (50%) water, with anticorrosion additives as recommended by engine manufacturer.

D. Expansion Tank: Constructed of welded steel plate and rated to withstand maximum closed-loop coolant system pressure for engine used. Equip with gage glass and petcock.

E. Temperature Control: Self-contained, thermostatic-control valve modulates coolant flow automatically to maintain optimum constant coolant temperature as recommended by engine manufacturer.

F. Coolant Hose: Flexible assembly with inside surface of nonporous rubber and outer covering of aging-, ultraviolet-, and abrasion-resistant fabric.

1. Rating: 50-psig maximum working pressure with coolant at 180 deg F (82 deg C), and non-collapsible under vacuum.
2. End Fittings: Flanges or steel pipe nipples with clamps to suit piping and equipment connections.

G. Coolant piping external to engine-generator set. Use ASTM B 88, Type L copper tubing with brazed joints, sized as recommended by engine manufacturer. Refer to Section 230000" Basic Mechanical Materials and Methods" for basic piping installation and joint construction.

2.7 FUEL SUPPLY SYSTEM

A. Natural gas.

2.8 ENGINE EXHAUST SYSTEM

A. Muffler: Critical type, sized as recommended by engine manufacturer. Muffler must be installed inside the generator enclosure.

1. Provide muffler with drain outlet through a petcock.

B. Connection from Engine to Exhaust System: Flexible section of corrugated stainless-steel pipe, minimum 18-inch length from exhaust outlet to muffler with flanged pipe connections.

C. Connection from Exhaust Pipe to Muffler: Stainless-steel expansion joint with liner.

D. Exhaust Piping External to Engine: ASTM A 53, Schedule 40, welded, black steel, with welded joints and fittings.

2.9 COMBUSTION-AIR INTAKE

A. Description: Heavy-duty, engine-mounted air cleaner with replaceable dry-filter element and "blocked filter" indicator.

2.10 STARTING SYSTEM

A. Description: 24-V electric, with negative ground and including the following items:

1. Components: Sized so they will not be damaged during a full engine-cranking cycle with ambient temperature at maximum specified in "Environmental Conditions" Paragraph in "Service Conditions" Article.
2. Cranking Motor: Heavy-duty unit that automatically engages and releases from engine flywheel without binding.
3. Cranking Cycle: As required by NFPA 110 for system level specified
4. Battery: Adequate capacity within ambient temperature range specified in "Environmental Conditions" Paragraph in "Service Conditions" Article to provide specified cranking cycle at least three times without recharging.
5. Battery Cable: Size as recommended by engine manufacturer for cable length indicated. Include required interconnecting conductors and connection accessories.

6. Battery Compartment: Factory fabricated of metal with acid-resistant finish and thermal insulation. Thermostatically controlled heater shall be arranged to maintain battery above 10 deg C regardless of external ambient temperature within range specified in "Environmental Conditions" Paragraph in "Service Conditions" Article. Include accessories required to support and fasten batteries in place.
7. Battery-Charging Alternator: Factory mounted on engine with solid-state voltage regulation and 35-A minimum continuous rating.
8. Battery Charger: Current-limiting, automatic-equalizing and float-charging type. Unit shall comply with UL 1236 and include the following features:

    a. Operation: Equalizing-charging rate of 10 A shall be initiated automatically after battery has lost charge until an adjustable equalizing voltage is achieved at battery terminals. Unit shall then be automatically switched to a lower float-charging mode and shall continue to operate in that mode until battery is discharged again.
    b. Automatic Temperature Compensation: Adjust float and equalize voltages for variations in ambient temperature from minus 40 deg C to plus 60 deg C to prevent overcharging at high temperatures and undercharging at low temperatures.
    c. Automatic Voltage Regulation: Maintain constant output voltage regardless of input voltage variations up to plus or minus ten percent (+/-10%).
    d. Ammeter and Voltmeter: Flush mounted in door. Meters shall indicate charging rates.
    e. Safety Functions: Sense abnormally low battery voltage and close contacts providing low battery voltage indication on control and monitoring panel. Sense high battery voltage and loss of ac input or dc output of battery charger. Either condition shall close contacts that provide a battery-charger malfunction indication at system control and monitoring panel.
    f. Enclosure and Mounting: NEMA 250, Type 1, wall-mounted cabinet.

2.11 CONTROL AND MONITORING

A. Functional Description: When mode-selector switch on the control and monitoring panel is in the automatic position, remote-control contacts in one (1) or more separate automatic transfer switches initiate starting and stopping of the generator set. When mode-selector switch is switched to the on position, the generator set starts. The off position of the same switch initiates generator-set shutdown. When generator set is running, specified system or equipment failures or derangements automatically shut down the generator set and initiate alarms. Operation of a remote emergency-stop switch also shuts down the generator set.

B. Functional Description: Switching on-off switch on the generator control panel to the on position starts the generator set. The off position of the same switch initiates generator-set shutdown. When generator set is running, specified system or equipment failures or derangements automatically shut down the generator set and initiate alarms. Operation of a remote emergency-stop switch also shuts down the generator set.

C. Configuration: Operating and safety indications, protective devices, basic system controls, and engine gages shall be grouped in a common control and monitoring panel mounted on the generator set. Mounting method shall isolate the control panel from generator-set vibration.

D. Indicating and protective devices and controls shall include those required by NFPA 110 for a Level 1 system, and the following:

    1. Digital Indicating and Protective Devices and Controls:

        a. AC voltmeter.
        b. AC ammeter.
        c. AC Frequency Meter: Dial type.

d. DC voltmeter (alternator battery charging).
e. Engine-coolant temperature gage.
f. Engine lubricating-oil pressure gage.
g. Engine lube oil temperature.
h. Running-time meter.
i. Ammeter-voltmeter, phase-selector switch(es).
j. Generator-voltage adjusting rheostat.
k. Upper and lower meter scale indicator lights.
l. Start-stop switch.
m. Overspeed shutdown device.
n. Coolant high-temperature shutdown device.
o. Coolant low-level shutdown device.
p. Oil low-pressure shutdown device.
q. Auto/Off/Test switch. Test mode shall automatically start unit without interrupting normal electrical supply.
r. Overspeed shutdown device with LED status indicator which lights when overspeed condition has occurred as cause of shutdown.
s. Coolant high-temperature shutdown device with LED status indicator which lights when pre-alarm operating temperature has been reached and stays lit when shutdown occurs.
t. Coolant low-level shutdown device with LED status indicator which lights when low coolant level causes shutdown.
u. Oil low-pressure shutdown device with LED status indicator which lights when pre-alarm oil pressure condition has been reached and stays lit when shutdown occurs.
v. Overcrank shutdown device with LED status indicator which indicates engine has failed to start after 60-second cranking period.
w. Lamp test switch and audible alarm with silencer switch.
x. Low coolant temperature alarm with LED status indicator which indicates failure of block heater.
y. LED status indicator for “switch off”, which indicates when control switch has been placed in “off” position.
z. LED status indicator for “system ready”, indicating no malfunctions detected.
aa. Fuel tank derangement alarm.
bb. Fuel tank high-level shutdown of fuel supply alarm.
cc. Generator overload.

E. Supporting Items: Include sensors, transducers, terminals, relays, and other devices and include wiring required to support specified items. Locate sensors and other supporting items on engine or generator, unless otherwise indicated.

F. Connection to Data Link: A separate terminal block, factory wired to Form C dry contacts, for each alarm and status indication is reserved for connections for data-link transmission of indications to remote data terminals.

G. Common Remote Audible Alarm: Comply with NFPA 110 requirements for Level 1 systems. Include necessary contacts and terminals in control and monitoring panel.

H. 12/24 Volt remote annunciator panel: with lights, audible alarm, alarm switch and lamp test switch, in accordance with NFPA 110, Level 1, to monitor the following conditions:

1. Line power.
2. Generator power.
3. System ready (in auto position).
4. Alarm switch off.
5. Generator switch off.

6. Emergency stop.
7. Engine high-temperature shutdown.
8. Lube-oil low-pressure shutdown.
9. Overspeed shutdown.
10. Remote emergency-stop shutdown.
11. Engine high temperature prealarm.
12. Lube-oil low-pressure prealarm.
13. Fuel tank, low-fuel level.
14. Low coolant level.
15. Overcrank shutdown.
16. Coolant low-temperature alarm.
17. Control switch not in auto position.
18. Battery-charger malfunction alarm.
19. Battery low-voltage alarm.
20. Battery high voltage alarm.

I. Remote Alarm Annunciator: Comply with NFPA 99. Labeled LED shall identify each alarm event. Common audible signal shall sound for alarm conditions. Silencing switch in face of panel shall silence signal without altering visual indication. Connect so that after an alarm is silenced, clearing of initiating condition will reactivate alarm until silencing switch is reset. Cabinet and faceplate are surface- or flush-mounting type to suit mounting conditions indicated.

J. Remote Emergency-Stop Switch: Flush; wall mounted, unless otherwise indicated; and labeled. Push button shall be protected from accidental operation.

2.12 GENERATOR OVERCURRENT AND FAULT PROTECTION

A. Generator Circuit Breaker: Molded-case, thermal-magnetic type, one hundred percent (100%) rated; complying with NEMA AB 1 and UL 489.

1. Tripping Characteristic: Designed specifically for generator protection.
2. Trip Rating: Matched to generator rating.
3. Shunt Trip: Connected to trip breaker when generator set is shut down by other protective devices.
4. Mounting: Adjacent to or integrated with control and monitoring panel.
5. Circuit breaker must be mounted inside generator enclosure. External circuit breakers or power breakers are not acceptable.

B. Generator Protector: Microprocessor-based unit that continuously monitors current level in each phase of generator output, integrates generator heating effect over time, and predicts when thermal damage of the alternator will occur. When signaled by the protector or other generator-set protective devices, a shunt-trip device in the generator disconnect switch shall open the switch to disconnect the generator from the load circuits. Protector shall perform the following functions:

1. Initiates a generator overload alarm when the generator has operated at an overload equivalent to one hundred ten percent (110%) of full-rated load for 60 seconds. Indication for this alarm is integrated with other generator-set malfunction alarms.
2. Under single or three-phase fault conditions, regulates the generator to three hundred percent (300%) of rated full-load current for up to 10 seconds.
3. As the overcurrent heating effect on the generator approaches the thermal damage point of the unit, the protector switches the excitation system off, opens the generator disconnect device, and shuts down the generator set.
4. Senses clearing of a fault by other overcurrent devices and controls recovery of rated voltage to avoid overshoot.

C. Ground-Fault Indication: Comply with NFPA 70, Article 700.7(D). Integrate ground-fault alarm indication with other generator-set alarm indications.

D. Provide generator output breaker with one N.C. and one N.O. contact indicating breaker status. This status indication shall signal an alarm to the remote annunciator panel to indicate a "Generator Output Breaker Open" alarm. The remote annunciator panel shall be equipped with a single summary alarm wired to the building BMS system indicating a "Generator Trouble" alarm.

2.13 GENERATOR, EXCITER, AND VOLTAGE REGULATOR

A. Comply with NEMA MG 1 and specified performance requirements.

B. Drive: Generator shaft shall be directly connected to engine shaft. Exciter shall be rotated integrally with generator rotor.

C. Electrical Insulation: Class H or Class F.

D. Stator-Winding Leads: Brought out to terminal box to permit future reconnection for other voltages if required.

E. Construction shall prevent mechanical, electrical, and thermal damage due to vibration, overspeed up to one hundred twenty-five percent (125%) of rating, and heat during operation at one hundred ten percent (110%) of rated capacity.

F. Excitation shall use no slip or collector rings, or brushes, and shall be arranged to sustain generator output under short-circuit conditions as specified.

G. Enclosure: Drip-proof.

H. Instrument Transformers: Mounted within generator enclosure.

I. Voltage Regulator: Solid-state type, separate from exciter, providing performance as specified.

1. Adjusting rheostat on control and monitoring panel shall provide plus or minus five percent (+/-5%) adjustment of output-voltage operating band.
2. Provide with under-frequency protection and moisture-resistive protection.
3. Regulation shall be within plus or minus two percent (+/-2%) of rated voltage from no load to full load.
4. On application of rated load at rated power factor, instantaneous voltage dip shall NOT exceed twenty percent (20%), with recovery within one second.

J. Strip Heater: Thermostatically controlled unit arranged to maintain stator windings above dew point.

K. Windings: Two-thirds pitch stator winding and fully linked amortisseur winding.

L. Subtransient Reactance: Twelve percent (12%), maximum.

M. Provide Permanent Magnet Generator (PMG) system.

N. Alternator shall be self-ventilated, one-piece cast aluminum alloy, uni-directional internal fan shall provide high volume, low noise air delivery with broad range, 12-load reconnectable, four-pole rotating field unit.

O. Temperature rise shall be within NEMA MG1-22.40, IEEE and ANSI Standards for standby duty at rated output.

P. Provide front-end mounted junction box for load connections. Junction box shall have space to mount regulator and voltage adjust rheostat inside box and to relocate same to opposite side without unit modification.

Q. Locked Rotor kVA: Total available skVA shall be minimum 6,600 at thirty-five percent (35%) voltage dip (1,650 skVA for each unit). Ninety percent (90%) sustained voltage ratings will not be accepted.

2.14 SYSTEM CONTROLLER (PM-SC)

A. The power manager system controller shall be an integrated microprocessor-based solution providing full digital integration with the generator controllers. The system controller shall utilize standard hardware and firmware manufactured by the generator supplier. The use of PLC based solutions will be considered less desirable due to reliability and support concerns posed by custom hardware/custom software solutions. A preference will be shown for designs that use the same control board hardware for both the generator(s) and system controller.

B. To ensure reliability and serviceability, the system controller shall be required to meet the same requirements as listed for the generator controller.

C. The control panel will provide a touch screen display to provide intuitive access to all user pertinent system status information.

D. The power for the system controller shall utilize redundant DC sources - an internal DC source inclusive of charging system and an external DC source from one of the generator's cranking batteries.

E. The system controller shall interface with the generators using digital communications. Any of the generator(s) status, operation conditions, or configuration parameters shall be accessible with a single point communication via the system controller.

F. The system controller shall provide sequence of facility load through three (3) priority loading (permissive) load steps and three (3) load shedding steps. These output parameters function based on the number of generators on the generator bus. The priority loading function provides sequential permissive contact closures enabling load to be transferred onto the generator in response to generators coming on-line. The load shedding function provides contact closures that disconnects load from the generator bus in response to a reduction in available generator capacity.

G. In addition to the communication requirements identified in Paragraph 2.3.3, the system controller shall provide modem communications as standard.

H. The system controller and digital communications shall enhance system operation; neither shall be required to synchronize or operate the generators in parallel. Systems that require external control hardware or digital communications to synchronize and operate the generators in parallel are not acceptable.

I. The design of the system shall allow continued generator paralleled operation with failures to the system controller and/or communication. Control systems that have any systemic single point failure modes are not acceptable. This is inclusive of the reactive cross current and isochronous load sharing control loops.

J. The design of the system shall also provide generator start and paralleled operation with failures to the system controller and/or communication.

2.15 SOUND ATTENUATED OUTDOOR GENERATOR-SET ENCLOSURE

A. Description: Vandal-resistant, sound attenuated weatherproof steel housing, wind resistant up to 100 mph. Multiple panels shall be lockable and provide adequate access to components requiring maintenance including rear-hinged control panel door. Panels shall be removable by one person without tools. Instruments and control shall be mounted within enclosure.

1. Provide locking hasps (keyed alike) on engine side panels and control door.

B. Description: Prefabricated or pre-engineered enclosure with the following features:

1. Construction: Galvanized-steel, metal-clad, integral structural-steel-framed building erected on concrete foundation.
2. Structural Design and Anchorage: Wind resistant up to 100 mph.
3. Space Heater: Thermostatically controlled and sized to prevent condensation.
4. Louvers: Equipped with bird screen and filter arranged to permit air circulation when engine is not running while excluding exterior dust, birds, and rodents.
5. Hinged Doors: With padlocking provisions.
6. Ventilation: Louvers equipped with bird screen and filter arranged to permit air circulation while excluding exterior dust, birds, and rodents.
7. Thermal Insulation: Manufacturer's standard materials and thickness selected in coordination with space heater to maintain winter interior temperature within operating limits required by engine-generator-set components.
8. Muffler Location: Within enclosure
9. Enclosure Panelboard: Within enclosure, serving lights, receptacles, heaters, controls, batter charger and devices within enclosure. All electrical components and devices served by the enclosure panelboard shall be factory prewired to this panelboard.
10. Sound attenuation to reduce emitted sound to maximum of 76dBA at 23 feet.

C. Engine Cooling Airflow through Enclosure: Maintain temperature rise of system components within required limits when unit operates at one hundred ten percent (110%) of rated load for 2 hours with ambient temperature at top of range specified in system service conditions.

D. Interior Lights with Switch: Factory-wired, vapor-proof type fixtures within housing; arranged to illuminate controls and accessible interior.

E. Convenience Outlets: Factory wired. Arrange for external electrical connection. Exterior Lighting: Contractor to supply and field install external lighting for generator enclosures.

2.16 FINISHES

A. Indoor and Outdoor Enclosures and Components: Manufacturer's standard enamel over corrosion-resistant pretreatment and compatible standard primer.

2.17 SOURCE QUALITY CONTROL

A. Prototype Testing: Factory test engine-generator set using same engine model, constructed of identical or equivalent components, and equipped with identical or equivalent accessories.

1. Tests: Comply with NFPA 110, Level 1 energy converters in Paragraphs 3.2.1, 3.2.1.1, and 3.2.1.2.
2. Generator Tests: Comply with IEEE 115.

3. Components and Accessories: Items furnished with installed unit that are not identical to those on tested prototype shall have been factory tested to demonstrate compatibility and reliability.

B. Project-Specific Equipment Tests: Before shipment, factory test engine-generator set and other system components and accessories manufactured specifically for this Project. Perform tests at rated load and power factor. Include the following tests:

1. Full load run as a complete paralleled system for minimum 4 hours for base and alternate bids. Systems not factory paralleled and tested prior to shipment will not be accepted.
2. Parallel operation.
3. Maximum power.
4. Voltage regulation.
5. Transient and steady-state governing.
6. Single-step load pickup.
7. Safety shutdown.
8. Observation of Factory Tests: Provide fourteen (14) days' advance notice of tests and opportunity for observation of tests by Owner's representative.

C. Report factory test results within ten (10) days of completion of test.

D. Provide evidence of UL2200 listing for specified engine generators.

E. Provide evidence of EPA certification.

F. Provide factory warranty documentation for all equipment.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas, equipment bases, and conditions, with Installer present, for compliance with requirements for installation and other conditions affecting packaged engine-generator performance.

B. Examine roughing-in of piping systems and electrical connections. Verify actual locations of connections before packaged engine-generator installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 CONCRETE BASES

A. Coordinate size and location of concrete bases. Verify structural requirements with structural engineer.

B. Concrete base is specified in Section 260500 "Common Work Results for Electrical," and concrete materials and installation requirements are specified in Division 3.

3.3 INSTALLATION

A. Comply with packaged engine-generator manufacturers' written installation and alignment instructions and with NFPA 110.

B. Install packaged engine generators level on concrete base.

1. Vibration Isolation: Mount packaged engine generator on restrained spring isolators to provide vibration isolation.

C. Install packaged engine generator to provide access, without removing connections or accessories, for periodic maintenance.

D. Electrical Wiring: Install electrical devices furnished by equipment manufacturers but not specified to be factory mounted.

1. Verify that electrical wiring is installed according to manufacturer's submittal and installation requirements in Division 26 Sections. Proceed with equipment start up only after wiring installation is satisfactory.
2. Provide interconnecting wiring between generator and automatic transfer switch(es).
3. Provide interconnecting wiring between generator and remote annunciator panel.
4. Provide interconnecting wiring between the SCR control system operating components, sensors, generator set, troubles, and alarms.

3.4 CONNECTIONS

A. Piping installation requirements are specified in Division 23 Sections. Drawings indicate general arrangement of piping and specialties. The following are specific connection requirements:

1. Install fuel, cooling-system, and exhaust-system piping adjacent to packaged engine generator to allow service and maintenance.
2. Connect cooling-system water supply and drain piping to gas engine heat exchangers. Install flexible connectors at connections to engine generator and remote radiator.
3. Connect fuel piping to engines with a gate valve and union.

a. Natural- and LP-gas piping, valves, and specialties for gas piping inside the building are specified in Section 231123 "Facility Natural Gas Piping."

4. Connect exhaust-system piping to engines.

B. Ground equipment according to Section 260526 "Grounding and Bonding for Electrical Systems."

C. Connect wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

D. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.5 IDENTIFICATION

A. Identify system components according to Section 230553 "Identification for HVAC Piping and Equipment" and Section 260553 "Identification for Electrical Systems."

3.6 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test and adjust field-assembled components and equipment installation, including connections, and to assist in field testing. Report results in writing.

B. Perform the following field tests and inspections and prepare test reports: Furnish required materials, equipment, and services to perform on-site tests, in presence of Architect and Owner, to demonstrate system operation. Correct defects and re-test system until proper operation is guaranteed. Materials and equipment shall include: temporary power and wiring; temporary cooling; 480Volt, 3PH, 350KW, infinitely variable, outdoor load bank and operator; monitoring devices, etc.

1. Perform each electrical test and visual and mechanical inspection stated in NETA ATS, Sections 7.15.2.1 and 7.22.1 (except for vibration baseline test). Certify compliance with test parameters. Tests shall be conducted by applying load (via load bank) to load side of automatic transfer switch or to another load point acceptable to Engineer.
2. Perform tests recommended by manufacturer.
3. NFPA 110 Acceptance Tests: Perform tests required by NFPA 110 that are additional to those specified here including, but not limited to, the following:

    a. Single-step full-load pickup test.

4. Battery Tests: Equalize charging of battery cells according to manufacturer's written instructions. Record individual cell voltages.

    a. Measure charging voltage and voltages between available battery terminals for full-charging and float-charging conditions. Check electrolyte level and specific gravity under both conditions.
    b. Test for contact integrity of all connectors. Perform an integrity load test and a capacity load test for the battery.
    c. Verify acceptance of charge for each element of the battery after discharge.
    d. Verify that measurements are within manufacturer's specifications.

5. Battery-Charger Tests: Verify specified rates of charge for both equalizing and float-charging conditions.
6. System Integrity Tests: Methodically verify proper installation, connection, and integrity of each element of engine-generator system before and during system operation. Check for air, exhaust, and fluid leaks.
7. Exhaust-System Back-Pressure Test: Use a manometer with a scale exceeding 40-inch wg. Connect to exhaust line close to engine exhaust manifold. Verify that back pressure at full-rated load is within manufacturer's written allowable limits for the engine.
8. Exhaust Emissions Test: Comply with applicable government test criteria.
9. Voltage and Frequency Transient Stability Tests: Use recording oscilloscope to measure voltage and frequency transients for fifty and one hundred percent (50 and 100%) step-load increases and decreases, and verify that performance is as specified.
10. Harmonic-Content Tests: Measure harmonic content of output voltage under twenty-five percent (25%) and at one hundred percent (100%) of rated linear load. Verify that harmonic content is within specified limits.
11. Noise Level Tests: Measure A-weighted level of noise emanating from generator-set installation, including engine exhaust and cooling-air intake and discharge, at four (4) locations on the property line, and compare measured levels with required values.

C. Coordinate tests with tests for transfer switches and run them concurrently.

D. Test instruments shall have been calibrated within the last twelve (12) months, traceable to standards of the National Institute for Standards and Technology, and adequate for making positive observation of test results. Make calibration records available for examination on request.

E. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.

F. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.

G. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

H. Remove and replace malfunctioning units and retest as specified above.

I. Retest: Correct deficiencies identified by tests and observations and retest until specified requirements are met.

J. Report results of tests and inspections in writing. Record adjustable relay settings and measured insulation resistances, time delays, and other values and observations. Attach a label or tag to each tested component indicating satisfactory completion of tests.

3.7 STARTUP SERVICE

A. Engage a factory-authorized service representative to perform startup service.

B. Inspect field-assembled components and equipment installation, including piping and electrical connections. Report results in writing.

C. Complete installation and startup checks according to manufacturer's written instructions.

3.8 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain packaged engine generators. Refer to Division 1.

1. Coordinate this training with that for transfer switches.

END OF SECTION 263213

SECTION 263600 - TRANSFER SWITCHES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes transfer switches rated 600 V and less, including the following:

1. Automatic transfer switches.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include rated capacities, weights, operating characteristics, furnished specialties, and accessories.

B. Shop Drawings: Dimensioned plans, elevations, sections, and details showing minimum clearances, conductor entry provisions, gutter space, installed features and devices, and material lists for each switch specified.

1. Single-Line Diagram: Show connections between transfer switch, bypass/isolation switch, power sources, and load; and show interlocking provisions for each combined transfer switch and bypass/isolation switch.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For manufacturer and testing agency.

B. Manufacturer Seismic Qualification Certification: Submit certification that transfer switches accessories, and components will withstand seismic forces defined in Section 260548 "Vibration and Seismic Controls for Electrical Systems." Include the following:

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.

a. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified."
b. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."

2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

C. Field quality-control test reports.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For each type of product to include in emergency, operation, and maintenance manuals. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:

1. Features and operating sequences, both automatic and manual.
2. List of all factory settings of relays; provide relay-setting and calibration instructions, including software, where applicable.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: Maintain a service center capable of providing training, parts, and emergency maintenance repairs within a response period of less than 8 hours from time of notification.

B. Testing Agency Qualifications: An independent agency, with the experience and capability to conduct the testing indicated, that is a member company of the InterNational Electrical Testing Association or is a nationally recognized testing laboratory (NRTL) as defined by OSHA in 29 CFR 1910.7, and that is acceptable to authorities having jurisdiction.

1. Testing Agency's Field Supervisor: Person currently certified by the InterNational Electrical Testing Association or the National Institute for Certification in Engineering Technologies to supervise on-site testing specified in Part 3.

C. Source Limitations: Obtain automatic transfer switches through one (1) source from a single manufacturer.

D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

E. Comply with NEMA ICS 1.

F. Comply with NFPA 70.

G. Comply with NFPA 99.

H. Comply with NFPA 110.

I. Comply with UL 1008 unless requirements of these Specifications are stricter.

1.7 PROJECT CONDITIONS

A. Interruption of Existing Electrical Service: Do not interrupt electrical service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electrical service:

1. Notify owner no fewer than two (2) days in advance of proposed interruption of electrical service.
2. Do not proceed with interruption of electrical service without owner’s written permission.

1.8 COORDINATION

A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 03.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

1. Contactor Transfer Switches:

a. Generac Power Systems, Inc.
b. Emerson; ASCO Power Technologies, LP
c. Caterpillar; Engine Div.
d. Onan/Cummins Power Generation; Industrial Business Group
e. Kohler Power Systems; Generator Division
f. Spectrum Detriot Diesel
g. Russelectric, Inc.
h. GE Zenith Controls

2.2 GENERAL TRANSFER-SWITCH PRODUCT REQUIREMENTS

A. Indicated Current Ratings: Apply as defined in UL 1008 for continuous loading and total system transfer, including tungsten filament lamp loads not exceeding thirty percent (30%) of switch ampere rating, unless otherwise indicated.

B. Tested Fault-Current Closing and Withstand Ratings: Adequate for duty imposed by protective devices at installation locations in Project under the fault conditions indicated, based on testing according to UL 1008.

1. Where transfer switch includes internal fault-current protection, rating of switch and trip unit combination shall exceed indicated fault-current value at installation location.

C. Solid-State Controls: Repetitive accuracy of all settings shall be plus or minus two percent (+/- 2%) or better over an operating temperature range of minus 20 to plus 70 deg C.

D. Resistance to Damage by Voltage Transients: Components shall meet or exceed voltage-surge withstand capability requirements when tested according to IEEE C62.41. Components shall meet or exceed voltage-impulse withstand test of NEMA ICS 1.

E. Electrical Operation: Accomplish by a non-fused, momentarily energized solenoid or electric-motor-operated mechanism, mechanically and electrically interlocked in both directions.

F. Switch Characteristics: Designed for continuous-duty repetitive transfer of full-rated current between active power sources.

1. Limitation: Switches using molded-case switches or circuit breakers or insulated-case circuit-breaker components are not acceptable.
2. Switch Action: Double throw; mechanically held in both directions.

3. Contacts: Silver composition or silver alloy for load-current switching. Conventional automatic transfer-switch units, rated 225 A and higher, shall have separate arcing contacts.

G. Neutral Terminal: Solid and fully rated, unless otherwise indicated.

H. Oversize Neutral: Ampacity and switch rating of neutral path through units indicated for oversize neutral shall be double the nominal rating of circuit in which switch is installed.

I. Heater: Equip switches exposed to outdoor temperatures and humidity, and other units indicated, with an internal heater. Provide thermostat within enclosure to control heater.

J. Annunciation, Control, and Programming Interface Components: Devices at transfer switches for communicating with remote programming devices, annunciators, or annunciator and control panels shall have communication capability matched with remote device.

K. Factory Wiring: Train and bundle factory wiring and label, consistent with Shop Drawings, either by color-code or by numbered or lettered wire and cable tape markers at terminations. Color-coding and wire and cable tape markers are specified in Section 260553 "Identification for Electrical Systems."

1. Designated Terminals: Pressure type, suitable for types and sizes of field wiring indicated.
2. Power-Terminal Arrangement and Field-Wiring Space: Suitable for top, side, or bottom entrance of feeder conductors as indicated.
3. Control Wiring: Equipped with lugs suitable for connection to terminal strips.

L. Enclosures: General-purpose NEMA 250, Type 1 complying with NEMA ICS 6 and UL 508, unless otherwise indicated.

2.3 AUTOMATIC TRANSFER SWITCHES

A. Comply with Level 1 equipment according to NFPA 110.

B. Switching Arrangement: Double-throw type, incapable of pauses or intermediate position stops during normal functioning, unless otherwise indicated.

C. Manual Switch Operation: Under load, with door closed and with either or both sources energized. Transfer time is same as for electrical operation. Control circuit automatically disconnects from electrical operator during manual operation.

D. Manual Switch Operation: Unloaded. Control circuit automatically disconnects from electrical operator during manual operation.

E. Signal-Before-Transfer Contacts: A set of normally open/normally closed dry contacts operates in advance of retransfer to normal source. Interval is adjustable from 1 to 30 seconds.

F. Communication Interface: Matched to capability of remote annunciator or annunciator and control panel.

G. Transfer Switches Based on Molded-Case-Switch Components: Comply with NEMA AB 1, UL 489, and UL 869A.

H. In-Phase Monitor: Factory-wired, internal relay controls transfer so it occurs only when the two (2) sources are synchronized in phase. Relay compares phase relationship and frequency

difference between normal and emergency sources and initiates transfer when both sources are within 15 electrical degrees, and only if transfer can be completed within 60 electrical degrees. Transfer is initiated only if both sources are within 2 Hz of nominal frequency and seventy percent (70%) or more of nominal voltage.

I. Motor Disconnect and Timing Relay: Controls designate starters so they disconnect motors before transfer and reconnect them selectively at an adjustable time interval after transfer. Control connection to motor starters is through wiring external to automatic transfer switch. Time delay for reconnecting individual motor loads is adjustable between 1 and 60 seconds, and settings are as indicated. Relay contacts handling motor-control circuit inrush and seal currents are rated for actual currents to be encountered.

J. Automatic Transfer-Switch Features:

1. Undervoltage Sensing for Each Phase of Normal Source: Sense low phase-to-ground voltage on each phase. Pickup voltage shall be adjustable from eighty-five to one hundred percent (85-100%) of nominal, and dropout voltage is adjustable from seventy-five to ninety-eight percent (75-98%) of pickup value. Factory set for pickup at ninety percent (90%) and dropout at eighty-five percent (85%).
2. Adjustable Time Delay: For override of normal-source voltage sensing to delay transfer and engine start signals. Adjustable from 0 to 6 seconds, and factory set for 1 second.
3. Voltage/Frequency Lockout Relay: Prevent premature transfer to generator. Pickup voltage shall be adjustable from eighty-five to one hundred percent (85-100%) of nominal. Factory set for pickup at ninety percent (90%). Pickup frequency shall be adjustable from ninety to one hundred percent (90-100%) of nominal. Factory set for pickup at ninety-five percent (95%).
4. Time Delay for Retransfer to Normal Source: Adjustable from 0 to 30 minutes, and factory set for 10 minutes to automatically defeat delay on loss of voltage or sustained undervoltage of emergency source, provided normal supply has been restored.
5. Test Switch: Simulate normal-source failure.
6. Switch-Position Pilot Lights: Indicate source to which load is connected.
7. Source-Available Indicating Lights: Supervise sources via transfer-switch normal- and emergency-source sensing circuits.

    a. Normal Power Supervision: Green light with nameplate engraved "Normal Source Available."
    b. Emergency Power Supervision: Red light with nameplate engraved "Emergency Source Available."

8. Unassigned Auxiliary Contacts: Two (2) normally open, single-pole, double-throw contacts for each switch position, rated 10 A at 240-V ac.
9. Transfer Override Switch: Overrides automatic retransfer control so automatic transfer switch will remain connected to emergency power source regardless of condition of normal source. Pilot light indicates override status.
10. Engine Starting Contacts: One (1) isolated and normally closed, and one (1) isolated and normally open; rated 10 A at 32-V dc minimum.
11. Engine Shutdown Contacts: Instantaneous; shall initiate shutdown sequence at remote engine-generator controls after retransfer of load to normal source.
12. Engine Shutdown Contacts: Time delay adjustable from 0 to 5 minutes, and factory set 5 five minutes. Contacts shall initiate shutdown at remote engine-generator controls after retransfer of load to normal source.
13. Engine-Generator Exerciser: Solid-state, programmable-time switch starts engine generator and transfers load to it from normal source for a preset time, then retransfers and shuts down engine after a preset cool-down period. Initiates exercise cycle at preset intervals adjustable from seven to thirty (7-30) days. Running periods are adjustable

from 10 to 30 minutes. Factory settings are for 7-day exercise cycle, 20-minute running period, and 5-minute cool-down period. Exerciser features include the following:

a. Exerciser Transfer Selector Switch: Permits selection of exercise with and without load transfer.
b. Push-button programming control with digital display of settings.
c. Integral battery operation of time switch when normal control power is not available.

2.4 SOURCE QUALITY CONTROL

A. Factory test and inspect components, assembled switches, and associated equipment. Ensure proper operation. Check transfer time and voltage, frequency, and time-delay settings for compliance with specified requirements. Perform dielectric strength test complying with NEMA ICS 1.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Design each fastener and support to carry load indicated by seismic requirements and according to seismic-restraint details. See Section 260548 "Vibration and Seismic Controls for Electrical Systems."

B. Floor-Mounting Switch: Anchor to floor by bolting.

1. Concrete Bases: 4 inches high, reinforced, with chamfered edges. Extend base no more than 4 inches in all directions beyond the maximum dimensions of switch, unless otherwise indicated or unless required for seismic support. Construct concrete bases according to Section 260529 "Hangers and Supports for Electrical Systems."

C. Identify components according to Section 260553 "Identification for Electrical Systems."

D. Set field-adjustable intervals and delays, relays, and engine exerciser clock.

3.2 CONNECTIONS

A. Wiring to Remote Components: Match type and number of cables and conductors to control and communication requirements of transfer switches as recommended by manufacturer. Increase raceway sizes at no additional cost to Owner if necessary to accommodate required wiring.

B. Ground equipment according to Section 260526 "Grounding and Bonding for Electrical Systems."

C. Connect wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

3.3 FIELD QUALITY CONTROL

A. Perform tests and inspections and prepare test reports.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installation, including connections, and to assist in testing.
2. After installing equipment and after electrical circuitry has been energized, test for compliance with requirements.
3. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
4. Measure insulation resistance phase-to-phase and phase-to-ground with insulation-resistance tester. Include external annunciation and control circuits. Use test voltages and procedure recommended by manufacturer. Comply with manufacturer's specified minimum resistance.

    a. Check for electrical continuity of circuits and for short circuits.
    b. Inspect for physical damage, proper installation and connection, and integrity of barriers, covers, and safety features.
    c. Verify that manual transfer warnings are properly placed.
    d. Perform manual transfer operation.

5. After energizing circuits, demonstrate interlocking sequence and operational function for each switch at least three times.

    a. Simulate power failures of normal source to automatic transfer switches and of emergency source with normal source available.
    b. Simulate loss of phase-to-ground voltage for each phase of normal source.
    c. Verify time-delay settings.
    d. Verify pickup and dropout voltages by data readout or inspection of control settings.
    e. Test bypass/isolation unit functional modes and related automatic transfer-switch operations.
    f. Perform contact-resistance test across main contacts and correct values exceeding 500 microhms and values for 1-pole deviating by more than fifty percent (50%) from other poles.
    g. Verify proper sequence and correct timing of automatic engine starting, transfer time delay, retransfer time delay on restoration of normal power, and engine cool-down and shutdown.

6. Ground-Fault Tests: Coordinate with testing of ground-fault protective devices for power delivery from both sources.

    a. Verify grounding connections and locations and ratings of sensors.

B. Testing Agency's Tests and Inspections:

1. After installing equipment and after electrical circuitry has been energized, test for compliance with requirements.
2. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
3. Measure insulation resistance phase-to-phase and phase-to-ground with insulation-resistance tester. Include external annunciation and control circuits. Use test voltages and procedure recommended by manufacturer. Comply with manufacturer's specified minimum resistance.

    a. Check for electrical continuity of circuits and for short circuits.
    b. Inspect for physical damage, proper installation and connection, and integrity of barriers, covers, and safety features.
    c. Verify that manual transfer warnings are properly placed.

d. Perform manual transfer operation.

4. After energizing circuits, demonstrate interlocking sequence and operational function for each switch at least three times.

   a. Simulate power failures of normal source to automatic transfer switches and of emergency source with normal source available.
   b. Simulate loss of phase-to-ground voltage for each phase of normal source.
   c. Verify time-delay settings.
   d. Verify pickup and dropout voltages by data readout or inspection of control settings.
   e. Test bypass/isolation unit functional modes and related automatic transfer-switch operations.
   f. Perform contact-resistance test across main contacts and correct values exceeding 500 microhms and values for 1-pole deviating by more than fifty percent (50%) from other poles.
   g. Verify proper sequence and correct timing of automatic engine starting, transfer time delay, retransfer time delay on restoration of normal power, and engine cool-down and shutdown.

5. Ground-Fault Tests: Coordinate with testing of ground-fault protective devices for power delivery from both sources.

   a. Verify grounding connections and locations and ratings of sensors.

C. Coordinate tests with tests of generator and run them concurrently.

D. Report results of tests and inspections in writing. Record adjustable relay settings and measured insulation and contact resistances and time delays. Attach a label or tag to each tested component indicating satisfactory completion of tests.

E. Remove and replace malfunctioning units and retest as specified above.

F. Infrared Scanning: After Substantial Completion, but not more than sixty (60) days after Final Acceptance, perform an infrared scan of each switch. Remove all access panels so joints and connections are accessible to portable scanner.

1. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each switch eleven (11) months after date of Substantial Completion.
2. Instrument: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
3. Record of Infrared Scanning: Prepare a certified report that identifies switches checked and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.4 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain transfer switches and related equipment as specified below. Refer to Section 017900 "Demonstration and Training."

B. Coordinate this training with that for generator equipment.

END OF SECTION 263600

SECTION 264313 - TRANSIENT-VOLTAGE SUPPRESSION FOR LOW-VOLTAGE ELECTRICAL POWER CIRCUITS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes field-mounted TVSS for low-voltage (120 to 600 V) power distribution and control equipment.

B. Related Sections:

1. Section 262413 "Switchboards" for factory-installed TVSS.
2. Section 262726 "Wiring Devices" for devices with integral TVSS.

1.3 DEFINITIONS

A. ATS: Acceptance Testing Specifications.

B. SVR: Suppressed voltage rating.

C. TVSS: Transient voltage surge suppressor(s), both singular and plural; also, transient voltage surge suppression.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated. Include rated capacities, operating weights, electrical characteristics, furnished specialties, and accessories.

B. Qualification Data: For qualified testing agency.

C. Product Certificates: For TVSS devices, from manufacturer.

D. Field quality-control reports.

E. Operation and Maintenance Data: For TVSS devices to include in emergency, operation, and maintenance manuals.

F. Warranties: Sample of special warranties.

1.5 QUALITY ASSURANCE

A. Testing Agency Qualifications: Member company of NETA or an NRTL.

1. Testing Agency's Field Supervisor: Currently certified by NETA to supervise on-site testing.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a testing agency, and marked for intended location and application.

C. Comply with IEEE C62.41.2 and test devices according to IEEE C62.45.

D. Comply with NEMA LS 1.

E. Comply with UL 1283 and UL 1449.

F. Comply with NFPA 70.

1.6 PROJECT CONDITIONS

A. Interruption of Existing Electrical Service: Do not interrupt electrical service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electrical service according to requirements indicated:

1. Notify Architect and Construction Manager no fewer than two (2) days in advance of proposed electrical service interruptions.
2. Do not proceed with interruption of electrical service without Architect and Construction Manager written permission.

B. Service Conditions: Rate TVSS devices for continuous operation under the following conditions unless otherwise indicated:

1. Maximum Continuous Operating Voltage: Not less than one hundred fifteen percent (115%) of nominal system operating voltage.
2. Operating Temperature: 30 to 120 deg F (0 to 50 deg C).
3. Humidity: Zero to eighty-five percent (0-85%), noncondensing.
4. Altitude: Less than 20,000 feet above sea level.

1.7 COORDINATION

A. Coordinate location of field-mounted TVSS devices to allow adequate clearances for maintenance.

1.8 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of surge suppressors that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Five (5) years from date of Substantial Completion.

B. Special Warranty for Cord-Connected, Plug-in Surge Suppressors: Manufacturer's standard form in which manufacturer agrees to repair or replace electronic equipment connected to circuits protected by surge suppressors.

1.9 EXTRA MATERIALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Replaceable Protection Modules: One (1) of each size and type installed.

PART 2 - PRODUCTS

2.1 SERVICE ENTRANCE SUPPRESSORS (Type 1)

A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one (1) of the following:

1. ABB USA
2. AC Data Solutions
3. Advanced Protection Technologies Inc. (APT)
4. Atlantic Scientific
5. Current Technology Inc.; Danaher Power Solutions
6. Danaher Power Solutions; United Power Products
7. Eaton Electrical Inc.; Cutler-Hammer Business Unit
8. General Electric Company; GE Consumer & Industrial - Electrical Distribution
9. Intermatic, Inc.
10. LEA International
11. Leviton Mfg. Company Inc.
12. Liebert Corporation; a division of Emerson Network Power
13. Northern Technologies, Inc.; a division of Emerson Network Power
14. Siemens Energy & Automation, Inc.
15. Square D; a brand of Schneider Electric
16. Surge Suppression Incorporated

B. Surge Protection Devices:

1. Comply with UL 1449, Type 1.
2. Modular design (with field-replaceable modules).
3. Fuses, rated at 200-kA interrupting capacity.
4. Fabrication using bolted compression lugs for internal wiring.
5. Integral disconnect switch.
6. Redundant suppression circuits.
7. Redundant replaceable modules.
8. Arrangement with copper bus bars and for bolted connections to phase buses, neutral bus, and ground bus.
9. Arrangement with wire connections to phase buses, neutral bus, and ground bus.
10. LED indicator lights for power and protection status.
11. Audible alarm, with silencing switch, to indicate when protection has failed.
12. Form-C contacts rated at 5 A and 250-V ac, one (1) normally open and one (1) normally closed, for remote monitoring of protection status. Contacts shall reverse on failure of any surge diversion module or on opening of any current-limiting device. Coordinate with building power monitoring and control system.
13. Six-digit transient-event counter set to totalize transient surges.

C. Peak Single-Impulse Surge Current Rating: 320 kA per mode/640 kA per phase.

D. Minimum single impulse current ratings, using 8-by-20-mic.sec waveform described in IEEE C62.41.2

1. Line to Neutral: 70,000 A.
2. Line to Ground: 70,000 A.
3. Neutral to Ground: 50,000 A.

E. Protection modes and UL 1449 SVR for grounded wye circuits with 400 V for 208Y/120 V., 3-phase, 4-wire circuits shall be as follows:

1. Line to Neutral: 700 V for 208Y/120 V.
2. Line to Line: 1200 V for 208Y/120 V.
3. Neutral to Ground: 700 V for 208Y/120 V.

F. Protection modes and UL 1449 SVR for 240 V, 480 V, or 600 V, 3-phase, 3-wire, delta circuits shall be as follows:

1. Line to Line: 1000 V for 240 V.
2. Line to Ground: 1000 V for 240 V.

2.2 PANELBOARD SUPPRESSORS (Type 2)

A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one (1) of the following:

1. ABB USA
2. AC Data Solutions
3. Advanced Protection Technologies Inc. (APT)
4. Atlantic Scientific
5. Current Technology Inc.; Danaher Power Solutions
6. Danaher Power Solutions; United Power Products
7. Eaton Electrical Inc.; Cutler-Hammer Business Unit
8. General Electric Company; GE Consumer & Industrial - Electrical Distribution
9. Intermatic, Inc.
10. LEA International
11. Leviton Mfg. Company Inc.
12. Liebert Corporation; a division of Emerson Network Power
13. Northern Technologies, Inc.; a division of Emerson Network Power
14. Siemens Energy & Automation, Inc.
15. Square D; a brand of Schneider Electric
16. Surge Suppression Incorporated

B. Surge Protection Devices:

1. Non-modular.
2. LED indicator lights for power and protection status.
3. Audible alarm, with silencing switch, to indicate when protection has failed.
4. Form-C contacts rated at 5 A and 250-V ac, one (1) normally open and one (1) normally closed, for remote monitoring of protection status. Contacts shall reverse on failure of any surge diversion module or on opening of any current-limiting device. Coordinate with building power monitoring and control system.

2.3 ENCLOSURES

A. Indoor Enclosures: NEMA 250 Type 1.

B. Outdoor Enclosures: NEMA 250 Type 4X.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install TVSS devices at service entrance on load side, with ground lead bonded to service entrance ground.

B. Install TVSS devices for panelboards and auxiliary panels with conductors or buses between suppressor and points of attachment as short and straight as possible. Do not exceed manufacturer's recommended lead length. Do not bond neutral and ground.

1. Provide multiple, 30-A circuit breaker as a dedicated disconnecting means for TVSS unless otherwise indicated.

3.2 FIELD QUALITY CONTROL

A. Perform tests and inspections.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

B. Tests and Inspections:

1. Perform each visual and mechanical inspection and electrical test stated in NETA ATS, "Surge Arresters, Low-Voltage Surge Protection Devices" Section. Certify compliance with test parameters.
2. After installing TVSS devices but before electrical circuitry has been energized, test for compliance with requirements.
3. Complete startup checks according to manufacturer's written instructions.

C. TVSS device will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

3.3 STARTUP SERVICE

A. Do not energize or connect service entrance equipment, panelboards, control terminals or data terminals to their sources until TVSS devices are installed and connected.

B. Do not perform insulation resistance tests of the distribution wiring equipment with the TVSS installed. Disconnect before conducting insulation resistance tests, and reconnect immediately after the testing is over.

3.4 DEMONSTRATION

A. Engage a factory-authorized service representative to train owner's maintenance personnel to maintain TVSS devices.

END OF SECTION 264313

SECTION 265119 - LED INTERIOR LIGHTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Interior solid-state luminaires that use LED technology.
2. Lighting fixture supports.

B. Related Requirements:

1. Section 260923 "Lighting Control Devices" for automatic control of lighting, including time switches, photoelectric relays, occupancy sensors, and multipole lighting relays and contactors.

1.3 DEFINITIONS

A. CCT: Correlated color temperature.

B. CRI: Color Rendering Index.

C. Fixture: See "Luminaire."

D. IP: International Protection or Ingress Protection Rating.

E. LED: Light-emitting diode.

F. Lumen: Measured output of lamp and luminaire, or both.

G. Luminaire: Complete lighting unit, including lamp, reflector, and housing.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Arrange in order of luminaire designation.
2. Include data on features, accessories, and finishes.
3. Include physical description and dimensions of luminaires.
4. Include emergency lighting units, including batteries and chargers.
5. Include life, output (lumens, CCT, and CRI), and energy efficiency data.
6. Photometric data and adjustment factors based on laboratory tests, complying with IESNA Lighting Measurements Testing and Calculation Guides, of each lighting fixture type. The adjustment factors shall be for lamps and accessories identical to those indicated for the lighting fixture as applied in this Project IES LM-79 and IES LM-80.

a. Manufacturers' Certified Data: Photometric data certified by manufacturer's laboratory with a current accreditation under the National Voluntary Laboratory Accreditation Program for Energy Efficient Lighting Products.
b. Testing Agency Certified Data: For indicated luminaires, photometric data certified by a qualified independent testing agency. Photometric data for remaining luminaires shall be certified by manufacturer.

B. Shop Drawings: For nonstandard or custom luminaires.

1. Include plans, elevations, sections, and mounting and attachment details.
2. Include details of luminaire assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
3. Include diagrams for power, signal, and control wiring.

C. HPBS Submittals:

1. Product Data for Section 16a-38k-5(d): For paints and coatings, including printed statement of VOC content.

D. Samples: For each luminaire housing supply at submittal stage a paint chip of the fixture color as specified on the fixture schedule for approval.

E. For luminaires and lamps ref to Product Schedule: Shipping carton/box designation to be clearly marked with same designations as indicated on Drawings.

1.5 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Reflected ceiling plan(s) and other details, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Lighting luminaires.
2. Suspended ceiling components.
3. Partitions and millwork that penetrate the ceiling or extend to within 12 inches of the plane of the luminaires.
4. Structural members to which equipment and or luminaires will be attached.
5. Initial access modules for acoustical tile, including size and locations.
6. Items penetrating finished ceiling, including the following:

a. Other luminaires.
b. Air outlets and inlets.
c. Speakers.
d. Sprinklers.
e. Access panels.
f. Ceiling-mounted projectors.

7. Moldings.

B. Qualification Data: For testing laboratory providing photometric data for luminaires.

C. Seismic Qualification Certificates: For luminaires, accessories, and components, from manufacturer.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.

D. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

E. Product Certificates: For each type of luminaire.

F. Product Test Reports: For each luminaire, for tests performed by manufacturer and witnessed by a qualified testing agency.

G. Sample warranty.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For luminaires and lighting systems to include in operation and maintenance manuals.

1. Provide a list of all lamp types used on Project; use ANSI and/or manufacturers' model numbers.

1.7 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Lamps (Arrays) + Driver(s): One (1) spare for every twenty-five (25) of each type and rating installed. Furnish at least one (1) of each type.
2. Diffusers and Lenses: One (1) for every ten (10) of each type and rating installed. Furnish at least one (1) of each type.
3. Globes and Guards: One (1) for every ten (10) of each type and rating installed. Furnish at least one (1) of each type.

1.8 QUALITY ASSURANCE

A. Luminaire Photometric Data Testing Laboratory Qualifications: Provided by an independent agency, with the experience and capability to conduct the testing indicated, that is an NRTL as defined by OSHA in 29 CFR 1910.7, accredited under the NVLAP for Energy Efficient Lighting Products, and complying with the applicable IES testing standards.

B. Provide luminaires from a single manufacturer for each luminaire type.

C. Each luminaire type shall be binned within a three-step MacAdam Ellipse to ensure color consistency among luminaires.

D. Mockups: For interior lighting luminaires in room or module mockups, complete with power and control connections.

1. Obtain Architect's approval of luminaires in mockups before starting installations.
2. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.

3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Protect finishes of exposed surfaces by applying a strippable, temporary protective covering before shipping.

1.10 WARRANTY

A. Warranty: Manufacturer and Installer agree to repair or replace components of luminaires that fail in materials or workmanship within specified warranty period.

B. Warranty Period: Five (5) years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Luminaires and lamps shall be labeled vibration and shock resistant.

1. The term "withstand" means "the luminaire will remain in place without separation of any parts when subjected to the seismic forces specified and the luminaire will be fully operational during and after the seismic event."

2.2 LUMINAIRE REQUIREMENTS

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. NRTL Compliance: Luminaires for hazardous locations shall be listed and labeled for indicated class and division of hazard by an NRTL.

C. FM Global Compliance: Luminaires for hazardous locations shall be listed and labeled for indicated class and division of hazard by FM Global.

D. Recessed Fixtures: Comply with NEMA LE 4.

E. Bulb shape complying with ANSI C79.1.

F. Lamp base complying with ANSI C81.61 (where applicable).

G. CRI of minimum 80. CCT of 4000K.

H. Rated lamp life of 50,000 hours.

I. Lamps dimmable from one hundred to zero percent (100-0%) of maximum light output.

J. Internal driver.

K. Nominal Operating Voltage: 120-277 VAC.

1. Lens Thickness: At least 0.125-inch minimum unless otherwise indicated.

L. Housings:

1. Extruded-aluminum or aluminum housing and heat sink.
2. Finish approval by Architect and Owner from manufacturer's entire range.

M. Manufacturer – Base of Design

1. See Fixture Schedule on Drawings.

2.3 MATERIALS

A. Metal Parts:

1. Free of burrs and sharp corners and edges.
2. Sheet metal components shall be steel unless otherwise indicated.
3. Form and support to prevent warping and sagging.

B. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position.

C. Diffusers and Globes:

1. Acrylic Diffusers: One hundred percent (100%) virgin acrylic plastic, with high resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.
2. Glass: Annealed crystal glass unless otherwise indicated.
3. Lens Thickness: At least 0.125-inch minimum unless otherwise indicated.

D. Housings:

1. Extruded-aluminum or aluminum housing and heat sink.
2. Powder-coat finish.

E. Factory-Applied Labels: Comply with UL 1598. Include recommended lamps. Locate labels where they will be readily visible to service personnel, but not seen from normal viewing angles when lamps are in place.

1. Label shall include the following lamp characteristics:

a. "USE ONLY" and include specific lamp type.
b. Lamp diameter, shape, size, wattage, and coating.
c. CCT and CRI for all luminaires.

2.4 METAL FINISHES

A. Variations in finishes are unacceptable in the same piece. Variations in finishes of adjoining components are acceptable if they are within the range of approved Samples and if they can be and are assembled or installed to minimize contrast.

2.5 LUMINAIRE FIXTURE SUPPORT COMPONENTS

A. Comply with requirements in Section 260529 "Hangers and Supports for Electrical Systems" for channel and angle iron supports and nonmetallic channel and angle supports.

B. Single-Stem Hangers: ½-inch steel tubing with swivel ball fittings and ceiling canopy. Finish same as luminaire.

C. Wires: ASTM A 641, Class 3, soft temper, zinc-coated steel, 12-gage.

D. Rod Hangers: 3/16-inch minimum diameter, cadmium-plated, threaded steel rod.

E. Hook Hangers: Integrated assembly matched to luminaire, line voltage, and equipment with threaded attachment, cord, and locking-type plug.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine roughing-in for luminaire to verify actual locations of luminaire and electrical connections before fixture installation. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 TEMPORARY LIGHTING

A. If approved by the Architect, use selected permanent luminaires for temporary lighting. When construction is sufficiently complete, clean luminaires used for temporary lighting and install new lamps.

3.3 INSTALLATION

A. Comply with NECA 1.

B. Install luminaires level, plumb, and square with ceilings and walls unless otherwise indicated.

C. Install lamps in each luminaire.

D. Supports:

1. Sized and rated for luminaire weight.
2. Able to maintain luminaire position after cleaning and relamping.
3. Provide support for luminaire without causing deflection of ceiling or wall.
4. Luminaire mounting devices shall be capable of supporting a horizontal force of one hundred twenty-five percent (125%) of luminaire weight and vertical force of four hundred percent (400%) of luminaire weight.

E. Flush-Mounted Luminaire Support:

1. Secured to outlet box.
2. Attached to ceiling structural members at four (4) points equally spaced around circumference of luminaire.

3. Trim ring flush with finished surface.

F. Wall-Mounted Luminaire Support:

1. Attached to structural members in walls or bracing detail if shown on Drawings.
2. Do not attach luminaires directly to gypsum board.

G. Ceiling-Mounted Luminaire Support:

1. Ceiling mount with two (2) 5/32-inch diameter aircraft cable supports adjustable to 120 inches in length.
2. Pendant mount requirements per fixture schedule model number.
3. Ceiling mount with hook mount.

H. Suspended Luminaire Support:

1. Pendants and Rods: Where longer than 48 inches, brace to limit swinging.
2. Stem-Mounted, Single-Unit Luminaires: Suspend with twin-stem hangers. Support with approved outlet box and accessories that hold stem and provide damping of luminaire oscillations. Support outlet box vertically to building structure using approved devices.
3. Continuous Rows of Luminaires: Use tubing or stem for wiring at one (1) point and rod or wire support for suspension for each unit length of luminaire chassis, including one (1) at each end.
4. Do not use ceiling grid as support for pendant luminaires. Connect support wires or rods to building structure.

I. Ceiling-Grid-Mounted Luminaires:

1. Secure to any required outlet box.
2. Secure luminaire to the luminaire opening using approved fasteners in a minimum of four (4) locations, spaced near corners of luminaire.
3. Use approved devices and support components to connect luminaire to ceiling grid and building structure in a minimum of four locations, spaced near corners of luminaire.

J. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables" for wiring connections.

3.4 IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

3.5 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. Operational Test: After installing luminaires, switches, and accessories, and after electrical circuitry has been energized, test units to confirm proper operation.
2. Test for Emergency Lighting: Interrupt power supply to demonstrate proper operation. Verify transfer from normal power to battery power and retransfer to normal.

B. Luminaire will be considered defective if it does not pass operation tests and inspections.

C. Prepare test and inspection reports.

3.6 ADJUSTING

A. Occupancy Adjustments: When requested within twelve (12) months of date of Substantial Completion, provide on-site assistance in adjusting the direction of aim of luminaires to suit occupied conditions. Make up to two (2) visits to Project during other-than-normal hours for this purpose. Some of this work may be required during hours of darkness.

1. During adjustment visits, inspect all luminaires. Replace lamps or luminaires that are defective.
2. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.
3. Adjust the aim of luminaires in the presence of the Architect.

END OF SECTION 265119

SECTION 265219 - EMERGENCY AND EXIT LIGHTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Emergency lighting units.
2. Exit signs.
3. Luminaire supports.

1.3 DEFINITIONS

A. CCT: Correlated color temperature.

B. CRI: Color Rendering Index.

C. Emergency Lighting Unit: A lighting unit with internal or external emergency battery powered supply and the means for controlling and charging the battery and unit operation.

D. Fixture: See "Luminaire" Paragraph.

E. Lumen: Measured output of lamp and luminaire, or both.

F. Luminaire: Complete lighting unit, including lamp, reflector, and housing.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of emergency lighting unit, exit sign, and emergency lighting support.

1. Include data on features, accessories, and finishes.
2. Include physical description of the unit and dimensions.
3. Battery and charger for light units.
4. Include life, output of luminaire (lumens, CCT, and CRI), and energy-efficiency data.
5. Include photometric data and adjustment factors based on laboratory tests, complying with IES LM-45, for each luminaire type.

a. Testing Agency Certified Data: For all luminaires, photometric data certified by a qualified independent testing agency.

B. Shop Drawings: For nonstandard or custom luminaires.

1. Include plans, elevations, sections, and mounting and attachment details.
2. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

3. Include diagrams for power, signal, and control wiring.

1.5 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Reflected ceiling plan(s) and other details, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Luminaires.
2. Suspended ceiling components.
3. Partitions and millwork that penetrate the ceiling or extend to within 12 inches of the plane of the luminaires.
4. Structural members to which equipment will be attached.
5. Size and location of initial access modules for acoustical tile.
6. Items penetrating finished ceiling including the following:

a. Other luminaires.
b. Air outlets and inlets.
c. Speakers.
d. Ceiling-mounted projectors.
e. Sprinklers.
f. Access panels.

B. Qualification Data: For testing laboratory providing photometric data for luminaires.

C. Product Certificates: For each type of luminaire.

D. Seismic Qualification Certificates: For luminaires, accessories, and components, from manufacturer.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

E. Product Test Reports: For each luminaire for tests performed by a qualified testing agency.

F. Sample Warranty: For manufacturer's warranty.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For luminaires and lighting systems to include in emergency, operation, and maintenance manuals.

1. Provide a list of all lamp types used on Project; use ANSI and manufacturers' codes.

1.7 QUALITY ASSURANCE

A. Luminaire Photometric Data Testing Laboratory Qualifications: Provided by an independent agency, with the experience and capability to conduct the testing indicated, that is an NRTL as defined by OSHA in 29 CFR 1910.7, accredited under the National Volunteer Laboratory Accreditation Program for Energy Efficient Lighting Products, and complying with the applicable IES testing standards.

B. FM Global Compliance: Luminaires for hazardous locations shall be listed and labeled for indicated class and division of hazard by FM Global.

C. Mockups: For interior luminaires in room or module mockups, complete with power and control connections.

1. Obtain Architect's approval of luminaires and signs in mockups before starting installations.
2. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Protect finishes of exposed surfaces by applying a strippable, temporary protective covering before shipping.

1.9 WARRANTY

A. Warranty: Manufacturer and Installer agree to repair or replace components of luminaires that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Two (2) years from date of Substantial Completion.

B. Special Warranty for Emergency Lighting Batteries: Manufacturer's standard form in which manufacturer of battery-powered emergency lighting unit agrees to repair or replace components of rechargeable batteries that fail in materials or workmanship within specified warranty period.

1. Warranty Period for Emergency Power Unit Batteries: Five (5) years from date of Substantial Completion. Full warranty shall apply for first year and prorated warranty for the remaining four (4) years.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Luminaires shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

1. The term "withstand" means "the luminaire will remain in place without separation of any parts when subjected to the seismic forces specified and the luminaire will be fully operational during and after the seismic event."

2.2 GENERAL REQUIREMENTS FOR EMERGENCY LIGHTING

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. NRTL Compliance: Fabricate and label emergency lighting units, exit signs, and batteries to comply with UL 924.

C. Comply with NFPA 70 and NFPA 101.

D. Comply with NEMA LE 4 for recessed luminaires.

E. Comply with UL 1598 for fluorescent luminaires.

F. Lamp Base: Comply with ANSI C81.61 or IEC 60061-1.

G. Bulb Shape: Complying with ANSI C79.1.

H. Internal Type Emergency Power Unit: Self-contained, modular, battery-inverter unit, factory mounted within luminaire body.

1. Emergency Connection: Operate one lamp continuously at an output of 1100 lumens each upon loss of normal power. Connect un-switched circuit to battery-inverter unit and switched circuit to luminaire ballast.
2. Operation: Relay automatically turns lamp on when power-supply circuit voltage drops to eighty percent (80%) of nominal voltage or below. Lamp automatically disconnects from battery when voltage approaches deep-discharge level. When normal voltage is restored, relay disconnects lamps from battery, and battery is automatically recharged and floated on charger.
3. Environmental Limitations: Rate equipment for continuous operation under the following conditions unless otherwise indicated:

    a. Ambient Temperature: Less than 0 deg F (minus 18 deg C) or exceeding 104 deg F (40 deg C), with an average value exceeding 95 deg F (35 deg C) over a 24-hour period.
    b. Ambient Storage Temperature: Not less than minus 4 deg F (minus 20 deg C) and not exceeding 140 deg F (60 deg C).
    c. Humidity: More than ninety-five percent (95%) (condensing).
    d. Altitude: Exceeding 3300 feet.
4. Test Push-Button and Indicator Light: Visible and accessible without opening luminaire or entering ceiling space.

    a. Push Button: Push-to-test type, in unit housing, simulates loss of normal power and demonstrates unit operability.
    b. Indicator Light: LED indicates normal power on. Normal glow indicates trickle charge; bright glow indicates charging at end of discharge cycle.

5. Battery: Sealed, maintenance-free, nickel-cadmium or lead-acid type as scheduled.
6. Charger: Fully automatic, solid-state, constant-current type with sealed power transfer relay.
7. Remote Test: Switch in handheld remote device aimed in direction of tested unit initiates coded infrared signal. Signal reception by factory-installed infrared receiver in tested unit triggers simulation of loss of its normal power supply, providing visual confirmation of either proper or failed emergency response.
8. Integral Self-Test: Factory-installed electronic device automatically initiates code-required test of unit emergency operation at required intervals. Test failure is annunciated by an integral audible alarm and a flashing red LED.

I. Refer to Section 260923 “Lighting Control Devices” for requirements for UL924 emergency shunt relays.

2.3 EMERGENCY LIGHTING

A. General Requirements for Emergency Lighting Units: Self-contained units.

B. Emergency Luminaires:

1. Emergency Luminaires: Shall be as indicated on Lighting Fixture Schedule on Drawings and described in Section, with the following additional features:

    a. Operating at nominal voltage of 6 V dc.
    b. Internal emergency power unit.
    c. Rated for installation in damp locations, and for sealed and gasketed luminaires in wet locations.
    d. UL 94 5VA flame rating.

C. Remote Emergency Lighting Units:

1. Emergency Lighting Unit: Shall be as indicated on Lighting Fixture Schedule on Drawings.
2. Operating at nominal voltage of 6 V dc.
3. Wall mount with universal junction box adaptor.
4. UV stable thermoplastic housing, rated for wet locations.
5. Two (2) LED lamp heads.
6. External emergency power unit.

2.4 EXIT SIGNS

A. General Requirements for Exit Signs: Comply with UL 924; for sign colors, visibility, luminance, and lettering size, comply with authorities having jurisdiction.

B. Internally Lighted Signs:

1. Operating at nominal voltage of 277 V ac.
2. Lamps for AC Operation: LEDs; 50,000 hours minimum rated lamp life.
3. Self-Powered Exit Signs (Battery Type): Internal emergency power unit.
4. Master/Remote Sign Configurations:

    a. Master Unit: Comply with requirements above for self-powered exit signs, and provide additional capacity in LED power supply for power connection to remote unit.
    b. Remote Unit: Comply with requirements above for self-powered exit signs, except omit power supply, battery, and test features. Arrange to receive full power requirements from master unit. Connect for testing concurrently with master unit as a unified system.

5. Exit Signs wired to emergency lighting power source (AC type): Shall be wired through a UL 924 listed relay providing connection to emergency lighting circuit with an alternate non-emergency circuit (normal lighting) to power the sign on a loss of the emergency circuit.

C. Photoluminescent Signs:

1. Use strontium oxide aluminate compound to store ambient light and release the stored energy when the light is removed. Include universal bracket for flush-ceiling, wall, or end mounting.

2. Unit shall be UL 924 listed for use above the door and for low-level applications for minimum 90-minute durations.
3. Furnish with extruded aluminum frame and concealed mounting hardware.
4. Chevrons shall be self-adhesive type, meeting NFPA requirements.
5. Unit shall carry 10-year warranty.

D. Specified Signs for Accessible Exit shall meet power and illumination requirements for exit signs. These shall be furnished with universal symbol of accessibility (wheelchair symbol – dynamic character) having a minimum height of 6 inches and meeting the requirements of IBC 1011.1.2.

2.5 MATERIALS

A. Metal Parts:

1. Free of burrs and sharp corners and edges.
2. Sheet metal components shall be steel unless otherwise indicated.
3. Form and support to prevent warping and sagging.

B. Doors, Frames, and Other Internal Access:

1. Smooth operating, free of light leakage under operating conditions.
2. Designed to permit relamping without use of tools.
3. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position.

C. Diffusers and Globes:

1. Prismatic or Clear, UV-stabilized acrylic.
2. Glass: Annealed crystal glass unless otherwise indicated.
3. Acrylic: One hundred percent (100%) virgin acrylic plastic, with high resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.
4. Lens Thickness: At least 0.125-inch minimum unless otherwise indicated.

D. Housings:

1. Extruded aluminum or polycarbonate housing as scheduled.

E. Conduit: Rigid galvanized steel, minimum ¾-inch in diameter.

2.6 METAL FINISHES

A. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.7 LUMINAIRE SUPPORT COMPONENTS

A. Comply with requirements in Section 260529 "Hangers and Supports for Electrical Systems" for channel and angle iron supports and nonmetallic channel and angle supports.

B. Support Wires: ASTM A 641, Class 3, soft temper, zinc-coated steel, 12-gage.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for conditions affecting performance of luminaires.

B. Examine roughing-in for luminaire to verify actual locations of luminaire and electrical connections before luminaire installation.

C. Examine walls, floors, roofs, and ceilings for suitable conditions where emergency lighting luminaires will be installed.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Comply with NECA 1.

B. Install luminaires level, plumb, and square with ceilings and walls unless otherwise indicated.

C. Install lamps in each luminaire.

D. Supports:

1. Sized and rated for luminaire and emergency power unit weight.
2. Able to maintain luminaire position when testing emergency power unit.
3. Provide support for luminaire and emergency power unit without causing deflection of ceiling or wall.
4. Luminaire-mounting devices shall be capable of supporting a horizontal force of one hundred percent (100%) of luminaire and emergency power unit weight and vertical force of four hundred percent (400%) of luminaire weight.

E. Wall-Mounted Luminaire Support:

1. Attached to structural members in walls.
2. Do not attach luminaires directly to gypsum board.

F. Suspended Luminaire Support:

1. Pendants and Rods: Where longer than 48 inches, brace to limit swinging.
2. Stem-Mounted, Single-Unit Luminaires: Suspend with twin-stem hangers. Support with approved outlet box and accessories that hold stem and provide damping of luminaire oscillations. Support outlet box vertically to building structure using approved devices.
3. Do not use ceiling grid as support for pendant luminaires. Connect support wires or rods to building structure.

G. Ceiling Grid Mounted Luminaires:

1. Secure to any required outlet box.
2. Secure emergency power unit using approved fasteners in a minimum of four (4) locations, spaced near corners of emergency power unit.
3. Use approved devices and support components to connect luminaire to ceiling grid and building structure in a minimum of four (4) locations, spaced near corners of luminaire.

3.3 IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

3.4 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. Test for Emergency Lighting: Interrupt power supply to demonstrate proper operation. Verify transfer from normal power to battery power and retransfer to normal.

B. Luminaire will be considered defective if it does not pass operation tests and inspections.

C. Prepare test and inspection reports.

3.5 STARTUP SERVICE

A. Perform startup service:

1. Charge emergency power units and batteries minimum of 24 hours and conduct one-hour discharge test.

3.6 ADJUSTING

A. Adjustments: Within twelve (12) months of date of Substantial Completion, provide on-site visit to do the following:

1. Inspect all luminaires. Replace lamps, emergency power units, batteries, signs, or luminaires that are defective.

a. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.

2. Conduct short-duration tests on all emergency lighting.

END OF SECTION 265219

SECTION 265600 - EXTERIOR LIGHTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Exterior luminaires with lamps and ballasts.
2. Luminaire-mounted photoelectric relays.
3. Poles and accessories.
4. Luminaire lowering devices.

1.3 DEFINITIONS

A. CCT: Correlated color temperature.

B. CRI: Color-rendering index.

C. HID: High-intensity discharge.

D. LER: Luminaire efficacy rating.

E. Luminaire: Complete lighting fixture, including ballast housing if provided.

F. Pole: Luminaire support structure, including tower used for large area illumination.

G. Standard: Same definition as "Pole" above.

1.4 STRUCTURAL ANALYSIS CRITERIA FOR POLE SELECTION

A. Dead Load: Weight of luminaire and its horizontal and vertical supports, lowering devices, and supporting structure, applied as stated in AASHTO LTS-4-M.

B. Live Load: Single load of 500 lbf distributed as stated in AASHTO LTS-4-M.

C. Ice Load: Load of 3 lbf/sq. ft. applied as stated in AASHTO LTS-4-M Ice Load Map.

D. Wind Load: Pressure of wind on pole and luminaire and banners and banner arms, calculated and applied as stated in AASHTO LTS-4-M.

1. Basic wind speed for calculating wind load for poles exceeding 49.2 feet in height is 115 mph.

a. Wind Importance Factor: 1.0.
b. Minimum Design Life: Fifty (50) years.
c. Velocity Conversion Factors: 1.0.

2. Basic wind speed for calculating wind load for poles 50 feet high or less is 100 mph.

    a. Wind Importance Factor: 1.0.
    b. Minimum Design Life: Fifty (50) years.
    c. Velocity Conversion Factors: 1.0.

1.5 SUBMITTALS

A. Product Data: For each luminaire, pole, and support component, arranged in order of lighting unit designation. Include data on features, accessories, finishes, and the following:

1. Physical description of luminaire, including materials, dimensions, effective projected area, and verification of indicated parameters.
2. Details of attaching luminaires and accessories.
3. Details of installation and construction.
4. Luminaire materials.
5. Photometric data based on laboratory tests of each luminaire type, complete with indicated lamps, ballasts, and accessories.

    a. Testing Agency Certified Data: For indicated luminaires, photometric data shall be certified by a qualified independent testing agency. Photometric data for remaining luminaires shall be certified by manufacturer.
    b. Manufacturer Certified Data: Photometric data shall be certified by manufacturer's laboratory with a current accreditation under the National Voluntary Laboratory Accreditation Program for Energy Efficient Lighting Products.

6. Photoelectric relays.
7. Ballasts, including energy-efficiency data.
8. Lamps, including life, output, CCT, CRI, lumens, and energy-efficiency data.
9. Materials, dimensions, and finishes of poles.
10. Means of attaching luminaires to supports, and indication that attachment is suitable for components involved.
11. Anchor bolts for poles.
12. Manufactured pole foundations.

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
2. Anchor-bolt templates keyed to specific poles and certified by manufacturer.
3. Design calculations, certified by a qualified professional engineer, indicating strength of screw foundations and soil conditions on which they are based.
4. Wiring Diagrams: For power, signal, and control wiring.

C. Samples: For products designated for sample submission in the Exterior Lighting Device Schedule. Each Sample shall include lamps and ballasts.

D. Pole and Support Component Certificates: Signed by manufacturers of poles, certifying that products are designed for indicated load requirements in AASHTO LTS-4-M and that load imposed by luminaire and attachments has been included in design. The certification shall be based on design calculations by a professional engineer.

E. Qualification Data: For qualified agencies providing photometric data for lighting fixtures.

F. Field quality-control reports.

G. Operation and Maintenance Data: For luminaires and poles include in emergency, operation, and maintenance manuals.

H. Warranty: Sample of special warranty.

1.6 QUALITY ASSURANCE

A. Luminaire Photometric Data Testing Laboratory Qualifications: Provided by an independent agency, with the experience and capability to conduct the testing indicated, that is an NRTL as defined by OSHA in 29 CFR 1910.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. Comply with IEEE C2, "National Electrical Safety Code."

D. Comply with NFPA 70.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Package aluminum poles for shipping according to ASTM B 660.

B. Store poles on decay-resistant-treated skids at least 12 inches above grade and vegetation. Support poles to prevent distortion and arrange to provide free air circulation.

C. Retain factory-applied pole wrappings on fiberglass and laminated wood poles until right before pole installation. Handle poles with web fabric straps.

D. Retain factory-applied pole wrappings on metal poles until right before pole installation. For poles with nonmetallic finishes, handle with web fabric straps.

1.8 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace products that fail in materials or workmanship; that corrode; or that fade, stain, perforate, erode, or chalk due to effects of weather or solar radiation within specified warranty period. Manufacturer may exclude lightning damage, hail damage, vandalism, abuse, or unauthorized repairs or alterations from special warranty coverage.

1. Warranty Period for Luminaires: Five (5) years from date of Substantial Completion.
2. Warranty Period for Metal Corrosion: Five (5) years from date of Substantial Completion.
3. Warranty Period for Color Retention: Five (5) years from date of Substantial Completion.
4. Warranty Period for Poles: Repair or replace lighting poles and standards that fail in finish, materials, and workmanship within manufacturer's standard warranty period, but not less than three (3) years from date of Substantial Completion.

1.9 EXTRA MATERIALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Lamps: One (1) for every one hundred (100) of each type and rating installed. Furnish at least one (1) of each type.

2. Glass and Plastic Lenses, Covers, and Other Optical Parts: One (1) for every one hundred (100) of each type and rating installed. Furnish at least one (1) of each type.
3. Drivers: One (1) for every one hundred (100) of each type and rating installed. Furnish at least one (1) of each type.
4. Globes and Guards: One (1) for every twenty (20) of each type and rating installed. Furnish at least one (1) of each type.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, product(s) indicated on Drawings.

2.2 GENERAL REQUIREMENTS FOR LUMINAIRES

A. Luminaires shall comply with UL 1598 and be listed and labeled for installation in wet locations by an NRTL acceptable to authorities having jurisdiction.

1. LER Tests Incandescent Fixtures: Where LER is specified, test according to NEMA LE 5A.
2. LER Tests Fluorescent Fixtures: Where LER is specified, test according to NEMA LE 5 and NEMA LE 5A as applicable.
3. LER Tests HID Fixtures: Where LER is specified, test according to NEMA LE 5B.

B. Lateral Light Distribution Patterns: Comply with IESNA RP-8 for parameters of lateral light distribution patterns indicated for luminaires.

C. Metal Parts: Free of burrs and sharp corners and edges.

D. Sheet Metal Components: Corrosion-resistant aluminum unless otherwise indicated. Form and support to prevent warping and sagging.

E. Housings: Rigidly formed, weather- and light-tight enclosures that will not warp, sag, or deform in use. Provide filter/breather for enclosed luminaires.

F. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position. Doors shall be removable for cleaning or replacing lenses. Designed to disconnect ballast when door opens.

G. Exposed Hardware Material: Stainless steel.

H. Plastic Parts: High resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.

I. Light Shields: Metal baffles, factory installed and field adjustable, arranged to block light distribution to indicated portion of normally illuminated area or field.

J. Reflecting surfaces shall have minimum reflectance as follows unless otherwise indicated:

1. White Surfaces: Eighty-five percent (85%).
2. Specular Surfaces: Eighty-three percent (83%).

3. Diffusing Specular Surfaces: Seventy-five percent (75%).

K. Lenses and Refractors Gaskets: Use heat- and aging-resistant resilient gaskets to seal and cushion lenses and refractors in luminaire doors.

L. Luminaire Finish: Manufacturer's standard paint applied to factory-assembled and -tested luminaire before shipping. Where indicated, match finish process and color of pole or support materials.

M. Factory-Applied Finish for Steel Luminaires: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

1. Surface Preparation: Clean surfaces to comply with SSPC-SP 1, "Solvent Cleaning," to remove dirt, oil, grease, and other contaminants that could impair paint bond. Grind welds and polish surfaces to a smooth, even finish. Remove mill scale and rust, if present, from uncoated steel, complying with SSPC-SP 5/NACE No. 1, "White Metal Blast Cleaning," or SSPC-SP 8, "Pickling."
2. Exterior Surfaces: Manufacturer's standard finish consisting of one (1) or more coats of primer and two (2) finish coats of high-gloss, high-build polyurethane enamel.

    a. Color: As selected by Architect from manufacturer's full range.

N. Factory-Applied Finish for Aluminum Luminaires: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

1. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.
2. Class I, Color Anodic Finish: AA-M32C22A42/A44 (Mechanical Finish: medium satin; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class I, integrally colored or electrolytically deposited color coating 0.018-mm or thicker) complying with AAMA 611.

    a. Color: Dark bronze.

O. Factory-Applied Labels: Comply with UL 1598. Include recommended lamps and ballasts. Labels shall be located where they will be readily visible to service personnel, but not seen from normal viewing angles when lamps are in place.

1. Label shall include the following lamp and ballast characteristics:

    a. "USES ONLY" and include specific lamp type.
    b. Lamp diameter code (T-4, T-5, T-8, T-12), tube configuration (twin, quad, triple), base type, and nominal wattage for fluorescent and compact fluorescent luminaires.
    c. Lamp type, wattage, bulb type (ED17, BD56, etc.) and coating (clear or coated) for HID luminaires.
    d. Start type (preheat, rapid start, instant start) for fluorescent and compact fluorescent luminaires.
    e. ANSI ballast type (M98, M57, etc.) for HID luminaires.
    f. CCT and CRI for all luminaires.

2.3 LUMINAIRE-MOUNTED PHOTOELECTRIC RELAYS

A. Comply with UL 773 or UL 773A.

B. Contact Relays: Factory mounted, single throw, designed to fail in the on position, and factory set to turn light unit on at 1.5 to 3 fc and off at 4.5 to 10 fc with 15 second minimum time delay. Relay shall have directional lens in front of photocell to prevent artificial light sources from causing false turnoff.

1. Relay with locking-type receptacle shall comply with ANSI C136.10.
2. Adjustable window slide for adjusting on-off set points.

2.4 GENERAL REQUIREMENTS FOR POLES AND SUPPORT COMPONENTS

A. Structural Characteristics: Comply with AASHTO LTS-4-M.

1. Wind-Load Strength of Poles: Adequate at indicated heights above grade without failure, permanent deflection, or whipping in steady winds of speed indicated in "Structural Analysis Criteria for Pole Selection" Article.
2. Strength Analysis: For each pole, multiply the actual equivalent projected area of luminaires and brackets by a factor of 1.1 to obtain the equivalent projected area to be used in pole selection strength analysis.

B. Luminaire Attachment Provisions: Comply with luminaire manufacturers' mounting requirements. Use stainless-steel fasteners and mounting bolts unless otherwise indicated.

C. Mountings, Fasteners, and Appurtenances: Corrosion-resistant items compatible with support components.

1. Materials: Shall not cause galvanic action at contact points.
2. Anchor Bolts, Leveling Nuts, Bolt Caps, and Washers: Hot-dip galvanized after fabrication unless otherwise indicated.
3. Anchor-Bolt Template: Plywood or steel.

D. Handhole: Oval-shaped, with minimum clear opening of 2½ by 5 inches with cover secured by stainless-steel captive screws. Provide on all, except wood poles.

E. Concrete Pole Foundations: Cast in place or precast, with anchor bolts to match pole-base flange. Concrete, reinforcement, and formwork are specified in Section 033000 "Cast-in-Place Concrete."

F. Power-Installed Screw Foundations: Factory fabricated by pole manufacturer, with structural steel complying with ASTM A 36 and hot-dip galvanized according to ASTM A 123; and with top-plate and mounting bolts to match pole base flange and strength required to support pole, luminaire, and accessories.

G. Breakaway Supports: Frangible breakaway supports, tested by an independent testing agency acceptable to authorities having jurisdiction, according to AASHTO LTS-4-M.

2.5 ALUMINUM POLES

A. Poles: Seamless, extruded structural tube complying with ASTM B 429, Alloy 6063-T6 with access handhole in pole wall.

B. Poles: ASTM B 209, 5052-H34 marine sheet alloy with access handhole in pole wall.

1. Shape: Round straight.
2. Mounting Provisions: Butt flange for bolted mounting on foundation or breakaway support.

C. Pole-Top Tenons: Fabricated to support luminaire or luminaires and brackets indicated, and securely fastened to pole top.

D. Grounding and Bonding Lugs: Welded ½-inch threaded lug, complying with requirements in Section 260526 "Grounding and Bonding for Electrical Systems," listed for attaching grounding and bonding conductors of type and size listed in that Section, and accessible through handhole.

E. Brackets for Luminaires: Detachable, with pole and adapter fittings of cast aluminum. Adapter fitting welded to pole and bracket, then bolted together with stainless-steel bolts.

1. Tapered oval cross section, with straight tubular end section to accommodate luminaire.
2. Finish: Same as pole.

F. Aluminum Finish: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

1. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.
2. Class I, Color Anodic Finish: AA-M32C22A42/A44 (Mechanical Finish: medium satin; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class I, integrally colored or electrolytically deposited color coating 0.018-mm or thicker) complying with AAMA 611.

a. Color: As selected by Architect and Owner from manufacturer's full range.

2.6 POLE ACCESSORIES

A. Minimum 1800-W transformer, protected by replaceable fuses, mounted behind access cover.

B. Base Covers: Manufacturers' standard metal units, arranged to cover pole's mounting bolts and nuts. Finish same as pole.

C. Transformer Type Base: Same material and color as pole. Coordinate dimensions to suit pole's base flange and accept indicated accessories.

PART 3 - EXECUTION

3.1 LUMINAIRE INSTALLATION

A. Install lamps in each luminaire.

B. Fasten luminaire to indicated structural supports.

1. Use fastening methods and materials selected to resist seismic forces defined for the application and approved by manufacturer.

C. Adjust luminaires that require field adjustment or aiming. Include adjustment of photoelectric device to prevent false operation of relay by artificial light sources, favoring a north orientation.

3.2 POLE INSTALLATION

A. Alignment: Align pole foundations and poles for optimum directional alignment of luminaires and their mounting provisions on the pole.

B. Clearances: Maintain the following minimum horizontal distances of poles from surface and underground features unless otherwise indicated on Drawings:

1. Fire Hydrants and Storm Drainage Piping: 60 inches.
2. Water, Gas, Electric, Communication, and Sewer Lines: 10 feet.
3. Trees: 15 feet from tree trunk.

C. Concrete Pole Foundations: Set anchor bolts according to anchor-bolt templates furnished by pole manufacturer. Concrete materials, installation, and finishing requirements are specified in Section 033000 "Cast-in-Place Concrete."

D. Foundation-Mounted Poles: Mount pole with leveling nuts, and tighten top nuts to torque level recommended by pole manufacturer.

1. Use anchor bolts and nuts selected to resist seismic forces defined for the application and approved by manufacturer.
2. Grout void between pole base and foundation. Use non-shrink or expanding concrete grout firmly packed to fill space.
3. Install base covers unless otherwise indicated.
4. Use a short piece of ½-inch diameter pipe to make a drain hole through grout. Arrange to drain condensation from interior of pole.

E. Embedded Poles with Concrete Backfill: Set poles in augered holes to depth below finished grade indicated on Drawings, but not less than one-sixth of pole height.

1. Make holes 6 inches in diameter larger than pole diameter.
2. Fill augered hole around pole with air-entrained concrete having a minimum compressive strength of 3000 psi at twenty-eight (28) days, and finish in a dome above finished grade.
3. Use a short piece of ½-inch diameter pipe to make a drain hole through concrete dome. Arrange to drain condensation from interior of pole.
4. Cure concrete a minimum of 72 hours before performing work on pole.

F. Poles and Pole Foundations Set in Concrete Paved Areas: Install poles with minimum of 6-inch wide, unpaved gap between the pole or pole foundation and the edge of adjacent concrete slab. Fill unpaved ring with pea gravel to a level 1 inch below top of concrete slab.

G. Raise and set poles using web fabric slings (not chain or cable).

3.3 BOLLARD LUMINAIRE INSTALLATION

A. Align units for optimum directional alignment of light distribution.

B. Install on concrete base with top 4 inches above finished grade or surface at bollard location. Cast conduit into base, and shape base to match shape of bollard base. Finish by troweling and rubbing smooth. Concrete materials, installation, and finishing are specified in Section 033000 "Cast-in-Place Concrete."

3.4 INSTALLATION OF INDIVIDUAL GROUND-MOUNTING LUMINAIRES

A. Install on concrete base with top 4 inches above finished grade or surface at luminaire location. Cast conduit into base, and finish by troweling and rubbing smooth. Concrete materials, installation, and finishing are specified in Section 033000 "Cast-in-Place Concrete."

3.5 CORROSION PREVENTION

A. Aluminum: Do not use in contact with earth or concrete. When in direct contact with a dissimilar metal, protect aluminum by insulating fittings or treatment.

B. Steel Conduits: Comply with Section 260533 "Raceway and Boxes for Electrical Systems." In concrete foundations, wrap conduit with 0.010-inch thick, pipe-wrapping plastic tape applied with a fifty percent (50%) overlap.

3.6 GROUNDING

A. Ground metal poles and support structures according to Section 260526 "Grounding and Bonding for Electrical Systems."

1. Install grounding electrode for each pole unless otherwise indicated.
2. Install grounding conductor pigtail in the base for connecting luminaire to grounding system.

B. Ground nonmetallic poles and support structures according to Section 260526 "Grounding and Bonding for Electrical Systems."

1. Install grounding electrode for each pole.
2. Install grounding conductor and conductor protector.
3. Ground metallic components of pole accessories and foundations.

3.7 FIELD QUALITY CONTROL

A. Inspect each installed fixture for damage. Replace damaged fixtures and components.

B. Illumination Observations: Verify normal operation of lighting units after installing luminaires and energizing circuits with normal power source.

1. Verify operation of photoelectric controls.

C. Illumination Tests:

1. Measure light intensities at night. Use photometers with calibration referenced to NIST standards. Comply with the following IESNA testing guide(s):

a. IESNA LM-5, "Photometric Measurements of Area and Sports Lighting Installations."
b. IESNA LM-50, "Photometric Measurements of Roadway Lighting Installations."
c. IESNA LM-52, "Photometric Measurements of Roadway Sign Installations."
d. IESNA LM-64, "Photometric Measurements of Parking Areas."
e. IESNA LM-72, "Directional Positioning of Photometric Data."

D. Prepare a written report of tests, inspections, observations, and verifications indicating and interpreting results. If adjustments are made to lighting system, retest to demonstrate compliance with standards.

3.8 DEMONSTRATION

A. Train Owner's maintenance personnel to adjust, operate, and maintain luminaire lowering devices.

END OF SECTION 265600

SECTION 271000 - STRUCTURED CABLING

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Communications system design requirements.

B. Communications pathways.

C. Copper cable and terminations.

D. Fiber optic cable, terminations, and interconnecting devices.

E. Communications equipment room fittings.

F. Communications outlets.

G. Communications grounding and bonding.

H. Communications identification.

I. Cabling testing procedures.

1.2 RELATED REQUIREMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

B. Division 07 - Firestopping.

C. Division 26 - Grounding and Bonding for Electrical Systems.

1. Includes intersystem bonding termination.
2. Includes bonding jumpers for bonding of communications systems and electrical system grounding.

D. Division 26 - Conduit for Electrical Systems.

E. Division 26 - Cable Trays for Electrical Systems.

F. Division 26 - Boxes for Electrical Systems.

G. Division 26 - Underfloor Raceways for Electrical Systems.

H. Division 26 - Identification for Electrical Systems: Identification products.

I. Division 26 - Wiring Devices.

J. Division 33 - Electrical Underground Ducts, Ductbanks, and Manholes.

1.3 Definitions

A. BICSI: Building Industry Consulting Services International

B. EIA: Electronic Industries Association

C. TIA: Telecommunications Industries Association

D. UL: Underwriters Laboratory

E. NFPA: National Fire Protection Association

1.4 REFERENCE STANDARDS

A. ANSI/TIA-1152-A - Requirements for Field Test Instruments and Measurements for Balanced Twisted-Pair Cabling.

B. ANSI/TIA-568-0.D - Generic Telecommunications Cabling for Customer Premises.

C. BICSI N1 - Installation Practices for Telecommunications and ICT Cabling and Related Cabling Infrastructure, 1st Edition 2019.

D. EIA/ECA-310 - Cabinets, Racks, Panels, and Associated Equipment Revision E, 2005.

E. FM (AG) - FM Approval Guide current edition.

F. ICEA S-83-596 - Indoor Optical Fiber Cables 2016.

G. ICEA S-90-661 - Category 3, 5, & 5e Individually Unshielded Twisted Pair Indoor Cables (With or Without An Overall Shield) For Use in General Purpose and LAN Communications Wiring Systems Technical Requirements 2012.

H. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

I. TIA-455-21 - FOTP-21 - Mating Durability of Fiber Optic Interconnecting Devices 1988a (Reaffirmed 2012).

J. TIA-492AAAA - Detail Specification for 62.5-um Core Diameter/125-um Cladding Diameter Class Ia Graded-Index Multimode Optical Fibers 2009b.

K. TIA-492AAAB - Detail Specification for 50-um Core Diameter/125-um Cladding Diameter Class Ia Graded-Index Multimode Optical Fibers 2009a.

L. TIA-492AAAC - Detail Specification for 850-nm Laser-Optimized, 50-um Core Diameter/125-um Cladding Diameter Class Ia Graded-Index Multimode Optical Fibers 2009b.

M. TIA-492AAAD - Detail Specification for 850-nm Laser-Optimized, 50-um Core Diameter/125-um Cladding Diameter Class Ia Graded-Index Multimode Optical Fibers 2009.

N. TIA-492CAAA - Detail Specification for Class IVa Dispersion-Unshifted Single-Mode Optical Fibers 1998 (Reaffirmed 2002).

O. TIA-492CAAB - Detail Specification for Class IVa Dispersion-Unshifted Single-Mode Optical Fibers with Low Water Peak 2000 (Reaffirmed 2005).

P. TIA-526-7 - Measurement of Optical Power Loss of Installed Single-Mode Fiber Cable Plant 2015a.

Q. TIA-526-14 - Optical Power Loss Measurement of Installed Multimode Fiber Cable Plant 2015c.

R. TIA-568 (SET) - Commercial Building Telecommunications Cabling Standard Set 2019.

S. TIA-568.2 - Balanced Twisted-Pair Telecommunications Cabling and Components Standard 2018d.

T. TIA-568.3 - Optical Fiber Cabling and Components Standard 2016d.

U. TIA-569 - Telecommunications Pathways and Spaces 2019e.

V. TIA-598 - Optical Fiber Cable Color Coding 2014d.

W. TIA-606 - Administration Standard for Telecommunications Infrastructure 2017c.

X. TIA-607 - Generic Telecommunications Bonding and Grounding (Earthing) for Customer Premises 2019d.

Y. UL (DIR) - Online Certifications Directory Current Edition.

Z. UL 444 - Communications Cables Current Edition, Including All Revisions, and Edition 5, 2017.

AA. UL 514C - Nonmetallic Outlet Boxes, Flush-Device Boxes, and Covers Current Edition, Including All Revisions.

BB. UL 1651 - Fiber Optic Cable Current Edition, Including All Revisions.

CC. UL 1863 - Communications-Circuit Accessories Current Edition, Including All Revisions.

1.5 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate requirements for service entrance and entrance facilities with Communications Service Provider.
2. Coordinate the work with other trades to avoid placement of other utilities or obstructions within the spaces dedicated for communications equipment.
3. Coordinate arrangement of communications equipment with the dimensions and clearance requirements of the actual equipment to be installed.
4. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

B. Arrange for Communications Service Provider to provide service.

C. Preinstallation Meeting: Convene prior to commencing work of this section, as requested of the GC or Owner, to review service requirements and details with Communications Service Provider representative.

1.6 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for each product.

C. Sustainable Design Documentation: Submit manufacturer's product data on cable and cable insulation showing compliance with specified lead content requirements.

D. Shop Drawings: Show compliance with requirements on isometric schematic diagram of network layout, showing cable routings, telecommunication closets, rack and enclosure layouts and locations, service entrance, and grounding, prepared and approved by BICSI Registered Communications Distribution Designer (RCDD).

E. Evidence of qualifications for installer.

F. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, installation, and operation of product.

G. Test Plan: Complete and detailed plan, with list of test equipment, procedures for inspection and testing, and intended test date; submit at least 60 days prior to intended test date.

H. Field Test Reports.

I. Copper and Fiber Test reports. Document data for each measurement. Data for submittals shall be printed in a summary report that is formatted similar to Table 10.1 in BICSI TDMM, or transferred from the instrument to the computer, saved as text files, and printed and submitted.

J. Installation contractor shall register all copper and fiber test results with the manufacturer(s) to attain the manufacturers extended warranty on labor an material. The manufacturer's approved documentation shall be delivered to the Owner.

K. Project Record Documents: Prepared and approved by BICSI Registered Communications Distribution Designer (RCDD).

1. Record actual locations of outlet boxes and Data Rooms.
2. Show as-installed color coding, pair assignment, polarization, and cross-connect layout.
3. Identify Data Rooms and equipment rooms by room number on drawings.

L. Operation and Maintenance Data: List of all components with part numbers, sources of supply, and operation and maintenance instructions; include copy of project record documents

1.7 QUALITY ASSURANCE

A. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

B. Manufacturer Qualifications: At least 3 years experience manufacturing products of the type specified. experience in the installation and testing of the type of system specified, and:

C. Installer Qualifications: A company having at least 3 years experience in the installation and testing of the type of system specified, and:

1. Employing a BICSI Registered Communications Distribution Designer (RCDD).
2. Supervisors and installers factory certified by manufacturers of products to be installed.
3. Employing BICSI Registered Cabling Installation Technicians (RCIT) for supervision of all work.

D. Products: Listed, classified, and labeled as suitable for the purpose intended.

E. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

F. Telecommunications Pathways and Spaces: Comply with TIA/EIA-569-A.

G. Grounding: Comply with ANSI-J-STD-607-A.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

B. Keep stored products clean, dry and in a temperature permitted by the manufacturer.

C. Test cables upon receipt at Project site.

1. Test optical fiber cable to determine the continuity of the strand end to end. Use optical loss test set.
2. Test optical fiber cable while on reels. Use an optical time domain reflectometer to verify the cable length and locate cable defects, splices, and connector, including the loss value of each. Retain test data and include the record in maintenance data.
3. Test each pair of UTP cable for open and short circuits.

1.9 WARRANTY

A. See Section 017800 - Closeout Submittals, for additional warranty requirements.

B. Correct defective Work within a 2 year period after Date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SYSTEM DESIGN

A. Provide a complete permanent system of cabling and pathways for voice, data, audio visual, and security communications, including cables, conduits and wireways, pull wires, support structures, enclosures and cabinets, and outlets.

1. Comply with TIA-568 (SET) (cabling) and TIA-569 (pathways) (commercial standards).
2. Comply with Communications Service Provider requirements.
3. Provide fixed cables and pathways that comply with NFPA 70 and TIA-607 and are UL listed or third party independent testing laboratory certified.
4. Provide connection devices that are rated for operation under conditions of 32 to 140 degrees F (0 to 60 degrees C) at relative humidity of 0 to 95 percent, noncondensing.
5. In this project, the term plenum is defined as return air spaces above ceilings, inside ducts, under raised floors, and other air-handling spaces.

B. System Description:

1. Building Entrance / Service Provider Cable: By others.
2. Backbones - Within Buildings: Copper, Category 3, 25 Pair
3. Backbones - Within Building: OM4 Multimode Fiber, 12 Strand
4. Horizontal - Provide Category 6A plenum voice and data cabling, termination devices, and outlets per drawings.
5. Provide additional outlets where indicated on drawings.

C. Equipment Room (ER)/ Main Distribution Frame (MDF): Centrally located support structure for terminating horizontal cables that extend to telecommunications outlets, functioning as point of presence to external service provider.

D. Telecommunication Rooms (TRs)/ Intermediate Distribution Frame (IDF): Support structures for terminating horizontal cables that extend to telecommunications outlets.

E. Backbone Cabling: Cabling, pathways, and terminal hardware connecting Telecommunication Rooms (TRs/IDFs) with Equipment Room (ER/MDF), wired in star topology with Equipment Room (ER) at center hub of star.

F. Cabling to Outlets: Specified horizontal cabling, wired in star topology to Equipment Room or Telecommunication Room located at center hub of star; also referred to as "links".

2.2 PATHWAYS

A. General Requirements: Comply with TIA/EIA-569-C.

B. Cable Support: NRTL labeled for support of Category 5E and above cabling, designed to prevent degradation of cable performance and pinch points that could damage cable.

1. Support brackets with cable tie slots for fastening cable ties to brackets.
2. Lacing bars, spools, J-hooks, and D-rings.
3. Straps and other devices.

C. Conduit: As specified in Division 260533.13; provide pull cords in all conduit.

D. Cable Trays: As specified in Division 260536.

E. Underfloor Ducts: As specified in Division 260539.

F. Overhead Service Entrance: Weatherhead or service entrance fitting located on outside of building with galvanized rigid steel or intermediate metallic conduit running to entrance facility.

G. Underground Service Entrance: Rigid polyvinyl chloride (PVC) conduit, Schedule 40.

H. Firestop Sleeves: Listed; provide as required to preserve fire resistance rating of building elements.

1. Products:

a. Hilti Fire Stopping Products; www.hilti.com
b. STI Fire Stopping Products; www.stifirestop.com
c. HoldRite, a brand of Reliance Worldwide Corporation; HydroFlame Pro Series/HydroFlame Custom Built: www.holdrite.com/#sle.
d. Approved Equivalents
e. Substitutions: See Section 016000 - Product Requirements.

2.3 FIrestopping

A. Comply with requirements in Division 07 Section "Penetration Firestopping."

B. Comply with TIA/EIA-569-C.

C. Comply with BICSI TDMM, "Firestopping System" Article.

2.4 Copper Cable and terminations

A. Manufacturers:

1. Berk-Tek
2. Superior Essex
3. Belden
4. Leviton
5. Hubbell Premise Wiring
6. Panduit
7. Siemon
8. Substitutions: See Section 016000 - Product Requirements.

B. Copper Horizontal Cable:

1. Description: 100 ohm, balanced twisted pair cable complying with TIA-568.2 and listed and labeled as complying with UL 444.
2. Cable Type: Voice and Data: TIA-568.2 Category 6A UTP; 23 AWG.
3. Cable Type - Voice: TIA-568.2 Category 5e UTP (unshielded twisted pair); 24 AWG.
4. Cable Capacity: 4-pair.

C. Cable Applications: Use listed NFPA 70 Type CMP plenum cable unless otherwise indicated.

1. Cable Applications:

a. Plenum Applications: Use listed NFPA 70 Type CMP plenum cable.
b. Cable Jacket Color - Voice and Data Cable: Blue.

D. Copper Cable Terminations: Insulation displacement connection (IDC) type using appropriate tool; use screw connections only where specifically indicated.

E. Jacks and Connectors: Modular 8P8C (RJ-45), non-keyed, terminated with 110-style insulation displacement connectors (IDC); high impact thermoplastic housing; suitable for and complying with same standard as specified horizontal cable; UL 1863 listed.

1. Performance: 500 mating cycles.
2. Voice and Data Jacks: 8-position modular jack, color-coded for both T568A and T568B wiring configurations.

F. Copper Patch Cords:

1. Description: Factory-fabricated 4-pair cable assemblies with 8-position modular connectors terminated at each end.

2.5 FIBER OPTIC CABLE AND INTERCONNECTING DEVICES

A. Manufacturers:

1. Berk-Tek
2. Superior Essex
3. Belden
4. Panduit
5. Hubbell Premise Wiring
6. Corning
7. Substitutions: See Section 016000 - Product Requirements.

B. Fiber Optic Backbone Cable:

1. Description: Tight buffered, non-conductive fiber optic cable complying with TIA-568.3, TIA-598, ICEA S-83-596 and listed as complying with UL 444 and UL 1651.
2. Cable Type: Multimode, laser-optimized 50/125 um (OM4) complying with TIA-492AAAD.
3. Cable Capacity: Quantity of fibers as indicated on drawings; 24-fiber.
4. Cable Applications:

    a. Plenum Applications: Use listed NFPA 70 Type OFNP plenum cable.

5. Cable Jacket Color:

    a. Laser-Optimized Multimode Fiber (OM3/OM4): Aqua.
    b. Multimode Fiber (OM1/OM2): Orange.
    c. Single-Mode Fiber (OS1/OS2): Yellow.

C. Fiber Optic Horizontal Cable:

1. Description: Tight buffered, non-conductive fiber optic cable complying with TIA-568.3, ICEA S-83-596 and listed as complying with UL 444 and UL 1651.
2. Cable Type: Multimode, laser-optimized 50/125 um (OM4) complying with TIA-492AAAD
3. Cable Capacity: 2-fiber; Quantity of fibers as indicated on drawings.
4. Cable Applications: Use listed NFPA 70 Type OFNP plenum cable unless otherwise indicated.
5. Cable Jacket Color:

    a. Laser-Optimized Multimode Fiber (OM3/OM4): Aqua.
    b. Multimode Fiber (OM1/OM2): Orange.

c. Single-Mode Fiber (OS1/OS2): Yellow.

D. Fiber Optic Interconnecting Devices:

1. Connector Type: Type LC.
2. Connector Performance: 500 mating cycles, when tested in accordance with TIA-455-21.
3. Maximum Attenuation/Insertion Loss: 0.3dB.

2.6 COMMUNICATIONS EQUIPMENT ROOM FITTINGS

A. Copper Cross-Connection Equipment:

1. Manufacturers:

a. Belden
b. Leviton
c. Hubbell Premise Wiring
d. Panduit
e. Siemon
f. Substitutions: See Section 016000 - Product Requirements.

2. Connector Blocks for Category 3 Cabling: Type 66 insulation displacement connectors; capacity sufficient for cables to be terminated plus 25 percent spare.
3. Patch Panels for Copper Cabling: Sized to fit EIA/ECA-310 standard 19 inch (482.6 mm) wide equipment racks; 0.09 inch (2.2 mm) thick aluminum; cabling terminated on Type 110 insulation displacement connectors; printed circuit board interface.

a. Jacks: Non-keyed 8P8C (RJ-45), suitable for and complying with same standard as cable to be terminated; maximum 48 ports per standard width panel.
b. Capacity: Provide ports sufficient for cables to be terminated plus 25 percent spare.
c. Labels: Factory installed laminated plastic nameplates above each port, numbered consecutively; comply with TIA-606.
d. Provide incoming cable strain relief and routing guides on back of panel.

B. Fiber Optic Cross-Connection Equipment:

1. Manufacturers:

a. Belden
b. Leviton
c. Hubbell Premise Wiring
d. Panduit
e. Siemon
f. Substitutions: See Section 016000 - Product Requirements.

2. Patch Panels for Fiber Optic Cabling: Sized to fit EIA/ECA-310 standard 19 inch (482.6 mm) wide equipment racks; 0.09 inch (2.2 mm) thick aluminum.

a. Adapters: As specified above under FIBER OPTIC CABLE AND INTERCONNECTING DEVICES; maximum of 24 duplex adaptors per standard panel width.

b. Labels: Factory installed laminated plastic nameplates above each port, numbered consecutively; comply with TIA-606.
c. Provide incoming cable strain relief and routing guides on back of panel.
d. Provide rear cable management tray at least 8 inches (203 mm) deep with removable cover.
e. Provide dust covers for unused adapters.

C. Backboards: Interior grade plywood without voids, 3/4 inch (19 mm) thick; UL-labeled fire-retardant.

1. Size: As indicated on drawings.
2. Do not paint over UL label.

D. Equipment Frames, Racks and Cabinets:

1. Manufacturers:

a. Chatsworth
b. Great Lakes
c. Hubbell Premise Wiring
d. Panduit
e. Siemon
f. Substitutions: See Section 016000 - Product Requirements.

2. Component Racks: EIA/ECA-310 standard 19 inch (482.6 mm) wide.
3. Wall Mounted Racks: Steel construction, hinged to allow access to back of installed components.

a. Load Rating: 300 pounds.

4. Floor Mounted Racks: Aluminum or steel construction with corrosion resistant finish; vertical and horizontal cable management channels, top and bottom cable troughs, and grounding lug.

a. Load rating: pounds (kg).

5. Freestanding Cabinets: Front and rear doors with locks; removable side panels with locks; vented top and rear door; adjustable leveling feet; cable access in roof and base; grounding bar.

a. Load rating: 1,500 pounds.
b. Roof mounted fan, capacity: 4.

6. Wall Mounted Cabinets: Front doors with locks, louvered side panels, top and bottom cable access, and ground lug.

a. Cover inside of cabinet back with plywood backboard as specified.
b. Load rating: 300 pounds.
c. Roof mounted fan, capacity: 2.
d. Duplex AC power outlet inside cabinet.

7. Cabinets: Steel construction with corrosion resistant finish.
8. Locks: Keyed alike.

E. Cable Management:

1. Manufacturers:

a. Chatsworth
b. Great Lakes
c. Hubbell Premise Wiring
d. Panduit
e. Siemon
f. Substitutions: See Section 016000 - Product Requirements.

2.7 COMMUNICATIONS OUTLETS

A. Manufacturers:

1. Belden
2. Leviton
3. Hubbell Premise Wiring
4. Panduit
5. Siemon
6. Substitutions: See Section 016000 - Product Requirements.

B. Outlet Boxes: Comply with Section 26 0533.16.

1. Provide depth as required to accommodate cable manufacturer's recommended minimum conductor bend radius.
2. Minimum Size, Unless Otherwise Indicated:

a. Wall Phone Only Outlets: 4 inch by 2 inch by 2-1/8 inch deep (100 by 50 by 54 mm) trade size.
b. Data or Combination Voice/Data Outlets: 4 inch square by 2-1/8 inch deep (100 by 54 mm) trade size.
c. Fiber Optic Outlets: 4-11/16 inch square by 2-1/8 inch deep (119 by 54 mm) trade size.

C. Wall Plates:

1. Comply with system design standards and UL 514C.
2. Accepts modular jacks/inserts.
3. Capacity:

a. Wall Phone Only Outlets: 1 port.
b. Data or Combination Voice/Data Outlets: 4 ports.

D. Wall Plate Material/Finish - Flush-Mounted Outlets: High impact thermoplastic, color to be selected by Architect during product submissions.

E. GROUNDING AND BONDING COMPONENTS

1. Comply with TIA-607.
2. Comply with Section 260526.

F. IDENTIFICATION PRODUCTS

1. Comply with TIA-606.
2. Comply with Section 260553.

G. SOURCE QUALITY CONTROL

1. See Section 014000 - Quality Requirements, for additional requirements.
2. Factory test cables according to TIA-568 (SET).

PART 3 - EXECUTION

3.1 INSTALLATION - GENERAL

A. Comply with latest editions and addenda of TIA-568 (SET) (cabling), TIA-569 (pathways), TIA-607 (grounding and bonding), BICSI N1, NFPA 70, and SYSTEM DESIGN as specified in PART 2.

B. Coordinate backbone cabling with required protectors and demarcation point provided by the communications service provider.

C. Comply with Communication Service Provider requirements.

D. Grounding and Bonding: Perform in accordance with TIA-607 and NFPA 70.

E. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07 8400.

3.2 INSTALLATION OF PATHWAYS

A. Install pathways with the following minimum clearances:

1. 48 inches (1220 mm) from motors, generators, frequency converters, transformers, x-ray equipment, and uninterruptible power systems.
2. 12 inches (300 mm) from power conduits and cables and panelboards.
3. 5 inches (125 mm) from fluorescent and high frequency lighting fixtures.
4. 6 inches (150mm) from flues, hot water pipes, and steam pipes.

B. Conduit, in Addition to Requirements of Section 26 0533.13:

1. Arrange conduit to provide no more than the equivalent of two 90 degree bend(s) between pull points.
2. Conduit Bends: Inside radius not less than 10 times conduit internal diameter.
3. Arrange conduit to provide no more than 100 feet (30 m) between pull points.
4. Do not use conduit bodies.
5. Minimum Cover - Underground Service Entrance: Comply with NFPA 70 and Communications Service Provider requirements.

C. Pathway Installation in Communications Equipment Rooms:

1. Position conduit ends adjacent to a corner on backboard where a single piece of plywood is installed, or in the corner of room where multiple sheets of plywood are installed around perimeter walls of room.

2. Install cable trays to route cables if conduits cannot be located in these positions.
3. Secure conduits to backboard when entering room from overhead.
4. Extend conduits 3 inches above finished floor.
5. Install metal conduits with grounding bushings and connect with grounding conductor to grounding system.

D. Outlet Boxes:

1. Coordinate locations of outlet boxes provided under Section 26 0533.16 as required for installation of telecommunications outlets provided under this section.

a. Mounting Heights: Unless otherwise indicated, as follows:
   1) Telephone and Data Outlets: 18 inches (450 mm) above finished floor.
   2) Wall mounted Telephone Outlets: 48 inches (1.2 m) above finished floor to top of telephone.

b. Orient outlet boxes for vertical installation of wiring devices unless otherwise indicated.
c. Provide minimum of 24 inches (600 mm) horizontal separation between flush mounted outlet boxes installed on opposite sides of fire rated walls.
d. Unless otherwise indicated, provide separate outlet boxes for line voltage and low voltage devices.
e. Locate outlet boxes so that wall plate does not span different building finishes.
f. Locate outlet boxes so that wall plate does not cross masonry joints.

3.3 INSTALLATION OF EQUIPMENT AND CABLING

A. Cabling:

1. Do not bend cable at radius less than manufacturer's recommended bend radius; for unshielded twisted pair use bend radius of not less than 4 times cable diameter.
2. Do not over-cinch or crush cables.
3. Do not exceed manufacturer's recommended cable pull tension.
4. When installing in conduit, use only lubricants approved by cable manufacturer and do not chafe or damage outer jacket.

B. Wiring Method: Install cables in raceways and J-hooks except where cable trays are required in Drawings. Conceal raceway and cables except in unfinished spaces.

1. 1. Install plenum cable in environmental air spaces, including plenum and non-plenum ceilings.

C. Wiring Method: Conceal conductors and cables in accessible ceilings, walls, and floors where possible.

D. All exposed cabling shall be installed within conduit. Conduit in exposed areas shall match the color of the wall or ceiling it is attached to. Only exceptions are in data rooms, mechanical spaces, and above concealed ceilings.

1. Exposes Areas include but are not limited to:

a. Gymnasiums.
b. All open ceiling spaces.

c. Cabling that is visible above specially designed ceilings.

E. Pre-terminated fiber optic cabling will be accepted. All devices mandated within this specification shall be used to make up this pre-terminated cable.

F. Cabling Installation:

1. Install 110-style IDC termination hardware unless otherwise indicated.
2. MUTOA shall not be used as a cross-connect point.
3. Consolidation points may be used only for making a direct connection to telecommunications outlet/connectors.
4. Do not use consolidation point as a cross-connect point, as a patch connection, or for direct connection to workstation equipment.
5. Locate consolidation points for UTP at least 49 feet from communications equipment room.
6. Terminate all conductors; no cable shall contain unterminated elements. Make terminations only at indicated outlets, terminals, cross-connects, and patch panels.
7. Cables may not be spliced. Secure and support cables at intervals not exceeding 30 inches and not more than 6 inches from cabinets, boxes, fittings, outlets, racks, frames, and terminals.
8. Install lacing bars to restrain cables, to prevent straining connections, and to prevent bending cables to smaller radii than minimums recommended by manufacturer.
9. Bundle, lace, and train conductors to terminal points without exceeding manufacturer's limitations on bending radii, but not less than radii specified in BICSI ITSIM, "Cabling Termination Practices" Chapter. Install lacing bars and distribution spools.
10. Do not install bruised, kinked, scored, deformed, or abraded cable. Do not splice cable between termination, tap, or junction points. Remove and discard cable if damaged during installation and replace it with new cable.
11. Cold-Weather Installation: Bring cable to room temperature before dereeling. Heat lamps shall not be used for heating.

G. Service Loops (Slack or Excess Length): Provide the following minimum extra length of cable, looped neatly:

1. At Distribution Frames: 120 inches (3000 mm).
2. At Outlets - Copper: 12 inches (305 mm).
3. At Outlets - Optical Fiber: 39 inches (1000 mm).

H. Copper Cabling:

1. Category 5e and Above: Maintain cable geometry; do not untwist more than 1/2 inch (12 mm) from point of termination.
2. For 4-pair cables in conduit, do not exceed 25 pounds (110 N) pull tension.
3. Use T568B wiring configuration.

I. Fiber Optic Cabling:

1. Prepare for pulling by cutting outer jacket for 10 inches (250 mm) from end, leaving strength members exposed. Twist strength members together and attach to pulling eye.
2. Support vertical cable at intervals as recommended by manufacturer.

J. Wall-Mounted Racks and Enclosures:

1. Install to plywood backboards only, unless otherwise indicated.

2. Mount so height of topmost panel does not exceed 78 inches (1980 mm) above floor.

K. Floor-Mounted Racks and Enclosures: Permanently anchor to floor in accordance with manufacturer's recommendations.

L. Floor-Mounted Enclosures: Connect adjacent cabinets together and remove interior side panels.

M. Identification:

1. Use wire and cable markers to identify cables at each end.
2. Use manufacturer-furnished label inserts, identification labels, or engraved wallplate to identify each jack at communications outlets with unique identifier.
3. Use identification nameplate to identify cross-connection equipment, equipment racks, and cabinets.
4. Labels shall meet the legibility, defacement, exposure, and adhesion requirements of UL 969.
5. Labels shall be preprinted using a mechanical means of printing (e.g. laser printer)
6. Where used for cable marking, provide vinyl substrate with a white printing area and a clear "tail" that self laminates the printed area when wrapped around the cable. If cable jacket is white, provide cable label with printing area that is any other color than white, preferable orange or yellow - so that labels are easily distinguishable.
7. Where insert type labels are used provide clear plastic cover over label.
8. Provide plastic warning tape 6 inches wide continuously printed and bright colored 18" above all direct buried services, underground conduits, and duct-banks.

3.4 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for additional requirements.

B. Comply with inspection and testing requirements of specified installation standards.

C. Provide all labor, materials, tools, field-test instruments and equipment required for the complete testing, identification, and administration of the work called for in the Contract Documents.

D. Only test results with a PASS will be accepted. Field-test results with a *PASS will be rejected.

E. Testing shall be performed on each cabling link. (100% Testing)

F. All Tests shall be documented.

G. Trained technicians who have successfully attended an appropriate training program and have obtained a certificate as proof thereof shall execute the tests. These certificates may have been issued by any of the following organizations or an equivalent organization:

1. Manufacturer of the connectors or cable.
2. Manufacturer of the test equipment used for the field certification.
3. Training Organizations (BICSI, Equivalent)

H. The Owner or the Owner's representative may select a random sample of five percent of the installed service links. The Owner or the Owner's representative shall test these randomly selected links. The results obtained shall be compared to the data provided by the installation

contractor. If more than two percent of the sample results differ in terms of the pass/fail determination, the installation contractor under supervision of the representative shall repeat 100 percent testing at no cost to the Owner.

I. Engage a qualified testing agency to evaluate cables.

J. Cable will be considered defective if it does not pass tests and inspections.

K. Visual Inspection:

1. Inspect cable jackets for certification markings.
2. Inspect cable terminations for color coded labels of proper type.
3. Inspect outlet plates and patch panels for complete labels.
4. Inspect patch cords for complete labels.
5. Inspect cable placement, cable termination, grounding and bonding, equipment, and patch cords, and labeling of all components.

L. Category 6A Modular Plug Termination Link Testing Requirements:

1. Each cabling link shall be tested for:

a. Wire Map
b. Length
c. Propagation Delay
d. Delay Skew
e. DC Loop Resistance
f. Insertion Loss
g. NEXT (Near-End Cross Talk)
h. PS NEXT (Power Sum Near-End Cross Talk)
i. ACR-N (Power Sum Attenuation to Crosstalk Ratio Near-End)
j. ACR-F (Attenuation to Crosstalk Ratio Far-End)
k. PS ACR-F (Power Sum Attenuation to Crosstalk Ratio Far-End)
l. Return Loss

2. All installed cabling Modular Plug Terminated Links shall be field-tested and pass the test requirements and analysis as dictated by the Manufacturer to achieve the extended warranty. Any Modular Plug Terminated Link that fails these requirements shall be diagnosed and corrected until the Modular Plug Terminated Links meets the performance requirements. The final and passing results of the tests for all Modular Plug Terminated Links shall be provided in the test results documentation.
3. Modular Plug Terminated Links shall comply with the Permanent Link transmission requirements of the ANSI/TIA-568-2.D standard.

a. The MPTL shall be tested with a Permanent Link Adapter on the Main Unit and a Patch Cord Adapter suitable for Category 6A testing on the Far End or Remote Test Equipment

4. Acceptance of the test results shall be given in writing after the project is fully completed and tested in accordance with the Contract Documents and to the satisfaction of the Owner.

M. Category 5e and Above Permanent Link Testing Requirements:

1. Each Cabling Link shall be tested for:

a. Wire Map
b. Length
c. Propagation Delay
d. Delay Skew
e. DC Loop Resistance
f. DC Resistance Unbalance within a pair
g. DC Resistance Unbalance between pairs
h. Insertion Loss
i. NEXT (Near-End Cross Talk)
j. PS NEXT (Power Sum Near-End Crosstalk)
k. ACR-N (Attenuation to Crosstalk Ratio Near-End)
l. PS ACR-N (Power Sum Attenuation to Crosstalk Ratio Near-End)
m. ACR-F (Attenuation to Crosstalk Ratio Far-End)
n. Return Loss
o. TCL (Transverse Conversion Loss)
p. ELTCTL (Equal Level Transverse Conversion Transfer Loss)

2. All installed cabling Permanent Links shall be field-tested and pass the test requirements and analysis as dictated by the Manufacturer for the extended warranty. Any Permanent Link that fails these requirements shall be diagnosed and corrected. Any corrective action that must take place shall be documented and followed with a new test to prove that the corrected Permanent Link meets performance requirements. The final and passing result of the tests for all Permanent Links shall be provided in the test results documentation.
3. Acceptance of the test results shall be given in writing after the project is fully completed and tested in accordance with the Contract Documents and to the satisfaction of the Owner.

N. Fiber Optic Cabling Test Requirements:

1. All tests performed on optical fiber cabling that uses a laser or LED in a test set shall be carried out with safety precautions in accordance with ANSI Z136.2.
2. The tests must be carried out by trained technicians who have successfully attended an appropriate training program, which includes testing with an OLTS and an OTDR and have obtained a certificate as proof thereof. These certificates may have been issued by any of the following organizations or an equivalent organization:

   a. Manufacturer of the fiber optic cable and/or fiber optic connectors.
   b. Manufacturer of the test equipment used for the field certification.
   c. Training Organizations (e.g. BICSI).

3. Link and channel test results from the OLTS and OTDR shall be recorded in the test instrument upon completion of each test for subsequent uploading to a PC in which the administrative documentation (reports) may be generated.
4. Fiber end faces shall be inspected at 200X and 400X magnification. 200X magnification is suitable for inspecting multimode and singlemode fibers. 400X magnification may be used for detailed examination of singlemode fibers. Scratched, pitted, or dirty connectors shall be diagnosed and corrected.
5. Testing shall be performed on each cabling segment (connector to connector)Testing shall be performed on each cabling channel (equipment to equipment) that is planned for use per the owner's instructions.
6. Testing of the cabling shall be performed using high-quality test cords of the same fiber type as the cabling under test. The test cords for OLTS testing shall be between 1m and 4m in length. The test cords for OTDR testing shall be approximately 100 m for the launch cable and at least 25 m for the receive cable.

7. Optical Loss Testing:

    a. Horizontal/Backbone Link:
        1) Multimode links shall be tested at 850 nm and 1300 nm in accordance with ANSI/TIA-526-14-B, one-cord reference method.
        2) Singlemode backbone links shall be tested at 1310 nm and 1550 nm in accordance with ANSI/TIA/EIA-526-7, Method A.1, One Reference Jumper equivalent method.
        3) Link attenuation does not include any active devices or passive devices other than cable, connectors, and splices, i.e. link attenuation does not include such devices as optical bypass switches, couplers, repeaters, or optical amplifiers.

    b. ODTR Testing:
        1) Fiber links shall be tested at the appropriate operating wavelengths for anomalies and to ensure uniformity of cable attenuation and connector insertion loss.
            a) Multimode: 850 nm and 1300 nm
            b) Singlemode: 1310 and 1550 nm
        2) Each fiber link and channel shall be tested in both directions.
        3) A launch cable shall be installed between the OTDR and the first link connection.
        4) A receive cable shall be installed after the last link connection

    c. Magnified End Face Inspection:
        1) Fibers shall be inspected at 250X or 400X magnification.

    d. Length Measurement:
        1) The length of each fiber shall be recorded.
        2) The optical length shall be measured using an OLTS or OTDR.

    e. Polarity Testing
        1) Paired duplex fibers in multi-fiber cables shall be tested to verify polarity in accordance with Clause E.5.3 of ANSI/TIA-568-C.0. The polarity of the paired duplex fibers shall be verified using an OLTS.

8. Each cabling link shall be tested in compliance with the following Test Limits
9. Multimode Backbone: Perform tests in accordance with TIA-526-14.
10. Single Mode Backbone: Perform tests in accordance with TIA-526-7.
11. Links: Perform optical fiber end-to-end attenuation tests and field reel tests.

O. Cable Testers:

1. The field-test instrument shall be within the calibration period recommended by the manufacturer. Minimum calibration is 12 months prior to testing.
2. The tester shall have Level IIIe accuracy in accordance with ANSI/TIA-1152-A
3. The tester must be capable of storing > 10,000 results for all measurements listed above.
4. Acceptable Manufacturers:

    a. Fluke Networks
    b. Prior approved manufacturer.

P. Final Verification Tests: Perform verification tests for UTP systems after the complete communications cabling and workstation outlet/connectors are installed.

1. Voice Tests: These tests assume that dial tone service has been installed. Connect to the network interface device at the demarcation point. Go off-hook and listen and receive a dial tone. If a test number is available, make and receive a local, long distance, and digital subscription line telephone call.
2. Data Tests: These tests assume the Information Technology Staff has a network installed and is available to assist with testing. Connect to the network interface device at the demarcation point. Log onto the network to ensure proper connection to the network.

END OF SECTION 271000

SECTION 274100 - AUDIO VIDEO SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

B. Related Drawings:

1. Audio Video (AV) Drawings
2. Theatrical Drawings
3. Electrical Drawings
4. Architectural Drawings
5. Technology Drawings
6. Theatrical Rigging Drawings

C. Coordinate work with other trades to properly execute the work within this specification.

D. System features mentioned in this specification, or shown on the AV drawings, are required, whether they are listed in both places. Where there is conflict between this specification or the AV drawings, the more stringent requirement shall apply.

1.2 BIDDER RESPONSIBILITY

A. This specification and the AV drawings are detailed only to the extent necessary to show design intent and signal flow. The bidder shall examine and be thoroughly familiar with all contract drawings, design intent, systems specified, their installation, configuration, and industry best practices. The contractor is responsible for all devices and configuration required to produce a fully functional system, including devices that may not be documented on either this specification or the AV drawings. Equipment required to meet this stipulation shall be provided without claim for additional payment. Specific products to meet the required functionality are listed within this specification and notated within the AV drawing package.

1.3 SUMMAY

A. furnish and install sound, video, and communication systems as shown on drawings and as specified herein, complete with all apparatus, equipment, power supplies, wiring, labor, and services necessary to ensure a complete working system. Verify completeness of equipment listed and correctness of type numbers. Furnish and install supplementary equipment needed to meet system requirements, without claim for added payment. Labor furnished shall be specialized and experienced in systems installation.

B. Furnish any engineering services to provide a complete and professionally installed systems.

C. All areas shall receive new cabling as specified.

D. This work includes, but is not limited to the following:

1. Furnish all back boxes and enclosures.
2. Deliver to the job site all back boxes which are to be installed by others.
3. Furnish and install all wire and cable.
4. Furnish any additional items, not specifically mentioned herein, to meet system requirements as specified, without claim for additional payment. Such items may include hardware, transformers, line/distribution amplifiers, and other devices for proper installation, interface, isolation or gain structure.
5. Programming and documenting of all software-controlled devices. Provide DSP and control system programming prior to final testing, if requested by the Consultant.
6. Refer to Submittals section of this specification for all submittal requirements.
7. Provide frequency scanning and coordination for all AV system wireless transmitters and receivers. Account for local frequencies used by others within the surrounding area.
8. Setup and adjustment of signal processing, system tests and adjustments, written report, demonstration for approval, participation in acceptance tests and final adjustments where required.
9. Submission of shop drawings prior to fabrication.
10. Verification of dimensions and conditions at the job site.
11. Installation in accordance with these specifications, manufacturer's recommendations, and all applicable code requirements.
12. Setup and adjustment of signal processing, system tests and adjustments, written report, demonstration for approval, participation in acceptance tests, and final adjustments as required.
13. Coordination with the Electrical Contractor is required to assure correct Systems conduit routing, Systems backbox locations, and clean power circuit locations as specified in Division 26 – Electrical.
14. Coordination with the Lighting Contractor
15. Coordination with the Fire Alarm Systems Contractor
16. Coordination with the Tel/Data Contractor and other Low Voltage Contractors
17. Coordination with the Owner's IT department and installers
18. Performance standards, without claim for additional payment
19. System Documentation
20. Instruction of owner's operating personnel
21. Maintenance and services for one year
22. Guarantee all equipment and components for the specified period from the date of acceptance.

E. All work described within this section must be coordinated with other trades to ensure a successful installation.

1.4 SUBMITTALS

A. Provide Submittals in accordance with requirements of Division 01 – General Requirements and as described within this specification.

B. Bidder Qualifications (Pre-Bid Submittal):

1. Perspective bidders must be thoroughly experienced in installing, engineering, configuring and testing systems of the scope and size specified. Bidders must be a system integrator, normally engaged in the business of audiovisual and sound reinforcement system installation. Bidder shall provide a list of systems their company

has furnished and installed of similar size and scope within the last (5) years. Indicate project name, address, and reference.

2. Bidder shall have qualified CTS, CTS-D, and CTS-I engineers, technicians, and project managers who will be assigned to this project. A CTS-D and CTS-I shall be employed on this project for the entirety of the installation and close-out.
3. The bidder shall have a qualified and certified system programmer who will program the system. Submit any and all manufacturer certifications related to system programming, DSP programming, and control programming.

C. Bid Submittals:

1. In conjunction with the bidding requirements set forth in the Division 01 documents, the bidder shall submit itemized unit prices for all devices, or their equivalents, listed within this specification or documented on the AV drawings.
2. The bid price shall include any Add-Alternates described.

D. Product Data: Submit manufacturer's technical data, product specifications, installation instructions, and other pertinent information as applicable for each product or material specified or required. Do not procure material or begin work until product data and shop drawing submittals have been approved. All product data shall be submitted in one submission, in PDF format, with manufacturer provided specifications and cutsheets.

E. Shop Drawings: Shop drawings shall be created in ACAD or equivalent and submitted electronically in DWG and PDF.

1. Include plan view locations, elevations, installation details, and accessories.
2. Functional Block Diagram: Show single-line interconnections between components for signal transmission and control. Show cable types and sizes. Show all transformers, switches, relays, and control circuits.
3. Drawings of loudspeaker mounting arrangements, equipment rack layouts, and receptacle and control plates and boxes.
4. Plate and panel schedule listing all plates individually with size, mounting condition, backbox size, and plate finish color.
5. Drawings of projector mounting arrangement and line of sight studies showing proper alignment and dimensions with the projection screen and projection equipment.
6. Complete list of wire run numbers and termination locations of each end.
7. Schematic diagrams of patch bays.
8. Drawings of final assemblies of loudspeaker, screen, and projector suspension equipment stamped by a certified structural engineer. Each system solution must be separately engineered, verified, and stamped.
9. Provide IP address table and addressing protocol in coordination with Owner's IT department.
10. Provide mockup of all system graphical user interface screens. Supply narrative and demonstration of all touch panel programming. Supply panel layouts and button functions listed.
11. Submit equipment rack layouts.
12. Submit samples of lettering/label size and typeface for custom plates, panels, or other equipment where required.
13. Provide EDID and HDCP management plan for all video signals.
14. Consultant and Architect shall approve all panel and furniture finishes. The Consultant and Architect may request samples of finishes which the Contractor shall provide at no additional cost to the project.
15. Provide conduit riser documented in plan and elevation view.

F. Closeout Submittals:

1. Create user manuals for all devices within the system, including instructions for how to use the device.
2. Create and mount a simplified line diagram protected in a plastic sheath and mount behind each AV cabinet.
3. Create floor plans showing locations of all faceplates, interconnections, speakers, projectors, and their cable paths, including cable identification on 11x17 drawings. Deliver to owner upon completion of the installation.
4. Create record drawings on 30x42 drawings of as-built conditions in ACAD or equivalent and deliver electronically and in PDF format.
5. Operating and Maintenance instructions for each product. O&Ms shall be complete for each device.
6. Contractor's written warranty for all parts and labor for a period of one year from project acceptance.
7. Manufacturer's standard product warranty. Extend all special warranties to project where available.
8. Equipment List: Include every piece of equipment by model number, manufacturer, serial number, location, and date of original installation.
9. List of spare and replacement parts recommended to be stored at the site for ready access.

1.5 QUALITY ASSURANCE

A. Single Source Responsibility: Obtain all materials from one source from a single approved manufacturer for each different product required.

B. All materials shall be new and shall conform to applicable provisions of Underwriters Laboratories and the American Standards Association.

C. The contractor awarded this project is responsible for all permits, licenses, and inspections unless otherwise noted.

D. Follow latest federal, state, and local electrical and safety codes. Where conflicts exist, apply the most stringent requirement.

E. Certification: CE, FCC Class A

F. Contributing Organizations – The Organizations listed below have published standards used to establish the technical references to be followed under this scope of work.

1. Acoustical Society of America (ASA) (ASC S1)
2. Alliance for Telecommunications Industry (ATIS) (ASC T1)
3. American Society of Safety Engineers (ASSE) (ASC A1264)
4. Audio Engineering Society (AES) (ASC S4)
5. Electronics Industry Alliance (EIA) (CEMA)
6. Entertainment Services and Technology Association (ESTA) (ASC E1)
7. Institute of Electrical and Electronics Engineers (IEEE) (ASC C136) (802.1)
8. International Cable Engineers Association (ICEA) Formerly IPCEA
9. International Standards Organization (ISO)
10. National Electrical Manufacturer's Association (NEMA) (ASC C119)
11. National Fire Protection Associations (NFPA)
12. National Safety Council (NSC) (ASC A10)

13. Photographic and Imaging Manufacturer's Association (PIMA)
14. Society of Motion Picture and Television Engineers (SMPTE)
15. Telecommunications Industry Association (TIA)
16. Underwriters Laboratories (UL) (ASC C101) (CE)
17. NTSC
18. National Association of Broadcasters (NAB) – System technical standards for video and RF compliance are listed in the most recent edition of the NAB Handbook

G. Applicable Performance Standards – Execute all Division work in accordance with the following standards:

1. ANSI S4.48-1992 (R1998): Recommended Practice for the Application of Connectors, Part 1, XLR-Type polarity, and gender
2. ANSI S4.55-1997: Recommended Practice for conservation of the Polarity of Audio Signals
3. ANSI S4.56-1997: Recommended Practice for the subjective evaluation of Loudspeakers
4. ANSI S12.2-1995 (R1999): Criteria for Evaluating Room Noise
5. ANSI T1.217-1991 (R1998): Integrated Services Digital Network (ISDN) Management – Primary Rate Physical Layer
6. ANSI T1.522-2000: Quality of Service (QOS) for Business Multimedia Conferencing. Specifies classes of Service for conferencing on IP Networks
7. AES15: ANSI S4.49: AES Recommended practice for Sound Reinforcement Systems – Communications Interface PA-422.
8. AES-R1-1997 AES project report for professional audio: Specifications for audio on high capacity media
9. AES14-1992 (r1998) AES standard for professional audio equipment --Application of connectors, part 1, XLR-type polarity and gender
10. AES24-1-1999, (Revision of AES24-1-1995) AES standard for sound system control - Application protocol for controlling and monitoring audio devices via digital data networks
11. AES26-2001 (Revision of AES26-1995) AES recommended practice for professional audio -- Conservation of the polarity of audio signals
12. ANSI/TIA/EIA 606-1993: Standard for the Telecommunications Infrastructure of Commercial Buildings
13. ANSI/TIA/EIA 607-1994: Commercial Building Grounding and Bonding Requirements for Telecommunications
14. IEEE 149-1979 (R1990): Test Procedure for Antennas
15. IEEE 1100-1999: Powering and Grounding Sensitive Electronic Equipment
16. NEMA 250-2001: Enclosures for Electrical Equipment
17. SMPTE 292M: SMPTE 292M defines the base 1.485Gbps HD-SDI. Note: This standard can handle all HD formats except 1920*1080 @ 50P and 60P.
18. SMPTE 372M: Uncompressed Dual-Link HD-SDI for 50P & 60P
19. SMPTE 424M: 2.97 Gbps HD-SDI for 50P & 60P
20. TIA/EIA-568-B: Digital audio over Cat5 audio cable
21. UL 1047-1999: Isolated Power Systems Equipment
22. UL 1581-1998: Reference Standard for Electrical Wires, Cables, and Flexible Cords
23. UL 1682-1998: Standard for Safety for Plugs, Receptacles, and Cable Connectors, of the Pin and Sleeve Type up to 800 Amperes and up to 600 volts ac or dc.
24. UL 467-1998: Grounding and Bonding Equipment
25. UL 813-1999: Commercial Audio Equipment and accessories for use in commercial enterprises… this standard was originally listed for public review in the October 13, 1995 issue of Standards Action. It is being resubmitted owing to substantive changes in the text.
26. ANSI/TIA/EIA-568-A: Commercial Building Telecommunications Cabling
27. ANSI/TIA/EIA-569-A: Commercial Building Standard for Telecommunications Pathways and Spaces

28. ANSI/TIA/EIA-607: Commercial Building Grounding and Bonding Requirements for Telecommunications
29. ANSI/TIA/EIA TSB-72: Centralized Optical Fiber Cabling Guidelines
30. ANSI/TIA/EIA-526-14A: Optical Power Loss Measurements of Installed Multimode Fiber Cable Plant
31. ANSI/TIA/EIA-526-7 Measurement of Optical Power Loss of Installed Single mode Fiber Cable Plant
32. ANSI/IEEE C-2 National Electrical Safety Code how to install cabling in accordance with the most recent edition of BICSI® publications:
33. BICSI Telecommunications Distribution Methods Manual
34. BICSI Cabling Installation Manual

1.6 DELIVERY, STORAGE AND HANDLING

A. Take care in handling products in accordance with manufacturer's instructions.

B. Store indoors in original undamaged packaging, in a well-ventilated area protected from weather, moisture, soiling, extreme temperatures, and humidity. Store products upright in secure, protected area. Do not stack! Verify with manufacturer that site conditions are acceptable before receiving material.

C. Environmental Conditions: Capable of withstanding the following environmental conditions without mechanical or electrical damage or degradation of operating capability:

1. Interior, Controlled Environment: System components installed in temperature-controlled interior environments shall be rated for continuous operation in ambient temperatures of 36 to 122 deg F (2 to 50 deg C) dry bulb and 20 to 90 percent relative humidity.
2. Drop shipping of equipment to the Owner's site is not allowed.

1.7 WARRANTY and Guarantee

A. All systems and components shall be guaranteed free of defects in materials and workmanship for a period of one (1) year (or to the length of the Manufacturer's warranty if longer) from the date of acceptance and shall be repaired or replaced within forty-eight (48) hours following report of such defects by the owner.

B. The Contractor shall be available on call and on eight (8) hour notice during the first month following acceptance of the system, to assist the Owner's representatives in any problems which may arise during the initial period of operation. If corrective measures on-site are required, they will be performed within 12 hours of the determination of a need for a site visit.

C. If, during the Guarantee period, any component is out of service for more than seven (7) days due to unavailability of parts or service, Contractor shall supply and install an identical new component. If an identical component is not available, Contractor will substitute equivalent equipment, with the approval of the Owner.

D. During the course of the Guarantee period, the Systems Contractor will provide the Owner with a 24 hour service phone number for emergency calls. A service engineer will respond to all emergency calls within one (1) hour. The personnel answering this call must be fully qualified to troubleshoot problems and propose solutions. A qualifying emergency event is defined as an event that may cause severe hardship or cause the systems to be inoperable or unusable for a scheduled class or event.

E. During the course of the Guarantee period, the Contractor shall provide a minimum of three (3) service visits to the site for inspection and adjustment of equipment. Contractor shall submit proposed schedule for these visits and shall notify Owner and Systems Designer in writing at least one month in advance of each visit.

F. During the course of the guarantee period, the Systems Contractor will supply the Owner with any published updates of manufacturer provided operating programs for any and all software-controlled equipment that are issued to correct “bugs”. During the Guarantee period, the Owner will rely on the Systems Contractor to determine when to update the software, unless it is needed to correct a situation that renders the systems unstable, non-functional, or otherwise affects operations.

G. Repeated device failures, defined as the failure of a device or a single type of device three or more times over three contiguous months, will be considered as a failure of a manufactured system and all items of this type shall be replaced at no charge to the Owner.

H. At least one representative of the Systems Contractor, well versed in the installation and the operation of the systems, shall be on site in support of the Owner for the first significant public event in each space (as determined by the Owner) where the system will be used. The Contractor representative(s) for this event shall also be competent in show operations.

I. Contractor is to coordinate ongoing remote access to AV Systems Networks for support and troubleshooting. Owner to provide the access at their discretion.

PART 2 - PRODUCTS

2.1 SUBSTITUTIONS

A. Certain items of equipment are specified by the manufacturer’s type numbers to indicate an acceptable standard of quality and performance. Substitutions of equal equipment beyond the alternatives listed will be permitted only if such equipment is listed in an addendum to this specification. Address request for listing substitutions to the Architect. With any request for substitution, include measured data proving the equivalence of the proposed substitute in quality and performance. The Consultant shall be the final judge of the validity of the data submitted.

B. The substitution request shall include the following:

1. List of advantages to the system
2. Cost savings
3. Printed Specifications
4. Previous field experience using the substitution

2.2 INTERACTIVE DISPLAY BACKBOX

A. The interactive display backbox shall be:

1. Chief PAC525FCW or equivalent.
2. The AV Contractor shall coordinate power in each In-Wall storage box with the electrician.
3. Include and install cover plate.

2.3 INTERACTIVE DISPLAY

A. The interactive display manufacturer shall be SMART Technologies.

B. The chosen interactive display shall be #SBID-MX275-V4

1. Alternates shall not be accepted.

C. Each interactive display shall have an OPS Slot-In PC.

D. The chosen OPS Slot-In PC shall be SMART TECH #UKG-PCM11-I7V.

1. Alternates shall not be accepted.
2. Each interactive display shall be mounted to the Manufacturer furnished slim wall mount.
3. Each interactive display shall have a Wireless Mouse and Keyboard.

    a. The basis of design Wireless Mouse and Keyboard shall be Logitech #MK270 or equivalent.

4. Each interactive display shall have a power strip to be mounted in the existing backbox.

    a. The basis of design power strip shall be Front Row #1010-00017 or equivalent.

2.4 CLASSROOM AV FLUSH MOUNT SPEAKERS

A. The Classroom & K-12 Conference Room Flush Mount Speaker System basis of design shall be Front Row.

B. Equivalents may be accepted providing they meet the form and function of the specified system. Approved equivalent manufacturers include:

1. Extron
2. Equivalent

C. Each flush mount speaker system shall include the following basis of design devices:

1. Plenum Rated Ceiling Enclosure: Front Row #1000-00094
2. Page Override: Front Row #1010-00004
3. Ceiling Power Strip: Front Row #1010-00017
4. Ceiling Speakers: Front Row #SP-C

    a. Provide speaker quantities as shown on drawings

5. Provide any additional material as required by the manufacturer for a fully-functional system.
6. Refer to signal flow for additional devices.

2.5 CLASSROOM PENDANT MOUNT SPEAKER

A. The Classroom & K-12 Conference Room Flush Mount Speaker System basis of design shall be Front Row.

B. Equivalents may be accepted providing they meet the form and function of the specified system. Approved equivalent manufacturers include:

1. Extron
2. Equivalent

C. Each flush mount speaker system shall include the following basis of design devices:

1. Wall Mounted Enclosure: Front Row #1000-00122
2. Page Override: Front Row #1010-00004
3. Ceiling Power Strip: Front Row #1010-00017
4. Ceiling Speakers: JBL #65P/T or equivalent.

    a. Provide speaker quantities as shown on drawings

5. Provide any additional material as required by the manufacturer for a fully-functional system.
6. Refer to signal flow for additional devices.

2.6 CLASSROOM AV INPUT PANEL

A. The Classroom AV Input Panel basis of design manufacturer shall be Atlona or equivalent.

1. The basis of design input panel shall be Atlona #AT-OME-EX-WP-KIT-LT or equivalent.
2. Equivalents may be accepted providing they meet the form and function of the specified device.
3. Approved equivalent manufacturers:

    a. AV ProEdge
    b. Extron

B. The Classroom AV 3.5mm Panel basis of design manufacturer shall be Extron or equivalent.

1. The basis of design 3.5mm panel shall be Extron #WPD 101 3.5mm
2. Equivalents may be accepted providing they meet the form and function of the specified device.
3. Approved equivalent manufacturers:

    a. Custom
    b. Equivalent

C. The AV Input Panel & 3.5mm Panel must be capable of fitting into an existing 2-Gang backbox.

D. Provide the following with each AV input panel:

1. QTY (1) 6’ HDMI Cable – Extron or equivalent
2. QTY (1) 6’ 3.5mm Cable – Extron or equivalent

2.7 CONFERENCE ROOM AV INPUT PANEL

A. The Classroom AV Input Panel basis of design manufacturer shall be Atlona or equivalent.

1. The basis of design input panel shall be Atlona #AT-OME-EX- KIT-LT or equivalent.
2. Equivalents may be accepted providing they meet the form and function of the specified device.
3. Approved equivalent manufacturers:

    a. AV ProEdge
    b. Extron

B. Contractor awarded this project must coordinate the location of these extenders with the furniture vendor. Include all patch cabling and pass-thru devices as required.

C. Provide the following with each AV input panel:

1. QTY (1) 6’ HDMI Cable – Extron or equivalent
2. QTY (1) 6’ 3.5mm Cable – Extron or equivalent

2.8 CLASSROOM & CONFERENCE ROOM CONTROL PANEL

A. The Classroom & K-12 Conference Room Control Panel basis of design manufacturer shall be Front Row or equivalent.

1. The basis of design control panel shall be Front Row #CB-2050
2. Equivalents may be accepted providing they meet the form and function specified. Equivalent devices must be proven to work with the submitted control processor for these rooms.

2.9 CAFETERIA LOUDSPEAKER

A. The cafeteria loudspeaker shall be:

1. Fulcrum Acoustic #DX1295 or equivalent.
2. QTY (2) required.
3. Approved Alternate Manufacturers:
    1) QSC
4. Include all mounting hardware, including suspension and U-Brackets, as required.

2.10 GYMNASIUM LOUDSPEAKER

A. The gymnasium loudspeaker shall be:

1. EV #SX100+
2. QTY (6) required.
3. Approved alternate manufacturers:
    1) Community
    2) QSC
4. Include all mounting hardware, including suspension and U-Brackets, as required.

2.11 AUDITORIUM LOUDSPEAKER

A. The auditorium loudspeaker shall be:

1. Fulcrum Acoustic #DX1595 or equivalent.
2. QTY (3) required.
3. Approved Alternate Manufacturers:
    1) QSC
4. Include all mounting hardware, including suspension and U-Brackets, as required.

2.12 AUDITORIUM PROJECTOR

A. The gymnasium and auditorium projector shall be:

1. Epson #EB-PU2216B or equivalent
2. QTY (1) required in gymnasium.
3. QTY (1) required in auditorium.
4. Approved alternate manufacturers:
    1) Christie
5. Include all mounting hardware for ceiling mounted projector.
6. Include required lens, contractor shall field verify throw distance prior to procurement.

2.13 AVOIP ENCODER

A. The AVoIP encoder shall be:

1. Visionary Solutions #DUET-WP-H or equivalent
2. QTY required as shown on plans.
3. Approved alternate manufacturers:
    1) AV ProEDGE

2.14 AVOIP DECODER

A. The AVoIP decoder shall be:

1. Visionary Solutions #D4100 or equivalent
2. QTY (1) required in gymnasium.
3. QTY (1) required in auditorium.
4. Approved alternate manufacturers:
    1) AV ProEDGE

2.15 TOUCHSCREEN CONTROL PANEL

A. The touchscreen control panel shall be:

1. QSYS #TSC-70-G3 or equivalent
2. QTY required as shown on plans

3. Approved alternate manufacturer:
    1) As approved for use with the submitted DSP and control processor.

2.16 DIGITAL AUDIO PANEL

A. The digital audio panel shall be:

1. QSYS #D2i & QSYS #unD6IOBT or equivalent
2. QTY required as shown on plans
3. Approved alternate manufacturer:
    1) Symetrix

2.17 DIGITAL XLR PANEL

A. The digital XLR panel shall be:

1. QSYS #unDX4I & RDL #D-XLRF or equivalent
2. QTY required as shown on plans

2.18 AUDITORIUM DIGITAL SNAKE

A. The auditorium digital snakle shall be:

1. Allen & Heath DX164-W

    a. QTY (1)

2. Allen & Heath DX168

    a. QTY (1)

2.19 AV NETWORK SWITCH

A. The AV network switch shall be QSYS or equivalent

B. Approved model numbers are shown on plans. Switch shall be sized to accommodate quantity of devices and sufficient POE++ to support devices required.

C. Approve alternate manufacturers:

1. Netgear

2.20 DIGITAL SIGNAL PROCESSOR

A. The digital signal processor and control processor shall be:

1. QSYS #Core110F or equivalent
2. QTY (1) required in Cafeteria

3. QTY (1) required in Gymnasium
4. QTY (1) required in Auditorium

B. Approved alternate manufacturers:

1. Symetrix
2. Biamp

C. Include all required I/O devices to meet the requirements shown on the plans.

D. Include all required QSYS licenses for Dante channels, configuration, and maximum processing power.

2.21 AUDITORIUM DIGITAL MIXING BOARD

A. The mixing board shall be Allen & Heath #SQ7 or equivalent.

B. Include the following:

1. Dante Card with applicable licenses
2. Dust Cover

C. Approved alternate manufacturers:

1. Midas
2. Yamaha

D. QTY (1) required in auditorium.

2.22 AMPLIFIERS

A. The amplifiers shall be QSYS or equivalent.

B. The approved model numbers are shown on plans. Amplifiers shall be sized to accommodate speakers and channels they are supporting.

C. Approved alternate manufacturers:

1. APEX

2.23 ELECTRIC SCREEN

A. The electric screens shall be DA-Lite or approved equivalent:

1. Auditorium #14154

B. Include all mounting hardware, control, and power requirements for a fully functional system.

C. Approved alternate manufacturers:

1. Draper

2. Alternates must meet or exceed the size, housing, and display material of the basis of design screens.

2.24 AV CABINETS

A. The AV cabinets shall be Middle Atlantic or equivalent:

1. Gymnasium #CWR-18-32PD
2. Auditorium #SR-40-28
3. Cafeteria #CWR-18-32PD

B. AV Cabinets shall have locking front doors.

C. Approved alternate manufacturers:

1. Lowell
2. Legrand

2.25 WIRELESS MICROPHONE SYSTEM

A. The wireless microphone systems shall be Shure ULX or equivalent.

1. Approve alternate manufacturers:
    1) Sennheiser

B. Cafeteria Wireless Microphone System:

1. QTY (1) ULXD4D
2. QTY (2) U864 Antennae
3. Shure active antenna amplifiers as required
4. QTY (2) ULXD2/SM58
5. QTY (2) ULXD1
6. QTY (2) MX185
7. QTY (2) SBC220

C. Gymnasium Wireless Microphone System:

1. QTY (1) ULXD4D
2. QTY (2) U864 Antennae
3. Shure active antenna amplifiers as required
4. QTY (2) ULXD2/SM58
5. QTY (2) ULXD1
6. QTY (2) MX185
7. QTY (2) SBC220

D. Auditorium Wireless Microphone System:

1. QTY (1) U845UWB
2. QTY (3) ULXD4Q
3. QTY (2) U864 Antennae
4. Shure active antenna amplifiers as required
5. QTY (12) ULXD2/SM58

6. QTY (12) ULXD1
7. QTY (12) MX185
8. QTY (12) Countryman #E6
9. QTY (6) SBC220

2.26 ASSISTED LISTENING SYSTEMS

A. Contractor shall provide a system for the hearing impaired for the gymnasium, cafeteria, and Auditorium.

B. Provide wireless assisted listening system consisting of FM transmitter, antenna, portable battery-operated receivers with earphones and inductive couplers. Provide frequencies separate and free from interference with other FM systems. Provide all assistive listening system components from the same manufacturer.

C. Assisted Listening System basis of design: Listen Technologies.

1. Approved Alternate Manufacturer: Williams AV

D. Cafeteria Assisted Listening System

1. QTY (1) #LT800-072 with LA-326 rack mounting kit.
2. QT (2) #LA-122 antennae
3. QTY (7) #LR-4200-072 receivers
4. QTY (7) #LA-403 headphones
5. QTY (2) #LA-430 neckloop induction coil
6. QTY (1) #LA-381 12-unit charging tray.

E. Gymnasium Assisted Listening System

1. QTY (1) #LT800-072 with LA-326 rack mounting kit.
2. QT (2) #LA-122 antennae
3. QTY (31) #LR-4200-072 receivers
4. QTY (31) #LA-403 headphones
5. QTY (8) #LA-430 neckloop induction coil
6. QTY (3) #LA-381 12-unit charging tray.

F. Auditorium Assisted Listening System

1. QTY (1) #LT800-072 with LA-326 rack mounting kit.
2. QT (2) #LA-122 antennae
3. QTY (20) #LR-4200-072 receivers
4. QTY (20) #LA-403 headphones
5. QTY (5) #LA-430 neckloop induction coil
6. QTY (2) #LA-381 12-unit charging tray.

2.27 AUDITORIUM LOOSE EQUIPMENT

A. Shure #SM57-LC or equivalent

1. QTY (10)

B. Shure #SM58-LC or equivalent

1. QTY (10)

C. Shure #SM81-LC or equivalent

1. QTY (4)

D. Shure #SM27-LC or equivalent

1. QTY (4)

E. Shure #Beta 87A or equivalent

1. QTY (8)

F. Audix #MB84509 or equivalent

1. QTY (2)

G. Audix #MBStand or equivalent

1. QTY (2)

H. AKG #D112 or equivalent

1. QTY (1)

I. Sennheiser #e604 or equivalent

1. QTY (4)

J. Radial Labs #J48 or equivalent

1. QTY (4)

K. Radial Labs #JPC or equivalent

1. QTY (1)

L. Konig & Meyer #25900-500-55 or equivalent

1. QTY (12)

M. SKB #3i-20150-MC24 or equivalent

1. QTY (2)

2.28 GENERAL EQUIPMENT

A. Whenever any equipment is specified by manufacturer and model number, it is for purposes of establishing a standard of quality, performance, construction and function.

B. All materials and equipment shall be new and of the latest design or model offered for sale by the manufacturer.

C. Equipment models provided shall operate at the required AC line voltage and frequency.

D. Contractor shall provide quantities as indicated in the equipment list, detail drawings, location drawings, schedule of terminations, and as required for a complete installation.

2.29 AUDIO & VIDEO WIRE AND CABLE

A. All wire numbers listed in the drawings are Belden unless otherwise noted.

B. THHN wire is not an allowable substitute for twisted pair stranded loudspeaker wiring.

C. Approved manufacturers: Belden, Canare, Gepco, West Penn, Whirlwind

D. Where conflict exists with any codes or ordinances, such codes and ordinances shall take precedence.

E. Where conflict exists with electrical specifications, the higher standard or more stringent requirement shall apply.

2.30 SPECIFICATIONS – RACK MOUNT PANELS

A. Material: 11 gauge steel or 1/8" Aluminum, minimum thickness Finish: Black or to match adjacent equipment

B. Size: 19" wide, standard EIA mounting hole spacing, height as specified

2.31 SPECIFICATIONS – BACK BOX ENCLOSURES

A. Material: Code grade steel

B. Finish: Black or galvanized Size: As specified

2.32 SPECIFICATIONS – PLUG BOX AND TERMINATION PANELS

A. Material: 11 gauge steel or 1/8" Aluminum, minimum thickness Finish: Black (unless instructed otherwise by Architect)

B. Size: As specified

C. Approved Manufacturers: Steel City, Raco, Hoffman, Whirlwind, Pro Co, Wireworks

2.33 AUDIO TRANSFORMERS

A. All transformers shall be selected for proper interface and loading in the circuits as required by as-built conditions and per manufacturer's recommendations.

2.34 LOUDSPEAKER RIGGING EQUIPMENT:

A. Provide rigging for loudspeakers and suspended loudspeakers. Provide with sufficient number of suspension points for field adjustment of loudspeaker aiming. Color to determine color. Verify that adequate clearance from all other hanging components and adequate clearance from structural steel is provided. Provide all required hardware necessary for the safe and proper installation of loudspeakers.

B. Available manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work, include but are not limited to:

1. APE Rigging
2. Polar Focus

C. MAJOR EQUIPMENT

D. Equipment provided shall be as specified herein or an approved substitute.

E. Detailed performance specifications shall be those published by the manufacturer effective on the date of this document for all equipment listed.

2.35 DETAIL DRAWINGS

A. Furnish all materials and labor to provide complete and finished work even though not specifically shown on the drawings.

B. Detail drawings are located in large format AV drawings.

PART 3 - EXECUTION

3.1 AUDIO SYSTEM REQUIREMENTS

A. Requirements herein refer to materials and work which are related to or part of the Systems. Where conflict exists with other specifications concerning such work or materials, this specification takes precedence unless otherwise approved in writing by the Owner.

3.2 INSTALLATION OF SYSTEMS

A. Locate all apparatus requiring adjustments, cleaning or similar attention so that it will be accessible for such attention. Equipment racks shall be positioned to permit full access for operation and service.

B. Furnish and install brackets, braces and supports. All mounting hardware shall be included.

C. All bolts and fasteners must be Grade 5 or better.

D. All bolted attachments to have lock washers or other self-locking fasteners.

E. Provide all required mounting brackets and framing, hardware and components, safety systems and rigging systems using the following minimum design factors (given as ratio of working load limit (WWL) : rated breaking load):

1. 5:1 – Minimum design factor for all mounting components regardless of mounting condition.
2. 5:1-8:1 – Minimum design factor for manufacturer provided mounts & assemblies where engineered stamped documentation and destructive testing data is provided by manufacturer.
3. 10:1 – For all hardware and connecting assemblies between manufacturer rated assemblies when equipment is hung above the general public. This includes but is not limited to wire rope, bolts, shackles, turnbuckles, beam clamps, supplemental steel provided by Systems contractor and other connecting hardware.
4. Design factor calculations to be provided with all equipment mounting details.
5. Systems Contractor shall coordinate required additional blocking, supplemental steel or channel strut supports with Main Contractor & specific trade contractors.
6. All mounting systems not provided as a complete package from a single manufacturer must be engineered, approved, and have drawings stamped by a professional rigging engineer or licensed structural engineer, as approved by the Main Contractor. The engineer shall verify that the design meets or exceeds design criteria for this particular use case. Each mounting system solution must be separately engineered, verified, and stamped.

F. All supporting structures and enclosures supplied by the Contractor not having a standard factory paint finish shall be painted. Paint specifications will be supplied by the Architect or indicated herein.

G. Provide custom color or finish for any equipment or materials supplied which are exposed to public view. Color and finish of all such equipment or materials shall be approved in writing by the Architect. This does not exclude equipment or materials where standard colors and finishes may be specified herein.

H. Finish of blank panels and custom assembly panels shall match adjacent equipment panels. Verify all panel colors with Architect. All color choices should be clearly indicated on panel drawing submittals, and on the panel schedule.

I. Switches, connectors, jacks, receptacles, outlets, cables and cable terminations shall be logically and permanently marked. Custom panel nomenclature shall be engraved, etched or screened. Markings for these items are detailed in the drawings to ensure consistency and clarity. Verify any changes in working type size and/or placement with the Systems Designer prior to marking.

J. Protect equipment and related wiring where construction conditions may cause damage or environmental conditions exceed manufacturer’s specifications.

K. The standard reference for the layout and construction of the system shall be:

1. Giddings, Philip. Audio Systems Design and Installation.

L. All cables, connectors and peripheral equipment’s required to attain a fully functional system shall be furnished, installed and performed by the contractor awarded this project.

M. Locate all apparatus requiring adjustments, cleaning or similar attention so that it will be accessible for such attention.

N. Provide custom color or finish for any equipment or materials supplied which are exposed to public view. Color and finish of all such equipment or materials shall be approved in writing by the Architect. This does not exclude equipment or materials where standard colors and finishes may be specified herein.

O. Switches, connectors, jacks, receptacles, outlets, cables and cable terminations shall be logically and permanently marked. Custom panel nomenclature shall be engraved, etched or screened. Markings for these items are detailed in the drawings to ensure consistency and clarity. Verify any changes in working type size and/or placement with the Systems Designer prior to marking.

P. The equipment specified herein is designed to operate in environments of normal humidity, dust and temperature. Protect equipment and related wiring where extreme environmental conditions can occur.

Q. Secure equipment firmly in place, including control panels, loudspeakers, conduit, amplifiers, racks, and cables. Make fasteners and supports to support their loads with a safety factor of at least three.

R. Take precautions to prevent electromagnetic and electrostatic hum. Install equipment to provide safe operation.

S. Clearly, consistently, logically, and permanently mark connectors, jacks, relays, receptacles, cables, and cable terminations.

T. All wall mounted devices shall be mounted, secured and installed in accordance with SEI/ASCE 7 and shall additionally withstand the effects of any motions within the building as determined by SEI/ASCE 7.

U. The term “WITHSTAND” means “THE UNITS WILL REMAIN IN PLACE WITHOUT SEPARATION OF ANY PARTS FROM THE DEVICE WHEN SUBJECTED TO THE SEISMIC FORCES SPECIFIED AND THE UNIT WILL BE FULLY OPERATIONAL AFTER THE SEISMIC EVENT.”

V. SECURE ATTACHMENT OF AUDIO VISUAL ITEMS

1. To ensure proper attachment of Fixtures, Furnishings & Equipment items, including and Technology items, where “items” are attached to wall, ceiling, overhead structure, and/or floor, Contractor shall provide information adequate for architect to verify items, attached to wall, ceiling, and/or floor are attached securely and per manufacturer’s recommendations. Architect’s review may be implemented during submittal process.
2. Contractor shall provide struts, hangers, fasteners, safety harnesses, channels, bolts, screws, rods, etc. to securely attach items to existing structure as required to meet field conditions and meet applicable codes.

W. CONDUIT

X. Review and coordinate Systems conduit installation with the electrical contractor to ensure proper operation of the Systems.

Y. All wiring shall be in conduit unless authorized by the Architect, approved by the Systems Designer, and permitted by code. Exceptions are short runs at rack terminations where there is no means of connecting conduit to the equipment.

Z. Where installed exposed, conduits shall be parallel with or at right angles to walls or ceilings and shall be supported from walls or ceilings by means of approved galvanized iron clamps or hangers. Conduit connections to equipment racks shall be insulated.

AA. Minimum size conduit shall be 3/4 inch. All conduit shall be sized for maximum 40% fill or less if required by code.

BB. No conduit run between pull boxes/termination boxes may exceed 100 feet in length.

CC. No conduit run shall have more than 180 degrees of combined turns between pull boxes/termination boxes, and no single turn may exceed 90 degrees.

DD. Conduit containing STP, UTP, and COAX wire types must be installed so that the final length of the cable runs does not exceed maximum allowable cable lengths.

3.3 CONDUIT SEPARATION

A. Systems wiring is divided into wiring groups according to their nominal voltage levels (refer to Schedule of Terminations):

	Wiring Type
Group A	Microphones and other sensitive wiring (0 mV to 100 mV)
Group B	Line level wiring (100 mV to 10 V)
Group C	Loudspeaker and control wiring (10 V to 70 V)
Group D	Telephone, video, control and digital circuits
Group E	Fiber optic cable
Group F	Spare Conduit

1. Note: These wiring groups must never be intermixed within a given conduit run or junction box.

B. Minimum conduit separation between conduits carrying wiring of different groups is:

	Group A	Group B	Group C	Group D	Group E
Group A	adjacent	6"	12"	12"	adjacent
Group B	-	adjacent	12"	6"	adjacent
Group C	-	-	adjacent	6"	adjacent
Group D	-	-	-	adjacent	adjacent
Group E	-	-	-	-	adjacent
Group F	12”	12”	12”	12”	adjacent

1. Note: Ninety degree crossings in close proximity are acceptable. Separations must be maintained until within six feet of box or gutter entry.

C. Minimum conduit separation between conduits carrying Systems wiring and other electrical service conduit is:

	Group A	Group B	Group C	Group D	Group E	Group F
Dimmer controlled lighting	24"	12"	6"	12"	adjacent	24”
SCR controlled	24"	12"	6"	12"	adjacent	24”

services						
220/440V circuits	6"	6"	adjacent	adjacent	adjacent	24”
All other services	6"	6"	adjacent	adjacent	adjacent	24”

1. Note: Heavy current demands in or long parallel runs with the above services may dictate greater separations to avoid interference in the Systems. Separations must be maintained until within six feet of box or gutter entry.

D. Contractor must have written authorization from the Systems Designer for any conduit installation which does not conform to these requirements. The conduit separations above are based on the use of EMT conduit for all AV and other signals. Separations where Rigid conduit is utilized for AV systems and/or other adjacent systems may be halved. Separations where PVC conduit is utilized for AV systems and/or other adjacent systems must be doubled. The Contractor must request information on separation adjustments for each instance where a different type of conduit than what is listed above is used.

1. ELECTRICAL POWER

E. Review and coordinate electrical power system installation including grounding with the electrical contractor to ensure proper operation of the Systems.

F. Verify that all AC power circuits designated for Systems equipment are wired with correct polarity and isolated ground. Report in writing any discrepancies found to the Architect for corrective action.

G. Provide distribution of electrical power within the equipment racks with a minimum of one spare AC receptacle for each four in use per branch circuit.

3.4 STEEL SUPPORTS

A. Fabricate and install any supports so that the installation does not weaken or overload the building structure. Do not impose the weight of equipment or fixtures on supports provided for other trades or systems. No drilling or cutting of concrete beams, joists, or structural steel, nor welding to structural steel, will be permitted except as authorized, in writing, by the Architect.

3.5 BOXES

A. With the exception of portable equipment, all boxes, conduits, cabinets, equipment and related wiring shall be held in place and the mounting shall be plumb and square.

B. All boxes shall be securely mounted to building structure. All boxes shall be installed so that wiring contained in them is accessible. Install blanking devices or threaded plugs in all unused holes.

C. Wiring groups and circuits shall be isolated as indicated herein. Common pull or junction boxes are not permitted except as authorized, in writing, by the Systems Designer.

D. Clean all box interiors before installing plates, panels or covers.

E. Using permanent marker on the box or on wire tags, indicate the lengths of installed cable for all COAX and Category wiring inside the box.

F. Using permanent marker, inside the box, indicate the box name, for example “AA”.

3.6 WIRING METHODS AND PRACTICES

A. Provide installation of all Systems wire and cable, ensuring proper:

B. Pulling Tensions

C. Quantities

D. Types

E. Lengths

1. Routing

F. Wire Group Separation

1. Identification

G. The interconnection of equipment in a rack shall use the same wire by type as specified for runs external to racks unless otherwise indicated on AV single line drawings. All wiring within racks shall be direct between devices without splices.

H. Connector polarity shall be maintained except for terminations at equipment manufactured to other standards. In the event that manufactured equipment can be ordered with, or internally set to, various standards, the equipment shall be configured as follows:

1. Polarity for XLR style connector shall be: pin 2-high, pin 3-low, and pin 1-shield.

I. Polarity for TRS style connector shall be: tip-high, ring-low, and sleeve-shield.

J. Spare wire runs of each group and type shall be pulled to each termination location. The number of spares shall be ten percent of those in actual use or one, whichever is greater.

K. Splicing of cables is not permitted between terminations of specified equipment.

L. Do not pull wire or cable through any box fitting or enclosure where change of raceway alignment or direction occurs without written approval from the Systems Designer; do not bend conductors to less than recommended radius. Employ temporary guides, sheaves, and rollers to protect cables from excess tension, abrasion or damaging bending during installation.

M. Provide wire pulling lubricants and pulling tensions in accordance with the wire and cable manufacturer's recommendations.

N. All wires shall be permanently identified at each wire end by marking with self-laminating adhesive labels fully covered with clear heat shrink tubing, and a chart kept of each wire's function. This applies to wire within a rack assembly as well as wire running in conduit.

O. Wire ends should be wrapped with heat shrink tubing. Each shield or drain wire should be covered with heat shrink to avoid unintentional connections.

P. Use Wago or Entrelec DIN rail mounted terminal blocks for all terminal block wiring connections. Do not exceed one wire per terminal connection point. Do not cut strands from conductors to fit lugs or terminals. Spare terminal blocks, equivalent to 10% of those in actual use, shall be provided.

Q. Form, in an orderly manner, all conductors in enclosures and boxes, wire ways and wiring troughs, providing circuit and conductor identification. Tie using wraps of appropriate size and type. Limit spacing between ties to six (6) inches and provide circuit and conductor identification at least once in each enclosure.

R. Provide service loops, minimum 6', at each termination so that plates, panels, patch bays, and equipment can be dismounted and placed on an adjacent horizontal work surface allowing for safe service and inspection without disconnection.

S. Maximum installed length of Category cables is 200'

T. Maximum installed length of Coaxial cable for HD-SDI, 3G-SDI, 6G-SDI, and 12G-SDI is 200'

U. Provide lengths of installed cables marked inside each termination back box using legible and permanent markings.

3.7 GROUNDING

A. Audio system wiring shall conform to the following procedures:

1. Audio equipment AC ground pins shall connect to AC isolated ground.
2. Audio equipment chassis shall connect to AC isolated ground or rack frames.
3. Audio rack frames shall connect to AC isolated ground bus in panelboard by means of #2 gauge (minimum) conductor.
4. Audio shields between AC powered pieces of equipment, where signal shield is tied to chassis ground, shall be directly connected to ground at the initiating end only. Capacitively terminate the receiving end with a 0.1µF capacitor.
5. Audio signal paths between AC powered pieces of equipment shall be connected using balanced lines and/or transformer isolation as required. No unbalanced signal paths may be connected to the patch bay.
6. Isolate all Systems wiring from racks, back boxes and conduit.
7. Isolate all Systems racks from conduit and other conductive surfaces. Use insulated bushings for conduit connections and a dielectric plinth between racks and conductive flooring materials.
8. AC isolated ground system shall be isolated from all other facility grounds except at the single point of connection at the AV isolation Transformer.
9. All metallic conduit, boxes and enclosures shall be grounded in accordance with the current National Electrical Code.

B. Metallic enclosures containing active equipment shall be grounded with due regard for the minimization of electrical noise. This may include the provision of grounding conductors separate from the AC ground.

3.8 EQUIPMENT RACKS

A. The equipment racks shall be considered as custom assemblies and shall be assembled, wired and tested in the Contractor's shop. Assembly of racks on-site will not be permitted, without written approval from the Systems Designer (except for system wiring which must terminate directly to the patch bays via soldering, punch-down or other non-connectorized termination process).

B. Placement of equipment in equipment racks, as shown in the drawings, is for maximum operator convenience. Verify any changes in placement of the equipment with the Systems Designer before assembly.

C. Racks shall be installed plumb and square without twists in the frames or variations in level between adjacent racks.

D. All wire, cable, terminal blocks, rack mounted equipment, and active slots of card frame systems shall be clearly and logically labeled as to their function, circuit, or system. Labeling on manufactured equipment shall be by engraved plastic laminate or by thermal printer on adhesive tape, with white lettering on black background or dark background that is similar to panel finish.

E. Provide stiffeners to custom panels to prevent panel deformation during normal plugging or switching operations.

F. All wires and cables used in assembling custom panels and equipment racks shall be formed into harnesses which are tied and supported in accordance with accepted engineering practice.

G. Harnessed cables shall be combed straight, wrapped every six (6) to ten (10) inches, and attached to the structure as necessary. Each cable that breaks out from a harness for termination shall be provided with an ample service loop so that panels, patch bays, and equipment can be dismounted and placed on an adjacent horizontal work surface allowing for safe service and inspection without disconnecting.

H. Harnessed cables shall be formed in either a vertical or a horizontal relationship to equipment, controls, components or terminations.

I. Cable shields shall be connected to the isolated ground system with due regard for ground loops. (See Giddings reference book, Chapter 10)

J. All system components and related wiring shall be located with due regard for the minimization of induced electro-magnetic and electrostatic noise, for the minimization of wiring length, for proper ventilation, and to provide reasonable safety and convenience for the operator.

K. All rack mounted equipment, with front panel controls, shall be provided with security covers to avoid tampering with preset levels. If specific security covers are not included in the equipment list, the Contractor will provide the manufacturer's security cover for each specified device or a suitable alternate.

L. Every device shall be installed with regard for proper polarity. Absolute polarity shall be maintained through the entire Systems signal chain.

M. Any permanently mounted electronic device must be balanced. Contractor will provide balancing transformers for unbalanced equipment connections where necessary.

N. System Power Control

1. Provide a relay-controlled power switching system with a master power switch and power-on indicator for the system. Connect the master power switch to control each receptacle in the rack except for one of the spare receptacles. Label unswitched receptacles "UNSWITCHED".
2. Middle Atlantic USC-6R
3. Atlas Sound SACR-191
4. Juice Goose CQ1520
    1) Quantity: A/R

O. Remote Power ON/OFF Switch:

P. Provide a single-Rackspace mounted remote power key switch with LED status indicators.

a. Middle Atlantic K-DEC in rack panel
b. Juice Goose Equal
c. Equal
    1) Quantity: A/R

2. VERIFICATION TESTS

Q. Test each point to point wire segment individually, and test any linkage of multiple point to point cables that form an end to end link.

R. Contractor must document all verification test requirements and results for submission (see 3.13.A below).

S. Confirm that each individual wire and cable run (whether in a rack or in conduit) is identified with a unique number. These numbers are affixed to both ends of each cable and are clearly visible. Provide a complete list of these numbers along with the termination location of each end of the wire run.

T. Verify all circuits and extensions for correct connection, continuity and polarity. Absolute polarity must be maintained between all points in the system.

U. Identify installed length of all copper and fiber cabling.

V. Confirm that all system outputs are free of spurious signals including oscillations and radio frequency signals. A wide band oscilloscope shall be used to verify this condition.

1. Confirm that the system is free of audible clicks, pops, and other noises when any operating control is activated, with or without input signal.

W. For all microphone lines, tie lines, return lines and effect loudspeaker lines, confirm:

1. Proper circuits appearing at each termination location
2. Proper circuits appearing at each jack bay position
3. Continuity of all conductors
4. Proper polarity is maintained
5. Absence of shorts between conductors within each circuit
6. Absence of shorts between circuit conductors and conduit

X. Perform a sweep test to 0.5MHz

Y. For RF Coaxial cabling confirm:

1. Receptacles output does not exceed +15dBmv (50-400MHz - +6 dBmv minimum, above 400MHz - +3dBmv minimum)
2. For each modulated video output, tap to meet +9dBmv (+/- 3dBmv)
3. Verify that all TV channels are visible and free of any interference or signal distortion
4. Frequency sweep test from 5MHz to 1000MHz.

Z. For all other Coaxial cabling confirm:

1. Verify that the installed cable meets, at a minimum, the requirements set forth in SMPTE ST 2081 for 6G-SDI single-link and 12G-SDI dual-link.
2. Verify that TDR impedance is 75 +/-3 ohms
3. Frequency sweep test from 5MHz to 6GHz.

AA. For Category Cabling:

1. Use Category 6A cable pair tester to verify compliance with TIA/EIA standards referenced above (including all current addendums)
2. Test each cable using the permanent link procedure for opens, shorts, reversals, cross twists and mis-wiring. Check NEXT, ELFEXT, Delay Skew, Return Loss, and Alien Crosstalk.

BB. Report all mis-wiring or failures found and report retests as needed.

CC. If any conductors report open or short, replace the entire wire and re-test.

DD. For Fiber cabling:

1. Using appropriate test devices and proper factory terminated jumpers, measure all fiber optic line attenuations, end to end, as required by TIA/EIA-526-14A.
2. Optical budget may not exceed the cable performance by length plus splice and connector losses (0.03 dB for each fusion splice, 0.3dB for each mechanical splice, and/or 0.4 dB for each connector).
3. Overall attenuation must meet TIA/EIA-568B standards. Perform attenuation tests at 850nm and 1300nm.

EE. Confirm that loudspeakers and mountings are free of buzzes and rattles when the loudspeaker is swept with sine wave tones over its rated bandwidth at one-half (1/2) its maximum rated power.

FF. For all permanently mounted loudspeaker terminations, provide impedance measurement of each pair of loudspeaker lines with all loudspeakers connected and all amplifiers disconnected. These measurements shall be documented as editable tabular data listing impedance for each 1/3 octave band from 20 Hz to 20 kHz and shall be accurate to the nearest tenth of an Ohm.

GG. For all intercom terminations, confirm proper operation by initiating and receiving audio communication and call light. For single lines connected to a matrix, test each line with each channel in the matrix. Verify that all channels are quiet and without spurious noise.

HH. For all electronic devices mounted in racks and connected to patch bays, confirm:

1. Every input and output is balanced.
2. Proper polarity is maintained throughout the entire audio path.

3. Tip connection of each TRS jack is connected to the positive terminal of each corresponding input or output.

II. For all devices requiring IP addressing:

1. IP addressing scheme must make use of subnets such that all devices, regardless on which network (Audio, Video, Control, or House) they reside, have a unique IP address to eliminate the possibility of duplicate IP addresses if networks are inadvertently cross-patched.
2. All devices must have static IP addresses.
3. Create a spreadsheet of all devices and their IP addresses, Subnet Masks, MAC Addresses, and other pertinent IP configuration information.
4. Coordinate all IP addressing schemes with the Owner.

JJ. If the Audio, Video, and Control network switches are dedicated to these systems and the systems do not rely on Owner furnished and configured network switches:

1. Configure network switches to operate properly and provide the proper network configurations to support the network devices and protocols used by those devices.
2. Configure, as needed, VLANS, IGMP, QOS, and other protocols requiring configuration to provide a fully functioning and robust network system.
3. With all networks configured and operating, and all network devices configured and operating, confirm that the networks are behaving as expected and as required.

KK. Electrical Contractor, coordinating with the Systems Contractor must confirm that there are no shorts between the Neutral and Isolated Ground conductors, and between the isolated ground conductor and building ground for each AV Technical Power circuit. Electrical Contractor, coordinating with the Systems Contractor must confirm there are no Bootleg Grounds or Neutral-Ground Reversals on each AV Technical Power circuit.

LL. The Contractor is responsible for the programming and configuration of all DSP systems and control systems necessary as specified in this project specification and AV large format drawings.

1. Programming and configuration must be complete and ready prior to System Designer’s arrival for verification of functionality and acceptance testing.
2. Programming for the DSP systems must contain control pages to support normal operations, and to support Acceptance Testing and System Tuning operations, as described in this specification and the large format AV drawings.
3. Programming for the Control Systems must include all master controller code and touch panel code and graphics, working together to provide the function as described in this specification and the large format AV drawings.

MM. Test all Audio, Video, and Control system controls, including but not limited to mixing consoles, switchers, routers, touch panels, paging stations, volume controls, and source selectors for proper operation.

NN. Test proper operation of any portable controls at each designated control location (Stage Manager’s rack, for example).

3.9 INITIAL ADJUSTMENT

A. All initial adjustments must be documented and submitted as part of the Verification Test Reports (see 3.13).

B. Make all adjustments and modifications so that the system is operational and fully functional including but not limited to:

C. Update all device software and firmware to the latest manufacturer's recommended release that allows for proper operation with ALL OTHER DEVICES in the systems.

1. Make all adjustments and modifications for system gain structure per recommendations of major component manufacturers.
2. Properly configure all EDID and HDCP settings to allow for proper function of all video systems.
3. Install all programming for digital mixing consoles, DSP, Control and any other software based devices in the systems, and verify that audio and video signal passes as designed through these systems. Verify that control systems function as specified. Contractor to provide initial DSP and control system programming prior to acceptance testing, one full set of programming changes and adjustments, prior to handover to the Owner, and one additional set of changes and adjustments during the initial warranty period, as part of the base scope of work.
4. Properly balance all 70 Volt loudspeaker zones to be consistent from zone to zone using amplifier settings and loudspeaker taps to adjust for differing loudspeakers or installation height. All 70 Volt loudspeakers within a given zone must not have a broadband SPL variation of greater than +/- 2dB.
5. Properly adjust delay and equalization for all loudspeaker systems using SIM, SMAART or other similar dual FFT type measurement devices. All testing and adjustment shall be in accordance with all manufacturer recommendations and industry standard practice. Contact the Systems Designer for further system delay and equalization requirements.
6. Capture traces showing magnitude and phase response for each loudspeaker or loudspeaker cluster before and after equalization and delay adjustments.
7. Capture traces showing magnitude and phase response for the systems operating as a whole from 3 locations in each major seating area. One of these areas should be the House Mix Position, if applicable.
8. Equalization and timing of the loudspeaker systems shall be further adjusted as required by the Systems Designer and Owner during Acceptance Testing.

3.10 VERIFICATION TEST REPORT

A. Submit written report detailing the results of Initial Adjustments and Verification Tests. Report to include, at minimum, the following:

1. Copies of all relevant drawings, charts, test instrument data, and photographs.

    a. PDF copies of all available manufacturers' operation and service literature for each major system component.
    b. Copy of all programming files including, but not limited to, Audio DSP programming and Graphic User Interface (GUI) files, Control system Touch Panel GUI files and control system control programming files including un-compiled source codes.
    c. All other documentation and results of testing and initial settings as referenced in 3.11, and 3.12 above.

d. Written certification that the installation conforms to the requirements stated herein, is complete in all respects, and is ready for inspection, Acceptance Testing, and tuning.

2. Prepare and submit an InfoComm standard Commissioning Checklist for each system in this specification.
3. Prepare and submit a training syllabus for Owner training (see section 3.15).

B. This report shall be completed and submitted to the Systems Designer for review a minimum of five (5) days prior to Acceptance Testing and final tuning.

3.11 ACCEPTANCE TESTING

A. Acceptance Testing shall be performed by the Systems Designer and Contractor during a period designated by the Architect. Contractor shall furnish a minimum of two (2) technicians or one technician per Systems Designer commissioning team, for the acceptance testing period, and one or more engineers fully capable of programming DSP and Control systems and making any other engineering adjustments to equipment in the systems. Contact Systems Designer for number of commissioning teams that will be deployed. For Bid purposes assume there will be 1 commissioning team.

B. The minimum time required for Acceptance Testing is 2 working days, including 1 days of dedicated quiet time. Coordinate this time so that free access, work lighting, and electrical power are available on the site.

C. Ensure that Systems areas are in a clean and orderly condition ready for acceptance testing.

D. Be prepared to verify the performance of any portion of the system by demonstration, listening tests and instrumented measurements.

E. Be prepared to facilitate the visual inspection of system components and wiring, including removal of termination panels for inspection of wiring termination and wire management practices.

F. Be prepared to demonstrate all software and control systems.

G. Be prepared to go through the commissioning checklist and verify all items as complete.

H. Make additional mechanical and electrical adjustments within the scope of the work and which are deemed necessary by the Systems Designer as a result of the Acceptance Tests. This may include realigning of loudspeaker systems, changes in system gain structures, grounding, filtering or interfaces.

I. Final acceptance will be contingent upon issuance by the Systems Designer of a letter of acceptance stating that the work has been completed and is in accordance with the contract documents.

J. Contractor will bear any costs incurred for additional Systems Designer's time and expenses due to failure to have the system functioning in accordance with specification requirements at the times scheduled for Systems Designer's Acceptance Testing.

K. Confirm that each individual wire and cable run is identified with a unique number. These numbers are affixed to both ends of each cable and are clearly visible. Provide a complete list of these numbers along with the termination location of each end of the wire run.

L. Confirm that all system outputs are free of spurious signals including oscillations and radio frequency signals. A wide band oscilloscope shall be used to verify this condition.

M. Confirm that the system is free of audible clicks, pops, and other noises when any operating control is activated, with or without input signal.

N. For all microphone lines, tie lines, return lines and effect loudspeaker lines, confirm:

1. Proper circuits appearing at each termination location.
2. Proper circuits appearing at each jack bay position.
3. Continuity of all conductors.
4. Proper polarity is maintained.
5. Absence of shorts between conductors within each circuit.
6. Absence of shorts between circuit conductors and conduit.

O. Confirm that speakers and mountings are free of buzzes and rattles when the speaker is swept with sine wave tones over its rated bandwidth at one-half its maximum rated power.

P. For each installed data network cable or fiber optic cable confirm conformance to the specified TIA/EIA performance standards

3.12 USER TRAINING

A. Contractor will provide in-depth training in operation and regular maintenance of all systems and on all equipment included in the scope of work contained in this specification and the AV large format drawings.

B. Training to include (but is not limited to):

1. Detailed operation of mixing consoles, video switchers and routers, computer control systems and other essential system elements as relevant to their installation in this project.
2. Maintenance and repair of system equipment, including replacement procedures for user-replaceable parts.
3. Review of Operation and Maintenance Manual (See 3.16)

C. Contractor will provide a minimum of (2) training sessions of four hours each with times and dates to be approved by the Owner.

D. The first session shall take place in the presence of the Systems Designer and shall occur directly after the completion of Acceptance Testing. If the Systems Designer, Owner, and/or Architect judge any work to be deficient and/or not substantially complete at the time scheduled for training, the training will be postponed until the Systems Designer, Owner, and Architect judge the entire AV system conforms to this specification and the AV large format drawings.

E. Contractor will bear any costs incurred for additional Systems Designer's time and expenses due to failure to have the system functioning in accordance with specification requirements at the times scheduled for User Training.

3.13 SYSTEM DOCUMENTATION

A. Within thirty (30) days of the Acceptance Testing, prepare and submit a CD-ROM of the preliminary Operation and Maintenance manual for approval by the Systems Designer. Manual to include, at minimum, the following documents in PDF format:

1. Table of contents
2. Written Guarantee and service policy
3. Basic power on/off and operational procedure
4. Copies of all shop drawings which have been updated to include any changes made during the installation process
5. All available manufacturers' operation and service literature for each major system component
6. One line signal flow diagram with all cable runs and patch points identified by alpha-numeric character
7. Copy of the Verification Test report
8. Copy of conduit riser diagram
9. Copy of the final tuning settings as provided by the Systems Designer
10. Copy of the IP Addressing table
11. Copy of all uncompiled source codes and configuration files which have been updated to include any changes made during the installation process.

B. Systems Designer will review the above system documentation. Upon approval, Contractor shall prepare and submit to the Owner:

1. Five (5) copies of the final Operation and Maintenance manual on CD-ROM or DVD.
2. Two (2) hard copies of the final Operation and Maintenance manual printed and neatly bound

C. Provide framed or laminated copy of the as-built signal flow diagram for each theater to be mounted in each control room. This diagram shall have all cable runs and patch points identified by alpha-numeric character.

END OF SECTION 274100

SECTION 275116 - PUBLIC ADDRESS SYSTEM

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Central Control sound system

B. Volume limiter/compressors

C. Speakers

D. Preamplifiers

E. Power amplifiers

F. Equipment cabinet

G. Equipment rack

H. Telephone paging adapters

I. Noise-operated gain controllers

J. Battery backup power unit

K. Conductors and cables

1.2 RELATED DOCUMENTS

A. The Contractor, Subcontractors and/or suppliers providing goods or services referenced in or related to this Section shall also be bound by the Documents identified in Division 01 Section “Summary”, Paragraph 1.1A, entitled “Related Documents.”

B. Related Drawings

C. “T” Drawings – Technology Plans

D. Related Sections:

E. Section 271000 – “Structured Cabling”

F. Section 275313 – "Clock Systems"

G. Section 274100 – “Audio Visual Systems”

1.3 GENERAL REQUIREMENTS

A. The conditions of the General Contract (General, Supplementary, and other Conditions) and the General Requirements are hereby made a part of this Section.

B. All bids shall be based on the equipment as specified herein. The catalog numbers and model designations are that of the basis-of-design: Bogen Nyquist E7000 Series IP-Based Communications System.

1. Approved Alternates:

a. Telecor Equivalent
b. Valcom Equivalent

C. Contractors who wish to submit alternative equipment shall provide the specifying authority with the appropriate documentation at least 10 business days prior to bid opening. The submitted documentation must provide a feature-by-feature comparison identifying how the proposed equipment meets the operation and functionality of the system described in this specification. Prior to bid date, the contractor shall provide adequate and complete submittal information, which shall include but not be limited to specification sheets, working drawings, shop drawings, and system demonstration. The alternative supplier-contractor must also provide a list to include six installations identical to the proposed system.

D. The contractor shall provide the FCC registration number of the proposed system, where applicable.

E. Final approval of the alternative system shall be determined at the time of job completion. Failure to provide the "precise functional equivalent" shall result in the removal of the alternative system at the contractor’s expense.

F. The contractor for this work shall have read all the bidding requirements, the general requirements of division xx, and the contract proposal forms, and shall be held to the execution of this work. The contractor shall be bound by all the conditions and requirements therein.

G. The contractor shall be responsible for providing a complete functional system, including all necessary components whether included in this specification or not.

H. In preparing the bid, the contractor should consider that no claim will be made against the owner for any costs incurred by the contractor for any equipment demonstrations requested by the owner.

1.4 REFERENCE STANDARDS

A. NFPA 70 – National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.5 SCOPE OF WORK

A. The contractor shall supply and install all equipment, accessories, and materials in accordance with these specifications and drawings to provide a complete and operating IP-Based Communications System including but not limited to:

1. The platform shall provide complete Nyquist E7000 intercom and employ state of the art IP Technology including the minimum functions listed.

    a. Intercom call between staff locations and classrooms with Unlimited Station capacity
    b. Interactive Facility Maps
    c. User customizable Announcements with priority
    d. Text-to-Speech Announcements
    e. Emergency Classroom Check-In can be used to enhances campus security
    f. Emergency or Normal Announcements are capable of being recorded and activated by a speed dial on an administrative console, DTMF, wireless panic button, mobile app, web browser or external IP networked system using HTTPS URL-based Application Programming Interface (API)
    g. Internal clock is synchronized with NTP network time server whether on the LAN, WAN or Internet keeping the Scheduled events (Bells) and Announcements accurate within milliseconds.
    h. Audio distribution allow for scheduled or manually activated audio to be activated from the Admin Web UI, contact closure, Admin phone and/or by use of Routines
    i. Unlimited Schedules
    j. Unlimited Time, Paging, and Audio Zones
    k. Unlimited Page Stacking/Queueing
    l. Unlimited Scheduled events
    m. Unlimited Scheduled Audio events
    n. Integrated Internet Radio Source
    o. Email Notifications and Alerts the system can send an email with a system event, contact closure, or when a Routine has been activated to name a few
    p. Supervised Station Status system can be setup to send an email when a Nyquist device goes offline.
    q. Clock / Messaging Display capability improves school communications
    r. Alert Filters – Allow facilities to monitor for such as weather events, earthquakes, tornados, tsunami, volcanoes, public health, power outages, and many other National Weather Alerts emergencies and warnings.
    s. Multi-Site All Call paging allows authorized users to make normal district wide pages
    t. Multi-Facility Emergency All-Call paging allows authorized users to make emergency district wide pages
    u. Administrative Graphical User Interface or GUI that can be used by technicians or Administrative: CoS and Roles define who has access to what parts of the GUI
    v. Push-to-Talk Microphone
    w. Ambient Noise Sensing

B. The system shall have a Routines feature that allows staff to activate via Admin Web UI, dial string, panic button, mobile app, API or with an Admin phone touch interface. Routines can automatically launch a procedure, or sequence of actions, that the E7000 system executes as a result of an input trigger. Routines are designed with school security plans and can support crisis plans for situations such as school lockdown, weather events, or emergency evacuation.

1. Direct Inward Station Access or DISA allows administrator or first responder or emergency personnel with proper login codes to call into the system from outside the school into any classroom, zone, or entire facility with customer supplied SIP enabled Telephone Network. DISA is designed to allow remote monitoring, Facility All-Call or Zone Paging, and two-way conversation from outside the facility.
2. Authorized staff can use the Admin Web UI to configure the Clock/Messaging Display function. They can use it to create messages that will display on monitors connected to the 10-Watt plenum-rated Intercom Modules with HDMI 1.3 (max. 1920 x 1080 @ 24/30

Hz) output or the NQ-GA10PV devices in a selected zone, multiple zones, or to specific stations. When creating the message, you can set several options, including when and how long the messages are displayed, priority of messages, and the appearance of the messages. The schedule programming allows the event names to be displayed analog or digital clock along with day and date on an NQ-GA10PV Display. You can also remove messages from the message queue either manually or via a Routine.

3. The ADA requires that title II entities (State and local governments) and title III entities (businesses and nonprofit organizations that serve the public) communicate effectively with people who have communication disabilities. The goal is to ensure that communication with people with these disabilities is equally effective as communication with people without disabilities. With this in mind the Bogen Nyquist E7000 helps people who have vision disabilities with clear audio paging, messaging and hearing disabilities with visual messaging to any display to assist in communicating.
4. Interactive Facility Maps that are intuitive to use. Simply click on a classroom or area of the GUI and it can initiate an intercom, page or drill to another map level. I addition when the system is in Check-In mode the classroom has a pop up of a room's video feed via the Maps view if equipped. The system shall allow authorized staff to use the Map-based Audio/Video room monitoring during emergency check-in. Systems that don't have provisions for this are not considered equal.
5. In the event of wide area network or WAN outage every facility must be capable of operating standalone and allow for all features listed within this specification to work. Systems that rely on the WAN to operate shall not be considered for comparison in this bid.
6. Manage Check-In functionality that allows staff to quickly verify that they are aware that a check-in event is underway and are reporting classroom status for their assigned classrooms or areas. For staff to check-in all they have to do is press their Call Switch after they have completed their required check-in procedure. Examples of check-in events include but are not limited to weather related shelter-in-place, safety related lockdown, fire evacuation, room occupancy.
7. The E7000 has a Disable Audio feature that can be activated via contact closure from fire alarm or security system, Admin Web UI, dial string, panic button, mobile app., API or with an Admin phone touch interface. When the E7000 has its Audio Disabled the follow features are disabled: programmed or manually activated audio distribution, Zone Paging, normal announcement files, All-Call Paging, manual normal tones and scheduled event tones.
8. Optional password protection for multi-site emergency all-Call, multi-site all-call, facility page. Emergency all-call page, all-call page, emergency announcement, announcement, zone page, alarm, and tone are used to prevent unauthorized use of the system.
9. Text-to-Speech option allows Admin Web UI users to add custom announcements into the system by simply typing the text that you want converted to speech for this announcement. The system will then generate a .wav file that can be used by the E7000 system. Systems that don't offer Text-to-Speech options shall not be equivalent.
10. Installation Wizards are available for installers to reduce the setup time on major components in the system programming. Included wizards are as follows: Customer Information, Dialing Length, Station, User, Time Zone, Network Time Server, and Zones as a minimum.
11. The public address system shall integrate with the PBX/VoIP within the school for complete access to this system from any handset part of the PBX/VoIP.
12. The public address system shall integrate with the access control system. Upon activation of threat levels in the access control system, the public address system shall broadcast emergency announcements pre-recorded by the Owner. The contractor shall coordinate the pre-recorded messages, testing with the access control system, and configuration of what threat level activates what announcement. Configure these messages with the security consultant, public address designer, and Owner.

13. The public address system shall integrate with the Fire Alarm annunciation system to announce emergencies from the fire-alarm system through the public address system.

1.6 SUBMITTALS

A. Product Data: Provide data showing electrical characteristics and connection requirements. Indicate layout of equipment mounted in racks and cabinets, component interconnecting wiring, and wiring diagrams of field wiring to speakers and remote input devices.

B. Test Results: Indicate satisfactory completion of each recommended by the manufacturer.

C. Manufacturer's installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of product.

D. Manufacturer's Certificate: Certify that products meet or exceed the specified requirements.

E. Manufacturer's Field Reports: Indicate that installation is complete and system performs according to specified requirements.

F. Project Record Documents: Record actual locations of speakers, control equipment, and outlets for input/outlet connectors.

G. Operation Data: Include instructions for adjusting, operating, and extending the system.

H. Maintenance Data: Include repair procedures and spare parts documentation.

I. Specification sheets on all items including cable types

J. Outline drawing of system control cabinet showing relative position of all major components

K. Shop drawings, detailing integrated electronic communications network system including, but not limited to, the following:

1. Station wiring arrangement
2. Equipment cabinet detail drawing

L. Wiring diagrams showing typical connections for all equipment

M. Numbered Certificate of Completion for installation, programming, and service training, which identifies the installing technician(s) as having successfully completed the Nyquist E7000 technical training course provided by the Bogen Communications, Inc.

1.7 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70 and Federal Communications Commission.

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience with field service facilities within 100 miles of the project.

C. Supplier Qualifications: Authorized distributor of specified manufacturer with minimum three years documented experience.

D. Installer Qualifications: Authorized installer of specified manufacturer with service facilities within 100 miles of the project.

E. Products: Listed, classified, and labeled as suitable for the purpose intended.

F. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

G. All items of equipment shall be designed by the manufacturer to function as a complete system and shall be accompanied by the manufacturer's complete service notes and drawings detailing all interconnections.

H. The contractor shall be an established communications and electronics contractor that maintains a locally run and operated business and has done so for at least 10 years. The contractor shall be a duly authorized distributor of the equipment supplied with full manufacturer's warranty privileges.

I. The contractor shall show satisfactory evidence, upon request, that he or she maintains a fully equipped service organization capable of furnishing adequate inspection and service to the system. The contractor shall maintain at his or her facility the necessary spare parts in the proper proportion as recommended by the manufacturer to maintain and service the equipment being supplied.

1.8 SINGLE SOURCE RESPONSIBILITY

A. Except where specifically noted otherwise, all equipment supplied shall be the standard product of a single manufacturer of known reputation and a minimum of 30 years of experience in the industry. The supplying contractor shall have attended the manufacturer's installation and service training classes. A certificate of this training shall be provided with the contractor's submittal.

1.9 SAFETY / COMPLIANCE TESTING

A. The communications system and its components shall, where applicable, bear the label of a Nationally Recognized Testing Laboratory (NRTL), such as Environmental Technology Laboratory (ETL), and shall be listed by their re-examination service. All work must be completed in strict accordance with all applicable electrical codes, under direction of a qualified and factory-approved contractor, and to the approval of the owner.

B. Bogen’s Nyquist E7000 solution is consistent with those NEMA SB 40-2015 requirements that specifically apply to school paging and intercom systems only as outlined within the ANSI/NEMA SB 40-2015 standards publication.

1.10 IN-SERVICE TRAINING

A. The contractor shall provide a minimum of eight hours of in-service training with this system. These sessions shall be broken into segments, which will facilitate the training of individuals in

the operation of this system including Admin Web UI Dashboard operation, Scheduling, and Audio Distribution as a minimum. Operation manuals shall be provided at the time of this training.

1.11 WIRING

A. System wiring and equipment installation shall be in accordance with generally accepted engineering best practices as established by the EIA and the NEC. Wiring shall meet all state and local electrical codes. All wiring shall be tested to be free from grounds and shorts.

B. All system wiring shall be labeled at both ends of the cable. All labeling shall be based on the room 1numbers as indicated in the architectural graphics package.

C. Wiring shall be done per manufacturer's recommendation (Cat 5 or West Penn #357) depending on speaker type. All terminal connections are to be on barrier strips.

1.12 PROTECTION

A. The contractor shall provide all necessary transient protection on the AC power feed and on all station lines leaving or entering the building.

B. The contractor shall note on their system drawings, the type and location of these protection devices and all wiring information. Such devices are not to be installed above the ceiling.

1.13 SERVICE AND MAINTENANCE

A. The contractor shall, at the owner's request, make available a service contract offering continuing factory authorized service of this system after the initial hardware and software warranty periods.

B. System shall include software maintenance that includes bug fixes and new feature releases for a period of five years. In addition, the contractor shall provide at the owner’s request additional maintenance contracts that are available as one-year, three-year, and five-year extensions. The contractor shall provide a 24-hour response time from call by customer.

C. The system manufacturer shall maintain engineering and service departments capable of rendering advice regarding installation and final adjustment of the system.

1.14 WARRANTY

A. The Bogen Nyquist hardware products identified in this specification shall be warranted to be free from defects in materials and workmanship for five (5) years from the date of sale to the original purchaser; except for the NQ-SYSCTRL, NQ-T1100 and NQ-T1000 which each carry a two (2) year warranty. The Bogen Nyquist software products identified on this specification are warranted to be free from defects in material and workmanship for ninety (90) days from the date of sale to the original purchaser.

PART 2 - SYSTEM SPECIFICATION

2.1 MANUFACTURERS

A. Manufacturers, subject to compliance with requirements specifications, provide the following system:

1. Bogen Nyquist E7000 IP-based paging and intercom solution manufactured by Bogen Communications, Inc.

B. The specifying authority must approve any alternative system 10 days prior to bid day.

C. The intent is to establish a standard of quality, function, and features. It is the responsibility of the contractor to ensure that the proposed product meets or exceeds every standard set forth in these specifications.

D. The functions and features specified are vital to the operation of this facility; therefore, inclusion in the list of acceptable manufacturers does not release the contractor from strict compliance with the requirements of this specification.

2.2 EQUIPMENT

A. Install and configure the equipment below as required by the Contract Drawings and functionality of the system in order to furnish a complete, fully-functional Public Address system.

1. Nyquist NQ-SYSCTRL System Controller

a. Configuration and management via a Web-based Graphical User Interface (GUI)
b. Wizard based setup for quick installation
c. Remote access from virtually any PC/MAC, tablet, or mobile device
d. Continuous monitoring of stations and appliances to ensure system operation
e. Dual network adapters to allow the System Controller to operate on two separate networks
f. Music automatically added to music library and playlist from USB port
g. Network-based audio that can be sourced (input) from any number of Nyquist appliances (NQ-P0100, NQ-A2xxx, NQ-A4xxx, etc.)
h. Ample storage for music files, recorded announcements, and call recordings
i. G722 and OPUS audio codec support to deliver superior HD audio quality
j. Convection air cooled; fan-less design for quiet, maintenance-free operation
k. Wall, rack, or shelf mountable

2. Nyquist NQ-E7030 Analog Station Bridge (ASB)

a. 24 station interface supporting analog speakers and call switches
b. 120-Watts of available power at 25-Volts
c. Two dynamic talk paths/amplification channels
d. Support Category G wiring or better
e. 25/70-volt speaker(s), ceiling-mounted, wall-mounted, and paging horns
f. CAN Bus 2.0 interface designed for support of Nyquist Digital Call Switch (DCS) NQ-E7020 that can initiate Normal, Urgent, or Emergency priority calls, all with options for Privacy Mode

g. Analog/Mechanical Call Switches capable of placing Normal, Urgent, or Emergency priority calls, Bogen CA15C rocker style momentary call button
h. Wall, rack, or shelf mountable

3. Nyquist NQ-P0100 Matrix Mixer Pre-Amplifier (MMPA)

a. No less than four Mic/Line inputs used for analog audio input like AM/FM Tuner or CD Player
b. Channel 4 configurable for Push-to-Talk MIC application
c. Line Level output to drive external amplifier
d. Software programmable configuration and operation
    1) Push-to-Talk Channel
    2) Push-to-Talk Type
    3) Push-to-Talk Zone
    4) Mixer Channels

e. Configurable built-in DSP
    1) Noise Gate
    2) Compressor/Limiter functions, etc.
    3) Tone Controls: Low Shelving, Mid Bandpass and Hi Shelving
    4) Multi-band Parametric EQ
    5) Variable Low-Cut/High-Pass filters
    6) CH1 can be configured as a digital AES/EBU (AES3) input

f. USB 2.0 host port, Type-A connector (future use)
g. Powered by 100V – 240V Universal AC Mains
h. Wall, rack, or shelf mountable

4. The Nyquist two and four channel amplifiers available in the following number of channels and watts

a. NQ-A2060 two channel with 60 watts per channel
b. NQ-A2120 two channel with 120 watts per channel
c. NQ-A2300 two channel with 300 watts per channel
d. NQ-A4060 four channel with 60 watts per channel
e. NQ-A4120 four channel with 120 watts per channel
f. NQ-A4300 four channel with 300 watts per channel
g. These amplifiers shall include GUI based DSP controls; 16-band Graphic Equalizer; Signal Present and Clip Monitor; Adjustable High Pass, Low Pass, and Bandpass Filters; Noise Gate; Compressor/Limiter; and 7-band Parametric Equalizer. Outputs shall be provided for 4-, 8-ohm, 25V, and 70V distributed systems.
h. Bridged or Mono Mode
i. Integrated Digital Signal Processor
    1) Noise Gate
    2) Compressor/Limiter functions, etc.
    3) Tone Controls: Low Shelving, Mid Bandpass and Hi Shelving
    4) Multi-band Parametric EQ
    5) Variable Low-Cut/High-Pass filters

j. One Line-Level Input on two channel amplifiers
k. Two Line-Level Inputs on the four channel amplifiers
l. 100/1000 GB ethernet connection
m. USB 2.0 host port, Type-A connector (future use)

n. 100V – 240V Universal AC Mains
o. Wall, rack, or shelf mountable
p. The amplifiers shall carry the necessary safety agency listings for both the US and Canada. The amplifier shall employ convection air cooling. Amplifiers that require fans for cooling shall not be considered equal.

5. Nyquist NQ-E7010 Input/Output Controller

a. Power over Ethernet 802.3af compliant
b. 8 x Dry Contact Closure Inputs
c. 8 x Relay Driver Outputs (Open-Collector)
d. USB 2.0 host port, Type-A connector (future use)
e. Software programmable configuration and operation including; Contact Type, Extension, Name, Close Interval, Actions (911, Audio, Alarm, Announcement, All-Call, Multi-Site-Emergency-All-Call, Emergency-Call, Emergency-All-Call, Hourly, Audio-Disabled, No Action, Page, Tone, Enable-Audio and Manual), Action ID, Zones, Close Extension, Dashboard Type, Dashboard Title, Dashboard Scope, Dashboard Text, Dashboard Style, Email and Routines
f. Wall, rack, or shelf mountable

6. Nyquist NQ-GA10P 10-Watt Intercom Module

a. Power over Ethernet 802.3af compliant
b. Low-impedance (8-ohm) speaker output. Designed for use with Drop-In Ceiling Speaker CSD2X2L/U
c. Network-based audio output (paging, intercom, audio distribution)
d. Talkback support
e. Push-to-Talk Microphone that can be routed anywhere over Bogen's Nyquist network
f. Ambient Noise Sensor connection for Amplifier volume output control
g. DSP-based noise rejection and voice bandwidth optimization
h. Web-based configuration
i. Analog Call Switch support (Bogen CA15C, or equivalent)
j. Digital Call Switch support (Bogen NQ-E7020)
k. Audio Active Control SPDT Relay Output Rated at 2A
l. In-wall, in-ceiling, shelf, or device mountable UL 2043 plenum-rated package
m. Integrated slotted mounting flanges
n. Available PS4815W 48VDC External Power Supply when PoE isn't available

7. Nyquist NQ-GA10PV 10-Watt Intercom Module with HDMI Clock/Messaging Display.

a. HDMI 1.3 (max. 1920 x 1080 @ 24/30 Hz) output that can be configured many ways:
    1) Analog Clock with Messaging
    2) Digital Clock with Messaging
    3) Single Column Messaging
    4) Two Column Messaging
    5) Three Column Messaging
    6) Priority Fullscreen Messaging

b. Power over Ethernet 802.3af compliant
c. Low-impedance (8-ohm) speaker output. Designed for use with Drop-In Ceiling Speaker CSD2X2L/U
d. Network-based audio output (paging, intercom, audio distribution)

e. Talkback support
f. Push-to-Talk Microphone that can be routed anywhere over Bogen's Nyquist network
g. Ambient Noise Sensor connection for Amplifier volume output control
h. DSP-based noise rejection and voice bandwidth optimization
i. Web-based configuration
j. Analog Call Switch support (Bogen CA15C, or equivalent)
k. Digital Call Switch support (Bogen NQ-E7020)
l. Audio Active Control SPDT Relay Output Rated at 2A
m. In-wall, in-ceiling, shelf, or device mountable UL 2043 plenum-rated package
n. Integrated slotted mounting flanges
o. Available PS4815W 48VDC External Power Supply when PoE isn't available

8. Nyquist NQ-GA20P2 Plenum-Rated 20-Watt Integrated Amplifier

a. Single 20-watt, 8-ohm speaker output
b. Single Balanced Line Output
c. Power over Ethernet Plus (PoE+) 802.3at compliant
d. Nyquist network-based audio output (paging, intercom, audio distribution)
e. Web-based configuration
f. Front panel Power and Status LEDs
g. In-wall, in-ceiling, shelf, or device mountable UL 2043 plenum-rated package
h. Integrated slotted mounting flanges
i. Available PS4830W 48VDC External Power Supply when PoE+ isn't available
j. NQ-T1100 VoIP Admin Phone Color Touch Display (aka Admin Station)
k. 7" 800 x 480-pixel color display with backlight
l. Touch screen display for one touch operation
m. Full-duplex hands-free speakerphone with AEC
n. Call hold
o. Mute
p. Redial, call return, auto answer
q. PoE (802.3af) Class-3 support
r. Headset with EHS support
s. Dual Gigabit Ethernet ports
t. Desk Mountable
u. Optional Wall mount available

9. NQ-T1000 VoIP Staff Phone LCD Display (aka Staff Station)

a. 132 x 64-pixel graphical LCD with backlight
b. Two-port 10/100M Ethernet Switch
c. Full-duplex hands-free speakerphone with AEC
d. Call hold
e. Mute
f. Redial, call return, auto answer
g. PoE (802.3af) Class-3 support
h. Dual-color (red or green) illuminated LEDs for line status information
i. Two 10/100M Ethernet ports
j. Wall or desk mountable

10. Optional third-party equipment support

a. Telephony interface device(s) for FXO/FXS analog port connectivity
b. Third-party hardware FXS gateway support includes:

1) Two port FXS gateway Cisco SPA-112 typically used for analog interface to existing PBX CO port support
2) 24 port FXS gateway Yeastar TA-2400 typically used for analog staff phone support

2.3 COMPONENTS AND DESCRIPTIONS

A. The Nyquist E7000 Series Educational System is a software-based VoIP paging and intercom system.

B. The System must be capable of supporting existing Bogen Multicom 2000 and Bogen Quantum Multicom IP wiring, 25-Volt speakers and analog call-switches, and equivalent competitive systems utilizing the existing architectural numbering scheme. The VoIP capabilities of the Nyquist system will enable the support of the features across the Nyquist appliances within the facility. The following sections define how the system handles each of the features in the system. Systems that do not allow the reuse of existing wiring or numbering scheme shall not be deemed acceptable. Systems that do not allow appliances to be seamlessly integrated via the existing customers LAN are not considered equal.

C. Nyquist E7000 Software

1. The Nyquist E7000 software is pre-installed on a Nyquist NQ-SYSCTRL System Controller or can be optionally installed on a dedicated dealer or customer supplied server. An unlimited number of facilities can be networked into a Nyquist-based District.
2. Audio shall be transmitted between the System Controller and the Nyquist appliances using the customer supplied LAN/WAN using both G.722 and Opus 48k audio encoding and streaming technology to deliver High Definition DVD quality audio. Systems that do not use G.722 and Opus for audio encoding and streaming shall not be deemed equivalent.
3. Installers have the ability to verify that the Nyquist System Controller can access Internet-based URLs required for the system to run properly by clicking on the "Check Internet Site Access" on the license activation wizard. If the installer made mistakes in configuring the network the install has the ability to go back and make changes to the network by clicking on the “Network Wizard” button.
4. The Nyquist software and Nyquist appliances firmware shall be upgradeable via the Nyquist Web UI System Update page that contains a list of available Nyquist software updates. When automatic software check and download are enabled, new software updates will automatically be downloaded and appear in the System Update list, and a dashboard message will be displayed to announce newly available software. Release notes can be viewed for each available update. System updates can be started via the System Update list. The System Update page includes a "Check for System Updates" button that can be used to manually check for and download available Nyquist software updates.
5. Prior to preforming Nyquist updates the technician shall have the ability to verify if the default gateway, Network Time Protocol, and Domain Name Servers are configured and available, to obtain network interface and routing tables status, and to display the Nyquist E7000’s public IP address. See "Check Internet Site Access" under "System Parameters”. The E7000 system can be setup to automatic check for new Nyquist System software and automatic download of new Nyquist System Software
6. It shall be possible for a Nyquist facility to make “station-to-station” calls and “remote facility” All-Call pages to a single facility or to all Nyquist facilities in a district via the Nyquist Web UI or an Admin Station. Systems that require remote viewing software or other application software to be installed/loaded on to additional servers or PCs to make

station-to-station calls and remote facility All-Call or district paging shall not be considered equivalent.

7. The Nyquist software is designed to handle all facility and district-wide communications, including but not limited to, inter-facility intercom calling and paging, district-wide Emergency All-Call and local facility point-to-point calls. Via the Nyquist Web UI, every facility shall be configured with the IP addresses of all the other remote facilities within the district. To ensure that these communications are operating correctly at all times the Nyquist appliances are supervised and remote facilities are monitored, if a device or facility has a fault the system can send and/or email and also display a message if a device changes state. System that don't provide Station Supervision and remote Facility Monitoring shall not be considered.
8. Nyquist can support an unlimited number of facilities; however, the maximum number of simultaneous remote facility intercom calls supported is based on the actual performance of the WAN and the Nyquist System Controller CPU load.
9. The voice quality of the facility calls may vary based on the WAN conditions. The maximum network bandwidth that All-Call and Zone Paging uses is average of 0.086 Mbps (Multicast G.722), and intercom calls average of 0.171 Mbps (unicast, G.722).
10. The system shall facilitate the repetitive playing of Normal or Emergency audio tones or announcements directed to an All-Call or a Paging Zone until stopped by the Nyquist user via the Web UI, an Admin Station, or a dry contact closure connected to the Nyquist I/O Controller NQ-E7010.
11. Through the use of Routines, a trained individual can create a routine that can perform a sequence of events that can include the repetitive playing of normal or emergency audio files, make or break contact closure(s), display different messages in different areas, send email(s), and place a phone call (if equipped) offsite and play a pre-recorded message. Routines can be triggered/started by Application Programming Interface (API) or the playing of normal or emergency audio files, make or break contact closure(s) or almost any feature or function in the E7000 system. The system must also be capable of executing multi-site Routines (e.g., supports District-wide lockdown). Systems that don't provide Routines are not equal.
12. A built-in Master Clock shall be included to automatically control class change bells or other time-based events. The Master Clock shall have an unlimited number of Events that may be programmed into any of the unlimited number of Facilities, unlimited number of Schedules, and unlimited number of Holiday events. The schedules shall be nameable for easy selection when assigning schedules to days or overriding a schedule. Schedules can be overridden via the Admin Web UI or Admin phone.
13. Network Time Synchronization. The system shall be capable of periodically updating/synchronizing the processor's time with a Network Time Server running Network Time Protocol (NTP) via the school's LAN network. Systems that do not provide Network Time Synchronization will not be deemed equivalent. The Nyquist server can be the NTP server for other devices on the LAN such as IP clocks and other IP devices.

D. Nyquist E7000 System Software Application

1. The Nyquist software is pre-installed on the Nyquist System Controller, and upon boot-up, users can log in to the Nyquist application via a web browser that supports WebRTC. Systems that require Com Port redirect software, client PC application, software or serial-to-Ethernet adapters for user access are not deemed equal. Communications between the System Controller and the Web UI(s) shall be via secure Hyper Text Transfer Protocol (HTTPS) connections (i.e., https://).
2. The Nyquist Web UI shall be configured with four different default user access levels, based on four unique user roles. Systems that do not provide unlimited access levels and unlimited number of user roles are not considered equal.
3. The four default roles shall be: admin, optech, operator, and user. These roles provide a starting point/example for administrators to create additional roles

4. Only a user assigned the admin role shall be able to provide access to users, giving them the ability to create, delete, edit, and view system parameters.
5. Only an Administrator shall have the ability to adjust roles and Class of Service (CoS) of users. The roles determine if users can view the definable data objects that can include configuration, alarms, and performance data and if users can perform certain operations based on the user's role and station's CoS. All changes to roles and CoS are effective immediately, without the need to restart the browser or reboot the System controller or server.
6. The Nyquist Web UI Dashboard shall provide full administrative capabilities to manage/operate the following system features:

    a. Calling/Paging – Used to access directory, dial pad, Page Exclusion, Call Forwarding, Zone Page, Record Page, Prepending Page, All-Call, Emergency All-Call, Manage Check-in and operate Routines.
    b. Multi-Site Calling/Paging – Used for Facility Page, Multi-Site All Call, and Multi-Site Emergency All Call.
    c. Tones/Announcements – Used for Tones, Announcements, Alarms, Stop Announcement, Display Message, and Remove Message.
    d. View Weekly Schedule – Used to show the current active Bell Schedules.
    e. Audio Distribution – Used to distribute audio sources to Stations, Audio Zones or entire facility. Operators can create an unlimited number Audio Distributions as needed by the facility
    f. Enable or Disable Audio – Used to place the Nyquist system into Page Exclusion mode (i.e., "mute" the system) when a contact closure is supplied from the fire alarm panel. Systems that do not provide this capability are deemed not equal.

7. Systems that require application software to be installed on a PC to manage the above features shall not be considered.
8. To facilitate installation and configuration of the system, additional Web UI menus are required. The menus shall only be visible to users with the correct roles and CoS. The navigation menus found on the Web UI shall be as follows:

    a. System Parameters – Allow installers to adjust core system parameters including Product License, Restart Server, Station Supervision, Email Configuration, System Update, Shut Down Server, Check Internet Site Access, Check Server Status, Edit system tools and adjust all the System Parameters.
    b. Zones and Queues – Allow installers to create and modify Paging, Time, and Audio Zones. Installers can also setup Queues that can be used to eliminate feedback.
    c. Schedules – Allow installers and administrators to create bell schedules for multiple Schools, predefine alternative schedules to run, prevent the bells from ringing on a holiday, and schedule an announcement to play. The system shall allow an unlimited number of schedules to operate simultaneously within a facility.
    d. CoS Configuration – Allow the installer to create, modify, and delete CoS groups that control station access to the following features: Call-in Level, Zone Paging, All-Call Paging, Emergency All-Call, Inter-Facility Call/Page, Audio Distribution, Remote Pickup, Join Conversation, Call Forwarding, Walking Class of Service, External Call Routing, Call Transfer/3-way Calling, Manually Activate Tone Signals, Call Any Station, Manage Recording, Monitor Calls, Monitor Locations, Conference Admin, Conference User, Voicemail, Record Calls, Activate Alarm Signals, Disable Audio, Enable Audio, Allow Callee Auto-answer, District Paging, Inter-Facility Features, Manage Output Contacts, and Execute Routines.
    e. Admin Groups – Allow the installer to create, modify, and delete software groupings of admin phones, staff phones, and Admin Web UIs that can ring when a station calls in with a call switch.

f. Stations – Allow the installer to set up, modify, and delete stations; set up Page Exclusion; view Station Status; and add New Stations.
g. Bridge Devices – Allow the installer to configure the Nyquist ASBs.
h. Amplifier Devices – Allow the installer to configure Nyquist Two and Four and PA Amplifiers
i. Audio – Allow the installer to upload and manage Announcements, Playlists, Recordings, Songs, Tones, and Internet Radio Services. The system must support the uploading of both MP3 and WAV files and make Audio file management simple for users. Systems that limit the size of Audio files shall not be considered equal.
j. Users – Allow the installer to manage users by giving them the proper roles and assign extensions if needed.
k. Roles – Allow the installer to grant users rights to Create, Delete, Edit, Restart System, Sort Menu, Systems Update, Manage, Import/Export, Restore, Settings, or View.
l. Facilities – Allow the installer to set up the district wide facilities for remote paging and calling.
m. Outside Lines – Allow the installer to set up FXS and FXO ports for inbound and outbound system calling.
n. SIP Trunks – Allow the installer to set up SIP trunks into the facility for inbound or outbound calling.
o. Call Details – Allow the installer to review the historical system activities that can be used for incident investigation or system troubleshooting.
p. System Backup/Restore – Allow the installer to preform system backups or restores and allow the backups to be scheduled to run automatically.
q. System Logs – Allow the installer to view and export log files, Nyquist-Intercom, and Web Server logs that can be used for troubleshooting and technical assistance.
r. Paging Exclusions – Allow the installer to view and edit stations that are excluded from paging.
s. Firmware – Update firmware for Nyquist speakers and appliances.
t. Routines – Allow installers to create routines that are a sequence of actions, that the Nyquist system executes as a result of an input trigger. Routines can support crisis plans for situations such as school lockdowns, weather events, or emergency evacuations.
u. Alert Filters – Allow installers to select the National Weather Alerts that the facility needs to monitor for such as weather events, earthquakes, tsunami, volcanoes, public health, power outages, and many other emergencies.
v. Systems that do not provide these options as a minimum shall not be considered equal.

E. Nyquist NQ-E7030 Analog Station Bridge

1. The Nyquist NQ-E7030 ASB allows facilities with existing Multicom or Quantum or compatible intercom systems to upgrade to Nyquist. Each ASB supports up to 24 speakers and call switches with 120-Watts of embedded 25 Volt power. The ASB is designed to drive almost any combination of 25 Volt speakers and horns.
2. The Nyquist ASB contains two 120-Watt amplifiers that are used dynamically by the system and allows two simultaneous amplified audio paths through the ASB. Either amplifier can be used for an intercom call and/or program (Paging, Time Tones and Audio) distribution.
3. Each of the 24 station interface ports - Support connections to as many as 24 individual 25 Volt speakers with one 25 Volt speaker connection per interface used for direct communication between the admin area and the classroom via Half-duplex talkback using the speaker as pickup and the 24 dry contact closure-type analog Call Switch connections allow for support of legacy Call-Switches like the CA15C.

4. On the back of the ASB is a CAN Bus 2.0 Interface designed to support the connection of 24 or more Nyquist NQ-E7020 Digital Call Switches DCS that can be associated with the programmed stations. Systems that don't support Digital Call Switches shall not be considered equal.
5. On the front of the ASB are two (2) x RGB full spectrum LED's. The POWER LED appears as solid red during initial power up, flashes green during a boot sequence, and appears solid green when fully booted. The STATUS LED uses the following indicators to provide information about the appliance:
    1) Flashing red – No network connection found
    2) Solid blue – The ASB is in an uninitialized state and is not associated to a server. (The server may be in a discovery mode.)
    3) Solid green – The ASB is registered to a Nyquist server and is in normal operation
    4) Flashing green – The ASB has an IP address but is not registered with the Nyquist server
    5) Solid red – The ASB needs to be rebooted or reset so that the Nyquist application can resume
    6) Flashing Blue – The ASB is updating.
6. USB 2.0 host port, type A connector designed for future applications.
7. On the front of the ASB you will also find the 10/100 Ethernet network connection. The ASB can be configured with a static IP address or use DHCP for connection to the customers network as required by the Network Administrator
8. The ASB gets its power from a universal mains power supply (100VAC – 240VAC)
9. The Nyquist NQ-E7030 ASB shall be rack, wall, or shelf mountable and shall include the required mounting bracket hardware.

F. Nyquist NQ-P0100 Matrix Mixer Pre-Amplifier (MMPA)

1. The Nyquist NQ-P0100 MMPA is designed to bring external audio into the Nyquist system. The MMPA interfaces with a local sound system by accepting one or more analog audio sources, mixing them, and outputting them to either, a) the network for Audio Distribution, or b) the MMPA's line level output that can then be inserted into an external amplifier to drive local sound system in gyms, cafeterias, auditoriums, etc. The MMPA supports the following:

    a. Four software selectable Line/MIC Input channels via three XLR connectors and four sets of screw-terminals. Input channel four (4) shall be capable of being configured to support a Push-to-Talk microphone Bogen model DDU-250. Channel-1 can be configured as a digital AES/EBU (AES3) input. Line/Monitor output – The MMPA becomes a station on the Nyquist system, allowing users to call it directly or to include it in any of the Page, Time, or Audio Zones and can be direct one-way page by calling it extension.
    b. The MMPA shall support the following features: Line-Level output to drive input on a local amplifier or self-amplified speaker; One USB 2.0 host port (Type-A connector) for future use; two (2) x RGB full spectrum LED status indicators.
    c. Configurable built-in Digital Signal Processing for Noise Gate, Compressor/Limiter functions, etc., Tone Controls: Low Shelving, Mid Bandpass and Hi Shelving, Multi-band Parametric EQ, and Variable Low-Cut/High-Pass filters.
    d. The MMPA is powered by Universal mains supply (100VAC – 240VAC).
    e. The MMPA shall be wall or shelf mountable and shall include the required mounting bracket hardware.

2. The system shall be equipped a minimum of one (1) Nyquist MMPA that allows for up to four user-configurable audio inputs. The MMPA shall support Line, MIC, and digital AES/EBU (AES3) input sources. The system supports an unlimited number of MMPAs.

G. Nyquist NQ-E7010 Input/Output Controller

1. The Nyquist NQ-E7010 I/O Controller is designed to accept contact closure inputs and activate open-collector outputs to drive relay coils. These inputs and outputs are used to trigger events or to be triggered by an event or Routine within the Nyquist system.

    a. PoE Class-1; IEEE 802.3af compliant with Optional 48VDC 15W power supply
    b. Eight Dry Contact Closure Inputs that can be used with Fire Alarm Override Relays, external event triggers (for example, Lockdown Buttons, etc.)
    c. Eight Relay Driver Outputs (Open-Collector) for use with Clock Correction (Sync Pulse), response to contact closure inputs, etc.
    d. USB 2.0 host port, Type-A connector (future use)
    e. Two (2) x RGB full spectrum LED Power and Status indicators

2. The Nyquist NQ-E7010 I/O Controller shall support wall or shelf-mounting options and shall include the required mounting bracket hardware.
3. The Nyquist NQ-E7010 I/O Controller shall be designed for wall or shelf mounting.

H. Bogen Analog Call Switch CA-15C for use with the Nyquist ASB or NQ-GA10P(V)

1. The momentary Call Switch shall be capable of placing a combination of Normal/Urgent/Emergency Calls based on the software configuration of the Call Switch.
2. Normal/Emergency call configuration: Making a Normal call in this mode involves pressing the button on the Call Switch once. A call is then placed to the designated Admin Station. An Emergency call involves pressing the call switch at least four times. The Emergency call is then routed to the designated Admin Station. In both scenarios, the calling station number and call-in level (Normal or Emergency) are displayed on the Admin Station or on a group of Admin Stations. Additionally, Emergency calls can be routed to an alternative Admin Station or Emergency Link.
3. Urgent/Emergency call configuration: Making an Urgent call in this mode involves pressing the button on the Call Switch once. A call is then placed to the designated Admin Station. An Emergency call involves pressing the button on the Call Switch at least four times. The Emergency call is then routed to the designated Admin Station. In both scenarios, the calling station number and call-in level (Urgent or Emergency) are displayed on the Admin Station or on a group of Admin Stations. Additionally, Emergency calls can be routed to an alternative Admin Station or Emergency Link.
4. Emergency Only call configuration: Making an Emergency call in this mode involves pressing the Emergency call switch with Call Level Emergency one time. The call is then switched to the Admin Station. This requires the display of the station number and call-in level on the Admin Station or on a group of Admin Stations. Additionally, Emergency calls can be routed to any Admin Station, including Emergency Link.
5. Emergency Link Transfer - If an Emergency call goes unanswered by the Admin Station and the Emergency link transfer is active, the Emergency call will be forwarded to the loudspeaker associated with the Emergency Link Station. Any station equipped with a loudspeaker can be programmed as the Emergency Link Transfer. Systems that do not provide Emergency Link Transfer shall not be considered equal.
6. In addition to the mechanical click of a Call Switch button press, a call confirmation audio file shall be played on the associated loudspeaker when a call is placed. The three call-in levels shall have distinct audio confirmation messages:

a. Call Placed
b. Urgent Call Placed
c. Emergency Call Placed

I. The Nyquist plenum-rated amplifier shall be a model NQ-GA20P2 20-watt integrated amplifier and shall utilize UL 2043 plenum-rated packaging.

1. One 20 watt 8-ohm speaker output (with PoE+)
2. One Balanced Line Output
3. RJ-45 for Nyquist network connection
4. Power-over-Ethernet Plus (PoE+) 802.3at compliant
5. Nyquist network-based audio output Web-based configuration
6. Power and Status LEDs
7. In-wall, in-ceiling, shelf, or device mountable UL 2043 plenum-rated package
8. Optional 48VDC External Power Supply (PS4830W; sold separately)

J. The Nyquist plenum-rated amplifier shall be a model NQ-GA20P2 20-watt integrated amplifier and shall utilize UL 2043 plenum-rated packaging. The amplifier shall be capable of being powered with an 802.3at compliant Power-over-Ethernet Plus (PoE+) switch, PoE+ power injector, or 48VDC external power supply PS4830W. The amplifier shall provide a frequency response from 20-20 kHz +/- 0.25 dB at rated power. Distortion shall be less than 0.05% THD+N. The amplifier shall include GUI based configuration. Output shall be provided for both line level or 8-ohm speaker connections. Audio line level output shall be 2.2V RMS @10kΩ (+27 dB) electronically balanced.

K. The Nyquist based two channel amplifier shall be a model [_____], rated at [_____] watts RMS per channel (NQ-A2060/2x60 watts, NQ-A2120/2x120 watts, and NQ-A2300/2x300 watts) with switch selectable 2-Channel or 1-Channel bridged operation. The amplifier shall have one dedicated Balanced Line Input. The amplifier shall provide a frequency response from 20-20 kHz +/- 0.25 dB at rated power. Distortion shall be less than 0.03%. The amplifier shall include GUI based DSP controls; 16-band Graphic Equalize; Signal Present and Clip Monitor; Adjustable High Pass, Low Pass, and Bandpass Filters; Noise Gate; Compressor/Limiter; and 7-band Parametric Equalizer. Outputs shall be provided for 4-, 8-ohm, 25V, and 70V distributed systems. The amplifier shall be rack mountable 1/2 Rack Width - Wall, Rack, or Shelf mountable 1RU and 2RU packages or by using a 19” Rack Mount Kit (NQ-RMK03; sold separately). It shall carry the necessary safety agency listings for both the US and Canada. The amplifier shall employ convection air cooling. Amplifiers that require fans for cooling shall not be considered equal.

L. The Nyquist based four channel amplifier shall be a model [_____], rated at [_____] watts RMS per channel (NQ-A4060/4x60 watts, NQ-A4120/4x120 watts, and NQ-A4300/4x300 watts) with switch selectable 4-Channel or 2-Channel bridged operation. The amplifier shall have two dedicated Balanced Line Inputs with both Phoenix plug and XLR connections for each input. The amplifier shall provide a frequency response from 20-20 kHz +/- 0.25 dB at rated power. Distortion shall be less than 0.03%. The amplifier shall include GUI based DSP controls; 16-band Graphic Equalizer; Signal Present and Clip Monitor; Adjustable High Pass, Low Pass, and Bandpass Filters; Noise Gate; Compressor/Limiter; and 7-band

M. Nyquist NQ-T1100 VoIP Admin Phone – Color Touch Display (Admin Station)

1. The Nyquist Admin Station shall have the following features:

a. 7” 800 x 480-pixel color display with backlight
b. Touch screen display for one touch operation

c. Full-duplex hands-free speakerphone with AEC
d. Call hold
e. Mute
f. Redial, call return, auto answer
g. PoE (802.3af) Class-3 support
h. Headset with EHS support
i. Dual Gigabit Ethernet ports
j. Desk Mountable
k. Optional Wall mount capable

2. The Nyquist Admin Station display panel shall show the time of day and day of week, the current bell schedule(s), and the station numbers and call-in priority of staff stations that are calling in. Depending upon the system programming, an Admin Station shall display menus to activate Zone Paging, All-Call Paging, Emergency All-Call Paging, District All-Call paging, alarm signals, and external functions.
3. The Admin Station shall be capable of calling either the loudspeaker or Staff Station at each classroom location.
4. The Admin Station shall display the classroom number of any station that calls 911. This allows front-office administrators to direct emergency personnel to the correct physical location in the building when they arrive. If a system is not connected to outside phone lines, then 911 calls can be routed to a designated station within the facility. The system shall automatically record all 911 calls made from any station. The 911 call recording shall begin as soon as 911 is dialed and continue unit the call is terminated. Recorded calls shall be maintained on the system for later playback review and/or retrieval by authorized personnel and/or authorities. Systems that do not provide this feature will not be deemed equal.

N. Nyquist NQ-T1000 Staff VoIP Phone – LCD Display (Staff Station)

1. Nyquist Staff Station shall have the following features:

a. 132 x 64-pixel graphical LCD with backlight
b. Two-port 10/100M Ethernet Switch
c. Full-duplex hands-free speakerphone with AEC
d. Call hold
e. Mute
f. Redial, call return, auto answer
g. PoE (802.3af) Class-3 support
h. Dual-color (red or green) illuminated LEDs for line status information
i. Two 10/100M Ethernet ports
j. Wall or desk mountable

2. The classroom Staff Station shall be capable of the following features depending on how the station CoS is configured:

a. Emergency intercom call – Staff Stations shall be capable of making an Emergency intercom call, which is then routed to the assigned Admin Station. This requires the display of the architectural number and call in level on the Admin Station. Systems that do not provide this feature are not equivalent.
b. Speed dial
c. Toggle audio distribution on and off
d. Call Forward activation and deactivation for All-Calls/Busy/No Answer/Busy or No Answer
e. Conference Calling

f. Transfer Call
g. Dial Administrative station– Staff Stations can allow the user to dial the station number to call to the Admin phone or its associated speaker. The call shall be routed to the Admin Station showing the architectural number that is calling.
h. Emergency All-Call – An emergency page shall be broadcasted to all the stations in the facility.
i. Place Outside Call
j. Remote Answer
k. Single-Zone/All-Station Page
l. Call Waiting Tone for Outside Calls – It shall be possible to feed the call waiting tone to the Administrative Phone during a conversation.
m. Transfer call from VoIP speaker in classroom down to an associated Staff Station
n. Transfer call from analog speaker in classroom down to an associated Staff Station
o. Transfer call from VoIP Staff Station in classroom up to an associated VoIP speaker
p. Transfer call from Staff Station in classroom up to an associated analog speaker

O. Additional Loudspeakers for use with the Nyquist ASB

1. 25-Volt Classroom Speakers shall be Bogen:

a. Ceiling Mounted Speakers: CSD2X2U Drop-In Ceiling Speaker
b. Wall Baffle Speakers: MB8TSQ/SL Metal Box Speaker

2. 25-Volt Hallway Speakers shall be Bogen:

a. Ceiling Mounted Speakers: S810T725PG8U Ceiling Speaker
b. Wall Baffle Speakers: MB8TSQ/SL Metal Box Speaker

3. 25-Volt Outdoor/Gym/Locker Room Speakers shall be Bogen:

a. FMH15T mounted in BBSM6 surface-mounted vandal-resistant enclosure/BBFM6 flush-mounted vandal-resistant enclosure with FMHAR8 adapter ring and SGHD8 heavy duty grille
b. KFLDS30T Wide Dispersion Re-entrant Horn Loudspeakers

4. 25-Volt Pendant Speakers shall be Bogen:

a. OCS1 Orbit Ceiling Speakers
b. OPS1 Orbit Pendant Speakers

P. Wire guards shall be provided and installed for each speaker where indicated on the drawings.

Q. Public Address Strobe:

1. Each public address strobe location shall include the following:
2. QTY (1) RDL ACR-1 Audio Relay
3. QTY (1) Altronix RB5 Relay
4. QTY (1) Edwards 53X-G1 Rotating Beacon, 24V, CONFIRM COLOR PRIOR TO PROCUREMENT
5. QTY (1) Edwards WBR Wall Mounting Bracket
6. QTY (1) Altronix SMP-5 Power Supply
7. QTY (1) TA238175 Transformer

8. QTY (1) STI EM121204 Utility Box
9. All required cabling
10. The power supply for the public address strobes shall be located in the data closet / telecommunication room.
11. The strobe shall activate during an all call or direct room call to the room the strobe is located in.

R. Cabling:

1. All cabling shall be plenum rated.
2. The contractor shall provide wiring in raceway for the proper operation of the sound systems as called for in this specification, or as shown on the drawings. The types of cable required are as follows:

    a. Loudspeaker Cable: It shall contain three (3) 22 AWG stranded tinned copper conductors (two (2) aluminum-polyester shielded and one (1) unshielded), plus a #22 AWG copper drain wire in a chrome PVC jacket. Conductors shall be polyethylene insulated with 0.014 inch thickness. Jacket thickness shall be 0.028 inch and overall outer diameter 0.21 inch. Loudspeaker cable shall be Belden or approved equal.
    b. Microphone Cable: Cable shall consist of one (1) pair of 20 AWG stranded, tinned copper conductors, plus a #20 stranded drain wire in a chrome PVC jacket. Conductors shall be polyethylene insulated and aluminum-polyester shielded. Microphone cable shall be Belden or approved equal.

3. Raceways:
4. Conduit and Boxes: Comply with Section 260533 "Raceway and Boxes for Electrical Systems." Flexible metal conduit shall not be used.
5. Outlet boxes shall be not less than 2 inches wide, 3 inches high, and 2½ inches deep.

2.4 SYSTEM CAPABILITIES

A. The communication system shall be a Bogen Nyquist E7000 Series Educational System and shall provide a comprehensive communications network between administrative areas and staff locations throughout the facility.

B. The system shall provide no less than the following features and functions:

1. Software-based, state-of-the-art, Voice over IP (VoIP) paging and intercom solution.
2. The system shall provide a Web User Interface (Web UI) shall allow users to configure and control the system, in accordance with their assigned User Role, from any Web browser enabled PC, Mac, Android or iOS tablet or mobile device.
3. Amplified-voice communication with analog loudspeakers shall use a shielded audio pair when connected to an ASB.
4. The system shall support any combination of the following VoIP phone station types: NQ-T1100 Administrative VoIP Phone – Color Touch Display (Admin Station) or NQ-T1000 Staff VoIP Phone – LCD Display (Staff Station).

    a. All VoIP phone station types shall utilize the same type of field wiring.
    b. There shall be no limit to the number of Admin Stations that can be connected to a facility. Systems that require different head-end equipment to make Admin Stations function, or systems that limit the number of Admin or Staff Stations shall not be deemed acceptable.

5. Future station alterations shall only require the Station Type to be changed in system programming. Alterations shall not require field wiring or system head-end alterations, unless an analog station device is being replaced by a VoIP station device or vice-versa.
6. The system shall be a global non-blocking system. The system shall be capable of unlimited amplified intercom paths per facility. Two amplified intercom paths shall be provided with each ASB for its complement of 24 stations. All hardware, etc., required to achieve the necessary number of amplified-voice intercom channels for this system shall be included in this submittal. ASB amplified-voice intercom channels shall provide voice-activated switching. Systems requiring the use of a push-to-talk switch on administrative telephones shall not be acceptable. There shall be an automatic level control for return speech during amplified-voice communications. The intercom amplifier shall also provide control over the voice switching sensitivity and delay times of the VOX circuitry on the ASB.
7. The system shall provide 911 Dial-Through via outside FXO/FXS lines or SIP trunks to ensure that one or more lines are always available for 911 calls. The 911 Dial-Through is available to any properly configured station (via CoS). When a station dials 911, the 911 call is processed as follows:

    a. Call routes to an Emergency Group where the call can be answered.
    b. The 911 CO lines can be pre-configured and reserved. If the 911 reserved lines are busy, the normal CO lines will be connected to route the 911 calls. If all the normal CO lines are busy, then one of the ongoing calls shall be disconnected and the 911 call shall be placed.
    c. When 911 is dialed from any station, its designated Admin Station or Admin Group will receive a message that the station has dialed 911.
    d. The system shall automatically record all 911 calls made from any station. The 911 call recording shall begin as soon as 911 is dialed and shall continue until the call is terminated. Recorded calls shall be maintained on the system for later playback review and/or retrieval by authorized personnel and/or authorities.

8. It is of highest importance that Emergency calls from stations receive prompt attention. Therefore, it is important that there be an alternative destination in case the Emergency call does not get answered at the primary location. Details are as follows:

    a. Staff-generated Emergency calls shall be treated as the second highest system priority. Therefore, all Emergency calls shall annunciate at the top of the call queue of their respective Admin Station or Admin Group. Should that Emergency call go unanswered for 15 seconds, the call shall be re-routed to an alternative speaker station. Then, a tone will prompt the caller to make a verbal call for help and annunciates to the Emergency link station “Emergency.” During the transfer, the original administrative telephone shall continue to ring the distinctive Emergency Ring. Should the Emergency Transfer-to-Station have an associated Admin Station, it will also ring for the Emergency call.
    b. The Emergency Transfer-to-Station shall be software configurable.
    c. Systems failing to transfer unanswered Emergency calls or failing to immediately connect to the designated Admin Station shall not be deemed as equal.

9. There shall be a Facility Wide Emergency All-Call feature. The Emergency All-Call shall be accessed from designated Admin Stations or the Nyquist Dashboard or by the activation of an external contact closure that shall give a microphone input Emergency status. The Emergency All-Call function shall have the highest system priority and shall override all other loudspeaker-related functions including Time Tones, Normal All-Call or Zone Pages, or Audio Distribution.

a. Considering that Emergency calls are to be treated with the highest level of concern, systems that do not regard Emergency All-Call with the highest priority shall not be deemed as equal.
b. Upon touching the Directory icon, a menu shall appear on the Admin Station display prompting the user to select the desired menu.
c. The Emergency All-Call shall capture the highest-level system priority and shall be transmitted over all speakers in the facility. It shall also be capable of activating an external control output, which can be used to activate external relays to automatically override volume controls, local sound systems, or strobe circuits.
d. This Emergency All-Call feature can have a four-digit pin number associated with it that would be required to use the feature or override someone that is already using this feature.
e. Systems without Emergency All-Call or systems with All-Call that cannot be activated by external means or that do not capture complete system priority or activate an external relay, shall not be acceptable.

10. There shall be unlimited Alarm Tones (four by default). Each may be accessed by dialing *91 and the two-digit tone number from any Admin Station, SIP Trunk, or FXO/FXS system interface. These Alarm Tones are separate from the Time Tones. Users shall be able to add an unlimited number of Alarm Tones to the system by uploading MP3 or WAV files. Systems that do not allow the user to upload MP3 and WAV files to customize the Alarm Tones or need to use external alarm/tone generators or special software or have less than four Emergency Alarm Tones shall not be acceptable.
11. Upon touching the Directory icon on an Admin Station, a menu shall appear on the display prompting the user to select from the sub-menus. The Alarms sub-menu is the first available. This precludes the user from having to memorize complicated key sequences to access Alarm Tones.
12. There shall be unlimited I/O Controller relay driver outputs accessible and controllable by properly authorized users via an Administrative Web UI. These outputs remain set until accessed and reset. Users shall have the ability to review the status of each relay driver output. Users shall be prompted through fields via a plain English menu, precluding users from having to remember any dialing sequences to control this feature. The system shall support an unlimited number of I/O Controllers, and each I/O Controller shall be able to interact with any and all other I/O Controllers on the system (i.e., an input on one I/O Controller can trigger an output on one or more different I/O Controllers). Systems that require the user to remember complicated dialing schemes or prompt the user via cryptic commands shall not be acceptable.
13. The I/O Controller can create a contact closure when the following operations are performed in the system:

    a. 911 call placed
    b. Audio Distributed
    c. Alarm is played
    d. Announcement is played
    e. All-Call preformed
    f. Multi-Site All-Call performed
    g. Multi-Site Emergency-All-Call
    h. Emergency-Call
    i. Emergency-All-Call
    j. Audio-Disabled
    k. Page

14. The system shall provide software controlled and programmable control outputs for external relay activation for use with strobe lights, magnetic locks, card access systems,

motion detectors, cameras, or any low-voltage, dry contact creating device. Systems using dedicated security stations for control of external functions shall not be acceptable.

15. The system shall be capable of interfacing to PSTN/PBX/iPBX via both FXO/FXS line and SIP trunk connectivity.
16. The system shall be capable of providing each facility (i.e., (i.e., Nyquist location) an unlimited number of incoming FXO/FXS or SIP trunk lines that can be designated by the user to ring the designated Day Admin or Night Admin. Where an Admin Station is designated to receive outside line calls, the incoming call's Caller ID information shall appear on the display. The system shall also provide the ability to make outside line calls from Admin Stations. This ability shall be programmable for each Admin Station and there shall be an unlimited number of CoS available to assign to any station.
17. The system shall be capable of supporting DID, DISA, and Security DISA functions.

    a. The system shall provide a password-protected Security DISA feature that shall only be accessible from authorized Police, Fire, Emergency personnel, or an off-premise security office that monitors the facility's security system. The Security DISA feature shall function as follows: Upon dialing the Security DISA phone number, the caller will receive a dial tone from the system, after which he or she must enter the assigned Security DISA passcode on the dial pad. Upon confirmation, the system will present the dial tone again and will allow the authorized personnel to dial any station/classroom on the system and monitor the activity without any pre-announce tone or privacy beep. This will allow the authorized personnel to audibly assess the situation and determine what actions need to be taken.
    b. All DISA and Security DISA calls shall be automatically recorded by the system for later playback review and/or retrieval by authorized personnel and/or authorities.

18. The system shall provide for field-programmable three-, four-, five-, or six-digit architectural station numbers.
19. There shall be an automatic level control for return speech during amplified-voice communications.
20. Each station loudspeaker shall be assignable to all or any combination of Paging, Time, and/or Audio Zones. Systems that do not provide unlimited Paging, Time, and/or Audio Zones shall not be acceptable.
21. There shall be unlimited schedules with unlimited programmable events per facility. Each event shall sound one user-selected tone or external audio source. It shall be possible to assign each schedule to a day of the week or to manually change schedules from an authorized user via a web-based UI. Systems that do not provide unlimited schedules, events, and tones, or that require software to be installed on a PC to perform these functions shall not be acceptable.

    a. The system shall provide multiple concurrent schedules per facility/location to accommodate split facilities (for example., combined Elementary and Middle School, combined Middle and High School, etc.).
    b. The system must be capable of providing Class Change Music to be played from an external audio source or audio files that are stored in playlists on the system during class change periods or whenever a facility wants music to be played in an area (i.e., (i.e., one or more Time Zones) on an automated schedule.
    c. Each event shall be able to be directed to any one or more of the unlimited Time Zones.
    d. Each of the unlimited Time Zones shall have a programmable, customizable Preannounce Tone and volume control that is unique unto itself.
    e. Each event shall play any of the Normal tones or external audio. Each event may utilize a different tone. For example, the system shall be capable of sending the gymnasium, shop classes, and pool a separate, unique time tone to indicate "clean

up." Minutes later, the entire facility can be sent a different time tone to indicate class change.

f. Each of the unlimited Time Tones may be manually activated by selected VoIP Admin Phones or via an authorized user with access to the Web UI. These tones shall remain active as long as the telephone remains off-hook or until canceled from the keypad or the Nyquist Web UI.

g. Systems that do not provide an unlimited number of schedules or do not provide automatic activation of schedules shall not be acceptable.

22. Internal Master Clock shall be included, allowing an unlimited number of events per facility. Systems that do not provide an internal master clock or that must supply an external master clock to meet these specifications shall not be acceptable.
23. The Nyquist E7000 is capable of synchronizing with an NTP server and automatically adjusting the Daylight Savings Time for any time zone in the world. The server that the Nyquist E7000 application is running on can also be used as an NTP server for other systems on the LAN (for example, IP Clocks and control systems).
24. There shall be a Zone Page/All-Call Page feature that is accessible by selected Admin Phones and FXO/FXS or SIP connection to the PSTN or PBX/iPBX.
25. There shall be an option to play a pre-announce tone at any loudspeaker selected for voice paging.
26. There shall be a voice-intercom feature that is accessible by CoS authorized staff phones, all Admin VoIP phones, and Admin Web UIs.

    a. There shall be a privacy beep played every 15 seconds at any selected loudspeaker to indicate that an intercom call is in progress.
    b. There shall be a pre-announce tone played at any selected loudspeaker for intercom call communication.
    c. For special applications, the privacy and pre-announce tone signals shall be capable of being disabled during system initialization.
    d. There shall be a switch over to private telephone communications should the person at the classroom loudspeaker pick up his or her Staff Station and dial *3 to transfer the call down to the associated classroom Staff Station.

27. There shall be various levels of telephonic communication accessible by all Admin Stations and Staff Stations.

    a. Staff Stations must be capable of being programmed to ring one Admin Station during day hours and a different Admin Station during night hours. Day and Night start hours shall be configurable. Staff Stations shall be capable of being assigned to any Admin station. Systems that limit the number and assignment of staff call-ins to an Admin Station shall not be acceptable.

28. Each VoIP speaker or ASB speaker equipped with a call switch (analog or digital) shall be configurable as one of three call-in types, as follows:

    a. Normal/Emergency
    b. Urgent/Emergency
    c. Emergency

29. Call buttons programmed for access Normal / Emergency or Urgent / Emergency shall be able to initiate an Emergency call by repeated flashing of the phone's hook switch, or repeated pressing of the DCS or the Call Switch. Systems that require additional switches and/or conductors to initiate an Emergency call, shall not be acceptable.

30. Normal and Urgent calls shall be placed into the queue for the designated Admin Station or Admin Web UI.
31. Each Admin Station call queue shall first be sorted per call priority (for example, Emergency, then Urgent, and then Normal). Calls are sorted within each priority level on a first-in, first-out basis. When a call is answered, it shall automatically be removed from the queue. Systems that do not sort calls per priority and order received shall not be acceptable.

    a. The display shall simultaneously display a minimum of three intercom calls pending.
    b. Additional calls beyond three shall be indicated by a scrolling option on the right-hand side of the screen thus prompting the user that additional calls are waiting.

32. It shall be possible to answer any incoming call by picking up the handset while it is ringing. It shall not be necessary to press any buttons to answer a call unless the call has dropped into the queue.
33. Staff Stations shall receive a dial tone upon going off-hook. Outgoing calls are made by dialing the desired station. Incoming calls can be directed to the telephone or to the associated loudspeaker for a hands-free reply. There shall be a switchover from loudspeaker to private telephone communication when a person picks up the handset, dials *3, and presses Enter/OK.
34. Staff Stations shall be programmable for any type of system access, provided by or restricted by the following CoS options:

    a. CoS Name
    b. Call-in Level
    c. Zone Paging
    d. All-Call Paging
    e. Emergency All-Call
    f. Inter-Facility Call/Page
    g. Audio Distribution
    h. Remote Pickup
    i. Join Conversation
    j. Call Forwarding
    k. Walking Class of Service
    l. External Call Routing
    m. Call Transfer/3-way Calling
    n. Manually Activate Tone Signals
    o. Call Any Station
    p. Manage Recordings
    q. Monitor Calls
    r. Monitor Locations
    s. Conference Admin
    t. Conference User
    u. Voicemail
    v. Record Calls
    w. Activate Alarm Signals
    x. Disable Audio
    y. Enable Audio
    z. Allow Callee Auto-answer
    aa. District Paging
    bb. Inter-Facility Features
    cc. Manage Output Contacts
    dd. Execute Routines

35. Each Station in a facility can have a unique CoS programmed with an unlimited number of CoS combinations.
36. Staff Stations shall be able to make a Normal call to any Admin Station by dialing the Admin Station's extension number. Staff Stations shall also be able to initiate an Emergency Intercom Call by dialing ****. Emergency Calls shall ring the Designated Day/Night Admin Station. The system shall provide for each station to have a Personal Identification Number (PIN). By dialing the PIN at any system telephone, the administrator shall have access to Emergency paging regardless of the restrictions on the phone being used.
37. Admin Stations shall receive a dial tone upon going off-hook. Outgoing calls are made by dialing the desired stations. Incoming calls can be directed to the telephone or to the associated loudspeaker for a hands-free reply. There shall be an automatic switchover from loudspeaker to private telephone communication should the person pick up his or her handset.
38. The display shall normally show the time of day and day of week, bell schedule name, and the numbers of a minimum of three stations calling-in, along with the call-in status of each station (Normal, Urgent, Emergency). The Admin Station's display shall indicate the station number being dialed from the Admin Station.
39. The display shall also provide user-friendly menu selections to assist the operator when using the Nyquist system. Displays shall be in English for maximum ease-of-use. Systems that require the operator to memorize long lists of operating symbols or control codes shall not be acceptable.
40. Admin Stations shall be programmable for any type of system access, providing or restricting the following CoS options:

    a. Call-in Level
    b. Zone Paging
    c. All-Call Paging
    d. Emergency All-Call
    e. Inter-Facility Call/Page
    f. Audio Distribution
    g. Remote Pickup
    h. Join Conversation
    i. Call Forwarding
    j. Walking Class of Service
    k. External Call Routing
    l. Call Transfer/3-way Calling
    m. Manually Activate Tone Signals
    n. Call Any Station
    o. Manage Recordings
    p. Monitor Calls
    q. Monitor Locations
    r. Conference Admin
    s. Conference User
    t. Voicemail
    u. Record Calls
    v. Activate Alarm Signals
    w. Disable Audio
    x. Enable Audio
    y. Allow Callee Auto-answer
    z. District Paging
    aa. Inter-Facility Features
    bb. Manage Output Contacts
    cc. Execute Routines

41. Program selection and its distribution or cancellation shall be accomplished from a designated Admin Station with the assistance of the menu display system. Distribution and cancellation shall be to any one or combination of speakers, any Audio Zone or Audio Zones, or All Zones. It shall be possible to provide an unlimited number of program channels for the user to pick from.

    a. It shall be possible via an Admin Station to manually initiate any of the unlimited Normal Tones or Emergency Tones. The Tones shall be separate and distinctly different from the Alarm Tones. The Tone selected shall be capable of being played one time, continuously until it is canceled, or until the administrative display phone is placed back on-hook.
    b. Each Admin Station shall maintain a unique queue of all stations calling that Admin VoIP phone.

42. VoIP Wall Baffle and VoIP Ceiling Speakers shall be configurable as either a VoIP Speaker Only or as a VoIP Speaker with DCS.

    a. The Bogen Nyquist VoIP speakers are powered via PoE. Use an 802.3af compliant PoE network switch port or PoE Injector to power these speakers. One PoE network switch port or PoE Injector is required per VoIP speaker.
    b. VoIP speakers can be equipped with a DCS that can be programmed as a Normal/Emergency, Urgent/Emergency, or Emergency Only and shall be able to initiate an Emergency call by touching the DCS one, two, or three times depending on the CoS and current call state of the DCS. If the station is authorized for Privacy Mode, the users can touch and hold for 4 seconds to enable Privacy Mode or hold for four seconds to disable Privacy Mode. Systems that require mechanical, membrane, or an additional number of switches to initiate an Emergency call, shall not be acceptable.
    c. Emergency Calls from VoIP Speaker with DCS shall have priority over the Normal and Urgent calls in the queue on the Admin Stations and will show up at the top of the list. Systems that do not provide priority for Emergency Call shall not be acceptable.
    d. Normal and Urgent calls shall be logged into queue for the designated Admin Stations.
        1) Admin Stations shall ring for when they receive a call, and then the call will be removed from the queue when the call is answered or when the Admin Queue times out (default is 30 minutes).

    e. Each queue call shall first be sorted by call priority (Emergency, then Urgent, and then Normal). Calls are sorted within each priority level on a first-in, first-out basis. When a call is answered, it shall automatically be removed from the queue. Systems that do not sort calls by priority and order received, shall not be acceptable. The display shall simultaneously show a minimum of three staff calls pending. Additional staff calls beyond three shall be indicated by an arrow pointing down thus prompting the Admin user that additional calls are waiting.
    f. It shall be possible to answer any incoming call simply by picking up the handset while it is ringing. It shall not be necessary to hit any buttons to answer a call unless the call has dropped into the queue.

43. System programming shall be from an authorized Nyquist Admin User via any web browser. A valid username and password shall be required to gain access to the following programmable functions:

    a. System Parameters – Allow installers to adjust core system parameters.

b. Zones – Allow installers to create and modify Paging, Time, and Audio Zones.
c. Schedules – Allow installers and administrators to create Bell Schedules for the facility, predefine alternative schedules to run. Holiday Events prevent the bells from ringing on a school holiday. The system shall allow an unlimited number of schedules to operate simultaneous within a facility.
d. Admin Groups – Allow the installer to create, modify, and delete software groupings of admin phones that can ring when a station calls in with a call switch.
e. CoS Configuration – Allow the installer to create, modify, and delete CoS groups that can have the following features defined: Call in Level, Zone Paging, All-Call Paging, Emergency All-Call, Inter-Facility Call/Page, Audio Distribution, Remote Pickup, Join Conversation, Call Forwarding, Walking Class of Service, External Call Routing, Call Transfer/3-way Calling, Manually Activate Tone Signals, Call any Station, Manage Recording, Monitor Calls, Monitor Locations, Conference Admin, Conference User, Voicemail, Record Calls, Activate Alarm Signals, Disable Audio, Enable Audio, Allow Callee Auto-answer, District Paging, Inter-Facility Features, and Execute Routines.
f. Stations – Allow the installer to set up, modify, delete stations, set up Page Exclusion, view stations' status, and add a station.
g. Bridge Devices – Allow the installer to install the Nyquist ASBs.
h. Audio – Allow the installer to upload and manage Announcements, Playlists, Announcements, Songs, and Tones. The must support the uploading of both MP3 and WAV files making Audio file management simple for users. Systems that limit the size of Audio files shall not be considered equal.
i. Users – Allow the installer to manage users by giving them the proper Role and assign an Extension if needed.
j. Roles – Allow the installer to limit user to the following: create, delete, edit, restart server, sort menu, systems update, manage, import/export, restore, settings, or view.
k. Facilities – Allow the installer to set up the district wide facilities for remote paging and calling.
l. Outside Line – allow the installer to set up FXS and FXO ports for inbound and outbound system calling.
m. SIP Trunks – allow the installer to set up SIP trunks into the facility for inbound or outbound calling.
n. Call Details – allow the installer to review the historical system activities that can be used for incident investigation or system troubleshooting.
o. System Backup/Restore – allow the installer to preform system backup or restores and allow the backups to be scheduled to run automatically.
p. System Logs – allow the installer to view and export Server, Nyquist-Intercom, and Web Server logs that can be used for trouble shooting and technical assistance.
q. Paging Exclusions – allow the installer to view and edit station that are excluded from paging.
r. Firmware – is used to update Nyquist appliances.
s. Routines – Allow installers to create routines that are a sequence of actions, that the Nyquist system executes as a result of an input trigger. Routines can support crisis plans for situations such as school lockdowns, weather events, or emergency evacuations
t. Alert Filters – Allow installers to select the National Weather Alerts that the facility needs to monitor for such as weather events, earthquakes, tsunami, volcanoes, public health, power outages, and many other emergencies.
u. Help –Provides information about the system, online help topics, and System Administrator Manual.
v. Systems not capable of supporting web-based configuration and control, or require plugins or dedicated application software, shall not be deemed as equal.

w. Systems that require a Serial-to-Ethernet converter, or require additional application software on a PC for configuration and/or control shall not be deemed as equal.

44. Admin Groups
45. Admin Stations can be placed into Admin Groups, which are used if incoming calls are not answered by the assigned Admin Station or the Day or Night Admin associated with the Admin Station. Admin Groups act as an always answer feature by providing an alternate list of Admin Stations. If an incoming call is not answered by the assigned Admin Station within 30 seconds for normal calls or 15 seconds for emergency calls, all Admin Stations in the Admin Group will ring.
46. If Call Forwarding is enabled at the Admin Station, Nyquist tries the forwarded extension. If that station does not answer or is busy, the call timeout is reduced to 15 seconds. After 15 seconds, the call rolls over to the Admin Group.
47. If an Emergency level call receives no answer, the Admin Group will ring if the Day Admin or Night Admin does not answer.
48. Admin Stations can be assigned to multiple Admin Groups. A Day or Night Admin can also be assigned to one or more Admin Groups.
49. Call Detail Reporting

    a. The Call Details feature allows the viewing and/or printing of detail records of every call in a facility in a call log format. Calls include scheduled announcements, paging, and internally and externally made or received telephone calls.

50. System Backup/Restore

    a. The system backup feature allows users with access to back up the system database, voicemail, and recordings.
    b. The system restore allows users with access to perform a system restore of previously backed up database, voicemail, and/or recordings.
    c. The installer also can set up an automatic backup that can be performed daily, weekly, or monthly.

51. System Log Files

    a. A log file records either events or messages that occur when software runs and is used when troubleshooting the system. The following parts of the Nyquist system generate log files:
        1) Server (This provides access to the Debian Linux OS server log files.)
        2) Intercom (This provides access to the Intercom application server log files
        3) Web Server (This provides access to the web server log files.)

    b. From the web-based UI, system logs can be viewed directly or exported via download to a PC, Mac, or Android device and then copied to removable media or attached to an email to technical support.

52. Paging Exclusions

    a. For school testing and exams, the administrators shall be able to put stations into Page Exclusion mode. During this time, the stations will only receive Emergency All-Call pages – not music, tones, or All-Calls. Emergency pages will still be heard at the station even if that station is set to exclude paging.

53. Firmware

a. Installers can manage the available firmware. Because the Nyquist E7000 is constantly evolving and changing new versions of firmware will become available and the Firmware section allow installers or authorized users the ability to upload, check for updates, or configure the system to automatically download new firmware for later installation. Systems that can't automatically check for new software are not considered equivalent.

54. Routines are designed to automatically launch a procedure, or sequence of actions, that the Nyquist system executes as a result of an input trigger.
55. Some of the events (triggered by dashboard, IP Phone, I/O Controller contact, or Routines API) that can be created are as follows:

    a. Lockdown Routines
    b. Emergency Evacuation Routines
    c. Fire Alarm Routines
    d. Weather Alert Routines

56. As you can see the power of Routines can support your facilities crisis plans for situations such as lockdown, lockout, weather events, or emergency evacuations.
57. Alert Filters Configuration - The Common Alerting Protocol (CAP) is an international standard format for emergency alerting and public warning. It is designed for all hazards related to weather events, earthquakes, tornado, tsunami, volcanoes, public health, power outages, and many other emergencies.
58. CAP elements and values are used when configuring alert filters for your Nyquist system. This part of the configuration allows installers to select or "Enable" or disable the filters needed for each facility. This filtered information can then be displayed on the NQ-GA10PV through the campus.
59. The growing list of information that can currently be displayed are as follows: 911 Telephone Outage, Administrative Message, Air Quality Alert, Air Stagnation Advisory, Arroyo And Small Stream Flood Advisory, Ashfall Advisory, Ashfall Warning, Avalanche Advisory, Avalanche Warning, Avalanche Watch, Beach Hazards Statement, Blizzard Warning, Blizzard Watch, Blowing Dust Advisory, Blowing Dust Warning, Brisk Wind Advisory, Child Abduction Emergency, Civil Danger Warning, Civil Emergency Message, Coastal Flood Advisory, Coastal Flood Statement, Coastal Flood Warning, Coastal Flood Watch, Dense Fog Advisory, Dense Smoke Advisory, Dust Advisory, Dust Storm Warning, Earthquake Warning, Evacuation - Immediate, Excessive Heat Warning, Excessive Heat Watch, Extreme Cold Warning, Extreme Cold Watch, Extreme Fire Danger, Extreme Wind Warning, Fire Warning, Fire Weather Watch, Flash Flood Statement, Flash Flood Warning, Flash Flood Watch, Flood Advisory, Flood Statement, Flood Warning, Flood Watch, Freeze Warning, Freeze Watch, Freezing Fog Advisory, Freezing Rain Advisory, Freezing Spray Advisory, Frost Advisory, Gale Warning, Gale Watch, Hard Freeze Warning, Hard Freeze Watch, Hazardous Materials Warning, Hazardous Seas Warning, Hazardous Seas Watch, Hazardous Weather Outlook, Heat Advisory, Heavy Freezing Spray Warning, Heavy Freezing Spray Watch, High Surf Advisory, High Surf Warning, High Wind Warning, High Wind Watch, Hurricane Force Wind Warning, Hurricane Force Wind Watch, Hurricane Local Statement, Hurricane Warning, Hurricane Watch, Hydrologic Advisory, Hydrologic Outlook, Ice Storm Warning, Lake Effect Snow Advisory, Lake Effect Snow Warning, Lake Effect Snow Watch, Lake Wind Advisory, Lakeshore Flood Advisory, Lakeshore Flood Statement, Lakeshore Flood Warning, Lakeshore Flood Watch, Law Enforcement Warning, Local Area Emergency, Low Water Advisory, Marine Weather Statement, Nuclear Power Plant Warning, Radiological Hazard Warning, Red Flag Warning, Rip Current Statement, Severe Thunderstorm Warning, Severe Thunderstorm Watch, Severe Weather Statement, Shelter In Place Warning, Short Term Forecast, Small Craft Advisory, Small Craft Advisory For Hazardous Seas, Small Craft Advisory For Rough Bar, Small Craft Advisory

For Winds, Small Stream Flood Advisory, Snow Squall Warning, Special Marine Warning, Special Weather Statement, Storm Surge Warning, Storm Surge Watch, Storm Warning, Storm Watch, Test, Tornado Warning, Tornado Watch, Tropical Depression Local Statement, Tropical Storm Local Statement, Tropical Storm Warning, Tropical Storm Watch, Tsunami Advisory, Tsunami Warning, Tsunami Watch, Typhoon Local Statement, Typhoon Warning, Typhoon Watch, Urban And Small Stream Flood Advisory, Volcano Warning, Wind Advisory, Wind Chill Advisory, Wind Chill Warning, Wind Chill Watch, Winter Storm Warning, Winter Storm Watch, and Winter Weather Advisory.

60. Systems that are not capable of displaying National Weather Service CAP information to give advanced warning to facilities shall not be considered equal.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine conditions, with the installer present, for compliance with requirements and other conditions affecting the performance of the Nyquist E7000 Series Educational System.

B. Do not proceed until unsatisfactory conditions have been corrected.

3.2 EQUIPMENT MANUFACTURER'S REPRESENTATIVE

A. All work described herein to be done by the manufacturer's authorized representative shall be provided by a documented factory authorized representative of the basic line of equipment to be utilized.

B. As further qualification for bidding and participating in the work under this specification, the manufacturer's representative shall hold a valid C-10 Contractor's License issued by the Contractor's State License Board of [your state]. The manufacturer's representative shall have completed at least 10 projects of equal scope, giving satisfactory performance, and shall have been in the business of furnishing and installing sound systems of this type for at least five years. The manufacturer's representative shall be capable of being bonded to ensure the owner of performance and satisfactory service during the guarantee period.

C. The manufacturer's representative shall provide a letter with submittals from the manufacturer of all major equipment stating that the manufacturer's representative is an authorized distributor. This letter shall also state that the manufacturer guarantees service performance for the life of the equipment and that there will always be an authorized distributor assigned to service the area in which the system has been installed.

D. The contractor shall furnish a letter from the manufacturer of the equipment. This letter shall certify that the equipment has been installed according to factory intended practices, that all the components used in the system are compatible, and that all new portions of the systems are operating satisfactorily. Further, the contractor shall furnish a written unconditional guarantee, guaranteeing all parts and all labor for a period of five years after final acceptance of the project by the owner.

3.3 INSTALLATION

A. The installation, adjustment, testing, and final connection of all conduit, wiring, boxes, cabinets, etc., shall conform to local electrical requirements and shall be sized and installed in accordance with the manufacturer's approved shop drawings.

B. Low-voltage wiring may be run exposed above ceiling areas where they are easily accessible.

C. The contractor shall install the new system at the location shown on the plans.

D. All Staff Stations and Call Switches shall be wall-mounted:

1. Mount at 54" AFF.
2. All wiring should be concealed.
3. Verify exact location with architect.
4. Avoid mounting near doors to prevent students from activating and running out of the rooms.

E. Admin Stations can be desk or wall mounted.

F. Speaker and telephone lines run above ceiling and not in conduit shall be tie-wrapped to a ceiling joist with a maximum spacing of 8' between supports. No wires shall be laid on top of ceiling tile.

G. Connect field cable to each Analog Speaker transformer using UL butt splices for #22 AWG wire.

H. Contractor shall provide a minimum of eight hours of configuration and operational instruction to school personnel.

I. On the first school day following installation of the Nyquist System, the contractor shall provide a technician to stand by and assist in system operation.

J. Mark and label all demarcs IDF and MDF points with destination point numbers. Rooms with more than one outlet shall be marked XXX-1, XXX-2, XXX-3, etc. where XXX is the room number.

K. No graphic room number shall exceed the sequence from 000001 through 899999.

1. All outside speakers shall be on a separate Page Zone and Time Zone.
2. All zones shall be laid out not to exceed 40 Watts (@25V) maximum per zone.
3. All hallway speakers shall be tapped at 1 Watt (@25V) maximum.
4. All outside horns shall be tapped at 3.75 Watts (@25V) maximum.
5. All classroom speakers shall be tapped at ½ Watt (@25V) maximum.
6. Large rooms, such as cafeterias, shall be tapped at 2 Watts (@25V) maximum.

L. Plug disconnect: All major equipment components shall be fully pluggable by means of multi-pin receptacles and matching plugs to provide for ease of maintenance and service.

M. Protection of cables: Cables within terminal cabinets, equipment racks, etc., shall be grouped and bundled (harnessed) as to type and laced with No. 12 cord waxed linen lacing twine or T and B wire-ties, or hook and loop cable management. Edge protection material shall be installed on edges of holes, lips of ducts, or any other point where cables or harnesses cross a metallic edge.

N. Cable identification: Cable conductors shall be color-coded and individual cables shall be individually identified. Each cable identification shall have a unique number located approximately 1-1/2" from cable connection at both ends of cable. Numbers shall be approximately 1/4" in height. These unique numbers shall appear on the As-Built Drawings.

O. Shielding: Cable shielding shall be capable of being connected to common ground at point of lowest audio level and shall be free from ground at any other point. Cable shields shall be terminated in the same manner as conductors.

P. Provide complete “in service" instructions of system operation to school personnel. Assist in programming of telephone system.

3.4 GROUNDING

A. The contractor shall provide equipment grounding connections for Integrated Telecommunications/Time/Audio/Media System as indicated. Tighten connections to comply with tightening torques specified in UL Standard 486A to ensure permanent and effective grounds.

B. The contractor shall provide ground equipment, conductor, and cable shields to eliminate shock hazard and to minimize the greatest extent possible, ground loops, common mode returns, noise pickup, cross talk, and other impairments.

C. The contractor shall provide all necessary transient protection on the AC power feed and on all station lines leaving or entering the building.

D. The contractor shall note on their drawings the type and locations of these protection devices and all wiring information.

E. The contractor shall furnish and install a dedicated, isolated earth ground from the central equipment rack and bond to the incoming electrical service ground buss bar.

3.5 INSTALLATION OF SOUND SYSTEM WIRING

A. All installations shall comply with NECA 1.

B. Provide all conduits, conductors, boxes, receptacles, etc. indicated on the Drawings, herein specified, or required for the proper operation of the sound systems.

C. Installation of all sound system wiring and all equipment shall be performed under the direct supervision of a C-EST certified Field Engineer.

D. All Sound System conductors to and between the speakers and the Category 5E consolidation block shall be free from splices or other breaks.

1. Interconnecting terminals as specified may be used only at terminals of loudspeakers, privacy switches, amplifiers, microphone receptacles, or where directed.

E. All loudspeaker cables shall be terminated in the following manner:

1. The end connected to the loudspeaker transformer leads shall be neatly soldered and taped where such loudspeakers are not equipped with terminal strips. Where

loudspeakers are equipped with terminal strips, the ends shall be equipped with U-type solderless lugs described above.

2. Where two (2) or more loudspeakers are on the same circuit, shall be soldered neatly to terminals of the loudspeaker transformers to form a "loop" circuit.
3. Unused leads or taps of loudspeaker matching transformers shall each be separately taped to insulate the conductors from each other and from grounded parts of the equipment.

F. All connections between/among components within the Central Control Rack shall be performed under the direct supervision of personnel authorized by the manufacturer of the Central Control Rack.

G. All connections of conductors entering the Central Control Rack and terminated at the terminal blocks shall be performed by the Contractor.

H. All connections shall be made under the direct supervision of the Manufacturer's Representative. Connections shall not be made until the Contractor and the Manufacturer's Representative have explained to the Owner's Representative the procedure to be followed.

I. Wiring Method: Conceal conductors and cables in accessible ceilings, walls, and floors where possible.

J. Wiring within Enclosures: Bundle, lace, and train cables to terminal points with no excess and without exceeding manufacturer's limitations on bending radii. Provide and use lacing bars and distribution spools.

K. All cabling shall be plenum rated and properly gauged per the distances of the devices from the central control station.

L. Install 18” excess cable at each termination at microphone, attenuator, volume control, speaker, and other system outlet.

M. Install 6’ excess cable at each termination at system cabinet.

N. Grounding

1. A dedicated #10 ground wire shall be installed in conduit from the main ground bus of the electrical service and/or adequate building ground and attached to the frame of all the sound racks/cabinets and all required devices. Conduit bonds shall be used only for rack to rack continuities.

3.6 PROTECTION

A. The Contractor shall provide all necessary transient protection on the AC power feed and on all station lines leaving or entering the building.

B. The Contractor shall note in his system drawings, the type and location of these protection devices as well as all wiring information. Such devices are not to be installed above the ceiling.

3.7 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

B. Tests and Inspections:

1. Upon completion of the installation, contractor shall engage a factory-authorized service representative to perform overall performance test in the presence of the Owner's representative. Provide testing reports and certificate of completion of testing. The test shall include, but not be limited to the following:

a. Loudspeaker Circuits Test
   1) Transmit audio signals at normal levels over each loudspeaker circuit for determination of proper loudspeaker volume and clarity.
   2) Adjust transformer taps for proper output, as necessary.

b. Input Circuits Test
   1) Transmit audio signals at normal levels over each input circuit to determine proper operation of each input circuit. The test shall be performed using each of the two (2) input selector switches over each of the two (2) program channels. Each input source (tuner, CD/MP3 player, Mic., etc.) on the selector switch shall be tested.

c. Load Test
   1) Check for proper system operation when the entire system load (all speakers) is applied to either channel.

d. Communications Tests
   1) Initiate, by means of the central controls, two-way communications between classroom speaker and PA system.
   2) ALL-CALL via Central Controls: Check all speakers in the entire new building
   3) Zone paging via central controls.

e. Signal-to-Noise Ratio Test:
   1) Measure signal-to-noise ratio of complete system at normal gain settings as follows:
      a) Disconnect microphone at connector or jack closest to it and replace it in the circuit with a signal generator using a 1000-Hz signal. Replace all other microphones at corresponding connectors with dummy loads, each equal in impedance to microphone it replaces. Measure signal-to-noise ratio.
      b) Repeat test for each separately controlled zone of loudspeakers.
      c) Minimum acceptance ratio is 50 dB.

f. Distortion Test:
   1) Measure distortion at normal gain settings and rated power. Feed signals at frequencies of 50, 200, 400, 1000, 3000, 8000, and 12,000 Hz into each preamplifier channel. For each frequency, measure distortion in the paging and all-call amplifier outputs. Maximum acceptable distortion at any frequency is three percent (3%) total harmonics.

g. Acoustic Coverage Test:
   1) Feed pink noise into system using octaves centered at 500 and 4000 Hz. Use sound-level meter with octave-band filters to measure level at five (5) locations in each zone. For spaces with seated audiences, maximum permissible variation in level is plus or minus 2 dB. In addition, the levels

between locations in same zone and between locations in adjacent zones must not vary more than plus or minus 3 dB.

h. Power Output Test:
   1) Measure electrical power output of each power amplifier at normal gain settings of 50, 1000, and 12,000 Hz. Maximum variation in power output at these frequencies must not exceed plus or minus 1 dB.

i. Signal Ground Test:
   1) Measure and report ground resistance at pubic address equipment signal ground. Comply with testing requirements specified in Section 260526 "Grounding and Bonding for Electrical Systems."

j. Inspection:
   1) Verify that units and controls are properly labeled and interconnecting wires and terminals are identified. Prepare a list of final tap settings of paging speaker-line matching transformers.

k. Public address and mass notification systems will be considered defective if they do not pass tests and inspections.
l. Prepare test and inspection reports.
m. Include a record of final speaker-line matching transformer-tap settings, and signal ground-resistance measurement certified by Installer.

3.8 SERVICE/MAINTENANCE/WARRANTY

A. The Contractor shall provide a five (5) year equipment warranty of the installed system against defects in material and workmanship. All materials shall be provided at no expense to the Owner during normal working hours. The warranty period shall begin on the date of acceptance by the Owner/Engineer.

B. The Contractor shall, at the Owner's request, make available a service contract offering continuing factory authorized service of this system after the initial warranty period.

C. The system manufacturer shall maintain engineering and service departments capable of rendering advice regarding installation and final adjustment of the system.

D. The Contractor shall submit a written warranty from an authorized distributor of the sound system that the system installed is free from defects in materials and workmanship, for the period of one (1) year from the date of acceptance by the Owner. This warranty shall include all parts and labor.

3.9 DEMONSTRATION – TRAINING

A. Bidding contractor shall engage a factory-authorized service representative to train the Owner's maintenance personnel to adjust, operate, and maintain the public address system.

B. The vendor shall provide various levels of training including Manufacturer provided training as mandated by the Owner.

C. Sixteen (16) hours of training shall be included as part of this specification. These training hours shall be partitioned as the Owner mandates and as required.

D. Train Owner's personnel on operation and maintenance of each component of system.

1. Use operation and maintenance manual as training reference, supplemented with additional training materials as required.
2. Instructor shall be manufacturer's training personnel

3.10 GENERAL FIELD POLICY

A. When inspecting or supervising the installation of equipment, manufacturers' representative shall be accompanied at all times by the technology consultant. In order to make the necessary arrangements, the Owner shall be notified at least forty-eight (48) hours in advance of the manufacturer's representative visit to the School.

B. Any changes of equipment shall be made only with the written permission of the technology consultant.

C. Changes in location of equipment may be made only with the written permission of the technology consultant.

D. All changes of location of equipment (including pull boxes, conduit runs, wire sizes, etc.) shall be incorporated in the As-built Sound/System Intercom Riser Diagram installed in the School.

3.11 DOCUMENTATION

A. Provide the following directly to the Supervisor of Technology Services.

1. One printed copy of all field programming for all components in system
2. One copy of all diagnostic software with a copy of field programming data for each unit

B. One copy of all field wiring runs, location, and end designation of system

END OF SECTION 275116

SECTION 275313 - CLOCK SYSTEM

PART 1 - General

1.1 Summary of work

A. This Section specifies materials and accessories for a 2-wire digital communication clock system.

a. Section Includes:
b. Master clock;
c. Converter box;
d. Secondary analog clock;
e. Secondary digital clock;
f. Elapsed timer control panel.

B. This Section specifies materials and accessories for the IP-PoE clock system.

1. Section Includes:

a. (S)NTP server/master clock;
b. Elapsed timer;
c. Secondary analog IP-PoE clock;
d. Secondary digital IP-PoE clock.

C. This Section specifies materials and accessories for a wireless clock system.

1. Section Includes:

a. Master clock;
b. Repeaters;
c. Secondary analog clock;
d. Secondary digital clock;
e. Elapsed timer control panel.

1.2 RELATED REQUIREMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections apply to this Section.

B. Section [27 05 00 - Common Work Results for Communications: conductors and cables].

C. Section [27 15 00 - Communications Horizontal Cabling].

D. Section [27 10 53 - Clock System Commissioning].

E. Section [27 51 16 – Public Address System].

F. Related Drawings: “T” Drawings – Technology Plans

1.3 REFERENCE STANDARDS

A. Federal Communications Division (FCC)

1. Part 15 - Code of Federal Regulations.

B. National Fire Protection Association (NFPA).

1. NFPA 70E-[2012], Standard for Electrical safety in the Workplace.

C. US Green Building Council (USGBC).

1. LEED® NC Version 2.2-[2009], LEED (Leadership in Energy and Environmental Design): Green Building Rating System Reference Package For New Construction and Major Renovations.

D. Underwriter's Laboratories (UL)

E. Institute of Electrical and Electronics Engineers (IEEE)

1. IEEE 802.3af-[1998], Standard for Information Technology – Telecommunications and Information Exchange Between Systems.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Co-ordination: Co-ordinate work of this Section with communications and electronics work and with work of other trades for proper time and sequence to avoid construction delays.

B. High Performance Building Submittal Requirements: The contractor or subcontractor must submit the following High Performance Building certification items:

1. A Connecticut High Performance Building Compliance letter shall be provided verifying agreement with relevant High Performance requirements. Information to be supplied includes, but is not limited to:

a. The percentage by weight of recycled content in the product(s). Identify post-consumer and/or pre-consumer recycled content.
b. The manufacturing location for the product(s); and the location (source) of the raw materials used to manufacture the product(s).
c. Provide material costs for the materials included in the contractor's or subcontractor's work. Material cost does not include costs associated with labor and equipment.

2. Letters of Certification, provided from the product manufacturer on the manufacturer's letterhead, to verify the amount of recycled content.
3. Product Cut Sheets for all materials that meet the High Building Performance Requirements this Section.
4. Material Safety Data Sheets (MSDS), for all applicable products. Applicable products include, but are not limited to adhesives, sealants, carpets, paints and coatings applied on the interior of the building. MSDS shall indicate the Volatile Organic Compound (VOC) limits of products submitted (If an MSDS does not include a product's VOC content, then product data sheets, manufacturer literature, or a letter of certification from the manufacturer can be submitted in addition to the MSDS to indicate the VOC content).

C. Pre-installation Meeting: Convene pre-installation meeting after Award of Contract and [one week] before starting work of this Section to verify project requirements, substrate conditions and coordination with other building sub-trades, and to review manufacturer's written installation instructions.

1. Comply with Section 01 31 19 - Project Meetings and co-ordinate with other similar pre-installation meetings.
2. Notify attendees 2 weeks prior to meeting and ensure meeting attendees include as minimum:

    a. Owner;
    b. Consultant;
    c. Communications and Electronics Subcontractor;
    d. Architect;
    e. Manufacturer's Technical Representative

3. Ensure meeting agenda includes review of methods and procedures related to insulation installation including co-ordination with related work.
4. Record meeting proceedings including corrective measures and other actions required to ensure successful completion of work and distribute to each attendee within 1 week of meeting.

1.5 ACTION AND INFORMATIONAL SUBMITTALS

A. Make submittals in accordance with Contract Conditions and Section 01 33 00 - Submittal Procedures.

B. Product Data: Submit product data including manufacturer's literature for clock system materials and accessories, indicating compliance with specified requirements and material characteristics.

1. Submit list on clock system manufacturer's letterhead of materials and accessories to be incorporated into Work.
2. Include product name.
3. Include preparation instructions and recommendations, installation methods, and storage and handling requirements.
4. Include contact information for manufacturer and their representative for this Project.

C. Shop Drawings: Submit shop drawings with information as follows:

1. Diagram of proposed system showing system platform appliance, communication pathway, and schedule of individual device locations.
2. Indicate integration with the Owner's network and servers. Include line diagram of network relationships.
3. Show system power requirements.

D. Samples:

1. Submit one sample of each type of device used on project. Samples will be returned Contractor for incorporation into the Work after Consultant's review.

E. Test Reports:

1. Submit evaluation and test reports or other independent testing agency reports showing compliance with specified performance characteristics and physical properties.

F. Subcontractor Experience: Submit verification of communication and electronics subcontractor's experience.

G. Manufacturer's Authorization: Submit verification that of communication and electronics subcontractor's authorization from clock system manufacturer to perform Work of this section.

H. Sustainable Design (LEED).

1. LEED Submittals: In accordance with Section [01 35 21 – LEED Requirements]

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: Supply maintenance data for clock system for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.

B. Sustainable Design Closeout Documentation (LEED).

1. Provide calculations on end-of-project recycling rates, salvage rates, and landfill rates for work of this Section demonstrating percentage of construction wastes which were recycled.
2. Submit verification from recycling facility showing receipt of materials.

C. Record Documentation: In accordance with Section 01 78 00 - Closeout Submittals.

1. List materials used in clock system work.
2. Warranty: Submit warranty documents specified.

1.7 QUALITY ASSURANCE

A. Communications and Electronics Subcontractor Quality Assurance:

1. Work experience of [3] years minimum with work similar to work of this Section.
2. Manufacturer's authorization to perform work of this section.

B. Supplier's Accreditation: Use only suppliers accredited by clock system manufacturer.

C. Supplier's Maintenance Requirements:

1. Ensure local supplier has adequate facility for storage of spare parts for clock system.

D. Sustainability Standards Certification (LEED).

1. LEED submittals: In accordance with Section [01 35 21 - LEED Requirements].

1.8 DELIVERY STORAGE AND HANDLING

A. Delivery and Acceptance Requirements:

1. Deliver material in accordance with Section 01 61 00 - Common Product Requirements.
2. Deliver materials and accessories in clock system manufacture's original packaging with identification labels intact and to suit project.
3. Ensure clock system materials are not exposed to moisture during delivery.
4. Replace damaged clock system materials.

B. Storage and Handling Requirements: Store materials off ground in dry location and protected from exposure to fumes and harmful weather conditions and at temperature conditions recommended by manufacturer.

1. Store in original packaging until installed.

C. Packaging Waste Management:

1. Separate and recycle waste packaging materials in accordance with Section [01 74 19 - Construction Waste Management and Disposal].
2. Remove waste packaging materials from site and dispose of packaging materials at appropriate recycling facilities.
3. Collect and separate for disposal, paper, and plastic material in appropriate on-site storage containers for recycling [in accordance with Waste Management Plan].

1.9 WARRANTY

A. Project Warranty: Refer to Contract Conditions for project warranty provisions.

B. Manufacturer's warranty: Submit, for Owner's acceptance, manufacturer's standard warranty document executed by authorized company official. Manufacturer's warranty is in addition to and not intended to limit other rights Owner may have under Contract Conditions.

C. Warranty period: [2] years commencing on Date of Purchase.

PART 2 - PRODUCTS

2.1 MANUFACTURER

A. Basis of Design Manufacturer: Sapling Inc., 670 Louis Drive, Warminster, Pennsylvania 18974, USA, Phone: 1-215-322-6063, URL: www.sapling-inc.com.

2.2 IP CLOCK SYSTEM REQUIREMENTS

A. Ensure clock system components are designed to operate as part of a complete system and include "fail-proof" design to ensure power interruption does not cause system failure.

B. Ensure system can work in conjunction with existing wiring.

C. Ensure system operates utilizing Power over Ethernet to IEEE 802.3af.

D. Ensure system works with monitoring software for system controls from one location and including options as follow:

1. Mark clocks as priority for quick viewing;
2. Uploading and downloading configuration capabilities;
3. Sending numeric messages to digital clocks;
4. Sending countdown functions to digital clocks;
5. Sending alphanumeric messages to digital clocks;
6. Displaying which clocks are not receiving (S)NTP time.

E. Ensure system monitor is run on PC on same network as IP-PoE system.

1. Server installation is not required.

F. Ensure system is capable of operating without physical servers and software.

1. Ensure each clock in system has built-in web interface for programming.

G. Ensure system is capable of programming clocks immediately upon receipt of signal.

1. Analog and digital clocks automatically correct themselves on receipt of signal.
2. Include built-in closed-loop system in analog clocks capable of allowing clocks to detect position of hands and bring clocks to correct time even if clocks are manually altered.
3. Ensure analog clocks have diagnostic function capable of allowing user to view how long since clock received signal.
4. Ensure analog clocks are capable of functional tests of electronics and gears.

H. Ensure each individual product is bench tested at manufacturer’s facility.

1. Random testing is unacceptable.

I. Ensure each product is designed, assembled, and tested in the United States of America.

J. Basis of design: Sapling Inc., IP-PoE Clock System.

2.3 IP-POe SYSTEM MAster clock

A. Master Clock Type 1: To UL and cUL 863.

1. Ensure master clock includes 10 pre-programmed (S)NTP backup addresses.
2. Ensure master clock is capable of acting as (S)NTP server which other devices can point to receive time through (S)NTP protocol.
3. Ensure master clock is capable of receiving (S)NTP time signal via Ethernet.
4. Ensure master clock is capable of receiving digital signals through RS485 connection.
5. Ensure master clock is capable of correcting secondary clocks for Daylight Saving Time
6. Ensure master clock is capable of customizing Daylight Saving Time, in the event of international use or a change in government regulations.
7. Ensure master clock is capable of outputting RS485 signals.
8. Ensure master clock has two clock circuits capable of outputting signals including:

    a. 59 minute correction;
    b. 58 minute correction;
    c. National Time or Rauland correction;
    d. Once a day pulse;
    e. Rauland digital correction.

9. Communications Interface: Ensure master clock system is capable of being programmed remotely through online interface accessible through LAN and compatible with Microsoft Internet Explorer and Mozilla Firefox web browsers.

    a. Ensure interface includes functions as follows:
        1) Allow users to schedule bells and other events;
        2) Display features;
        3) Show IP settings;
        4) Show other master clock settings;
        5) Set time and date;
        6) Download or upload master clock settings;
        7) Configure e-mail alerts for various instances.

10. Display: Two row, 20 character LED and backlit LED display and 2 x 8 inch rubber keypad for operator programming.
11. Optional relays: Include [_____] relays to ensure master clock is capable of utilizing [4] [8] zones that can be used for scheduling facility systems as follows:

    a. Bells;
    b. Lights;
    c. [_____].

12. Allow for programming of master clock through 16 button rubber tactile keypad or built-in web interface.
13. Ensure master clock can contain up to 800 events.
14. Ensure master clock can contain up to 255 schedule changes.
15. Ensure system is capable of interfacing with GPS, Internet and intranet systems.
16. Ensure master clock has internal battery to save settings and operate internal real-time clock for 10 years.
17. Input Voltage: 85 V AC – 264 V AC, 50/60 Hz.
18. GPS: Built-in GPS receiver capable of receiving synchronization signal from satellites with roof mounted antennae and connected with 75 foot long cable with options for 150 or 300 foot cable.
19. Basis of design: Sapling Inc., NTP 8000 Series NTP Server/Master Clock.

B. Master Clock Type 2: To UL and cUL E192482.

1. Ensure master clock includes 10 pre-programmed (S)NTP backup addresses.
2. Ensure master clock is capable of acting as (S)NTP server which other devices can point to receive time through (S)NTP protocol.
3. Ensure master clock is capable of receiving (S)NTP time signal via Ethernet.
4. Ensure master clock is capable of receiving digital signals through RS485 connection.

C. Ensure master clock is capable of correcting secondary clocks for Daylight Saving Time

1. Ensure master clock is capable of customizing Daylight Saving Time, in the event of international use or a change in government regulations.
2. Ensure master clock is capable of outputting RS485 signals.
3. Ensure master clock has two clock circuits capable of outputting signals including:

    a. 59 minute correction;
    b. 58 minute correction;
    c. National Time or Rauland correction;
    d. Once a day pulse;

e. Rauland digital correction.

4. Ensure system is capable of interfacing with GPS, Internet and intranet systems.
5. Allow for programming of master clock through two push button switches on front panel.
6. Ensure master clock is capable of interfacing with both analog and digital secondary clocks.
7. Communications Interface: Ensure master clock system is capable of being programmed remotely through online interface accessible through LAN and compatible with Microsoft Internet Explorer and Mozilla Firefox web browsers.

    a. Ensure interface includes functions as follows:
        1) Display features;
        2) Show IP settings;
        3) Show other master clock settings;
        4) Set time and date;
        5) Download or upload master clock settings;
        6) Configure e-mail alerts for various instances.

8. Ensure master clock has internal battery to save settings and operate internal real-time clock for 10 years.
9. Input Voltage: 85 V AC – 264 V AC, 50/60 Hz.
10. GPS: Built-in GPS receiver capable of receiving synchronization signal from satellites with roof mounted antennae and connected with 75 foot long cable with options for 150 or 300 foot cable.
11. Basis of design: Sapling Inc., NTP 7000 Series NTP Server/Master Clock.

2.4 IP-POE SYSTEM secondary clocks

A. Analog Clocks: To UL and cUL, designed for IP-PoE system with fully automatic plug and play capability.

1. Ensure secondary clock is capable of receiving NTP protocol through CAT5 or CAT6:
2. Clock display: [12] [24] hour [white face with black numbers] [black face with white numbers] [custom face [_____] custom logo [_____]].

    a. Size: [Round [12] [16] inches] [Square [9 x 9] [12 x 12] inches].

3. Built-in Web Interface includes features such as:

    a. Password protected interface. Open access is unacceptable;
    b. Naming of the clock;

4. Selecting time interval clock receives NTP time;

    a. Bias seconds configuration for altering correct time +/- 9999 seconds;
    b. Setting GMT offset for time zone configuration;
    c. Built-in diagnostic mode;
    d. Select all IP settings;
    e. DHCP capability;
    f. Server redundancy capability. Up to 10 servers can be used as backup in case of failure.
    g. Domestic and International Daylight Saving Time capability;
    h. E-mail alerts for situations as follow:

1) If NTP synchronization received is larger than specified interval.
2) If time sync received is larger than specified interval.
3) If clock has been reset.

5. Materials:

a. Dial: Polystyrene
b. Case: Shallow profile, smooth surface [metal] [SlimLine ABS].
c. Crystal: Shatter-proof, side-molded, polycarbonate.

6. Hand tolerance:

a. Hour and minute hands: ± 1/4 minute.

7. Second hand: ± 1/2 minute.
8. Power Requirements: Power over Ethernet (PoE), 48 V DC.
9. Basis of design: Sapling Inc., SAP Series Clock.

B. Digital Clocks: To UL and cUL, designed for IP-PoE system.

1. Display: High-efficiency red LED numeral display with [4] [6] digits.

a. Display size: [2.5] [4.0] inches
b. Format: [12] [24] hour.
c. Brightness: Ensure display has four level of brightness adjustment.
d. Bezel:
1) Smooth Surface, red colored.
2) Bezel size: [4.69 x 10.31] [6.75 x 13.31] [4.69 x 13.56] [6.75 x 18.31] inches.
3) Visibility: [100] [250] feet minimum.

e. messaging capabilities such as “BELL” and “Fire” from software on the network;
f. Alternating Time/Date functionality.

2. Power Requirements: Power over Ethernet (PoE), 48 V DC.
3. Clock mounting: [ABS, surface mount housing] [Metal, flush mount housing] [ABS double mount housing].
4. Built-in Web Interface includes feature options as follow:

a. Password protected interface. Open access is unacceptable;

5. Naming of the clock;

a. Selecting time interval clock receives NTP time;
b. Bias seconds configuration for altering correct time +/- 9999 seconds;
c. Setting GMT offset for time zone configuration;
d. 12/24 hour mode;
e. Select all IP settings;
f. DHCP capability;
g. Server redundancy capability. Up to 10 servers can be used as backup in case of failure.
h. Domestic and International Daylight Saving Time capability;
i. E-mail alerts for situations as follow:
1) If NTP synchronization received is larger than specified interval
2) If time sync received is larger than specified interval

3) If clock has been reset
4) If count up has been activated (if clock is interfacing with an elapsed timer control panel)
5) If countdown has been activated (if clock is interfacing with an elapsed timer control panel).

j. Four levels of brightness;
k. American or European time format [MM:DD:YY][DD:MM:YY]
l. Brightness scheduling capability:
1) Ensure clock is capable of changing brightness level two times minimum throughout day
2) Ensure clock brightness is selectable: Off, Low, Medium, or High

6. Basis of design: Sapling Inc., [SBP 3100 Series Digital IP-PoE Clock] [SBP 3200 Series Digital IP-PoE Clock] [SBP 3300 Series Digital Clock].

2.5 IP-POE SYSTEM Accessories

A. Elapsed Timer: Digital Timer: Interface capability with digital clock.

1. Capable of working with 4-digit or 6-digit digital clocks.
2. Count up functionality from 00:00:00 to 99:59:59.
3. Programmable countdown functionality starting at 99:59:59.
4. Customizable backlit buttons.
5. Ensure timer is capable of controlling digital clock functions.
6. Ensure timer is capable of activating relay at completion of count down on the digital clock (SBP 3300 Series only)
7. Basis of design: Sapling Inc., Digital Elapsed Timer.

B. Conductor and cables: In accordance with Section [27 05 00 - Common Work Results for Communications].

C. Signal and Control Circuits: Manufacturer’s recommended stranded, single conductors or twisted pair cable.

D. Data Circuits: Category 5 minimum, twisted pair cable.

E. Plenum Cable: UL listed and labelled for plenum installation.

F. Hangers and Supports: In accordance with Section [27 05 00 - Common Work Results for Communications].

2.6 PRODUCT SUBSTITUTIONS

A. Substitutions: [In accordance with Section 01 23 13 - Product Substitution Procedures] [No substitutions permitted].

PART 3 - EXECUTION

3.1 INSTALLERS

A. Use only installers with [3] years minimum experience with work similar to work of this Section.

B. Ensure all clock system components are installed by single communications and electronics subcontractor.

3.2 EXAMINATION

A. Verification of Conditions: Verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for clock system installation in accordance with manufacturer's written recommendations.

1. Visually inspect substrate in presence of Consultant.
2. Ensure surfaces are free of snow, ice, frost, grease and other deleterious materials.
3. Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Consultant.

B. Start of clock system installation indicates installer's acceptance of substrate installation conditions.

3.3 SYSTEM INSTALLATION

A. Install clock system in accordance with manufacturer's written recommendations and in accordance with NFPA 70E.

B. Integrate clock system with Owner's electrical and communications network.

C. Install wiring in accordance with requirements of local Authority Having Jurisdiction.

1. Do cabling in accordance with Section [27 15 00 - Communications Horizontal Cabling].

D. Conceal wiring except in unfinished spaces and as approved in writing by Consultant.

E. Install clocks only after painting and other finish work is completed in each room.

F. Install clocks and other devices square and plumb.

3.4 FIELD QUALITY CONTROL

A. Field Inspection: Coordinate field inspection in accordance with Section [01 45 00 - Quality Control].

3.5 system startup

A. At completion of installation and before final acceptance, turn on equipment and ensure equipment is operating properly, and clock system devices and components are functioning.

B. Evaluate and test each device in clock system on room-by-room basis using factory-trained technicians.

1. Fix or replace devices which fail test or are functioning incorrectly.
2. Submit evaluation and report showing results of room-by-room tests and overall system compliance within 3 days of testing being carried out.

3.6 CLEANING

A. Progress Cleaning: Perform cleanup as work progresses [in accordance with Section 01 74 00 - Cleaning and Waste Management].

1. Leave work area clean at end of each day.

B. Final Cleaning: Upon completion, remove surplus materials, rubbish, tools, and equipment [in accordance with Section 01 74 00 – Cleaning and Waste Management].

C. Waste Management:

1. Co-ordinate recycling of waste materials with [01 74 19 - Construction Waste Management and Disposal].
2. Collect recyclable waste and dispose of or recycle field generated construction waste created during construction or final cleaning related to work of this Section.
3. Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.7 demonstration and training

A. Arrange system demonstration and training session for Owner’s operation and maintenance personnel.

1. Allow Owner and Consultant [7] days minimum advance notice before training session.

B. Break down system demonstration and training session into logical segments for Owner’s operations and maintenance personnel.

C. Train Owner’s maintenance personnel in procedures and schedules involved in operating, troubleshooting, servicing, and preventative maintenance of clock system.

D. Training shall consist of a minimum of two (2) 4-hour training sessions.

E. Deliver two (2) sets of operating instructions and programming manuals for the clock system to the Owner’s Representative.

F. Deliver all programming codes and passwords for the system to the Owner’s Representative.

3.8 System commissioning

A. Do clock system commissioning in accordance with Manufacturer requirements.

3.9 PROTECTION

A. Protect installed products and accessories from damage during construction.

B. Repair damage to adjacent materials caused by clock system installation.

END OF SECTION 275313

SECTION 280500 - SECURITY CONDUCTOR CABLES

PART 1 - General

1.1 Section Includes

A. System Requirements

B. Cabling

1.2 RELATED REQUIREMENTS

1. The Contractor, Subcontractors and/or suppliers providing goods or services referenced in or related to this Section shall also be bound by the Documents identified in Division 01 Section “Summary”, Paragraph 1.1A, entitled “Related Documents.” OR Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
2. Division 07 - Firestopping.
3. Division 08 - Door Hardware: Electrically operated door hardware, for interface with access control system. Includes door hardware with integral request to exit devices.
4. Division 26 - Grounding and Bonding for Electrical Systems.
5. Division 26 - Conduit for Electrical Systems.
6. Division 26 - Identification for Electrical Systems: Identification products and requirements.
7. Division 27 - Structured Cabling: Data cables for access control system IP network connections.
8. Division 28 - Video Surveillance: For interface with access control system.
9. Division 28 - Building Intrusion Detection: For interface with access control system.
10. Division 28 - Fire Detection and Alarm: For interface with access control system.

B. Refer to the following construction documents for Data Room locations and device locations only.

1. “T” Drawings – Technology Plans

C. Any apparatus, appliance, material, or work not shown on the Drawings but mentioned in the Specifications, or vice versa, and any incidental accessories necessary to make the work complete and perfect in all respects and ready for operation, even if not particularly specified, shall be provided without additional expense. Coordinate with each system manufacturer to ensure all hardware, firmware, relays, or other necessary components are provided prior to bid submission.

D. All work of this Section to comply with the requirements of the Conditions of Contract, with all Specification Sections of Division 01 – General Requirements, with the Security Drawings, and with all other Contract Documents.

E. Refer to Division 26 of the Contract Documents, Electrical, for all Specifications governing the installation of raceway (conduit, EMT, cable trays, wire trough, etc.), system junction and pull boxes, and device rough-in boxes, for all Security System work shown on the Security Drawings. Conduit, back box, and trough work to be provided by this Contractor.

F. Refer to Division 26 of the Contract Documents, Electrical, for all work related to the interconnection of Security System equipment to 120 VAC power sources.

G. Refer to Division 09 of the Contract Documents, Finishes, for details relating to acoustical ceilings and gypsum board systems, floor finishes, painting, etc., for information pertinent to device and back box selection and installation.

H. Refer to Division 08 of the Contract Documents, Openings, for details relating to doors, door frames, windows, and window frames, for information pertinent to the selection of magnetic contact devices and their associated placement and installation, including back box selection and installation.

I. Refer to Division 08 of the Contract Documents, Openings, for details relating to door and door frame hardware and preparation, electrified lock power supplies, required coordination to accommodate these components and/or systems, lock voltage and current draw coordination, coordination of fail-safe electrified locks, and any other related equipment or requirements

J. Refer to Division 06, Wood, Plastics, Composites, and coordinate all desk locations and installation details with the Millwork Contractor.

K. Review all other Specification Sections as required to achieve complete inter- trade coordination.

1.3 DEFINITIONS

A. “Project Manager” shall mean the Owner’s appointed representative.

B. “As Necessary” shall mean work which is required for completed construction, but is not necessarily shown or described in the Contract Documents.

C. “As Required” shall mean work which is required for completed construction and is shown on the drawings or described in the project specification.

D. “Install” shall mean to set in place complete with all mounting facilities and connections as required ready for normal use of service

E. “Substantial Completion” shall mean that the project is sufficiently complete to be utilized for its intended use as stated in the body of this written specification.

F. “Conduit” shall include all fittings, sleeves, connections, hangers and other accessories related to such conduit.

G. “Surface Metal Raceway” shall include all fittings, sleeves, connections, hangers and other accessories related to such raceway.

H. “Concealed” shall mean hidden from sight, as in chases, furred spaces, shafts, fixed ceiling or embedded in construction.

I. “Exposed”, shall mean not “concealed” as defined above.

J. “Governmental” shall mean all municipal, state and federal government agencies.

K. The words “Furnish”, “Supply” and “Provide” shall mean purchase, deliver to the job site, protect and provide interim storage and install in accordance with manufacturer’s specifications.

L. Words “Approved Equal” shall mean any product which in the opinion of the Technology Consultant is equal in quality, arrangement, appearance, and performance to the product specified.

M. “Cabling” shall mean cable assembly, raceway, conductors, fittings and any other necessary accessories to make a complete wiring system.

N. “Product” shall mean any item of equipment, material, fixture, apparatus, appliance or accessory installed under this Division.

O. Words in the singular shall also mean and include the plural, wherever the context so indicates, and words in the plural shall mean the singular, wherever the context so indicates.

P. “Contractor” refers to the biding/installation Contractor responsible for furnishing and installation of all work indicated within this specification.

1.4 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

B. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

C. NFPA 101 - Life Safety Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

D. UL 294 - Access Control System Units; Current Edition, Including All Revisions.

E. UL 1076 - Proprietary Burglar Alarm Units and Systems; Current Edition, Including All Revisions.

F. System shall be RoHS (Restriction of Hazardous Substances) compliant and meet proposed amendments to the reduction of toxic substances in manufacturing in stated in the Environmental Design of Electrical Equipment Act (EDEE).

G. Installation shall comply with NECA 1-2010 “Standard Practice of Good Workmanship in Electrical Construction”

H. Installation shall comply with NEC/NFPA 70E “Standard for Electrical Safety in the Workplace”

I. Electronic data exchange between Video Surveillance System and the Access Control System shall comply with SIA TVAC

J. Installation shall comply with FCC CFR 47 Part 15 Class A “Telecommunications, Radio, Frequency, Digital Device Emission:

K. Installation shall comply with Federal, State, and Local Codes and Authority Having Jurisdiction (AHJ).

L. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

1.5 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate the work with other installers to provide suitable security wiring for all security systems.

1.6 SUBMITTALS

A. See Division 01 – Administrative Requirements for submittal procedures.

B. Evidence of Qualifications for Installer:

1. The Contractor shall be a bona fide security systems contractor, licensed by the State of Connecticut for the installation of the low voltage security and signal communication systems, and engaged in security system maintenance, service and contracting for at least the last five years.
2. The Contractor shall employ technicians who have been trained by the Manufacturer specified within this section to install the systems of this Manufacturer.
3. The contractor shall be a factory authorized stocking distributor of the manufacturer of the equipment included in the system so that immediate replacement parts can be made from inventory and service provided as needed on an emergency basis.
4. The Contractor shall submit with the bid a manufacturer's certificate of acceptance of the qualifications of the Installing Contractor to install, test, maintain and repair the manufacturer's equipment.
5. In order for the Security Consultant to verify that they meet the competency requirements of this specification, Contractors must submit the following information if so requested:

    a. Proof that the Contractor has installed, services and maintained similar security systems for a minimum of ten (10) years.
    b. Proof that the Contractor is a firm which currently and regularly installs, services and maintains security systems as a full time business.
    c. The names and qualifications of security system technicians that shall perform and supervise the work and perform tests or adjustments on the systems and equipment. Qualifications shall include all schooling, training, and history of work experience.
    d. A list of four prior systems comparable to the one specified under this contract which were installed, serviced, and maintained satisfactorily by the Contractor for a minimum of one (1) year. Each system listed shall include the firm or owner, location, person to contact (with telephone number), date of installation and service period, and a brief description of the system and work performed on the system.

6. The Contractor shall submit any other information required by the Security Consultant to determine the competency of the Contractor. If this information is not submitted as requested, it shall be submitted within the time specified by the Architect after the bid opening. If the Contractor fails to submit the information in accordance with the Security Consultant's request, the Contractor shall be declared non-responsive, and may be rejected to perform the work specified within this section.

C. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instruction for storage, handling, protection, examination, preparation, installation, and operation of product.

D. Manufacturer's detailed field-testing procedures.

E. Product Data: Provide details and technical specifications for each product indicated. Include physical dimensions, features, performance, electrical characteristics, ratings, software versions, and operating system details.

1. Equipment Submittals

a. Provide a Title Page, with project name, Contractor's name and address, contact information, date of submission, and submission revision number.
b. Provide a Parts List, for proposed equipment, materials, components and devices, listing the following information for each line item:

1) The system type
2) Model number
3) Specification sheet page reference

c. Provide Manufacturers Specification Sheet with descriptive information for equipment, materials, components and devices. Number each page, to correspond with the Parts List.
d. Clearly delineate (with highlighter, arrow, or underline) on each specification sheet, specific model numbers, options and configurations being proposed for this project.
e. Indicate kinds of materials and finishes for equipment where more than one option is presented.

2. Acceptance Testing Plan

a. Submit a written document detailing the test procedures to be followed in evaluating and proving the installed system(s).
b. Provide a sample of the test forms to be used for each system and for each component of each system.
c. Include all tests required by the equipment manufacturer and by this Specification

3. Incomplete or unchecked submittals which do not contain complete data on the work and full information on related matters will be returned for correction.

F. CE and FCC Compliance Certificates:

G. Field quality-control reports

H. Current Specified Manufacturer Integrator Certification Letter

I. Current Specified Manufacturer Training Certificates (listing expiration dates) for Two technicians from the supporting office

J. Warranty: Software support and warranty information for all components, including Service Level Agreement (SLA) details, and duration of agreement from date of system acceptance by Owner. Submit sample of manufacturer's warranty and documentation of final executed warranty completed in Owner's name and registered with manufacturer.

K. Project Record Documents: Record actual locations of system components and installed wiring arrangements and routing.

1.7 QUALITY ASSURANCE

A. Comply with the following:

1. NFPA 70.
2. NFPA 101 (Life Safety Code).
3. The requirements of the local authorities having jurisdiction.
4. Applicable TIA/EIA standards.

B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

D. Installer Qualifications: Company specializing in performing the work of this section with minimum three years documented experience with access control systems of similar size, type, and complexity and providing contract maintenance service as a regular part of their business; authorized manufacturer's representative.

1. Contract maintenance office located within 100 miles (160 km) of project site.

E. Maintenance Contractor Qualifications: Same entity as installer.

F. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

G. The requirements of the State Building Code and local regulations establish the minimum acceptable quality of workmanship and materials, and all work shall conform thereto unless more stringent requirements are indicated or specified herein.

H. All work shall comply with the latest editions of the codes as referenced herein.

I. Follow manufacturer's directions for articles furnished, in addition to directions shown on drawings or specified herein.

J. Protect all work, materials, and equipment from damage during process of work. Replace all damaged or defective work, materials and equipment without additional cost to DCAMM.

K. All equipment and materials for permanent installation shall be the products of recognized manufacturers and shall be new.

L. Equipment and materials shall:

1. Where normally subject to Underwriters Laboratory Inc. listing or labeling services, be so listed or labeled.
2. Be without blemish or defect.
3. Not be used for temporary purposes.
4. Be in accordance with the latest applicable NEMA standards.
5. Be products which will meet with the acceptance of all authorities having jurisdiction over the work. Where such acceptance is contingent upon having the products examined, tested and certified by Underwriters or another recognized testing laboratory, the product shall be so examined, tested and certified.

M. Except for conduit, conduit fittings, outlet boxes, wire and cable, all items of equipment or material of one generic type shall be the product of one manufacturer throughout.

N. For items which are to be installed but not purchased as part of the electrical work, the electrical work shall include:

1. The coordination of their delivery.
2. Their unloading from delivery trucks driven into any point on the property line at grade level.
3. Their safe handling and field storage up to the time of permanent placement in the project.
4. The correction of any damage, defacement or corrosion to which they may have been subjected. Replacement, if necessary, shall be coordinated with Contractor who originally purchased the item.
5. Their field make up and internal wiring as may be necessary for their proper operation.
6. Their mounting in place including the purchase and installation of all dunnage, supporting members, and fastenings necessary to adapt them to architectural and structural conditions.
7. Their connection to building wiring including the purchase and installation of all termination junction boxes necessary to adapt and connect them to this wiring. Included also shall be the purchase and installation of any substitute lugs or other wiring terminations as may be necessary to adapt their terminals to the building wiring as called for and to the connection methods set forth in these specifications.

O. Items which are to be installed but not purchased as part of the electric work shall be carefully examined upon delivery to the project. Claims that any of these items have been received in such condition that their installation will require procedures beyond the reasonable scope of the electric work will be considered only if presented in writing within one week of the date of delivery to the project of the items in question. The work includes all procedures, regardless of how extensive, necessary to put into satisfactory operation, all items for which no claims have been submitted as outlined above.

P. Seismic Performance: Provide equipment capable of withstanding the effects of earthquake motions determined according to ASCE/SEI 7 and current building codes for the state of CT.

1. The term “withstand” means “the system(s) will remain in place without separation of any parts when subjected to the seismic forces specified and the system will be fully operational after the seismic event.”

1.8 PROJECT CONDITIONS

A. Environmental Conditions: Capable of withstanding the following environmental conditions without mechanical or electrical damage or degradation of operating capability:

1. Interior, Controlled Environment: System components installed in temperature-controlled interior environments shall be rated for continuous operation in ambient temperatures of 36 to 122 deg F (2 to 50 deg C) dry bulb and twenty to ninety percent (20-90%) relative humidity, noncondensing. Use NEMA 250, Type 1 enclosures.
2. Interior, Uncontrolled Environment: System components installed in non- temperature-controlled interior environments shall be rated for continuous operation in ambient temperatures of 0 to 122 deg F (minus 18 to plus 50 deg C) dry bulb and twenty to ninety percent (20-90%) relative humidity, noncondensing. Use NEMA 250, Type 3R enclosures.

3. Exterior Environment: System components installed in locations exposed to weather shall be rated for continuous operation in ambient temperatures of minus 30 to plus 122 deg F (minus 34 to plus 50 deg C) dry bulb and twenty to ninety percent (20-90%) relative humidity, condensing. Rate for continuous operation when exposed to rain as specified in NEMA 250, winds up to 85 mph and snow cover up to 24 inches thick. Use sufficiently rated NEMA 250 enclosures.
4. Hazardous Environment: System components located in areas where fire or explosion hazards may exist because of flammable gases or vapors, flammable liquids, combustible dust, or ignitable fibers shall be rated, listed, and installed according to NFPA 70.
5. Corrosive Environment: System components subject to corrosive fumes, vapors, and wind-driven salt spray in coastal zones. Use sufficiently rated NEMA 250 enclosures.
6. Security Environment: Camera housing for use in high-risk areas where surveillance equipment may be subject to physical violence.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

B. Store products in manufacturer's unopened packaging, keep dry and protect from damage until ready for installation.

1.10 FIELD CONDITIONS

A. Maintain field conditions within manufacturer's required service conditions during and after installation.

1.11 WARRANTY

A. See Division 01 – Closeout Submittals for additional warranty requirements.

B. The Integrator guarantees the Systems to be installed under this specification to be free from any defects in workmanship and materials for a period of one (1) year from the date of final completion/acceptance of the project by the Owner as evidenced by the date of final payment for the work. The Contractor shall promptly and at their own expense remedy any defects in the work and pay for any damage to other work resulting thereof, which shall appear during the period of time covered by this guarantee. Neither the final certificate of payment nor any provisions in this Agreement shall constitute an acceptance of work not done in accordance with this specification or relieve the Contractor of liability with respect to any expressed warranties or guarantees or responsibility for faulty materials or workmanship.

C. Submit manufacturer's standard warranties.

PART 2 - PRODUCTS

2.1 SYSTEM REQUIREMENTS

A. Furnish and install Electronic Security System cabling consisting of required equipment, conduit, boxes, wiring, connectors, hardware, supports, accessories, software, system

programming, etc. as necessary for a complete operating system that provides the functional intent indicated.

B. It is the responsibility of the contractor awarded this project to ensure the cable used is approved by the equipment manufacturer for its intended use and will meet environmental and distance requirements.

C. Shields and twisted wire are required unless PROHIBITED by the Access Control or Intrusion Detection Manufacturer.

D. 20 AWG is a minimum wire size unless PROHIBITED by the Access Control and Intrusion Detection Manufacturer.

2.2 CABLING:

A. All cabling shall be plenum rated.

B. Approved Manufacturer's:

1. Belden
2. West Penn

C. System Cable: Provide cable as shown below or as recommended by the Manufacturer.

1. Low Voltage Security Alarm Signal Cable shall be twisted, single pair, shielded cable, with shield drain wire, with overall jacket, gauge calculated to compensate for length of run and current requirements. All conductors for security zone signal to be minimum #20 AWG, UL listed. All wires to be color coded. One pair #20 AWG per security device zone required.
2. Low Voltage Security Power, 12 VDC cable shall be minimum of #18 AWG for runs up to 150,' and a minimum of #16 AWG for runs up to 300,' twisted, shielded stranded, with shield drain wire, UL listed, jacketed, pair, separate color code from any other power circuits.
3. Electric Lock Power Cable shall be minimum of #14 AWG for runs up to 200' serving a single lock. Twisted, shielded, stranded, jacketed pair, UL listed, separate color ode from any other power circuits.
4. Composite Cable (Reader, Lock, Monitor, REX): CAT6 jacketed Plenum cable with overall shield, including (6) Conductor Shielded 22AWG w/ripcord, 4-Conductor 22AWG w/ripcord, 4-Conductor 22AWG w/ripcord, and 4-Conductor 18 AWG w/ripcord; or equal with written approval by Security Consultant.
5. Lock Power, at Double Doors: Jacketed Plenum cable, unshielded, 4-conductor 18 AWG (7- strand), unshielded, or approved equal.
6. Request-to-Exit Cable, at Double Doors: Plenum rated jacket, 4-conductor 22 AWG (7-strand), unshielded, or approved equal.
7. Special Control Cable, at Double Emergency Exit Doors with Power Booster: Plenum rated cable, 4-conductor 12 AWG (19 strand), unshielded, or approved equal.
8. Card Reader Cable for second card reader at same portal: 3 Pair Shielded 22AWG or approved equal.
9. Alarm Monitoring: 1Pair Shielded 22AWG, or equal.
10. Area Motion Detector: 2 Pair Shielded 20AWG, or equal.
11. Push Buttons: 2 Conductor 18AWG.
12. Lockdown Buttons: 2 Pair Shielded 18AWG, or equal
13. Data: 2 Pair Shielded 20AWG, or equal.
14. Strobe: 2 Pair Shielded 18AWG, or equal.

15. Network Cable: CAT 6, or as required by Division 27, whichever is more stringent.

D. Cable installed below grade shall be rated for immersion in water.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that ratings and configurations of system components are consisted with the indicated requirements.

C. Verify that mounting surfaces are ready to receive the system components.

D. Verify that branch circuit wiring is installed, completed, tested, and ready for connection to system.

E. Verify that conditions are satisfactory prior to starting work.

F. Device Locations

1. All device locations are to be field verified with the Owner prior to start of project. Architectural drawings are for approximation purposes only. Additional charges will not be allowed for outlet installation in areas not reviewed or approved by the Owner.

G. Examine pathway elements intended for cables. Check raceways and other elements for compliance with space allocations, installation tolerance, hazards to camera installation, and other conditions affecting installation.

H. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install access control system in accordance with NECA 1 (general workmanship).

B. Install products in accordance with manufacturer’s instructions.

C. Unless otherwise indicated, use wiring in conduit.

1. Use suitable listed cables in we locations, including underground raceways.
2. Use suitable listed cables for vertical wire applications.
3. All cabling shall be plenum rated.
4. Install wiring in conduit for the following:

    a. Where required for rough-in.
    b. Where required by the AHJ.
    c. Where exposed to damage.
    d. Where installed outside the building.
    e. For exposed connections from outlet boxes to devices.

5. Conduit: comply with Division 26.

6. Conceal cables unless specifically indicated to be exposed.
7. User power transfer hinges specified within Division 08 for concealed connections to door hardware.
8. Cables in the following areas may be exposed:

    a. Equipment Closets

9. Route exposed cables in parallel or perpendicular to building structural members and surfaces.
10. Do not exceed manufacturer's recommended maximum cable length between components.

D. Provide grounding and bonding in accordance with Division 26.

E. Install firestopping to preserve the fire resistance rating of partitions and other elements, using materials and methods specified in Division 07.

F. Install power supplies and other auxiliary components at control stations unless otherwise indicated.

G. Identify system components, wiring, cabling, and terminals according to ANSI/EIA/TIA standards.

H. Wiring may be run in concealed spaces without conduit, in electrical trays (approved by owner), and where otherwise shown on drawings, provided conductors are reasonably protected from mechanical and environmental damage.

I. Conductors run without conduit shall be approved, UL Listed, rated and labeled for Plenum use.

J. Secure wire and cable with approved supports in accordance with the referenced standards and the Authority Having Jurisdiction.

K. Provide cable supports at a minimum of 4-foot intervals.

L. Equipment and devices shall be installed on approved electrical back-boxes. Do not install equipment and devices directly on walls, ceilings or structural components without back- boxes.

M. Secure cables to cabinets, junction boxes, pull boxes and outlet boxes with approved cable clamps.

N. Independently support cables. Do not use other supports i.e., (suspended ceilings, suspended ceiling supporting members, lighting fixtures, mechanical piping, or mechanical ducts).

O. Support cable independently of junction boxes, pull boxes, fixtures, suspended ceiling T- bars, angle supports, and similar items.

P. Support cable using cable trays, D-brackets, support straps, support wires or other approved cable supports.

Q. Fasten cable supports to building structure and surfaces.

R. In shared electrical trays, open ducts, and other cable runs without conduit, separate and strap Access Control cable so that it is clearly distinguishable from all other cables.

S. Clearly mark security system cables at minimum intervals of every 10-feet. Marking shall be with a permanent, printed label, color-coded tag, or other distinguishing marking. Felt tip pen marking on the cable is not acceptable.

T. After installation, and before termination, wiring shall be checked and tested to insure there are no grounds, opens, or shorts on any conductors or shields. In addition, wiring between buildings or underground and all coax cables shall have insulation tested with a megohmmeter and a reading of greater than 20 megohms shall be required to successfully complete the test.

U. Run wires continuously from termination to termination without splices. Splices at junction box locations are not allowed.

V. Water-resistant protection shall be continuous throughout the cable in outdoor surface conduit, poles, in-slab pull-boxes, in-slab conduit, and underground conduit and pull-boxes, and in any areas subject to moisture and/or water infiltration.

1. Splices/Junctions: Provide water-proof protection of splices and junctions, in surface conduit and boxes, in-slab conduit and pull-boxes, underground conduit, and underground pull-boxes, to prevent the entry of moisture or water into cables, splices or connections.
2. Cable Entries: Provide water-blocking sealants at all conduit entries into pull- boxes, junction boxes, back-boxes, cabinets, etc., to prevent the entry of moisture or water into the conduit and cable system.

W. Labeling: Identify wire and cable clearly with permanent labels wrapped around the full circumference within one inch of each connection. Correlate the number designated on the associated Shop or Field Drawings. Assign wire or able designations consistently throughout a given system. Each wire or cable shall carry the same labeled designation over its entire run. Regardless of intermediate terminations.

X. Boxes: Provide a box loop for wire and cable routed through pull boxes or controller panels. Cable loops and bends shall not be at a radius less than that recommended by the manufacturer. Coordinate pull box size with the Division 26 Contractor as necessary to accommodate this requirement.

Y. Wire Lacing and Dressing: Dress, lace, tie or harness wire and cable vertically, horizontally and at right angles to the enclosure surfaces to prevent mechanical stress on electrical connections as required herein and in accordance with accepted professional practice. No wire or cable shall be supported by a connection point.

Z. Non-Coaxial Connections: Make non-coaxial connections and approved splices within terminal cabinets (except microphone or line level) to screw-type barrier blocks with insulated crimp-type spade lugs. Size all lugs properly to assure high electrical integrity. Connect only one (1) wire per spade lug and not more than two (2) lugs per screw terminal.

AA. Non-Coaxial splicing at device locations to equipment with wire leads shall be made with pre-approved wire Dolphin Connectors.

BB. Shielded Cables: Shielded cables shall be insulated. Do not permit shields to contact conduit, raceway, boxes, terminal cabinets or equipment enclosures. Tin terminated shield drain wires and insulate with heat shrinkable tubing.

CC. Coaxial Splices: Coaxial splices, if required and approved, shall be on plate mounted dual - barrel type insulated BNC connectors, secured in such a manner that no stress is placed upon the connector.

DD. Unacceptable Conditions: Correct any unacceptable wiring conditions immediately upon discovery, and upon receiving notice to correct.

EE. Wiring to provide all 120 VAC sources and points of connection to same shall be by the Electrical Contractor.

FF. All wiring, including low voltage power, voice, signal and data communication, shall be installed in approved metal raceway as required. All wiring, conduit and installation shall be in accordance with the latest edition of the National Electrical Code, especially article 725, with conduit fill requirements as though system wiring were 120VAC, (40% conduit fill) and the requirements of Division 26, Electrical Specifications. Up- size conduits from sizes shown on drawings, as necessary not to exceed 40% fill criteria. All conduit shall be ¾" minimum unless otherwise noted on the riser diagrams.

GG. Ensure cabling shield does not touch terminal connections. Provide "one-end" ground on all shields using drain wires at control panels, power supplies, or head end equipment, then to separate and dedicated RF ground via #8 AWG copper cable. Insulate shield at device end with shrink tubing to completely cover shield and drain wire.

HH. Where multiple devices are served by the same shielded cable, shield continuity shall be maintained and properly insulated to eliminate intermittent grounding. Do not bring shield grounds directly to a building electrical ground point of connection. Carefully follow manufacturer's instructions and advise Engineer accordingly. Shield grounds shall be treated as specified herein unless prohibited by manufacturers.

II. Lay out conduit and cable runs with Electrical and General Contractor prior to installation, and maintain 1'-0" clearance from parallel runs with 120VAC or larger voltage conduit and wiring. Cross 120VAC or larger voltage conduit runs at 90° to reduce EMI and RF induction in security wiring.

JJ. All wires shall be color coded to provide separate identification of intrusion alarm signal, 12 VDC, 24 VAC, or ACS/IDS system data communication, lock power, video signal, VSS alarm input, zone expansion or relay board power and data bus or any other system function. Wires shall be similarly coded for each system serviced throughout the entire installation.

KK. All resistors shall be solder connected or double crimp connected to eliminate any additional circuit resistance. Wires connected to resistors shall be solder-tinned to insure positive solder connection or crimp connection. Resistors shall be insulated with shrink tubing extending a minimum of 1" either side of resistor. (Unless factory installed and potted as part of magnetic contact construction.)

LL. No intermediate cable splices are allowed without the specific written approval of the Security Consultant. Request clarification and approval prior to installation of any splices.

MM. All alarm circuits shall be tagged at the device end and field control panel end with alarm panel or zone addressing module hardware circuit terminal address numbers.

NN. Transformers and power supplies shall be identified, along with their cable, at both transformer and load fed end of cable.

OO. Each alarm device system cable shall be tagged at both the device and control panel end with the device type (i.e. door contact, motion detector, etc.).

PP. All 12VDC power circuits shall be tagged at each device and 12VDC power supply fused terminal strip with 12VDC panel and fused circuit number.

QQ. All power cables shall be tagged at the device end and power panel end with matching numbers.

RR. All wiring in panels shall be neatly dressed, run parallel wherever possible, and provided with adequate slack for future maintenance and service terminations.

SS. All “unused” wire conductors shall be insulated to eliminate shorts and grounds, tagged with their terminal points and identified as “spare” at each end with a unique spare cable tag identification system.

TT. Minor deviations (relocations) in wire runs to installed mounting locations may be required prior to final acceptance when site conditions affect the equipment’s operation, performance, or purpose. Relocations which require only minimal work (plus or minus 15’) and/or materials shall be made without additional cost or credit.

UU. The Contractor shall note that connection of alarm zone circuits to the ACS/IDS panels will require the installation of end-of-line resistors in each zone circuit. Locate as close to the device as possible to provide as much circuit supervision as possible. EOL resistors shall not be located at the panel for active security circuits. All unused zones shall have the end-of-line resistor mounted in the panel if manufacturers’ requirements so dictate. Where end-of-line resistors are to be mounted at devices that are factory sealed and have factory configured wire leads, the resistor shall be spliced in-line with the leads as close to the device as possible (splices shall be soldered and covered with heat shrink tubing as specified elsewhere in these specifications).

VV. The Contractor shall install panel cover-operated tamper switches in each equipment enclosure, cabinet, housing, to actuate an alarm signal before access to equipment wiring within the enclosure is gained. Tamper switch mounting hardware shall be concealed so that the location of the switch cannot be visually detected from the exterior of the enclosure. These circuits shall be supervised.

WW. All wiring or cable shall be tested for, and be free of, opens and shorts. All wiring shall test free of grounds with the exception of circuits that are intended to be connected to the ground side of protective circuits.

XX. All wire and cables entering equipment cabinets and enclosures shall be grouped and tied inside the enclosures on 6-inch centers with self-locking nylon cable ties. All wiring shall be grouped in an orderly fashion. Under no circumstances is the use of adhesive tapes (electrical or other) permitted for either permanent or temporary ties or wire management.

YY. All stranded wiring that is connected to equipment that has terminal strips or screw lugs shall be terminated with either nylon insulated crimp-on spade lugs, equal to Thomas & Betts STA-KON fork tongue locking type or equivalent, sized for correct wire and screw sizes or shall be solid bare wire attached to screw terminals. Where compression screws are used to cap wiring, wiring shall be tinned to eliminate destranding and consequent poor connection. Each spade lug or wire shall be marked with a self- sticking numbered wire marker and documented on the as-built wiring diagrams.

ZZ. All wiring that is connected to equipment with solder lug connectors shall terminate wire to lug in a solder joint. The solder joint, lug and any bare wire shall be covered with heat shrink tubing. Multi-conductor bare wire ends shall be soldered to prevent de-stranding.

AAA. Each wire and cable shall be clearly marked within each enclosure, junction box, or where termination is made. Wires and cables shall be marked with a clear, heat-shrink system such as “Shrink Mark” or equivalent, labeling system as manufactured by RayChem. Cable numbers

shall be generated on a PC. Felt-tip “Sharpie” type pen markings are unacceptable. Marking documentation shall be included with the detailed wiring diagram to be provided to the Owner on completion of the installation as part of the As-Built documentation in the “Project Manuals”.

BBB. Wiring and cables that are installed shall maintain color coding from origination point to termination point. Where paired cable is used, the pairs in the cable shall be maintained in the run. Pairs shall not be separated to form different pairs than those in the original cable. Color coding shall be maintained within the system. Maintaining color coding applies to all type circuits in the system.

CCC. Review wiring type, scheme and tagging for all systems prior to installation, with factory/technical representatives. Advise the engineer of any required modifications prior to wire procurement and installation and obtain approval accordingly. It is the contractor’s responsibility to review the system’s wiring with the factory representatives and supply the cables which meet their requirements. Where heavier gauge cables are specified by the engineer and such provide enhanced performance reliability, durability or future capacity, they shall be used unless prohibited by the manufacturer.

DDD. Paralleling of multi-conductor cables to “create” a cable of larger wire gauge is prohibited, except at door frame power transfer hinges.

EEE. Wiring diagrams shall be provided in all signal and power panels along with cable schedules, in a clear plastic envelope, for future use in system maintenance and service.

FFF. Run electric lock power circuits so that each electrified locking door opening is wired on its own wire pair to a dedicated fused circuit in the lock power supply.

GGG. Connect no more than five (5) 12VDC security devices to a single pair of 12VDC power wires without the engineer’s approval. Terminate these 12VDC power circuits on a dedicated fused outlet in the 12VDC power supply

3.3 FIELD QUALITY CONTROL

A. Testing Agency: The Contractor shall engage a qualified testing agency to perform tests and inspections with the Owner and appointed project manager.

B. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.

C. Perform tests and inspections.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

D. Tests and Inspections:

1. Inspection: Verify that units and controls are properly installed, connected, and labeled, and that interconnecting wires and terminals are identified.
2. Pretesting: Align and adjust system and pretest components, wiring, and functions to verify that they comply with specified requirements.
3. Test Schedule: Schedule tests after pretesting has been successfully completed and system has been in normal functional operation for at least fourteen (14) days. Provide a minimum of ten (10) days notice of test schedule.

4. Operational Tests: Perform operational system tests to verify that system complies with Specifications. Include all modes of system operation. Test equipment for proper operation in all functional modes.

E. Access Control System shall be considered defective if it does not pass tests and inspections.

F. Prepare test and inspection reports.

3.4 CLEANING

A. Remove rubbish and debris: Installation contractor is not allowed you use the onsite dumpster and is responsible to discard their own debris off site.

B. Clean installed items using methods and materials recommended in writing by manufacturer.

C. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

3.5 CLOSEOUT ACTIVITIES

A. See Division 01 – Closeout Submittals for Closeout Submittals.

3.6 PROTECTION

A. Protect installed system components from subsequent construction operations.

3.7 MAINTENANCE

A. See Division 01 – Execution and Closeout Requirements for additional requirements relating to maintenance service.

B. Adjustments:

1. Occupancy Adjustments: When requested within twelve (12) months of date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to two (2) visits to Project during other-than-normal occupancy hours for this purpose. Tasks shall include, but are not limited to, the following:

a. Check cable connections.
b. Check proper operation of access control devices.
c. Provide a written report of adjustments and recommendations.

C. Provide to Owner, at no extra cost, a separate maintenance contract for the service and maintenance of the Access Control System for One Year from date of Substantial Completion. Include a separate description of preventative maintenance, systematic examination, cleaning, inspection, and testing, with a detailed schedule.

D. Conduct site visit at least once every three months to perform inspection, testing, and preventative maintenance. Submit report to Owner indicating maintenance performed along with evaluations and recommendations.

E. Provide trouble call-back service upon notification by Owner:

1. Include allowance for call-back service during normal working hours at no extra cost to Owner.
2. Owner will pay for call-back service outside of normal working hours on an hourly basis, based on actual time spent at the site and not including travel time; include hourly rate and definition of normal working hours in maintenance contract.

END OF SECTION 280500

SECTION 280528 - PATHWAYS FOR SECURITY SYSTEMS

PART 1 - General

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

B. Related Drawings

1. “T” Drawings – Technology Plans

C. Related Sections:

1. Section 271000 – Communication Horizontal
2. Section 280500 – Security Conductor Cables
3. Section 281300 – Access Controls
4. Section 281600 – Intrusion Detection
5. Section 282300 – Video Surveillance

1.2 SUMMARY

A. Section Includes:

1. Metal conduits and fittings.
2. Nonmetallic conduits and fittings.
3. Optical-fiber-cable pathways and fittings.
4. Metal wireways and auxiliary gutters.
5. Nonmetallic wireways and auxiliary gutters.
6. Surface pathways.
7. Boxes, enclosures, and cabinets.
8. Handholes and boxes for exterior underground cabling.

1.3 DEFINITIONS

A. ARC: Aluminum rigid conduit.

B. GRC: Galvanized rigid steel conduit.

C. IMC: Intermediate metal conduit.

1.4 ACTION SUBMITTALS

A. Product Data: For surface pathways, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets.

B. Shop Drawings: For custom enclosures and cabinets. Include plans, elevations, sections, and attachment details.

1.5 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Pathway routing plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of items involved:

1. Structural members in paths of pathway groups with common supports.
2. HVAC and plumbing items and architectural features in paths of conduit groups with common supports.

B. Qualification Data: For professional engineer.

C. Seismic Qualification Certificates: For pathway racks, enclosures, cabinets, equipment racks and their mounting provisions, including those for internal components, from manufacturer.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which certification is based and their installation requirements.
4. Detailed description of conduit support devices and interconnections on which certification is based and their installation requirements.

D. Source quality-control reports.

PART 2 - PRODUCTS

2.1 METAL CONDUITS AND FITTINGS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. AFC Cable Systems, Inc.
2. Allied Tube & Conduit; a Tyco International Ltd. Co.
3. Alpha Wire Company
4. Anamet Electrical, Inc.
5. Electri-Flex Company
6. O-Z/Gedney; a brand of EGS Electrical Group
7. Picoma Industries; Subsidiary of Mueller Water Products, Inc.
8. Republic Conduit
9. Robroy Industries
10. Southwire Company
11. Thomas & Betts Corporation
12. Western Tube and Conduit Corporation
13. Wheatland Tube Company; a division of John Maneely Company

B. General Requirements for Metal Conduits and Fittings:

1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
2. Comply with TIA-569-B.

C. GRC: Comply with ANSI C80.1 and UL 6.

D. ARC: Comply with ANSI C80.5 and UL 6A.

E. IMC: Comply with ANSI C80.6 and UL 1242.

F. PVC-Coated Steel Conduit: PVC-coated rigid steel conduit.

1. Comply with NEMA RN 1.
2. Coating Thickness: 0.040 inch minimum.

G. EMT: Comply with ANSI C80.3 and UL 797.

H. Fittings for Metal Conduit: Comply with NEMA FB 1 and UL 514B.

1. Conduit Fittings for Hazardous (Classified) Locations: Comply with UL 886 and NFPA 70.
2. Fittings for EMT:

   a. Material: Steel.
   b. Type: Setscrew.

3. Expansion Fittings: PVC or steel to match conduit type, complying with UL-467, rated for environmental conditions where installed, and including flexible external bonding jumper.
4. Coating for Fittings for PVC-Coated Conduit: Minimum thickness of 0.040 inch, with overlapping sleeves protecting threaded joints.

I. Joint Compound for IMC, GRC, or ARC: Approved, as defined in NFPA 70, by authorities having jurisdiction for use in conduit assemblies, and compounded for use to lubricate and protect threaded conduit joints from corrosion and to enhance their conductivity.

2.2 NONMETALLIC CONDUITS AND FITTINGS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. AFC Cable Systems, Inc.
2. Allied Tube & Conduit; a Tyco International Ltd. Co.
3. Anamet Electrical, Inc.
4. Arnco Corporation
5. CANTEX Inc.
6. CertainTeed Corp.
7. Condux International, Inc.
8. Electri-Flex Company
9. Kraloy
10. Lamson & Sessions; Carlon Electrical Products
11. Niedax-Kleinhuis USA, Inc.
12. RACO; a Hubbell company
13. Thomas & Betts Corporation

B. General Requirements for Nonmetallic Conduits and Fittings:

1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
2. Comply with TIA-569-B.

C. RNC: Type EPC-40-PVC complying with NEMA TC 2 and UL 651 unless otherwise indicated.

D. Rigid HDPE: Comply with UL 651A.

E. Continuous HDPE: Comply with UL 651B.

F. RTRC: Comply with UL 1684A and NEMA TC 14.

G. Fittings for RNC: Comply with NEMA TC 3; match to conduit or tubing type and material.

H. Solvent cements and adhesive primers shall have a VOC content of 510 and 550 g/L or less, respectively, when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.3 OPTICAL-FIBER-CABLE PATHWAYS AND FITTINGS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Alpha Wire Company.
2. Arnco Corporation.
3. Endot Industries Inc.
4. IPEX.
5. Lamson & Sessions; Carlon Electrical Products.

B. Description: Comply with UL 2024; flexible-type pathway, approved for plenum installation unless otherwise indicated.

1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
2. Comply with TIA-569-B.

2.4 METAL WIREWAYS AND AUXILIARY GUTTERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Cooper B-Line, Inc.
2. Hoffman; a Pentair company
3. Mono-Systems, Inc.
4. Square D; a brand of Schneider Electric

B. Description: Sheet metal, complying with UL 870 and NEMA 250 and sized according to NFPA 70.

1. Metal wireways installed outdoors shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2. Comply with TIA-569-B.

C. Fittings and Accessories: Include covers, couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.

D. Wireway Covers: Screw-cover type unless otherwise indicated.

E. Finish: Manufacturer's standard enamel finish.

2.5 NONMETALLIC WIREWAYS AND AUXILIARY GUTTERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Allied Moulded Products, Inc.
2. Hoffman; a Pentair company
3. Lamson & Sessions; Carlon Electrical Products
4. Niedax-Kleinhuis USA, Inc.

B. General Requirements for Nonmetallic Wireways and Auxiliary Gutters:

1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
2. Comply with TIA-569-B.

C. Description: Fiberglass polyester, extruded and fabricated to required size and shape, without holes or knockouts. Cover shall be gasketed with oil-resistant gasket material and fastened with captive screws treated for corrosion resistance. Connections shall be flanged and have stainless-steel screws and oil-resistant gaskets.

D. Description: PVC, extruded and fabricated to required size and shape, and having snap-on cover, mechanically coupled connections, and plastic fasteners.

E. Fittings and Accessories: Couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings shall match and mate with wireways as required for complete system.

F. Solvent cements and adhesive primers shall have a VOC content of 510 and 550 g/L or less, respectively, when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.6 SURFACE PATHWAYS

A. General Requirements for Surface Pathways:

1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
2. Comply with TIA-569-B.

B. Surface Metal Pathways: Galvanized steel with snap-on covers complying with UL 5. Manufacturer's standard enamel finish in color selected by Architect.

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

    a. Mono-Systems, Inc.
    b. Niedax-Kleinhuis USA, Inc.
    c. Panduit Corp
    d. Wiremold/Legrand

C. Surface Nonmetallic Pathways: Two- or three-piece construction, complying with UL 5A, and manufactured of rigid PVC with texture and color selected by Architect from manufacturer's standard colors. Product shall comply with UL-94 V-0 requirements for self-extinguishing characteristics.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. Hubbell Incorporated; Wiring Device-Kellems Division
    b. Lamson & Sessions; Carlon Electrical Products
    c. Mono-Systems, Inc.
    d. Panduit Corp.
    e. Wiremold/Legrand

2.7 BOXES, ENCLOSURES, AND CABINETS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Adalet

B. Cooper Technologies Company; Cooper Crouse-Hinds

1. EGS/Appleton Electric
2. Erickson Electrical Equipment Company
3. Hoffman; a Pentair company
4. Hubbell Incorporated; Killark Division
5. Lamson & Sessions; Carlon Electrical Products
6. Milbank Manufacturing Co.
7. Molex; Woodhead Brand
8. Mono-Systems, Inc.
9. O-Z/Gedney; a brand of EGS Electrical Group
10. RACO; a Hubbell company
11. Robroy Industries
12. Spring City Electrical Manufacturing Company
13. Stahlin Non-Metallic Enclosures; a division of Robroy Industries
14. Thomas & Betts Corporation
15. Wiremold/Legrand

C. General Requirements for Boxes, Enclosures, and Cabinets:

1. Comply with TIA-569-B.
2. Boxes, enclosures and cabinets installed in wet locations shall be listed for use in wet locations.

D. Sheet-Metal Outlet and Device Boxes: Comply with NEMA OS 1 and UL 514A.

E. Cast-Metal Outlet and Device Boxes: Comply with NEMA FB 1, aluminum, Type FD, with gasketed cover.

F. Box extensions used to accommodate new building finishes shall be of same material as recessed box.

G. Metal Floor Boxes:

1. Material: Cast metal.
2. Type: Fully adjustable.
3. Shape: Rectangular.
4. Listing and Labeling: Metal floor boxes shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

H. Nonmetallic Floor Boxes: Nonadjustable, rectangular.

1. Listing and Labeling: Nonmetallic floor boxes shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

I. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.

J. Cast-Metal Access, Pull, and Junction Boxes: Comply with NEMA FB 1 and UL 1773, cast aluminum with gasketed cover.

K. Device Box Dimensions: as specified within the Architectural drawings.

L. Nonmetallic Outlet and Device Boxes: Comply with NEMA OS 2 and UL 514C.

M. Hinged-Cover Enclosures: Comply with UL 50 and NEMA 250, with continuous-hinge cover with flush latch unless otherwise indicated.

1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.
2. Nonmetallic Enclosures:

a. Material: Plastic.
b. Finished inside with radio-frequency-resistant paint.

3. Interior Panels: Steel; all sides finished with manufacturer's standard enamel.

PART 3 - EXECUTION

3.1 PATHWAY APPLICATION

A. Indoors: Apply pathway products as specified below unless otherwise indicated:

1. Exposed, Not Subject to Physical Damage: EMT.
2. Exposed, Not Subject to Severe Physical Damage: EMT.

3. Exposed and Subject to Severe Physical Damage: GRC. Pathway locations include the following:

    a. Loading dock.
    b. Corridors used for traffic of mechanized carts, forklifts, and pallet-handling units.
    c. Mechanical rooms.
    d. Gymnasiums.

4. Concealed in Ceilings and Interior Walls and Partitions: EMT. Allow plenum cable in j-hooks or cable tray.
5. Damp or Wet Locations: GRC.
6. Pathways for Optical-Fiber or Communications Cable in Spaces Used for Environmental Air: Plenum-type, optical-fiber-cable pathway.
7. Pathways for Concealed General-Purpose Distribution of Optical-Fiber or Communications Cable: Plenum-type, optical-fiber-cable pathway.
8. Boxes and Enclosures: NEMA 250 Type 1, except use NEMA 250 Type 4 stainless steel in institutional and commercial kitchens and damp or wet locations.

B. Minimum Pathway Size: ¾-inch trade size. Minimum size for optical-fiber cables is 1 inch.

C. Pathway Fittings: Compatible with pathways and suitable for use and location.

1. Rigid and Intermediate Steel Conduit: Use threaded rigid steel conduit fittings unless otherwise indicated. Comply with NEMA FB 2.10.
2. PVC Externally Coated, Rigid Steel Conduits: Use only fittings listed for use with this type of conduit. Patch and seal all joints, nicks, and scrapes in PVC coating after installing conduits and fittings. Use sealant recommended by fitting manufacturer and apply in thickness and number of coats recommended by manufacturer.
3. EMT: Use setscrew or compression, cast-metal fittings. Comply with NEMA FB 2.10.

D. Do not install aluminum conduits, boxes, or fittings in contact with concrete or earth.

E. Install surface pathways only where indicated on Drawings.

F. Do not install nonmetallic conduit where ambient temperature exceeds 120 deg.

3.2 INSTALLATION

A. Comply with NECA 1, NECA 101, and TIA-569-B for installation requirements except where requirements on Drawings or in this article are stricter. Comply with NECA 102 for aluminum pathways. Comply with NFPA 70 limitations for types of pathways allowed in specific occupancies and number of floors.

B. Keep pathways at least 6 inches away from parallel runs of flues and steam or hot-water pipes. Install horizontal pathway runs above water and steam piping.

C. Complete pathway installation before starting conductor installation.

D. Comply with requirements in Section 260529 "Hangers and Supports for Electrical Systems" for hangers and supports.

E. Arrange stub-ups so curved portions of bends are not visible above finished slab.

F. Install no more than the equivalent of two (2) 90-degree bends in any pathway run. Support within 12 inches of changes in direction. Utilize long radius ells for all optical-fiber cables.

G. Conceal conduit and EMT within finished walls, ceilings, and floors unless otherwise indicated. Install conduits parallel or perpendicular to building lines.

H. Support conduit within 12 inches of enclosures to which attached.

I. Pathways Embedded in Slabs:

1. Run conduit larger than 1-inch trade size, parallel or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support. Secure pathways to reinforcement at maximum 10-foot intervals.
2. Arrange pathways to cross building expansion joints at right angles with expansion fittings.
3. Arrange pathways to keep a minimum of 2 inches of concrete cover in all directions.
4. Do not embed threadless fittings in concrete unless specifically approved by Architect for each specific location.
5. Change from ENT to RNC, Type EPC-40-PVC before rising above floor.

J. Stub-ups to Above Recessed Ceilings:

1. Use EMT, IMC, or RMC for pathways.
2. Use a conduit bushing or insulated fitting to terminate stub-ups not terminated in hubs or in an enclosure.

K. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of pathway and fittings before making up joints. Follow compound manufacturer's written instructions.

L. Coat field-cut threads on PVC-coated pathway with a corrosion-preventing conductive compound prior to assembly.

M. Terminate threaded conduits into threaded hubs or with locknuts on inside and outside of boxes or cabinets. Install insulated bushings on conduits terminated with locknuts.

N. Install pathways square to the enclosure and terminate at enclosures with locknuts. Install locknuts hand tight plus ¼ turn more.

O. Do not rely on locknuts to penetrate nonconductive coatings on enclosures. Remove coatings in the locknut area prior to assembling conduit to enclosure to assure a continuous ground path.

P. Cut conduit perpendicular to the length. For conduits of 2-inch trade size and larger, use roll cutter or a guide to ensure cut is straight and perpendicular to the length.

Q. Install pull wires in empty pathways. Use polypropylene or monofilament plastic line with not less than 200-lb tensile strength. Leave at least 12 inches of slack at each end of pull wire. Cap underground pathways designated as spare above grade alongside pathways in use.

R. Surface Pathways:

1. Install surface pathway for surface telecommunications outlet boxes only where indicated on Drawings.
2. Install surface pathway with a minimum 2-inch radius control at bend points.

3. Secure surface pathway with screws or other anchor-type devices at intervals not exceeding 48 inches and with no less than two supports per straight pathway section. Support surface pathway according to manufacturer's written instructions. Tape and glue are not acceptable support methods.

S. Pathways for Optical-Fiber and Communications Cable: Install pathways, metal and nonmetallic, rigid and flexible, as follows:

1. ¾-Inch Trade Size and Smaller: Install pathways in maximum lengths of 50 feet.
2. 1-Inch Trade Size and Larger: Install pathways in maximum lengths of 75 feet.
3. Install with a maximum of two (2) 90-degree bends or equivalent for each length of pathway unless Drawings show stricter requirements. Separate lengths with pull or junction boxes or terminations at distribution frames or cabinets where necessary to comply with these requirements.

T. Install pathway sealing fittings at accessible locations according to NFPA 70 and fill them with listed sealing compound. For concealed pathways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install pathway sealing fittings according to NFPA 70.

U. Install devices to seal pathway interiors at accessible locations. Locate seals so no fittings or boxes are between the seal and the following changes of environments. Seal the interior of all pathways at the following points:

1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
2. Where an underground service pathway enters a building or structure.
3. Where otherwise required by NFPA 70.

V. Comply with manufacturer's written instructions for solvent welding PVC conduit and fittings.

W. Expansion-Joint Fittings:

1. Install in each run of aboveground RNC that is located where environmental temperature change may exceed 30 deg F, and that has straight-run length that exceeds 25 feet. Install in each run of aboveground RMC and EMT conduit that is located where environmental temperature change may exceed 100 deg F and that has straight-run length that exceeds 100 feet.
2. Install type and quantity of fittings that accommodate temperature change listed for each of the following locations:

    a. Outdoor Locations Not Exposed to Direct Sunlight: 125 deg F temperature change.
    b. Outdoor Locations Exposed to Direct Sunlight: 155 deg F temperature change.
    c. Indoor Spaces Connected with Outdoors without Physical Separation: 125 deg F temperature change.
    d. Attics: 135 deg F temperature change.

3. Install fitting(s) that provide expansion and contraction for at least 0.00041 inch per foot of length of straight run per deg F of temperature change for PVC conduits. Install fitting(s) that provide expansion and contraction for at least 0.000078 inch per foot of length of straight run per deg F of temperature change for metal conduits.
4. Install expansion fittings at all locations where conduits cross building or structure expansion joints.

5. Install each expansion-joint fitting with position, mounting, and piston setting selected according to manufacturer's written instructions for conditions at specific location at time of installation. Install conduit supports to allow for expansion movement.

X. Mount boxes at heights indicated on Drawings. If mounting heights of boxes are not individually indicated, give priority to ADA requirements. Install boxes with height measured to center of box unless otherwise indicated.

Y. Recessed Boxes in Masonry Walls: Saw-cut opening for box in center of cell of masonry block, and install box flush with surface of wall. Prepare block surface to provide a flat surface for a raintight connection between box and cover plate or supported equipment and box.

Z. Horizontally separate boxes mounted on opposite sides of walls so they are not in the same vertical channel.

AA. Support boxes of three (3) gangs or more from more than one (1) side by spanning two (2) framing members or mounting on brackets specifically designed for the purpose.

BB. Fasten junction and pull boxes to or support from building structure. Do not support boxes by conduits.

CC. Set metal floor boxes level and flush with finished floor surface.

DD. Set nonmetallic floor boxes level. Trim after installation to fit flush with finished floor surface.

3.3 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR COMMUNICATIONS PENETRATIONS

A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Section 271000 "Structured Cabling."

3.4 FIRESTOPPING

A. Install firestopping at penetrations of fire-rated floor and wall assemblies. Comply with requirements in Section 078413 "Penetration Firestopping."

3.5 PROTECTION

A. Protect coatings, finishes, and cabinets from damage or deterioration.

1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
2. Repair damage to PVC coatings or paint finishes with matching touchup coating recommended by manufacturer.

END OF SECTION 280528

SECTION 280800 –COMMISSIONING OF FIRE ALARM SYSTEMS

PART 1 - GENERAL – NEEDS A SECTION TO HANDLE THE MULTI PHASED ASPECT OF THIS PROJECT AS EACH PHASE REQUIED TO BE SIGNED OFF AND APPROVED AND THEN OWNER TAKING ACCPETANCE OF SYSTEM AS EACH AREA IS TURNED OVER OR WILL A FINAL OVER TEST BE REQUIRED AT END OF LAST PHASE FOR ENTIRE PROJECT. ALSO COMMENTS BELOW.

1.1 GENERAL REQUIREMENTS

A. Work under this contract shall conform under requirements of Division 019100, Division 280000, General Requirements, Conditions of the Contract, and Supplementary Conditions. This specification covers commissioning of fire alarm systems which are part of this project.

B. Furnish labor and material to accomplish complete fire alarm systems commissioning as specified herein.

C. All trades must adhere to the applicable commissioning and testing guidelines and best practices.

1.2 SECTION INCLUDES

A. This specification section provides a general overview of the fire alarm commissioning process and must be read in conjunction with the following related sections:

1. Construction Documents for affected building systems.
2. Section includes the commissioning process requirements for fire alarm equipment.
3. Fire alarm trade specific commissioning sections in Division 280000.
4. This project is pursuing LEED Certification. See related specifications for sustainable design requirements affecting work of this Section.

1.3 INTRODUCTION

A. Commissioning is a process, and its purpose includes the below:

1. To clearly document the design intent.
2. To verify that the systems installation and performance is in accordance with the plans, specifications and design intent.
3. To train the owner’s operators so that they fully understand the design intent and the operation and maintenance requirements of the equipment.
4. To witness & verify all systems are integrated & operating as intended by the Basis of Design (BOD).
5. Coordinate a warranty phase transition through close-out of the project.

B. Definitions

1. Commissioning: the process of ensuring that systems are designed, installed functionally tested and capable of being operated and maintained to perform in conformity with the design intent. The commissioning begins with planning and includes design, construction, start-up, acceptance, and training, and can be applied throughout the life of the building.
2. Commissioning authority: the designated person, company, or agent who implements the overall commissioning process.
3. Commissioning Plan: A document defining the commissioning process, which is developed in increasing detail as the project progresses through its various phases.

4. Commissioning report: the document that records the results of the commissioning process, including the as-built performance of the fire alarm system and unresolved issues.
5. Commissioning specification: the contract document that details the objective, scope, and implementation of the construction and acceptance phases of the commissioning process as developed in the design-phase Commissioning Plan.
6. Commissioning team: those people responsible for working together in carrying out the commissioning process.
7. Design intent: a detailed explanation of the ideas, concepts, and criteria that are defined by the owner to be important. This typically is an expansion of the information provided in the Owner's Program.
8. Design intent document: a detailed written document, evolving throughout the commissioning process, clearly defining items and criteria of the design intent.
9. Functional Performance Testing (FPT): the process of determining the ability of a system to operate in accordance with the final design intent.
10. Systems Manual: a composite document that expands the scope of the operation manual and maintenance manual by including the additional information gathered by the commissioning process.
11. Verification: that full range of checks and tests carried out to determine if all components, subsystems, systems, and interfaces between systems operate in accordance with the contract documents. In this context, “operate” includes all modes and sequences of control operation, interlocks and conditional control responses, and specified responses to abnormal or emergency conditions.

C. Scope of Work during Design Development Phase DO WE NEED TO LIST DD ITEMS SINCE THIS WILL ONLY BE ISSUED WITH BID SET

1. The CxA reviews the Owner Project Requirements (OPR) and Basis of Design (BoD) documentation.
2. The CxA conducts an initial review of the design prior to the construction documents phase.
3. The CxA conducts a focused review of the construction documents when close to completion. This review should be conducted prior to issuing the construction documents for bid and captured in the commissioning report.
4. Prepare a pre-construction phase commissioning plan.
5. Review fire alarm matrix.
6. Review and comment on submittals from each Contractor for compliance with the OPR, BoD, Contract Documents, and construction-phase commissioning plan. Review and comment on performance expectations of systems and equipment and interfaces between systems relating to the OPR and BoD.

D. Scope of Work during Construction Phase

1. Review required submittals and test data
2. Help finalize details of the Commissioning Plan
3. Organize/facilitate periodic commissioning team meetings
4. Review start-up and testing and balancing reports
5. Participate in O&M training
6. Review revised Owner’s Project Requirements (OPR)
7. Review revised Basis Of Design (BOD)
8. Provide revised commissioning plan
9. Integrate Cx tasks into construction schedule
10. Coordinate a construction phase commissioning kick-off meeting
11. Provide submittal review and comments
12. Review of test and balance report.
13. Perform a controls point-to-point check report review
14. Coordinate a controls integration coordination meeting (FA, FP, P, HVAC, ELEC)
15. Provide a master commissioned equipment list

16. Review start-up reports.
17. Provide pre-functional procedures & test data forms
18. Provide functional testing procedures & test data forms
19. Coordinate test procedure & review with the GC and the Engineer
20. Review contractor test reports
21. Draft commissioning meeting agenda and minutes
22. Execute fire & smoke inspections and testing
23. Maintain a commissioning issues log

E. Scope of work during Acceptance Testing Phase

1. Verify approved sequences of operations
2. Coordinate test procedure & review with the GC and the Engineer.
3. Draft commissioning meeting agenda and minutes
4. Review training agendas, materials, and schedule
5. Review contractor test reports
6. Coordinate, witness, and document functional performance tests
7. Verify that the system complies with the contract documents,
8. Perform functional performance testing,
9. Conduct O&M staff walkthrough of systems
10. Conduct Operations & Maintenance review
11. Submit final test report,
12. Assemble a systems manual
13. Identify and document deficiencies,
14. Execute an issue resolution log
15. Remedy deficiencies and retest,

F. Scope of Work during Post-Occupancy Phase –COMPARE AGAINST RFP ISSUED BY TOWN FOR POST OCCUPANCY SCOPE

1. Establish an as-built record of the system performance,
2. Complete the as-built records,
3. Complete the Systems Manual
4. Confirm training plan has been implemented
5. Compile final systems manual
6. Compile operations and maintenance plan
7. Turn over all required close out documentation and warranties.
8. ~~Perform seasonal testing~~ ??????
9. Submit final commissioning report
10. Perform 10-month review
11. Develop ongoing Cx plan

G. Systems to be Included in Commissioning Process

All fire alarm systems, sub-systems, and equipment installed, interconnected, and integrated under Division 280000 shall be commissioned. This includes but is not limited to:

1. Fire Alarm Initiating Devices

    a. Area Smoke Detectors
    b. Duct Smoke Detectors
    c. Carbon Monoxide Detectors (if applicable)
    d. Pull Stations
    e. Tamper Switches
    f. Water Flow Switches

2. Fire Alarm Panels
3. Alarm Annunciators

a. Alarms
b. Strobes
c. Speakers

4. BMS Integration

1.4 QUALITY ASSURANCE

A. The Contractor will provide qualified point person throughout the commissioning process.

1. The point person will attend all commissioning team meeting and provide all required documentation requested by the CxA.
2. Contractor to provide onsite technician for functional performance test activities support, as required by the CxA.
3. Contractors will comply with tests that follow manufacturer's calibration procedures and intervals. Recalibrate test instruments immediately after instruments have been repaired resulting from being dropped or damaged. Affix calibration tags to test instruments. Furnish calibration records to CxA upon request.

B. Related Requirements

1. Section 019100 - General Commissioning Requirements.
2. ~~LEED Sustainable Design Requirements~~. SHOULD CHPS BE REFERENCED?
3. Contractor shall adhere to all requirements of Division 280000.
4. NFPA 3 and NFPA 4
5. NFPA 25, 2011 Edition
6. 2014 NYC Fire code.
7. NFPA, ASME, and associated testing guidelines.

C. References:

1. ASHRAE Standard 202-2018: Commissioning Process for Buildings and Systems.
2. ASHRAE Application Handbook – 2019: Chapter 44 – HVAC Commissioning (Building Commissioning).
3. ASHRAE Guideline 4-2019: Preparation of Operating and Maintenance Documentation for Building Systems.
4. ASHRAE Guideline 0-2019: The Commissioning Process.
5. ASHRAE Guideline 1.3-2018: Building Operations and Maintenance Training for the HVAC&R Commissioning Process
6. NFPA 3: Recommended Practice on Commissioning and Integrated Testing of Fire Protection and Life Safety Systems
7. NFPA 4: Standard for Integrated Fire Protection and Life Safety System Testing
8. NFPA 72: National Fire Alarm & Signaling Code
9. ~~LEED V4: Energy and Atmosphere Prerequisite Fundamental Commissioning and Verification~~
10. ~~LEED V4: Energy and Atmosphere Credit Enhanced Commissioning~~
11. ~~Associated testing guidelines.~~

1.5 RESPONSIBILITIES

A. Fire Alarm Contractors

1. Include cost of commissioning requirements in the contract price.
2. Include requirements for submittal data, O&M data, and training in each purchase order or sub-contract written.
3. Ensure cooperation and participation of specialty sub-contractors such as fire alarm vendors.

4. Ensure all alarm systems that are constructed, inspected, installed, & pre-functional tested & documents are submitted to the CxA verify the systems meets all requirements in Divisions 280000.
5. Perform all pre-functional testing required & submit documents that verify completion of testing to the CxA in accordance with Divisions 280000.
6. Ensure subcontractors perform assigned commissioning responsibilities.
7. Ensure participation of equipment manufacturers in appropriate start-up, testing, and training activities when required by individual equipment specifications.
8. Prepare preliminary schedule for life safety system pre-tests, orientations and inspections, O&M manual submissions, training sessions, equipment start-up and task completion for use by the Commissioning Authority. Update schedule as appropriate throughout the construction period.
9. Perform and document completed startup and system operational checkout procedures, providing copy to Commissioning Authority (CxA).
10. Provide factory supervised startup services for equipment and systems where specified. Coordinate work with manufacturer and CxA.
11. Remove system of all troubles and supervisory alarms prior to functional tests and inspections.
12. Pre-test all initiating devices to verify and record addresses of devices, verify alarm annunciators, and verify fire alarm panel alarms are consistent. In addition, pre-test shall verify that system responds per the fire alarm matrix.
13. Coordinate with equipment manufacturers to determine specific requirements to maintain validity of warranties.
14. Provide personnel to assist CxA during equipment or system verification checks, and functional performance tests in accordance with Divisions 280000.
15. Provide means to activate activating devices during pre-tests, functional tests, and inspections (i.e. canned smoke).
16. Ensure participation of major equipment manufacturers in appropriate training and testing activities.
17. Attend Construction Phase coordination meeting scheduled by the Commissioning Authority.
18. Ensure participation of major equipment manufacturers/suppliers in appropriate training and testing activities.
19. Attend initial training session.
20. Conduct FA system orientation and inspection at the equipment placement completion stage.
21. Update drawings to the record condition to date, and review with the Commissioning Authority.
22. Provide as-built documentation showing all addresses for all addressable devices.
23. Gather O&M data on all equipment, and assemble in binders as required by the Commissioning Specification. Submit to Commissioning Authority prior to the completion of construction.
24. Notify the Commissioning Authority a minimum of two weeks in advance, so that the witnessing of equipment and system start-up, pre-functional testing and functional testing can begin.
25. Participate in, and schedule vendors and Contractors to participate in the training sessions as set up by the Commissioning Authority.
26. Provide written notification to the General Contractor and Commissioning Authority that the following work has been completed in accordance with the contract documents, and that the equipment, systems, and sub-system are operating as required.

    a. FA equipment including all heads, alarms and all Division 280000 equipment.
    b. Fire detection and smoke detection devices furnished under other divisions of this specification as they affect the operation of the life safety systems.
    c. Verify building control systems are functioning to control life safety equipment and smoke control systems.
    d. Fire smoke dampers are operating per design intent.

27. A complete set of as-built records to the Commissioning Authority

B. Automatic Controls and Building Automation System Contractors

1. Include cost for commissioning requirements in the contract price.
2. Ensure all fire alarm systems and interconnections to other systems meet all requirements in accordance with Division 280000.
3. Review design for controllability with respect to selected manufacturer's equipment.
4. Verify proper hardware specification exists for functional performance required by specification and sequence of operation.
5. Provide a points list of monitoring points within Division 280000.
6. Attend initial commissioning coordination meeting scheduled by the Commissioning Authority.
7. Provide the following submittals to the Commissioning Authority.

    a. Hardware and software submittals
    b. Control panel construction shop drawings.
    c. Narrative description each piece of equipment monitored.
    d. Diagrams showing all; control points, sensor locations, point names, actuators, controls, and where necessary points of access superimposed on diagrams of the physical equipment.
    e. Logic diagrams showing the logic flow of the system.
    f. A list of all control points, including analog inputs, analog outputs, digital inputs, and digital outputs. Include the values of all parameters for each system point. Provide a separate list for each stand alone control unit.
    g. A complete control language program listing including all software routines employed in operating the control system. Also provide a program write-up, organized in the same manner as the control software. This narrative shall describe the logic flow of the software and the functions of each routine and sub-routine. It should explain individual math or logic operations that are not clear from reading the software listing.
    h. Hardware operation and maintenance manuals.
    i. Application software and project applications code manuals.

8. Provide thorough training operating professionals on hardware operations and programming, and the application program for the system.
9. Provide control system technician for use during system verification and functional performance testing.
10. Provide systems modifications as required.
11. Verify BACNET connections to Landlord systems as applicable.
12. Verify all monitoring points with the CxA associated with Division 280000.

C. Equipment Suppliers and Miscellaneous Contractors.

1. Include cost for commissioning requirements in the contract price.
2. Provide submittals, and appropriate O&M manual section(s).
3. Provide factory supervised startup services for equipment and systems where specified. Coordinate work with manufacturer and CxA.
4. Attend initial commissioning coordination meeting scheduled by the Commissioning Authority.
5. Participate in training sessions as scheduled by the Commissioning Authority.
6. Demonstrate performance of equipment as applicable.

1.6 DOCUMENTATION

A. The Commissioning Authority shall oversee and maintain the development of commissioning documentation. The commissioning documentation shall be kept in three ring binders, and organized by system and sub-system when practical. All pages shall be numbered, and a table

of contents page(s) shall be provided. The commissioning documentation shall include, but not be limited to, the following:

1. A complete description of how the alarm system is intended to operate.
2. All accepted shop drawings of alarm equipment. Shop drawings shall be full size sheets folded as required to fit in binders.
3. Final Commissioning Plan
4. All pre-functional performance test checklists, signed by indicating personnel, organized by system and sub-system.
5. All verification and functional performance test checklists/results, signed by indicated personnel, organized by system and sub-system.
6. Start-Up reports, test & inspection reports and certificates.
7. Issues Log with corrective action verification.
8. Final Commissioning Report

PART 2 - PRODUCTS

2.1 TEST EQUIPMENT

A. The appropriate Contractor(s) shall furnish all special tools and equipment required during the commissioning process. A list of all tools and equipment to be used during commissioning shall be submitted to the Commissioning Authority for approval. The owner shall furnish necessary utilities for the commissioning process.

B. All testing equipment used on jobsite will require a valid and non-expired calibration certificate.

C. Provide all standard testing equipment required to perform startup and initial checkout and required functional performance testing; unless otherwise noted such testing equipment will NOT become the property of Owner.

D. Equipment-Specific Tools: Where special testing equipment, tools and instruments are specific to a piece of equipment, are only available from the vendor, and are required to accomplish startup or Functional Testing, provide such equipment, tools, and instruments as part of the work at no extra cost to Owner; such equipment, tools, and instruments are to become the property of Owner.

2.2 TEST EQUIPMENT - PROPRIETARY

A. Proprietary test equipment and software required by any equipment manufacturer for programming and/or start-up, whether specified or not, shall be provided by the manufacturer of the equipment. Manufacturer shall provide the test equipment, demonstrate its use, and assist in the commissioning process as needed. Proprietary test equipment (and software) shall become the property of the owner upon completion of the commissioning process.

PART 3 - EXECUTION

3.1 GENERAL

A. A pre-construction meeting of all commissioning team members shall be held at a time and place designated by the owner. The purpose shall be to familiarize all parties with the commissioning process, and to ensure that the responsibilities of each party are clearly understood.

B. The Contractor shall complete all phases of work so the systems can be started, tested, balanced, and acceptance procedures undertaken. This includes the complete installation of all

equipment, materials, duct, wire, controls, etc. per the contract documents and related directives, clarifications, and change orders.

C. A Commissioning Plan shall be developed by the Commissioning Authority. The Contractor shall assist the Commissioning Authority in preparing the Commissioning Plan by providing all necessary information pertaining to the actual equipment and installation. If contractor initiated system changes have been made that alter the commissioning process, the commissioning Authority shall notify the Contracting Officer.

D. Acceptance procedures are normally intended to begin prior to completion of a system and/or sub-systems, and shall be coordinated with the Division 280000 contractor. Start of acceptance procedures before system completion does not relieve the contractor from completing those systems as per the schedule.

3.2 PREPARATION

A. The Construction Manager and subcontractors are to cooperate with the CxA in development of the Pre-Functional Checklists and Functional Test Procedures.

B. The Construction Manager and subcontractors are to furnish additional information requested by the CxA.

C. The Construction Manager and subcontractors are to prepare a preliminary schedule for fire alarm testing and equipment start-up for use by the CxA; update the schedule as appropriate.

D. Notify the CxA forty-eight (48) hours in advance when pre-testing and startup of each piece of equipment will occur; when commissioning activities not yet performed or not yet scheduled will delay construction notify ahead of time and be proactive in seeing that the CxA has the scheduling information needed to efficiently execute the commissioning process.

E. Put all fire alarm, equipment and systems into operation and continue operation during each working day of and commissioning, as required.

3.3 PARTICIPATION IN ACCEPTANCE PROCEDURES

A. The Contractor shall provide skilled technicians to start-up and debug all systems within Division 280000. These same technicians shall be made available to assist the Commissioning Authority in completing the commissioning program. Work schedules, time required for testing, etc. shall be requested by the Commissioning Authority and coordinated by the contractor. Contractor shall ensure that the qualified technician(s) are available and present during the agreed upon schedules and of sufficient duration to complete the necessary tests, adjustments, and/or problem resolutions.

B. System performance problems and discrepancies may require additional technician time, Commissioning Authority time, reconstruction of systems, and/or replacement of system components. The additional technician time shall be made available for subsequent commissioning periods until the required system performance is obtained.

C. The Commissioning Authority reserves the right to question the appropriateness and qualifications of the technicians relative to each item of equipment, system, and/or sub-system. Qualifications of technicians shall include expert knowledge relative to the specific equipment involved and a willingness to work with the Commissioning Authority. Contractor shall provide adequate documentation and tools to start-up and test the equipment, system, and/or sub-system.

3.4 DEFICIENCY RESOLUTION

A. In some systems, improper adjustments, misapplied equipment, and/or deficient performance under varying loads will result in additional work being required to commission the systems. This work shall be completed under the direction of the Contracting Officer, with input from the contractor, equipment supplier, and Commissioning Authority. Whereas all members shall have input and the opportunity to discuss, debate, and work out problems, the Contracting Officer shall have final jurisdiction over any additional work done to achieve performance.

B. Corrective work shall be completed in a timely fashion to permit the completion of the commissioning process. Experimentation to demonstrate system performance may be permitted. If the Commissioning Authority deems the experimentation work to be ineffective or untimely as it relates to the commissioning process, the Commissioning Authority shall notify the Contracting Officer, indicating the nature of the problem, expected steps to be taken, and suggested deadline(s) for completion of activities. If the deadline(s) pass without resolution of the problem, the Contracting Officer reserves the right to obtain supplementary services and/or equipment to resolve the problem. Costs incurred to solve the problems in an expeditious manner shall be the contractor's responsibility.

3.5 ADDITIONAL COMMISSIONING

A. Additional commissioning activities may be required after system adjustments, replacements, etc., are completed. The contractor(s) suppliers and Commissioning Authority shall include a reasonable reserve to complete this work as part of their contractual obligations. WHAT DO YOU ENVISION FOR THIS, THE "REASONABLE RESERVE"…?

3.6 ACCEPTANCE PROCEDURES

A. Verification Tests

1. Scope of Verification Tests

a. Operating tests and checks to verify that all components, equipment, systems, sub-systems, and interfaces between systems, operate in accordance with the contract documents. These tests are to include all operating modes, interlocks, specified control responses, specific responses to abnormal or emergency conditions and verifications of the proper response of the building automation system controllers and sensors.
b. All functional testing will meet all requirements in accordance with NFPA 72 as well as Divisions 280000.

2. Participants in Verification tests

a. The Commissioning Authority shall be responsible for preparing the scope of these tests. The Commissioning Authority shall schedule the tests and assemble the commissioning team members who shall be responsible for the tests. Participating contractors, manufacturers, suppliers, etc. shall include all costs to do the work involved in these tests in their proposals. Following is a list of tasks and supporting information that shall be required.
b. Fire Alarm contractor – provide the services of a controls engineer who is familiar with the details of the project. Provide details of the control system, schematics, and a narrative description of control sequences of operation.
c. Mechanical contractor – provide the services of a technician(s) who is (are) familiar with the construction and operation of this system. Provide access to the contract plans, shop drawings, and equipment cut sheets of all installed equipment.

3. Documentation and Reporting Requirements

a. Provide checklists for each component, piece of equipment, system, and sub-system, including all addresses, interfaces, interlocks, etc. Each item to be tested

shall have a different entry line with space provided for comments. Separate checklists shall be prepared for each mode of operation. Provide space to indicate whether the mode under test responded as required or not. Also, provide space for all necessary parties to sign off on each checklist.

b. Data sheets used in verification of the proper operation of the sequence shall include piece of equipment to be verified based on the design intent. Also, provide space for all necessary parties to sign off on each checklist.

c. All test procedures and data sheets shall be submitted to the design professional and CxA for review and acceptance.

4. Instrumentation

a. The Contactor shall furnish all measurement instrumentation for the verification tests. All instruments will have calibrated within one year period prior to these tests.

5. Verification Procedures

a. The Commissioning Authority shall direct and witness the verification operating tests and checks for all equipment and systems.

1) Set the system equipment into the operating mode to be tested, i.e. normal, bypass, emergency power, and alarm conditions.
2) The Commissioning Authority shall inspect and verify the position of each device and interlock identified on the checklist. Each item shall be signed off as acceptable (yes), or failed (no).
3) This test shall be repeated for each operating cycle that applies to the system being tested.
4) Operating checks shall include all safety cutouts, alarms and interlocks with smoke control and life safety systems during all modes of operation of the fire alarm system.
5) If during a test an operating deficiency is observed, appropriate comments shall be added to the checklist data sheet & an issues log with corrective action verified with completion will be documented and tracked until final commissioning report is issued.
6) Verification of the proper alarm annunciators and panel shall be as follows:
7) For each fire alarm panel, record the alarm response and device address of the initiating device.
8) The fire alarm system shall undergo a complete validation of all initiating devices.

B. Functional Performance Testing

1. Scope of Functional Testing

a. Functional performance tests shall determine if the fire alarm system is providing the required services in accordance with the final design intent. They shall also determine the installed capacity of all components.

2. Submittals

a. Detailed procedures for each series of tests shall be submitted to the Commissioning Authority for review and acceptance. The procedures shall include samples of the data sheets that will be part of the reports.

3. Participants in Functional Performance Tests

a. Participants in the functional performance tests shall be the same as those listed in the verification tests.

4. Instrumentation

a. Instrumentation requirements shall be the same as those listed in the verification tests.

5. Functional Performance Test Procedures

a. The Commissioning Authority shall supervise and direct all functional performance tests. Following is a list of test examples:

1) Activate an area smoke detector and confirm address, annunciator, alarms at fire alarm panels, and system response based on fire alarm matrix.
2) Activate water flow switch and confirm system response based on fire alarm matrix.
3) Activate a duct smoke detector and confirm interlock with respective HVAC equipment.

6. Documentation and Reporting Requirements

a. All measured data, data sheets, and a comprehensive summary, describing the operation of the fire alarm system at the time of testing shall be submitted to the Commissioning Authority.
b. A preliminary functional performance test report shall be prepared by the Commissioning Authority and submitted to the Design Professional or review. Any identified deficiencies need to be evaluated by the Design Professional and Construction Manager to determine if they are part of the contractor's contractual obligations. Construction deficiencies shall be corrected by the responsible contractor(s) and the specific functional performance test repeated.
c. If it is determined that the fire alarm system is constructed in accordance with the contract documents, and the performance deficiencies are not part of the contract documents, the Contracting Officer must decide whether any required modifications needed to bring the performance of the fire alarm system up to the finalized design intent shall be implemented, or if the test shall be accepted as submitted. If corrective work is performed, the Contracting Officer shall determine if a portion or all required functional performance tests should be repeated, and a revised report submitted.

3.7 OPERATING AND MAINTENANCE MANUAL

A. Refer to project specifications for complete O&M manual requirements.

1. System Descriptions

a. Each major system shall be described, typewritten, in general terms, including major components, interconnections, theory of operation, theory of controls, unusual features and major safety precautions. This information should correlate with information provided in the manufacturer's instruction book. This section shall include, but not limited to, the following data:

1) Detailed description of each system and each of its components showing initiating devices, valves, panels, subpanels, and other components, with diagrams and illustrations where applicable.
2) Wiring and control diagrams with data to explain detailed operation and control of each component.

3) Control sequences describing start-up, all modes of operation, shut down, & emergency shutdown.
4) Corrected shop drawings.
5) Approved products data including all performance curves and rating data.
6) Copies of approved certifications and laboratory test reports (where applicable).
7) Copies of warranties.

b. System diagrams or drawings shall be incorporated in the appropriate systems descriptions including systems boundaries for testing for the CxA, will be highlighted. These diagrams or drawings should be reduced in size or folded to usefully fit into the manual.

2. Operating Instructions

a. Condensed, typewritten, suitable for posting, instructions shall be provided for each major piece of equipment. Where more than one (1) common unit is installed, one instruction is adequate. The instructions shall provide procedures for:

1) Starting up the equipment/system.
2) Shutting down the equipment/system.
3) Operating the equipment in emergency or unusual conditions.
4) Bypassing zones and systems.
5) Safety precautions.
6) Trouble shooting suggestions.
7) Status indicators
8) Other pertinent data applicable to the operation of particular systems or equipment.

b. The instructions shall be suitable for posting adjacent to the equipment concerned. The Contractor shall provide instructions for all installed systems.

3. Ongoing and preventive Maintenance

a. Condensed, typewritten procedures for recommended ongoing and preventive maintenance actions shall be provided for each category of equipment/system.

This information shall include, but not be limited to the following:

1) Maintenance and overhaul instructions.
2) Part list, including source of supply and recommended spare parts.
3) Name, address, and 24 hour telephone number of each subcontractor who installed equipment and systems, and local representative for each type of system.
4) Other pertinent data applicable to the maintenance of particular systems or equipment.

b. These recommended preventive maintenance actions shall be categorized by the following recommended frequencies:

1) Weekly
2) Monthly
3) Quarterly
4) Semi-Annual
5) Annual
6) Other

3.8 OPERATING AND MAINTENANCE TRAINING

A. The Life safety Contractor, and appropriate sub-contractors, shall provide comprehensive operating and maintenance instruction on building systems prior to delivery. The instruction shall include classroom instruction deliver by competent instructors based upon the contents of the operating manual. Emphasis shall be placed upon overall systems diagrams and descriptions, and why systems were designed as they were. The overall system instructions shall preferably be delivered by the consulting engineers. The classroom instructions shall also include detailed equipment instruction by qualified manufacturer representatives for all equipment for which operating instructions are provided. The manufacturer representative training shall emphasize operating instructions, and preventive maintenance as described in the operating manual. Provide training agenda to the CxA one week prior to the training session. At a minimum, the training sessions shall cover the following items:

1. Types of installed systems
2. Theory of operation

    a. Design intent
    b. Alarm conditions
    c. Emergency conditions and procedures
    d. Other issues important to facility operation.

3. System operations.
4. Use of fire alarm system.

    a. Sequence of operation
    b. Problem indicators
    c. Supervisory Alarms
    d. Trouble Alarms
    e. Diagnostics
    f. Corrective actions

5. Service, maintenance, diagnostics and repair.
6. Use of reports and logs.
7. Troubleshooting, investigation of malfunctions, and determining reasons for the problems.

B. Each classroom training period shall be followed by an inspection, explanation and demonstration of the system concerned by the instructors.

C. The contractor shall be responsible for organizing, arranging, and delivering a schedule of system training agreeable with the facility manager.

D. The contractor shall provide, at or before substantial completion, a proposed agenda for each system and schedule of the above training for approval by the Commissioning Authority (CxA).

END OF SECTION 28 08 00

SECTION 281300 - ACCESS CONTROL SYSTEM

PART 1 - GENERAL

1.1 Section Includes

A. System Requirements

B. Access Control Field Devices

C. Access Control System

1.2 RELATED REQUIREMENTS

A. The Contractor, Subcontractors and/or suppliers providing goods or services referenced in or related to this Section shall also be bound by the Documents identified in Division 01 Section “Summary”, Paragraph 1.1A, entitled “Related Documents.” OR Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

B. Division 07 - Firestopping.

C. Division 08 - Door Hardware: Electrically operated door hardware, for interface with access control system.

1. Includes door hardware with integral request to exit devices.

D. Division 26 - Hydraulic Elevators: For interface with access control system.

E. Division 26 - Grounding and Bonding for Electrical Systems.

F. Division 26 - Conduit for Electrical Systems.

G. Division 26 - Identification for Electrical Systems: Identification products and requirements.

H. Division 27 - Structured Cabling: Data cables for access control system IP network connections.

I. Division 28 - Video Surveillance: For interface with access control system.

J. Division 28 - Building Intrusion Detection: For interface with access control system.

K. Division 28 - Fire Detection Alarm: For interface with access control system.

L. Refer to the following construction documents for Data Room locations and device locations only.

1. “Y” Drawings – Security Plans

2. "T" Drawings – Technology Plans

M. Any apparatus, appliance, material, or work not shown on the Drawings but mentioned in the Specifications, or vice versa, and any incidental accessories necessary to make the work complete and perfect in all respects and ready for operation, even if not particularly specified, shall be provided without additional expense. Coordinate with each system manufacturer to insure all hardware, firmware, relays, or other necessary components are provided prior to bid submission.

N. All work of this Section to comply with the requirements of the Conditions of Contract, with all Specification Sections of Division 01 – General Requirements, with the Security Drawings, and with all other Contract Documents.

O. Refer to Division 26 of the Contract Documents, Electrical, for all Specifications governing the installation of raceway (conduit, EMT, cable trays, wire trough, etc.), system junction and pull boxes, and device rough-in boxes, for all Security System work shown on the Security Drawings. Conduit, back box, and trough work to be provided by this Contractor.

P. Refer to Division 26 of the Contract Documents, Electrical, for all work related to the interconnection of Security System equipment to 120 VAC power sources.

Q. Refer to Division 09 of the Contract Documents, Finishes, for details relating to acoustical ceilings and gypsum board systems, floor finishes, painting, etc., for information pertinent to device and back box selection and installation.

R. Refer to Division 08 of the Contract Documents, Openings, for details relating to doors, door frames, windows, and window frames, for information pertinent to the selection of magnetic contact devices and their associated placement and installation, including back box selection and installation.

S. Refer to Division 08 of the Contract Documents, Openings, for details relating to door and door frame hardware and preparation, electrified lock power supplies, required coordination to accommodate these components and/or systems, lock voltage and current draw coordination, coordination of fail-safe electrified locks, and any other related equipment or requirements

T. Refer to Division 06, Wood, Plastics, Composites, and coordinate all desk locations and installation details with the Millwork Contractor.

U. Review all other Specification Sections as required to achieve complete inter- trade coordination.

1.3 DEFINITIONS

A. API: Application Programming Interface

B. AVI: Audio Video Interleave

C. CA: Certificate Authority

D. CAC: Common Access Card

E. CE: European Union Conformity

F. CPU: Central Processing Unit

G. CSV: Comma Separated Values

H. DNS: Domain Name Server

I. DSM: Door Status Monitor

J. DVR: Digital Video Recorder

K. EACS: Electronic Access Control System

L. FCC: Federal Communications Commission

M. FIPS: Federal Information Processing Standard

N. FIFO: First In – First Out

O. FTP: File Transfer Protocol

P. FRAC: First Responder Authentication Credential

Q. GB: Gigabyte

R. GSOC: Global Security Operations Center

S. GUI: Graphical User Interface

T. HA: High Availability

U. HTML: Hypertext Markup Language

V. 4, H.265: Video Compression Standards

W. I2C: Inter-Integrated Circuit

X. IEEE: Institute of Electrical and Electronics Engineers

Y. I/O: Input / Output

Z. IP: Internet Protocol

AA. IS: Integrated System

BB. JPEG: Joint Photographic Experts Group

CC. LAN: Local Area Network

DD. LDAP: Lightweight Directory Access Protocol

EE. MB: Megabyte

FF. MJPEG: Motion JPEG

GG. MSATA: Mini-Serial Advanced Technology Attachment

HH. MSP: Mobile Security Professional

II. MTBF: Mean-Time Between Failure

JJ. NAS: Network Attached Storage

KK. NAT: Network Address Translation

LL. NBAPI: NetBox Application Programming Interface

MM. NECA: National Electric Code Association

NN. NFPA: National Fire Protection Association

OO. NVR: Network Video Recorder

PP. ODBC: Open Database Connectivity

QQ. OS: Operating System

RR. OVID: Open Video Integration Driver

SS. PDF: Portable Document Format

TT. PIN: Personal Identification Number

UU. PIV: Personal Identity Verification

VV. PoE: Power over Ethernet

WW. PTZ: Pan-Tilt-Zoom

XX. RAID: Redundant Array of Independent Disks

YY. RAM: Random Access Memory

ZZ. REX: Request to Exit

AAA. RFID: Radio Frequency Identification

BBB. RoHS: Restriction of Hazardous Substances

CCC. ROM: Read Only Memory

DDD. RU: Rack Unit

EEE. SFTP: Secure File Transfer Protocol

FFF. SHA: Secure Hash Algorithm

GGG. SIO: Serial Input / Output

HHH. SLA: Sealed Lead-Acid

III. SMS: Security Management System or Short Message Service (text messaging)

JJJ. SSL: Secure Sockets Layer

KKK. SUSP: Software Upgrade and Support Plan

LLL. TCP: Transmission control protocol - connects hosts on the Internet

MMM. TIA: Telecommunications Industry Association

NNN. TLS: Transport Layer Security

OOO. TWIC: Transportation Worker Identification Credential

PPP. UI: User Interface

QQQ. UPS: Uninterruptible Power Supply

RRR. UTP: Unshielded Twisted Pair

SSS. VMS: Video Management System

TTT. WAN: Wide Area Network

UUU. Wi-Fi: Wireless Network

VVV. AS NECESSARY: Shall mean work which is required for completed construction, but is not necessarily shown or described in the Contract Documents.

WWW. AS REQUIRED: Shall mean work which is required for completed construction, but is not necessarily shown or described in the Contract Documents.

XXX. Substantial Completion: Shall mean that the project is sufficiently complete to be utilized for its intended use as stated in the body of this written specification.

YYY. Contractor/INTEGRATOR: Refers to the biding/installation Contractor responsible for furnishing and installation of all work indicated within this specification.

1.4 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

B. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

C. CSBC101.2 & CFSC 102.1 [in CT Projects] - Life Safety Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

D. UL 294 - Access Control System Units; Current Edition, Including All Revisions.

E. UL 1076 - Proprietary Burglar Alarm Units and Systems; Current Edition, Including All Revisions.

F. System shall be RoHS (Restriction of Hazardous Substances) compliant and meet proposed amendments to the reduction of toxic substances in manufacturing in stated in the Environmental Design of Electrical Equipment Act (EDEE).

G. Installation shall comply with NECA 1-2010 “Standard Practice of Good Workmanship in Electrical Construction”

H. Installation shall comply with NEC/NFPA 70E “Standard for Electrical Safety in the Workplace”

I. Electronic data exchange between Video Surveillance System and the Access Control System shall comply with SIA TVAC

J. Installation shall comply with FCC CFR 47 Part 15 Class A “Telecommunications, Radio, Frequency, Digital Device Emission:

K. Installation shall comply with Federal, State, and Local Codes and Authority Having Jurisdiction (AHJ).

L. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

1.5 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate the work with other installers to provide suitable door hardware as required for both access control functionality and code compliance.
2. Coordinate the placement of readers with millwork, furniture, equipment, etc. installed under other sections or by others.
3. Coordinate the work with other installers to provide power for equipment at required locations.
4. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

B. Access Control Cloud Services:

1. Subscription fees to be paid by Owner.
2. Obtain Owner approval of subscription fees and terms of service prior to submittal.

C. Preinstallation Meetings:

1. Conduct meeting with facility representative to review reader and equipment locations.
2. Conduct meeting with facility representative and other related equipment manufacturers to discuss access control system interface requirements.

D. Confidentiality of Documents

1. The project documents, consisting of all technical proposals, drawings, specifications, shop drawings, as-built drawings, manufacturer's literature, etc., shall be considered proprietary information and are to be treated with complete confidentiality. Dissemination of any security system documentation to any party not considered "need-to-know" without a pre-defined and approved agreement will be considered a violation of the contract documents and all pursuant clauses regarding financial penalties, project termination, and/or legal prosecution will apply. The Contractor is to obtain a list of "need-to-know" parties from the Owner and/or Construction Manager.
2. Use of the Contract drawings and specifications is restricted to the original site for which they were prepared. Publication therefore is expressly limited to such use. Re-use, reproduction, storage by any medium or publication by any method in whole or in part is prohibited. Visual contact with the Contract drawings and specifications constitutes prima facie evidence of the acceptance of these restrictions. Unlawful publication, dissemination, and use of these documents carry significant liability and the Owner maintains the right to legally pursue restitution and/or penalty for violation of these confidentiality conditions.
3. All documents marked "DO NOT DUPLICATE" are to be returned to the Construction Manager for proper disposal and handling upon completion of their relevant use.

1.6 SUBMITTALS

A. See Division 01 – Administrative Requirements for submittal procedures.

1.7 Evidence of Qualifications for Installer:

1. The Contractor shall be a bona fide security systems contractor, licensed by the State of Connecticut for the installation of the low voltage security and signal communication systems, and engaged in security system maintenance, service and contracting for at least the last five years.
2. The Contractor shall employ technicians who have been trained by the Manufacturer specified within this section to install the systems of this Manufacturer.
3. The contractor shall be a factory authorized stocking distributor of the manufacturer of the equipment included in the system so that immediate replacement parts can be made from inventory and service provided as needed on an emergency basis.
4. The Contractor shall submit with the bid a manufacturer's certificate of acceptance of the qualifications of the Installing Contractor to install, test, maintain and repair the manufacturer's equipment.
5. In order for the Security Consultant to verify that they meet the competency requirements of this specification, Contractors must submit the following information if so requested:

    a. Proof that the Contractor has installed, services and maintained similar security systems for a minimum of ten (10) years.
    b. Proof that the Contractor is a firm which currently and regularly installs, services and maintains security systems as a full time business.

c. The names and qualifications of security system technicians that shall perform and supervise the work, and perform tests or adjustments on the systems and equipment. Qualifications shall include all schooling, training, and history of work experience.
d. A list of four prior systems comparable to the one specified under this contract which were installed, serviced, and maintained satisfactorily by the Contractor for a minimum of one (1) year. Each system listed shall include the firm or owner, location, person to contact (with telephone number), date of installation and service period, and a brief description of the system and work performed on the system.

6. The Contractor shall submit any other information required by the Security Consultant to determine the competency of the Contractor. If this information is not submitted as requested, it shall be submitted within the time specified by the Architect after the bid opening. If the Contractor fails to submit the information in accordance with the Security Consultant's request, the Contractor shall be declared non-responsive, and may be rejected to perform the work specified within this section.

B. Design Data: Standby battery/UPS Calculations

C. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instruction for storage, handling, protection, examination, preparation, installation, and operation of product.

D. Manufacturer's detailed field-testing procedures.

E. Maintenance contracts.

F. Product Data: Provide details and technical specifications for each product indicated. Include physical dimensions, features, performance, electrical characteristics, ratings, software versions, and operating system details.

G. Shop Drawings:

1. General: General: Bid documents, including drawings, details and specifications are considered conceptual in nature, and provide direction on products and project requirements. Contractor is given a choice of methods that may be incorporated into the system. These choices may affect the overall design, configuration and installation of the proposed system.
2. Contractor Responsibility: Prepare and submit shop drawings, rendered in the latest AutoCAD DWG file format, which show details of all work to ensure proper installation of the work using those materials and equipment specified or allowed under the approved plans and specifications. A complete Shop Drawing submittal drawing package shall consist of Drawings, Equipment Data Sheet Submittals, and an Acceptance Testing Plan.
3. Completeness: The Equipment Submittals, Acceptance Testing Plan, and the Shop Drawings should be submitted as a complete and contiguous package. Partial or unmarked submittals will not be accepted for review.
4. Scheduling: A schedule of shop drawing submissions shall be submitted for the Architect and Owner's Representative review on a form acceptable to the Architect within ten (10) days after award of the Contract. The schedule of shop drawing submissions shall include as a minimum, but not limited to the requirements stated herein.
5. Requirements: Provide the following information complete, and in the manner described herein:

a. Hardware, Application Software, and Network Requirements: A system description including analysis and calculations used in sizing equipment required by the security systems. The description shall show how the equipment will operate as a system to meet the performance requirements of the systems. The following information shall be supplied as a minimum:

1) Server(s) processor(s), disk space and memory size
2) Workstation(s) processor(s), disk space and memory size
3) Description of facility (field) control equipment (Controllers/Field Panels, Models) and their configuration
4) Operating System(s) Software, where software is provided or upgraded
5) Application Software, with Optional and Custom Software Modules supplied in this project
6) Integration Schemes: Proposed connectivity, software, development requirements, and SDK information, for inter-system communication.
7) Network bandwidth and reliability requirements
8) Number and location of LAN ports required
9) Other specific network requirements, preferences, and constraints
10) Backup/archive system size and configuration
11) Start-up operations
12) System power requirements and Uninterruptible Power Supply (UPS) sizing
13) Device/Component environmental requirements (cooling and/or heating parameters)

b. Shop Drawings: Shop Drawings shall be numbered consecutively and shall accurately and distinctly present the following information:

1) Title Sheet
2) Floor Plans: Showing devices, pull boxes, cabinets, conduits and conductors in their proposed locations with device numbering scheme.
3) Riser Diagram: Showing all conduit relationships between devices shown on the Floor Plans. Show all power sources.
4) Single-Line/Block Diagrams: Show signal relationships of controls and devices within the system.
5) Custom Assembly Diagrams: For each custom assembly such as Access Control Terminal Cabinets, receptacle assemblies, or door control panels, provide an assembly drawing illustrating the appearance of the assembled device. Include dimensions, assembly components, and functional attributes (momentary or alternate action switch, lens color, panel finish)
6) Component Connection Diagrams

a) For each equipment component such as a computer, video switcher, camera or video recorder, show the rear elevation of the device and all connectors/terminations as a pictorial.
b) Show the wire designations on connectors. Typical wiring detail where multiple of same device is provided.
c) Show a schedule of the wire colors connected to the pins on each device connector.

c. Equipment Wiring Diagrams

1) Show a pictorial illustration of each equipment enclosure and/or terminal cabinet, including terminals, components and wiring devices.

2) Show the device nomenclature exactly as shown on the single line diagrams.
3) Terminations: Show every termination and terminating cable, with applicable cable and wire numbers matching the single line diagrams.

    a) Every termination in the system must be documented.
    b) Termination information may be rendered as a wiring list(s), if properly coordinated with, and referenced to, typical component and single-line diagrams. Otherwise, the Shop Drawings shall show a pictorial of every component in the system, with its terminations.

4) Show wire colors for each terminal.
5) For each wire exiting the enclosure, show the destination of the wire by floor, room number and the drawing number of the panel where the wire terminates.
6) Provide working dimensions and erection dimensions.
7) Arrangements and sectional views
8) Necessary details, including complete information for making connections between work under this Contract, existing work, and work under other Contracts.
9) Stock or standard drawings will not be accepted for review unless full identification and supplementary information is shown thereon in ink or typewritten form.
10) Duplicate of design drawings may be used where each sheet is modified to reflect contractor coordination, specific requirements of the project and multi discipline conditions.
11) Each Drawing or page shall include:

    a) Project name, Project Number and descriptions.
    b) Submittal date and space for revision dates.
    c) Identification of equipment, product or material.
    d) Name of Contractor and Subcontractor.
    e) Name of Supplier and Manufacturer.
    f) Relation to adjacent structure of material.
    g) Physical dimensions clearly identified.
    h) ASTM and Specifications references.
    i) Identification of deviations from the Contract Documents.
    j) Contractor's stamp, initialed or signed, dated and certifying to review of submittal, certification of field measurements and compliance with Contract.
    k) Location at which the equipment or materials are to be installed. Location shall mean both physical location and location relative to other connected or attached material.

d. Equipment Submittals

1) Provide a Title Page, with project name, Contractor’s name and address, contact information, date of submission, and submission revision number.
2) Provide a Parts List, for proposed equipment, materials, components and devices, listing the following information for each line item:

    a) The system type
    b) Model number

c) Specification sheet page reference

3) Provide Manufacturers Specification Sheet with descriptive information for equipment, materials, components and devices. Number each page, to correspond with the Parts List.
4) Clearly delineate (with highlighter, arrow, or underline) on each specification sheet, specific model numbers, options and configurations being proposed for this project.
5) Indicate kinds of materials and finishes for equipment where more than one option is presented.

e. Acceptance Testing Plan

1) Submit a written document detailing the test procedures to be followed in evaluating and proving the installed system(s).
2) Provide a sample of the test forms to be used for each system and for each component of each system.
3) Include all tests required by the equipment manufacturer and by this Specification

f. Spare Parts List: Submit a list of recommended spare parts for Owner's review & approval and/or amending. Spare parts shall comprise a minimum of 5% or minimum of 2 each of field devices, device termination boards and a minimum of 1 system controller boards.

g. Training Program

1) Submit a training program 10 working days prior to scheduled training to be followed in training key employees in the operation and maintenance of the installed system at the project site. The proposed training program shall be designed to provide a level of basic competence with the system for selected personnel. These selected personnel shall then be expected to train other personnel as required, utilizing the training that they have been given and the body of training documentation provided by Contractor. This plan shall comply with the requirements stated in the "Training" section, of these Specifications, all stated hours of which shall be considered to be classroom hours.
2) Submit a curriculum to account for, and relate, each subject to actual training time. All required hours shall be accounted for in this curriculum.
3) The training plan shall cover the overall system, each individual system, each subsystem, and each component. The plan shall also cover procedures for database management, normal operations, and failure modes with response procedures for each failure. Each procedural item must be applied to each equipment level.

h. Incomplete or unchecked submittals which do not contain complete data on the work and full information on related matters will be returned for correction.

i. Verification: The contractor shall check and acknowledge all shop drawings and shall place his signature on all shop drawings submitted for approval. Contractor's signature shall constitute a representation that all quantities, dimensions, field construction criteria, materials, catalog numbers, performance criteria and similar data have been verified and that, in his opinion, the submittal fully meets the requirements of the Contract Documents.

j. Timeliness: The Contractor shall schedule, prepare and submit a complete shop drawing assembly in accordance with a time-table that will allow his suppliers and manufacturers sufficient time to fabricate, manufacture, inspect test and deliver their respective products to the project site in a timely manner so as to not delay the complete performance of the work.

k. Departure from Contract Requirements: If shop drawings show departures from the Contract requirements, the Contractor shall make specific mention thereof in his letter of transmittal, otherwise review of such submittals shall not constitute review of the departure. Review of the drawings shall constitute review of the specific subject matter for which the drawings were submitted and not of any other structure, materials, equipment, or apparatus shown on the drawings.

l. Contractor Responsibility: The review of shop drawings will be general and shall not relieve the Contractor of responsibility for the accuracy of such drawings, nor for the proper fitting and construction of the work, nor for the furnishing of materials or work required by the Contract. No construction called for by shop drawings shall be initiated until such drawings have been reviewed and approved.

m. Shop Drawing Submittal Review: The procedure in seeking review of the shop drawings shall be as follows:

1) The Contractor shall submit four (4) complete sets and/or electronic PDFs of shop drawings with equipment submittals and other descriptive data with one copy of a letter of transmittal to the Architect for review thirty (30) working days after award of the contract. The letter of transmittal shall contain the project name, Architect's Project Number, the name of the Contractor, the list of drawings submitted including numbers and titles, requests for any review of departures from the contract requirements and any other pertinent information. Drawings submitted for review shall be full-sized and included with the equipment submittals.

2) Drawings or descriptive data will be stamped "Reviewed", "Furnish as Corrected", "Revise and Resubmit", "Rejected" or 'Submit Specific Item' and one copy with a Letter of Transmittal will be transmitted to the Contractor with the return of submitted documents.

3) If a shop drawing or data is stamped "Reviewed" or "Furnish as Corrected", no additional submittal is required for that shop drawing.

4) If a shop drawing or data is stamped "Revise and Resubmit" or "Rejected", the Contractor shall make the necessary corrections and resubmit the documents as required above. The letter transmitting corrected documents shall indicate that the documents are re-submittals.

5) The Contractor shall revise and resubmit the shop drawing as required, until they are stamped either "Reviewed" or "Furnish as Corrected."

H. Equipment and Software List: Include every piece of equipment and software by product/model name and/or number, manufacturer, serial number, revision number, location, and date of original installation. If factory and/or bench testing regimens are required by the project plan, add pretesting record of each piece of equipment and software, listing name of person testing, date of test, and adjustments made.

I. CE and FCC Compliance Certificates:

J. Field quality-control reports

K. Current Specified Manufacturer Integrator Certification Letter

L. Current Specified Manufacturer Training Certificates (listing expiration dates) for Two technicians from the supporting office

M. Warranty: Software support and warranty information for all components, including Service Level Agreement (SLA) details, and duration of agreement from date of system acceptance by Owner. Submit sample of manufacturer's warranty and documentation of final executed warranty completed in Owner's name and registered with manufacturer.

N. Project Record Documents: Record actual locations of system components and installed wiring arrangements and routing.

O. Operation and Maintenance Data: Include detailed information on system operation, equipment programming and setup, replacement parts, and recommended maintenance procedures and intervals.

1. Include contact information for entity that will be providing contract maintenance and trouble call-back service.
2. General: The Contractor is responsible for providing accurate drawings and equipment manuals describing and depicting the systems as they are actually installed and operated.
3. Phase One: Notwithstanding requirements specified elsewhere, submit the following labeled as the "Operating and Maintenance Manual" within thirty (30) days after Final Acceptance of the Installation:

    a. Record Drawings: Submit two (2) copies of revised versions of drawings as submitted in the "Shop and Field" and "Equipment Wiring Diagrams" Submittals showing actual device locations, conduit routing, wiring and relationships as they were constructed. Include nomenclature showing as-built wire designations and colors. Drawings shall include room numbers coinciding with Owner space planning numbering. Drawings shall be submitted in electronic editable AutoCAD files, in ".dwg" format, on CD or DVD disks.
    b. Manuals: Submit two (2) copies of each of the following materials in bound manuals, or electronic PDF copies on CD/DVD discs, with labeled dividers:

        1) A final Bill of Material for each system.
        2) Equipment Instruction Manuals: Complete, project specific comprehensive instructions for the operation of devices and equipment provided as part of this work.
        3) Manufacturers Instruction Manuals: Specification sheets, brochures, Operation Manuals and service sheets published by the manufacturers of the components, devices and equipment provided.
        4) Include information for testing, repair, troubleshooting, assembly, disassembly and recommended maintenance intervals.
        5) Provide a replacement parts list with current prices. Include list of recommended spare parts, tools, and instruments for testing and maintenance purpose.
        6) Performance, Test and Adjustment Data: Comprehensive documentation of performance verification according to parameters specified herein.
        7) Warranties: Provide an executed copy of the Warranty Agreement and copies of all manufacturers' Warranty Registration papers as described herein.

1.8 Quality Assurance

A. Comply with the following:

1. NFPA 70.
2. NFPA 101 (Life Safety Code).
3. The requirement of the local authorities having jurisdiction.
4. Applicable TIA/EIA standards.

B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

D. Installer qualifications: company specializing in performing the work of this section with minimum three years documented experience with access control systems of similar size, type, and complexity and providing contract maintenance service as a regular part of their business; authorized manufacturer's representative.

1. Contract maintenance office located within 100 miles (160km) of project site.

E. Maintenance contractor qualifications: same entity as installer.

F. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities jurisdiction.

G. The requirements of the State Building Code and local regulations establish the minimum acceptable quality of workmanship and materials, and all work shall conform thereto unless more stringent requirements are indicated or specified herein.

H. All work shall comply with the latest editions of the codes as referenced herein.

I. Follow manufacturer's directions for articles furnished, in addition to directions shown on drawings or specified herein.

J. Protect all work, materials, and equipment from damage during process of work. Replace all damaged or defective work, materials and equipment without additional cost to the Project.

K. All equipment and materials for permanent installation shall be the products of recognized manufacturers and shall be new.

L. Equipment and materials shall:

1. Where normally subject to Underwriters Laboratory Inc. listing or labeling services, be so listed or labeled.
2. Be without blemish or defect.
3. Not be used for temporary purposes.
4. Be in accordance with the latest applicable NEMA standards.
5. Be products which will meet with the acceptance of all authorities having jurisdiction over the work. Where such acceptance is contingent upon having the products examined,

tested and certified by Underwriters or another recognized testing laboratory, the product shall be so examined, tested and certified.

M. Except for conduit, conduit fittings, outlet boxes, wire and cable, all items of equipment or material of one generic type shall be the product of one manufacturer throughout.

N. For items which are to be installed but not purchased as part of the electrical work, the electrical work shall include:

1. The coordination of their delivery.
2. Their unloading from delivery trucks driven into any point on the property line at grade level.
3. Their safe handling and field storage up to the time of permanent placement in the project.
4. The correction of any damage, defacement or corrosion to which they may have been subjected. Replacement, if necessary, shall be coordinated with Contractor who originally purchased the item.
5. Their field make up and internal wiring as may be necessary for their proper operation.
6. Their mounting in place including the purchase and installation of all dunnage, supporting members, and fastenings necessary to adapt them to architectural and structural conditions.
7. Their connection to building wiring including the purchase and installation of all termination junction boxes necessary to adapt and connect them to this wiring. Included also shall be the purchase and installation of any substitute lugs or other wiring terminations as may be necessary to adapt their terminals to the building wiring as called for and to the connection methods set forth in these specifications.

O. Items which are to be installed but not purchased as part of the electric work shall be carefully examined upon delivery to the project. Claims that any of these items have been received in such condition that their installation will require procedures beyond the reasonable scope of the electric work will be considered only if presented in writing within one week of the date of delivery to the project of the items in question. The work includes all procedures, regardless of how extensive, necessary to put into satisfactory operation, all items for which no claims have been submitted as outlined above.

P. Seismic Performance: Provide equipment capable of withstanding the effects of earthquake motions determined according to ASCE/SEI 7 and current building codes for the state of CT.

Q. The term “withstand” means “the system(s) will remain in place without separation of any parts when subjected to the seismic forces specified and the system will be fully operational after the seismic event.”

1.9 PROJECT CONDITIONS

A. Environmental Conditions: Capable of withstanding the following environmental conditions without mechanical or electrical damage or degradation of operating capability:

1. Interior, Controlled Environment: System components installed in temperature-controlled interior environments shall be rated for continuous operation in ambient temperatures of 36 to 122 deg F (2 to 50 deg C) dry bulb and twenty to ninety percent (20-90%) relative humidity, noncondensing. Use NEMA 250, Type 1 enclosures.

2. Interior, Uncontrolled Environment: System components installed in non- temperature-controlled interior environments shall be rated for continuous operation in ambient temperatures of 0 to 122 deg F (minus 18 to plus 50 deg C) dry bulb and twenty to ninety percent (20-90%) relative humidity, noncondensing. Use NEMA 250, Type 3R enclosures.
3. Exterior Environment: System components installed in locations exposed to weather shall be rated for continuous operation in ambient temperatures of minus 30 to plus 122 deg F (minus 34 to plus 50 deg C) dry bulb and twenty to ninety percent (20-90%) relative humidity, condensing. Rate for continuous operation when exposed to rain as specified in NEMA 250, winds up to 85 mph and snow cover up to 24 inches thick. Use sufficiently rated NEMA 250 enclosures.
4. Hazardous Environment: System components located in areas where fire or explosion hazards may exist because of flammable gases or vapors, flammable liquids, combustible dust, or ignitable fibers shall be rated, listed, and installed according to NFPA 70.
5. Corrosive Environment: System components subject to corrosive fumes, vapors, and wind-driven salt spray in coastal zones. Use sufficiently rated NEMA 250 enclosures.
6. Security Environment: Camera housing for use in high-risk areas where surveillance equipment may be subject to physical violence.

1.10 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

B. Store products in manufacturer's unopened packaging, keep dry and protect from damage until ready for installation.

1.11 FIELD CONDITIONS

A. Maintain field conditions within manufacturer's required service conditions during and after installation.

1.12 WARRANTY

A. See Division 01 – Closeout Submittals for additional warranty requirements.

B. The Integrator guarantees the Systems to be installed under this specification to be free from any defects in workmanship and materials for a period of one (1) year from the date of final completion/acceptance of the project by the Owner as evidenced by the date of final payment for the work. The Contractor shall promptly and at their own expense remedy any defects in the work and pay for any damage to other work resulting thereof, which shall appear during the period of time covered by this guarantee. Neither the final certificate of payment nor any provisions in this Agreement shall constitute an acceptance of work not done in accordance with this specification or relieve the Contractor of liability with respect to any expressed warranties or guarantees or responsibility for faulty materials or workmanship.

C. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of equipment related to the Access Control System, and control-station equipment that fail in materials or workmanship within specified warranty period.

1. Warranty Period: The standard manufacturer's warranty shall apply or a minimum of a one (1) year warranty from the date of Substantial Completion.

D. The Integrator shall provide all services required to maintain the system in an operational state as specified by the manufacturer for a period of one (1) year after acceptance.

E. Service response shall be within twelve (12) hours of the initial request for service and shall be provided twenty-four (24) hours per day, seven (7) days per week and three hundred sixty-five (365) days per year.

F. Contractor shall include, as part of this warranty, a program for maintenance for each integrated system.

1. Provide details of coverage, preventive maintenance schedules, exclusions and service rates for all billable time and travel charges.
2. Maintenance shall include two (2) semi-annual inspections and tests to verify the intended operation of the security system(s). System testing shall include but not be limited to the testing of all devises, fault modes and batteries. A detailed test report indicating these results and any corrective measures shall be furnished to the owner.

G. The Contractor shall provide software and firmware upgrades as required and available to the Owner.

H. Submit manufacturer's standard warranties.

PART 2 - PRODUCTS

2.1 SYSTEM REQUIREMENTS

A. Furnish and install Access Control System consisting of required equipment, conduit, boxes, wiring, connectors, hardware, supports, accessories, software, system programming, etc. as necessary for a complete operating system that provides the functional intent indicated.

B. The awarded contractor of this section shall furnish and install a network access controlled system into this facility using electronic security devices. This integrated access control system shall incorporate all devices necessary to achieve the specified system, all associated monitoring and recording software, hardware, configuration, testing and training.

C. The contractor awarded this project must include the following licenses and configuration:

1. Access Control Manufacturer licenses for each camera on the Specified VMS system
2. Input / Output panels, and network nodes for all access-controlled doors, all door position switches, all duress & lockdown buttons, and all security strobes.
3. Access Control Manufacturer Licenses for integration with the Specified Intrusion Detection System.
4. Threat Level, Lockdown button configuration, and Day alarm configuration.
5. Alarm and notification configuration through the Specified Access Control User Interface GUI.

D. This Access Control System described within this specification shall be fully integrated with the Video Surveillance, Intrusion Detection, Public Address, and Fire Alarm System.

E. All installation, peripheral devices, required licensing and configurations are required as part of this specification to establish a coherent, functional system as described within this bid package.

F. Security control and network cabling to/from the equipment rooms to the controlled doors, as described within the documents shall be furnished and installed by the contractor awarded this project.

G. Any and all additional interconnection cabling required for a functional system shall be furnished and installed by the contractor awarded this portion of work.

H. Final terminations to all devices are required by the Contractor awarded this Section.

I. The Contractor awarded this Section shall furnish and install a complete integrated security system and all associated, terminations, supporting devices, configuration of system, testing and training in accordance with this Bid package.

J. This specification is used to identify the requirements for an integrated access control system. The operator workstation(s) shall be used for database programming and storage of historical events and as a User interface with the Video Surveillance System.

K. This system shall be integrated with the building's fire alarm system for proper activation of "fail-secure" locking mechanisms.

L. All interconnections required to the fire alarm system shall be terminated by the fire alarm installers and shall be coordinated with the contractor awarded this portion of work.

M. All system configuration(s) shall be included to attain a fully functional system and shall be within the Scope of work of the awarded contractor of this Bid package. This configuration shall include but not be limited to the following:

1. Configuration of all controlled doors and devices.
2. Configuration of all cameras shall be managed from the Access Control Platform
3. Configuration of LAN switches – Active Electronics as required.
4. Configuration of Access Control platform shall allow for Web access into the Access Control and Video Surveillance systems from all schools and via an internet connection which shall VPN into the owner's network.
5. Configuration of the Lockdown / Duress / Emergency buttons, as directed by the Security Consultant, Police Department, and Owner.
6. Configuration of the Access Control, Intrusion Detection, and Video Surveillance integration.
7. Configuration of the Day Alarm system, which will notify users of a propped or opened door equipped with door position switches, as directed by the security consultant and Owner.

N. Environmental Conditions: System(s) shall withstand the environmental conditions without mechanical or electrical failure, damage or degradation of its operating capacity Capable of withstanding the following environmental conditions without mechanical or electrical damage or degradation of operating capability:

1. Interior, Controlled Environment: System components installed in temperature-controlled interior environments shall be rated for continuous operation in ambient temperatures of

36 to 122 deg F (2 to 50 deg C) dry bulb and twenty to ninety percent (20-90%) relative humidity, noncondensing. Use NEMA 250, Type 1 enclosures.

2. Interior, Uncontrolled Environment: System components installed in non- temperature-controlled interior environments shall be rated for continuous operation in ambient temperatures of 0 to 122 deg F (minus 18 to plus 50 deg C) dry bulb and twenty to ninety percent (20-90%) relative humidity, noncondensing. Use NEMA 250, Type 3R enclosures.
3. Exterior Environment: System components installed in locations exposed to weather shall be rated for continuous operation in ambient temperatures of minus 30 to plus 122 deg F (minus 34 to plus 50 deg C) dry bulb and twenty to ninety percent (20-90%) relative humidity, condensing. Rate for continuous operation when exposed to rain as specified in NEMA 250, winds up to 85 mph and snow cover up to 24 inches thick. Use sufficiently rated NEMA 250 enclosures.
4. Hazardous Environment: System components located in areas where fire or explosion hazards may exist because of flammable gases or vapors, flammable liquids, combustible dust, or ignitable fibers shall be rated, listed, and installed according to NFPA 70.
5. Corrosive Environment: System components subject to corrosive fumes, vapors, and wind-driven salt spray in coastal zones. Use sufficiently rated NEMA 250 enclosures.
6. Security Environment: Camera housing for use in high-risk areas where surveillance equipment may be subject to physical violence.

2.2 ACCESS CONTROL FIELD DEVICES

A. Proximity Readers:

1. The selected manufacturer shall be HID – USA in 15370 Barranca Pkwy, Irvine, CA. Other manufacturers will be considered, providing equipment meets or exceeds the quality and functionality specified.
2. The selected model shall be:
3. HID, RP40, Wall-mounted multiCLASS SE Reader

    a. HID, RP15, Wall-Mounted Mullion Mount multiCLASS SE Reader

4. Features:

    a. Accepts 5 to 16 volts, meeting most voltage requirements.
    b. Available with Wiegand or Clock-and-Data interface.
    c. Allows easy upgrade from magstripe to a proximity reader; no rewiring or pulling of new cable required.
    d. Offers high reliability, consistent read-range and low power consumption in an easy-to-install package.
    e. Mounts directly onto metal with no change in read range performance.
    f. Provides multicolor LED, compatibility with all standard access control systems and internal or host control of LED and beeper.
    g. Includes multilingual installation manual.

5. Specifications:

    a. Typical Maximum* Read Range

        1) ProxCard® II card – up to 5.5 inches

2) ISOProx® II card – up to 5 inches

b. DuoProx® II card – up to 5 inches

1) Smart ISOProx®/DuoProx® cards – up to 5 inches
2) Proximity & MIFARE® card – up to 5 inches
3) ProxCard® Plus card – up to 2 inches
4) ProxKey® II keyfob – up to 2 inches
5) MicroProx® Tag – up to 2.5 inches
6) *Depending on local installation conditions.

c. Dimensions:

1) inches x 1.7 inches x 1.0 inch

d. Material:

1) Polycarbonate UL 94

e. Power Supply:

1) Standard MiniProx: 5-16 VDC
2) Loc. MiniProx: 5-16 VDC
3) Linear power supplies are recommended.

f. Current Requirements:

1) Max Average 30 mA
2) Typ Peak: 75 mA

g. Operating Temperature:

1) -22° to 150° F (-30° to 65° C)

h. Operating Humidity:

1) 0-95% relative humidity non-condensing

i. Weight:

1) With Terminal Strip: 3.5 oz.
2) With Pigtail: 3.8 oz.
3) Loc. MiniProx: 3.8 oz.

j. Transmit Frequency:

1) 125 kHz

k. Excite Frequency:

1) 125 kHz

l. Cable Distance:

1) Wiegand Interface: 500 feet
2) Clock-and-Data Interface: 50 feet
3) Recommended cable is ALPHA 1295 (22 AWG) 5 conductor
4) Minimum stranded with overall shield or equivalent. Additional conductors may be required for LED or beeper control.

m. Environmental:

1) IP55

n. Certifications:

1) UL294/cUL (US), FCC Certification (US), IC (Canada), CE (EU),
2) C-tick (Australia, New Zealand),
3) SRRC (China), MIC (Korea), NCC (Taiwan), MIC (Japan), iDA
4) (Singapore), RoHS

B. Request to Exit Sensor (REX / RTE):

1. Coordinate with the door hardware vendor and use the Provided Exit Request Touch Bar or Integral Lock Signal Switch, where specified in Division 08.
2. Where integral exit request touch bar is not specified, furnish an install the following:

a. Manufacturer:

1) BOSCH

a) #DS160
b) Approved Equivalent

C. Door Position Switches (Door Contacts):

1. All Door Position Switches shall be Double Pole-Double Throw (DPDT).
2. Door position switches shall be installed by the Contractor. The Contractor shall align, prepare, and fabricate doors and frames to accept specified door position switches. The Contractor shall be responsible for coordinating the installation, so systems and hardware operate as specified. Door Position Switches will be installed at the top of the door in the first instance. If unable to install on top, then side installation on the handle side is acceptable.
3. Surface Mounted Door Switch: DPDT sensor. Interlogix or approved equal. Surface Mounted Magnetic Switch with armored cable. Route armored cable to junction box and permanently secure to box with clamp or set-screws. Use only where flush-mounted devices cannot be installed.
4. Non-fire rated Doors, Flush Mount:

a. Interlogix Model 1076C-W or approved equivalent Concealed Magnetic Door Switch.

5. Fire Rated Doors:

a. General: Contractor shall coordinate access control hardware equipment and installation so as to maintain the Fire Rating of each specific door to the satisfaction of the Local Authority Having Jurisdiction.

D. Lockdown Button:

1. The selected model shall be: Safety Technologies Inc, #SS-2000 or an Approved Equivalent

   a. The lock down button shall be green and labeled “LOCKDOWN”
   b. The lockdown button shall have a key-to-reset function
   c. Include plastic cover – STI #6518

2. Lock-down buttons must be configured to Owner requirements. Minimally, these buttons will have to interface with the Access Control System, Intrusion Detection System, Public Address System and Video Surveillance System.
3. Lock Down buttons shall automatically release fire-alarm hold-open doors.
4. Lock Down buttons shall cause the security strobes to activate. Coordinate configuration and functionality with Security Consultant and Owner.
5. Lockdown shall send emails and text messages to up to 50 users.
6. Lockdown shall notify the Magic Monitor Bricks of an event.
7. Lockdown shall signal a pre-recorded message over the public address system. Coordinate message with public address integrator.
8. Lockdown shall dial-out to the central monitoring company, through the Honeywell intrusion detection panel.

E. Panic / Duress Button

1. The selected model shall be: Sentrol UL Rated #3050 or an Approved S2 equivalent. Include bi-color latching LED and single pole, double throw contacts.
2. Panic / Duress buttons must be configured to Owner requirements. Coordinate configuration and functionality with Security Consultant and Owner.

F. Security Strobe Lights:

1. The selected model shall be:

   a. Talkaphone #ETP-EL12/24 or approved equal.
   b. Contractor shall demonstrate that lamps are visible in direct sunlight prior to final installation and approval.
   c. Include low voltage power supplies.
   d. Lights shall be controlled through outputs of the Access Control Panel. Coordinate configuration and functionality with Security Consultant and Owner.

G. Access Control Panel:

1. The selected model shall be:

   a. DSX-1048 – Alternates shall not be accepted.

      1) QTY (A/R)

H. Access Control Intelligent Output Controller:

1. The selected model shall be:

    a. DSX-1042 – Alternates shall not be accepted.

        1) QTY (A/R)

I. Access Control Intelligent Input Controller

1. The selected model shall be:

    a. DSX-1044 – Alternates shall not be accepted.

        1) QTY (A/R)

J. Access Control Software:

1. The selected model shall be:

    a. WINDSX SQL – Alternates shall not be accepted.

        1) QTY of Licenses (A/R)

    b. The access control software shall be furnished with a dedicated server meeting or exceeding all manufacturer requirements. The server must be rack mounted.

        1) Approved Server Manufacturers:

            a) Dell
            b) Seneca
            c) BCDVIDEO
            d) DSX

K. Alertus System:

1. Alert Beacon:

    a. The alert beacons shall be Alertus #Alert Beacon. Alternates shall not be accepted.

2. Text to Speech Module:

    a. The TTS Module shall be Alertus TTS module or equivalent.

3. Configure panic/duress and lockdown buttons to connect to alert beacons.
4. Alert beacons shall connect to LAN, configure with Owner's existing Alertus Server and Owner's Security Vendor.
5. Alert Beacons on property shall trigger TTS to send announcements over the fire alarm notification system. Coordinate with Fire Alarm Vendor.
6. Alert Beacons on property shall connect to DSX system to trigger security strobes on property.

L. Door Release Buttons:

1. The selected model shall be:

    a. Dortronics #H276-HD29 or an Approved S2 equivalent
    b. The door release button shall be engraved with the label “ASSOCIATED DOOR # Push to Release”
    c. The door release button shall be mounted to FSR #DSKB_385 Single Gang Table Box.

M. Access Control Source Power:

1. Derive primary Access Control 120VAC power from a designated power source within the telecommunication room, as shown on the T & Y drawings.
2. Power cable shall be protected by conduit.
3. Transformer shall be installed in locked cabinets, protected by tamper switches. Plug-in transformers which are not protected by locked cabinets are not acceptable.
4. Serve all Low Voltage powered devices within the Access Control Cabinet from the Electronics Power Supply.
5. Provide barriers as necessary to separate Class 1 from Class II power.

N. Access Control System Source Power Supplies and Batteries:

1. Furnish and Install Altronix UL Listed Class II power supplies or approved equivalent.
2. Serve all low voltage powered devices within the Access Control Enclosure from the Electronics Power Supply.
3. Capacity: The power supply shall be capable of powering a minimum of 125 percent of the load required at the time of acceptance (25% spare capacity).
4. Power Monitoring: The system shall monitor the loss and restoration of power at the Access Control Panel of both primary and secondary loss of power. Loss and restoration of power shall be displayed at the console, but shall not require resetting the system.
5. Battery Back-up: Provide battery back-up to retain functions of all electronics for a period of four (4) hours upon loss of 120VAC power.

O. Lock Power Supply (LPS)

1. Provide Altronix, UL Listed Class II power supplies within a ventilated, locked, cabinet within the telecommunication rooms as noted on the T & Y drawings, or as otherwise required, to affect proper system performance. Cabinet shall be equipped with a tamper switch, which shall be connected to the Access Control System to provide a supervisory alarm. Power supply shall include separate terminals for each door lock. Power supply voltage shall be required by the hardware supplied locks.
2. Capacity: The power supply shall be capable of powering 200 percent of the load required at the time of acceptance (100% spare capacity).
3. Power Monitoring: The system shall monitor the loss and restoration of power at the Access Control Cabinet. Restoration of power shall be displayed at the console but shall not require resetting the system.
4. Battery Back-Up: Power supplies shall be equipped with integral battery recharging circuits and batteries. If a separate cabinet is used for batteries, the cabinet shall be locked and provided with a tamper switch connected to the Access Control System.

    a. Fail Safe Door Locks: Provide four (4) hours of battery backup for Low-Voltage electrified door hardware.
    b. Fail-Secure Door Locks: Provide battery backup enough to operate fail-secure door locks 100 times per hour, for four (4) hours.

5. Power supply output may be connected to remove UL-approved distribution board of the same manufacturer mounted within the Access Control Cabinet.
6. Provide a Fire Alarm Interface Relay to interface the LPS to the Access Control system and Fire Alarm System as shown on the contract drawings.
7. Transformers shall be installed in locked cabinets, protected by tamper switches. Plug-in transformers which are not protected by locked cabinets are not acceptable.

P. Auto Door Actuator Interface Relay: Furnish and install Dayton Model 5YR20N, or equal, with compatible relay base, at automated doors to ensure the Access Control System approved the Credential / Push Plate before actuator motor is engaged.

Q. Provide IDEC RTE series interval timer, or equal, for interface with motorized door Push Plates and the Automated Door Operator. This will be used to provide a functional time extension for the interaction of between the Access Control system and the Automated Door Hardware, to avoid damage and prevent unwanted alarms.

1. Unit shall be UL listed and operate on 24VDC.
2. Unit shall mount to UL listed relay socket.
3. Unit shall mount within the door operator housing.

R. Access Control Cabinet:

1. System controllers and field control boards serving a given area shall be installed inside Access Control Cabinets. No controller or control module shall be mounted independently of the cabinet and its power supplies. Refer to the drawings and the following descriptions for details on the Access Control Cabinet construction.

S. Provide Access Control Cabinets as described below, located in the telecommunication rooms where the access control cabling terminates, per the T & Y Drawings, to house all equipment. Each access control cabinet shall contain the following equipment to support the current and future alarm initiating and controlled devices to be connected to the Access Control System:

a. Access Control Cabinet:

1) Indoor: NEMA 2, hinged, locking cabinet by Access Control Manufacturer, Hoffman, or approved equal, sized to fit contents. Lock shall be coordinated with the Owner allowing replacement by the Owner.
2) Outdoor: Stainless steel, NEMA 4X, hinged locking handle cabinet by Access Control Manufacturer, Hoffman, or approved equal, sized to fit contents.
3) Provide door tamper switch and wire into alarm input for each Access Control Cabinet.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that ratings and configurations of system components are consisted with the indicated requirements.

C. Verify that mounting surfaces are ready to receive the system components.

D. Verify that branch circuit wiring is installed, completed, tested, and ready for connection to system.

E. Verify that conditions are satisfactory prior to starting work.

F. Device Locations

1. All device locations are to be field verified with the Owner prior to start of project. Architectural drawings are for approximation purposes only. Additional charges will not be allowed for outlet installation in areas not reviewed or approved by the Owner.

G. Examine pathway elements intended for cables. Check raceways and other elements for compliance with space allocations, installation tolerance, hazards to camera installation, and other conditions affecting installation.

H. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install access control system in accordance with NECA 1 (general workmanship).

B. Install products in accordance with manufacturer's instructions.

C. Unless otherwise indicated, use wiring in conduit.

1. Use suitable listed cables in we locations, including underground raceways.
2. Use suitable listed cables for vertical wire applications.
3. All cabling shall be plenum rated.

D. Install wiring in conduit for the following:

a. Where required for rough-in.
b. Where required by the AHJ.
c. Where exposed to damage.
d. Where installed outside the building.
e. For exposed connections from outlet boxes to devices.

2. Conduit: comply with section [_____]
3. Conceal cables unless specifically indicated to be exposed.
4. User power transfer hinges specified within Division 08 for concealed connections to door hardware.
5. Cables in the following areas may be exposed:

a. Equipment Closets

6. Route exposed cables in parallel or perpendicular to building structural members and surfaces.
7. Do not exceed manufacturer's recommended maximum cable length between components.

E. Provide grounding and bonding in accordance with Division 26.

F. Install firestopping to preserve the fire resistance rating of partitions and other elements, using materials and methods specified in Division 07.

G. Install all devices and infrared illuminators level and plumb.

H. Install power supplies and other auxiliary components at control stations unless otherwise indicated.

I. Identify system components, wiring, cabling, and terminals according to ANSI/EIA/TIA standards.

J. Door Hardware Coordination

1. Doors shall not be locked in path of legal egress unless integrated with the fire alarm for release upon the fire alarm system notification. All access controlled locked door within the path of legal egress must be brought to the attention of the Architect and Security Consultant prior to rough-in.
2. Refer to Section Division 08 for Door Hardware requirements and coordination. Contractor shall work directly with door hardware supplier to ensure the provision of specified mechanical and electronic functionality.
3. Request to Exit Activation: Contractor shall configure the system such that Request to Exit devices and System Controllers will react quickly enough to bypass alarms before a fast-moving individual can reach and open the door. This bypass shall be evaluated and verified by the Contractor on the fully configured and operation Access Control system prior to acceptance testing. When possible, use door hardware with REX devices built into the hardware.
4. Fire Alarm Interface: Electrified locks, strikes and turnstiles which are part of this work and which may be locked in the path of legal exiting, shall be connected to the building Fire Alarm System in accordance with the AHJ requirement such that they automatically unlock in the event of activation of the Fire Alarm System. This shall occur whether the activation is a result of a manual pull station, smoke detector, or sprinkler flow switch.

    a. A fire alarm “general / common alarm relay” shall be programmed at the fire alarm control panel to activate the Access Control System interface relays located in each Lock Power Supply cabinet. The Access Control Contractor shall research and provide all necessary fire alarm system conduit, wire, hardware, and programming to perform required interface.
    b. This interface shall not depend on the Access Control System host or Remove Controllers for its operation. Locate these interface relays electrically ahead of lock power distribution. The Contractor shall supply and install programmed alarm interface relay(s) with sufficient capacity to control the power supplied to all controlled locks.

5. Access Control Lock Configuration

    a. Secured Doors: Doors equipped with electric locks shall be individually programmed for locking and unlocking at specific times of the day. A valid credential presented at a reader will allow the portal to unlock for a programmed period of time.
    b. Stairwell Door Locks:

1) Stairwell doors which are locked from the stairwell side shall have the capability to be simultaneously unlocked upon a signal from the Fire Command Center, Fire Alarm Panel, or the Access Control Command Center when applicable.
2) Stairwell locking systems shall, in all respects, comply with the requirements of the Building Codes for “Means of Egress”.
3) Contractor shall provide clearly labeled switches, in the required locations, to unlock all stairwell doors simultaneously for “non-fire” emergencies. Coordinate wall or desk mounted switch style, with the Owner and the AHJ.
4) This interface shall not depend on the Access Control System Host or Remote Controllers for its operation. Locate interface relays for each stairwell door electrically ahead of the Access Control System lock control, to independently override the Access Control System Control.

c. Upon authorization by card reader or manual means, “door force” and “door held open” alarms associated with the portals shall be automatically bypassed (prevented from reporting an alarm) for a duration of time that is programmable on an individual door and individual cardholder basis.
d. The door shall re-lock immediately upon closing, after an authorized access, and the bypass duration shall be immediately truncated. A door position switch will be required at every door for this purpose. The same door position switch shall be used to sense the position of the door for “door forced” and “door held open” alarms.
e. Free Egress Authorization

1) Unless otherwise shown on the plans or described herein, the system shall detect the normal egress of a user at any individual portal and shall bypass any alarm associated with the portal for a duration of time that is programmable on an individual door and individual cardholder basis.
2) Timing shall be independently programmed for each portal during the initial enrollment process. This function allows extended timing for disabled persons to pass through a portal.
3) The timing function shall automatically truncate after an adjustable period (0-4 seconds) after a portal is closed. This feature allows a subsequent alarm at the portal to be detected and prevents the portal from being re-opened without an authorized request.
4) “Request-to-Exit” devices shall be used to signal the system that an individual is ready to exit the secured door. Request-to-Exit devices may include but not be limited to:

    a) Integral Lock Handle Signal Switches
    b) Touch Bars (Electro-Mechanical or Electronic)
    c) Push Bars (Mechanical)
    d) Push Buttons

5) On doors with integral electro-mechanical locking mechanisms (strikes, electrical panic hardware, or electrical mortise locks) the mechanical action of the door hardware shall enable egress without requiring release of the electrical mechanism. The Request-to-Exit device shall not unlock the door.
6) On doors with integral electro-mechanical locking mechanisms (magnetic locks), a Request-to-Exit device may unlock the door, releasing the electrical mechanism for the programmed duration. Refer to the drawings for details and direction.

7) On doors with Intercom Systems or Door Release Buttons, the Contractor shall interconnect the intercom system or door release button to activate the Request to Exit function and unlock the door. The door release request contact shall be connected to an input on the Access Control System, such that an event shall be registered into the Access Control System indicating its operation.

f. Sequences: Verify each door type sequence at each door with the Owner.

1) Doors with Door Position Switches (DPS) and Request-to-Exit (REX) Devices:

a) DPS and REX contacts shall be wired to Access Control System auxiliary input. Configure the Access Control System to mask the associated DPS alarm for a minimum of 45 seconds. Coordinate the required masking duration with the Owner.
b) Access Control System shall report a “door forced” alarm when any time the door is opened without a valid REX request. The subsequent operation of an associated REX shall not abort a “door forced” alarm already sensed by the system.
c) Access Control System shall report a “door-held-open” alarm after the door has been opened and the masking duration has ended.

2) Doors with Electronic Locking (EL), DPS and REX devices:

a) DPS and REX contacts shall be wired to Access Control System auxiliary input. Configure the Access Control System to mask the associated DPS alarm for a minimum of 45 seconds. Coordinate the required masking duration with the Owner.
b) Electronic lock shall be wired to Access Control System auxiliary output. Configure the Access Control System to mask the associated DPS alarm during timed or commanded unlock.
c) Electric lock shall be locked and unlocked based on preprogrammed schedules and conditions, and by manual control from the Access Control System client workstations.
d) Access Control System shall not cause an alarm event when door is unlocked.
e) Access Control System shall report a “door forced” alarm when any time the door is opened without a valid REX request. The subsequent operation of an associated REX shall not abort a “door forced” alarm already sensed by the system.
f) Access Control System shall report a “door-held-open” alarm after the door has been opened and the masking duration has ended during locked mode.
g) REX device shall not unlock the door.

3) Doors with Card Access Control (CR), EL, DPS and REX devices:

a) CR, EL, DPS and REX devices shall be wired to a door controller board.
b) Electronic lock shall be locked on command from the system at any time.

c) Electronic lock shall unlock during a preset time zone or from the system.
d) Electronic lock shall be unlocked and shall not require use of card reader during timed unlock mode.
e) Access Control System shall not report activity when door is scheduled unlocked.
f) During locked mode Card Reader shall unlock the door, mask DPS preventing alarm.
g) Access Control System shall report a “door-held-open” alarm after the door has been opened and the masking duration has ended.
h) Access Control System shall report a “door forced” alarm when any time the door is opened without a valid REX request. The subsequent operation of an associated REX shall not abort a “door forced” alarm already sensed by the system.
i) REX device shall not unlock door.

4) Doors with Auto-Operators, Proximity CR, EL, DPS and REX devices:

a) Auto-Operator controls, CR, EL, DPS and REX devices shall be wired to a door controller board.

5) Electronic lock shall be locked on command from the system at any time.

a) Electronic lock shall unlock during a preset time zone.
b) EACS shall not report alarm activity when door is unlocked.
c) Auto-Operator door dwell times will meet all ADA/DDA requirements.
d) Day mode: proximity card reader shall activate the auto operator to open the door.
e) Secure mode: Card reader, auto operator function, shall activate the auto door operator at all times.
f) Card Reader shall unlock the door, mask the DPS device preventing alarm and allow use of door open pushbuttons. Electronic lock to be unlocked prior to door open mechanism is engaged. Where auto door equipment is not provided with door open pushbuttons, the door shall automatically open after unlocking. NOTE: The exterior door open pushbutton should not function without first presenting a valid access card.
g) Access Control System shall report a “door-held-open” alarm after the door has been opened and the masking duration has ended during locked mode.
h) Access Control System shall report a “door forced” alarm when any time the door is opened without a valid REX request. The subsequent operation of an associated REX shall not abort a “door forced” alarm already sensed by the system.
i) Use of push plate shall activate the Access Control System REX, unlock the door and operate the auto door system only after a valid card read.
j) Door shall report a door held open time when REX (push plate or signal from the door operator) is activated, door is opened from the secured side and the system bypass time has expired during locked mode.
k) Verify interior push plate is operational in both lock and unlocked modes.

l) Verify exterior push plate is operational during unlocked mode.
m) Verify exterior push plate is non-operational until valid card read during locked mode.
n) Verify exterior push plate is operational after valid card read during locked mode.
o) Verify door can be manually opened during locked mode from secured side.

g. Doors with Auto-Operators, Dual CR (Mag Stripe and Proximity types), EL, DPS and REX devices:

1) Auto-Operator controls, CR, EL, DPS and REX devices shall be wired to a door controller board.
2) Electric lock shall be locked on command from the system at any time.
3) Electric lock shall unlock during a preset time zone.
4) Door shall not report alarm activity when door is unlocked.
5) Secure mode:

a) Proximity card reader, auto operator function, shall open the door at all times.
b) During secure mode the card reader shall operate as item e above.

6) Access Control System shall report a “door-held-open” alarm after the door has been opened and the masking duration has ended during locked mode
7) Access Control System shall report a “door forced” alarm when any time the door is opened without a valid REX request. The subsequent operation of an associated REX shall not abort a “door forced” alarm already sensed by the system.
8) Use of push plate shall activate the Access Control System REX, unlock the door and operate the auto door system from the inside; however, the push plate will not operate the door from the exterior (secure) side unless there is a valid access card presented.
9) Door shall report a door held open time when REX (push plate or signal from the door operator) is activated, door is opened from the secured side and the system bypass time has expired during locked mode.
10) Verify interior push plate is operational in both locked and unlocked modes.
11) Verify exterior push plate is operational only during unlocked mode.
12) Verify exterior push plate is non-operational until valid card read during locked mode.
13) Verify exterior push plate is operational after valid card read during locked mode.
14) Verify door can be manually opened during locked mode from secured side.

h. Auto Sliding Doors shall operate similar to Doors with Auto-Operators (as applicable).

1) Contractor to coordinate and confirm door hardware includes electronic remote door locking control capability.
2) Verify sliding door break away feature is not disabled when door is in legal path of egress.

i. Exterior Gates:

1) Insert as defined by hardware group. [Provide gate with electric strike] [Provide gate with electrified mortise handle] CR, EL, DPS, REX wired to input / output / door controller card as required by application.
2) Gate shall operate as described for door with similar access control devices including being tied to the Fire Alarm System via a relay so the gates will unlock on receipt of a fire alarm.

6. Electrical Connections to Door Hardware: Wire connections to door hardware pigtail leads shall be made using the manufacturer-provided quick-connect devices, or by Dolphin insulated dis- placement connectors. Wire nuts and splices are not acceptable.
7. Tamper Devices

a. Terminal cabinets, equipment cabinets, enclosures, power supply cabinets, exposed wireways, and pull and junction boxes with wire connections or splices shall be equipped with tamper switches programmed to report an alarm.
b. Junction boxes requiring tamper switches that are associated with an individual alarmed de- vice (such as a door position switch) may report to the respective device alarm point if end- of-line resistors and the system are configured to support 6-state alarm reporting. Other cabinet and box tamper switches shall report as independent alarm points.
c. Power Supply/Battery Chargers: Power supply/battery chargers shall be connected to alarm monitoring points to provide an "Event" indication of tamper, power failures and other system troubles.

K. Access Control System Connectivity

1. Access Control Network: Access Control Servers, Client Workstations and Controllers shall reside on the Owners' Local Area (LAN) and/or Wide Area Network (WAN) to allow global event activity and shared data interchange.
2. Provide and coordinate with Owner IT adequate network "firewalls" to maintain the security of Access Control System controls and information while connected to shared computer networks and transmission media. Contractor shall coordinate shared resource usage with the Owner, and develop network security schemes acceptable to the Owner to ensure the integrity of the Access Control System.
3. LAN Communications & Connectivity, (Integrated CPU's and Controller's)

a. Provide LAN communications interfaces for the applicable Access Control System Server, Clients and Controllers to support multiple workstation and integration schemes that are part of this work.
b. LAN Communications: Contractor shall utilize the facility's Local Area Network for Access Control System connections and interfaces, as shown on the drawings and described herein.
c. Coordinate with Access Control System equipment and software manufacturers to provide network inter- face devices compatible with the established LAN/WAN network.
d. Coordinate with the Owner's IT Department to provide servers, Access Control System clients, network interface devices, bandwidth utilization, and appurtenances acceptable to the Owner.

4. Controller Communications

a. Between controllers at an individual location, and between controllers located within the same building, the controller network may be implemented using

standard, twisted, shielded copper conductors as approved by the system manufacturer. It is also acceptable for controllers to be LAN connected, regardless of location.

L. Duress / Lockdown Alarm System

1. Furnish and install duress / lockdown alarm devices as shown on the Drawings, and as coordinated with final architectural millwork details, millwork shop drawings and consoles.
2. Wire alarm signal circuit using two-conductor twisted, shielded cable per cable specifications. Specified device contains latching L.E.D. Run additional two- conductor cable, dedicated to intrusion detection system, 12VDC power, per cable specifications, to power supply via reset switch at power supply.
3. Each hardwired duress alarm system device shall be wired to an Access Control input panel and intrusion detection remote field input module panels as separate 24 hour security zones.
4. Duress devices associated alarm signal circuitry to be fully supervised for open, short, normal and alarm. Provide required end-of-line resistors to achieve this supervision per manufacturer's specifications. Locate as close to device as possible, preferably in device homerun junction box. Protect wires from button to junction box using miniature Greenfield/stainless steel sheathing.
5. Provide separate 12 VDC, power kill, LED reset switch in security device low voltage power supply cabinet enclosure, and wire duress device LED power through switch. Label switch accordingly.

M. Emergency Standby Power

1. Low-Voltage Equipment: Access Control System Remote Controllers, peripheral devices and Lock Power Sup- plies shall have their own 4-hour battery back-up systems.

    a. Power back-up may be in the form of direct DC battery power back-up or by 120VAC Uninterruptable Power Supplies (UPS), depending upon equipment requirements.
    b. Lock Power Supplies shall allow fail-secure locks to be operated by the system a minimum of 100 times-per-hour, during this time period. Fail-safe locks shall be maintained for the full 4-hours.
    c. Battery back-up systems may be distributed throughout the facility to provide the required emergency power to individual components.
    d. Battery back-up systems shall include battery chargers to keep storage batteries at their peak charge.

N. Security System Integration

1. The Contractor shall be responsible for providing hardware and software interfaces to achieve the specified system performance described herein and, by reference, realize absolute and seamless compatibility with the related component systems.
2. The Contractor shall ensure system additions and modifications provided under this scope of work have no negative effect on the individual components and systems, and their core functionality, and no permanent effect beyond that specified or implied by the scope of work.
3. Purpose

a. Integration is the process of designing, deploying, and configuring independently operating systems with the ability to request, receive, extract, process, and act upon information from other systems.
b. Successful system integration must address three fundamental issues:

1) Functionality: What information is needed, how it is to be requested and processed, and what functions or activities need to occur upon receipt of the information.
2) Connectivity: How systems will be connected to support the communication of information and commands. (Special interfaces, wiring, networks, databases.)
3) Communication: How information will be communicated between systems. (Instruction sets, language, protocols, formats, priority.)

4. Environment

a. Integration components shall generally comprise special elements of independent subsystems, and shall be located within, or in close proximity to, the processing components of each independent subsystem. Where subsystems require special hardware or communications interfaces to support integration, the special hardware should be located near the independent subsystem processing components or network appliance, based on the manufacturers' recommendation. See the drawings for details on mounting locations.
b. Central Administrative Post: Components of the main integration system operating shell may be distributed throughout the site / facility, in relation to the other integrated subsystems. The main EACS system monitoring occurs in the Massachusetts State House building Primary Security Operations Center (SOC – room 013A-1). System programming, rules configuration, and control shall occur either at this location or at another location designated by the Owner.

5. Infrastructure and Connectivity:

a. Devices/Appliances: Appliances and devices shall be connected to their respective systems via the applicable communications network.
b. System LAN/WAN Connectivity: System Servers and microprocessor-based Control Panels, shall reside on the Local Area Network (LAN) or Wide Area Network (WAN) tier designated for integrated components.
c. Enterprise: LAN networks will be connected to the Wide Area Network, to establish connectivity between remote sites and both the Primary and Alternate Security Operations Center (SOC – room SB05-1).

6. Attributes

a. The attributes of the integrated environment are primarily defined by the subsystems that are to be integrated. Verify existing system components to be expanded by this project.
b. Integrated systems comprise the processors, software, electrical control panels, data gathering panels, special data interfaces, and converters required to allow systems to communicate with each other, process information, and allow users to program and perform operations.

7. Functions

a. The system shall provide the following automated processing rules, at a minimum:
b. The object of “Access Control system integration” is to automatically configure the system to display, record, and report appropriate system activity to various elements of the system. Automatic configuration can free operators from difficult control tasks, give the operator more time to respond to events, reduce operator error, and ensure critical system tasks occur consistently.
c. Electronic Access Control system elements shall be electronically integrated in such a way as to enable detection, database records and/or event-initiated instructions to be communicated between system components, to initiate recording, display, communication, and control activities.
d. Event-Initiated Interface, General:

1) The system shall support the capability to send and receive alarm and control messages between the Access Control System and video systems via a LAN communications link, using API, XML, or other industry-standard communication languages and formats, and shall act upon those messages received.
2) The system shall support the capability to send and receive alarm and control messages and alarm signal between the Access Control system and Intrusion Detection System for lockdown / duress / and panic button initiation.
3) Where integration may require the implementation of data interfaces, Contractor shall propose such integration to the Owner for approval, before proceeding with the work.
4) Software routines required to accomplish the required data-interface with external equipment and controls will be fully developed, installed, tested and supported by the Contractor.
5) The manufacturer of each applicable system will also support the data interface and will be engaged by the Contractor to provide on-site technical assistance where required to prepare, repair, configure, and test the system to operational condition.
6) Communication of event information between systems shall take place automatically and immediately when the event is sensed by the System.

3.3 FIELD QUALITY CONTROL

A. Testing Agency: The Contractor shall engage a qualified testing agency to perform tests and inspections with the Owner and appointed project manager.

B. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.

C. Perform tests and inspections.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

D. Tests and Inspections:

1. Inspection: Verify that units and controls are properly installed, connected, and labeled, and that interconnecting wires and terminals are identified.

2. Pretesting: Align and adjust system and pretest components, wiring, and functions to verify that they comply with specified requirements.
3. Test Schedule: Schedule tests after pretesting has been successfully completed and system has been in normal functional operation for at least fourteen (14) days. Provide a minimum of ten (10) days notice of test schedule.
4. Operational Tests: Perform operational system tests to verify that system complies with Specifications. Include all modes of system operation. Test equipment for proper operation in all functional modes.

E. Access Control System shall be considered defective if it does not pass tests and inspections.

F. Prepare test and inspection reports.

3.4 CLEANING

A. Remove rubbish and debris: Installation contractor is not allowed you use the onsite dumpster and is responsible to discard their own debris off site.

B. Clean installed items using methods and materials recommended in writing by manufacturer.

C. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

3.5 CLOSEOUT ACTIVITIES

A. See Division 01 – Closeout Submittals for Closeout Submittals.

B. Demonstration: Demonstrate proper operations of system to Owner and correct deficiencies or make adjustments as directed.

C. Training:

1. By means of training classes augmented by individual instruction as necessary, the Bidding contractor shall fully instruct the BOE's designated staff and personnel in the operation, adjustment and maintenance of all products, equipment and systems.
2. General Training Requirements:

    a. The security contractor shall submit proposal to conduct training courses for the security personnel in the operation and maintenance of the security systems within this security project.
    b. The security contractor shall include training manuals and aids in the quantity as requested by the Owner. The training manuals shall include an agenda, defined objectives for each lesson, and a detailed description of the subject matter for each lesson. All personnel providing the instructions shall be certified by the equipment manufacturer for all applicable hardware and software.
    c. Approval of the planned training content and training schedule shall be obtained by the Owner at least 45 days before the training is scheduled.
    d. Training shall be provided by qualified, factory trained and certified engineers familiar with each system and its operations and shall be provided at the site for a period of no less than the hours stipulated below.

3. Training Topics:

   a. System Administration Training

      1) This training shall focus on determining and implementing system operational parameters.
      2) The first training class shall be conducted so that it is completed approximately 30 days prior to acceptance of the system and final system reliability testing. 8 Hours of Administration training; (2) 4-hour classes.
      3) The second training class shall be conducted so that it is completed approximately 7 days prior to acceptance of the system and final system testing. The system administrator shall be included as part of this final system acceptance and reliability testing. 6 Hours of training; (2) 3-hour classes.
      4) This Administrations training shall include:

         a) Overall architecture and configuration of each system.
         b) Use of all system functions.
         c) ID badging design and production.
         d) Card-holder setup and configuration.
         e) Card-holder access level assignment.
         f) Access Door programming.
         g) Alarm setup and implementation.
         h) Data storage and retrieval through reports.
         i) Creation of reports.
         j) System database backup procedures.
         k) Hardware specifications.
         l) Fault diagnosis and corrections.

   b. System User Monitoring Training

      1) This training shall be for each designated personnel at this school.
      2) This training shall focus on day-to-day system operations. Each user shall be capable to start the systems, operate them, recover the systems after a failure, and describe the specific hardware architecture and operation of the systems.
      3) The first training class shall be conducted so that it is completed approximately 30 days prior to acceptance of the system and final system reliability testing. All System User Training shall be performed at each school within this specification. 8 Hours of User training; (2) 4-hour classes.
      4) The second training class shall be conducted so that it is completed approximately 7 days prior to acceptance of the system and final system testing. The system administrator shall be included as part of this final system acceptance and reliability testing. 6 Hours of User training; (2) 3-hour classes.
      5) Training shall include:

         a) Use of overall system monitoring functions as determined by the security administration staff.
         b) Monitoring alarm events.
         c) Monitoring personnel access into the facility.
         d) Assessing, responding to, and clearing alarms and messages.
         e) Monitoring access door status.

f) Running routine reports.
g) General hardware architecture.
h) Functional operation of each system and interaction between these systems.
i) All Operator commands.
j) Database entry.
k) Report generation.
l) Alarm assessment.
m) Simple diagnostics.

c. System Troubleshooting and Maintenance Training

1) Training shall be provided with the internal features and configuration of the security systems so the user can trouble shoot and repair most configuration and physical device problems.
2) The training class shall be conducted so that it is completed approximately 14 days prior to acceptance of the system and final reliability testing. The users shall be included as part of this reliability testing. 8 Hours of training; (2) 4-hour classes.
3) This training shall include:

a) System networking communications and diagnostics.
b) Device configuration and programming.
c) Controller setup.
d) Wiring and cabling overview.
e) System Diagnostics.
f) Software troubleshooting.
g) Physical layout of each piece of hardware.
h) Preventive maintenance procedures and schedules.
i) Calibration procedures.

d. IT Training

1) Training shall be provided information of the security systems to the IT staff. This shall include information as to how each system functions within the LAN/WAN network infrastructures. 4 Hours of training.
2) Topics shall include:

a) Network topologies.
b) Maintenance of data security.

4. Training hours and sessions must be documented by the instructor and approved by the Owner before project closeout.
5. Should the training be deemed as inadequate by the Owner, the owner reserves the right to retain outside manufacturer training. If this outside manufacturer training has an associated cost, this cost shall be deducted from the final invoice of this project.
6. The Owner reserves the right to request the Contractor to videotape training sessions and turn over video records (DVD format) to Owner as part of the “Owner Project Manuals” and Deliverables.

3.6 PROTECTION

A. Protect installed system components from subsequent construction operations.

3.7 MAINTENANCE

A. See Division 01 – Execution and Closeout Requirements for additional requirements relating to maintenance service.

B. Adjustments:

1. Occupancy Adjustments: When requested within twelve (12) months of date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to two (2) visits to Project during other-than-normal occupancy hours for this purpose. Tasks shall include, but are not limited to, the following:

a. Check cable connections.
b. Check proper operation of access control devices.
c. Provide a written report of adjustments and recommendations.

C. Provide to Owner, at no extra cost, a separate maintenance contract for the service and maintenance of the Access Control System for One Year from date of Substantial Completion. Include a separate description of preventative maintenance, systematic examination, cleaning, inspection, and testing, with a detailed schedule.

D. Conduct site visit at least once every three months to perform inspection, testing, and preventative maintenance. Submit report to Owner indicating maintenance performed along with evaluations and recommendations.

E. Provide trouble call-back service upon notification by Owner:

1. Include allowance for call-back service during normal working hours at no extra cost to Owner.
2. Owner will pay for call-back service outside of normal working hours on an hourly basis, based on actual time spent at the site and not including travel time; include hourly rate and definition of normal working hours in maintenance contract.

END OF SECTION 281300

SECTION 281600 - INTRUSION DETECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Refer to the following construction documents for Data Room locations and device locations only.

1. “T” Drawings – Technology Plans

1.2 SUMMARY

A. The scope of work required as part of this project shall include a new intrusion detection system installed into the school.

B. Section Includes:

1. Control Panel
2. Motion Sensors
3. Door Contacts
4. Intrusion detection devices

C. These specifications contain the functional and operational requirements for an integrated intrusion alarm system employing motion detection devices and door contacts as the primary means of intrusion detection for selected interior protection. This procurement shall include all the equipment required at various facilities as shown on the Drawings.

D. Responsibility for the integrated security systems and equipment is specified in the following sections and shall be coordinated with the finish door hardware and Fire Alarm sections.

E. The intrusion system is intended to provide protection of selected facilities against intrusion and for the detecting or discouraging of burglary or vandalism during the hours the facilities are unoccupied and report signal to the Central Station.

F. General: Provide and install an integrated security system and all devices, terminations, associated supporting devices, configuration of system, testing and training in accordance with this Bid package to provide a complete and functional system.

G. The cabling shall be provided and installed by the contractor awarded this project and as described within the construction bid document and referenced on the drawings associated with this bid package. All other cabling required to provide a complete and functional system shall be furnished and installed by the Contractor awarded this portion of work.

H. This specification is used to identify the requirements for integrated Burglar entry systems encompassing door contacts and motion detectors.

I. Responsibility for the integrated security systems and equipment is specified in the following sections and shall be coordinated with the Finish Hardware and Fire Alarm sections of the Phase I Construction.

J. It is the intent of these specifications to procure a fully acceptable, effective and reliable integrated security system. Refer to the Drawings for division of responsibility. These specifications recognize the importance of complete system operation and are not limited to specifying of equipment only. The following are also required from the selected bidder:

1. Proven experience in the security business.
2. Prompt delivery and professional installation including service of equipment as specified.
3. Bidder must provide, for objective evaluation, references, which clearly state and show the effectiveness of proposed equipment and services.
4. Used products will not be acceptable. Manufacturer must satisfactorily demonstrate that he has supplied and will continue to supply products to avoid the obsolescence of equipment installed in the building.
5. All equipment shall be fully guaranteed for twelve (12) months. This guarantee shall become effective from the day of installation completion. When in normal operation, if the equipment is found to be below the manufacturer's specification, repair and replacement of equipment shall be provided. Repairs shall be started within twenty-four (24) hours and completed without delay. Installation contractor shall either stock spares or be capable of obtaining all required replacement parts within twenty-four (24) hours.
6. Extended warranty terms shall be provided by the installing security system integrator at the time of bid.

1.3 APPLICABLE STANDARDS

A. All of the work within the scope of this bid shall be performed in accordance with the applicable state, county and city laws and ordinances. The bidder shall be able to obtain all permits and licenses as required in addition to being a licensed contractor. All materials, supplies and equipment being furnished shall be installed in accordance with the latest version of the applicable standards of:

1. OSHA
2. Uniform Building Code
3. Americans with Disabilities Act (ADA)
4. Components of the system shall be of the type approved by Safety and Regulatory Agencies including:

    a. Underwriters' Laboratories (UL), Inc.
    b. Federal Communications Commission (FCC).
    c. Agency approvals and UL Listing declare the system's design, components, and installation shall meet the highest standards.
    d. System installation shall comply with UL 681 and UL 611.

5. Alarm detection systems intended for UL certified fire alarm reporting shall meet the requirements of UL Standard 985, NFPA Standard 72 Chapter 2.
6. The equipment shall comply with Part 68 of the FCC Telephone Requirements Rules.
7. All circuits and equipment shall be installed and protected according to the National Electric Code and any applicable local requirements.

1.4 DEFINITIONS

A. LCD: Liquid-crystal display.

B. LED: Light-emitting diode.

C. PIR: Passive infrared.

D. RFI: Radio-frequency interference.

E. Protected or Protection Zone: A space or area for which an intrusion must be detected and uniquely identified, the sensor or group of sensors assigned to perform the detection, and any interface equipment between sensors and communication link to central-station control unit.

1.5 SUBMITTALS

A. Product Data: Components for sensing, detecting, systems integration, and control, including dimensions and data on features, performance, electrical characteristics, ratings, and finishes.

B. Shop Drawings: Detail assemblies of standard components that are custom assembled for specific application on this Project.

1. Functional Block Diagram: Show single-line interconnections between components including interconnections between components specified in this Section and those furnished under other Sections. Indicate methods used to achieve systems integration. Indicate control, signal, and data communication paths and identify programmable logic controllers, networks, and control interface devices and media to be used. Describe characteristics of network and other data communication lines.
2. Raceway Riser Diagrams: Detail raceway runs required for intrusion detection and for systems integration. Include designation of devices connected by raceway, raceway type, and size, and type and size of wire and cable fill for each raceway run.
3. Device Address List: Coordinate with final system programming.
4. System Wiring Diagrams: Include system diagrams unique to Project. Show connections for all devices, components, and auxiliary equipment. Include diagrams for equipment and for system with all terminals and interconnections identified.
5. Sensor detection patterns and adjustment ranges.

C. Equipment and System Operation Description: Include method of operation and supervision of each component and each type of circuit. Show sequence of operations for manually and automatically initiated system or equipment inputs. Description must cover this specific Project; manufacturer's standard descriptions for generic systems are not acceptable.

D. Field quality-control test reports.

E. Operation and Maintenance Data: For intrusion detection system to include in emergency, operation, and maintenance manuals. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:

1. Data for each type of product, including features and operating sequences, both automatic and manual.
2. Central-station control-unit hardware and software data.

F. Warranty: Special warranty specified in this Section.

G. In the event that the installation contractor does not furnish or does not supply sufficient documentation, the owner has the right to engage a separate contractor to attain any or all required documentation. All costs related with this event shall result in a back charge to the installation vendor via a change order.

1.6 QUALITY ASSURANCE

A. Installer Qualifications:

1. An employer of workers, at least one of whom is a technician certified by the National Burglar & Fire Alarm Association.
2. Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.
3. A copy of the Contractors Certified Installers Certificate shall be furnished with bid response.

B. Intrusion Detection Systems Integrator Qualifications: An experienced intrusion detection equipment supplier and/or Installer who has completed systems integration work for installations similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

D. FMG Compliance: FMG-approved and -labeled intrusion detection devices and equipment.

E. Comply with NFPA 70.

F. Electrical Power

1. Normal System Power Supply: 120V, 60Hz, through a locked disconnect device and an isolation transformer in a central-station control unit. Central-station control unit shall supply power to all components connected to it unless otherwise indicated.
2. Power Continuity for Central-Station Control Units: Batteries in power supplies of the central-station control unit and individual system components shall maintain continuous system operation during outages of both the normal and backup ac system supply.

a. Batteries: Rechargeable, valve-regulated, recombinant, sealed, lead-acid type with nominal ten (10) year life expectancy. Capacity adequate to operate portion of system served, including audible trouble signal devices for up to four (4) hours and audible and visual alarm devices under alarm condition for an additional ten (10) minutes.
b. Battery Charger: Solid-state fully automatic, variable-charging-rate type. Charger shall recharge fully discharged battery within twenty-four (24) hours.

G. Annunciation: Indicate a change in system condition and switching of system or component to backup power.

1.7 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer and Installer agree to repair or replace components of intrusion detection devices and equipment that fails in materials or workmanship within specified warranty period.

1. Warranty Period: The standard manufacturer’s warranty shall apply or a minimum of a one (1) year warranty from the date of Substantial Completion.

PART 2 - PRODUCTS

2.1 INTRUSION DETECTION SYSTEM

A. Basis of Design SHALL BE DIGITAL MONITORING PRODUCTS, INCORPORATED (DMP)

1. Series: XR550-DN Partitioned Commercial Burglary Alarm and Access Control Panel
2. Approved Equivalent Intrusion Detection Manufacturer:

a. Bosch G series Panels & Sesnos

B. Control Panel

1. DMP XR550-DN
2. The intrusion detection control panel shall have be furnished with the following functionality:

a. Onboard 10/100 Network Communication
b. Cellular Communication
c. Wi-Fi Communication
d. Access Control

C. Door Contacts

1. Refer to Door Hardware Schedule

D. MICROWAVE-PIR DUAL TECHNOLOGY MOTION SENSORS

1. DMP #CDX-DAM or approved equal.

E. 360° MOTION SENSORS

1. DMP#SX-360Z

F. Alarm Keypad Console

1. DMP #7173

G. Glass Break Sensor

1. DMP Model #5845LX

H. Panel Loop Expansions

1. Hard-wired detection equipment shall communicate to the system by way of the control panel loop expansion bus. The equipment shall have a (3) year warranty as stated in the current DMP Product Catalog and meet or exceed features offered in the following products:

a. Network Transient Suppressor – DMP Model 270
b. Trouble Sounder – DMP Model 277
c. Bus Splitter / Repeater Module – DMP Model 710
d. Output Expansion Module DMP Model 716
e. Dual Phone Line Module – DMP Model 893A

f. Motion Detector – DMP Model 6155LX (wall mount with built-in zone expander)
g. Motion Detector – DMP Model AP669 (ceiling mount 360' – requires DMP zone expander)
h. Glass Break Detector – DMP Model 5845LX (includes built-in zone expander)
i. Bus Splitter/Repeater Module – DMP Model 710
j. Door Contact – DMP Model SM20WG (surface applications – requires DMP zone expander)
k. Output Expansion Module - DMP Model 716
l. Graphic Annunciator Module - DMP Model 717

2.2 ENCLOSURE

A. The Control Panel shall be enclosed in a metal cabinet, suitable for wall mounting. The dimensions shall not exceed 14.5 inches in height, 12.5 inches in width or 3 inches in depth.

2.3 ELECTRICAL POWER REQUIREMENTS

A. System Power – The Fire and Burglary Alarm System shall operate using standard 120 volts AC, 50/60 Hz power.

1. Control Primary Power – Transformer power shall be 16.5 VAC, 40VA.
2. Backup Battery – A rechargeable 12 VDC, gel type, lead acid backup battery shall be provided. The battery shall be rated between 7 and 34- ampere hours (AH).
3. Alarm Power – Alarm power shall be 12 VDC, 1.7 amps for each bell output
4. Auxiliary Standby Power – Standby power shall be 12 VDC, 750 mA maximum.
5. Fusing – The battery input, auxiliary, and bell outputs shall be protected using PTC circuit breakers. All outputs shall be power limited.

2.4 SUBSTITUTIONS

A. Substitution of any item shall only be permitted when the Owner waives the specification(s) of a particular product(s) in writing, allowing a substitute item to be bid. It shall be the responsibility of the Contractor requesting the substitution that the proposed item is equivalent in each and every way to the originally specified product stated within this bid specification and drawing package and that it is in the best interest of the Owner to use the proposed substitute.

PART 3 - EXECUTION

3.1 COMMISSIONING OF SYSTEMS AND EQUIPMENT

A. Engage a factory-authorized service representative or technician who is familiar with this project to participate and assist, if necessary, in the functional performance testing of the equipment include in this Division with the Commissioning Agent.

3.2 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of intrusion detection.

1. Examine roughing-in for embedded and built-in anchors to verify actual locations of intrusion detection connections before intrusion detection installation.
2. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of intrusion detection.

B. Inspect built-in and cast-in anchor installations, before installing intrusion detection, to verify that anchor installations comply with requirements. Prepare inspection reports.

1. Remove and replace anchors where inspections indicate that they do not comply with requirements. Re-inspect after repairs or replacements are made.
2. Perform additional inspections to determine compliance of replaced or additional anchor installations. Prepare inspection reports.

C. For material whose orientation is critical for its performance as a ballistic barrier, verify installation orientation.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.3 SYSTEM INSTALLATION

A. The System shall be installed and tested in accordance with the Manufacturer's Installation instructions. The following conditions are applicable:

B. In order to ensure a complete, functional System, for bidding purposes, where information is not available from the Owner upon request, the worst case condition shall be assumed.

C. Interfaces shall be coordinated with the Owner's representative, where appropriate.

D. All necessary backboxes, pullboxes, connectors, supports, conduit, cable, and wire shall be furnished and installed to provide a complete and reliable System installation.

E. All conduit, cable, and wire shall be installed parallel and square with building lines. Conduit fill shall not exceed forty percent (40%). All wires shall be gathered, labeled and tied to create an orderly installation.

F. Comply with UL 681.

3.4 WIRING INSTALLATION

A. Wiring within Enclosures: Bundle, lace, and train conductors to terminal points. Use lacing bars and distribution spools. Separate power-limited and non-power-limited conductors as recommended in writing by manufacturer. Install conductors parallel with or at right angles to sides and back of enclosure. Connect conductors that are terminated, spliced, or interrupted in any enclosure associated with intrusion system to terminal blocks. Mark each terminal according to system's wiring diagrams. Make all connections with approved crimp-on terminal spade lugs, pressure-type terminal blocks, or plug connectors.

B. Wires and Cables:

1. Conductors: Size as recommended in writing by system manufacturer, unless otherwise indicated.

C. Splices, Taps, and Terminations: Make connections only on numbered terminal strips in junction, pull, and outlet boxes; terminal cabinets; and equipment enclosures.

D. Install power supplies and other auxiliary components for detection devices at controllers, unless otherwise indicated or required by manufacturer. Do not install such items near devices they serve.

E. Identify components with engraved, laminated-plastic or metal nameplate for central-station control unit and each terminal cabinet, mounted with corrosion-resistant screws.

3.5 GROUNDING

A. Ground system components and conductor and cable shields to eliminate shock hazard and to minimize ground loops, common-mode returns, noise pickup, cross talk, and other impairments.

B. Signal Ground Terminal: Locate at main equipment rack or cabinet. Isolate from power system and equipment grounding. Provide 5-ohm ground. Measure, record, and report ground resistance.

C. Install grounding electrodes of type, size, location, and quantity indicated.

3.6 FIELD QUALITY CONTROL

A. Pretesting: After installation, align, adjust, and balance system and perform complete pretesting to determine compliance of system with requirements in the Contract Documents. Correct deficiencies observed in pretesting. Replace malfunctioning or damaged items with new ones and retest until satisfactory performance and conditions are achieved. Prepare forms for systematic recording of acceptance test results.

1. Report of Pretesting: After pretesting is complete, provide a letter certifying that installation is complete and fully operable; include names and titles of witnesses to preliminary tests.

B. Perform the following field tests and inspections and prepare reports:

1. Inspection: Verify that units and controls are properly labeled and interconnecting wires and terminals are identified.
2. Operational Tests: Schedule tests after pretesting has been successfully completed. Test all modes of system operation and intrusion detection at each detection device. Test for detection of intrusion and for false alarms in each protected zone. Test for false alarms by simulating activities outside indicated detection patterns.
3. Electrical Tests: Comply with NFPA 72, Section A-7. Minimum required tests are as follows:

    a. Verify the absence of unwanted voltages between circuit conductors and ground.
    b. Test all conductors for short circuits using an insulation-testing device.
    c. With each circuit pair, short circuit at the far end of circuit and measure circuit resistance with an ohmmeter. Record circuit resistance of each circuit on Record Drawings.
    d. Verify that each controller is in normal condition as detailed in manufacturer's operation and maintenance manual.
    e. Verify that transient surge-protection devices are installed according to manufacturer's written instructions.

f. Test each initiating and indicating device for alarm operation and proper response at central-station control unit.

C. Report of Tests and Inspections: Prepare a written record of tests, inspections, and detailed test results in the form of a test log.

D. Tag all equipment, stations, and other components for which tests have been satisfactorily completed.

3.7 ADJUSTING

A. Occupancy Adjustments: When requested within twelve (12) months of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to three (3) visits to Project during other than normal occupancy hours for this purpose. Visits for this purpose shall be in addition to any required by warranty.

3.8 CLEANING

A. Remove rubbish and debris: Installation contractor is not allowed you use the onsite dumpster and is responsible to discard their own debris off site.

B. Clean installed items using methods and materials recommended in writing by manufacturer.

3.9 DEMONSTRATION – TRAINING

A. By means of training classes augmented by individual instruction as necessary, the Bidding contractor shall fully instruct the BOE's designated staff and personnel in the operation, adjustment and maintenance of all products, equipment and systems.

B. The Contractor shall be required to provide all training aids, e.g., notebooks, manuals as required.

C. All training shall be completed a minimum of two (2) weeks prior to system cut over. Training schedule shall be subject to the Owner approval.

D. Training shall be conducted by experienced personnel and supported by training aids. An adequate number and amount of training material shall be provided by the Contractor. The following is considered a minimum.

1. Functional flow-charts, overall block diagrams, and descriptive material for all software;
2. Schematic drawings for each of the hardware components;
3. All procedure manuals, specification manuals, and operating manuals;
4. As-built drawings.

E. Bidding contractor shall engage a factory-authorized service representative to provide formal training the Owner's maintenance personnel to adjust, operate, and maintain this Intrusion Detection system.

F. Training shall include the following:

1. User Training; Eight (8) hours of instruction to the users at EACH school within this project shall be included as part of this specification. Eight (8) hours of instruction per school is required.
2. Administrator Training; Twenty four (24) hours of advanced system administration training to the administrator of this system shall be included as part of this specification.
3. All training shall be divided up into four (4) hour sessions as mandated by the Owner.

G. Training hours and sessions must be documented by the instructor and approved by the Owner before project closeout.

H. Should the training be deemed as inadequate by the owner, the owner reserves the right to retain outside manufacturer training. If this outside manufacturer training has an associated cost, this cost shall be deducted from the final invoice of this project.

END OF SECTION INTRUSION DETECTION

SECTION 282300 - VIDEO SURVEILLANCE SYSTEM

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. System Requirements

B. Uninterruptible Power Supplies

C. Surge Protection

D. Client Workstations

E. Cameras

F. Video Surveillance Software

1.2 RELATED REQUIREMENTS

A. The Contractor, Subcontractors and/or suppliers providing goods or services referenced in or related to this Section shall also be bound by the Documents identified in Division 01 Section “Summary”, Paragraph 1.1A, entitled “Related Documents.” OR Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

B. Division 07 - Firestopping.

C. Division 08 - Door Hardware: Electrically operated door hardware, for interface with access control system. Includes door hardware with integral request to exit devices.

D. Division 26 - Hydraulic Elevators: For interface with access control system.

E. Division 26 - Grounding and Bonding for Electrical Systems.

F. Division 26 - Conduit for Electrical Systems.

G. Division 26 Identification for Electrical Systems: Identification products and requirements.

H. Division 27 - Structured Cabling: Data cables for access control system IP network connections.

I. Division 28 - Video Surveillance: For interface with access control system.

J. Division 28 -Building Intrusion Detection: For interface with access control system.

K. Division 28 - Fire Detection and Alarm: For interface with access control system.

L. Refer to the following construction documents for Data Room locations and device locations only.

1. “T” Drawings – Technology Plans

M. Any apparatus, appliance, material, or work not shown on the Drawings but mentioned in the Specifications, or vice versa, and any incidental accessories necessary to make the work complete and perfect in all respects and ready for operation, even if not particularly specified, shall be provided without additional expense. Coordinate with each system manufacturer to insure all hardware, firmware, relays, or other necessary components are provided prior to bid submission.

N. All work of this Section to comply with the requirements of the Conditions of Contract, with all Specification Sections of Division 01 – General Requirements, with the Security Drawings, and with all other Contract Documents.

O. Refer to Division 26 of the Contract Documents, Electrical, for all Specifications governing the installation of raceway (conduit, EMT, cable trays, wire trough, etc.), system junction and pull boxes, and device rough-in boxes, for all Security System work shown on the Security Drawings. Conduit, back box, and trough work to be provided by this Contractor.

P. Refer to Division 26 of the Contract Documents, Electrical, for all work related to the interconnection of Security System equipment to 120 VAC power sources.

Q. Refer to Division 09 of the Contract Documents, Finishes, for details relating to acoustical ceilings and gypsum board systems, floor finishes, painting, etc., for information pertinent to device and back box selection and installation.

R. Refer to Division 08 of the Contract Documents, Openings, for details relating to doors, door frames, windows, and window frames, for information pertinent to the selection of magnetic contact devices and their associated placement and installation, including back box selection and installation.

S. Refer to Division 08 of the Contract Documents, Openings, for details relating to door and door frame hardware and preparation, electrified lock power supplies, required coordination to accommodate these components and/or systems, lock voltage and current draw coordination, coordination of fail-safe electrified locks, and any other related equipment or requirements

T. Refer to Division 27, Telecommunications for all Ethernet Cabling for the Cameras.

U. Review all other Specification Sections as required to achieve complete inter- trade coordination.

1.3 DEFINITIONS

A. API: Application Programming Interface

B. AVI: Audio Video Interleave

C. CA: Certificate Authority

D. CAC: Common Access Card

E. CE: European Union Conformity

F. CPU: Central Processing Unit

G. CSV: Comma Separated Values

H. DNS: Domain Name Server

I. DSM: Door Status Monitor

J. DVR: Digital Video Recorder

K. EACS: Electronic Access Control System

L. FCC: Federal Communications Commission

M. FIPS: Federal Information Processing Standard

N. FIFO: First In – First Out

O. FTP: File Transfer Protocol

P. FRAC: First Responder Authentication Credential

Q. GB: Gigabyte

R. GSOC: Global Security Operations Center

S. GUI: Graphical User Interface

T. HA: High Availability

U. HTML: Hypertext Markup Language

V. H.264, H.265: Video Compression Standards

W. I^2C: Inter-Integrated Circuit

X. IEEE: Institute of Electrical and Electronics Engineers

Y. I/O: Input / Output

Z. IP: Internet Protocol

AA. IS: Integrated System

BB. JPEG: Joint Photographic Experts Group

CC. LAN: Local Area Network

DD. LDAP: Lightweight Directory Access Protocol

EE. MB: Megabyte

FF. MJPEG: Motion JPEG

GG. MSATA: Mini-Serial Advanced Technology Attachment

HH. MSP: Mobile Security Professional

II. MTBF: Mean-Time Between Failure

JJ. NAS: Network Attached Storage

KK. NAT: Network Address Translation

LL. NBAPI: NetBox Application Programming Interface

MM. NECA: National Electric Code Association

NN. NFPA: National Fire Protection Association

OO. NVR: Network Video Recorder

PP. ODBC: Open Database Connectivity

QQ. OS: Operating System

RR. OVID: Open Video Integration Driver

SS. PDF: Portable Document Format

TT. PIN: Personal Identification Number

UU. PIV: Personal Identity Verification

VV. PoE: Power over Ethernet

WW. PTZ: Pan-Tilt-Zoom

XX. RAID: Redundant Array of Independent Disks

YY. RAM: Random Access Memory

ZZ. REX: Request to Exit

AAA. RFID: Radio Frequency Identification

BBB. RoHS: Restriction of Hazardous Substances

CCC. ROM: Read Only Memory

DDD. RU: Rack Unit

EEE. SFTP: Secure File Transfer Protocol

FFF. SHA: Secure Hash Algorithm

GGG. SIO: Serial Input / Output

HHH. SLA: Sealed Lead-Acid

III. SMS: Security Management System or Short Message Service (text messaging)

JJJ. SSL: Secure Sockets Layer

KKK. SUSP: Software Upgrade and Support Plan

LLL. TCP: Transmission control protocol - connects hosts on the Internet

MMM. TIA: Telecommunications Industry Association

NNN. TLS: Transport Layer Security

OOO. TWIC: Transportation Worker Identification Credential

PPP. UI: User Interface

QQQ. UPS: Uninterruptible Power Supply

RRR. UTP: Unshielded Twisted Pair

SSS. VMS: Video Management System

TTT. WAN: Wide Area Network

UUU. Wi-Fi: Wireless Network

VVV. AS NECESSARY: Shall mean work which is required for completed construction, but is not necessarily shown or described in the Contract Documents.

WWW. AS REQUIRED: Shall mean work which is required for completed construction, but is not necessarily shown or described in the Contract Documents.

XXX. Substantial Completion: Shall mean that the project is sufficiently complete to be utilized for its intended use as stated in the body of this written specification.

YYY. Contractor/INTEGRATOR: Refers to the biding/installation Contractor responsible for furnishing and installation of all work indicated within this specification.

1.4 REFERENCE STANDARDS

A. 47 CFR 15 - Radio Frequency Devices; current edition.

B. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

C. NECA 303 - Standard for Installing Closed- Circuit Television (CCTV) Systems; 2005.

D. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

E. System shall be RoHS (Restriction of Hazardous Substances) compliant and meet proposed amendments to the reduction of toxic substances in manufacturing in stated in the Environmental Design of Electrical Equipment Act (EDEE).

F. Installation shall comply with NECA 1-2010 “Standard Practice of Good Workmanship in Electrical Construction”

G. Installation shall comply with NEC/NFPA 70E “Standard for Electrical Safety in the Workplace”

H. Electronic data exchange between Video Surveillance System and the Access Control System shall comply with SIA TVAC

I. Installation shall comply with FCC CFR 47 Part 15 Class A “Telecommunications, Radio, Frequency, Digital Device Emission:

J. Installation shall comply with Federal, State, and Local Codes and Authority Having Jurisdiction (AHJ).

K. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

1.5 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate the placement of cameras with structural members, ductwork, piping, equipment, luminaires, diffusers, fire suppression system components, and other potential conflicts installed under other sections or by others.
2. Coordinate the work with other installers to provide power for cameras and equipment at required locations.
3. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

B. Preinstallation Meetings:

1. Conduct meeting with facility representative to review camera and equipment locations and camera field of view objectives.
2. Conduct meeting with facility representative and other related equipment manufacturers to discuss video surveillance system interface requirements.

C. Confidentiality of Documents

1. The project documents, consisting of all technical proposals, drawings, specifications, shop drawings, as-built drawings, manufacturer’s literature, etc., shall be considered proprietary information and are to be treated with complete confidentiality. Dissemination of any security system documentation to any party not considered “need-to-know” without a pre-defined and approved agreement will be considered a violation of the contract documents and all pursuant clauses regarding financial penalties, project termination, and/or legal prosecution will apply. The Contractor is to obtain a list of “need-to-know” parties from the Owner and/or Construction Manager.
2. Use of the Contract drawings and specifications is restricted to the original site for which they were prepared. Publication therefore is expressly limited to such use. Re-use, reproduction, storage by any medium or publication by any method in whole or in part is

prohibited. Visual contact with the Contract drawings and specifications constitutes prima facie evidence of the acceptance of these restrictions. Unlawful publication, dissemination, and use of these documents carry significant liability and the Owner maintains the right to legally pursue restitution and/or penalty for violation of these confidentiality conditions.

3. All documents marked “DO NOT DUPLICATE” are to be returned to the Construction Manager for proper disposal and handling upon completion of their relevant use.

1.6 SUBMITTALS

A. See Division 01 – Administrative Requirements for submittal procedures.

B. Evidence of Qualifications for Installer:

1. The Contractor shall be a bona fide security systems contractor, licensed by the State of Connecticut for the installation of the low voltage security and signal communication systems, and engaged in security system maintenance, service and contracting for at least the last five years.
2. The Contractor shall employ technicians who have been trained by the Manufacturer specified within this section to install the systems of this Manufacturer.
3. The contractor shall be a factory authorized stocking distributor of the manufacturer of the equipment included in the system so that immediate replacement parts can be made from inventory and service provided as needed on an emergency basis.
4. The Contractor shall submit with the bid a manufacturer’s certificate of acceptance of the qualifications of the Installing Contractor to install, test, maintain and repair the manufacturer’s equipment.
5. In order for the Security Consultant to verify that they meet the competency requirements of this specification, Contractors must submit the following information if so requested:

    a. Proof that the Contractor has installed, services and maintained similar security systems for a minimum of ten (10) years.
    b. Proof that the Contractor is a firm which currently and regularly installs, services and maintains security systems as a full time business.
    c. The names and qualifications of security system technicians that shall perform and supervise the work, and perform tests or adjustments on the systems and equipment. Qualifications shall include all schooling, training, and history of work experience.
    d. A list of four prior systems comparable to the one specified under this contract which were installed, serviced, and maintained satisfactorily by the Contractor for a minimum of one (1) year. Each system listed shall include the firm or owner, location, person to contact (with telephone number), date of installation and service period, and a brief description of the system and work performed on the system.

6. The Contractor shall submit any other information required by the Security Consultant to determine the competency of the Contractor. If this information is not submitted as requested, it shall be submitted within the time specified by the Architect after the bid opening. If the Contractor fails to submit the information in accordance with the Security Consultant’s request, the Contractor shall be declared non-responsive, and may be rejected to perform the work specified within this section.

C. Design Data: Standby battery/UPS Calculations

D. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instruction for storage, handling, protection, examination, preparation, installation, and operation of product.

E. Manufacturer's detailed field-testing procedures.

F. Maintenance contracts.

G. Product Data: Provide details and technical specifications for each product indicated. Include physical dimensions, features, performance, electrical characteristics, ratings, software versions, and operating system details.

H. Shop Drawings:

1. General: General: Bid documents, including drawings, details and specifications are considered conceptual in nature, and provide direction on products and project requirements. Contractor is given a choice of methods that may be incorporated into the system. These choices may affect the overall design, configuration and installation of the proposed system.
2. Contractor Responsibility: Prepare and submit shop drawings, rendered in the latest AutoCAD DWG file format, which show details of all work to ensure proper installation of the work using those materials and equipment specified or allowed under the approved plans and specifications. A complete Shop Drawing submittal drawing package shall consist of Drawings, Equipment Data Sheet Submittals, and an Acceptance Testing Plan.
3. Completeness: The Equipment Submittals, Acceptance Testing Plan, and the Shop Drawings should be submitted as a complete and contiguous package. Partial or unmarked submittals will not be accepted for review.
4. Scheduling: A schedule of shop drawing submissions shall be submitted for the Architect and Owner's Representative review on a form acceptable to the Architect within ten (10) days after award of the Contract. The schedule of shop drawing submissions shall include as a minimum, but not limited to the requirements stated herein.
5. Requirements: Provide the following information complete, and in the manner described herein:

    a. Hardware, Application Software, and Network Requirements: A system description including analysis and calculations used in sizing equipment required by the security systems. The description shall show how the equipment will operate as a system to meet the performance requirements of the systems. The following information shall be supplied as a minimum:

        1) Server(s) processor(s), disk space and memory size
        2) Workstation(s) processor(s), disk space and memory size
        3) Description of facility (field) control equipment (Controllers/Field Panels, Models) and their configuration
        4) Operating System(s) Software, where software is provided or upgraded
        5) Application Software, with Optional and Custom Software Modules supplied in this project
        6) Integration Schemes: Proposed connectivity, software, development requirements, and SDK information, for inter-system communication.
        7) Network bandwidth and reliability requirements
        8) Number and location of LAN ports required
        9) Other specific network requirements, preferences, and constraints
        10) Backup/archive system size and configuration
        11) Start-up operations

12) System power requirements and Uninterruptible Power Supply (UPS) sizing
13) Device/component environmental requirements (cooling and/or heating parameters)

b. Shop Drawings: Shop Drawings shall be numbered consecutively and shall accurately and distinctly present the following information:

1) Title Sheet
2) Floor Plans: Showing devices, pull boxes, cabinets, conduits and conductors in their proposed locations with device numbering scheme.
3) Riser Diagram: Showing all conduit relationships between devices shown on the Floor Plans. Show all power sources.
4) Single-Line/Block Diagrams: Show signal relationships of controls and devices within the system.
5) Custom Assembly Diagrams: For each custom assembly such as Access Control Terminal Cabinets, receptacle assemblies, or door control panels, provide an assembly drawing illustrating the appearance of the assembled device. Include dimensions, assembly components, and functional attributes (momentary or alternate action switch, lens color, panel finish)
6) Component Connection Diagrams
    a) For each equipment component such as a computer, video switcher, camera or video recorder, show the rear elevation of the device and all connectors/terminations as a pictorial.
    b) Show the wire designations on connectors. Typical wiring detail where multiple of same device is provided.
    c) Show a schedule of the wire colors connected to the pins on each device connector.

c. Equipment Wiring Diagrams

1) Show a pictorial illustration of each equipment enclosure and/or terminal cabinet, including terminals, components and wiring devices.
2) Show the device nomenclature exactly as shown on the single line diagrams.
3) Terminations: Show every termination and terminating cable, with applicable cable and wire numbers matching the single line diagrams.
    a) Every termination in the system must be documented.
    b) Termination information may be rendered as a wiring list(s), if properly coordinated with, and referenced to, typical component and single-line diagrams. Otherwise, the Shop Drawings shall show a pictorial of every component in the system, with its terminations.

4) Show wire colors for each terminal.
5) For each wire exiting the enclosure, show the destination of the wire by floor, room number and the drawing number of the panel where the wire terminates.
6) Provide working dimensions and erection dimensions.
7) Arrangements and sectional views
8) Necessary details, including complete information for making connections between work under this Contract, existing work, and work under other Contracts.
9) Stock or standard drawings will not be accepted for review unless full identification and supplementary information is shown thereon in ink or typewritten form.

10) Duplicate of design drawings may be used where each sheet is modified to reflect contractor coordination, specific requirements of the project and multidiscipline conditions.
11) Each Drawing or page shall include:
    a) Project name, Project Number and descriptions.
    b) Submittal date and space for revision dates.
    c) Identification of equipment, product or material.
    d) Name of Contractor and Subcontractor.
    e) Name of Supplier and Manufacturer.
    f) Relation to adjacent structure of material.
    g) Physical dimensions clearly identified.
    h) ASTM and Specifications references.
    i) Identification of deviations from the Contract Documents.
    j) Contractor's stamp, initialed or signed, dated and certifying to review of submittal, certification of field measurements and compliance with Contract.
    k) Location at which the equipment or materials are to be installed. Location shall mean both physical location and location relative to other connected or attached material.

d. Equipment Submittals

1) Provide a Title Page, with project name, Contractor's name and address, contact information, date of submission, and submission revision number.
2) Provide a Parts List, for proposed equipment, materials, components and devices, listing the following information for each line item:
    a) The system type
    b) Model number
    c) Specification sheet page reference

3) Provide Manufacturers Specification Sheet with descriptive information for equipment, materials, components and devices. Number each page, to correspond with the Parts List.
4) Clearly delineate (with highlighter, arrow, or underline) on each specification sheet, specific model numbers, options and configurations being proposed for this project.
5) Indicate kinds of materials and finishes for equipment where more than one option is presented.

e. Acceptance Testing Plan

1) Submit a written document detailing the test procedures to be followed in evaluating and proving the installed system(s).
2) Provide a sample of the test forms to be used for each system and for each component of each system.
3) Include all tests required by the equipment manufacturer and by this Specification

f. Spare Parts List: Submit a list of recommended spare parts for Owner's review & approval and/or amending. Spare parts shall comprise a minimum of 5% or minimum of 2 each of field devices, device termination boards and a minimum of 1 system controller boards.
g. Incomplete or unchecked submittals which do not contain complete data on the work and full information on related matters will be returned for correction.

h. Verification: The contractor shall check and acknowledge all shop drawings and shall place his signature on all shop drawings submitted for approval. Contractor's signature shall constitute a representation that all quantities, dimensions, field construction criteria, materials, catalog numbers, performance criteria and similar data have been verified and that, in his opinion, the submittal fully meets the requirements of the Contract Documents.

i. Timeliness: The Contractor shall schedule, prepare and submit a complete shop drawing assembly in accordance with a time-table that will allow his suppliers and manufacturers sufficient time to fabricate, manufacture, inspect test and deliver their respective products to the project site in a timely manner so as to not delay the complete performance of the work.

j. Departure from Contract Requirements: If shop drawings show departures from the Contract requirements, the Contractor shall make specific mention thereof in his letter of transmittal, otherwise review of such submittals shall not constitute review of the departure. Review of the drawings shall constitute review of the specific subject matter for which the drawings were submitted and not of any other structure, materials, equipment, or apparatus shown on the drawings.

k. Contractor Responsibility: The review of shop drawings will be general and shall not relieve the Contractor of responsibility for the accuracy of such drawings, nor for the proper fitting and construction of the work, nor for the furnishing of materials or work required by the Contract. No construction called for by shop drawings shall be initiated until such drawings have been reviewed and approved.

l. Shop Drawing Submittal Review: The procedure in seeking review of the shop drawings shall be as follows:

1) The Contractor shall submit four (4) complete sets and/or electronic PDFs of shop drawings with equipment submittals and other descriptive data with one copy of a letter of transmittal to the Architect for review thirty (30) working days after award of the contract. The letter of transmittal shall contain the project name, Architect’s Project Number, the name of the Contractor, the list of drawings submitted including numbers and titles, requests for any review of departures from the contract requirements and any other pertinent information. Drawings submitted for review shall be full-sized and included with the equipment submittals.

2) Drawings or descriptive data will be stamped "Reviewed", "Furnish as Corrected", "Revise and Resubmit", "Rejected" or ‘Submit Specific Item’ and one copy with a Letter of Transmittal will be transmitted to the Contractor with the return of submitted documents.

3) If a shop drawing or data is stamped "Reviewed" or "Furnish as Corrected", no additional submittal is required for that shop drawing.

4) If a shop drawing or data is stamped "Revise and Resubmit" or “Rejected”, the Contractor shall make the necessary corrections and resubmit the documents as required above. The letter transmitting corrected documents shall indicate that the documents are re-submittals.

5) The Contractor shall revise and resubmit the shop drawing as required, until they are stamped either "Reviewed" or "Furnish as Corrected."

I. Equipment and Software List: Include every piece of equipment and software by product/model name and/or number, manufacturer, serial number, revision number, location, and date of original installation. If factory and/or bench testing regimens are required by the project plan, add pretesting record of each piece of equipment and software, listing name of person testing, date of test, and adjustments made.

J. CE and FCC Compliance Certificates:

K. Field quality-control reports

L. Current Specified Manufacturer Integrator Certification Letter

M. Current Specified Manufacturer Training Certificates (listing expiration dates) for Two technicians from the supporting office

N. Warranty: Software support and warranty information for all components, including Service Level Agreement (SLA) details, and duration of agreement from date of system acceptance by Owner. Submit sample of manufacturer's warranty and documentation of final executed warranty completed in Owner's name and registered with manufacturer.

O. Project Record Documents: Record actual locations of system components and installed wiring arrangements and routing.

P. Operation and Maintenance Data: Include detailed information on system operation, equipment programming and setup, replacement parts, and recommended maintenance procedures and intervals.

1. Include contact information for entity that will be providing contract maintenance and trouble call-back service.
2. General: The Contractor is responsible for providing accurate drawings and equipment manuals describing and depicting the systems as they are actually installed and operated.
3. Phase One: Notwithstanding requirements specified elsewhere, submit the following labeled as the "Operating and Maintenance Manual" within thirty (30) days after Final Acceptance of the Installation:

    a. Record Drawings: Submit two (2) copies of revised versions of drawings as submitted in the "Shop and Field" and "Equipment Wiring Diagrams" Submittals showing actual device locations, conduit routing, wiring and relationships as they were constructed. Include nomenclature showing as-built wire designations and colors. Drawings shall include room numbers coinciding with Owner space planning numbering. Drawings shall be submitted in electronic editable AutoCAD files, in ".dwg" format, on CD or DVD disks.
    b. Manuals: Submit two (2) copies of each of the following materials in bound manuals, or electronic PDF copies on CD/DVD discs, with labeled dividers:

        1) A final Bill of Material for each system.
        2) Equipment Instruction Manuals: Complete, project specific comprehensive instructions for the operation of devices and equipment provided as part of this work.
        3) Manufacturers Instruction Manuals: Specification sheets, brochures, Operation Manuals and service sheets published by the manufacturers of the components, devices and equipment provided.
        4) Include information for testing, repair, troubleshooting, assembly, disassembly and recommended maintenance intervals.
        5) Provide a replacement parts list with current prices. Include list of recommended spare parts, tools, and instruments for testing and maintenance purpose.
        6) Performance, Test and Adjustment Data: Comprehensive documentation of performance verification according to parameters specified herein.

7) Warranties: Provide an executed copy of the Warranty Agreement and copies of all manufacturers' Warranty Registration papers as described herein.

1.7 QUALITY ASSURANCE

A. Comply with the following:

1. NFPA 70.
2. Applicable TIA/EIA standards.

B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

D. Installer Qualifications: Company specializing in performing the work of this section with minimum three years documented experience with video surveillance systems of similar size, type, and complexity and providing contract maintenance service as a regular part of their business; authorized manufacturer's representative.

1. Contract maintenance office located within 100 miles (160 km) of project site.

E. Maintenance Contractor Qualifications: Same entity as installer.

F. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

G. The requirements of the State Building Code and local regulations establish the minimum acceptable quality of workmanship and materials, and all work shall conform thereto unless more stringent requirements are indicated or specified herein.

H. All work shall comply with the latest editions of the codes as referenced herein.

I. Follow manufacturer's directions for articles furnished, in addition to directions shown on drawings or specified herein.

J. Protect all work, materials, and equipment from damage during process of work. Replace all damaged or defective work, materials and equipment without additional cost to the Owner.

K. All equipment and materials for permanent installation shall be the products of recognized manufacturers and shall be new.

L. Equipment and materials shall:

1. Where normally subject to Underwriters Laboratory Inc. listing or labeling services, be so listed or labeled.
2. Be without blemish or defect.
3. Not be used for temporary purposes.
4. Be in accordance with the latest applicable NEMA standards.

5. Be products which will meet with the acceptance of all authorities having jurisdiction over the work. Where such acceptance is contingent upon having the products examined, tested and certified by Underwriters or another recognized testing laboratory, the product shall be so examined, tested and certified.

M. Except for conduit, conduit fittings, outlet boxes, wire and cable, all items of equipment or material of one generic type shall be the product of one manufacturer throughout.

N. For items which are to be installed but not purchased as part of the electrical work, the electrical work shall include:

1. The coordination of their delivery.
2. Their unloading from delivery trucks driven into any point on the property line at grade level.
3. Their safe handling and field storage up to the time of permanent placement in the project.
4. The correction of any damage, defacement or corrosion to which they may have been subjected. Replacement, if necessary, shall be coordinated with Contractor who originally purchased the item.
5. Their field make up and internal wiring as may be necessary for their proper operation.
6. Their mounting in place including the purchase and installation of all dunnage, supporting members, and fastenings necessary to adapt them to architectural and structural conditions.
7. Their connection to building wiring including the purchase and installation of all termination junction boxes necessary to adapt and connect them to this wiring. Included also shall be the purchase and installation of any substitute lugs or other wiring terminations as may be necessary to adapt their terminals to the building wiring as called for and to the connection methods set forth in these specifications.

O. Items which are to be installed but not purchased as part of the electric work shall be carefully examined upon delivery to the project. Claims that any of these items have been received in such condition that their installation will require procedures beyond the reasonable scope of the electric work will be considered only if presented in writing within one week of the date of delivery to the project of the items in question. The work includes all procedures, regardless of how extensive, necessary to put into satisfactory operation, all items for which no claims have been submitted as outlined above.

P. Seismic Performance: Provide equipment capable of withstanding the effects of earthquake motions determined according to ASCE/SEI 7 and current building codes for the state of CT.

1. The term “withstand” means “the system(s) will remain in place without separation of any parts when subjected to the seismic forces specified and the system will be fully operational after the seismic event.”

1.8 PROJECT CONDITIONS

A. Environmental Conditions: Capable of withstanding the following environmental conditions without mechanical or electrical damage or degradation of operating capability:

1. Interior, Controlled Environment: System components installed in temperature-controlled interior environments shall be rated for continuous operation in ambient temperatures of 36 to 122 deg F (2 to 50 deg C) dry bulb and twenty to ninety percent (20-90%) relative humidity, noncondensing. Use NEMA 250, Type 1 enclosures.

2. Interior, Uncontrolled Environment: System components installed in non- temperature-controlled interior environments shall be rated for continuous operation in ambient temperatures of 0 to 122 deg F (minus 18 to plus 50 deg C) dry bulb and twenty to ninety percent (20-90%) relative humidity, noncondensing. Use NEMA 250, Type 3R enclosures.
3. Exterior Environment: System components installed in locations exposed to weather shall be rated for continuous operation in ambient temperatures of minus 30 to plus 122 deg F (minus 34 to plus 50 deg C) dry bulb and twenty to ninety percent (20-90%) relative humidity, condensing. Rate for continuous operation when exposed to rain as specified in NEMA 250, winds up to 85 mph and snow cover up to 24 inches thick. Use sufficiently rated NEMA 250 enclosures.
4. Hazardous Environment: System components located in areas where fire or explosion hazards may exist because of flammable gases or vapors, flammable liquids, combustible dust, or ignitable fibers shall be rated, listed, and installed according to NFPA 70.
5. Corrosive Environment: System components subject to corrosive fumes, vapors, and wind-driven salt spray in coastal zones. Use sufficiently rated NEMA 250 enclosures.
6. Security Environment: Camera housing for use in high-risk areas where surveillance equipment may be subject to physical violence.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions and NECA 303.

B. Store products in manufacturer's unopened packaging, keep dry and protect from damage until ready for installation.

1.10 FIELD CONDITIONS

A. Maintain field conditions within manufacturer's required service conditions during and after installation.

1.11 WARRANTY

A. See Section Division 01 – Closeout Submittals for additional warranty requirements.

B. The Integrator guarantees the Systems to be installed under this specification to be free from any defects in workmanship and materials for a period of one (1) year from the date of final completion/acceptance of the project by the Owner as evidenced by the date of final payment for the work. The Contractor shall promptly and at their own expense remedy any defects in the work and pay for any damage to other work resulting thereof, which shall appear during the period of time covered by this guarantee. Neither the final certificate of payment nor any provisions in this Agreement shall constitute an acceptance of work not done in accordance with this specification or relieve the Contractor of liability with respect to any expressed warranties or guarantees or responsibility for faulty materials or workmanship.

C. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of equipment related to the Access Control System, and control-station equipment that fail in materials or workmanship within specified warranty period.

1. Warranty Period: The standard manufacturer's warranty shall apply or a minimum of a one (1) year warranty from the date of Substantial Completion.

D. The Integrator shall provide all services required to maintain the system in an operational state as specified by the manufacturer for a period of one (1) year after acceptance.

E. Service response shall be within twelve (12) hours of the initial request for service and shall be provided twenty-four (24) hours per day, seven (7) days per week and three hundred sixty-five (365) days per year.

F. Contractor shall include, as part of this warranty, a program for maintenance for each integrated system.

1. Provide details of coverage, preventive maintenance schedules, exclusions and service rates for all billable time and travel charges.
2. Maintenance shall include two (2) semi-annual inspections and tests to verify the intended operation of the security system(s). System testing shall include but not be limited to the testing of all devises, fault modes and batteries. A detailed test report indicating these results and any corrective measures shall be furnished to the owner.

G. The Contractor shall provide software and firmware upgrades as required and available to the Owner.

H. Submit manufacturer's standard warranties.

PART 2 - PRODUCTS

2.1 SYSTEM REQUIREMENTS

A. Furnish and install Video Surveillance System consisting of required equipment, conduit, boxes, wiring, connectors, hardware, supports, accessories, software, system programming, etc. as necessary for a complete operating system that provides the functional intent indicated.

B. The awarded contractor of this section shall furnish and install a network Video Surveillance (VSS) system into this facility using electronic security devices. This integrated VSS shall incorporate all devices necessary to achieve the specified system, all associated monitoring and recording software, hardware, configuration, testing and training.

C. The contractor awarded this project must include the following licenses and configuration:

1. VSS licenses for each camera on the Specified Access Control System

D. The contractor shall provide a rack mounted UPS for each equipment rack provided for powering all equipment located within the equipment rack. The UPS shall be supplied with an auto-shutdown feature to allow an automatic orderly shutdown of the connected server. The auto-shutdown feature shall be connected to and programmed to shut down any servers contained within the equipment rack being powered from the UPS.

E. Surge Protection: Protect components from voltage surges originating external to equipment housing and entering through power, communication, signal, control, or sensing leads. Include surge protection for external wiring of each conductor's entry connection to components.

F. This VSS described within this specification shall be fully integrated with the Access Control and Intrusion Detection System.

G. All installation, peripheral devices, required licensing and configurations are required as part of this specification to establish a coherent, functional system as described within this bid package.

H. Security Ethernet cabling from the indicated Telecommunication Rooms to the Specified Cameras as described within the documents shall be furnished and installed by the contractor awarded Division 27.

I. Any and all additional interconnection cabling required for a functional system shall be furnished and installed by the contractor awarded this portion of work.

J. Final terminations to all devices are required by the Contractor awarded this Section.

K. The Contractor awarded this Section shall furnish and install a complete integrated security system and all associated, terminations, supporting devices, configuration of system, testing and training in accordance with this Bid package.

L. This specification is used to identify the requirements for an integrated VSS. The operator workstation(s) shall be used for database programming and storage of historical events and as a User interface with the Access Control System.

M. Within the VMS, the Contractor shall create floor plan maps that include camera icons appropriately placed according to actual location. Upon clicking a camera icon, the video feed associated with that camera shall automatically be called up and displayed.

N. System Design Intent:

1. It is the intention of this system design to provide a fully functional Video Surveillance System for, minimally, the following features:

    a. The end user shall be able to access live or recorded video from within the VSS software and shall have the following capabilities:

        1) The end user shall have the ability to pause, stop, resume, fast forward, frame advance, rewind, and move to a different time window.
        2) The user shall be able to quickly switch between live and recorded video.
        3) The user shall be able to view multiple video feeds simultaneously.
        4) Upon alarm input to the IDS or ACS, a predetermined video feed or feeds that are associated with that alarm shall automatically display in the Access Control System Software window. This video window shall have the capability to display recorded (IE 10 seconds prior to alarm) video.
        5) Within the VSS software window, the end user shall have the ability to call up and display live video from any camera. This shall include the ability to display multiple live camera views simultaneously through a matrix view.
        6) Within the VMS, the end user shall have the ability to export recorded video to a local hard drive or to a removable media (such as CD or USB drive). The system shall automatically watermark this video file for future proof of authenticity.

O. System Functionality Overview:

1. System shall provide high-quality delivery and processing of IP-based video and control data using standard Ethernet-based networks.
2. System shall have seamless integration of all video surveillance and control functions.
3. Graphical user interface software shall manage all IP-based video matrix switching and camera control functions and recording and archive/retrieval management. IP system shall also be capable of integrating into larger system environments.
4. System design shall include all necessary compression software for high-performance, dual-stream, Motion JPEG and H.264 video.
5. All camera signals shall be compressed to H.264, encoded, and delivered onto the network for processing and control by the IP video-management software.
6. Camera system units shall be ruggedly built and designed for extreme adverse environments, complying with NEMA Type environmental standards.
7. The Camera's recorded images shall include masking of the unwanted areas within each camera view to minimize storage space. These recorded images shall be defined with the Owner and technology consultant.
8. Configuration of the Video Server to utilize two (2) Ethernet connections and Network Interface cards; one (1) for incoming video and recording and one (1) to send recorded video to the storage device.
9. Video management software shall be configured for the following.

    a. Recorded Video Compression Rate: H.264
    b. Frame Recorded Per Second: Fifteen (15).
    c. Resolution should be set at the highest obtainable from each camera specified.
    d. Stored data shall be saved for thirty (30) calendar days.
    e. Interior cameras shall record eighteen (18) hours per day.
    f. Exterior cameras shall record twenty-four (24) hours per day.
    g. Include 10% headroom storage.
    h. Include subtotal for processing and management software.
    i. Each camera "Field of View" shall be coordinated with the assistance of the Owner and/or the Security Consultant.

P. System Configuration Overview:

1. All system configuration(s) shall be included to attain a fully functional system and shall be within the Scope of work of the awarded Contractor of this section. This configuration shall include but not be limited to the following:

    a. Configuration of all cameras to be managed via the Video Management software.
    b. Configuration of Video Surveillance Server to view/record/access all cameras.
    c. Configuration of the Video Surveillance Servers to monitor all connected cameras for video loss. Video loss detection shall create an alarm on the VMS, alert any connected workstation, and simultaneously send an email to the system administrator conveying the video loss condition.
    d. Configuration of video storage devices with the server.
    e. Configuration of Browser Based Client for up to (4) users groups.
    f. Configuration of the Video Storage Server per the manufacturer's established best practices.
    g. Configuration of the Video Management Server per the manufacturer's established best practices.
    h. Configuration of the Video Mobile Server per the manufacturer's established best practices.
    i. Integration with the Owner's Active Directory.
    j. Configuration of LAN switches – Active Electronics, as related to the systems specified within this document. Including VLANS and IP addressing shall be as indicated by the Owner.

k. The Contractor shall coordinate any/all network connections with the Owner IT Department prior to making any physical connections to the Owner's network components. Failure to follow this directive may result in expenditures for repair and troubleshooting by the Owner's IT department or 3rd party IT contractor/vendor. Such expenditures to remedy any issues caused by incorrect coordination by the Contractor shall be borne by the Contractor.

l. The contractor will be responsible for establishing the security of all IP devices, servers, and VMS storage from adversary compromise (internal or external) in conjunction with the owner's IT Department.

m. The cost of investigation, repairs, and reprogramming resulting from any security breaches during the construction or operation of the systems (while under warranty or service agreement) attributable to the failure of the Contractor to implement approved IT security measures shall be borne by the contractor.

n. Configuration of the VMS and Access Control managed software to:

1) Allow complete interface between both platforms
2) Allow the Access Control System to access and view all video surveillance cameras.
3) Allow access and controlled network management system with Web and Internet access of the Video Surveillance system.

o. Programming camera names and recording parameters to optimize the camera for the environment for which it is operating in. Camera names shall be coordinated with the Owner prior to configuration. Naming all cameras within the system is the responsibility of the Contractor.

Q. Environmental Conditions: System(s) shall withstand the environmental conditions without mechanical or electrical failure, damage or degradation of its operating capacity Capable of withstanding the following environmental conditions without mechanical or electrical damage or degradation of operating capability:

1. Interior, Controlled Environment: System components installed in temperature-controlled interior environments shall be rated for continuous operation in ambient temperatures of 36 to 122 deg F (2 to 50 deg C) dry bulb and twenty to ninety percent (20-90%) relative humidity, noncondensing. Use NEMA 250, Type 1 enclosures.
2. Interior, Uncontrolled Environment: System components installed in non- temperature-controlled interior environments shall be rated for continuous operation in ambient temperatures of 0 to 122 deg F (minus 18 to plus 50 deg C) dry bulb and twenty to ninety percent (20-90%) relative humidity, noncondensing. Use NEMA 250, Type 3R enclosures.
3. Exterior Environment: System components installed in locations exposed to weather shall be rated for continuous operation in ambient temperatures of minus 30 to plus 122 deg F (minus 34 to plus 50 deg C) dry bulb and twenty to ninety percent (20-90%) relative humidity, condensing. Rate for continuous operation when exposed to rain as specified in NEMA 250, winds up to 85 mph and snow cover up to 24 inches thick. Use sufficiently rated NEMA 250 enclosures.
4. Hazardous Environment: System components located in areas where fire or explosion hazards may exist because of flammable gases or vapors, flammable liquids, combustible dust, or ignitable fibers shall be rated, listed, and installed according to NFPA 70.
5. Corrosive Environment: System components subject to corrosive fumes, vapors, and wind-driven salt spray in coastal zones. Use sufficiently rated NEMA 250 enclosures.
6. Security Environment: Camera housing for use in high-risk areas where surveillance equipment may be subject to physical violence.

2.2 VIDEO MANAGEMENT SYSTEM

A. The Video Management System shall be Avigilon Enterprise. Alternates shall not be accepted.

B. The Video Management Server shall be Avigilon.

C. Include an Avigilon Enterprise License per each new device specified within this project.

2.3 CAMERAS

A. The camera manufacturer shall be Avigilon. Alternates shall not be accepted.

B. Refer to camera schedule for make and model.

C. Interior and Exterior cameras shall be Avigilon H5A, Dome, 6MP or better cameras.

D. The Exterior multi-sensor cameras shall be Avigilon H4A, Dome, 12MP or better cameras.

2.4 SERVERS

A. Provide new storage server for new specified cameras.

B. Server shall be Avigilon NVR5 series. Alternates shall not be accepted.

C. Configure camera access on client's existing Avigilon system.

D. Provide camera calculations with server submission.

2.5 UNINTERRUPTIBLE POWER SUPPLIES (UPS)

A. The Contractor shall supply individual UPS' each Telecommunication Room or Equipment Room where Active Electronics supplying data and signal to the Video Surveillance System is located. The UPS will be used to support Ethernet switch, servers, video recorders, and any other rack mount security equipment.

B. The Contractor shall supply individual UPS at security guard post. UPS will be used to support security workstation, monitors, printer, intercom master station, and any other security equipment in that location.

C. The UPS shall be as manufactured by APC or approved equal

D. The supplied UPS shall support the equipment at each location plus an additional 500 Watts at 120VAC for a minimum of fifteen (15) minutes under full load

E. The Contractor shall supply the appropriately sized UPS as dictated by the accepted submitted equipment as approved by the Engineer.

F. The UPS located in ER / TR locations shall be rack mountable and shall include all mounting hardware.

G. The UPS shall have the capability of sending SMTP email messages

H. The UPS shall be supplied with software to connect to the security system Ethernet network to allow for monitoring and alarm condition of the UPS including but not limited to the following;

1. UPS on battery
2. UPS load capacity exceeded
3. UPS off line
4. UPS overheat
5. UPS experienced surge

2.6 Surge Protection:

A. Install Lightning / Surge protection for all exterior rated cameras. Ground all protectors to manufacturer recommendations and Code requirements.

B. The intent of the Lightning / Surge protector is to protect the connected electronics (switches, routers, servers) in the event a camera is struck by lightning.

C. Surge protectors shall be installed between camera and patch panel.

D. Acceptable manufacturers:

1. Ditek
2. Approved Equivalent

2.7 Client Workstations:

A. Client Viewing PC:

1. Avigilon RM7-WKS-4MN. Alternates shall not be accepted.

B. Wireless Mouse and Keyboard:

1. IOGEAR #GKM552R
2. Approved Equivalent

C. 55” Display and Mount:

1. SAMSUNG #QB55R or approved equal
2. The digital display shall meet the following requirements:

a. 55” diagonal
b. 3840 x 2160 minimal resolution
c. 500 nit minimal brightness
d. Approved for 24/7 operation
e. Includes a standard manufacturer 3-year warranty

3. CHIEF #MTM1U or approved equal
4. Include Chief #FHB5147 Universal Flat Panel Mount Hardware Kit

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that ratings and configurations of system components are consisted with the indicated requirements.

C. Verify that mounting surfaces are ready to receive the system components.

D. Verify that branch circuit wiring is installed, completed, tested, and ready for connection to system.

E. Verify that conditions are satisfactory prior to starting work.

F. Device Locations

1. All device locations are to be field verified with the Owner prior to start of project. Architectural drawings are for approximation purposes only. Additional charges will not be allowed for outlet installation in areas not reviewed or approved by the Owner.

G. Examine pathway elements intended for cables. Check raceways and other elements for compliance with space allocations, installation tolerance, hazards to camera installation, and other conditions affecting installation.

H. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install Video Surveillance system in accordance with NECA 1 (general workmanship).

B. Install products in accordance with manufacturer’s instructions.

C. Install cameras level and plumb.

D. Install cameras with 84-inch minimum clear space below cameras and their mountings. Change type of mounting to achieve required clearance.

E. Set pan unit and pan-and-tilt unit stops to suit final camera position and to obtain the field of view required for camera. Connect all controls and alarms and adjust.

F. Install power supplies and other auxiliary components within the Telecommunication Room unless otherwise indicated.

G. Install tamper switches on components indicated to receive tamper switches, arranged to detect unauthorized entry into system-component enclosures and mounted in self-protected, inconspicuous positions.

H. Identify system components, wiring, cabling, and terminals according to industry standards.

I. Unless otherwise indicated, use wiring in conduit.

1. Use suitable listed cables in we locations, including underground raceways.
2. Use suitable listed cables for vertical wire applications.
3. All cabling shall be plenum rated.
4. Install wiring in conduit for the following:

    a. Where required for rough-in.
    b. Where required by the AHJ.
    c. Where exposed to damage.
    d. Where installed outside the building.
    e. For exposed connections from outlet boxes to devices.

5. Conduit: comply with Division 26.
6. Conceal cables unless specifically indicated to be exposed.
7. User power transfer hinges specified within Division 08 for concealed connections to door hardware.
8. Cables in the following areas may be exposed:

    a. Equipment Closets

9. Route exposed cables in parallel or perpendicular to building structural members and surfaces.
10. Do not exceed manufacturer's recommended maximum cable length between components.

J. Provide grounding and bonding in accordance with Division 26.

K. Install firestopping to preserve the fire resistance rating of partitions and other elements, using materials and methods specified in Division 07.

L. Install power supplies and other auxiliary components at control stations unless otherwise indicated.

M. Identify system components, wiring, cabling, and terminals according to ANSI/EIA/TIA standards.

N. Security System Integration

1. The Contractor shall be responsible for providing hardware and software interfaces to achieve the specified system performance described herein and, by reference, realize absolute and seamless compatibility with the related component systems.
2. The Contractor shall ensure system additions and modifications provided under this scope of work have no negative effect on the individual components and systems, and their core functionality, and no permanent effect beyond that specified or implied by the scope of work.
3. Purpose

    a. Integration is the process of designing, deploying, and configuring independently operating systems with the ability to request, receive, extract, process, and act upon information from other systems.
    b. Successful system integration must address three fundamental issues:

        1) Functionality: What information is needed, how it is to be requested and processed, and what functions or activities need to occur upon receipt of the information.

2) Connectivity: How systems will be connected to support the communication of information and commands. (Special interfaces, wiring, networks, databases.)
3) Communication: How information will be communicated between systems. (Instruction sets, language, protocols, formats, priority.)

4. Environment

a. Integration components shall generally comprise special elements of independent subsystems, and shall be located within, or in close proximity to, the processing components of each independent subsystem. Where subsystems require special hardware or communications interfaces to support integration, the special hardware should be located near the independent subsystem processing components or network appliance, based on the manufacturers' recommendation. See the drawings for details on mounting locations.

5. Infrastructure and Connectivity:

a. Devices/Appliances: Appliances and devices shall be connected to their respective systems via the applicable communications network.
b. System LAN/WAN Connectivity: System Servers and microprocessor-based Control Panels, shall reside on the Local Area Network (LAN) or Wide Area Network (WAN) tier designated for integrated components.

6. Attributes

a. The attributes of the integrated environment are primarily defined by the subsystems that are to be integrated. Verify existing system components to be expanded by this project.
b. Integrated systems comprise the processors, software, electrical control panels, data gathering panels, special data interfaces, and converters required to allow systems to communicate with each other, process information, and allow users to program and perform operations.

7. Functions

a. The system shall provide the following automated processing rules, at a minimum:
b. The object of "Access Control system integration" is to automatically configure the system to display, record, and report appropriate system activity to various elements of the system. Automatic configuration can free operators from difficult control tasks, give the operator more time to respond to events, reduce operator error, and ensure critical system tasks occur consistently.
c. Electronic Access Control system elements shall be electronically integrated in such a way as to enable detection, database records and/or event-initiated instructions to be communicated between system components, to initiate recording, display, communication, and control activities.
d. Event-Initiated Interface, General:

1) The system shall support the capability to send and receive alarm and control messages between the Access Control System and video systems via a LAN communications link, using API, XML, or other industry-standard communication languages and formats, and shall act upon those messages received.

2) The system shall support the capability to send and receive alarm and control messages and alarm signal between the Access Control system and Intrusion Detection System for lockdown / duress / and panic button initiation.
3) Where integration may require the implementation of data interfaces, Contractor shall propose such integration to the Owner for approval, before proceeding with the work.
4) Software routines required to accomplish the required data-interface with external equipment and controls will be fully developed, installed, tested and supported by the Contractor.
5) The manufacturer of each applicable system will also support the data interface and will be engaged by the Contractor to provide on-site technical assistance where required to prepare, repair, configure, and test the system to operational condition.
6) Communication of event information between systems shall take place automatically and immediately when the event is sensed by the System.

3.3 FIELD QUALITY CONTROL

A. Testing Agency: The Contractor shall engage a qualified testing agency to perform tests and inspections with the Owner and appointed project manager.

B. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.

C. Camera Field Verification:

1. All camera locations MUST to be field verified with the Owner prior to start of project. Architectural drawings are for approximation purposes only. Additional charges will not be allowed for installation in areas not reviewed or approved by the Owner.
2. Camera images will be reviewed with the Owner and the Security Consultant. The contractor shall plan for three adjustments of the camera’s field of view as follows:

    a. Initial setup and testing
    b. Owner and / or Security Consultant adjustments #1
    c. Owner and / or Security Consultant adjustments #2

D. Perform tests and inspections.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

E. Tests and Inspections:

1. Inspection: Verify that units and controls are properly installed, connected, and labeled, and that interconnecting wires and terminals are identified.
2. Pretesting: Align and adjust system and pretest components, wiring, and functions to verify that they comply with specified requirements. Conduct tests at varying lighting levels, including day and night scenes as applicable. Prepare video-surveillance equipment for acceptance and operational testing as follows:

    a. Prepare equipment list described in "Submittals" Article.

b. Verify operation of auto-iris lenses.
c. Set back-focus of fixed focal length lenses. At focus set to infinity, simulate nighttime lighting conditions by using a dark glass filter of a density that produces a clear image. Adjust until image is in focus with and without the filter.
d. Set back-focus of zoom lenses. At focus set to infinity, simulate nighttime lighting conditions by using a dark glass filter of a density that produces a clear image. Additionally, set zoom to full wide angle and aim camera at an object 50 to 75 feet away. Adjust until image is in focus from full wide angle to full telephoto, with the filter in place.
e. Set and name all preset positions; consult Owner's personnel.
f. Set sensitivity of motion detection.
g. Connect and verify responses to alarms.
h. Verify operation of control-station equipment.

3. Test Schedule: Schedule tests after pretesting has been successfully completed and system has been in normal functional operation for at least fourteen (14) days. Provide a minimum of ten (10) days notice of test schedule.
4. Operational Tests: Perform operational system tests to verify that system complies with Specifications. Include all modes of system operation. Test equipment for proper operation in all functional modes.

F. Video Surveillance System shall be considered defective if it does not pass tests and inspections.

G. Prepare test and inspection reports.

H. Occupancy Adjustments: When requested within twelve (12) months of date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to two (2) visits to this Project location during other-than-normal occupancy hours for this purpose. Tasks shall include, but are not limited to, the following:

1. Check cable connections.
2. Check proper operation of cameras and lenses. Verify operation of auto-iris lenses and adjust back-focus as needed.
3. Adjust all preset positions; consult Owner's personnel.
4. Recommend changes to cameras, lenses, and associated equipment to improve Owner's use of video surveillance system.
5. Provide a written report of adjustments and recommendations

3.4 CLEANING

A. Clean installed items using methods and materials recommended in writing by manufacturer.

B. Clean video-surveillance-system components, including camera-housing windows, lenses, and monitor screens before installation and prior to final acceptance.

C. Remove rubbish and debris: Installation contractor is not allowed you use the onsite dumpster and is responsible to discard their own debris off site.

3.5 CLOSEOUT ACTIVITIES

A. See Division 01 – Closeout Submittals for Closeout Submittals.

B. Demonstration: Demonstrate proper operations of system to Owner and correct deficiencies or make adjustments as directed.

C. Training:

1. By means of training classes augmented by individual instruction as necessary, the Bidding contractor shall fully instruct the BOE's designated staff and personnel in the operation, adjustment and maintenance of all products, equipment and systems.
2. General Training Requirements:

   a. The security contractor shall submit proposal to conduct training courses for the security personnel in the operation and maintenance of the security systems within this security project.
   b. The security contractor shall include training manuals and aids in the quantity as requested by the Owner. The training manuals shall include an agenda, defined objectives for each lesson, and a detailed description of the subject matter for each lesson. All personnel providing the instructions shall be certified by the equipment manufacturer for all applicable hardware and software.
   c. Approval of the planned training content and training schedule shall be obtained by the Owner at least 45 days before the training is scheduled.
   d. Training shall be provided by qualified, factory trained and certified engineers familiar with each system and its operations and shall be provided at the site for a period of no less than the hours stipulated below.

3. Training Topics:

   a. System Administration Training

      1) This training shall focus on determining and implementing system operational parameters.
      2) The first training class shall be conducted so that it is completed approximately 30 days prior to acceptance of the system and final system reliability testing. 8 Hours of Administration training; (2) 4-hour classes.
      3) The second training class shall be conducted so that it is completed approximately 7 days prior to acceptance of the system and final system testing. The system administrator shall be included as part of this final system acceptance and reliability testing. 6 Hours of training; (2) 3-hour classes.
      4) This Administrations training shall include:
         a) Overall architecture and configuration of each system.
         b) Use of all system functions.
         c) ID badging design and production.
         d) Card-holder setup and configuration.
         e) Card-holder access level assignment.
         f) Access Door programming.
         g) Alarm setup and implementation.
         h) Data storage and retrieval through reports.
         i) Creation of reports.
         j) System database backup procedures.
         k) Hardware specifications.
         l) Fault diagnosis and corrections.

   b. System User Monitoring Training

1) This training shall be for each designated personnel at this school.
2) This training shall focus on day-to-day system operations. Each user shall be capable to start the systems, operate them, recover the systems after a failure, and describe the specific hardware architecture and operation of the systems.
3) The first training class shall be conducted so that it is completed approximately 30 days prior to acceptance of the system and final system reliability testing. All System User Training shall be performed at each school within this specification. 8 Hours of User training; (2) 4-hour classes.
4) The second training class shall be conducted so that it is completed approximately 7 days prior to acceptance of the system and final system testing. The system administrator shall be included as part of this final system acceptance and reliability testing. 6 Hours of User training; (2) 3-hour classes.
5) Training shall include:
    a) Use of overall system monitoring functions as determined by the security administration staff.
    b) Monitoring alarm events.
    c) Monitoring personnel access into the facility.
    d) Assessing, responding to, and clearing alarms and messages.
    e) Monitoring access door status.
    f) Running routine reports.
    g) General hardware architecture.
    h) Functional operation of each system and interaction between these systems.
    i) All Operator commands.
    j) Database entry.
    k) Report generation.
    l) Alarm assessment.
    m) Simple diagnostics.

c. System Troubleshooting and Maintenance Training

1) Training shall be provided with the internal features and configuration of the security systems so the user can trouble shoot and repair most configuration and physical device problems.
2) The training class shall be conducted so that it is completed approximately 14 days prior to acceptance of the system and final reliability testing. The users shall be included as part of this reliability testing. 8 Hours of training; (2) 4-hour classes.
3) This training shall include:
    a) System networking communications and diagnostics.
    b) Device configuration and programming.
    c) Controller setup.
    d) Wiring and cabling overview.
    e) System Diagnostics.
    f) Software troubleshooting.
    g) Physical layout of each piece of hardware.
    h) Preventive maintenance procedures and schedules.
    i) Calibration procedures.

d. IT Training

1) Training shall be provided information of the security systems to the IT staff. This shall include information as to how each system functions within the LAN/WAN network infrastructures. 4 Hours of training.
2) Topics shall include:
   a) Network topologies.
   b) Maintenance of data security.

4. Training hours and sessions must be documented by the instructor and approved by the Owner before project closeout.
5. Should the training be deemed as inadequate by the Owner, the owner reserves the right to retain outside manufacturer training. If this outside manufacturer training has an associated cost, this cost shall be deducted from the final invoice of this project.
6. The Owner reserves the right to request the Contractor to videotape training sessions and turn over video records (DVD format) to Owner as part of the "Owner Project Manuals" and Deliverables.

3.6 PROTECTION

A. Protect installed system components from subsequent construction operations.

3.7 MAINTENANCE

A. See Division 01 – Execution and Closeout Requirements for additional requirements relating to maintenance service.

B. Adjustments:

1. Occupancy Adjustments: When requested within twelve (12) months of date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to two (2) visits to Project during other-than-normal occupancy hours for this purpose. Tasks shall include, but are not limited to, the following:

   a. Check cable connections.
   b. Check proper operation of video surveillance devices.
   c. Provide a written report of adjustments and recommendations.

C. Provide to Owner, at no extra cost, a separate maintenance contract for the service and maintenance of the Access Control System for One Year from date of Substantial Completion. Include a separate description of preventative maintenance, systematic examination, cleaning, inspection, and testing, with a detailed schedule.

D. Conduct site visit at least once every three months to perform inspection, testing, and preventative maintenance. Submit report to Owner indicating maintenance performed along with evaluations and recommendations.

E. Provide trouble call-back service upon notification by Owner:

1. Include allowance for call-back service during normal working hours at no extra cost to Owner.

2. Owner will pay for call-back service outside of normal working hours on an hourly basis, based on actual time spent at the site and not including travel time; include hourly rate and definition of normal working hours in maintenance contract.

END OF SECTION 282300

SECTION 283111 - DIGITAL, ADDRESSABLE FIRE-ALARM SYSTEM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors, and/or suppliers providing goods and services referenced in or related to this section will be required to support the Commissioning effort in accordance with the requirements identified in Section 019113 “General Commissioning Requirements”.

B. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Fire-alarm control unit.
2. Manual fire-alarm boxes.
3. System smoke detectors.
4. Heat detectors.
5. Carbon monoxide detectors.
6. Notification appliances.
7. Magnetic door holders.
8. Remote annunciator.
9. Addressable interface device.
10. Digital alarm communicator transmitter.
11. Radio alarm transmitter.

1.3 DEFINITIONS

A. LED: Light-emitting diode.

B. NICET: National Institute for Certification in Engineering Technologies.

1.4 SYSTEM DESCRIPTION

A. Noncoded addressable system, with automatic sensitivity control of certain smoke detectors and multiplexed signal transmission, dedicated to fire-alarm service only.

1.5 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Fire-alarm control unit and raceways shall withstand the effects of earthquake motions determined according to SEI/ASCE 7.

1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."

1.6 SUBMITTALS

A. General Submittal Requirements:

1. Submittals shall be approved by authorities having jurisdiction prior to submitting them to Architect.
2. Shop Drawings shall be prepared by persons with the following qualifications:

    a. Trained and certified by manufacturer in fire-alarm system design.
    b. NICET-certified fire-alarm technician, Level III and/or Level IV minimum.
    c. Licensed or certified by authorities having jurisdiction.

B. Product Data: For each type of product indicated.

C. Shop Drawings: For fire-alarm system. Include plans, elevations, sections, details, and attachments to other work.

1. Comply with recommendations in the "Documentation" Section of the "Fundamentals of Fire Alarm Systems" Chapter in NFPA 72.
2. Include voltage drop calculations for notification appliance circuits.
3. Include battery-size calculations.
4. Include performance parameters and installation details for each detector, verifying that each detector is listed for complete range of air velocity, temperature, and humidity possible when air-handling system is operating.
5. Include plans, sections, and elevations of heating, ventilating, and air-conditioning ducts, drawn to scale and coordinating installation of duct smoke detectors and access to them. Show critical dimensions that relate to placement and support of sampling tubes, detector housing, and remote status and alarm indicators. Locate detectors according to manufacturer's written recommendations.
6. Include voice/alarm signaling-service equipment rack or console layout, grounding schematic, amplifier power calculation, and single-line connection diagram.
7. Include floor plans to indicate final outlet locations showing address of each addressable device. Show size and route of cable and conduits.

D. Delegated-Design Submittal: For smoke and heat detectors indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1. Drawings showing the location of each smoke and heat detector, ratings of each, and installation details as needed to comply with listing conditions of the detector.
2. Design Calculations: Calculate requirements for selecting the spacing and sensitivity of detection, complying with NFPA 72.

E. Qualification Data: For qualified Installer.

F. Seismic Qualification Certificates: For fire-alarm control unit, accessories, and components, from manufacturer.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

G. Field quality-control reports.

H. Operation and Maintenance Data: For fire-alarm systems and components to include in operation and maintenance manuals. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:

1. Comply with the "Records" Section of the "Inspection, Testing and Maintenance" Chapter in NFPA 72.
2. Provide "Record of Completion Documents" according to NFPA 72 article "Permanent Records" in the "Records" Section of the "Inspection, Testing and Maintenance" Chapter.
3. Record copy of site-specific software.
4. Provide "Maintenance, Inspection and Testing Records" according to NFPA 72 article of the same name and include the following:

    a. Frequency of testing of installed components.
    b. Frequency of inspection of installed components.
    c. Requirements and recommendations related to results of maintenance.
    d. Manufacturer's user training manuals.

5. Manufacturer's required maintenance related to system warranty requirements.
6. Abbreviated operating instructions for mounting at fire-alarm control unit.
7. Copy of NFPA 25.

I. Software and Firmware Operational Documentation:

1. Software operating and upgrade manuals.
2. Program Software Backup: On magnetic media or compact disk, complete with data files.
3. Device address list.
4. Printout of software application and graphic screens.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: Personnel shall be trained and certified by manufacturer for installation of units required for this Project.

B. Installer Qualifications: Installation shall be by personnel certified by NICET as fire-alarm Level III technician.

C. Source Limitations for Fire-Alarm System and Components: Obtain fire-alarm system from single source from single manufacturer. Components shall be compatible with, and operate as, an extension of existing system.

D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

E. NFPA Certification: Obtain certification according to NFPA 72

1.8 PROJECT CONDITIONS

A. Interruption of Existing Fire-Alarm Service: Do not interrupt fire-alarm service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary guard service according to requirements indicated:

1. Notify Architect and Construction Manager no fewer than two (2) days in advance of proposed interruption of fire-alarm service.

2. Do not proceed with interruption of fire-alarm service without Architect and Construction Manager written permission.

1.9 SEQUENCING AND SCHEDULING

A. The system alarm operation subsequent to the alarm activation of any manual pull station, sprinkler flow switch, hood suppression system or automatic detection device is to be in accordance with Article 2.2 of this specification.

B. Alarm Verification:

1. The activation of any system smoke detector shall initiate an Alarm Verification operation whereby the panel will reset the activated detector and wait for a second alarm activation.
2. If, within 1 minute after resetting, a second alarm is reported from the same or any other smoke detector, the system shall process the alarm as described previously.
3. If no second alarm occurs within one minute the system shall resume normal operation.
4. The Alarm Verification is to operate only on smoke detector alarms. Other activated initiating devices shall be processed immediately.
5. The alarm verification operation is to be selectable by addressable device.
6. The control Unit shall have the capability to display the number of times (tally) a device has gone into a verification mode. Should this smoke verification tally reach a pre-programmed number, a trouble condition shall occur.

C. Supervisory Service:

1. The control panel shall have a dedicated supervisory service condition and a dedicated supervisory service acknowledge switch.
2. Activating the Supervisory Service Acknowledge Switch will silence the supervisory audible signal while maintaining the Supervisory Service listing on indicating the tamper contact is still in the off-normal state.
3. Restoring the valve to the normal position shall cause the Supervisory Service indication to reset thus indicating restoration to normal position.
4. Restoring the valve to the normal position shall cause the supervisory service audible signal to pulse thus indicating restoration to normal position.
5. Activating the Supervisory Service Acknowledge Switch will silence the audible signal and restore the system to normal.

D. A manual evacuation switch shall be provided to operate system alarm indicating appliances. Other control circuits shall not be activated. However, an actual alarm shall be processed as described previously.

E. Activation of an auxiliary bypass switch shall override the automatic functions either selectively or throughout the system.

F. Alarm and trouble conditions shall be immediately displayed on the control panel front.

1.10 SOFTWARE SERVICE AGREEMENT

A. Comply with UL 864.

B. Technical Support: Beginning with Substantial Completion, provide software support for two (2) years.

C. Upgrade Service: Update software to latest version at Project completion. Install and program software upgrades that become available within two (2) years from date of Substantial

Completion. Upgrading software shall include operating system. Upgrade shall include new or revised licenses for use of software.

1. Provide thirty (30) days' notice to Owner to allow scheduling and access to system and to allow Owner to upgrade computer equipment if necessary.

1.11 EXTRA MATERIALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Lamps for Strobe Units: Quantity equal to ten percent (10%) of amount installed, but no fewer than one (1) unit.
2. Smoke Detectors and Heat Detectors: Quantity equal to ten percent (10%) of amount of each type installed, but no fewer than one (1) unit of each type.
3. Detector Bases: Quantity equal to two percent (2%) of amount of each type installed, but no fewer than one (1) unit of each type.
4. Keys and Tools: One (1) extra set for access to locked and tamper-proofed components.
5. Audible and Visual Notification Appliances: One (1) of each type installed.
6. Fuses: Two (2) of each type installed in the system.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. All new fire alarm components shall be by the same manufacturer as the existing system (**Notifier "ONYX NFS2"**).

B. SYSTEMS OPERATIONAL DESCRIPTION

C. Fire-alarm signal initiation shall be by one (1) or more of the following devices and systems:

1. Manual stations.
2. Heat detectors.
3. Smoke detectors.
4. Duct smoke detectors.
5. Verified automatic alarm operation of smoke detectors.
6. Automatic sprinkler system water flow and pressure.
7. Heat detectors in elevator shaft.
8. Fire-extinguishing system operation (Kitchen Hoods).

D. Fire-alarm signal shall initiate the following actions:

1. Continuously operate alarm visual notification appliances until extinguished by the Alarm Reset Switch.
2. Identify alarm at fire-alarm control unit and remote annunciators.
3. Transmit an alarm signal to the remote alarm receiving station.
4. Release fire and smoke doors held open by magnetic door holders.
5. Activate voice/alarm communication system until silenced by the alarm silence switch or individual circuit switch at the control panel.
6. From an interface with the local systems, the fire alarm system shall mute the sound/paging systems during an alarm.
7. Switch heating, ventilating, and air-conditioning equipment controls to fire-alarm mode.
8. Close smoke dampers in air ducts of designated air-conditioning duct systems.

9. Recall elevators to primary or alternate recall floors.
10. Activate emergency shutoffs for gas and fuel supplies.
11. Record events in the system memory.

E. Supervisory signal initiation shall be by one (1) or more of the following devices and actions:

1. Valve supervisory switch.
2. Low-air-pressure switch of a dry-pipe sprinkler system.
3. Elevator shunt-trip supervision.
4. Generator general alarm switch.
5. Carbon monoxide detector.

F. System trouble signal initiation shall be by one (1) or more of the following devices and actions:

1. Open circuits, shorts, and grounds in designated circuits.
2. Opening, tampering with, or removing alarm-initiating and supervisory signal-initiating devices.
3. Loss of primary power at fire-alarm control unit.
4. Ground or a single break in fire-alarm control unit internal circuits.
5. Abnormal ac voltage at fire-alarm control unit.
6. Break in standby battery circuitry.
7. Failure of battery charging.
8. Abnormal position of any switch at fire-alarm control unit or annunciator.
9. Low-air-pressure switch operation on a dry-pipe or preaction sprinkler system.

G. System Trouble and Supervisory Signal Actions: Initiate notification appliance and annunciate at fire-alarm control unit and remote annunciators.

2.2 FIRE-ALARM CONTROL UNIT

A. General Requirements for Fire-Alarm Control Unit:

1. Field-programmable, microprocessor-based, modular, power-limited design with electronic modules, complying with UL 864 and listed and labeled by an NRTL.

a. System software and programs shall be held in flash electrically erasable programmable read-only memory (EEPROM), retaining the information through failure of primary and secondary power supplies.
b. Include a real-time clock for time annotation of events on the event recorder and printer.

2. Addressable initiation devices that communicate device identity and status.

a. Smoke sensors shall additionally communicate sensitivity setting and allow for adjustment of sensitivity at fire-alarm control unit.
b. Temperature sensors shall additionally test for and communicate the sensitivity range of the device.

3. Addressable control circuits for operation of mechanical equipment.

B. Alphanumeric Display and System Controls: Arranged for interface between human operator at fire-alarm control unit and addressable system components including annunciation and supervision. Display alarm, supervisory, and component status messages and the programming and control menu.

1. Annunciator and Display: Liquid-crystal type, two (2) lines of forty (40) characters, minimum.
2. Keypad: Arranged to permit entry and execution of programming, display, and control commands and to indicate control commands to be entered into the system for control of smoke-detector sensitivity and other parameters.

C. Circuits:

1. Initiating Device, Notification Appliance, and Signaling Line Circuits: NFPA 72, Class B.

    a. Initiating Device Circuits: Style B.
    b. Notification Appliance Circuits: Style Y.
    c. Signaling Line Circuits: Style 3.
    d. Install no more than fifty (50) addressable devices on each signaling line circuit.

2. Serial Interfaces: Two (2) RS-232 ports for printers.

D. Smoke-Alarm Verification:

1. Initiate audible and visible indication of an "alarm-verification" signal at fire-alarm control unit.
2. Activate an NRTL-listed and -approved "alarm-verification" sequence at fire-alarm control unit and detector.
3. Sound general alarm if the alarm is verified.
4. Cancel fire-alarm control unit indication and system reset if the alarm is not verified.

E. Notification Appliance Circuit: Operation shall sound with an initial alert tone, followed by a pre-recorded emergency voice message of approximately 15 seconds, followed by a repeating alarm “whoop” tone.

F. Elevator Recall:

1. Smoke detectors at the following locations shall initiate automatic elevator recall. Alarm-initiating devices, except those listed, shall not start elevator recall.

    a. Elevator lobby detectors except the lobby detector on the designated floor.
    b. Smoke detector in elevator machine room.
    c. Smoke detectors in elevator hoistway.

2. Elevator lobby detectors located on the designated recall floors shall be programmed to move the cars to the alternate recall floor.
3. Heat detectors in an elevator shaft and elevator machine room shall shut down elevators associated with the location without time delay.

G. Door Controls: Door hold-open devices that are controlled by smoke detectors at doors in smoke barrier walls shall be connected to fire-alarm system.

H. Remote Smoke-Detector Sensitivity Adjustment: Controls shall select specific addressable smoke detectors for adjustment, display their current status and sensitivity settings, and change those settings. Allow controls to be used to program repetitive, time-scheduled, and automated changes in sensitivity of specific detector groups. Record sensitivity adjustments and sensitivity-adjustment schedule changes in system memory, and print out the final adjusted values on system printer.

I. Transmission to Remote Alarm Receiving Station: Automatically transmit alarm, supervisory, and trouble signals to a remote alarm station.

J. Primary Power: 24-V dc obtained from 120-V ac service and a power-supply module. Initiating devices, notification appliances, signaling lines, trouble signals, supervisory signals and supervisory and digital alarm communicator transmitters shall be powered by 24-V dc source.

1. Alarm current draw of entire fire-alarm system shall not exceed eighty percent (80%) of the power-supply module rating.

K. Secondary Power: 24-V dc supply system with batteries, automatic battery charger, and automatic transfer switch.

1. Batteries: Vented, wet-cell pocket, plate nickel cadmium.

2. System shall be provided with sufficient battery capacity to operate the entire system upon loss of normal 120 VAC power in a normal supervisory mode for a period of 60 hours with 5 minutes of alarm operation at the end of this period.

L. Instructions: Computer printout or typewritten instruction card mounted behind a plastic or glass cover in a stainless-steel or aluminum frame. Include interpretation and describe appropriate response for displays and signals. Briefly describe the functional operation of the system under normal, alarm, and trouble conditions.

2.3 MANUAL FIRE-ALARM BOXES

A. General Requirements for Manual Fire-Alarm Boxes: Comply with UL 38. Boxes shall be finished in red with molded, raised-letter operating instructions in contrasting color; shall show visible indication of operation; and shall be mounted on recessed outlet box. If indicated as surface mounted, provide manufacturer's surface back box.

1. Single-action mechanism, pull-lever type; with integral addressable module arranged to communicate manual-station status (normal, alarm, or trouble) to fire-alarm control unit.
2. Station Reset: Key operated switch.
3. Indoor Protective Shield: Factory-fabricated clear plastic enclosure hinged at the top to permit lifting for access to initiate an alarm. Lifting the cover actuates an integral battery-powered audible horn intended to discourage false-alarm operation.
4. Weatherproof Protective Shield: Factory-fabricated clear plastic enclosure hinged at the top to permit lifting for access to initiate an alarm.

2.4 SYSTEM SMOKE DETECTORS

A. General Requirements for System Smoke Detectors:

1. Comply with UL 268; operating at 24-V dc, nominal.
2. Detectors shall be two-wire type.
3. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to fire-alarm control unit.
4. Base Mounting: Detector and associated electronic components shall be mounted in a twist-lock module that connects to a fixed base. Provide terminals in the fixed base for connection to building wiring.
5. Self-Restoring: Detectors do not require resetting or readjustment after actuation to restore them to normal operation.
6. Integral Visual-Indicating Light: LED type indicating detector has operated and power-on status.

7. Remote Control: Unless otherwise indicated, detectors shall be analog-addressable type, individually monitored at fire-alarm control unit for calibration, sensitivity, and alarm condition and individually adjustable for sensitivity by fire-alarm control unit.

    a. Rate-of-rise temperature characteristic shall be selectable at fire-alarm control unit for 15 or 20 deg F per minute.
    b. Fixed-temperature sensing shall be independent of rate-of-rise sensing and shall be settable at fire-alarm control unit to operate at 135 or 155 deg F.
    c. Provide multiple levels of detection sensitivity for each sensor.

B. Photoelectric Smoke Detectors:

1. Detector address shall be accessible from fire-alarm control unit and shall be able to identify the detector's location within the system and its sensitivity setting.
2. An operator at fire-alarm control unit, having the designated access level, shall be able to manually access the following for each detector:

    a. Primary status.
    b. Device type.
    c. Present average value.
    d. Present sensitivity selected.
    e. Sensor range (normal, dirty, etc.).

C. Ionization Smoke Detector:

1. Detector address shall be accessible from fire-alarm control unit and shall be able to identify the detector's location within the system and its sensitivity setting.
2. An operator at fire-alarm control unit, having the designated access level, shall be able to manually access the following for each detector:

    a. Primary status.
    b. Device type.
    c. Present average value.
    d. Present sensitivity selected.
    e. Sensor range (normal, dirty, etc.).

D. Duct Smoke Detectors: Photoelectric type complying with UL 268A.

1. Detector address shall be accessible from fire-alarm control unit and shall be able to identify the detector's location within the system and its sensitivity setting.
2. An operator at fire-alarm control unit, having the designated access level, shall be able to manually access the following for each detector:

    a. Primary status.
    b. Device type.
    c. Present average value.
    d. Present sensitivity selected.
    e. Sensor range (normal, dirty, etc.).

3. Weatherproof Duct Housing Enclosure: NEMA 250, Type 4X; NRTL listed for use with the supplied detector.
4. Each sensor shall have multiple levels of detection sensitivity.
5. Sampling Tubes: Design and dimensions as recommended by manufacturer for specific duct size, air velocity, and installation conditions where applied.
6. Relay Fan Shutdown: Rated to interrupt fan motor-control circuit.

7. Remote Test Switch: With keyed switch and LED indicator.

2.5 HEAT DETECTORS

A. General Requirements for Heat Detectors: Comply with UL 521.

B. Heat Detector, Combination Type: Actuated by either a fixed temperature of 135 deg F or a rate of rise that exceeds 15 deg F per minute unless otherwise indicated.

1. Mounting: Twist-lock base interchangeable with smoke-detector bases.
2. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to fire-alarm control unit.

C. Heat Detector, Fixed-Temperature Type: Actuated by temperature that exceeds a fixed temperature of 190 deg F.

1. Mounting: Twist-lock base interchangeable with smoke-detector bases.
2. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to fire-alarm control unit.

2.6 CARBON MONOXIDE DETECTORS

A. General Requirements for System-type Carbon Monoxide Detectors:

1. Comply with UL 2075 and UL 2034; operating at 24-V dc, nominal.
2. Electrochemical sensing technology.
3. Detectors shall be two-wire type.
4. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to fire-alarm control unit.
5. Self-Restoring: Detectors do not require resetting or readjustment after actuation to restore them to normal operation.

B. Integral Visual-Indicating Light: LED type indicating detector has operated and power-on status.

2.7 NOTIFICATION APPLIANCES

A. General Requirements for Notification Appliances: Connected to notification appliance signal circuits, zoned as indicated, equipped for mounting as indicated and with screw terminals for system connections.

1. Combination Devices: Factory-integrated audible and visible devices in a single-mounting assembly, equipped for mounting as indicated and with screw terminals for system connections.

B. Horns: Electric-vibrating-polarized type, 24-V dc; with provision for housing the operating mechanism behind a grille. Comply with UL 464. Horns shall produce a sound-pressure level of 90 dBA, measured 10 feet from the horn, using the coded signal prescribed in UL 464 test protocol.

C. Visible Notification Appliances: Xenon strobe lights comply with UL 1971, with clear or nominal white polycarbonate lens mounted on an aluminum faceplate. The word "FIRE" is engraved in minimum 1-inch high letters on the lens.

1. Rated Light Output: 15/30/75/110 cd, selectable in the field.
2. Mounting: Wall mounted unless otherwise indicated.

3. For units with guards to prevent physical damage, light output ratings shall be determined with guards in place.
4. Flashing shall be in a temporal pattern, synchronized with other units.
5. Strobe Leads: Factory connected to screw terminals.
6. Mounting Faceplate: Factory finished, red.

D. Voice/Tone Notification Appliances (Speakers):

1. Appliances shall comply with UL 1480 and shall be listed and labeled by an NRTL.
2. High-Range Units: Rated 2 to 15 W.
3. Low-Range Units: Rated 1 to 2 W.
4. Mounting: Flush.
5. Matching Transformers: Tap range matched to acoustical environment of speaker location.

2.8 FIREFIGHTERS' TWO-WAY TELEPHONE COMMUNICATION (AREA OF REFUGE)

A. System shall be hands free and shall comply with the Americans with Disabilities Act providing two-way voice communications to a constantly attended location.

B. Units shall have dual audio and visual alarms.

C. System shall provide supervision of area stations and wiring.

D. System shall be furnished complete with all relay cards, amplifiers, etc as required for operation. System shall also be furnished with battery backup or shall be tied to fire alarm system for battery backup. Adjust fire alarm battery capacity accordingly. Equipment enclosures shall be surface mount type.

E. Furnish specified Cornell system or equal by Housing Devices, Inc. Master unit shall have spare capacity as indicated on Drawings.

2.9 MAGNETIC DOOR HOLDERS

A. Description: Units are equipped for wall or floor mounting as indicated and are complete with matching doorplate. Projection of holder and armature must be coordinated with other hardware and wall conditions to ensure that door sits parallel to wall when fully open. Where magnetic holders are used on fire-rated doors, they must be wired into the fire control panel for fail-safe operation.

1. Electromagnet: Requires no more than 3 W to develop 25-lbf holding force.
2. Wall-Mounted Units: Flush mounted unless otherwise indicated.
3. Rating: 120-V ac; or 24-V ac or dc.

B. Material and Finish: Match door hardware.

C. Acceptable Manufacturers and/or Products: LCN, Rixson, Sargent

2.10 REMOTE ANNUNCIATOR

A. Description: Annunciator functions shall match those of fire-alarm control unit for alarm, supervisory, and trouble indications. Manual switching functions shall match those of fire-alarm control unit, including acknowledging, silencing, resetting, and testing.

1. Mounting: Flush cabinet, NEMA 250, Type 1.

B. Display Type and Functional Performance: Alphanumeric display and LED indicating lights shall match those of fire-alarm control unit. Provide controls to acknowledge, silence, reset, and test functions for alarm, supervisory, and trouble signals.

2.11 ADDRESSABLE INTERFACE DEVICE

A. Description: Microelectronic monitor module, NRTL listed for use in providing a system address for alarm-initiating devices for wired applications with normally open contacts.

B. Integral Relay: Capable of providing a direct signal to elevator controller to initiate elevator recall, to circuit-breaker shunt trip for power shutdown and other functions as required.

2.12 DIGITAL ALARM COMMUNICATOR TRANSMITTER

A. Digital alarm communicator transmitter shall be acceptable to the remote central station and shall comply with UL 632 and be listed and labeled by an NRTL.

B. Functional Performance: Unit shall receive an alarm, supervisory, or trouble signal from fire-alarm control unit and automatically capture two (2) telephone lines and dial a preset number for a remote central station. When contact is made with central station(s), signals shall be transmitted. If service on one (1) of the lines is interrupted for longer than 45 seconds, transmitter shall initiate a local trouble signal and transmit the signal indicating loss of telephone line to the remote alarm receiving station over the remaining line. Transmitter shall automatically report telephone service restoration to the central station. If service is lost on both telephone lines, transmitter shall initiate the local trouble signal.

C. Local functions and display at the digital alarm communicator transmitter shall include the following:

1. Verification that both telephone lines are available.
2. Programming device.
3. LED display.
4. Manual test report function and manual transmission clear indication.
5. Communications failure with the central station or fire-alarm control unit.

D. Digital data transmission shall include the following:

1. Address of the alarm-initiating device.
2. Address of the supervisory signal.
3. Address of the trouble-initiating device.
4. Loss of ac supply or loss of power.
5. Low battery.
6. Abnormal test signal.
7. Communication bus failure.

E. Control panel and NAC panel shall receive 120 VAC power via a dedicated branch circuit protected in accordance with the National Electric Code.

1. The system shall support one hundred percent (100%) of notification and initiating devices in alarm or operated at the same time, under both primary (AC) and secondary (battery) power conditions.
2. System shall be provided with sufficient battery capacity to operate the entire system upon loss of normal 120 VAC power in a normal supervisory mode for a period of 60 hours with 5 minutes of alarm operation at the end of this period. Any system cabinets

furnished with independent power supplies and/or batteries shall also meet these requirements.

3. System shall automatically transfer to standby batteries upon power failure. All battery charging and recharging operations shall be automatic.
4. All circuits requiring system operating power shall be 24 VDC and shall be individually fused or equivalently protected at the control unit.
5. The incoming power to the system shall be supervised so that any power failure must be audibly and visibly indicated at the control unit and the annunciator. A green "power on" LED shall be displayed continuously while incoming power is present.
6. If a “LOW BATTERY” condition is left unattended a second stage “DEPLETED BATTERY” trouble condition shall be audibly and visibly reported at the control unit indicating the batteries are below the listed system operating voltage.
7. The system batteries shall be supervised so that a low battery condition or disconnection of the battery shall be audibly and visibly indicated at the control unit and the annunciator.

F. Self-Test: Conducted automatically every 24 hours with report transmitted to central station.

2.13 DEVICE GUARDS

A. Description: Welded wire mesh of size and shape for the manual station, smoke detector, gong, or other device requiring protection.

1. Factory fabricated and furnished by manufacturer of device.
2. Finish: Paint of color to match the protected device.

PART 3 - EXECUTION

3.1 COMMISSIONING OF SYSTEMS AND EQUIPMENT

A. Engage a factory-authorized service representative or technician who is familiar with this project to participate and assist, if necessary, in the functional performance testing of the equipment include in this Division with the Commissioning Agent.

3.2 EQUIPMENT INSTALLATION

A. Comply with NFPA 72 for installation of fire-alarm equipment.

B. Equipment Mounting: Install fire-alarm control unit on wall with tops of cabinets not more than 72 inches above the finished floor.

C. Smoke- or Heat-Detector Spacing:

1. Smooth ceiling spacing shall not exceed 30 feet.
2. Spacing of detectors for irregular areas, for irregular ceiling construction, and for high ceiling areas shall be determined according to Appendix A in NFPA 72.
3. HVAC: Locate detectors not closer than 3 feet from air-supply diffuser or return-air opening.
4. Lighting Fixtures: Locate detectors not closer than 12 inches from any part of a lighting fixture.

D. Duct Smoke Detectors: Comply with NFPA 72 and NFPA 90A. Install sampling tubes so they extend the full width of duct.

E. Carbon Monoxide Detectors: Comply with NFPA 720. Install per manufacturer's instructions and as remotely located from the heating appliance as possible (within room). Detectors shall be individually addressablly monitored and programmed to initiate a supervisory signal.

F. Heat Detectors in Elevator Shafts: Coordinate temperature rating and location with sprinkler rating and location.

G. Remote Status and Alarm Indicators: Install near each smoke detector and each sprinkler water-flow switch and valve-tamper switch that is not readily visible from normal viewing position.

H. Audible Alarm-Indicating Devices: Install not less than 6 inches below the ceiling. Install bells and horns on flush-mounted back boxes with the device-operating mechanism concealed behind a grille.

I. Visible Alarm-Indicating Devices: Install adjacent to each alarm bell or alarm horn and at least 6 inches below the ceiling.

J. Device Location-Indicating Lights: Locate in public space near the device they monitor.

K. Annunciator: Install with top of panel not more than 72 inches above the finished floor.

3.3 CONNECTIONS

A. For fire-protection systems related to doors in fire-rated walls and partitions and to doors in smoke partitions, comply with requirements in Section 087100 "Door Hardware." Connect hardware and devices to fire-alarm system.

1. Verify that hardware and devices are NRTL listed for use with fire-alarm system in this Section before making connections.

B. Make addressable connections with a supervised interface device to the following devices and systems. Install the interface device less than 3 feet from the device controlled. Make an addressable confirmation connection when such feedback is available at the device or system being controlled.

1. Smoke dampers in air ducts of designated air-conditioning duct systems.
2. Alarm-initiating connection to elevator recall system and components.
3. Alarm-initiating connection to activate emergency shutoffs for gas and fuel supplies.
4. Supervisory connections at valve supervisory switches.
5. Supervisory connections at low-air-pressure switch of each dry-pipe sprinkler system.
6. Supervisory connections at elevator shunt trip breaker.

3.4 IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

B. Install framed instructions in a location visible from fire-alarm control unit.

3.5 GROUNDING

A. Ground fire-alarm control unit and associated circuits; comply with IEEE 1100. Install a ground wire from main service ground to fire-alarm control unit.

3.6 FIELD QUALITY CONTROL

A. Field tests shall be witnessed by authorities having jurisdiction.

B. Perform tests and inspections.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

C. Tests and Inspections:

1. Visual Inspection: Conduct visual inspection prior to testing.

a. Inspection shall be based on completed Record Drawings and system documentation that is required by NFPA 72 in its "Completion Documents, Preparation" Table in the "Documentation" Section of the "Fundamentals of Fire Alarm Systems" Chapter.
b. Comply with "Visual Inspection Frequencies" Table in the "Inspection" Section of the "Inspection, Testing and Maintenance" Chapter in NFPA 72; retain the "Initial/Reacceptance" column and list only the installed components.

2. System Testing: Comply with "Test Methods" Table in the "Testing" Section of the "Inspection, Testing and Maintenance" Chapter in NFPA 72.
3. Test carbon monoxide detectors in accordance with NFPA 720.
4. Test audible appliances for the public operating mode according to manufacturer's written instructions. Perform the test using a portable sound-level meter complying with Type 2 requirements in ANSI S1.4.
5. Test audible appliances for the private operating mode according to manufacturer's written instructions.
6. Test visible appliances for the public operating mode according to manufacturer's written instructions.
7. Factory-authorized service representative shall prepare the "Fire Alarm System Record of Completion" in the "Documentation" Section of the "Fundamentals of Fire Alarm Systems" Chapter in NFPA 72 and the "Inspection and Testing Form" in the "Records" Section of the "Inspection, Testing and Maintenance" Chapter in NFPA 72.

D. Reacceptance Testing: Perform reacceptance testing to verify the proper operation of added or replaced devices and appliances.

E. Fire-alarm system will be considered defective if it does not pass tests and inspections.

F. Prepare test and inspection reports.

G. Maintenance Test and Inspection: Perform tests and inspections listed for weekly, monthly, quarterly, and semiannual periods. Use forms developed for initial tests and inspections.

H. Annual Test and Inspection: One year after date of Substantial Completion, test fire-alarm system complying with visual and testing inspection requirements in NFPA 72. Use forms developed for initial tests and inspections.

3.7 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain fire-alarm system.

END OF SECTION 283111

SECTION 310800 - EARTHWORK

PART 1 - GENERAL

1.1 DESCRIPTION

A. General: Perform earthwork in accordance with the Contract Documents.

B. Work Included: Work of this Section includes all labor, materials, equipment, and services necessary to complete the excavation, foundations, subgrade preparation, filling and grading as shown on the Drawings and specified herein including, but not limited to the following:

1. Removal and replacement beneath the building pad, foundations, utilities, and hardscape features as detailed in the project geotechnical report.
2. All earth excavation to the bottom of foundations, walls, pits, slabs, manholes, etc. as required and indicated on the Contract Drawings, or to a lower elevation to achieve required bearing capacity, as directed by the Owner's Geotechnical Engineer.
3. Excavation, filling and rough grading of site area at adjacent structures and roadways as required and within the Contract Limit Line.
4. Excavation, filling, grading and compacting to required elevations for all floors, slabs on grade, and structural slabs.
5. Excavation, filling, grading and compacting to required elevations for appurtenances and site work.
6. Filling and compacting of soil below foundation slab-on-grades, behind below grade walls, and beneath structural slabs.
7. Legal disposing off the site, of surplus excavated materials unsuitable for filling or backfilling.
8. Pumping and dewatering as required for work of this section and for foundation work.
9. Subgrade preparation for foundations.
10. Protection and monitoring of adjacent structures, structures to remain, utilities, and pavements.
11. Other labor and materials as may be reasonably inferred to be required to make the work under this Section complete.

C. The contractor shall coordinate all earthwork activities with the specialty ground improvement contractors such that all slab, foundation, utilities, and hardscape features bear on natural/competent material, are improved with ground improvement elements, or are addressed through a removal and replacement program. See geotechnical report.

D. The contractor shall coordinate all work with the specialty ground improvement contractor in the vicinity of utilities to remain. See geotechnical report.

1.2 RELATED SECTIONS

A. Concrete

B. Rock Excavating

C. Construction Drawings and Documents

1.3 REFERENCES

A. General: All work and materials under this section shall conform to the latest revision of the following standard specifications, where not otherwise required by the Contract Documents.

American Society for Testing and Materials (ASTM) – latest edition.

1. C 136 Test for Sieve Analysis of Fine and Coarse Aggregates.
2. D 422 Method for Particle Size Analysis of Soils.
3. D 1140 Test for Amount of Material in Soils Finer than No. 200 (75 mm) Sieve.
4. D 1556 Test for Density and Unit Weight of Soil in Place by the Sand-Cone Method.
5. D 1557 Test for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3) (Modified Proctor).
6. D 2216 Laboratory Determination of Moisture content of Soil and Rock Mass.
7. D 2487 Classification of Soils for Engineering Purposes (Unified Soil Classification System).
8. D 6938 Tests Methods for In-Place Density and Water Content of Soil and Soil- Aggregate in Place by Nuclear Methods (Shallow Depth).
9. D 4253 Test Method of Maximum Index Density and Unit Weight of Soils Using a Vibratory Table.
10. D 4254 Test Methods for Minimum Index Density and Unit Weight of Soils and Calculations of Relative Density.
11. D 4318 Test for Plastic Limit, Liquid Limit, and Plasticity Index of Soils.
12. D 1883 Test Method for California Bearing ratio (CBR) of Laboratory Compacted Soils.

B. American Association of State Highway and Transportation Officials (AASHTO) – Latest edition.

1. T 88 Mechanical Analysis of Soils.

C. All work shall comply with the requirements of the 2018 Connecticut State Building Code (IBC 2015), and the requirements and regulations of any other Federal, State, or Local ordinances having jurisdiction.

D. All work and materials under this section shall conform to the following references:

1. Geotechnical Engineering Study, prepared by Langan

E. Limits of Ground Improvement Work

1. See geotechnical report.
2. See structural and landscape plans.

F. Connecticut DOT Form 818.

1.4 SUBMITTALS

A. Within ten days after award of the contract, the Contractor shall submit a schedule detailing the sequence, and time of completion of all phases of work under this section.

B. At least two weeks in advance of imported fill use, the Contractor shall submit the following laboratory test data and a 25-pound soil sample to the Owner’s Geotechnical Engineer for review and approval:

1. Contractor to submit test reports on borrow material as follows:

a. Moisture and Density (modified proctor) Relationship: ASTM D1557.
b. Mechanical Analysis: AASHTO T-88.
c. Moisture content in accordance with ASTM D 2216.

d. Relative Density: ASTM D4254.
e. California Bearing Ratio (CBR): ASTM D1883, if utilized as subgrade material beneath paved areas.
f. Plasticity Index: ASTM 4318.
g. Test for Sieve Analysis of Fine and Coarse Aggregates: C 136.

2. Include data for all samples indicating the exact location and methods of transportation and placement of all materials.

3. Submit documentation for each of the imported material certifying them as “Clean Fill” in accordance with Part 2, Section 2.1, Article A of this specification and in accordance with Specification 02 6113.

C. The contractor shall submit the name of each material supplier and specific type and source of each material. Any change in source or soil type throughout the job requires approval of the Builder and the Owner’s Consultants.

D. Samples: Submit a 12 inch by 12 inch sample of geosynthetic filter fabric.

E. Temporary Excavation Support Shop Drawings:

1. Submit detailed shop drawings and calculations, to be reviewed by the Owner’s Geotechnical Engineer, of earthwork procedures and sequences including temporary excavation support systems, if required.
2. The temporary excavation support system drawings shall bear the signature and seal of a Professional Engineer registered in the State of Connecticut.

F. Dewatering: The contractor shall prepare dewatering shop drawings. The dewatering plan shall be designed by the contractor’s engineer.

G. Pre-Construction Conditions Survey: The Contractor will perform a pre-construction conditions survey of all immediate offsite adjacent structures and surrounding critical site features, the results of which will be made available to the Owner and Design Team upon completion of the survey (include digital copies of photographs). The survey shall consist of photographic and video documentation and shall include a plan detailing the limits of the work and any observed damage.

H. Monitoring: Submit a plan showing location of proposed vertical and horizontal control points. Submit survey readings of the control points within 24 hours of the survey. Plan and survey readings shall be signed and sealed by a Land Surveyor registered in the State of Connecticut.

I. Certification for Examination of Site and Records: Before proceeding with the Work, submit certification in an acceptable form, signed by the Contractor, stating that careful examination has been made of the site, existing structures, records of utility lines, test boring records, test pit records, and subsurface exploration reports by the Owner’s Geotechnical Engineer, the Drawings, and all other Contract Documents.

J. Submit approvals and permits to the General Contractor a minimum of 15 days prior to commencement of construction.

1.5 ENVIRONMENTAL CONSIDERATIONS

A. Install erosion control measures in the sequence shown of the plans or as directed by the Architect or regulatory agencies to protect adjacent properties and water resources from erosion and sediment damage.

B. Any off-site soil disposal requirement shall be performed in accordance with all applicable Local, State, and Federal regulations governing soil movement and disposal.

C. Dust and Erosion Control:

1. The Contractor shall take all necessary measures and provide equipment and/or materials to minimize dust from rising and blowing across the site and also to control surface water throughout the operation so that it does not run onto paved ways without being filtered. In addition, the Contractor shall control all dust created by construction operation and movement of construction vehicles, both on site and on paved ways. Comply with the 2002 Connecticut Sediment and Erosion Control Guidelines.

1.6 PROJECT CONDITIONS

A. The Contractor, by careful examination, shall inform himself as to the nature and location of the work; the conformation of the ground, the nature of the subsurface conditions; the location of the groundwater table; the character, quality and quantity of the materials to be encountered; the character of the equipment and facilities needed preliminary to and during the execution of the work; the conditions of adjacent structures and utilities and all other matters which can in any way effect the work.

B. The Contractor shall be held to have visited the site and to have familiarized himself with the existing conditions of adjoining utilities and structures.

C. The Contractor shall make his own deductions of the subsurface conditions which may affect the methods or cost of construction of the work hereunder, and he agrees that he will make no claims for damages or compensations, except as are provided under the agreement, should he find conditions during the progress of the work different from those as calculated and/or anticipated by him. Additional borings and other exploratory operations may be performed by Contractor, at the Contractor's option and following the Owner's approval. No change in the Contract Sum will be authorized for such additional exploration undertaken by the Contractor.

D. The Contractor shall investigate the conditions of public thoroughfares and roads as to availability, clearances, loads, limits, restrictions, and other limitations affecting transportation to, ingress and egress of the site of the work. The Contractor shall conform to all University, City and State, and Federal regulations concerning the transportation of materials to and from and at the job site and shall secure in advance such permits as may be required.

1.7 PRE-CONSTRUCTION CONDITION SURVEY

A. The Contractor shall perform a pre-construction conditions survey of the structures and critical site features immediately adjacent to the work area, prior to the start of work and shall include the results of this survey with their shop drawings submittal to the Owner and Design Team before commencement of said work.

1.8 PROTECTION

A. Protection of Adjacent Structures, Utilities and Pavements

1. Prior to commencement of any work, consult the records for existing utilities, and note all conditions and limitations, which might affect the work required under this section.
2. The Contractor shall become acquainted with the existence and location of all surface and subsurface structures and utilities within the project area. Contractor shall not damage any of those that are to remain and shall leave them accessible.
3. The work shall be executed so that no damage or injury will occur to existing public and adjoining or adjacent structures, streets, paving, sewers, gas, water, electric or any other pipes. Should any damage or injury caused by the contractor, or anyone in Contractor's employ, or by the work under this Contract occur, the Contractor shall, at his own expense, make good such damage and assume all responsibility for such injury.

4. Provide barricades and warning lights, barriers, etc., to prevent accidents, to avoid all necessary hazards and protect the public, the work, and property at all times, including Saturdays, Sundays, and holidays.
5. The above shall also include the protection of all existing utilities to remain in use within and adjacent to the area affected by the work of this project.
6. Monuments, bench marks and other reference features on streets bounding this project, shall be protected. Should these be disturbed in any manner, the Contractor shall have them replaced at own expense.
7. Excavation work shall be restricted to hours indicated in the Contract Documents.
8. The Contractor's surveyor shall install control points on the adjacent structures and pavement for vertical and horizontal monitoring (to the nearest 0.005 ft.). Control points shall be monitored weekly during excavation and foundation construction work.

B. Protection of Excavation Bottoms

1. Facilities and materials needed to prevent earth at bottom of excavation from becoming frozen or unsuitable to receive the foundations shall be furnished.
2. The excavation shall not be carried to final grades during freezing weather without providing complete protection against freezing of the subgrades as specified hereinafter. Complete protection against freezing shall also be provided if freezing weather sets in after completion of the excavation to final subgrade. This protection shall include adequate heating and coverage of the area to maintain temperatures above freezing until foundations have been concreted and backfilled.
3. Where excavations have been brought to the bottom elevations called for on the drawings, and the bottom of these excavations become unsuitable in the opinion of the Owner's Geotechnical Engineer because of inadequate protection by the Contractor, these excavations shall be carried to lower depths sufficient to provide stable bearing as determined by the Owner's Geotechnical Engineer.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Imported Material: Imported fill should consist of a relatively well-graded mixture of sand and gravel. Suitable imported fill should be free of organics, clay, excessive silt, other deleterious or compressible materials, cinders, frozen material, trash, masonry, rubble, and other deleterious materials. In addition, any approved imported fill should be free of all hazardous substances. Grain-size distribution and modified Proctor compaction tests (ASTM D1557) should be made on representative samples of the imported fill proposed.

B. Imported clean fill shall be "Clean Fill" as defined in the Solid Waste Regulations found at Section 22a-209-1 of the Regulations of Connecticut State Agencies: "Clean fill" means (1) natural soil (2) rock, brick, ceramics, concrete, and asphalt paving fragments which are virtually inert and pose neither a pollution threat to ground or surface waters nor a fire hazard and (3) polluted soil as defined in subdivision (45) of subsection (a) of section 22a-133k-1 of the Regulations of Connecticut State Agencies which soil has been treated to reduce the concentration of pollutants to levels which do not exceed the applicable pollutant mobility criteria and direct exposure criteria established in sections 22a-133k-1 through 22a-133k-3 of the Regulations of Connecticut State Agencies and which soil is reused in accordance with R.C.S.A. subdivision (3) of subsection (h) of section 22a-133k-2 of such regulations. Documentation, including, but not limited to laboratory analytical reports and source location, shall be provided for review and approval by owner or owner's Licensed Environmental Professional prior to the importation of clean fill materials.

C. 3/4-Inch Crushed Stone: Crushed stone shall be a quarry product or washed gravel stone obtained from offsite sources for use as detailed on the drawings. Crushed stone shall consist of durable crushed rock or gravel stone essentially free of silt, clay, loam or other deleterious materials and shall conform to the following graduation requirements for the nominal size indicated.

SQUARE MESH SIEVES	PERCENT FINER BY WEIGHT
Pass 1 Inch	100
Pass 3/4 Inch	90 – 100
Pass 1/2 Inch	20 – 55
Pass 3/8 Inch	0 – 15
Pass No. 4	0 – 5

D. Surface Aggregate Course: Naturally or artificially graded non-plastic mixture of durable, sound coarse and fine aggregate and obtained from offsite sources. Mixture to be free of debris, waste, frozen materials, and organics, and shall be well graded within the following limits (processed stone, no gravel) and conforming to the requirements of CT DOT 817 M.02.06 Grading C:

SQUARE MESH SIEVES	PERCENT FINER BY WEIGHT
Pass 1.5 Inch	100
Pass 3/4 Inch	45-80
Pass 1/4 Inch	25-60
Pass No. 10	15-45
Pass No. 40	5-25
Pass No. 100	0-10
Pass No. 200	0-5

E. Base: Naturally or artificially graded non-plastic mixture of durable, sound coarse and fine aggregate and obtained from offsite sources. Mixture to be free of debris, waste, frozen materials, and organics, and shall be well graded within the following limits (processed stone, no gravel):

SQUARE MESH SIEVES	PERCENT FINER BY WEIGHT

Pass 2-1/2 Inch	100
Pass 2 Inch	95 - 100
Pass 3/4 Inch	50 - 75
Pass 1/4 Inch	25 - 45
Pass No. 40	5 - 20
Pass No. 100	2 - 12

F. Subbase: Subbase material for use as pavement subbase course and other uses as detailed shall be obtained from offsite sources. Base shall consist of a non-plastic mixture of durable, sound coarse and fine aggregate with no more than 15 percent by weight of recycled bituminous concrete and shall be well graded within the following limits:

SQUARE MESH SIEVES	PERCENT FINER BY WEIGHT
Pass 3-1/2 Inch	100
Pass 1-1/2 Inch	55 - 100
Pass 1/4 Inch	25 - 60
Pass No. 10	15 - 45
Pass No. 40	5 - 25
Pass No. 100	0 - 10
Pass No. 200	0 - 5

G. Bedding Material:

1. Type "A" Bedding: Well-graded gravels and gravel sand mixtures free of debris, waste, frozen materials, and organics within the following limits:

SQUARE MESH SIEVES	PERCENT FINER BY WEIGHT
Pass 1-1/2 Inch	100
Pass No. 4	10 - 50
Pass No. 200	0 - 5

2. Type "B" Bedding: Sand or sandy soil free of debris, waste, frozen materials, and organics within the following limits:

SQUARE MESH SIEVES	PERCENT FINER BY WEIGHT
Pass 3/8 Inch	100
Pass No. 4	100 - 95
Pass No. 200	0 - 10

H. Granular Fill (Also Termed Structural Fill): Granular fill shall be obtained from offsite borrow sources for use as fill and backfill below and interior to building areas except where other materials are specified or detailed, and as details on the drawings. Granular fill shall consist of non-plastic naturally or artificially graded mixture of sound coarse and fine aggregates free of debris, waste, frozen materials and organics and conforming to the following gradation:

SQUARE MESH SIEVES	PERCENT FINER BY WEIGHT
Pass 3-1/2 Inch	100
Pass 1-1/2 Inch	55 – 100
Pass 1/4 Inch	25 – 60
Pass No. 10	15 – 45
Pass No. 40	5 – 25

Pass No. 100	0 – 10
Pass No. 200	0 – 5

I. General Fill: Clean, sound mixture of satisfactory soils free of debris, waste, frozen materials and organics with 3-inch maximum size aggregate and not more than 12 percent passing the No. 200 sieve.

J. Flowable / Excavatable Fill: Mixture of cement, GranCem, sand, water and admixtures to produce a flowable / excavatable fill with a compressive strength at 28 days of 100 psi to 150 psi.Crushed Stone/Crushed Gravel/Drainage Aggregate: Free draining natural clean, crushed durable stone free of deleterious materials and conforming to the gradation requirements commercially known as ¾-inch clean crushed durable stone (AASHTO No. 57 or approved alternative). Recycled concrete aggregate shall not be acceptable.

K. Processed Aggregate: Coarse and fine aggregates mixed to conform to the gradation requirements of M.05.01 material as defined on Connecticut DOT Form 818.

L. The use of recycled concrete aggregate (RCA) is not permitted as a drainage backfill material against structures.

M. Filter Fabric: Mirafi 140N manufactured by TC Mirafi or approved equivalent woven geotextile filter fabric where specified.

N. The use of mole rock is not permitted.

PART 3 - EXECUTION

3.1 CODES, PERMITS AND REGULATIONS

A. Comply with all applicable laws, rules, and ordinances and regulations of the Federal Government, Connecticut, and other jurisdictions.

B. Obtain and pay for all permits and licenses required to execute and complete the work.

C. In case of conflict between regulations and specifications, the Contractor shall comply with the most stringent applicable codes, regulations or specifications.

3.2 PUMPING AND DEWATERING

A. Provide adequate pumps, or other equipment, appurtenances, power, drains, materials and labor necessary to excavation continuously dry during excavation, foundation construction, and backfilling and at such other times as the progress of the work may demand or as necessary to insure safety to the structure shall be provided.

B. All pumping both inside and outside the areas of the building shall be performed, continued and maintained as required for the completion of all work, including the work of the mechanical trades, throughout the period of the contract.

C. Contractor shall manage runoff to limit impact on construction.

D. The dewatering system or systems shall be installed and operated in such a manner as to avoid the movement of fines or loss of ground from below the bearing level and shall not influence the stability of surrounding areas. The facilities needed to eliminate loss of ground shall be included.

E. The Contractor shall not use any portion of the building foundation units or any part thereof as a sump for drainage resulting from pumping in any other area. The Contractor shall not conduct water to privately owned properties.

F. Any pumped groundwater which will require off-site disposal shall comply with all Local, State, and Federal Environmental Regulations.

3.3 EXCAVATION

A. Removal and Replacement

1. The existing fill and peat material within the limits of the proposed building are not suitable for foundation or slab support in their current state. In areas where the depths of unsuitable material, as documented in the geotechnical report referenced herein, are relatively shallow, the contractor may elect to perform a removal and replacement program in lieu of ground improvement (outlined in the ground improvement specification).
2. In areas of the removal and replacement program, the Contractor shall removal all unsuitable material to the top of natural stratified sand and gravel, weathered rock, or bedrock material within the footprint in this area and beyond (i.e. exterior edge) a horizontal distance equal to the depth of the over-excavation below the proposed footing elevation. The contractor shall minimize disturbance of the natural material using appropriate techniques (i.e., flat plate welded across bucket of backhoe). Contractor shall backfill accordingly to proposed grades with structural fill as defined herein.
3. Contractor shall coordinate all removal/replacement work with the architectural, structural, and site drawings.
4. The base or bottom of the excavation shall be as-built and overlain upon the foundation (within the building) or site plan (throughout the site). The contractor's licensed professional surveyor shall provide this information to the Geotechnical and Structural Engineer.
5. In lieu of structural fill, the contractor may use drainage fill (stone) to assist with backfilling operations in proximity to the dewatered level of the groundwater. Drainage fill shall be placed in maximum 12-inch thick lifts and compacted with appropriate equipment to achieve densification. A properly designed geosynthetic filter fabric (Mirafi 140N or equivalent) shall be placed on the top and sides of the drainage fill to serve as a means of preventing migration of overlying soil fill into the drainage fill layer.
6. The contractor shall proofroll the bottom of the excavation prior to placement of structural fill or drainage stone or excavate in a manner so as to obtain a firm and unyielding condition of the surface of the sand and gravel with excavation techniques which minimize disturbance. The excavation subgrade shall be observed and approved by the Owner's Geotechnical Engineer prior to the placement of any structural fill or drainage fill material. The excavation shall be maintained in a dewatered condition such that observation of the surface of the excavation and subsequent backfilling can be accomplished in a relatively dry condition. Should soft or yielding conditions be observed, the contractor shall remove and replace this material with approved suitable compacted material. If alternative drainage fill material is to be utilized by the contractor based on particular circumstances, the proposed material shall be submitted to the Owner's Geotechnical Engineer for review and approval.

B. General

1. Excavation work shall include removal and disposal of all materials encountered regardless of the nature of the materials and shall be understood to include but not limited to rock, boulders, earth, hardpan, fill, structures, utilities, pavements, curbs, piping and debris, and others. Re-use of existing fill material shall only be permitted if the material meets the requirements for structural fill.
2. All excavation shall extend to the dimensions and elevations required for the installation of the work described herein and as indicated on the Drawings. Excavation shall be made to a depth that will allow installation of full depth of concrete slabs, and sub-base as shown on the Drawings and within a 1 inch tolerance. Excavation lines shall provide sufficient clearance for the proper execution of all concrete work, including allowances for form work, shoring and inspection.
3. Materials that in the opinion of the Owner's Geotechnical Engineer are not suitable for fill and any surplus earth shall be removed from the site and legally disposed off-site.
4. Existing utility lines to be retained that are shown on the drawings or the locations of which are made known to the Contractor prior to excavation operations, shall be protected from damage during excavation and backfilling, and if damaged, shall be repaired by the Contractor, at own expense.

C. Excavation for Foundations

1. Foundation subgrades shall be inspected and approved by the Owner’s Geotechnical Engineer before proceeding with the construction of foundations. Bottoms of footings shall be founded on the natural sand and gravel material, structural fill or fill improved via rammed aggregate piers or controlled modulus columns having net allowable uniform bearing pressures as specified in the Structural Drawings and as approved by the Owner’s Geotechnical Engineer.
2. Subgrade of foundations shall be level and free of loose soil, debris, standing water and frost prior to acceptance for placing concrete. A Geotechnical Engineer shall inspect and approve the foundation subgrade to verify that the subgrade material is adequate to provide the recommended allowable bearing pressure.
3. Unauthorized Excavation: When suitable bearing material is encountered at subgrade elevations shown on Drawings and excavation is made to greater depth, the foundations and foundation walls shall be extended to the lower elevation with concrete of the same strength used for the foundations, at no additional cost to the Owner.

D. Subgrade Preparation

1. Natural undisturbed material shall be graded and compacted to attain a uniform surface. These areas shall be determined by the Owner’s Geotechnical Engineer.
2. Prior to constructing foundations, slabs, utilities, utility structures, fields, and paved/hardscape areas, the subgrade shall be proofrolled in the presence of the Owner’s Geotechnical Engineer for the following conditions:

    a. Subgrades shall be proofrolled with a minimum of six passes of a 10-ton roller. For all other subgrades, proofrolling shall be accomplished with a minimum of six passes of a 5-ton walk-behind vibratory roller.
    b. Foundation elements shall not be placed until the subgrade is approved by the Owner’s Geotechnical Engineer. All structural fill footing subgrades shall be tested to confirm the top lift of the footing subgrade is compacted to the project specified requirement for structural fill material.
    c. Soft Areas during Compaction: If any areas show pumping, noticeable weaving, or which are otherwise unsatisfactory, undercut material to competent material within the limits and extent suggested by the Owner’s Geotechnical Engineer. These areas shall be replaced with either concrete of the same strength used for the foundation or structural fill, compacted to 95% of maximum dry density by ASTM D1557. The appropriate water content at the time of compaction should be plus or minus

2 percentage points of optimum moisture content as determined by the laboratory compaction test aforementioned, unless otherwise directed by the Engineer of Record. If structural fill is utilized, the excavation shall be oversized to include the zone of influence (1H:1V) beneath and beyond the footing and footing level.

d. Subgrades should be excavated level and if any cobbles or boulders are encountered at the footing subgrade level such that a relatively level subgrade is not achieved, the cobbles or boulders should be removed and replaced with compacted structural fill or compacted crushed stone.

e. Consideration should be given to protecting the natural sand and gravel subgrades after excavation utilizing either clean, crushed, durable, compacted ¾ inch stone, or a mud mat.

E. Excavation for General Grading:

1. Excavations made below the elevations shown or specified, unless authorized by Change Order, shall be filled and compacted as hereinafter specified, at no additional cost.

F. Trench Excavation:

1. Unless otherwise shown or specified, make trenches for piping and utilities not less than 16 inches or more than 24 inches wider than the outside width of the piping or utilities. Accurately grade bottoms of trenches with bell holes scooped out to provide uniform bearing and support of pipe and utilities on undisturbed soil throughout its entire length, except where other means of supporting pipe are indicated.
2. Trenches for underground conduit and piping, where necessary, shall be excavated to the required depth and bell holes shall be provided where necessary to insure uniform bearing. Trench excavation lines shall provide sufficient clearance for the proper execution of underground mechanical work.
3. Trenches shall be by open cut from the surface. No tunneling will be allowed except by consent of the Owner's Geotechnical Engineer. Irregularities at bottom of trench, or where excavation is below required depth, shall be refilled to required grade with compacted granular fill.
4. Pipe trenches shall be excavated and minimum cover shall be provided to required depths as per the Connecticut State Building Code. Excavated materials adjacent to trench as directed shall be neatly banked.
5. Where trenches are in wet or soft ground that in the opinion of the Owner's Geotechnical Engineer is unsuitable for supporting the piping, concrete cradles or approved equivalent shall be installed.
6. Where necessary, the sides of trenches and excavations shall be supported by adequate sheeting and bracing and conform with applicable OSHA regulations to insure proper construction and safety of the workers. The Contractor will be held responsible for the sufficiency of sheeting and bracing and for all damages to property or injury to persons resulting from improper quality, strength, placing, maintaining and removing of same.
7. Prior to utility installation, soil subgrades in the utility trenches should be proofrolled as specified herein. Pipe bedding should be placed and compacted in accordance with the pipe manufacturer's requirements or as indicated in the Drawings, whichever is more stringent.
8. Immediately after piping has been installed, tested, inspected, and accepted, piping shall be filled around with special care to solidly fill voids without causing injury to piping. Up to two feet above the pipe's crown, the utility excavation shall be backfilled using structural fill placed in 4-inch thick loose lifts. For the remainder of trench backfill, the excavation shall be backfilled using structural fill placed in 12-inch thick loose lifts. Each layer shall be compacted before placing the next layer. Backfill shall be in such a manner so as to prevent future settlement.

3.4 FILLING AND COMPACTING

A. General

1. Do not commence filling and backfilling operations until construction below finish grade has been approved, underground utilities and mechanical items inspected and tested, forms removed, waterproofing or damproofing and other improvements installed, trash and debris removed, and temporary and permanent bracing installed.
2. Do not commence backfilling, filling and grading until existing subgrade has been compacted to 95% of the material's maximum dry density as determined by the Modified Proctor Compaction Test (ASTM D1557).
3. Fill all excavations, backfill against all walls, and do all filling and grading necessary to bring the surfaces to the level required.
4. No fill material shall be placed on areas where free water is standing, or frozen subsoil area, or on surface which have not been approved for fill placement by the Owner's Geotechnical Engineer.
5. Do not backfill against concrete elements until the concrete has obtained its specified compressive strength.
6. Perform backfilling around foundation walls when the first floor provides sufficient bracing to withstand the backfill pressure. All other fill, backfill, and rolling to approximately finished grades shall then be completed.
7. Take particular care when rolling over areas where trenches or other excavations have been made and backfilled.
8. Grade bottoms of pavements and area way bottoms toward sediment pits or catch basins to maintain uniform thickness of the slabs.

B. Grading

1. Prior to placing fill or backfill in any area, grading is to be performed as required to provide for drainage. Ditching or filling around the area will be performed to intercept or divert all surface water. Within the area the ground which fill is to be placed will be graded so as to provide for unobstructed drainage from every point to a sump or other disposal point.
2. On completion of grading as specified above, closely examine to determine whether excessive wetness, springs, or other seepage of water can be observed at any point. If such conditions exist, positive drainage in suitable form, such as french drains or tilling, must be provided before placement of fill is undertaken.

C. Placement and Compaction of Controlled Fill and Backfill

1. Placement

a. Begin fill and backfilling in the lowest section of the area. Spread material evenly by mechanical equipment or by manual means above the approved compacted subgrade in lifts not exceeding 10 to 12 inches for material compacted by heavy machinery and 4 inches for material compacted by hand tamping. Build layers as horizontally as practical to prevent thickness of lift from exceeding that specified but provide with sufficient longitudinal and transverse slope to provide for runoff of surface water from every point.

b. Moisture Control: The moisture-density curve for the fill use shall be supplied to the Contractor as a guide in controlling moisture to achieve the required degree of compaction. If, in the opinion of the Owner's Geotechnical Engineer, fill material becomes too wet for the required compaction, the fill shall be dried by a method approved by the Owner's Geotechnical Engineer prior to commencing or continuing compaction operations. Likewise, if, in the opinion of the Owner's Geotechnical Engineer, the fill material becomes too dry for the required compaction, the fill shall be moistened by a method approved by the Owner's Geotechnical Engineer prior to commencing or continuing compaction operations. The water content at the time of compaction should be within 2% points of the optimum water content.

2. Compaction: Compact each lift to 95% of the maximum dry laboratory density by ASTM D1557. The degree of compaction shall be checked by the Owner's Geotechnical Engineer and each successive lift shall not be placed or compacted until the previous lift is inspected and approved by the Owner's Geotechnical Engineer. Compact the fill and backfill to elevations and limits shown on Drawings and is subject to final inspection and approval by the Owner's Geotechnical Engineer.
3. Drainage During Fill Operation: At all times, maintain and operate proper and adequate surface and subsurface drainage to the satisfaction of the Owner's Geotechnical Engineer in order to keep the construction site dry and in such condition that placement and compaction of fill may proceed unhindered by saturation of the area.
4. Frost: Do not place fill materials when either the fill materials or the previous lift (or subgrade) on which it is placed is frozen. In the event that any fill which has already been placed on the surface shall become frozen, it shall be scarified and re-compacted, or removed, to the approval of the Owner's Geotechnical Engineer before the next lift is placed. Remove or re-compact any soft spots resulting from frost to the satisfaction of the Engineer before new fill is placed.

3.5 MAINTENANCE

A. Protection of Graded Areas: Protect newly graded areas from traffic and erosion. Keep free of trash and debris.

B. Repair and re-establish grades in settled, eroded, and rutted areas to specified tolerances.

C. Reconditioning Compacted Areas: Where completed compacted areas are disturbed by subsequent construction operations or adverse weather, scarify surface, reshape, and compact to required density prior to further construction.

D. Settling: Where settling is measurable or observable at excavated areas, remove surface (pavement, lawn, or other finish), add backfill material, compact, and replace surface treatment. Restore appearance, quality, and condition of surface or finish to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

3.6 QUALITY CONTROL AND INSPECTION

A. The Owner will employ, at his own expense, a Geotechnical Engineer to review all laboratory test results and submitted reports specified in this Section.

B. The Owner's Geotechnical Engineer will interpret the tests, state in each report whether or not the test specimens and results comply with all requirements of the Contract Documents and note any deviations.

C. The Owner's Geotechnical Engineer will identify when and where samples are to be obtained. Contractor shall collect samples and forward them to the Owner's Testing Laboratory for testing. Testing Laboratory will submit the following laboratory test reports to the Owner's Geotechnical Engineer:

1. Laboratory results conducted on each type of borrow and fill material:

    a. Gradation Analysis ASTM D422.
    b. Atterberg limits ASTM D 4318.
    c. Modified Moisture-density curve determination ASTM D1557.

2. Owner's Geotechnical Engineer will determine the conformance of materials to be used for fills.

D. Field Inspection:

1. Foundation Subgrades: Foundation subgrades shall be inspected by Owner's Geotechnical Engineer to verify the design bearing capacities. The bottom of excavation prior to placement of structural fill shall be observed and approved by the Owner's Geotechnical Engineer prior to placement of structural fill. No foundation shall be constructed unless the Owner's Geotechnical Engineer approves the subgrade.
2. Proofrolling: Proofrolling where required shall be inspected by Owner's Geotechnical Engineer.
3. Paved Area and Building Slab Subgrades: Owner's Geotechnical Engineer shall inspect subgrades for paved areas and building slabs. No pavement or slab shall be constructed unless the subgrade approved by the Owner's Geotechnical Engineer.
4. Backfilling and Compaction: Backfilling and compaction below paved areas, building slabs, behind the foundation walls, and any other backfilling and compaction work shall be inspected by the Owner's Geotechnical Engineer. No fill shall be placed unless the previous lift is approved by the Owner's Geotechnical Engineer. Owner's Geotechnical Engineer will take field density tests of the subgrade for every 2,500 sq- ft. but not less than 3 tests in each compacted fill layer. All footing subgrades within structural fill shall have field density tests. Perform field density tests in accordance with ASTM D6938.

E. Contractor shall cooperate with the Owner's Geotechnical Engineer in the performance of the required tests.

3.7 DISPOSAL OF EXCAVATED MATERIALS

A. Legally dispose the excavated material to an off-site disposal facility, in accordance with all Local, State, and Federal Environmental regulations.

3.8 ERRORS IN DEPTH

A. In the event that any part of the excavation is carried, through error, beyond the depth and the dimensions indicated on the drawings of called for in the specifications, then the Contractor, at his own expense, shall furnish and install gravel or stone with which to fill to the required level, in all locations except beneath footings and piers. At these locations, Contractor shall be required to fill to level of bottom footing with concrete mixed in the proportion of the foundations bearing on them. Where established bottoms as shown on drawings have not been maintained or have been disturbed by operations under this contract, they shall be cleaned out and filled with concrete mixed in the proportion of the footings bearing upon them, without additional cost to the Owner.

END OF SECTION 310800

SECTION 311100 – CLEARING AND GRUBBING

PART 1 – GENERAL

1.1 RELATED SECTIONS AND DOCUMENTS

A. Drawing and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

B. The applicable provisions of the Connecticut Edition of the International Building Code, latest edition or as enforced by the local agency.

C. Architectural and Structural Plans and Specifications where the architectural and structural requirements are more stringent than the requirements outlined herein.

D. Section 02 01 00 – Protection of Existing Utilities

E. Section 31 25 00 – Soil Erosion and Sediment Control

F. Section 31 08 00 – Earthwork

1.2 SCOPE OF WORK

A. Clearing Site of debris, grass, trees, and other plant life in preparation for Site or building earthwork.

B. Protection of existing structures, trees, or vegetation indicated in contract documents to remain.

C. Removal of existing sidewalks, drives, curbs, etc.

D. Removal of asphalt pavement and athletic courts where indicated on contract documents and as specified herein.

E. Stripping topsoil, if necessary, from areas that are to be incorporated into limits of project.

F. Disposal of cleared, grubbed, and stripped materials in accordance with all applicable codes and ordinances.

1.3 REFERENCE STANDARDS

The Connecticut Department of Energy & Environmental Protection’s (CTDEEP) Guidelines for Soil Erosion and Sediment Control, latest edition.

1.4 ENVIRONMENTAL REQUIREMENTS

A. Construct temporary erosion control systems to protect adjacent properties and water resources from erosion and sedimentation.

B. Contractor shall be totally responsible for conducting soil erosion and sediment control and the storm water management practices in accordance with all applicable permits and for enforcement action taken or imposed by federal or state agencies, including cost of fines, construction delays, and remedial actions resulting from contractor's failure to comply with all provisions of the applicable permits.

1.5 PROJECT CONDITIONS

A. Contractor to provide a thorough inspection of the site prior to bidding and accept the site as is.

B. Variations to conditions or discrepancy in actual or described as proposed conditions as they apply to site preparation operations are to be brought to the attention of the Owner prior to commencement of sitework.

PART 2 - PRODUCTS

2.1 MATERIALS

Off-site materials shall be transported to project using well maintained and operating vehicles. Once on site, transporting vehicles shall stay on designated haul roads and shall at no time endanger improvements by rutting, overloading, or pumping.

PART 3 - EXECUTION

3.1 PREPARATION

Verify existing plant life that is to remain and any clearing limits are clearly tagged, identified, and fenced in such manner as to insure their safety throughout construction operations.

3.2 PROTECTION

A. Locate and identify existing utilities that are to remain and protect from damage.

B. Protect trees, plant growth, and features not designated for removal.

C. Conduct operations with minimum interference to public or private accesses and facilities. Maintain ingress and egress at all times and clean or sweep roadways daily as required by the governing authority. Dust control shall be provided with sprinkling systems or equipment provided by contractor.

D. Protect benchmarks, property corners, and other survey monuments from damage or displacement. If marker needs to be removed it shall be referenced by a licensed land surveyor and replaced, as necessary, by same at contractor’s cost.

E. Provide traffic control as required, in accordance with the U.S. Department of Transportation's "Manual on Uniform Traffic Control Devices”, Connecticut Department of Transportation and local requirements.

3.3 CLEARING, GRUBBING AND STRIPPING

A. The Contractor shall clear areas required for execution of work.

B. Unless otherwise indicated on Construction Drawings, the contractor shall remove trees, shrubs, grass, other vegetation, improvements, or obstructions interfering with installation of new construction. Removal includes digging out stumps and roots. Depressions caused by clearing and grubbing operations are to be filled to subgrade elevation to avoid collecting water to form ponds. Satisfactory fill material shall be placed in accordance with Section 31 08 00.

C. Remove grass, trees, plant life, stumps, and other construction debris from site to dump site that is suitable for handling such material according to state laws and regulations.

D. The Contractor shall strip all asphalt within the building footprint area and 10 ft beyond, and from any other areas to receive new fill. Removed asphalt can be milled by the Contractor and asphalt millings can be reused as subbase material beneath new pavements. Asphalt to be used as recycled material shall be milled to form a well-graded material having a maximum particle size of 2 inches. The Contractor shall provide dust control measures during any milling process. Excess asphalt materials shall be properly disposed of in accordance with all applicable codes and ordinances.

3.4 TOPSOIL EXCAVATION

A. Satisfactory topsoil is reasonably free of subsoil, clay lumps, stones, weeds, roots, and other objectionable material.

B. Cut heavy growths of grass from areas before stripping and remove cuttings with remainder of cleared vegetative material.

C. Strip topsoil from areas that are to be filled, excavated, landscaped, or re-graded to such depth that it prevents intermingling with underlying subsoil or questionable material.

D. Stockpile topsoil in storage piles in areas acceptable to the Owner. Construct storage piles to freely drain surface water. Cover storage piles in compliance with the erosion and sedimentation control specifications to prevent windblown dust and waterborne erosion. Dispose of unsuitable topsoil as specified for waste material, unless otherwise specified by Owner. Excess topsoil shall be removed from site by Contractor unless specifically noted otherwise on Construction Drawings.

E. Stockpiled topsoil shall be reused as general fill in landscaped areas as permitted by Owner’s geotechnical engineer and as specified in specifications.

END OF SECTION 311100

SECTION 312113 - RADON MITIGATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes systems for the following:

1. Radon system.
2. Sub-slab ventilation system.

1.3 DEFINITIONS

A. ABS: Acrylonitrile-butadiene-styrene plastic.

B. HDPE: High-density polyethylene plastic.

C. PE: Polyethylene plastic.

D. PP: Polypropylene plastic.

E. PS: Polystyrene plastic.

F. PVC: Polyvinyl chloride plastic.

1.4 SUBMITTALS

A. Product Data: For the following:

1. Perforated-wall pipe and fittings.
2. Solid-wall pipe and fittings.
3. Vapor barriers.

B. Approval of waterproofing manufacturer's service agent for use of drainage panels against and for waterproofing membrane protection.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the manufacturers specified below:

1. Fantech
2. RadonAway Inc.
3. Tjernlund Products, Inc.

2.2 PIPING MATERIALS

A. Refer to the "Piping Applications" Article in Part 3 for applications of pipe, tube, fitting, and joining materials.

2.3 PIPES AND FITTINGS

A. Perforated PVC Sewer Pipe and Fittings: ASTM D 2729, bell-and-spigot ends, for loose joints.

1. Gaskets: ASTM C 443, rubber.

B. Solid-Wall PVC Pipe: ASTM D 2665, drain, waste and vent.

1. PVC Socket Fittings: ASTM D 2665, socket type, made to ASTM D 3311, drain, waste, and vent patterns.

C. CPVC PIPING

1. CPVC, Chlorinated Polyvinyl Chloride Plastic, Schedule 80 Pipe: ASTM F 441.
2. CPVC Schedule 80 Fittings: ASTM F 439, socket type or ASTM F 437, threaded type.

2.4 SPECIAL PIPE COUPLINGS

A. Comply with ASTM C 1173, elastomeric, sleeve-type, reducing or transition coupling, for joining underground non-pressure piping. Include ends of same sizes as piping to be joined and corrosion-resistant metal tension band and tightening mechanism on each end.

1. Sleeve Materials:

a. For Plastic Pipes: ASTM F 477, elastomeric seal or ASTM D 5926, PVC.

2. Unshielded Flexible Couplings: Elastomeric sleeve with stainless-steel shear ring and corrosion-resistant metal tension band and tightening mechanism on each end.
3. Shielded Flexible Couplings: ASTM C 1460, elastomeric or rubber sleeve with full-length, corrosion-resistant outer shield and corrosion-resistant metal tension band and tightening mechanism on each end.

2.5 SOIL MATERIALS

A. Backfill, drainage course, impervious fill and satisfactory soil materials are specified in Section 312000 “Earth Moving”.

B. Sub-base shall conform to State of Connecticut DOT Form 816, Section M.03, Article M.0301, paragraph 2, DOT #6 or better with gas-permeable geotextile beneath and vapor barrier above.

2.6 GEOTEXTILE FILTER FABRICS

A. Description: Fabric of PP or polyester fibers or combination of both, with flow rate range from 110 to 330 gpm/sq. ft. when tested according to ASTM D 4491.

1. Structure Type: Nonwoven, needle-punched continuous filament or woven, monofilament or multifilament.
2. Style(s): Flat and sock.

2.7 RADON EXHAUST FAN

A. Description: In-line type, variable speed, mounted in radon stack on roof.

1. Ratings: 375 CFM at 0” external static pressure (when tested with 6-inch inlet and 6-inch discharge piping).
2. Operation: Fan shall run continuously, through local disconnect switch.
3. Electrical Requirements: 95-139 watts; 115 volts; 1-phase; coordinate power wiring and one (l) local disconnect switch provision by the Electrical Contractor.
4. Basis of Design: Radonaway **Model RP265**

2.8 RADON SYSTEM PRESSURE MONITOR

A. Description: Pressure switch/alarm, with warning signal relay, mounted in radon riser in chase. Provide fire-rated chase access door to service pressure switch/alarm device.

1. Operation: Pressure switch/alarm shall activate at 0.25” w.c.
2. Alarm Requirements: Coordinate wiring of “Loss of Negative Pressure” alarm into the Building Management System. Refer to Section 230900 “Instrumentation and Control for HVAC”.
3. Basis of Design: Radonaway **Checkpoint IIA**

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine surfaces and areas for suitable conditions where radon and sub-slab ventilation systems are to be installed.

B. Coordinate installations of this Section with all other trades, particularly structural and concrete work.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 EARTHWORK

A. Excavating, trenching, and backfilling are specified in Section 312000 “Earth Moving”.

3.3 PIPING APPLICATIONS

A. Under-Slab Radon and Sub-Slab Ventilation Piping (Within the Radon Suction Pit):

1. Pipe in subparagraph (2) below is available in NPS 4 (DN 100) only.
2. Perforated PVC sewer pipe and fittings and loose, bell-and-spigot joints.
3. Transition to 6-inch solid wall PVC sewer pipe at point where radon and sub-slab ventilation pipe leaves the radon collection pit.

B. Below Grade Piping Outside the Radon Collection Pit and Above-Grade Piping:

1. Solid-wall PVC sewer pipe and fittings and loose, bell-and-spigot joints.

3.4 RADON AND SUBSLAB VENTILATION PIPING

A. Place impervious fill material on subgrade adjacent to bottom of slab after concrete footing forms have been removed. Place and compact impervious fill to dimensions indicated, but not less than 6 inches deep and 12 inches wide.

B. Place impervious fill on subgrade adjacent to bottom of slab and compact to dimensions indicated, but not less than 6 inches deep and 12 inches wide after concrete footing forms have been removed.

C. Lay flat-style geotextile filter fabric in trench and overlap trench sides.

D. Place supporting layer of drainage course over compacted subgrade and geotextile filter fabric, to depth of not less than 4 inches. (Do not compact drainage layer).

E. Install piping as indicated in Part 3 "Piping Installation" Article for radon and subslab ventilation piping.

F. After satisfactory testing, cover piping to width of at least 6 inches on side away from footing and above top of pipe to within 12 inches of finish grade.

G. Install drainage course and wrap top of drainage course with flat-style geotextile filter fabric.

H. Place layer of flat-style geotextile filter fabric over top of drainage course, overlapping edges at least 4 inches.

3.5 RADON AND SUBSLAB VENTILATION PIPING INSTALLATION

A. Excavate for underslab drainage system after subgrade material has been compacted but before drainage course has been placed. Include horizontal distance of at least 6 inches between drainage pipe and trench walls. Grade bottom of trench excavations to required slope, and compact to firm, solid bed for drainage system.

B. Lay flat-style geotextile filter fabric in trench and overlap trench sides.

C. Place supporting layer of drainage course over compacted subgrade and geotextile filter fabric, to compacted depth of not less than 4 inches.

D. Encase pipe with sock-style geotextile filter fabric before installing pipe. Connect sock sections with adhesive or tape.

E. Install drainage piping as indicated in Part 3 "Piping Installation" Article for underslab subdrainage.

F. Add drainage course to width of at least 6 inches on side away from wall and to top of pipe to perform tests.

G. After satisfactory testing, cover piping with drainage course to elevation of bottom of slab, and compact and wrap top of course with flat-style geotextile filter fabric.

H. Install horizontal drainage panels as follows:

1. Coordinate placement with other drainage materials.
2. Lay perforated drainage pipe at inside edge of footings.

3. Place drainage panel over drainage pipe with core side up. Peel back fabric and wrap fabric around pipe. Locate top of core at bottom elevation of floor slab.
4. Butt additional panels against other installed panels. If panels have plastic flanges, overlap installed panel with flange.

I. All potential radon entry points sealed with polyurethane or equal (tooled-in). Typical locations include slab/wall joints, M/E/P penetrations and radon vent pipe penetrations in slabs/walls, etc.

3.6 PIPING INSTALLATION

A. Install piping beginning at points of system, true to grades and alignment indicated, with unbroken continuity of invert. Bed piping with full bearing in filtering material. Install gaskets, seals, sleeves, and couplings according to manufacturer's written instructions and other requirements indicated.

1. Lay perforated pipe with perforations down.

B. Use increasers, reducers and couplings made for different sizes or materials of pipes and fittings being connected. Reduction of pipe size in direction of flow is prohibited.

C. Install PVC piping according to ASTM D 2321.

D. PVC piping shall not be installed in plenum ceiling areas. Use plenum rated CPVC piping for those areas.

E. Vent pipes shall be labeled, minimum 4” diameter.

F. Vent pipe shall be routed through conditioned spaces or insulated.

G. Vent pipe discharge point shall be a minimum of 25 feet from air intake locations.

H. Isolate radon vent pipe from all building components to reduce vibration and noise transmission.

3.7 PIPE JOINT CONSTRUCTION

A. Join PVC pipe and fittings according to ASTM D 3034 with elastomeric seal gaskets according to ASTM D 2321.

B. Join perforated PVC pipe and fittings according to ASTM D 2729, with loose bell-and-spigot joints.

3.8 RADON EXHAUST FAN AND PRESSSURE SENSOR/ALARM SWITCH INSTALLATION

A. Install pressure sensor/alarm switch according to manufacturer’s best recommendations.

B. Do not install provide radon exhaust fans under Base Bid. If post-construction testing indicates fan or fans are required, fans will be provided through the contract change order process.

3.9 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

3.10 IDENTIFICATION

A. Materials and their installation are specified in Section 312000 “Earth Moving”. Arrange for installation of green warning tapes directly over piping.

1. Install PE warning tape or detectable warning tape over ferrous piping.
2. Install detectable warning tape over nonferrous piping and over edges of underground structures.

B. Provide identification for pressure switch alarm.

3.11 FIELD QUALITY CONTROL

A. Testing: After installing drainage course to top of piping, test drain piping with water to ensure free flow before backfilling. Remove obstructions, replace damaged components, and repeat test until results are satisfactory.

B. After completion of Radon Mitigation system installation, test for negative pressures and radon levels as described in Radon Subslab Depressurization Detail on Plumbing Drawings. Advise Owner, Architect, Engineer, and Construction Manager of test results. Use the services of a DEP-approved radon testing firm. A list of approved firms can be obtained on the State of Connecticut DEP website.

3.12 CLEANING

A. Clear interior of installed piping and structures of dirt and other superfluous material as work progresses. Maintain swab or drag in piping and pull past each joint as it is completed. Place plugs in ends of uncompleted pipe at end of each day or when work stops.

3.13 FAN INSTALLATION

A. Radon fans shall be installed before occupancy when the new building’s required radon tests produce results indicating unacceptable radon concentrations.

1. When radon test results are acceptable, it is not necessary to install a radon fan.
2. The fan shall be turned over to the Owner.

B. Vent stack pipe shall be supported above and below the place where the fan will be installed. The vent stack pipe shall support the fan.

C. A straight length of vent stack pipe, at least ten (10) pipe diameters long, should be directly below fan.

3.14 ELECTRICAL CONNECTION

A. Installation of wiring, conduit, and outlet are specified in Section 260519 “Low-Voltage Electrical Power Conductors and Cables”, Section 260533 “Raceways and Boxes for Electrical Systems”, and Section 262726 “Wiring Devices”.

B. An electrical junction box, with a receptacle, shall be installed within the range of a radon fan with a 6-foot long, typical, plugged cord.

3.15 FIELD QUALITY TESTING

A. Required radon tests, including initial tests, confirmatory initial radon tests, and post-mitigation tests shall be provided by an independent certified or licensed, or both, third party tester using test devices that meet U.S. EPA requirements and are listed by a recognized proficiency program.

B. Post-mitigation radon tests which are performed only on complete and operating radon systems, shall be initiated no sooner than 24 hours after the radon system began operation.

C. Building commissioning agent approval. Provide written notification to the GC and CxA that the following work has been completed in accordance with the contract documents, and that the equipment, systems, and sub-systems are operating as required.

1. Radon fans.

END OF SECTION 312113

SECTION 312316 - EXCAVATION, BACKFILL, AND SUBGRADE PREPARATION FOR PAVEMENT

PART 1 - GENERAL

1.1 RELATED SECTIONS AND DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

B. Section 320000 – General Requirements

C. Section 312500 – Soil Erosion and Sediment Control

D. Section 310000 – Earthwork

E. Section 321216 – Asphaltic Concrete Paving

F. Section 321313 – Portland Cement Concrete Paving

G. Section 321613 – Curbs and Sidewalks

H. Contract Drawings and Documents

I. Geotechnical Engineering Investigation by Langan Engineering

1.2 SCOPE OF WORK

A. Excavation and backfilling to line, grade and configuration as shown in the Contract Documents and as described in these specifications for proposed asphaltic concrete, porous asphaltic concrete and Portland cement concrete pavement

B. Removal of unsuitable material beneath proposed paved areas.

C. Compacting fill materials in acceptable manner as specified herein.

1.3 REFERENCE STANDARDS

A. American Society for Testing and Materials (ASTM) - latest edition

1. D 422 Method for Particle Size Analysis of Soils
2. D 1557 Test for Moisture-Density Relations of Soils Using 10-lb (4.5 Kg) Hammer and 18-inch (457 mm) Drop (Modified Proctor)
3. D 2216 Laboratory Determination of Moisture content of Soil
4. D 2487 Classification of Soils for Engineering Purposes
5. D 2922 Tests for Density of Soil and Soil- Aggregate in Place by Nuclear Methods (Shallow Depth)
6. D 3017 Test for Moisture Content of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)
7. D 4318 Test for Plastic Limit, Liquid Limit, and Plasticity Index of Soils

B. American Association of State Highway and Transportation Officials (AASHTO) - latest edition T 88 Mechanical Analysis of Soils

C. All applicable OSHA Regulations

D. Geotechnical Engineering Study, prepared by Langan.

1.4 QUALITY ASSURANCE

A. An Engineer, familiar with the requirements of the Subsurface Investigation and Contract Documents, selected and paid by the Owner (herein referenced to as “Owner’s Engineer”), may be retained to perform construction testing on filling operations and subgrade preparation as specified in section 31 00 00 and described herein. This inspection will not relieve the Contractor from his responsibility to complete the work in accordance with the plans and specifications.

1.5 SUBMITTALS

A. Submit gradation and certification of aggregate material that is to be used for review at least one week prior to use on-site.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Fill material from on-site as specified in Section 310800 of these Specifications and approved by the Owner’s Engineer.

B. Fill material from off-site as specified in Section 310800 of these specifications and approved by the Owner’s Engineer.

2.2 EQUIPMENT

A. Off-site materials shall be transported to project using well maintained and operating vehicles. Once on-site, transporting vehicles shall at no time endanger improvements by rutting, overloading, or pumping.

B. Excavation is to be performed using capable, well maintained equipment and methods acceptable to the Owner and the Contract Document requirements and schedule.

C. Compaction shall be performed using a 5-ton static drum weight, vibratory, smooth drum roller or as specified in the Geotechnical Report.

D. Smaller compaction equipment, together with thinner lifts may be required at areas of limited access or maneuverability. In such a case, the compaction equipment shall be a double drum walk-behind roller and shall be subject to the Owner’s Engineer approval.

PART 3 - EXECUTION

3.1 PREPARATION

A. Identify lines, elevations, and grades necessary to construct pavements, curb, sidewalk, and roadways as shown on Contract Documents.

B. Protect benchmarks, property corners, and other survey monuments from damage or displacement. If marker needs to be removed it shall be referenced by licensed land surveyor and replaced, as necessary, by same.

C. Locate and identify site utilities that have previously been installed and protect from damage.

D. Locate and identify existing utilities that are to remain and protect from damage.

E. Overexcavate and properly prepare areas of subgrade that are not capable of supporting proposed systems. These areas shall be stabilized by using aggregate material placed and compacted as specified.

3.2 EXCAVATION

A. Excavate roadways and pavement areas to line and grade as shown on the Contract Documents.

B. Areas of existing curb islands, sidewalks and existing pavement failure shall be excavated to competent soil to the satisfaction of the Owner's Engineer. Excavation of soft soils will be required in both fill and overlay areas to the satisfaction of the Owner's Engineer.

C. Perform excavation using capable, well maintained equipment and methods acceptable to Owner and local governing agencies.

D. Where existing grades are above proposed subgrade elevation, excavate materials in the pavement areas to the subgrade elevations necessary based on the finished pavement lines and grades as shown in the Contract Documents being careful not to overexcavate beyond the elevations needed. Replacement of fill in areas overexcavated by the Contractor without approval of the Owner's Engineer shall be replaced as compacted fill in accordance with these Specifications at no additional cost to the Owner.

E. Excavated on-site soils that meet the requirements of Section 31 00 00 of these Specifications and approved by the Owner's Engineer may be used as fill on-site.

F. Excavated on-site soils that are unsuitable for fill may be used in landscaped areas if approved by the Owner's Engineer. Otherwise this material shall be legally disposed of off-site at no additional cost to the Owner.

G. Unsuitable material, such as wood and any other deleterious materials determined to be unsuitable by the Owner's Engineer for use as on-site fill shall be legally disposed of off-site at no additional cost to the Owner.

3.3 SUBGRADE PREPARATION

A. Existing grades below areas of proposed pavement shall be leveled prior to fill placement or paving. The Contractor shall remove existing trees, roots, stumps, organic wetland soils, and top soil in these areas prior to placement of any fill and legally dispose of this material off-site at no additional cost to Owner.

B. The Contractor shall drain any standing or puddled water in low lying areas.

C. All existing grades below areas of proposed pavement shall be proofrolled and compacted with a minimum of 6 overlapping passes using the vibratory drum roller specified in part 2.02 of this Section prior to placement of pavement subbase. Existing areas which exhibit "pumping" or "rutting" under the action of the roller shall be removed and replaced with suitable fill material as specified in Section 310000 of these Specifications, or as directed by the Owner's Engineer.

D. Excavated on-site soils that are unsuitable for pavement subgrade below paved areas may be used in landscaped areas if approved by the Owner's Engineer. Otherwise this material shall be legally disposed of off-site at no additional cost to the Owner.

E. Unsuitable material, such as wood and any other deleterious materials determined to be unsuitable by the Owner's Engineer for use as on-site fill shall be legally disposed of off-site at no additional cost to the Owner.

3.4 SUBGRADE FILL PLACEMENT AND COMPACTION

A. Fill material shall not be placed in areas of standing water, in areas of frozen or thawing ground, or in areas that have not been approved by the Owner's Engineer.

B. Fill materials shall not be placed during unfavorable weather conditions. When work is interrupted by heavy rains, fill operations shall not be resumed until all saturated surficial soils are returned to a satisfactory moisture content as determined by the Owner's Engineer.

C. Maintain optimum moisture content of fill materials as specified herein to attain required compaction density.

D. Materials shall be tested in accordance with Section 310800.

E. If compaction requirements are not complied with at any time during construction process, remove and recompact deficient areas until proper compaction is obtained at no additional expense to Owner.

F. Fill lift surfaces shall be made smooth and free from ruts or indentations at the end of any work day when significant precipitation is forecast to prevent saturation of surficial fill material. Fill surfaces shall be graded to drain and sealed with a smooth drum roller at the completion of each work day.

G. Subgrade fill in paved areas shall be placed in uniform loose lifts and compacted in accordance with the Specifications.

H. Wet, saturated material shall be removed and replaced or scarified and air dried as necessary to achieve the field densities specified in this Section. Drying may be assisted by discing, harrowing, or pulverizing until moisture content is reduced.

I. Prior to paving, the subgrade shall be proofrolled with a minimum of 6 overlapping passes using a 5-ton static drum weight vibratory roller.

J. Remove areas of finished subgrade found to have insufficient compaction density of depth necessary and replace with suitable compacted fill as approved by the Owner or Owner's Engineer. Surface of subgrade after compaction shall be hard, uniform, smooth, stable, and true to grade and cross-section.

3.5 MAINTENANCE OF APPROVED SUBGRADE SURFACES

A. Finished subgrades shall be verified to ensure proper elevation and conditions for construction above subgrade.

B. Protect subgrade and binder course from excessive wheel loading during construction including concrete trucks, dump trucks, and other construction equipment.

C. Remove areas of finished subgrade found to have insufficient compaction density to depth necessary and replace in manner that will comply with compaction requirements by use of material that has been approved by the Owner's Engineer. Surface of subgrade after compaction shall be hard, uniform, smooth, stable, and true to grade and cross-section.

3.6 FINISH GRADING

A. Finish grading shall be in accordance with Section 310800.

3.7 QUALITY CONTROL

A. Compaction tests shall be performed by the Owner's Engineer as specified in Section 310800 together with the following for areas of proposed pavement:
   1. In cut areas, not less than one compaction test for every 15,000 square feet.
   2. In fill areas, one test for every 15,000 square feet for each lift.

B. Prior to paving, the finished subgrades shall be verified by the Contractor to ensure proper elevation and conditions for construction above subgrade.

C. Tolerances of 0.10 feet will be permitted. Any deviation from the design grades shall not result in changes in drainage areas or ponding. The Contractor shall provide engineering and field staking necessary for verification of lines, grades, and elevations.

END OF SECTION 312316

SECTION 312319 - DEWATERING

PART 1 – GENERAL

1.1 RELATED SECTIONS AND DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

B. Comply with water disposal requirements of authorities having jurisdiction.

C. Section 31 08 00 – Earthwork

D. Section 31 23 33 – Trench Excavation and Backfill for Utilities

E. Geotechnical Engineering Study prepared by Langan.

1.2 SCOPE OF WORK

A. Construction dewatering.

B. Erosion and Sediment Control

1.3 PERFORMANCE CRITERIA

Design, provide, test, operate, monitor, and maintain a dewatering system of sufficient scope, size, and capacity to control ground-water flow into excavations and permit construction to proceed on dry, stable subgrade.

PART 2 - PRODUCTS

2.1 PRODUCTS

All pumps, hoses, electricity, erosion control measures needed.

PART 3 - EXECUTION

3.1 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.

B. Prevent surface water and subsurface or ground water from entering excavations, from ponding on prepared subgrades, and from flooding surrounding area.

C. Protect subgrade and foundation soils from softening and damage by rain or water accumulation.

D. Install dewatering system to ensure minimum interference with roads, streets, walks, and other adjacent occupied and used facilities.

E. Accomplish dewatering without damaging existing buildings adjacent to excavation.

3.2 DEWATERING

A. Install dewatering system using wells, well points, or similar methods complete with pump equipment, standby power and pumps, filter material gradation, valves, appurtenances, water disposal, and surface-water controls.

B. Before excavation below ground-water level, place system into operation to lower water to specified levels and then operate it continuously until drains, sewers, and structures have been constructed and fill materials have been placed, or until dewatering is no longer required.

C. Dispose of water removed from excavations in a manner to avoid endangering public health, property, and portions of work under construction or completed. Dispose of water in a manner to avoid inconvenience to others.

D. Utilize Best Management Practices to prevent the discharge of turbid water to receiving water systems. Provide sumps, sedimentation tanks, filtration, or other methods to control turbidity and prevent the discharge of sediment. Provide additional measures to control turbidity if required by the Engineer or by authorities having jurisdiction.

E. Promptly repair damages to adjacent facilities caused by dewatering operations.

END OF SECTION 312319

SECTION 312333 - TRENCH EXCAVATION AND BACKFILL FOR UTILTIES

PART 1- GENERAL

1.1 RELATED SECTIONS AND DOCUMENTS

A. Drawing and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

B. Section 310800 – Earthwork

C. Section 312319 – Dewatering

D. Section 331116 – Site Water

E. Section 333000 – Site Sanitary Sewers

F. Section 334100 – Storm Sewer Systems

G. Section 337100 – Utilities

H. Construction Documents and Drawings

I. Local Utility Company Requirements

J. Geotechnical Engineering Study, prepared by Langan.

1.2 SCOPE OF WORK

A. Excavating trenches for the installation of utilities.

B. Backfilling trench with bedding material as specified and finish filling trenches with suitable material to proposed subgrade.

C. Compacting subgrade, bedding, and backfill materials in an acceptable manner.

D. Compliance with all environmental and health and safety regulations.

1.3 REFERENCE STANDARDS

A. American Society for Testing and Materials (ASTM) Latest Edition

1. D 422 Method for Particle Size Analysis
2. D 698 Test of Moisture Density Relations of Soils - Standard Proctor Method
3. D 1557 Test for Moisture-Density Relations of Soils Using 10-lb. (4.5 Kg)
4. Hammer and 18-inch (457 mm) Drop (Modified Proctor)
5. D 2216 Laboratory Determination of Moisture Content of Soil
6. D 2487 Classification of Soils for Engineering Purposes
7. D 2922 Tests for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)
8. D 3017 Test for Moisture Content of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)
9. D 4318 Test for Plastic Limit, Liquid Limit, & Plasticity Index of Soils

B. American Association of State Highway and Transportation Officials (AASHTO) latest edition

1. T 88 Mechanical Analysis of Soils

1.4 QUALITY ASSURANCE

A. A Geotechnical Engineer, selected and paid by owner, may be retained to perform construction inspection and testing on backfilling operations. This inspection will not relieve the Contractor from his responsibility to complete the work in accordance with the plans and specifications.

1.5 SUBMITTALS

A. The Contractor shall contact all utility companies and identify any requirements. Contractor shall provide written confirmation of the status of all utility construction to the Owner at the time of the preconstruction conference or no later than 30 days following the project possession date.

B. Submit gradation and origin for each type of offsite fill and/or bedding material that is to be used in backfilling.

1.6 PROJECT RECORD DOCUMENTS

A. Accurately record actual locations of all subsurface utilities, structures and obstructions encountered.

B. Accurately record any as-built variation from the construction plans and specifications. The Contractor shall provide as-built drawings within 30 days of project completion.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Bedding Material: AASHTO No. 67 processed sand and gravel free from debris, clay lumps, organic, or other deleterious material, and complying with following gradation requirements:

1. U. S. Sieve: Size Percent Passing (by weight)

a. 1 Inch: 100
b. 3/4 Inch: 90-100
c. 3/8 Inch: 20-55
d. No. 4: 0-10
e. No. 8: 0-5

B. Backfill material as approved by the owner and/or the Geotechnical Engineer and utility provider.

PART 3 - EXECUTION

3.1 PREPARATION

A. Set all lines, elevations, and grades for utility and drainage system work and maintain for the duration of work. Provide careful maintenance of benchmarks, property corners, monuments, or other reference points.

B. Protect and maintain in operating condition, existing utilities encountered during utility installation. Repair any damage to surface or subsurface improvements shown on Drawings.

C. Verify location, size, elevation, and other pertinent data required to make connections between existing utilities and drainage systems, and proposed construction indicated on Drawings. Coordinate all building utility connection locations and elevations with architectural plans. Contractor shall comply with all local codes and regulations.

D. Install dewatering systems that will be required to construct the proposed utilities to the design elevations and using the methods described herein. Water pumped out of excavations shall be disposed of on-site, and will not be discharged directly to the city storm drainage system.

E. Over-excavate and properly prepare areas of subgrade that are not capable of supporting the proposed systems. These areas are to be stabilized by using acceptable backfill materials and/or additional bedding material placed and compacted as specified to the satisfaction of the Geotechnical Engineer.

3.2 EXCAVATION

A. Contact local utility companies before excavation begins. Dig trenches at proper width and depth for laying pipe, conduit, or cable and in accordance with utility company requirements. Cut trench banks for safety and remove stones as necessary to avoid point-bearing.

B. All trench excavation side walls shall be sloped, shored, sheeted, braced or otherwise supported by means of sufficient strength to protect the workmen within them in accordance with the applicable rules and regulations established for construction by the Department of Labor, Occupational Safety and Health Administration (OSHA), and by local ordinances. Lateral travel distance to an exit ladder or steps shall not be greater than 25 feet in trenches 4 feet or deeper.

C. Trench width requirements below the top of the pipe shall not be less than 12 inches nor more than 24 inches wider than the outside surface of any pipe or conduit that is to be installed. All other trench width requirements for pipe, conduit, or cable shall be the minimum practical width that will allow for proper compaction of trench backfill and satisfy safety and utility company regulations.

D. Accurately grade trench bottom to an elevation 6 inches below the pipe, as per bedding details in construction drawings. Provide uniform bearing and support for each section of pipe on bedding material at every point along the entire length, except where necessary to excavate for bell holes, pipe joints, or other required connections. Dig bell holes and depressions for joints after trench bottom has been graded. Dig no deeper, longer, or wider than needed to make the joint connection properly.

E. During excavation, stockpile excavated material suitable for backfilling in an orderly manner far enough from the trench to avoid overloading, slides, or cave-ins.

F. Remove excavated materials from the site which are not suitable for backfill.

G. Any abandoned structures, utilities or debris discovered during excavation shall be removed and disposed of.

H. Utility alignments have been designed to avoid expected obstructions wherever possible. If unanticipated significant obstructions are encountered during utility installation work immediately notify the Owner and Engineer.

I. Prevent surface water from flowing into trenches or other excavations by temporary grading or other methods, as required. Remove accumulated water in trenches or other excavations by pumping or other acceptable methods.

J. Utility installation shall meet the following minimum pipe installation depths, or applicable codes and ordinances, measured from finished grade or the paved surface.

1. Water Mains: 54-inch minimum to top of pipe barrel, or as required by the local utility company, whichever is deeper.
2. Sanitary Sewer: Elevations, and grades as indicated on Drawings.
3. Storm Sewer: Elevations, and grades as shown on Drawings.
4. Electrical Conduits: 30-inch minimum to top of secondary service conduits, 36" minimum to the top of primary service conduits, or as required by NEC 300-5, NEC 710-36 codes, or the local utility company requirements, whichever is deeper.
5. Telephone Conduits: 18-inch minimum to top of conduit, or as required by the local utility company, whichever is deeper.
6. Gas Mains and Service: 30-inch minimum to top of pipe, or as required by the local utility company, whichever is deeper.

3.3 LATERALS

A. All utilities intended to connect to services within any building will be extended to within 5 feet of the exterior face of building in the direction and elevation to connect at those geometrical locations indicated or inferred on the drawings. All utility ends will be plugged and marked by a 2" x 4" piece of wood extending from the utility invert to 4 feet above final grade.

3.4 PIPE BEDDING

A. Accurately cut trenches for pipe or conduit to designated line and grade 6 inches below the bottom of the pipe, to width as specified previously. Compact trench bottoms a minimum of 95% of the maximum dry density as determined by ASTM D1557, Modified Proctor Test.

B. Over-excavate wet or unstable soil, if encountered, from trench bottom as necessary to provide a suitable base for continuous and uniform bedding.

C. Place bedding material and compact in 6 inch loose lifts to obtain at least 95% of the maximum dry density. Accurately shape bedding material to conform to lower portion of pipe barrel. After pipe installation, place and compact bedding material as specified above in maximum 6 inch loose layers to the springline of the pipe.

3.5 BACKFILLING

A. After pipe or conduit has been installed, bedded and tested as necessary, backfill trench to finish grade in 8 inch thick loose lifts of approved fill soils, compacting and testing each lift as specified above.

B. Systematically backfill to allow maximum time for natural settlement. Do not backfill over porous, wet, frozen or spongy subgrade surfaces. Should these conditions exist, the areas should be removed, replaced and recompacted.

3.6 COMPACTION

A. Exercise proper caution when compacting immediately over top of pipes or conduits.

B. Maintain optimum moisture content of fill materials to attain required compaction density.

END OF SECTION 312333

SECTION 312500 - SOIL EROSION AND SEDIMENT CONTROL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawing and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

B. Section 310000 - Earthwork

C. Contract Drawings and Documents

1.2 SCOPE OF WORK

A. Temporary and permanent soil erosion control systems.

1.3 REFERENCE STANDARDS

A. The Connecticut Department of Energy & Environmental Protection's (CTDEEP) Guidelines for Soil Erosion and Sediment Control, latest edition

1.4 QUALITY ASSURANCE

A. The Contractor shall carefully adhere to the construction sequence that is shown on the Contract Drawings.

B. The Contractor shall follow Soil Erosion and Sediment Control Notes that are shown on the Contract Drawings.

C. The Contractor shall make frequent inspection of temporary soil erosion controls and maintain them in working order until permanent soil erosion controls are established.

1.5 ENVIRONMENTAL REQUIREMENTS

A. The Contractor shall protect adjacent properties and water resources from soil erosion and sediment damage throughout construction.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Quick-growing grasses such as wheat, rye or oats in accordance with Contract Drawings.

B. Fencing for siltation control as specified on the Contract Drawings.

C. Fibrous blankets by North American Green SC150BN, biodegradable, or approved Equal.

D. Temporary mulches such as loose hay, straw, netting, wood, cellulose or agricultural silage.

E. Filter fabric as specified on the Contract Drawings, or approved equal.

F. Haybales free from invasive species

PART 3 - EXECUTION

3.1 PREPARATION

A. Review site conditions and sediment control plans.

B. Review the soil erosion and sediment control plans as they apply to current conditions. Any proposed deviation from the plans must be submitted to the Owner's Engineer in writing 72 hours prior to commencing that work.

3.2 SOIL EROSION CONTROL AND SLOPE PROTECTION IMPLEMENTATION

A. Place soil erosion control systems in accordance with the Contract Documents prior to any earthwork construction.

B. Limit the surface area of erodible earth material exposed by clearing and grubbing, excavation, borrow and embankment operations by following the construction phasing on the Soil Erosion and Sediment Control Plan.

C. The Contractor will be required to incorporate all permanent soil erosion control features into the project at the earliest practical time to minimize the need for temporary controls. Cut slopes shall be permanently seeded and mulched as the excavation proceeds to the extent considered desirable and practical. Equip catch basins with filter fabric inlet protection immediately upon construction.

D. The temporary soil erosion control systems installed by the Contractor shall be maintained as directed by the Owner's Engineer to control siltation at all times during the life of the contract. The Contractor must respond to any maintenance or additional work ordered by the Owner's Engineer within a 48 hour period.

E. Slopes that erode easily shall be temporarily seeded as the work progresses with quick growing grass grains of wheat, rye or oats unless otherwise specified in the Landscape Specifications. In areas where seeding is ineffective, as determined by the Owner's Engineer or other governing authorities, the Contractor shall provide fibrous netting as shown on Contract Drawings at no additional cost to the Owner.

F. All soil erosion control measures shall be maintained until all permanent improvements to the site are complete unless otherwise directed by the Owner's Engineer.

END OF SECTION 312500

SECTION 321216 – ASPHALTIC CONCRETE PAVING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawing and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

B. Section 312316 - Excavation, Backfill, and Subgrade Preparation for Pavement

C. Section 321613 - Curbs and Sidewalks

D. Section 321723 - Pavement Markings

E. Connecticut Department of Transportation Standard Specifications.

F. Contract Drawings and Documents

1.2 SCOPE OF WORK

A. Preparation and placement of asphaltic concrete binder course.

B. Preparation and placement of asphaltic concrete surface course.

1.3 REFERENCE STANDARDS

A. The Asphalt Institute (AI) latest edition

1. MS 2 Mix Design Methods for Asphaltic Concrete and Other Hot Mix Types
2. MS 3 Asphalt Plant Manual
3. MS 19 Basic Asphalt Emulsion Manual

B. US Army Corp of Engineers

1. UN-13 Hot Mix Asphalt Paving Handbook, (CE MP-ET)

C. American Society of Testing and Materials (ASTM) latest edition

1. D 946 Penetration - Graded Asphalt Cement for use in Pavement Construction
2. D 1188 Bulk Specific Gravity and Density of Compacted Bituminous Mixtures Using Paraffin-Coated Specimens
3. D 1559 Resistance to Plastic Flow of Bituminous Mixtures Using Marshall Apparatus

D. American Association of State Highway and Transportation Officials (AASHTO) latest edition

1. M 117 Mineral Filler "Bitumen-Saturated Cotton Fabrics Used in Roofing and Waterproofing"
2. M 140 Tack Coat "Emulsified Asphalt"
3. M 208 Tack Coat "Cationic Emulsified Asphalt"
4. M 226 Viscosity Graded Asphalt Cement
5. T 245 Marshall Mix Design

E. Connecticut Department of Transportation Standard Specifications, latest edition.

F. Town of Enfield Standards

1.4 QUALITY ASSURANCE

A. At the discretion of the Owner, an Engineer, selected and paid by Owner (herein referenced to as “Owner’s Engineer”, may be retained to perform construction testing of in-place asphaltic concrete courses for compliance with requirements for thickness, compaction, and surface smoothness. Asphaltic surface and base courses shall be randomly cored at minimum rate of 1 core per 20,000 sq. ft of paving. However, no less than 3 cores in light duty areas and 3 cores in heavy duty areas shall be obtained. Coring holes shall be immediately filled with full-depth asphaltic concrete. Asphaltic concrete pavement samples shall be tested for conformance with mix design.

B. Establish and maintain required lines and elevations.

C. In-place compacted thickness shall not be less than thickness specified on Contract Documents. Areas of deficient paving thickness shall receive tack coat and minimum 1-in. overlay; or shall be removed and replaced to proper thickness, at discretion of Owner; until specified thickness of course is met or exceeded at no additional expense to Owner.

D. Testing shall be performed on finished surface of each asphalt concrete course for smoothness, using 10-ft straightedge applied parallel with, and at right angles to centerline of paved area. Results of tests shall be made available to Owner upon request. Surfaces will not be acceptable if the following 10-ft straightedge tolerances for smoothness are exceeded:

1. Base Course Surface: 1/4-inch
2. Wearing Course Surface: 3/16-inch

E. Check surface areas at intervals necessary to eliminate ponding areas. Remove and replace unacceptable paving as directed by Owner.

F. Field density test for in-place materials shall be performed by examination of field cores in accordance with one of following standards:

1. Bulk specific gravity of paraffin-coated specimens: ASTM D 1188.
2. Bulk specific gravity using saturated surface-dry specimens: ASTM D 2726.

G. Rate of testing shall be 1 core per 20,000 sq. ft of pavement, with minimum of 3 cores. Cores shall be cut from areas representative of project. Areas of insufficient compaction shall be delineated, removed, and replaced in compliance with Specifications at no additional expense to Owner.

1.5 SUBMITTALS

A. Design Mix: Before any asphaltic concrete paving is constructed, submit actual design mix to the Owner’s Engineer for review and/or approval. Design mix submittal shall follow the format as indicated in the Asphalt Institute manual MS-2, Marshall Stability Method; and shall include the type/name of the mix, gradation analysis, grade of asphalt cement used, Marshall Stability (lbs.), flow, effective asphalt content (percent), and direct references to the Standard Specifications sections for each material. The design shall be for a mixture listed in the current edition of the Standard Specifications. Mix design over three (3) years old will not be accepted by the Owner’s Engineer.

B. Material Certificates: Submit materials certificate to the Owner's Engineer which is signed by material producer and Contractor, certifying that materials comply with, or exceed, the requirements herein.

C. Testing Results: Results of concrete, steel and paving tests performed by Contractor's testing laboratory shall be submitted to Owner's Engineer in a timely manner.

D. The results of Marshall Tests for the day of installation shall be submitted to the Field Engineer with the first truck delivery each day of asphalt placement.

1.6 PROJECT CONDITIONS

A. Weather Limitations:

1. Apply prime and tack coats when ambient temperature is above 40 degrees Fahrenheit, and when temperature has been above 35 degrees Fahrenheit for 12 hours immediately prior to application. Do not apply when base is wet, contains excess moisture, or during rain.
2. Construct asphaltic concrete paving when atmospheric temperature is above 40 degrees Fahrenheit.

B. Maintain access for vehicular and pedestrian traffic as required for other construction activities. Utilize temporary striping, flagmen, barricades, warning signs, and warning lights as required.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Provide asphalt-aggregate mixture to meet Connecticut Department of Transportation standards.

B. Asphalt Cement: Comply with AASHTO M 226; Table 2 AC-10, AC-20, or AC-30, viscosity grade, depending on local mean annual air temperature. See chart below:

1. Temperature Condition: Asphalt Grades

a. Cold, mean annual air temperature at 45 degrees Fahrenheit or lower: AC-10, 85/100 pen.
b. Warm, mean annual air temperature between 45 degrees Fahrenheit and 75 degrees Fahrenheit: AC-20, 60/70 pen.
c. Hot, mean annual air temperature at 75 degrees Fahrenheit or higher: AC-30

C. Tack Coat: Emulsified asphalt; AASHTO M 140 or AASHTO M 208, SS-1h, CSS-1, or CSS-1h, diluted with 1 part water to 1 part emulsified asphalt.

D. Mineral Filler: Rock or slag dust, hydraulic cement, or other inert material complying with AASHTO M 117, if recommended by state highway department specifications.

E. Asphalt-Aggregate Mixture: Unless otherwise noted on Contract Documents, Design Mix shall have minimum stability based on 50-blow Marshall complying with ASTM D 1559 of 1000 lb with flow between 8 and 16. The Design Mix shall be within sieve analysis and bitumen ranges specified below unless approved otherwise by Owner prior to placement.

1. Sieve Analysis of Mix

   a. Square Sieve: Total Percent Passing

      1/2": 100%
      3/8": 80 - 100%
      #4: 50 - 75%
      #8: 30 - 60%
      #16: 20 - 45%
      #30: 15 - 35%
      #50: 10 - 30%
      #200: 4 - 10%

   b. Percent bitumen by weight of total mix: 5.0 - 8.5 percent
   c. Air voids: 3 - 6 percent
   d. Aggregate voids filled with asphalt cement: 70 - 82 percent
   e. Allowable variance of bitumen by weight of total mix = 0.4 percent

2.2 EQUIPMENT

F. Maintain equipment in satisfactory operating condition and correct breakdowns in manner that will not delay or be detrimental to progress of paving operations.

PART 3 - EXECUTION

3.1 PREPARATION

A. Proof roll prepared base material surface to check for unstable areas. Paving work shall begin only after unsuitable areas have been corrected and are ready to receive paving.

B. Remove loose material from compacted base material surface immediately before applying prime coat.

3.2 APPLICATIONS

C. Tack Coat:

1. Apply to contact surfaces of previously constructed asphaltic concrete base courses or Portland cement concrete and surfaces abutting or projecting into asphaltic concrete or into asphaltic concrete pavement.
2. Apply tack coat to asphaltic concrete base course. Apply emulsified asphalt tack coat between each lift or layer of full depth asphaltic concrete bases and on surface of bases where asphaltic concrete paving will be constructed.
3. Apply emulsified asphalt tack coat in accordance with Connecticut Department of Transportation Standard Specifications.
4. Apply at minimum rate of 0.05 gal per sq. yd of surface.
5. Allow to dry until at proper condition to receive paving.

3.3 ASPHALTIC CONCRETE PLACEMENT

D. Place asphaltic concrete mixture on completed compacted subgrade surface, spread, and strike off. Spread mixture at following minimum temperatures:

1. Ambient temperature between 40 degrees Fahrenheit and 50 degrees Fahrenheit, mixture temp. = 285 degrees Fahrenheit
2. Ambient temperature between 50 degrees Fahrenheit and 60 degrees Fahrenheit, mixture temp. = 280 degrees Fahrenheit
3. Ambient temperature higher than 60 degrees Fahrenheit, mixture temp. = 275 degrees Fahrenheit

E. Whenever possible, pavement shall be spread by finishing machine; however, inaccessible or irregular areas may be placed by hand methods. Hot mixture shall be spread uniformly to required depth with hot shovels and rakes. After spreading, hot mixture shall be carefully smoothed to remove segregated course aggregate and rake marks. Rakes and lutes used for hand spreading shall be type designed for use on asphalt mixtures. Loads shall not be dumped faster that they can be properly spread. Workers shall not stand on loose mixture while spreading.

F. Paving Machine Placement: Apply successive lifts of asphaltic concrete in transverse directions with surface course placed parallel to flow of traffic. Place in typical strips not less than 10-ft wide.

G. Joints: Make joints between old and new pavements, or between successive days and work in manner that will provide continuous bond between adjoining work. Construction joints shall have same texture, density, and smoothness as other sections of asphaltic concrete course. Clean contact surfaces of joints and apply tack coat.

3.4 ROLLING AND COMPACTION

H. Mixture, after being spread, shall be thoroughly compacted by rolling as soon as it will bear the weight of rollers without undue displacement. Number, weight, types of rollers, and sequences of rolling operations shall be such that required density and surface are consistently attained while mixture is in workable condition.

I. The bituminous concrete pavement shall have a minimum thickness as specified on the Contract Documents and should be compacted to a minimum of 96% of the maximum unit weight as determined by the Marshall Mix Design Procedures in accordance with ASTM D-1559.

J. Compact mixture with hot hand tampers or vibrating plate compactors in areas inaccessible to rollers.

K. Breakdown Rolling: Accomplish breakdown or initial rolling immediately following rolling of joints and outside edge. Check surface after breakdown rolling and repair displaced areas by loosening and filling with hot material.

L. Second Rolling: Follow breakdown rolling as soon as possible, while mixture is hot. Continue second rolling until mixture has been thoroughly compacted.

M. Finish Rolling: Perform finish rolling while mixture is still warm enough for removal of roller marks. Continue rolling until roller marks are eliminated and course has attained maximum density.

N. Patching: Remove and replace paving areas mixed with foreign materials and defective areas. Cut out such areas and fill with fresh, hot asphaltic concrete. Compact by rolling to maximum surface density and smoothness.

O. Protection: After final rolling, do not permit vehicular traffic on pavement until it has cooled and hardened. Erect barricades to protect paving from traffic until mixture has cooled enough not to become marked.

P. Scheduling: After complete placement of the base course the contractor may be required to remobilize for the placement of the top course. This schedule requirement will be based on the building progress, and fully at the discretion of the Owner's Engineer.

END OF SECTION 321216

SECTION 321313 – PORTLAND CEMENT CONCRETE PAVING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawing and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

B. Section 310000 - Earthwork

C. Section 312316 - Excavation, Backfill, and Subgrade Preparation for Pavement

D. Connecticut Department of Transportation Standard Specifications, latest edition.

E. Contract Drawings and Documents

1.2 SCOPE OF WORK

A. Preparation and placement of Portland cement concrete sidewalk, pad areas, and other concrete areas identified on Contract Documents

1.3 REFERENCE STANDARDS

A. American Concrete Institute (ACI) latest edition

1. 301 Specifications for Structural Concrete for Buildings
2. 304R Guide for Measuring Mixing, Transporting and Placing Concrete
3. 308 Standard Practice for Curing Concrete

B. American Society for Testing and Materials (ASTM) latest edition

1. A 185 Steel Welded Wire Fabric, Plain for Concrete Reinforcement
2. C497 Steel Welded Wire Fabric, Deformed, for Concrete Reinforcement
3. A615 Deformed and Plain Billet-Steel for Concrete Reinforcement
4. C33 Concrete Aggregates
5. C 94 Ready-Mixed Concrete
6. C 150 Portland Cement
7. C 260 Air-Entraining Admixtures for Concrete
8. D 309 Liquid Membrane-Forming Compounds for Curing Concrete
9. C494 Chemical Admixtures for Concrete
10. C1751 Performed Expansion Joint Fillers for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types)
11. FS TT C 800 - Curing Compound, Concrete, for New and Existing Surfaces.

C. Connecticut Department of Transportation Standard Specification, latest edition.

1.4 QUALITY ASSURANCE

A. The Contractor shall pay for the services of a test laboratory, approved by the Engineer, for concrete inspection. The test laboratory shall have at least one Professional Engineer on staff and shall submit proof that any concrete inspectors used on the project shall have successfully completed the ACI course in Concrete Inspection within the past year.

B. Establish and maintain required lines and elevations.

C. Check surface areas at intervals necessary to eliminate ponding areas. Remove and replace unacceptable work as directed by Owner's Engineer.

D. Sweep concrete pavement and wash free of stains, discolorations, dirt, and other foreign material just prior to final inspection.

E. Protect concrete from damage until acceptance of work. Exclude traffic from pavement for at least 14 days after placement. When construction traffic is permitted, maintain pavement as clean as possible by removing surface stains and spillage of material.

1.5 SUBMITTALS

A. Submit materials certificate to the Owner's Engineer, which is signed by materials producer and Contractor, certifying that materials comply with, or exceed, requirements specified herein.

B. The Contractor shall retain an independent testing agency to perform the required tests. The Contractor shall provide any necessary assistance to the testing agency and provide the testing agency with the intended construction schedule at least one week prior to the start of construction.

C. Submit concrete mix design to the Owner's Engineer for review at least 14 days prior to use.

D. Testing results of concrete, steel and paving tests performed by Contractor's testing laboratory shall be submitted to Owner's Engineer in a timely manner.

1.6 PROJECT CONDITIONS

A. Maintain access for vehicular and pedestrian traffic as required for other construction activities. Utilize temporary striping, flagmen, barricades, warning signs, and warning lights as required.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Forms: Steel, wood, or other suitable material of size and strength to resist movement during concrete placement and to retain horizontal and vertical alignment until removal. Use straight forms, free of distortion and defects. Use flexible spring steel forms or laminated boards to form radius bends as required. Forms shall be of depth equal to depth of curbing or sidewalk, and so designed as to permit secure fastening together at tops. Coat forms with nonstaining type of coating that will not discolor or deface surface of concrete.

B. Welded Wire Mesh: Welded plain cold-drawn steel wire fabric, ASTM A 185.

C. Reinforcing Bars: Deformed steel bars, ASTM A 615, Grade 60.

D. Concrete materials: Comply with applicable requirements for concrete materials, admixtures, bonding materials, curing materials and others as required. Concrete shall have a minimum 28-day compressive strength of 4000 psi.

E. Joint Sealers: Resilient premolded bituminous impregnated fiberboard units complying with ASTM D 1751 FS HH-F-341, Type II, Class A.

F. Welded wire fabric as indicated on Contract Documents.

2.2 MIX DESIGN AND TESTING

A. Concrete mix design and testing shall comply with requirements of ACI.

B. Design mix to produce normal weight concrete consisting of Portland cement, aggregate, water reducing admixture, air entraining admixture, and water to produce following properties:
1. Compressive Strength: 4,500 psi, minimum at 28 days, unless otherwise indicated on Contract Documents.
2. Slump Range: 4-inches +/- 1-inch at time of placement
3. Air Entrainment: 5 to 7 percent

PART 3 - EXECUTION

3.1 PREPARATION

A. Proof-roll prepared base material surface to check for unstable areas. Paving work shall begin only after unsuitable areas have been corrected and are ready to receive paving. Compaction testing for the base material shall be completed prior to the placement of the paving.

B. Remove loose material from compacted base material surface to produce firm, smooth surface immediately before placing concrete.

3.2 INSTALLATION

A. Form Construction

1. Set forms to require grades and lines, rigidly braced and secured.
2. Install sufficient quantity of forms to allow continuance of work and so that forms remain in place minimum of 24 hours after concrete placement.
3. Check completed formwork for grade and alignment to following tolerances:
   a. Top of forms not more than 1/8-inch in 10-ft
   b. Vertical face on longitudinal axis, not more than
   c. 1/4-inch in 10 ft
4. Clean forms after each use and coat with form release agent as often as required to ensure separation from concrete without damage.
5. Install 6-inch x 6-inch welded wire fabric as indicated on Contract Documents. Support wire on metal wire chairs to ensure that wire stays mid-depth of sidewalk section during concrete pour.

B. Reinforcement: Locate, place and support reinforcement in accordance with Contract Documents and ACI.

3.3 CONCRETE PLACEMENT

A. Place concrete in accordance with requirements of Connecticut Department of Transportation Standard Specifications and ACI requirements.

B. Do not place concrete until base material and forms have been checked for line and grade. Moisten base material if required to provide uniform dampened condition at time concrete is placed. Concrete shall not be placed around manholes or other structures until they are at required finish elevation and alignment.

C. Deposit and spread concrete in continuous operation between transverse joints, as far as possible. If interrupted for more than 1/2 hour, place construction joint. Automatic machine may be used for curb and gutter placement at Contractor's option. Machine placement must produce curbs and gutters to required cross-section, lines, grades, finish and jointing as specified for formed concrete. If results are not acceptable, replace with formed concrete as specified.

D. Concrete placement in poor weather conditions shall be subject to limitation of ACI.

E. Joint Construction: Construct expansion, weakened-plane control or contraction, and construction joints straight with face perpendicular to concrete surface. Construct traverse joints perpendicular to centerline, unless otherwise detailed.
   1. Weakened-Plane Control or Contraction Joints: Provide joints per the drawings. Construct control joints for depth equal to at least 1/4 concrete thickness, as follows:
   2. Form tooled joints in fresh concrete by grooving top with recommended tool and finishing edge with jointer.
   3. Form sawed joints using powered saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut joints into hardened concrete as soon as surface will not be torn, abraded, or otherwise damaged by cutting action.
   4. Construction Joints: Place concrete joints at end of placements and at locations where placement operations are stopped for period of more than 1/2 hour, except where such placements terminate at expansion joints. Construct joints using standard metal keyway-section forms.
   5. Expansion Joints: Locate expansion joints per the drawings. Provide premolded joint filler for expansion joints abutting concrete curbs, catch basins, manholes, inlets, structures, sidewalks, and other fixed objects.

F. Joint Fillers: Extend joint fillers full width and depth of joint, and not less than 1/2-inch or more than 1-inch below finished surface where joint sealer is indicated. Furnish joint fillers in one-piece lengths for full width being placed, wherever possible. Where more than one length is required, lace or clip joint filler sections together.

3.4 CONCRETING FINISHING

A. After striking off and consolidating concrete, smooth surface by screening and floating. Adjust floating to compact surface and produce uniform texture. After floating, test surface for trueness with 10-ft straightedge. Distribute concrete as required to remove surface irregularities, and refloat repaired areas to provide continuous smooth finish.

B. Work edges of sidewalks, gutters, back top edge of curb, and formed joints with edging tool, rounding edge to 1/2-inch radius. After completion of floating and trowelling, when excess moisture or surface sheen has disappeared, complete surface finishing, as follows:

C. Paving: provide course, nonslip finish by scoring surface with stiff-bristled broom perpendicular to flow of traffic.

D. Curbs and sidewalks: Broom finish by drawing fine haired broom across surface perpendicular to line of traffic. Repeat operation as necessary to produce a fine line texture.

E. After form removal, clean ends of joints and point up minor honeycombed areas. Remove and replace areas or sections with major defects, as directed by Owner's Engineer.

F. Protect and cure finished concrete paving using acceptable moist curing methods, more particularly described in "water curing" section of ACI 308.

3.5 BACKFILL

A. After the concrete has set sufficiently, the spaces in front and back of the curb or sidewalk shall be refilled to the required elevation with suitable material in accordance with Section 310000, which shall be compacted until firm and solid and neatly graded.

3.6 CLEANING AND ADJUSTING

A. Sweep concrete pavement and wash free of stains, discolorations, dirt, and other foreign material just prior to final inspection.

B. Protect concrete from damage until acceptance of work. Exclude traffic from pavement for at least 14 days after placement. When construction traffic is permitted, maintain pavement as clean as possible by removing surface stains and spillage of materials.

END OF SECTION 321313

SECTION 321613 – CONCRETE CURB AND SIDEWALKS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawing and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

B. Section 310800 - Earthwork.

C. Section 312316 - Excavation, Backfill and Subgrade Preparation for Pavement.

D. Section 321313 - Portland Cement Concrete Paving

E. Connecticut Department of Transportation Standard Specifications, Latest Edition.

F. Contract Drawing and Documents

1.2 SCOPE OF WORK

A. Preparation and Placement of Concrete Sidewalk

B. Preparation and Placement of Concrete Curb

1.3 REFERENCE STANDARDS

A. American Concrete Institute (ACI) latest edition

1. 301 Specifications for Structural Concrete for Buildings
2. 304R Guide for Measuring Mixing, Transporting and Placing Concrete
3. 308 Standard Practice for Curing Concrete

B. American Society for Testing and Materials (ASTM) latest edition

1. A 185 Steel Welded Wire Fabric, Plain for Concrete Reinforcement
2. C497 Steel Welded Wire Fabric, Deformed, for Concrete Reinforcement
3. A615 Deformed and Plain Billet-Steel for Concrete Reinforcement
4. C33 Concrete Aggregates
5. C 94 Ready-Mixed Concrete
6. C 150 Portland Cement
7. C 260 Air-Entraining Admixtures for Concrete
8. D 309 Liquid Membrane-Forming Compounds for Curing Concrete
9. C494 Chemical Admixtures for Concrete
10. C1751 Performed Expansion Joint Fillers for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types)
11. FS TT C 800 - Curing Compound, Concrete, for New and Existing Surfaces.

C. Connecticut Department of Transportation Standard Specifications, latest edition.

D. Town of Enfield Standard Requirements

1.4 QUALITY ASSURANCE

A. The Contractor shall warrant that concrete curb and base is 4,500 psi unless otherwise noted on the Construction Documents.

B. Establish and maintain required lines and elevations.

C. Check surface areas at intervals necessary to eliminate ponding areas. Remove and replace unacceptable work as directed by Owner.

D. Sweep concrete pavement and wash free of stains, discolorations, dirt, and other foreign material just prior to final inspection.

E. Protect concrete from damage until acceptance of work. Exclude traffic from pavement for at least 30 days after placement. When construction traffic is permitted, maintain pavement as clean as possible by removing surface stains and spillage of material.

1.5 SUBMITTALS

A. Submit concrete mix design to the Owner's Engineer for review at least 14 days prior to use.

1.6 PROJECT CONDITIONS

A. Contractor shall maintain access for vehicular and pedestrian traffic as required for other construction activities. Utilize temporary striping, flagmen, barricades, warning signs, and warning lights as required.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Forms: Steel, wood, or other suitable material of size and strength to resist movement during concrete placement and to retain horizontal and vertical alignment until removal. Use straight forms, free of distortion and defects. Use flexible spring steel forms or laminated boards to form radius bends as required. The forms shall be of a depth equal to the depth of curbing or sidewalk, and so designed as to permit secure fastening together at the tops. Coat forms with non-staining type coating that will not discolor or deface surface of concrete.

B. Concrete Materials: Comply with requirements of Connecticut Department of Transportation Standard Specifications and applicable Section 321613 for concrete materials, admixtures, bonding materials, curing materials and others as required. Concrete shall have a minimum 28-day compressive strength of 4,500 psi.

C. Joint Fillers: Resilient pre-molded bituminous impregnated fiberboard units complying with AASHTO M 213.

D. Welded wire fabric as indicated on Contract Documents.

2.2 MIX DESIGN AND TESTING

A. Concrete mix design and testing shall comply with requirements of ACI.

B. Design mix to produce normal weight concrete consisting of Portland cement, aggregate, water-reducing admixture, air-entraining admixture, and water to produce the following properties:

1. Compressive Strength: 4,500 psi, minimum at 28 days, unless otherwise indicated on the Contract Drawings.
2. Slump Range: 3-inches +/- 1-inch at time of placement
3. Air Entrainment: 5 to 7 percent

PART 3 - EXECUTION

3.1 PREPARATION

A. Proof-roll prepared base material surface to check for unstable areas. The paving work shall begin after any unsuitable areas have been corrected and are ready to receive paving. Compaction testing for the base material shall be completed prior to the placement of the paving.

B. Surface Preparation: Remove loose material from compacted base material surface to produce a firm, smooth surface immediately before placing concrete.

3.2 INSTALLATION

A. Form Construction

1. Set forms to required grades and lines, rigidly braced and secured.
2. Install sufficient quantity of forms to allow continuance of work and so that forms remain in place a minimum of 24 hours after concrete placement.
3. Check completed formwork for grade and alignment to following tolerances:
4. Top of forms not more than 1/8-inch in 10-ft.
5. Vertical face on longitude axis, not more than 1/4-inch in 10-ft.
6. Clean forms after each use, and coat with form release agent as often as required to ensure separation from concrete without damage.
7. Install 6-inch x 6-inch welded wire fabric as indicated on Contract Documents. Support wire on metal wire chairs to ensure that wire stays mid-depth of sidewalk section during concrete pour.

B. Concrete Placement

1. Comply with applicable requirements of ACI and Architectural Specifications.
2. Do not place concrete until base material and forms have been checked for line and grade. Moisten base material if required to provide uniform dampened condition at time concrete is placed. Concrete shall not be placed around manholes or other structures until they are at the required finish elevation and alignment.
3. Place concrete using methods which prevent segregation of mix. Consolidate concrete along face of forms and adjacent to transverse joints with internal vibrator. Keep vibrator away from joint assemblies, reinforcement, or side forms. Consolidate with care to prevent dislocation of dowels, and joint devices.
4. Deposit and spread concrete in continuous operation between transverse joints, as far as possible. If interrupted for more than 2 hours, place construction joint. Automatic machine may be used for curb and gutter placement at Contractor’s option. Machine placement must produce curbs and gutters to required cross section, lines, grades, finish, and jointing as specified for formed concrete. If results are not acceptable, replace with formed concrete as specified.
5. Concrete placement shall be conducted in accordance with related ACI recommended procedures.

C. Joint Construction

1. Transverse Expansion Joints: Transverse expansion joint in sidewalk shall have the filler cut to the exact cross section of the sidewalk. The joints shall be similar to the type of expansion joint used in the adjacent pavement. Joint spacing as specified on the plans.
2. Joint Fillers: Extend joint fillers full-width and depth of joint, and not less than 1-inch or more than 2-inches below finished surface where joint sealer is indicated. Furnish joint fillers in one-piece lengths for full width being placed, wherever possible. Where more than one length is required, lace or clip joint filler sections together.
3. Joint Sealants: All joints shall be sealed with approved exterior pavement joint sealants and shall be installed per manufacturer's recommendations.

D. Concrete Finishing

1. After striking off and consolidating concrete, smooth surface by screening and floating. Adjust floating to compact surface and produce uniform texture. After floating, test surface for trueness with 10-ft straightedge. Distribute concrete as required to remove surface irregularities, and refloat repaired areas to provide continuous smooth finish.
2. Work edges of sidewalks, back top edge of integral curb, and formed joints with an edging took, and round to 2-inch radius. Eliminate tool marks on concrete surface. After completion of floating and troweling when excess moisture or surface sheen has disappeared, complete surface finishing as follows:
3. Inclined Slab Surfaces: Provide coarse, non-slip finish by scoring surface with stiff-bristled broom perpendicular to line of traffic.
4. Curbs, gutters, and sidewalks: Broom Finish by drawing fine-hair broom across surface perpendicular to line of traffic. Repeat operation as necessary to produce a fine line texture.

E. Do not remove forms for 24 hours after concrete has been placed. After form removal, clean ends of joints and point up any minor honeycombed areas. Remove and replace areas or sections with major defects, as directed.

F. Protect and cure finished concrete paving using acceptable moist-curing methods, more particularly described in the "water-curing" section of ACI 308-81.

3.3 BACKFILL

A. After the concrete has set sufficiently, the spaces in front and back of the curb and gutter or sidewalk shall be refilled to the required elevation with suitable material in accordance with Section 31 00 00, which shall be compacted until firm and solid and neatly graded.

3.4 CLEANING AND ADJUSTING

A. Sweep concrete pavement and wash free of stains, discolorations, dirt, and other foreign material just prior to final inspection.

B. Protect concrete from damage until acceptance of work. Exclude traffic from pavement for at least 14 days after placement. When construction traffic is permitted, maintain pavement as clean as possible by removing surface stains and spillage of materials.

END OF SECTION 321613

SECTION 321723 – PAVEMENT MARKINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawing and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

B. Contract Drawings and Documents

1.2 SCOPE OF WORK

A. Preparation and application of painted pavement markings.

1.3 REFERENCE STANDARDS

A. Connecticut Department of Transportation Standard Specifications, latest edition.

B. Manual on Uniform Traffic Control Devices, latest edition.

1.4 PROJECT CONDITIONS

A. Maintain access for vehicular and pedestrian traffic as required for other construction activities. Utilize flagmen, barricades, warning signs, and warning lights as required.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Paint shall be non bleeding, quick drying, alkyd petroleum base paint suitable for traffic bearing surface and shall be mixed in accordance with manufacturer's instructions before application.

B. Provide ready-mixed one component waterborne traffic line paint. Materials shall be Sherwin-Williams “Setfast” paint or approved equal.

1. Colors:
   Yellow: TM2161
   White: TM2160
   Blue: TM2133
   Black: TM2135

C. Preformed pavement markings shall be Stamark Intersection Grade Tape Series A420 as manufactured by 3M Traffic Control Materials Division, or approved equal.

PART 3 - EXECUTION

3.1 PREPARATION

A. Sweep and clean surface to eliminate loose material and dust.

B. Where existing pavement markings are indicated on Contract Documents to be removed or would interfere with adhesion of new paint, motorized abrasive device shall be used to remove markings. Equipment employed shall not damage existing paving or create surface hazardous to vehicle or pedestrian traffic. Within public rights-of-way, method of marking removal shall be approved by appropriate governing authority.

3.2 APPLICATION

A. Apply two (2) coats of paint, without addition of thinner, with maximum of 100 sq. ft per gal. Apply the first coat less than 5 days after the placing of bituminous pavement. Apply the second coat just prior to school opening. Apply with mechanical equipment to produce uniform straight edges. At sidewalk curbs and crosswalks, use straightedge to ensure uniform, clean, and straight stripe.

B. Install preformed pavement markings according to manufacturers recommended procedures for the specified material.

C. Following items shall be painted with colors noted below:

1. Pedestrian Crosswalks: White
2. Light Pole Bases, and Bollards: Yellow, or as specified in Contract Drawings.
3. On-Site Sign Bases: Black, or as specified in Contract Drawings.
4. Fire Lanes: as shown on Contract Documents.
5. Lane Striping where separating traffic moving in opposite directions: Yellow
6. Lane Striping where separating traffic moving in the same direction: White
7. Handicap Symbols: Blue or per local code and as shown on Contract Documents.
8. Parking Stall Striping: White, or as shown on Contract Documents.

D. The Minimum Required total Dry Film Thickness (DFT): The DFT shall be the minimum required dry film thickness as measured in mils. or as required by sections 2.1 of this specification as well as part of the referenced standard in section 1.2 of the same.

E. System Coverage Requirements:

1. 1st Coat - 3.0 mils DFT
2. 2nd Coat - 6.0 mils DFT

F. Exterior Paint Systems: Provide the following paint systems as indicated:

1. Parking stall, division and limit lines shall be 4" in width, true and straight. Color: White – DFT 6.0 mils.
2. Stop legends shall be as detailed on Drawing. Color: White - DFT 6.0 mils.
3. Wheelchair legends shall be as detailed on Drawing. Color: Blue. Parking stall striping shall be Blue at Handicapped stalls only - DFT 6.0 mils.
4. Diagonal striping Handicapped. Color: Blue - DFT 6.0 mils.
5. Diagonal striping Loading Zone. Color: White - DFT 6.0 mils.
6. Directional signage shall be as detailed on Drawing. Color: White - DFT 6.0 mils.
7. Centerline striping shall be 4" in width as detailed on Drawings. Color: White - DFT 6.0 mils.

END OF SECTION 321723

SECTION 323100 – CHAINLINK FENCES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawing and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

B. Section 321313 – Portland Cement Concrete

C. Construction Documents

D. Manufacturer's technical data and installation requirements

1.2 SCOPE OF WORK

A. Provide chain link fence, framework, and accessories.

B. Excavation for post bases: concrete foundation for posts.

C. Manufacturer's technical data and installation requirements.

1.3 REFERENCE STANDARDS

A. ASTM A116 Zinc-coated (Galvanized) Steel Woven Wire fence Fabric.

B. ASTM A120 Pipe, Steel, Black and Hot-Dipped Zinc Coated (Galvanized) Welded and seamless, for Ordinary Uses.

C. ASTM A121 Zinc-Coated (Galvanized) Steel Barbed Wire.

D. ANSI/ASTM A123 Zinc (Hot Dip Galvanized) Coatings on iron and steel products.

E. ASTM A153 Zinc Coating (Hot-Dip) on Iron and Steel Hardware.

F. ASTM A392 Zinc Coated Steel Chain-Link Fence Fabric.

G. ANSI A428 Weight of Coating on Aluminum-Coated Iron or Steel Articles.

H. ASTM A446 Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process, Structural (Physical) Quality.

I. ASTM A491 Aluminum-Coated Steel Chain Link Fence fabric.

J. ASTM A569 Steel, Carbon (0.15 Maximum Percent), Hot-Rolled Sheet and Strip Commercial Quality.

K. ASTM A585 Aluminum Coated Steel Barbed Wire.

L. ASTM C94 Ready-mixed Concrete.

M. ASTM F567 Installation of Chain-Link Fence.

N. ASTM F573 Residential Zinc-Coated Steel Chain Link fence fabric.

O. ASTM F668 Poly (Vinyl Chloride) (PVC) Coated Steel Chain Link Fence Fabric.

P. ASTM F669 Strength Requirements of Metal Posts and Rails for Industrial Chain Link Fence.

Q. ASTM F1083 Pipe, Steel, Hot-Dipped Zinc-Coated.

R. Chain Link Fence Manufacturers Institute (CLFMI)-Product Manual.

1.4 QUALITY ASSURANCE

A. Perform work in accordance with Manufacturer's instructions.

B. Perform work in accordance with ASTM F567.

1.5 HIGH PERFORMANCE BUILDING GENERAL REQUIREMENTS

A. Implement practices and procedures to meet the project's environmental goals, which include complying with Connecticut Standard Guidelines Compliance Manual for High Performance Buildings, September 2011 with additional mandatory building project requirements for schools. Specific project goals which may impact this and the other sections of this specification include: use of recycled-content materials; use of locally-manufactured materials; use of low-emitting materials; use of certified wood products; construction waste recycling; and the implementation of a construction indoor air quality management plan. Ensure that the requirements related to these goals, as defined in this Section and other Sections of the contract documents, are implemented to the fullest extent. Substitutions or other changes to the work shall not be allowed if such changes substantially compromise the stated High Performance Building criteria.

B. Comply with Connecticut Standard Guidelines Compliance Manual for High Performance Buildings, September 2011 with additional mandatory building project requirements for schools and the Department of Administrative Services / Office of School Construction Grants & Review High Performance School Construction Bulletin, June 2017.

1.6 SUBMITTALS

A. Submittals for review - the following submittals are intended for review and acceptability.

1. Section 320000 General Requirements for submittals.
2. Product Data: Provide data on fabric, posts, accessories, fittings and hardware.
3. Shop Drawings: Indicate plan layout, spacing of components, post foundation dimensions, hardware anchorage, and schedule of components.
4. Samples: Submit one sample of fence fabric, 12 inch X 12 inches in size Illustrating construction and finish.

B. Submittals for Information

1. Manufacturer's Installation Instructions: Indicate installation requirements, post foundation anchor bolt, templates, and any other data required.

C. Submittals for Closeout

1. Data: Provide Warranties and Bonds.
2. Project Record Documents: Accurately record actual locations of property perimeter posts relative to property lines and easements.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Fabric and boards:

1. No. 9 ga. finished size galvanized steel wires, 2-inch mesh, with top salvage knuckled and bottom selvage twisted and barbed.
2. Attached Wire Mesh shall be coated with Black PVC or approved equal.

B. End, Corner, and Pull Posts: Galvanized steel, minimum sizes and weights as follows:

1. Up to 6'-0" fabric Height: 2.375" OD pipe, 3.65 lbs./1 in.ft., or 3.5"x 3.5" roll-formed sections, 4.85 lbs./1 in.ft.
2. Over 6'-0" Fabric Height: 2.875" OD pipe, 5.79 lbs./1 in.ft., or 3.5"x 3.5" roll-formed sections, 4.85 lbs./1 in.ft.

C. Line Posts: Galvanized steel, minimum sizes and weights as follows:

1. Up to 6'-0"Fabric Height: 1.90"OD steel pipe, 2.70 lbs./1 in.ft. Or 1.875'x 1.625" C-sections, 2.28 lbs./1 in.ft.
2. 6'-0" to 8'-0"Fabric Height: 2.375"OD steel pipe, 3.65 lbs./1 in.ft. or 2.25" x 1.875" H-sections, 2.64 lbs./1 in.ft.
3. Over 8'-0"Fabric Height: 2.875"OD steel pipe, 5.79 lbs./1 in.ft. or 2.25"x 1.875" H-sections, 3.26 lbs./1 in.ft.

D. Top Rails: Rails: 1.66"OD pipe, 2.27 lbs./ft. or 1.625" x 1.25" roll-formed sections, 1.35 lbs./ft.; galvanized steel, manufacturer's longest lengths.

E. Couplings: Expansion type, approximately 6" long, for each joint.

F. Attaching Devices: Provide means for attaching top rail securely to each gate corner, pull and end post.

G. Sleeves: Galvanized steel pipe not less than 6" long and with inside diameter not less than ½"greater than outside diameter of pipe. Provide steep plate closure welded to bottom of sleeve of width and length not less than 1"greater than outside diameter of sleeve.

H. Tension Wire: 7 gage galvanized steel, coated coil spring wire, located at bottom of fabric.

I. Wire Ties: 11 ga. galvanized steel

J. Post Brace Assembly: Manufacturer's standard adjustable brace at end of gate posts and at both sides of corner and pull posts, with horizontal brace located at mid-height of fabric. Use same material as top rail for brace, and truss to line posts with 0.375" diameter rod and adjustable tightener.

K. Post tops: Galvanized steel, weather-tight closure cap for each tubular post. Furnish caps with openings to permit passage of top rail.

L. Stretcher Bars: Galvanized steel, one piece lengths equal to full height of fabric, with minimum cross-section of 3/16"x 3/4". Provide one stretch bar for each gate and end post, and two for each corner and pull post.

M. Stretch Bar Bands: Manufacturer's standard.

N. Portland Cement: ASTM C 150.

O. Aggregates: ASTM C 33.

P. Water: Potable.

Q. Non-shrink, Non-metallic Grout: Premixed, factory-packaged, noncorrosive, non-staining, nongaseous, exterior grout complying with CE CRD-C621.

PART 3 - EXECUTION

3.1 GATE FABRICATION

A. Fabricate swing gate perimeter frames of 1.90"OD pipe, galvanized steel. Provide horizontal and vertical members to ensure proper gate operation and for attachment of fabric, hardware, and accessories. Space frame members a maximum of 8'-0"apart.

B. Assemble gate frames by welding or special fittings and rivets for rigid connections. Install same fabric as for fence with stretcher bars at vertical edges. Install diagonal cross-bracing on gates as required to ensure rigid frame without sag or twist. Bars may be used at top and bottom edges. Attach stretchers to gate frame at 15 inches on center maximum.

C. Attach hardware to provide security against removal or breakage.

3.2 FINISH

A. Fabric Finish: Galvanized, ASTM A 392, Class I, with not less than 1.2 oz zinc/sq.ft. of surface.

B. Framing: Galvanized steel, ASTM A 120 or A 123, with not less than 1.8 oz. zinc/sq.ft. of surface.

C. Hardware and Accessories: Galvanized, ASTM A 153 with zinc weights in accordance with Table 1.

3.3 CONCRETE MIXING

A. Mix materials to obtain concrete with a minimum 28-day compressive strength of 2,500 psi; 1" maximum size aggregate, maximum 3"slump, and 2-4% entrained air.

3.4 INSTALLATION

A. Comply with recommended procedures and instructions of fencing manufacturer. Provide secure, aligned installation with line posts spaced at 10 feet- 0 inches on center maximum.

B. Grade Set Posts: Drill of hand excavate using post hole digger in firm or compacted soil.

C. Excavate hole for each post to minimum diameter recommended by fence manufacturer but not less than four times largest cross-section of post. Excavate hole depths approximately 3" lower than post bottom with bottom of posts set not less than 36" below finish grade surface.

D. Center and align posts in holes 3" above bottom of excavation.

E. Place concrete around posts; vibrate or tamp for consolidation. Check each post for vertical and top alignment. Hold in position during placement and finishing operations. Extend concrete footing 2" above grade. Crown footing to shed water.

F. Top Rails: Run rail continuously, bending to form radius for curve runs. Provide expansion couplings as recommended by manufacturer.

G. Center Rails: Provide center rails where indicated. Install in one piece between posts and flush with post on fabric side, using special offset fittings where necessary.

H. Brace Assemblies: Install braces so posts are plumb when diagonal rod is under proper tension.

I. Tension Wire: Install tension wires through post cap loops before stretching fabric and tie to each post cap with not less than 6 ga. galvanized wire. Fasten fabric to tension wire using 11 ga. galvanized steel hog rings spaced 24 inches on center.

J. Stretcher Bars: Secure at end, corner, pull, and gate posts by threading through or clamping to fabric at 4 inches on center, and secure to posts with metal bands spaced at 15 inches on center.

K. Fasteners: Install nuts for tension bands and hardware bolts on side of fence opposite fabric side. Peen ends of bolts or score treads to prevent removal of nuts.

END OF SECTION 323100

SECTION 329000 - PLANTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this section.

B. Section 31 2310 – Earthwork

C. Section 32 9100 – Planting Soils

D. Section 32 9200 – Turf and Grasses

E. Section 32 9353 – Landscape Maintenance

1.2 SUMMARY

A. This Section includes the following:

1. Tree, shrub, groundcover, perennial and bulb installation.
2. Fertilizing, mulching, trimming, guying, wrapping and edging.
3. Maintenance of installed plant material.
4. Warranty.
5. Tree staking

1.3 REFERENCES

A. American Joint Committee on Horticultural Nomenclature Publication: Standardized Plant Names.

B. ANSI Z60.1 - American Standard for Nursery Stock.

C. FS 0-F-241 - Fertilizers, Mixed, Commercial.

1.4 HIGH PERFORMANCE BUILDING GENERAL REQUIREMENTS

A. Implement practices and procedures to meet the project's environmental goals, which include complying with Connecticut Standard Guidelines Compliance Manual for High Performance Buildings, September 2011 with additional mandatory building project requirements for schools. Specific project goals which may impact this and the other sections of this specification include: use of recycled-content materials; use of locally-manufactured materials; use of low-emitting materials; use of certified wood products; construction waste recycling; and the implementation of a construction indoor air quality management plan. Ensure that the requirements related to these goals, as defined in this Section and other Sections of the contract documents, are implemented to the fullest extent. Substitutions or other changes to the work shall not be allowed if such changes substantially compromise the stated High Performance Building criteria.

B. Comply with Connecticut Standard Guidelines Compliance Manual for High Performance Buildings, September 2011 with additional mandatory building project requirements for schools and the Department of Administrative Services / Office of School Construction Grants & Review High Performance School Construction Bulletin, June 2017.

1.5 SUBMITTALS

A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.

B. Submit complete list of plant material nursery sources within four weeks of notice to proceed and prior to digging of plants. List is to include names of individuals to contact, phone numbers, addresses and latest possible date for completion of tagging.

C. Contractor to cover cost of Landscape Architect's plant tagging.

D. Submit waterproof tags prior to tagging trip. Tags to contain following information:

1. Contractor's name.
2. Plant genus, species and cultivar/variety.
3. Plant common name.
4. Name of nursery.
5. Size of plant.
6. Quantity of plant (i.e. 2 of 10)

E. Submit proposed planting schedule, indicating dates for each type of landscape work during normal seasons for such work in area of site. Correlate with specified maintenance periods to provide maintenance from date of substantial completion. Once accepted, revise dates only as approved in writing, after documentation of reasons of delay.

F. Submit schedule of arrival of "specimen plant material".

G. Submit instructions for continuing Owner maintenance. Include pruning and trimming methods and types, application frequency and recommended coverage of fertilizer; and water requirements for year-round care of installed plants. Document is to be in bound 8 ½" x 11" format. Submit prior to expiration of required maintenance period(s).

H. Submit for approval a proposed maintenance procedure and schedule of the storage of plant materials. Trees, shrubs, groundcover and perennials stored on and off site shall be maintained by watering, fertilizing, mulching, and spraying for infestation and disease to maintain these plants in a healthy condition. Plants stored off site shall be available for inspection by the Landscape Architect.

I. Samples of each of the following:

1. 5 lb (2 kg) of mulch for each type required for the Project, in labeled plastic bags.
2. Edging materials and accessories to verify color selected.

J. Qualification data for firms and persons specified in the "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of Landscape Architects and Owners, and other information specified.

1.6 QUALITY ASSURANCE

A. Prior to being approved, the successful bidder will be required to submit to the Landscape Architect a statement of qualifications listing the names of contact references for at least three jobs of similar scope that have been completed in the last five years. Attention is called to the fact that the installation will not be awarded to a firm that does not possess the required technical expertise and construction organization.

B. Allow Landscape Architect option of traveling to nursery to select trees from available stock. (See 1.4 C)

C. Allow for receipt of stamped nursery source list, to tag trees. (See 1.4 B)

D. Trees dug prior to tagging by Landscape Architect are subject to rejection.

E. Landscape Architect will confirm the trees satisfy the requirements of ANSI Z60.1 and all special conditions stated in project manual and drawings.

F. Measure trees and shrubs according to ANSI Z60.1 with branches and trunks or canes in their normal position. Do not prune to obtain required sizes. Take caliper measurements 6 inches (150mm) above ground for trees up to 4-inch (100-mm) caliper size, and 12 inches (300-mm) above ground for larger sizes. Measure main body of tree or shrub for height and spread; do not measure branches or roots tip-to-tip.

G. Unacceptable trees will not be tagged and a different Grower will be selected by Contractor at no expense to Owner. A second tagging trip will then be scheduled.

H. Decision by Landscape Architect to forego tagging trip does not release Contractor from responsibility of obtaining plant material which meets standards and conditions stated in project manual and drawings.

I. Minimum three years experience installing plant material of this type required of Installer.

J. Minimum five years' experience specializing in growing and cultivating the specified material is required by of Grower.

1.7 REGULATORY REQUIRMENTS

A. Comply with regulatory requirements for fertilizer and herbicide composition.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Plant material is to be COVERED with tarpaulin during transport.

B. Deliver soil conditioners and fertilizer in unopened waterproof bags showing weight, chemical analysis, and name of manufacturer. Keep materials in dry storage away from contaminants.

C. Provide freshly dug trees and shrubs. Do not prune prior to delivery unless otherwise approved by Landscape Architect. Do not bend or bind tie trees or shrubs in such a manner as to damage bark, break branches, or destroy natural shape. Do not drop balled and burlapped stock during delivery. Protect plants until planted to prevent damage to root balls or desiccation of leaves.

D. Deliver trees and shrubs after preparations for planting have been completed and plant immediately. If planting is delayed more than six hours after delivery, set trees and shrubs in shade, protect from weather and mechanical damage, and keep roots moist by covering with mulch, burlap or other acceptable means of retaining moisture.

E. Provide water to staged material as required to keep root balls moist.

F. Do not remove container-grown stock from containers until planting time.

1.9 ENVIRONMENTAL REQUIREMENTS

A. Do not install plant life when ambient temperatures may drop below 30 degrees F or above 90 degrees F.

B. Do not install plants when wind velocity exceeds 30 mph.

C. Planting shall be done when the ground is not frozen, snow covered, or in an otherwise unsuitable condition for planting.

D. Conduct planting operations during recommended planting seasons. Preferable planting season is March 15 to May 30 and October 15 to December 1, inclusive.

E. At the Subcontractor's option and full responsibility, planting operations may be conducted under unseasonable conditions without additional compensation.

1.10 JOB CONDITIONS

A. Locate above grade and underground utilities and perform Work in manner which will avoid damage. Hand excavate, as required.

B. Maintain grade stakes set by others until removal is mutually agreed upon by concerned parties.

C. Notify Landscape Architect, before proceeding, when conditions detrimental to plant growth are encountered, such as rubble fill or adverse drainage conditions.

D. Install plants after final grades are established and prior to establishment of lawns, unless otherwise approved by Landscape Architect. If planting occurs in undisturbed lawn areas or after lawn work, protect lawn areas and promptly repair damage to lawns resulting from planting operations. PROJECT CONDITIONS

1.11 SEQUENCING AND SCHEDULING

A. Coordinate the Work of this Section with installation of underground utilities, sodding and remainder of Work associated with this Project.

B. Proceed with and complete landscape work as rapidly as portions of site become available, working within seasonal limitations.

1.12 MAINTENANCE

A. Contractor shall maintain plant material until completion of 18-month guarantee period and Final Acceptance of work, as described in Part 3 of this Section

1.13 GUARANTEE

A. Plants shall be guaranteed for a period of 18-months after the date of Acceptance by the Owner.

1. When the work is accepted in parts, the guarantee periods shall extend from each of the partial acceptances to the terminal date of the last guarantee period. Thus, all guarantee periods terminate at one time.

B. Plants shall be healthy, free of pests and disease, and in flourishing condition at the end of the guarantee period. Plants shall be free of dead and dying branches and branch tips, and shall bear foliage of normal density, size and color.

C. Replace dead plants and all plants not in vigorous, thriving condition, as determined by the Architect during and at the end of the guarantee period, without cost to the Owner as soon as weather conditions permit and within the specified planting window.

1. Replacements shall closely match adjacent specimens of the same species. Replacements shall be subject to all requirements stated in this Specification.
2. Make all necessary repairs due to plant replacements. Such repairs shall be done at no extra cost to the Owner.
3. The guarantee of all replacement plants shall extend for an additional 18-month period from the date of their acceptance after replacement. In the event that a replacement plant is not acceptable during or at the end of the said extended guarantee period, the Owner may elect one more replacement or credit for each item.

D. At the end of the guarantee period, and no less than five days prior to final inspection, staking and guying materials, and tree wrap and ties shall be removed from the site.

1.14 FINAL INSPECTION AND FINAL ACCEPTANCE

A. At the end of the 18-month guarantee period, the Architect will, upon written notice offend of guarantee period inspect the work for Final Acceptance. Requests shall be received at least ten calendar days before the anticipated date for Final Inspection.

B. Upon completion and reinspection of full repairs or replacements necessary in the judgment of the Architect at that time, the Architect will recommend to the Owner that Final Acceptance of the Work of this Section be given.

PART 2 - PRODUCTS

2.1 TREES, SHRUBS, GROUND COVER AND BEDDING PLANTS

A. Plant material to be nursery grown stock conforming to ANSI Z60.1.

B. Publication for Standardized Plant Names will govern nomenclature issues.

C. Plans will supersede planting material schedule where a discrepancy in quantity occurs.

D. Provide plant material which is well branched and formed, sound, vigorous, healthy, and free from disease, sun-scald, windburn, abrasion, and harmful insects, eggs, larvae and such defects as knots sun scald, injuries, abrasions and disfigurement, and shall have healthy, normal, and unbroken root systems.

E. Provide symmetrically developed plant material, of uniform habit with straight boles and free from objectionable disfigurements. Tree leader shoots shall not be cut or broken.

F. Where formal arrangements or consecutive order of trees or shrubs are shown, select stock for uniform height and spread, and label with number to assure symmetry in planting.

G. Provide vigorous ground covers and vines with number and length of runners and clump size specified and proper age for the grade of plants specified. Use only vines and ground cover plants well established in removable containers, integral containers, or formed homogeneous soil sections.

H. Plants shall have been grown in the same or colder climatic zone of this project.

I. Provide plants according to measurements indicated. Measure sizes before pruning and with branches in normal position. Plants larger in size than specified may be used as approved.

J. Spray plants, budding into leaf or having soft growth, with an anti-desiccant at the nursery or collecting field before digging.

2.2 PLANTING AMENDMENT MATERIALS

A. Shrub and Tree Fertilizer: Tightly compressed, slow release planting tablets. Provide 50% of Nitrogen as water insoluble. The following or equal is acceptable:

1. AGRIFORM Planting Tablets by:

The Scott's Company

1-800-492-8255

B. Ground Cover Fertilizer: FS-0-F-241, Type 1, Class 1 with fifty percent of the elements derived from organic sources. Use fertilizer with N.P.K. ratio of 1:2:1 for Ground Cover Beds and 2:1:1 for Bedding Plant Beds.

C. Topsoil: Topsoil for backfill shall be as specified in Section 329100 - Landscape Grading.

D. Compost: Well-composted, stable, and weed-free organic matter, pH range of 5.5 to 8; moisture content 35 to 55 percent by weight; 100 percent passing through 1-inch sieve; soluble salt content of 5 to 10 decisiemens/m; not exceeding 0.5 percent inert contaminants and free of substances toxic to plantings; and as follows:

E. Organic Matter Content: 50 to 60 percent of dry weight.

F. Water: Clean, fresh and free of substances or matter which could inhibit vigorous growth of plants.

G. Herbicide: Comply with all applicable State and Federal Laws.

H. Pesticide: Comply with all applicable State and Federal Laws.

2.3 MULCH MATERIALS

A. Mulching Material: Double shredded, composted hardwood bark mulch free of growth or germination inhibiting ingredients.

B. Mineral Mulch: Hard durable stone, washed free of loam, sand, clay and other foreign substances, of following type, size range and color:

1. Type: Rounded, natural tan/beige color.

a. Size Range: 1”-2”

2.4 MISCELLANEOUS MATERIALS

A. Filter Fabric: Filter fabric shall be Trevira 1115, or equal approved by Landscape Architect. Trevira is manufactured by Hoechst Fibers Industries, P.O. Box 5887, Spartanburg, SC 29304 (1-800-845-7597 or 1-800-579-5479).

B. Anti-Desiccant: Emulsion type, film-forming agent, designed to permit transpiration but retard excessive loss of moisture from plants. Deliver in manufacturer’s fully identified containers and mix in accordance with manufacturer’s instructions.Setting Blocks: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.

C. Erosion Control Blanket: The following products or approved equal are acceptable:

1. S75 as manufactured by North American Green for 3:1 slopes.
2. C125 as manufactured by North American Green for 2:1 slopes or steeper.

D. Aluminum Edging: Edging shall be 3/16" x 4" aluminum painted black . Edging shall be installed according to manufacturer’s instructions.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify site is ready to accept Work of this section

B. Test drainage of plant beds and pits by filling with water twice in succession. Notify Landscape Architect of conditions permitting the retention of water in planting beds for more than twenty-four (24) hours.

C. Prior to the excavation of planting pits, or placing tree stakes, the Contractor shall ascertain the location of utility lines, electric cables and conduits, so that proper precautions may be taken not to disturb or damage subsurface improvements. Should obstructions be found, the Contractor shall promptly notify the Landscape Architect.

D. Beginning of installation means acceptance of existing conditions.

3.2 PREPARATION OF PLANT PITS AND BEDS

A. Plant Pits: Dig to produce vertical sides and flat, undisturbed bottoms. Scarify glazed side surfaces of pits. Size plant pits as shown on drawings.

B. Shrub masses, hedges, groundcover and perennial beds shall be entirely excavated edge to edge and backfilled with specified backfill mixture; they shall not be treated as individual planting pits.

C. Remove all sticks, stones, roots and other objectionable materials during tilling operations larger than one inch in diameter.

D. Damage to paving, sidewalks or other materials shall be removed and replaced at the Contractor’s expense and to the satisfaction of the Landscape Architect.

3.3 LAYOUT

A. Stake tree and shrub locations with 3/4" x 2" x 18" wood stakes driven into the soil at center points of plants. Paint tops of stakes representing tree locations a color different from the stakes locating shrubs. Contractor may stake continuous uninterrupted straight runs of shrubs at each end. Outline ground cover beds.

B. Mark all underground utilities.

C. Notify Owner's Representative, in writing, of portions of plant material which have been staked. Allow one week for Landscape Architect to review and adjust stake locations.

D. Plants which are planted prior to contractor receiving Landscape Architect's approval of staking and bed outlines are subject to being relocated at no cost to Owner.

3.4 PLANTING

A. Setting Plants: Handle balled and burlapped and container-grown plants by ball or container. Set plants and hold in plumb position until sufficient soil has been firmly placed around roots or ball. Set plants in relation to surrounding grade so that they are even with depth at which they were grown in nursery, collecting field, or container.

B. Place fertilizer prior to backfilling and in accordance with the manufacturer's recommendations. Ground cover plants may be planted after mulch is in place. Take care to avoid contaminating mulch with planting soil.

C. Backfill excavations for balled and burlapped stock with planting soil mixture to approximately half the depth of the ball and then tamp and water. Carefully remove, open or fold back burlap and tying materials. Completely remove plastic wrap before the placement of backfill. Finish backfilling and tamp. Form earth saucers around isolated plants of size ample enough to hold at least 2-1/2 gallons for shrubs or 5 gallons for trees. Do not use planting stock if ball is cracked or broken before or during planting operation.

D. Bulbs shall be planted in the locations and at the spacing indicated on the Drawings. Plant bulbs at the depths and orientation recommended by the Supplier. Do not remove the leaves until after they have lost their green color. Remove leaves by cutting.

3.5 FERTILIZATION, WATERING, EDGING, AND MULCHING

A. Trees, Shrubs and perennials: Fertilize according to manufacturer's recommendations.

B. Ground Cover Beds: Topdress beds with .12 lbs of actual phosphoric acid per cubic yard of Planting Bed Mix.

C. Watering: Provide uniform coverage which will not cause erosion or damage to the finished surface. Water sufficiently to penetrate the planting bed to a depth of 4 inches.

D. Uniformly edge beds or individual plants using a sharp tool to provide a clear cut division line between the planted area and the adjacent lawn. Refer to drawings for bed shape. Provide plant pits circular in shape for individual pits.

E. Mulch within 24 hours after planting. Spread to uniform thickness of 3 inches.

3.6 PRUNING AND REPAIR

A. Plants shall be neatly pruned and or clipped to preserve the natural character of the plants (with exception to clipped shrub hedges); in a manner appropriate to the particular requirements of each plant and to the satisfaction of the Landscape Architect. Unless otherwise directed by Landscape Architect, do not cut tree leaders; remove only injured or dead branches.

B. Remove broken or badly bruised branches with a clean cut. All pruning shall be done with sharp tools in accordance with instructions of the Owner. Accidental damage to trees occurring during the course of planting operations which is not so great as to necessitate removal of a branch or replacement of a plant shall promptly be treated as required in accordance with recognized horticultural practices.

3.7 CLEANING

A. Keep worksite in clean and orderly condition as Work progresses. Leave worksite "broom clean" at end of Work.

3.8 MAINTENANCE

A. See Section 329353 Landscape Maintenance

END OF SECTION 329000

SECTION 329100 – PLANTING SOILS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this section.

B. Section 31 0800 – Earthwork

C. Section 32 9000 – Planting

D. Section 32 9200 – Lawns and Grasses

1.2 RELATED SECTIONS

A. Testing off-site borrow soil, existing topsoil and amendment materials for approved use in planting soil mixes. Verification testing of on-site sub-soils.

B. Furnishing material from approved off-site source(s) as a base component for planting soil mixes and furnishing other soil amendment materials.

C. Amending, preparing, and mixing planting soils for plant areas.

D. Placing, spreading, and fine grading pre-mixed planting soil material of the type(s) indicated for plant areas.

E. Protecting all plant mix installations with snow fencing, filter fabric, or other approved means, over the surface area plant bed installations, until substantial completion.

F. Protection of finished paving, light poles utility or other finished work by means of wooden protection boards, or other approved means, over the area of construction concurrent with any and all construction operations.

1.3 HIGH PERFORMANCE BUILDING GENERAL REQUIREMENTS

A. Implement practices and procedures to meet the project's environmental goals, which include complying with Connecticut Standard Guidelines Compliance Manual for High Performance Buildings, September 2011 with additional mandatory building project requirements for schools. Specific project goals which may impact this and the other sections of this specification include: use of recycled-content materials; use of locally-manufactured materials; use of low-emitting materials; use of certified wood products; construction waste recycling; and the implementation of a construction indoor air quality management plan. Ensure that the requirements related to

these goals, as defined in this Section and other Sections of the contract documents, are implemented to the fullest extent. Substitutions or other changes to the work shall not be allowed if such changes substantially compromise the stated High Performance Building criteria.

B. Comply with Connecticut Standard Guidelines Compliance Manual for High Performance Buildings, September 2011 with additional mandatory building project requirements for schools and the Department of Administrative Services / Office of School Construction Grants & Review High Performance School Construction Bulletin, June 2017.

1.4 SUBMITTALS

A. Refer to and comply with General Requirements, for procedures and additional submittal criteria.

B. Product Data: Submit technical descriptive data for each manufactured or packaged product of this Section. Include manufacturer's product testing and analysis and installation instructions for manufactured or processed items and materials.

C. Locations: Submit locations of material sources. Submit location of mixing sites.

D. Certificates:

1. Submit certified analysis for each soil treatment, amendment, and fertilizer material specified and as used. Include guaranteed analysis and weight for packaged materials.

E. Test Reports: Submit written reports of each sample tested. Each report shall include the following as a minimum and such other information required specific to material tested:

1. Date issued.
2. Project Title and names of Contractor and supplier.
3. Testing laboratory name, address and telephone number, and name(s), as applicable, of each field and laboratory inspector.
4. Date, place, and time of sampling or test, with record of temperature and weather conditions.
5. Location of material source.
6. Type of test.
7. Results of tests including identification of deviations from acceptable ranges. Identify any toxic substance(s) harmful to plant growth or life.

F. Statement(s) of Qualifications: Submit within 45 days of notice to proceed to confirm qualifications as specified in Article 1.04, herein.

G. Schedule and Protection Plan: Submit a detailed plan for scheduling and sequencing of all contract work and for protection of soil mixes and other completed work including coordination with contractors requiring access through the site. Indicate with schedules and plans the utilization of soil mix and subsoil protection measures (filter fabric and snow fencing) over the surface area of plant bed installations, until substantial completion. Indicate with schedules and plans the utilization of finished work protection measures (wooden protection boards or other approved methods) over the work area of construction operations concurrent with all construction operations until substantial completion.

1.5 QUALITY ASSURANCE

A. Qualifications:

1. Installation and maintenance foreman on the job shall be competent English-speaking supervisor(s), experienced in landscape installation and maintenance. Perform work with personnel totally familiar with planting soil preparation and planting installations under the supervision of a foreman experienced with landscape work.
2. Agricultural Chemist: Experienced person or persons employed by public or private soils testing laboratory, qualified and capable of performing tests, making soil recommendations, and issuing reports as specified. Testing Laboratory and Agricultural Chemist shall be as approved by the Owner's Identified Agent.

B. References:

1. Association of Official Agricultural Chemists.
2. American Society for Testing and Materials (ASTM) using test criteria as specified or required by other references.

C. Pre-installation Conferences: Person(s) responsible for soil preparation and mixes of this Section shall attend Pre-installation Conference(s) to coordinate with work of other sections.

D. Inspections and Testing

1. Soil, compost, and other material testing required in this Section or additionally required by Owner's Representative shall be furnished and paid for by Contractor.
2. Contractor is to test installed soil in-place after installation to confirm material is as submitted. One sample should be taken per every 250sf of installed area.
3. Owner's Identified Agent reserves the right to take and analyze at any time such additional samples of materials as deemed necessary for verification of conformance to specification requirements. Contractor shall furnish samples for this purpose upon request and shall perform testing as requested.
4. If at any time, test results indicate that any soil delivered to the site does not comply with these specifications, the contractor shall immediately remove the non-compliant soils from site at the contractor's expense.

1.6 REQUIREMENTS

A. Comply with all rules, regulations, laws and ordinances of local, state, and federal authorities having jurisdiction. Provide labor, materials, equipment and services necessary to make work comply with such requirements without additional cost to Owner.

B. Procure and pay for permits and licenses required for work of this section. Comply with the requirement of any Remedial Action Work Plan that may apply to the project.

1.7 SITE CONDITIONS

A. Acquaintance with Existing Site Conditions

1. Through study of all Contract Documents and by careful examination of the site, become informed as to the nature and location of the Work, the nature of surface and subsurface soil conditions, the character, quality and quantity of the materials to be encountered, the character of equipment and facilities needed preliminary to and during the prosecution of the Work, the general and local conditions, and all other matters which can in any way affect the Work.
2. Investigate the conditions of public thoroughfares and roads as to availability, clearances, loads, limits, restrictions, and other limitations affecting transportation to, ingress and egress of this work site. Conform to all governmental regulations in regard to the transportation of materials to, from, and at the job site, and secure in advance such permits as may be necessary.
3. Should the Contractor, in the course of Work, find any discrepancies between Contract Drawings and physical conditions or any omissions or errors in Drawings, or in layout as furnished by the Owner, it will be Contractor's duty to inform the Owner's Identified Agent immediately in writing for clarification. Work done after such discovery, unless authorized by the Owner's Identified Agent, shall be done at the Contractor's risk.
4. Contractor shall be familiar with any Remedial Action Work Plan for the project and be experienced in working on sites with historic fill.

B. Environmental Requirements:

1. Perform both off-site mixing and on-site soil work only during suitable weather conditions. Do not disc, rototill, or work soil when frozen, excessively wet, or in otherwise unsatisfactory condition.
2. Soil mixes shall not be handled, hauled, or placed during rain or wet weather or when wet near or above field capacity.

C. Sequencing and Scheduling: Adjust, relate together, and otherwise coordinate work of this Section with work of Project and all other Sections of Project Specifications.

1.8 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Product Data: Packaged Materials: Deliver packaged materials to the location where soils are to be mixed, in unopened bags or containers, each bearing the name, guarantee, and trademark of the producer, material composition, manufacturers' certified analysis, and the weight of the materials Retain packages for the Construction Manager or Owner's Representative.

B. Soil or amendment materials stored on site temporarily in stockpiles prior to placement shall be protected from intrusion of contaminants and erosion. All temporary storage means and methods shall be approved by Owner's Representative.

C. After mixing, soil materials shall be covered with a tarpaulin until time of actual use.

PART 2 - PRODUCTS

2.1 PLANT MIX MATERIALS

A. All soil material to be imported to the site shall be tested every 500 CY to ensure soils meet applicable remediation standards for clean soils. Proof of compliance shall be provided by contractor prior to delivery of soils to site.

B. General:

1. All plant mix materials shall fulfill the requirements for new plant mixes as specified.
2. Samples of blended plant mixes shall be submitted by the Contractor for testing and analysis to the approved testing laboratory. Include verification testing of on-site sub-soils. Comply with specific material requirements specified.

    a. As necessary to conform to the requirements of these specifications, make any and all soil mix amendments, retest and resubmit reports indicating results until approved.

3. Owner's Representative may request additional testing by Contractor for confirmation of mix quality at any time until completion.

C. Base Component Material

1. Base Component Material shall be a sandy loam. Base Component Materials shall not be site salvaged unless approved by Owner's Identified Agent and CT DEEP.
2. Before base component material is used for mixing with amendments, handle and pile Base Component Material in the following manner:

    a. Homogenize to make a uniform mix, free of subsoil lenses and other irregularities.
    b. Aerate the base material to make a friable planting medium.
    c. Separate out and remove all clay lumps, stones, stocks, roots, and other debris.

D. Organic Matter

1. Leaf Mold: Shredded leaf litter, composted for a minimum of one year (12 months) and confirming to the following characteristics:

    a. The leaf mold must be free of debris such as plastic fragments, glass, and metal fragments.
    b. The leaf mold must be free of stones larger than 1/2", large branches, and large roots.
    c. Woodchips over 1" in length or diameter should be removed by screening.

2.2 SOIL AMENDMENT MATERIAL

A. Ground Limestone: Ground Limestone as a soil amendment material will only be used pending results of analysis.

1. Provide a Ground Agricultural Limestone with a minimum of 88% of calcium and magnesium carbonates.
2. Ground Limestone material shall have a total 100% passing the 10 mesh sieve, minimum of 90% passing the 20 mesh sieve, and a minimum of 60% passing the 100 mesh sieve.

2.3 HERBICIDES

A. Herbicides: May be required for use if there is seed germination after sub-grade placement and prior to 2planting mix installation or after subsequent plant mix installation. Under no circumstances are materials to be applied without specific instruction from the Owner's Identified Agent.

1. Herbicides shall be approved before use for type and rate of application by the Owner's Identified Agent and by local and state agencies with jurisdiction.
2. Post emergent herbicide shall be Roundup, as manufactured by Monsanto Agricultural Products Company, C3NJ, St. Louis, MO 63166, or an approved equal.

2.4 PLANTING SOIL MIXES

A. General: Adequate quantities of mixed planting soil materials shall be provided, to supplement topsoil stockpiled from site, to attain, after compaction and natural settlement, all design finish grades. Verify quantities for placement as specified in Planting and Turf and Grasses specifications and to suit conditions.

B. Uniformly mix ingredients as specified (Base Component Material, leaf mold, and other ingredients deemed to be necessary as a result of testing) by wind rowing/tilling on an approved hard surface area. Organic matter shall be maintained moist, not wet, during mixing.

C. Testing of Plant Mixes:

1. Perform initial soil mix tests to confirm compliance with specifications. In conjunction with the requirements of the specifications, these test results, when approved, will establish the standard to which all other test results must conform.
2. Follow-up Testing: Have one (1) composite sample tested prior to delivery and upon arrival to the site from each 500 c.y. of material or as required by Owner's Representative intended for use in each type of lawn and plant mix to include the following:

a. Soil Texture / Physical Analysis: Use the hydrometer method and classify the soil.
b. Nutrient Analysis:

1) Have nutrient levels (nitrate, nitrogen, phosphate, potassium, magnesium, calcium, ammonium, iron, and manganese) tested, and request testing laboratory recommendations for additional fertilizer requirements at both lawn and all plant areas if nutrient levels are below average.
2) Nutrient deficiencies in soils of plant areas shall be corrected at time of installation.
3) Nutrient deficiencies in soils of lawn areas shall be corrected both at time of lawn installations and during maintenance period as specified.

c. Test organic matter, pH, soluble salts, and percolation.

D. Soil Mix Types: Provide the following planting soil mix at the locations indicated. Percentages of components, unless otherwise noted, will be established upon completion of test results of the various mixes. The controlling factor will be the percent (%) organic matter as specified for each mix. Note that percent (%) by volume of components will be, in large part, determined by the leaf mold. Specifically the bulk density reading of the leaf mold will directly impact the organic matter readings which have been specified for each mix.

1. Topsoil / Horticultural Soil Mix shall be used for planting areas on natural subsoils.

    a. Test results must be submitted for per-cent (%) retained as well as for per-cent (%) passing for all sieve sizes. Failure to include any of the aforementioned criteria will be cause for rejection of the test report.

2. Soil Texture/ Physical Analysis (Sandy Loam)

    a. Sand – 50-70%
    b. Silt – 20-30%
    c. Clay – 10-20%
    d. Gravel content should not exceed 3% and soil should be free of glass, plastic and other foreign materials
    e. Chemical Analysis:

        1) Organic matter: 6.0 to 10.0%
        2) Soil reaction (pH): 6.0 to 7.0
        3) Soluble salt content (conductivity): The soluble salts measurement (Electric Conductivity) should not exceed 0.5 mmhos/cm measured as a 1: 5 dilute.

    f. Heavy metal content not to exceed the following amounts:

Element	Acetate Extract	HCL Extract
Iron	0.5 ppm	3.1 ppm
Manganese	0.5 ppm	15.4 ppm
Molybdenum	0.4 ppm	0.8 ppm
Zinc	0.2 ppm	4.4 ppm
Aluminum	0.2 ppm	1.2 ppm
Boron	1.1 ppm	1.7 ppm
Copper	None	0.01 ppm
Lead	01 ppm	0.4 ppm
Selenium	None	0.4 ppm
Mercury	None	None
Chromium	None	None
Cadmium	None	0.02 ppm
Nickel	None	0.04 ppm
Cobalt	None	0.05 ppm

None = none detected = below detection limits of 0.01 ppm.

    g. Percolation: 60% passing in 2 minutes, 40% retained. Soil should be saturated prior to conducting test.
    h. Other Amendments as required by test results and as approved.
    i. All imported topsoil must meet pollution standards for residential areas.

3. Bioretention Soil Mix

a. Bioretention soil mix is to be used in all detention basins and rain gardens.
b. Mix to consist of 60% coarse sand, 40% submitted Topsoil/Horticultural Soil Mix
c. Topsoil/Horticultural Soil Mix: Refer to specifications listed in section above
d. Coarse Sand

1) Particle Size Analysis

Sieve	Percent passing
3/8 inch (9.5 mm)	100
No 4 (4.75 mm)	95-100
No 8 (2.36 mm)	80-100
No 16 (1.18 mm)	50-85
No 30 (.60 mm)	25-60
No 50 (.30 mm)	10-30
No 100 (.15 mm)	2-10
No 200 (0.75 mm	2-5

2) Chemical Analysis
pH: lower than 7.0
Toxic substance analysis

e. Final Bioretention Mix

1) Particle Size Analysis

a) Sand – 80-85%
b) Silt – 8-15%
c) Clay – 2-8%

2) Chemical Analysis

a) pH – 5.5-6.5
b) Soluble salts: less than 2 mmho/cm

3) Contractor to submit toxic substance analysis and material drainage rate in addition to information listed above. Drainage rate of material to exceed 1 inch/hour

E. Stockpiling and Plant Mixes

1. General: Stockpiling and Plant Mixes utilized for planting soil on-site, off-site and at source should be restricted to no more than the needs of what can be used in a 24-hr. period. Stockpiles should be no more than 6 feet in height to prevent anaerobic conditions within the pile(s). Stockpiles shall be sheltered from weather to prevent excessive water absorption and blowing by winds as approved by Owner's Representative.

2.5 VERIFICATIONS

A. Prior to construction and soil placement operations at planting areas, ascertain the location of all electric cables, conduits, underdrainage systems and utility lines.

B. Take proper precautions so as not to disturb or damage sub-surface elements. Contractor failing to take these precautions shall be responsible for making requisite repairs to damaged utilities at Contractor's own expense.

C. Verify that required underground utilities are available, in proper location, and ready for use. Coordinate with other trades.

D. Verify that all work requiring access through or adjacent to areas where plant mixes are to be placed has been completed and no further access will be required. In the event that access will be required, this must be coordinated with the Owner's Representative.

2.6 PREPARATION OF SUBGRADE

A. Prior to depositing and spreading clean fill, sand and/or plant mix soils, the Contractor shall furnish and install grade stakes on a 10 foot grid in open areas and sufficiently spaced in other areas to insure correct line and grade of subgrade and finished grade.

1. Verify as constructed or existing subgrade elevations and do whatever additional grading is necessary to bring the subgrade to a true, smooth, slope parallel to the finish grade at all areas to receive planting soil for lawns.
2. Clean up subgrade and dispose of all debris and garbage prior to inspection.
3. Scarify compacted subgrades to permit drainage through soil layers. Scarification to occur minimum 6" in planting beds, 12" in rain garden or infiltration basins.

B. Remove all vegetation on subgrade or wherever additional soil is to be added to meet grade.

C. Any soils polluted by gasoline, oil, plaster, construction debris, unacceptable soils, or other substances which would render subgrade unsuitable for a proper lawn or plant growth, shall be removed from the premises whether or not such pollution occurs or exists prior to or during the Contract period. In the event that such material is placed, this material shall be removed and replaced with approved material. All remedial operations associated with soil mixes and controlled fill shall be reviewed and approved by the Owner's Representative responsible for remediation, when applicable.

2.7 PLACING PLANTING SOIL

A. Remove all large clods, lumps, brush, roots, stumps, litter, and other foreign material and stones one-half inch (1/2") in diameter or larger. Dispose of removed material legally off-site.

B. Do not place a muddy or wet soil mix.

C. Place and spread planting soil mix of the type specified over approved subgrade to a depth sufficiently greater than the depth required for planting areas so that after natural settlement, misting and/or light rolling, as previously approved by Owner's Identified Agent, the completed work will conform to the lines, grades, and elevations shown or otherwise indicated.

D. Topsoil/ Planting Soil Mix shall be placed at the following minimum depths, or as otherwise directed by the plans in all areas over natural subsoils.

1. Lawn Areas – 6” minimum
2. Planting Beds – 18” minimum
3. Tree Pits – 36” minimum

E. Grading Tolerances: Lawn and Planting areas shall be fine graded within ±1/10 (0.10) feet of grades indicated on drawings. Maintain all “flat” areas and slopes to allow free flow of surface drainage without ponding.

END OF SECTION 329100

SECTION 329200 – LAWNS AND GRASSES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawing and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

B. Section 32 9000 – Planting

C. Section 32 9100 – Planting Soils

1.2 SCOPE OF WORK

A. Provide lawns, meadow mixes, and sod (if selected by owner) in accordance with the contract documents.

B. Provide stakes and rope for protection of seed during establishment.

1.3 REFERENCES

A. Hortus III - 1976 Edition, Bailey Horatorium, Cornell University.

B. Technical Association of the Pulp and Paper Industry for Wood Cellulose.

C. Contract Drawings and Documents

1.4 EXAMINATION OF SITE AND DOCUMENTS

A. By submitting a bid the Contractor affirms that he has carefully examined the site and all conditions affecting work under this Section. No claim for additional costs will be allowed because of lack of full knowledge of existing conditions.

B. Plans, specifications, surveys, measurements, other documents and dimensions under which the work is to be performed are believed to be correct; but the Contractor shall have examined them for himself during the Bidding period, as no additional compensation will be made for errors for inaccuracies that may be found therein.

1.5 HIGH PERFORMANCE BUILDING GENERAL REQUIREMENTS

A. Implement practices and procedures to meet the project's environmental goals, which include complying with Connecticut Standard Guidelines Compliance Manual for High Performance Buildings, September 2011 with additional mandatory building project requirements for schools. Specific project goals which may impact this and the other sections of this specification include: use of recycled-content materials; use of locally-manufactured materials; use of low-emitting materials; use of certified wood products; construction waste recycling; and the implementation of a construction indoor air quality management plan. Ensure that the requirements related to

these goals, as defined in this Section and other Sections of the contract documents, are implemented to the fullest extent. Substitutions or other changes to the work shall not be allowed if such changes substantially compromise the stated High Performance Building criteria.

B. Comply with Connecticut Standard Guidelines Compliance Manual for High Performance Buildings, September 2011 with additional mandatory building project requirements for schools and the Department of Administrative Services / Office of School Construction Grants & Review High Performance School Construction Bulletin, June 2017.

1.6 SUBMITTALS TO LANDSCAPE ARCHITECT

A. Watering or irrigation plan and schedule, including source of water and methods for encouraging drought tolerance, prior to installation.

B. Maintenance plan through final acceptance, prior to installation.

C. Biweekly reports monitoring performance and corrective actions, after installation.

D. Product Data: Manufacturer's current catalog cuts and specifications of the following:

1. Fertilizer
2. Mulch

E. Certificates:

1. Certificates of inspection as required by law for transportation of each shipment of seed along with invoice.
2. Seed mix certificate including fertilizer and rate of application.
3. Sod mix certificate (if selected by owner).
4. Product certificates for soil amendments and fertilizer, from manufacturer.

1.7 FIELD QUALITY CONTROL

A. Tests: Samples of materials may be taken and tested for conformity to Specifications at any time.

B. Rejected Materials: Remove rejected materials immediately from the site at contractor's expense. Pay cost of testing of materials not meeting Specifications.

1.8 DELIVERY, STORAGE AND HANDLING

A. Seed:

1. Delivery: Furnish standard seed in unopened manufacturer's standard containers bearing quantity, analysis and name of manufacturer
2. Storage: Store seed with protection from weather, rodents or other conditions, which would damage or impair the effectiveness of the product.

B. Sod (if selected by owner):

1. Harvest, deliver, store, and handle sod according to requirements in "Specifications for Turfgrass Sod Materials" and "Specifications for Turfgrass Sod Transplanting and Installation" in TPI's "Guideline Specifications to Turfgrass Sodding." Deliver sod in time for planting within 24 hours of harvesting. Protect sod from breakage and drying.

C. Mulch:

1. Labeling: Each package of the cellulose fiber shall be marked by the manufacturer to show the air dry weight content.
2. Storage: Store seed with protection from weather, rodents or other conditions, which would damage or impair the effectiveness of the product.

1.9 PROJECT/SITE CONDITIONS

A. Existing Conditions: For protection of existing plants to remain, refer to Spec Section 32 90 00 – Planting

1.10 SEQUENCING AND SCHEDULING

A. Period of Application of Hydroseeding:

1. Within fourteen (14) calendar days after the completion of finish grading in any area.

B. Scheduling:

1. Hydroseeding: Perform on a section-by-section basis, upon approval of Landscape Architect, and immediately after finish grading and irrigation installation except for seasonal Limitations.

a. Season: Plant in Fall or Spring.

1) Allow sufficient time for full germination and 2 mowings before preliminary acceptance.

2. Embankment and Slopes: Complete in a continuous manner.
3. Acceptable Planting Window:

a. Place grass seed or sod only at seasonal times within appropriate temperature range and wind conditions for plant development as approved by Landscape Architect:
b. Acceptable Seeding Seasons/Times:

1) Spring: April 1st - June 15th
2) Fall: September 1st - October 15th

c. Seeding or sodding at any time other than within the above seasons shall be allowed only when the Contractor submits a written request for permission to do so and permission is granted in writing by the Owner. Newly seeded or sodded areas, if installed out of season, must be continuously watered according to best recommended and Landscape Architect approved practice. Contractor shall be responsible for providing an acceptable stand of grass as specified.

1.11 WARRANTY

A. The 90 day maintenance period begins with the Landscape Architects certification of substantial completion. The warranty period begins after the final acceptance of the maintenance period. The final acceptance occurs upon satisfactory completion of all work, included in the 90 day maintenance period, but exclusive of replacement of materials under the Warranty Period.

B. Time Period: Warrant that meadows shall be in a healthy and flourishing condition of active growth 18-months from date. Lawn to be in a healthy and flourishing condition of active growth 90-days from growth.

C. Appearance During Warranty: Lawns and sod shall be free of dead or dying patches, and all areas shall show foliage of a normal density, size and color.

D. Delays: Delays caused by the Contractor in completing planting operations, which extend the planting into more than one planting season, shall extend the Warranty Period correspondingly.

E. Coverage: Warrant growth and coverage of hydroseeded planting to the effect that a minimum of 95% shall be covered with specified planting after one growing season with no bare spots.

F. Exceptions: Contractor shall not be held responsible for failures due to neglect by owner, vandalism, etc., during Warranty Period. Report such conditions in writing.

PART 2 - PRODUCTS

2.1 MANUFACTURERS/GROWERS

A. Hydro Mulch and Soil Stabilizer: Obtain mulch and soil stabilizer from a certified source within proximity of the project site.

B. Turfgrass Sod: Certified complying with "Specifications for Turfgrass Sod Materials" in TPI's "Guideline Specifications to Turfgrass Sodding." Furnish viable sod of uniform density, color, and texture, strongly rooted, and capable of vigorous growth and development when planted.

C. Fertilizer:

1. Regular Type: Nitrogen content derived from organic sources; bearing manufacturer's statement of analysis. Minimum requirements: 12% nitrogen, 4% phosphoric acid, 8% potash.
2. Slow-release Type: 50% of nitrogen is in slow-release form. Content derived from organic or inorganic sources; bearing manufacturer's statement of analysis. Minimum requirements: 12% nitrogen, 4% phosphoric acid, 8% potash.
3. Commercial Mixed Type: Nitrogen content derived from organic or inorganic sources, bearing manufacturer's statement of analysis. Minimum requirements: 10% nitrogen, 10% phosphoric acid, 10% potash.

D. Lime: Ground limestone containing not less than 85% carbonates; 50% passing 100 mesh sieve and 90% passing 20 mesh sieve.

E. Seed: Shall be of a mix as specified on the plans furnished in un-opened containers and providing percentage of seed varieties and inert matter. All non-turf seeds shall be purchased and applied at a Pure Live Seed (PLS) rate as indicated on the plans. This may require the contractor to purchase/apply seed at a high rate as measured by bulk weight.

F. Straw Bales: Clean bales of straw of hay, wheat, rye, oats or barley.

G. Hydromulch: Wood cellulose fiber containing no germination inhibiting or growth inhibiting agents. Characteristics shall be as follows:

1. Percent moisture content: 9.0% (+3.0%)
2. Percent organic matter: 99.2% (+0.8).
3. Percent ash content: 0.8% (+0.2%).
4. pH: 4.8 (+0.5).
5. Water Holding Capacity: 1150 grams water/100 grams fiber, minimum.

H. Mulch: Clean, seed free straw of hay, wheat, rye, oats or barley.

I. Staking Pegs: 3/4" diameter by 8" long softwood.

J. Water: Clean, potable.

2.2 ACCESSORIES

A. Mulch: Shall be Product: "Silva Fiber", "X-100 Spra-mulch", or "Conwed".

1. Composition: Green-colored, fibrous, 100% virgin wood fibre mulch containing no growth or germination-inhibiting factors.
2. Weight: Weight specifications of this material from suppliers, and for all applications, shall refer only to air dry weight of the fiber material. Absolute air dry weight is based on the normal standards for wood cellulose and is considered equivalent to 10% moisture.
3. Dispersion in Slurry: Mulch shall be manufactured in such manner that after addition to and agitation in slurry tanks with fertilizer, seed, water and other approved additives, fibers in the material will become uniformly suspended to form a homogeneous slurry.
4. Absorption Capacity: When hydraulically sprayed on the ground, the material will form a blotter-like groundcover impregnated uniformly with seed, which will allow absorption of moisture and allow rainfall to percolate to the underlying soil.

2.3 HYDROSEED EQUIPMENT (if required)

A. Type: Commercial type hydro-seeder for the application of slurry. Equipment shall have a built-in agitation system with an operating capacity sufficient to agitate, suspend and homogeneously mix slurry.

B. Distribution Lines: Large enough to prevent stoppage and to provide even distribution of the slurry over the ground.

C. Pump Capacity: 150 psi at the nozzle.

D. Slurry-Tank: Minimum capacity of 1,000 gallons and shall be mounted on a traveling unit which will place the slurry tank and spray nozzles within sufficient proximity to the areas to be seeded.

2.4 MIXES

A. Hydroseeding Mix per (1,000 Sq. Ft.)

1. Lawn Areas:

a. 30 lbs. - Mulch
b. 7 lbs. - Lawn Seed
c. 10 lbs. - Fertilizer

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verification of Conditions:

1. Stones, Weeds, Debris: Verify that all areas to receive hydroseeding are clear of stones larger than 1/2 in. diameter, weeds, debris and other extraneous materials.
2. Grades: Verify that grades are within 1 in. plus or minus of the required finished grades. Verify that fertilization have been installed in another section. Report all variations in writing.

3.2 PREPARATION

A. Soil Moisture:

1. Excessive Moisture: Do not commence work of this section when soil moisture content is so great that excessive compaction will occur, nor when it is so dry that dust will form in air or that clods will not break readily.
2. Inadequate Moisture: Apply water, as necessary, to bring soil moisture content to an acceptable level.

3.3 SEEDING

A. Unless indicated otherwise, all "lawn" areas shall be seeded or sodded.

B. Provide soil preparation, seeding, sodding, weeding, watering, and otherwise all labor and materials necessary to secure the establishment of acceptable turf and meadows.

C. After planting soil has been placed, grading is complete, surface soils have been allowed to settle a minimum fourteen (14) days, remedial work is complete, and soil amendments have been applied as specified in this Section, water the planting soil seed bed twelve to twenty-four (12-24) hours prior to seed or sod installation to a depth making the planting soil evenly moist but not overly moist or slippery.

D. Water all seeded areas immediately following seed installation so that the seed bed surface is thoroughly soaked. Cut and maintain established grass in accordance with the requirements specified herein. Perform maintenance on completed areas as installation continues in other areas.

E. Seeding shall not be performed in windy weather.

F. Seeding shall be done in two (2) directions at right angles to each other.

G. Lawn areas shall be seeded by sowing evenly with an approved mechanical seeder at the rate indicated on the Construction Drawings. Culti-packer or approved similar equipment may be used to cover the seed and to form the seed bed in one operation. In areas inaccessible to culti-packer, the seeded ground shall be lightly raked with flexible rakes and rolled with a water ballast roller. After rolling, seeded areas are to be tightly mulched with wheat straw.

H. If the project completion date prohibits in-season planting, the Contractor shall prepare himself for out-of- season seeding so that all lawns shall be completed and ready for acceptance at time of project completion, without additional cost to the Owner. Lawn maintenance shall be the same as for other planting.

I. Lawns shall be maintained by the Contractor for at least 60 days after seeding, or as long as is necessary to establish a uniform stand of the specified grasses, or until substantial completion of the project or until acceptance of lawns, whichever is later.

J. In the event that lawn operations are completed too late in the Fall for adequate germination and/or growth, maintenance shall continue into the following growing season or until a uniform stand of the specified grasses has been established.

K. Water seeded areas twice the first week to a minimum depth of six inches (6") with a fine spray and once per week thereafter as necessary to supplement natural rain to the equivalent of one-inch (1") or to a six inch (6") depth.

L. The surface layer of soil for seeded areas must be kept moist during the germination period. After first cutting, water as specified above.

M. Make weekly inspections to determine the moisture content of the soil and adjust the watering schedule established by the irrigation system installer to fit conditions.

N. After grass growth has started, all areas or parts of areas, which fail to show a uniform stand of grass for any reason whatsoever shall be reseeded in accordance with the plans, and as specified herein. Such areas and parts of areas shall be reseeded repeatedly until all areas are covered with a satisfactory growth of grass at no additional cost to the Owner.

O. Watering shall be done in such a manner and as frequently as is deemed necessary by the Landscape Architect to assure continued growth of healthy grass. All areas of the site shall be watered in such a way as to prevent erosion due to excessive quantities applied over small areas and to avoid damage to the finished surface due to the watering equipment.

P. Water for the execution and maintenance of this work shall be provided by the Owner at no expense to the Contractor. The Contractor shall, however, furnish his own portable tanks, pumps, hose, pipe, connections, nozzles, and any other equipment required to transport the water from the available outlets and apply it to the seeded areas in an approved manner.

Q. Mowing of the seeded areas shall be initiated when the grass has attained a height of two and one-half to three inches (1-1/2" to 2"). Grass height shall be maintained between two and two and one-half inches (2" to 2-1/2") at subsequent cuttings depending on the time of year. Not more than one third (1/3) of the grass leaf shall be removed at any cutting and cutting shall not occur closer than ten (10) days apart.

R. When the amount of grass is heavy, it shall be removed to prevent destruction of the underlying turf. If weeds or other undesirable vegetation threaten to smother the planted species, such vegetation shall be mowed or, in the case of rank growths, shall be uprooted, raked and removed from the area by methods approved by the Landscape Architect.

S. Protect seeded area against trespassing while the grass is germinating. Furnish and install fences, signs, barriers or any other necessary temporary protective devices. Damage resulting from trespass, erosion, washout settlement or other causes shall be repaired by the Contractor at his expense.

T. Remove all fences, signs, barriers or other temporary protective devices after final acceptance.

3.4 HYDROSEEDING

A. Roughen surface to break-up large clods and surface crust, to scarify and remove irregularities that will hold water.

B. Mix specified seed, fertilizer and fiber mulch in water using clean, washed equipment specifically designed for hydroseed application. Continue mixing until uniformly blended into a homogenous slurry suitable for hydraulic application.

C. Apply slurry uniformly to all areas to be seeded in a two-step process.

D. Apply first slurry uniformly at a minimum rate of 500 lbs/acre dry weight but no less than a rate required to obtain the recommended seed-sowing rate of the seed mix supplier.

E. Apply second slurry cover coat of fiber mulch at rate of 1000 lbs/acre.

3.5 SODDING

A. Lay sod within 24 hours of harvesting. Do not lay sod if dormant or if ground is frozen or muddy.

B. Lay sod to form a solid mass with tightly fitted joints. Butt ends and sides of sod; do not stretch or overlap. Stagger sod strips or pads to offset joints in adjacent courses. Avoid damage to subgrade or sod during installation. Tamp and roll lightly to ensure contact with subgrade, eliminate air pockets, and form a smooth surface. Work sifted soil or fine sand into minor cracks between pieces of sod; remove excess to avoid smothering sod and adjacent grass.

C. Lay sod across angle of slopes exceeding 1:3.

D. Retain subparagraph below if required. Steel staple anchors are commonly used.

E. Anchor sod on slopes exceeding 1:6 with wood pegs spaced as recommended by sod manufacturer but not less than 2 anchors per sod strip to prevent slippage.

F. Saturate sod with fine water spray within two hours of planting. During first week after planting, water daily or more frequently as necessary to maintain moist soil to a minimum depth of 1-1/2 inches below sod.

3.6 SEEDING MEADOW AREAS

A. Do not use wet seed or seed which is moldy or otherwise damaged, in transit or storage.

B. Sow seed using a spreader, seeding machine or hydroseeder. Do not seed when wind velocity exceeds 5 mi. per hr. Distribute seed evenly over entire area by sowing equal quantity in 2 directions at right angles to each other. Under no circumstances shall wildflower seeds be mixed with to nurse crop seeds or warm season grass seed in the same spreader or mechanical seeder. Variations in seed size, shape a weight will contribute to uneven application and undesirable results.

C. If spreader is utilized for wildflower seeding, mix sufficient quantity of slightly moist sand with seed to ensure even application of seed. After seeding, rake seed lightly into top 1/8” of soil, roll lightly, and water with a fine spray.

D. If cultipacker or seed drill is used to apply seeds, equipment should be set to install seed at a maximum of ¼” depth followed by firming of the soil to maximize seed/soil contact.

E. Sow not less than the quantity of seed specified or scheduled. If utilizing spreader or seeding machine, protect seeded area against erosion by spreading straw type mulch after completion of seeding operation. If seeds are applied using a hydroseeder, 5-10% of the mulching fiber should be applied with the seeds, the balance should be applied separately a second step for optimal seedling germination. Spread uniformly to form a continuous blanket not less than 1½" thick, loose measurement over seeded areas.

1. If wind is a problem, then anchor mulch by spraying with tactifier at the rate of 10 to 13 gallons per 1000 sq. ft. Take precautions to prevent damage or staining of construction or other plantings adjacent to mulched areas.
2. If a hydroseeder is employed to apply seed, the proper procedures should be followed to minimize the amount of time that seed is circulated through pumps and paddles prior to application. Over circulation may damage the seed.

F. For areas to be seeded before 26 April

1. Areas to be seeded/planted are to be shallow tilled to a depth of 6" to remove existing turf type grasses and weeds, to expose dormant weed seeds and to remove large stones over 1½" in any dimension and sticks, roots, rubbish and other extraneous matter. Limit preparation to areas, which will be planted after preparation. Hand cultivation only will be permitted within the canopy areas of existing trees.
2. Soil amendments, as determined by soil tests, are to be spread and incorporated into topsoil to a minimum depth of 6".
3. Fine grade lawn and wildflower areas to smooth, even surface with loose, uniformly fine texture. Roll, rake and drag meadow areas, remove ridges and fill depressions, as required to meet finish grades.
4. Moisten prepared meadow planting areas to settle soil and amendments. Do not create a muddy soil condition.
5. Approximately two weeks following initial tilling, areas to be seeded/planted are to be treated with a non-selective, glyphosate based herbicide to kill any newly germinated grasses and weeds.

G. For areas to be seeded after 26 April

1. Following the first flush of spring growth on existing turf areas, areas to be seeded/planted are to be mowed to a height of 4" with all debris raked off and disposed of off-site. Areas to be seeded/planted are then to be sprayed with a non-selective glyphosate based herbicide to kill all grasses and forbs.
2. Approximately four weeks after initial spraying, Contractor is to inspect sprayed areas with Architect to determine success of vegetation removal. Follow up spot treatments may be required and shall be applied at that time. Soil amendments, as determined by soil tests, are to be applied to areas to be seeded/planted.

H. Preparation of Unchanged Grades: Where lawns or meadows are to be planted in areas that have not been altered or disturbed by excavating, grading, or stripping operations, prepare soil for lawn planting as follows: Till to a depth of not less than 6"; apply soil amendments and initial fertilizers as specified; remove high areas and fill in depressions; till soil to a homogenous mixture of fine texture, free of lumps, clods, stones, roots, and other extraneous matter. Hand cultivation only will be permitted within the canopy of areas of existing trees.

1. Note: Some limited tree protection areas may require removal of mulch, debris, stumps, herbaceous material, etc. before lawn can he installed.
2. Prior to preparation of unchanged areas, herbicidally treat or physically remove existing grass, vegetation and turf. Dispose of such material properly outside Owner's property; do not turn over into soil being prepared for lawns.

3.7 MAINTENANCE OF MEADOW AREAS

A. General Maintenance Requirements:

1. Maintenance work shall include but not be limited to watering; remedial work such as repair of eroded areas, reseeding, and keeping the area clean. All other work as deemed by the Contractor required in support of his guarantee, or as may be pointed out to the Contractor by the Landscape Architect during the guarantee period shall be provided.

B. In early spring before growth begins, mow to a height of 4 to 6 inches and leave the residue on the ground as a reservoir of viable seed.

1. Refer to plans for additional maintenance notes.
2. For grassy annual weed control, apply post-emergent herbicides such as “Acclaim” or approved equal, as per manufacturer’s recommendations and with written approval of Landscape Architect. Apply twice during first growing season.
3. Selectively apply broadleaf weed control spot spray as required with a broadleaf selective herbicide as recommended by manufacturer twice during first growing season.
4. Apply overseed to wildflower areas original wildflower seed mix at 50% original rate.

3.8 CLEANING

A. Hydroseed Overspray: Immediately after application, thoroughly wash off any plant materials, planting areas, or paved areas not intended to receive slurry mix.

1. Erosion: Immediately restore eroded areas. Keep all adjacent paved surfaces cleaned of dirt, mud or stains and organic debris.

END OF SECTION 329200

SECTION 329353 – LANDSCAPE MAINTENANCE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this section.

B. Section 32 9000 – Planting

C. Section 32 9200 – Lawns and Grasses

1.2 SUMMARY

A. Provide labor, materials, equipment, services and transportation to complete work.

1. Plant and turf maintenance including pruning, watering, drainage, irrigation, fertilizing, weed and pest control, adjusting tree guys, and mulching two times per year during 18-month warranty period.
2. Guaranty and replacement of unacceptable plants.
3. Fall Leaf Cleanup in fall every two weeks prior to acceptance
4. Providing Owner with Maintenance Manual.

1.3 REFERENCES

A. Comply with applicable requirements of:

1. State of Connecticut Department of Transportation (ConnDOT) Standard Specifications for Roads, Bridges and Incidental Construction, Latest addition
2. American Association of Nurserymen, American Standards for Nursery Stock, (ANSI Z60.1), latest edition, published by the American Association of Nurserymen, 1250 I Street, N.W., Suite 500 Washington, D.C. 20005.

1.4 DEFINITIONS

A. Maintenance: consists of keeping turf , woody, perennial and annual plants in healthy growing condition including watering, weeding, cultivating, remulching twice during 18-month warranty period, removal and replacement of dead plant material, resetting plants to proper grades or upright positions and maintaining saucer.

1.5 HIGH PERFORMANCE BUILDING GENERAL REQUIREMENTS

A. Implement practices and procedures to meet the project's environmental goals, which include complying with Connecticut Standard Guidelines Compliance Manual for High Performance Buildings, September 2011 with additional mandatory building project requirements for schools. Specific project goals which may impact this and the other sections of this specification include: use of recycled-content materials; use of locally-manufactured materials; use of low-emitting materials; use of certified wood products; construction waste recycling; and the implementation of a construction indoor air quality management plan. Ensure that the requirements related to

these goals, as defined in this Section and other Sections of the contract documents, are implemented to the fullest extent. Substitutions or other changes to the work shall not be allowed if such changes substantially compromise the stated High Performance Building criteria.

B. Comply with Connecticut Standard Guidelines Compliance Manual for High Performance Buildings, September 2011 with additional mandatory building project requirements for schools and the Department of Administrative Services / Office of School Construction Grants & Review High Performance School Construction Bulletin, June 2017.

1.6 SUBMITTALS

A. Submittals: in accordance with Section 013300 – Submittal Procedures

B. Materials List: provide list of materials to be used in maintenance; materials shall be the same as approved in related sections:

1. Fertilizers, soil amendments, testing see Section 329113 – Planting Soils.
2. Plant materials, mulch, and related materials, see Section 329000 - Planting.

C. Pest and Disease Treatment

1. Submit plan for pest and disease treatment; identify proposed materials and methods.
2. Explain why a problem does or may exist.

D. Maintenance Manual

1. Provide a maintenance manual to Owner describing operations for on-going upkeep of the installed plants. The manual shall address itself to specified types and uses of plants installed, and provide information for care of both newly installed plants and long-term maintenance.
2. Provide specific information on the following items:

    a. Watering: Watering season; diagnosis of watering need; frequency of watering; amount; time of day; methods and equipment; equipment maintenance.
    b. Fertilization: Fertilizing seasons; analysis for fertilizer selection; application rates and methods; preparation and conditions; application times; application equipment; post-application operations and care; precautions for fertilizer use.
    c. Liming: Liming season; analysis for liming; application rate; method and equipment for application.
    d. Pruning: Pruning goals and purposes; methods and techniques (relate to species); equipment; season; cleanup and disposal; precautions.
    e. Mulching of beds: Depths of mulch; refreshment and replacement of mulch.
    f. Miscellaneous plant maintenance: Weeding and weed control; pest and disease control; leaf and litter removal (required every two weeks during the fall if maintenance period is not complete before fall clean-up); bed edging; professional assistance for plant care; and plant replacement as necessary.

3. Include a month-by-month calendar of maintenance procedures, indicating operations listed above.
4. Include a developed Record Keeping document to be completed by the maintenance staff and submitted weekly to the Owner’s Representative during active maintenance period.

5. Submit a copy of maintenance manual to Owner's Representative for approval. Submit prior to planting completion. Owner's Representative may request revisions to manual to meet intent of project design.
6. Submit three copies of manual to Owner at acceptance meeting for planting work. Acceptance shall not be granted until manual has been submitted and approved.

1.7 QUALITY ASSURANCE

A. Qualifications: contractor shall have minimum five years' experience in landscape maintenance.

B. Regulatory Requirements

1. Secure permits, licenses, and pay fees including traffic control.
2. Comply with laws, regulations, and quarantines for agricultural and horticultural products.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Packing and Shipping: deliver materials in unopened containers bearing the manufacturer's name. Transport materials without damage. Protect finishes from abrasion, dirt, oils, grease, and chemicals. Pack materials to protect from weather.

B. Acceptance at Site: verify in writing that delivered materials conform to specifications and approved submittals.

C. Storage and Protection:

1. The owner will not provide areas of storage for the maintenance contractor.
2. Store materials in dry place, on pallets, off the ground; protect from sun.
3. Protect materials from theft, damage, weather, dirt, oils, grease, and construction.

1.9 PROJECT/SITE CONDITIONS

A. Environmental Requirements: do not work soils when dry, wet, or frozen.

1. Field Test

a. Form soil in palm of hand, if soil retains shape and crumbles upon touching, the soil may be worked.
b. If soil will not retain shape it is too dry and should not be worked.
c. If soil retains shape and will not crumble, it is too wet and should not be worked.

B. Planting Seasons: see Section 329000 – Planting

1.10 COMPLETION

A. Upon completion of planting, request Owner's Representative's review to determine if work is substantially complete. If work is complete, Owner's Representative will issue a Letter of Substantial Completion that establishes the effective date of the start of the 18-Month Maintenance Period for plantings and turf.

1. If work is not substantially complete, Owner's Representative will make a list of outstanding work to be done on a timely schedule agreed upon by Contractor and Owner's Representative.

2. Contractor shall notify Owner's Representative when outstanding work is accomplished and ready for review. When outstanding work is complete, in the judgment of Owner's Representative, a Letter of Substantial Completion will be issued.

1.11 PRELIMINARY ACCEPTANCE

A. After the Letter of Substantial Completeness the work will be reviewed for completeness and of Preliminary Acceptance

B. Plantings and turf shall be in thriving and vigorous condition at the time of review for Preliminary Acceptance. If plantings and turf are acceptable, Owner's Representative will issue a Letter of Preliminary Acceptance establishing the effective date of the 18-Month Guaranty Period.

1. If plantings are not thriving, in the judgment of Owner's Representative, remedial actions by Contractor will be required to repair or replace plantings.
2. Remedial work shall be done immediately and in accordance with related work of other sections.
3. At the conclusion of remedial work, Owner's Representative will review work and extend the Guaranty Period to incorporate new plantings.

1.12 FINAL ACCEPTANCE

A. After the 18-month Maintenance and Guaranty Period, plantings and turf will be reviewed.

B. Plantings and turf shall be in thriving and vigorous condition at the time of review for Final Acceptance. If plantings and turf are acceptable, Owner's Representative will issue a Letter of Final Acceptance.

1. If plantings and turf are not thriving, in the judgment of Owner's Representative, remedial actions by Contractor will be required to replace plantings.
2. Remedial work shall be done immediately and in accordance with related work of other sections.
3. At the conclusion of remedial work, Owner's Representative will review work and extend the Maintenance and Guaranty Period until plantings are deemed acceptable.

PART 2 - MATERIALS

2.1 MATERIALS

A. Materials utilized during the maintenance period shall be the same specified in the work of the related sections:

1. Fertilizers, soil amendments, testing, see Section 329113 – Planting Soils.
2. Seed, sod and related materials, see Section 329200 – Turf and Grasses
3. Plants, mulch, and related materials, see Section 329300 - Planting.

2.2 BIOLOGICAL, HORTICULTURAL, HERBICIDAL AND OTHER PEST CONTROL

A. Material Specification: shall be by a licensed pest control operator, with authority to purchase, utilize, and specify agricultural chemicals and agricultural products.

B. Use the least hazardous, least intrusive materials and methods.

2.3 EQUIPMENT

A. Vehicles: in good working order so oil and grease does not stain pavements and poison plantings. Signs identifying the vehicles shall be clearly displayed.

B. Machinery: in good working order so oil and grease does not stain pavements and poison plantings.

2.4 WATER

A. Water: Furnished by Contractor, suitable for irrigation and free from ingredients harmful to plant life.

B. Hoses and other watering equipment to be furnished by Contractor.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verification of Conditions: in the event field conditions are not as shown on Drawings and outlined in the Specifications, notify Owner's Representative in writing.

3.2 PREPARATION

A. Protection:

1. Agricultural Chemicals: protect site improvements from contact with agricultural chemicals, soil amendments, and fertilizers.

3.3 PRUNING

A. Pruning: prune with approval of Owner's Representative.

1. Remove dead branches, rubbing branches, and branches growing towards plant center.

3.4 DRAINAGE

A. Observe drainage in plant pits with hand soil augur.

B. Verify plant pits are draining; plant pits not draining shall be identified on the plan and brought to the attention of Owner's Representative.

3.5 PLANTS

A. Maintain plants in vigorous condition throughout the Maintenance and Guaranty Periods.

B. Replace plants that are missing, dead, not true to name or size as specified, or not in satisfactory growth, as determined by Owner's Representative. Replace plants found unacceptable within one month or in first month of next growing season, whichever comes first.

C. Plants must show a minimum of 75% healthy head with obvious growth since planting. Signs of disease, injury, or damage shall have been successfully treated or plant shall be rejected as determined by Owner's Representative.

D. Replacements plants shall be same kind and size as specified in plant list. Furnish and plant. Cost of replacement borne by Contractor except where it can be shown loss resulted from vandalism, fire, theft, or other causes beyond Contractor's control. Restore areas damaged or disturbed by replacement operations to their original condition.

3.6 WATERING

A. Water at a rate of one inch of water every five to seven days. Apply water such that it penetrates the soil to a depth of 6”.

B. Trees require a minimum of ten gallons each and shrubs a minimum of five gallons each per week.

C. If spring or fall months experience below average rainfall, periodic watering could be extended as part of this contract and at no additional charge as requested by Owner’s Representative.

D. If natural rainfall provides water to meet watering requirements, weekly watering could be reduced but only at the request of Owner’s Representative.

3.7 BASINS

A. Keep foot tamped and shaped earth dikes around plantings.

3.8 MULCH

A. Maintain mulch at 2” depth in planting areas with the exception of at stems and trunks of plants where mulch to be placed to a 0” depth and increasing to a depth of 2” at edge of rootballs and beyond.

B. Mulching is required two times per year during maintenance period, remove existing mulch as needed to maintain maximum 2” cover.

C. Maintain finish grades around plantings, at pavement edges, and at irrigation fixtures.

3.9 TREATMENT OF PEST AND DISEASES

A. Spray for both insect pests and diseases during maintenance period with notification and permission of Owner’s Representative. Apply herbicides, insecticides and fungicides as prescribed by their manufacturer and in accordance with State laws. Contractor shall possess from the State of Connecticut the proper registrations and permits for application of materials or have applications made by approved, qualified firm holding registrations and permits. Furnish copies of permits in connection with materials to Owner’s Representative. Spraying to be considered only after full consideration has been given to alternative pest control strategies. The least toxic approach to pest control shall be used.

3.10 ADJUSTING

A. Re-set settled plants to proper grade and position.

B. Restore planting saucer and adjacent material.

3.11 CLEANING

A. Clean up, remove and dispose off-site excess planting mixture, soil and debris generated under work of this section.

B. Wash and sweep clean site improvements and building surfaces. Clean spills and oversprays immediately.

C. Repair damage caused by maintenance operations.

3.12 PROTECTION

A. Protect work of this section until Final Acceptance.

B. Protect planted areas and soils from compaction by construction traffic and from contamination by construction materials.

END OF SECTION 329353

SECTION 329400 - ARBORICULTURE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawing and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specifications, apply to this section.

B. Section 024113 – Site Demolition

C. Section 311100 – Clearing and Grubbing

D. Section 310000 - Earthwork

E. Section 312333 – Trench Excavation for Utilities

F. Section 334100 – Storm Sewer

G. Section 329200 – Lawns and Grasses

H. Section 329300 – Landscape Planting

1.2 SCOPE OF WORK

A. This Work Included: Provide labor and materials as indication on Drawings and specified to implement basic arboricultural activities for existing trees, as well as construction observation of activities within the Tree Preservation Areas. Scope to include but not limited to

1. Pruning
2. Shade Tree Inventories
3. Diagnosis and Treatment Recommendations
4. Pre Planting Site Analysis, Plant Recommendations
5. Root Pruning
6. Integrated Pest Management
7. Monitor Excavation & Construction within Tree Preservation Area (Section 02200-Earthwork).
8. Disposal and Cleanup

B. Coordinate Work with that of other trades affecting or affected by Work of this Section and cooperate to assure the steady progress of Work.

1.3 REFERENCE STANDARDS

A. National Arborist Association (N.A.A.) Standards

B. American Society of Consulting Arborists

C. American National Standard for Tree Care Operations

1. ANSI Z133.1 – 1994
2. ANSI A300 – 1995

D. American Nurseryman Association Standards

1.4 QUALITY ASSURANCE

A. Arboriculture: comply with all applicable standards of the National Arborist Association (NAA) for pruning, guying, fertilizing and installation of lightning protection systems. Arborist shall have current certification by the International Society of Arboriculture (ISA).

1. All arboricultural work under this section shall be performed by personnel totally familiar with arboricultural work and under the supervision of an experienced foreman and ISA certified arborist.
2. Pruning shall be performed by tree workers who, through a minimum of five years related training and on-the-job experience, are familiar with the techniques and hazards of this work.

B. Analysis and testing of materials required under these specifications shall be in accordance with the current methods of the Association of Official Agricultural Chemists (AOCA) and ASTM.

C. Equipment and Safety

1. Equipment shall be modern and well maintained. Adhere to all applicable state and federal regulations. Contractor shall be responsible for damage to property resulting from equipment, including fluid leakage or damage resulting from equipment failure. Report incidents of this type immediately to Owner's representative.
2. Safety shall be a primary concern while working on the Site. Contractor shall have an established safety program and adhere to NAA, OSHA and ANSI standards applicable to the tree care industry, including electrical and utility requirements as well as personal equipment and safe work procedures.

D. Pesticide Applications

1. Certified Pesticide Applicator shall be responsible for supervision of all applications of fertilizer or pesticides on the site.
2. Pesticides shall be applied in strict compliance with label instructions and all applicable federal, state and local requirements. Material Safety Data sheets shall be available for pesticides in the Contractor's possession while on the site.

E. Arrange a pre-construction meeting between the Landscape Architect, General Contractor and Arboriculture Subcontractor. Such meeting shall seek to review the proposed arboriculture procedures, schedule, consideration of substitutions, and general review of specifications. Note that pruning, fertilization, vertical mulching and mulching activities should be performed prior to the start of construction activities, to improve the vigor of the existing trees to be preserved and to help mitigate the effects of construction stress.

1.5 DEFINITIONS

A. Diameter shall be defined as diameter at breast height (dbh) which is the average tree diameter at 4.5 feet from the ground on the uphill side of the tree.

B. Caliper shall be defined as the diameter of the trunk at 6” above the soil for trees up to 4” in caliper and as the diameter of the trunk at 12” above the soil for trees up to 12” caliper.

C. Root zone shall be defined as 1 (one) foot of radius around trunk for every inch of trunk diameter (at 4.5 feet above the ground level on the uphill side of the tree).

D. Tree Preservation Area shall be defined as all areas outside the limits of construction which contain trees and all areas within the limits of construction which are designated as tree preservation areas on the plans and/or in the field by fencing and signs.

1.6 HIGH PERFORMANCE BUILDING GENERAL REQUIREMENTS

A. Implement practices and procedures to meet the project’s environmental goals, which include complying with Connecticut Standard Guidelines Compliance Manual for High Performance Buildings, September 2011 with additional mandatory building project requirements for schools. Specific project goals which may impact this and the other sections of this specification include: use of recycled-content materials; use of locally-manufactured materials; use of low-emitting materials; use of certified wood products; construction waste recycling; and the implementation of a construction indoor air quality management plan. Ensure that the requirements related to these goals, as defined in this Section and other Sections of the contract documents, are implemented to the fullest extent. Substitutions or other changes to the work shall not be allowed if such changes substantially compromise the stated High Performance Building criteria.

B. Comply with Connecticut Standard Guidelines Compliance Manual for High Performance Buildings, September 2011 with additional mandatory building project requirements for schools and the Department of Administrative Services / Office of School Construction Grants & Review High Performance School Construction Bulletin, June 2017.

1.7 SUBMITTALS

A. General: Make submittals in accordance with the provisions and procedures of these documents. Render submittals and receive approval prior to delivery or installation. Approval by the Landscape Architect of submitted product data, samples, test reports, and certificates, or material inspected at source of supply, does not constitute final acceptance.

B. Product Data: Submit producers/manufacturers specifications, quality control, product data, and test reports for the following: Include instructions for handling, storage, installation and protection.
   1. All Pesticides, Insecticides, Herbicides, and other chemicals

C. Arboricultural Program: Submit detailed program of Arboriculture work and proposed schedule at the pre-construction meeting.

D. Arborist Qualifications
   1. Include evidence of experience, including project list.
   2. Verification of membership in the National Arborist Association (NAA).

1.8 COORDINATION

A. The work of this Section shall be coordinated with that of other trades affecting, or affected by, this work, as necessary to assure the steady progress of all work of the Contract.

1.9 PERMITS AND CODES

A. All work shall comply with applicable codes, ordinances, rules, regulations, and laws of all local, municipal, and state authorities having jurisdiction. All work necessary to make site preparation comply with such requirements shall be provided without additional cost to Owner.

B. Procure and pay for all permits and licenses required for work under this Section.

1.10 REGULATORY REQUIREMENTS

A. Comply with all rules, regulations, laws and ordinances of local, state and federal authorities having jurisdiction. Provide labor materials, equipment and services necessary to make Work comply with such requirements without additional cost to Owner.

B. Investigate the conditions of public thoroughfares and roads as to availability, clearances, loads, limits, restrictions, and other limitations affecting transportation to and ingress and egress at the site. Conform to all governmental regulations regarding the transportation of materials and secure, in advance, any necessary permits.

C. Procure and pay for permits and licenses required for Work.

1.11 DELIVERY, STORAGE AND HANDLING

A. Packaged Materials: Deliver packaged materials in clearly marked containers showing net weight, guaranteed analysis and name of manufacturer. Specified requirements for packaged materials apply to bulk shipments. Protect materials from deterioration during delivery and during storage at site.

1.12 PROJECT CONDITIONS

A. Existing Conditions

1. Carefully examine the site before submitting a bid. Be informed as to the nature and location of the Work, general and local conditions including climate, adjacent properties and utilities, conformation of the ground, the nature of subsurface conditions, the character of equipment and facilities needed prior to and during execution of the Work. Be aware of and comply with restrictions regarding subsurface utilities and subterranean structures, including excavation and loading parameters.
2. Should the Contractor, in the course of Work, find any discrepancies between Drawings and physical conditions or any omissions or errors in Drawings, or in layout as furnished by the Landscape Architect, it will be his duty to inform the Landscape Architect immediately in writing for clarification. Work done after such discovery unless authorized by the Landscape Architect, shall be done at the Contractor’s risk.

B. Environmental Conditions – Arboriculture

1. Pruning: Pruning shall occur, no later than April 1st, prior to the leafing out of the trees. Pruning shall only occur when weather conditions are favorable; pruning shall not occur when branches are wet with snow or rain or when covered by ice.
2. Fertilization: Spring fertilization shall occur in early spring, before bud break. When leaves have fully expanded, fertilizing can continue until early July Fall fertilization shall occur after October 1st or after the first hard freeze, whichever comes first, when all possibility of top growth in past and before the moisture in the soil freezes casing root activity. Avoid fertilizing between July and September 1.

3. Pest control: Avoid use of herbicides within planting bed. Avoid use of fertilizer/herbicide combinations within the dripline of trees in plant beds.

PART 2 - PRODUCTS

2.1 SOIL AMENDMENT MATERIAL

A. Sand: Natural, medium to coarse grained in texture, free from decomposed organic matter like roots, sticks, leaves, paper and of any other undesirable trash-like glass, plastic or metal fragments, that could interfere with soil drainage and planting operations. Sand shall be salt-free.

B. Ground Limestone: Natural dolomitic limestone containing a minimum of 88% of calcium and magnesium carbonates. Total of 100% passing the 10 mesh sieve; minimum of 90% passing the 20 mesh sieve; minimum of 60% passing the 100 mesh sieve.

C. Water: Potable, clean, fresh and free from harmful materials. Water shall be furnished by the Owner. All hoses and other irrigation equipment required for the Work shall be furnished by the Contractor.

2.2 FERTILIZERS

A. General: As specified below, all fertilizer shall conform to applicable state fertilizer laws. It shall be uniform in composition, free-flowing, and shall be delivered to the site in the original, unopened containers, each bearing the manufacturer’s guaranteed analysis. Any fertilizer which is unsuitable for use will be rejected.

B. Fertilizer: To be determined based on testing.

2.3 MULCH

A. Mulch shall be double shredded hardwood bark.

2.4 PESTICIDES

A. Biological control for trees and shrubs: Bacillus thuringensis, predatory mites, parasitic nematodes, parasitic insects, predatory insects, or other approved biological agents.

B. Miticide for trees: chinomethionate or dicofol.

C. Miticide for trees: chinomethionate or dicofol.

D. Superior oil for trees: horticultural grade, highly refined potassium salts or fatty acids.

E. Insecticides for trees: acephate, cyfluthrin, fluvalinate, chlorpyrifos, bendiocarb, or dimethoate.

PART 3 - EXECUTION

3.1 GENERAL

A. Basic arboriculture shall include all activities as noted in drawings, and shall include other arboriculture activities as described herein. Note that pruning, fertilization, vertical mulching and mulching activities should be performed prior to the start of construction activities, to improve the vigor of the existing trees to be preserved and to help mitigate the effects of construction stress.

B. The Arborist shall monitor excavations and construction within the Tree Preservation Area, including: being on site during all excavations within the Tree Preservation Area to ensure that hand or approved mechanical excavations does not damage existing root systems, and to perform compensatory pruning. The construction that would occur within the Tree Preservation Area would include but not be limited to removal of existing pavements, pavements, and utility trenching.

3.2 PRUNING

A. Pruning – General: Pruning shall conform to ANSI A300 – 2017 standards as specified. Stripping of interior growth on trees is not acceptable. Interior growth may be selectively thinned when appropriate to type of prune. Thinning in general shall be accomplished from the tips of branches by removing diseased, crossing, and/or conflicting branch structure. Target pruning shall be the preferred method of branch removal. Equipment shall be sharp and well maintained. Proper equipment shall be used for all pruning procedures (i.e., handsaw, chainsaw, polesaw, or pole pruner). Employees pruning trees shall have adequate training as to the proper methods and procedures for tree pruning. Refer to ANSI A300 standards for other pruning requirements.

1. On trees known or suspected of being diseased, tools are to be disinfected with methyl alcohol at 70% (denatured wood alcohol diluted appropriately with water) or Clorox solution after each cut and between trees where there is known to be a danger of transmitting the diseased on tools.
2. The presence of any structural weakness, disease conditions, decayed trunk or branches, split crotches or branches, should be reported in writing to the Architect and Owner, and corrective measures recommended.

B. All Trees shall receive a crown cleaning to remove all dead, weak, and conflicting branches 1 (one) inch and larger at the point of attachment. Trees with root zone affected by construction shall receive a slight reduction in the meristematic regions at the branch tips in the crown.

3.3 ROOT PRUNING

A. Root pruning shall be performed in conjunction with Tree Preservation Fencing. Root pruning shall be performed as indicated on Drawings or as required, including: trenching for utilities, excavations for foundations, or wherever grades will be changed within the root zone of the tree to be preserved. Root pruning shall be to the depth of excavation or 24 inches, whichever is less. A trencher or vibratory plow shall be used to prune roots. Roots over 2” in diameter shall have a clean cut made on the surface of the root which is still attached to the tree. This cut shall be made with a hand saw or chain saw as soon as larger root is severed. Where fill is to be placed, root pruning shall be to the depth of top soil.

B. The Arborist must verify exact layout with General Contractor, to ensure root pruning in appropriate location.

C. When root pruning in conjunction with excavation and installation of utilities, the Arborist shall endeavor to work around and preserve the existing tree roots. Make all effort to preserve roots greater than 2" in diameter.

3.4 FERTILIZATION

A. Position Trees shall receive a liquid fertilization. Fertilizer shall be applied at a rate of 1.5 pounds of nitrogen per 1,000 square feet of root zone treated. A root stimulant shall be added for trees with root loss or disturbance or otherwise affected by construction. Fertilizer shall be injected using a soil probe at a depth of six inches. Fertilizer shall be applied in three foot grid pattern evenly distributed throughout the root zone.

3.5 INTEGRATED PEST MANAGEMENT (IPM)

A. Arborist shall provide an IPM technician and equipment to make necessary treatments. Technician shall be trained and licensed to apply necessary controls, and the control methods shall be reviewed and approved by the Arborist.

B. Work shall be completed in accordance with the town of Enfield landscaping standards.

C. IPM technician shall monitor and treat any pests which may inhibit the health or survival of the trees to be preserved. Technician shall make ten monitoring / treatment visits per year. Arborist shall submit a Site Monitoring/Treatment Report following each visit, which describes the pests observed and treatments which were applied, and shall report on other issues observed on Site which may affect survival or the trees.

D. Watering shall be included in IPM program. Water shall be applied to trees during Site Monitoring / Treatment Visits, whenever soil moisture is below 40% of field capacity.

3.6 TREE WOUND CARE

A. Tree wounds shall be treated according to standard practices, by a professional arborist. Wounds shall not be covered with dressings.

3.7 DISPOSAL AND CLEAN UP

A. All refuse and debris from these operations shall be legally disposed of off-site. Material shall be removed or neatly stored at the end of each day's work. Dumping on the site shall not be permitted. Burning of material on the site shall not be permitted.

B. Maintain the site in an orderly condition during the progress of Work. Con tenuously and promptly remove excess and waste materials; keep lawn areas, walks and roads clear. Store materials and equipment where directed. Immediately remove rejected materials from the property. Promptly remove equipment, surplus material, and debris and trash resulting from operations under this Contract upon completion and prior to initial acceptance of Work. Lave the site in a neat, orderly condition, "broom clean".

C. All materials generated by construction activities during this phase of work shall be completely removed at the end of this phase and the site shall be left in a safe and clean conditions.

END OF SECTION 329400

SECTION 331116 – SITE WATER

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawing and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

B. Section 312333 –Trench Excavation and Backfill for Utilities

C. Town of Greenwich Standards and Regulations

1.2 SCOPE OF WORK

A. Work under this Section shall consist of providing all labor, plant facilities, materials, and equipment necessary and required to install all proposed water facilities in accordance with the Contract Documents. This Work shall include but not be limited to:

1. Installation of water mains consisting of pipes, valves, thrust blocks, meter pits, hydrants, and all necessary and required accessory items and operations.

B. Coordination of the connection of building fire service lines to the on-site water mains with the Building Contractor.

C. Sterilization and testing of new water facilities.

1.3 SUBMITTALS

A. Product Data: Provide manufacturer's certificate for castings, pipe and accessories to certify that products meet or exceed specified requirements.

B. Shop drawings of hydrants, valves, and valve boxes.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Ductile Iron Pipe: AWWA C151-91. Thickness Class 54 or better. Push-on joint complying with AWWA C110-90 or C153, rubber gaskets. Cement mortar lining complying with AWWA C104-90 for pipe and fittings minimum 1/16” thick. Note this type of pipe is most preferred and must be used for all lines 4” in diameter or greater.

B. Control Valves:

1. General: Provide valves and flow control devices as indicated.
2. Minimum Working Pressure: 200 psi unless otherwise indicated, or required.
3. Valves shall open left.
4. Gate Valves: Standard shut off valves with maximum working pressure cast into body, outside screw and yoke type complying with AWWA C500.

5. Check Valves: Gravity operated, regular type, iron bodied, bronze fitted with metal to metal rubber faced checks, complying with AWWA C506.
6. Butterfly Valves: Rubber seated, equipped with gear or traveling nut actuator to minimize water hammer, complying with AWWA C504.

C. Valve Boxes: Minimum 5-1/4" diameter cast iron, slide type. Covers shall be non-locking and have the word WATER in the casting.

D. Accessories:

1. General: Provide anchorages for tees, plugs, caps, and bends. After installation, apply a full coat of asphalt or other acceptable corrosion retarding material to surfaces of rods and clamps.
2. Clamps, Straps and Washers: Steel, ANSI/ASTM A506.
3. Rods: Steel, ANSI/ASTM A575.
4. Rod Couplings: Malleable iron, ANSI/ASTM A197.
5. Bolts: Steel, ANSI/ASTM A307.
6. Cast Iron Washers: ANSI/ASTM A126, Class A.
7. Trust Blocks: 2,500 psi concrete. Use at all changes in directions and elsewhere as necessary.
8. Fittings: Fitting should be short body, cast iron or ductile iron, and should conform and be installed per applicable AWWA C110/A21.10-82 or C153/A21.53-84.
9. Water Service Identification: Blue metallic tape reading 'WATER LINE BURIED

E. Joints:

1. Restrained: 1700 series by EBAA Iron or field lock gaskets
2. Retaining Glands: 'Megalug' with a minimum working pressure of 250 psi, or approved equal

F. Hydrants:

1. Per drawings and local utility Specifications.
2. 3-way hydrant with a 5-1/4" valve and mechanical joint connections in accordance with AWWA C502, open left, as manufactured by Mueller or approved equal.

G. Concrete Valve Seats: Concrete for valve seats shall have a minimum compressive strength of 3,000 psi in 28 days.

PART 3 - EXECUTION

3.1 GENERAL

A. The Contractor shall install all water pipe in the locations as shown on the Drawings and/or as approved by the Owner's Representative. Pipe shall be of the type and sizes specified and shall be laid accurately to line and grade. Structures shall be accurately located and properly oriented. Installation should conform with applicable AWWA Standards for the installation of water mains.

3.2 EXCAVATION AND BACKFILL

A. The provisions of Section 312333 entitled "Trench Excavation and Backfill for Utilities" shall govern all work under this Section.

B. The bottom of the trench shall provide a minimum of 4-1/2’ of cover over the crown of the pipe. Stones are not permitted at the bottom of the trench or in contact with the pipe in any location.

C. Sand bedding shall be installed to line and grade as shown on the Contract Drawings. Bedding shall provide continuous and uniform support along the entire length of the pipe.

D. Backfill shall be in accordance with Section 312333, entitled “ Trench Excavation and Backfill for Utilities”

E. Metallic tape reading ‘WATER LINE BURIED BELOW’ shall be placed in trench along entire length of water line.

F. The trench shall be kept free of water throughout pipe installation in accordance with Section 312319, entitled “Dewatering”

G. Contractor shall plug open ends of pipe overnight with an inflatable rubber plug, or approved equal.

3.3 STORAGE AND HANDLING PIPE

A. All pipes shall be protected against impact, shock and free fall, and only equipment of sufficient capacity and proper design shall be used in the handling of the pipe. Storage of pipe on the job shall be in accordance with the pipe manufacturer's recommendations, subject to the approval of the Owner's Representative.

3.4 DAMAGE TO PIPE

A. Pipe which is defective from any cause, including damage caused by handling, and determined by the Owner's Representative as unrepairable, shall be unacceptable for installation and shall be replaced at no cost to the Owner as directed by the Owner's Representative.

B. Pipe that is damaged or disturbed through any cause prior to acceptance of the Work shall be repaired, realigned or replaced as directed by the Owner's Representative, at the Contractor's expense.

3.5 PIPE INSTALLATION

A. The installation of water pipe shall conform to the requirements of AWWA standards and shall be laid to required lines and grades.

B. Laying Pipe - Each length of pipe shall be laid with firm, full and even bearing throughout its entire length, in a trench prepared and maintained in accordance with Section 312333 entitled "Trench Excavation and Backfill for Utilities”. All pipe shall have sufficient cover above the top of the pipe, and must be laid in separate trenches at least ten feet from the sewer pipe. Crossing of other facilities must have 12 inch minimum clearance (18 inches minimum clearance from sanitary).

C. Every length of pipe shall be inspected and cleaned of all dirt and debris before being laid. The interior of the pipe and the jointing seal shall be free from sand, dirt and trash before installing in the line. No pipe is to be trimmed or chipped to fit.

D. No length of pipe shall be laid until the preceding lengths of pipe have been thoroughly embedded in place, so as to prevent movement or disturbance of the pipe.

E. Full Length of Pipe - Full lengths of pipe are to be used whenever possible to minimize the amount of cutting and splicing in the field.

F. Bedding and Backfilling - The type of materials to be used in bedding and backfilling and the method of placement shall conform to the requirements of Section 312333 entitled "Trench Excavation and Backfill for Site Utilities", Section 3.2 above, and as shown on the Details on the Drawings.

G. Protection During Construction - The Contractor shall protect the installation at all times during construction, and movement of construction equipment, vehicles and loads over and adjacent to any pipe shall be performed at the Contractor's risk.

H. At all times when pipe laying is not in progress, all open ends of pipes shall be closed by temporary watertight plugs. If water is in the trench when work is resumed, the plug shall not be removed until the trench has been pumped dry and all danger of water entering the pipe has passed.

3.6 PIPE JOINTS

A. All joints are to be made water-tight and shall be tested in accordance with the requirements of the Water Company.

B. Pipe shall be jointed in strict accordance with the pipe manufacturer's instruction. Jointing of all pipe shall be done entirely in the trench.

C. At all tees, bends, dead ends and hydrant, joint restraint shall be provided on the first two joints on either side of the fitting.

D. Install retaining glands at all mechanical joint locations per manufacturer’s installation method.

3.7 THRUST BLOCKS

A. Thrust blocks shall be constructed at all bends by placing a minimum of one-third cubic yard of concrete for each fitting at the undisturbed side of excavation. The thrust block construction shall be adequate to sustain the imposed load. Placement of thrust blocks shall conform to the details and schedule of the Drawings.

3.8 CONNECTION TO EXISTING FACILITIES

A. General - The Contractor shall make all required connections of the proposed water lines into existing water facilities, where and as shown on the Drawings and/or as approved by the Owner's Representative. Connections shall be performed by a Contractor approved by the local utility company. The Contractor shall perform any investigation measures including, but not limited to, exploratory test pits to confirm the point of tie-in and avoidance of other utilities. All investigation measures should be performed a minimum of two weeks prior to the start of water main installation work. Notify engineer of any conflicts. The Contractor shall be responsible for relocating utilities in conflict.

B. Compliance with Requirements of Owner of Facility - Connections into existing water facilities shall be performed in accordance with the requirements of the Owner of the facility. The Contractor shall be required to comply with all such requirements, including securing of all required permits, and paying the costs thereof. The cost of making the connections in accordance with the requirements of the owner of the existing facility shall be included in the Contract Sum.

3.9 SERVICE LINES

A. General - The Contractor shall terminate the water laterals five feet from the building. Work shall include making the service line connections into the on-site water mains, furnishing and installing all service line pipe from the on-site water main systems to points located five feet outside of the proposed building lines and properly sealing the ends with watertight plugs. Service line extensions from these points into the building will be performed by the Building Contractor.

B. Coordination with Building Contractor - The Contractor shall be required to coordinate his work with the work of the Building Contractor to determine the exact location and elevation of the point of entry into the building. If the Building Contractor has installed his portion of the water service line, work under this Contract shall also include final connection of the water service line five feet outside the building line to the building service line at no additional cost to the Owner. The Contractor shall review the latest architectural/ mechanical plans to verify the location of the service laterals.

C. Connection into On-Site Water System - Water service line connections to the pipe of the on-site water mains shall be made with proper fittings supplied by the pipe manufacturer and as shown on the Drawings in a manner satisfactory to the Owner's Representative.

D. Connection into Off-Site Water System - Water service line connections to the pipe of the off-site water mains shall be made with proper fittings supplied by the pipe manufacturer and as shown on the Drawings in a manner satisfactory to the local authorities.

3.10 STERILIZING

A. All new water lines shall be flushed, sterilized and inspected prior to being put into service and the final connection(s) made to the existing system. Contractor shall sterilize lines in accordance with AWWA C601 or the local utility requirements, whichever is more restrictive.

B. The contractor is responsible for properly disposing of any chlorinated water in accordance with all State and Federal regulations. Any required permits for this work is also the responsibility of the contractor.

3.11 TESTING

A. General: The Contractor shall coordinate and perform all required testing in connection with water line installation. Hydrostatic and leakage tests shall be performed in accordance with the latest edition of AWWA C600 or the local utility requirements, whichever is more restrictive.

B. Scheduling of pressure and leakage tests shall be coordinated with the local water company and performed in the presence of local water company personnel.

C. Contractor shall furnish all necessary items to complete the required tests. Items include, but are not limited to:

Temporary plugs or caps
Pumps
Water meter
Pressure guage

D. Pipes proposed to be encased in concrete shall be tested prior to placing of the concrete.

3.12 FINAL INSPECTION

A. Upon completion of the Work and before final acceptance by the Owner, the entire water system may be subjected to a final inspection in the presence of the Site Engineer and/or Owner's Representative at the Owner's discretion. The Work shall not be considered as complete until all requirements for line, grade, cleanliness, leakage tests and workmanship have been met.

END OF SECTION 331116

SECTION 333000 – SITE SANITARY SEWERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawing and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

B. Section 310000 – Earthwork

C. Section 312333 –Trench Excavation and Backfill for Site Utilities

D. Town of Greenwich Standards and Regulations

1.2 SCOPE OF WORK

A. This Work under this section of the specifications shall consist of providing all labor, plant facilities, materials and equipment necessary to install all of the sanitary sewer facilities. This work shall include but not be limited to:

1. Installation of sanitary sewers consisting of manholes, pipe, cleanouts, laterals, wye connections, and all necessary and required accessory items and operations as shown on the Details and Drawings.
2. Connection to existing sanitary sewer facilities.

B. All necessary coordination with governing sewerage authority including local sewerage authority and local health department.

C. Testing of sanitary sewer system.

D. Abandonment and removal of existing sanitary sewer pipes and manholes.

1.3 SUBMITTALS

A. Product Data: Provide manufacturer's certificate for castings, pipe and accessories to certify that products meet or exceed specified requirements.

B. Submit shop drawings of the precast structures to the Owner’s Engineer for review prior to fabrication. Shop drawings shall include dimensions, reinforcing, joint treatment, invert elevations and invert locations.

C. Submit shop drawings of structure tops including frames and covers.

D. Anti-buoyancy calculations, if necessary

PART 2 - PRODUCTS

2.1 MATERIALS

A. The Contractor shall install materials based on this specification or per local specifications, whichever is more restrictive.

B. Polyvinyl Chloride (PVC) Pipe: ASTM D3034-93 for pipe and fittings, minimum wall thickness of SCH-40 or SDR-35 as indicated on drawings. Provide minimum three feet of pipe cover in pavement areas.

C. Precast Concrete Manholes: AASHTO M199-93/ASTM C478-90b, rated for H20 loading, with concrete strength of 4,000 psi.

D. Manhole Frames and Covers: Gray iron casting, AASHTO M105-93/ASTM A48, Class 30B. Pattern number as specified by the local authority or approved equal. All openings to comply to OSHA confined space access diameter. The word sewer is to be on the cover or as specified by the local sewage authority.

E. Manhole Steps: Aluminum alloy 6016T6 steps, manufactured by Alco or approved equal.

F. Cleanouts: Iron body type with extra heavy bronze plugs. Cover shall consist of Neenah Foundary Company Pattern No. R-1914 with locking cover, or approved equal.

G. Pipe joint: Rubber compression gaskets meeting ASTM D 3212.

PART 3 - EXECUTION

3.1 GENERAL

A. The Contractor shall install all sanitary sewer structures and pipe in the locations as shown on the Drawings and/or as approved by the Owner's Representative. Pipe shall be of the type and sizes specified and shall be laid accurately to line and grade. Structures shall be accurately located and properly oriented.

3.2 EXCAVATION AND BACKFILL

A. The provisions of Section 312333 entitled “Trench Excavation and Backfill for Utilities” shall govern all Work under this Section.

3.3 STORAGE AND HANDLING OF PIPE

A. All pipe shall be protected against impact, shock and free fall, and only equipment of sufficient capacity and proper design shall be used in the handling of the pipe. Storage of pipe on the job shall be in accordance with the pipe manufacturer's recommendations, subject to the approval of the Owner's Representative.

3.4 DAMAGE TO PIPE

A. Pipe which is defective from any cause, including damage caused by handling, and determined by the Owner's Representative as unrepairable, shall be unacceptable for installation and shall be replaced at no cost to the Owner as directed by the Owner's Representative. Damaged pipe shall be immediately marked with white paint and separated from usable pipe on site.

B. Pipe that is damaged or disturbed through any cause prior to acceptance of the Work shall be repaired, realigned or replaced as directed by the Owner's Representative, at the Contractor's expense.

3.5 PIPE INSTALLATION

A. Laying Pipe - Each length of pipe shall be laid with firm, full and even bearing throughout its entire length, in a trench prepared and maintained in accordance with Section 312333 entitled “Trench Excavation and Backfill for Utilities”. Pipe will be laid with bells upgrade.

B. Every length of pipe shall be inspected and cleaned of all dirt and debris before being laid. The interior of the pipe and the jointing seal shall be free from sand, dirt and trash before installing in the line. Extreme care must be taken to keep the bells of the pipe free from dirt and rocks so that joints may be properly assembled without over stressing the bells. No pipe is to be trimmed or chipped to fit.

C. No length of pipe shall be laid until the preceding lengths of pipe have been thoroughly embedded in place, so as to prevent movement or disturbance of the pipe.

D. Full Lengths of Pipe - Only full lengths of pipe are to be used in the installation except that partial lengths of pipe may be used at the entrance to structures where necessary to obtain a proper connection to the structure.

E. Pipe Entrances to Structures - All pipe entering structures shall be cut flush with the inside face of the structure, and the cut ends of the pipe surface of the structure shall be properly rounded and finished so that there will be no protrusion, ragged edges or imperfections that will impede the flow of water or affect the hydraulic characteristics of the installation.

F. Bedding and Backfilling - The type of materials to be used in bedding and backfilling and the method of placement shall conform to the requirements Section 312333 entitled “Trench Excavation and Backfill for Utilities” and as shown on the Details of the Drawings.

G. Protection During Construction - The Contractor shall protect the installation at all times during construction, and movement of construction equipment, vehicles and loads over and adjacent to any pipe shall be performed at the Contractor's risk.

H. At all times when pipe laying is not in progress, all open ends of pipes shall be closed by temporary water tight plugs. If water is in the trench when work is resumed, the plug shall not be removed until the trench has been pumped dry and all danger of water entering the pipe has passed.

I. Tolerance - Pipe shall be laid accurately to the line and grade as shown on the Drawings and/or as approved by the Owner's Representative. Allowable tolerances shall be 1/4 inch in grade and 1/2 inch in line in any section of pipe between manholes. No adverse grades shall be allowed. Deviations from these tolerances shall be grounds for rejection of the line of pipe by the Owner's Representative. Any line which has been rejected shall be rebuilt to the correct line and grade by the Contractor at his own expense.

J. Do not lay the sanitary sewer line closer than ten feet horizontally or 1.5 feet vertically to a water main or service line. Where sanitary sewer lines pass above water lines, encase the sewer in six inches of concrete for a distance of ten feet on each side of the crossing or substitute rubber-gasketed pressure pipe for the pipe being used for the same distance if approved by the appropriate sewerage authority.

3.6 PIPE JOINTS

A. All joints are to be made watertight in accordance with the requirements specified herein.

B. Pipe shall be jointed in strict accordance with the pipe manufacturer's instructions. Jointing of all pipe shall be done entirely in the trench.

C. Where sanitary sewer lines pass below water lines, lay pipe so that no joint in the sewer line will be closer than 3 feet horizontally to the water line.

D. Where sanitary sewer lines pass less than 18 inches below the water line, provide concrete encasement. The length of encasement is to be increased to the nearest joint beyond the specified horizontal offset distance.

E. Make joints between ductile-iron pipe and other types of pipe with standard manufactured ductile-iron adapters and fittings or as directed by the local sewerage authority. Install ductile-iron piping and fittings in accordance with the recommendations of the pipe manufacturer.

3.7 MANHOLES AND OTHER PRECAST STRUCTURES

A. General Requirements - All manholes shall be built in accordance with the Details and in the locations shown on the Drawings and as specified herein.

B. Structures shall be constructed of precast concrete. Precast structures will require Shop Drawing approval by the Owner's Representative and/or the Site Engineer.

C. No concrete shall be poured when the temperature is below 40 degrees Fahrenheit, or when indications are for lower temperatures within 24 hours, unless protection of concrete is approved by the Owner's Representative.

D. Manholes are to be constructed as soon as the pipe-laying reaches the location of the manhole. Should the Contractor continue his pipe-laying without making provision for completion of the manhole, the Owner's Representative shall have the authority to stop the pipe-laying operations until the manhole is completed.

E. Any manhole which is mislocated or oriented improperly shall be removed and rebuilt in its proper location, alignment and orientation at the Contractor's expense.

F. Foundations - All foundations shall rest on firm ground of uniform bearing.

G. Inverts - Smooth concrete invert channels shall be constructed in all manholes to insure a smooth flow of water through the structure.

H. The invert channels shall be carried up to the elevations shown on the Drawings and/or as approved by the Owner's Representative. Channels shall slope smoothly and evenly from the entrance pipe to the outlet pipe.

I. Frames, Covers and Gratings - Frames, covers and/or grating for manholes shall be of the type and size indicated on the Drawings or as required by the local authority. Frames shall be well bedded in mortar and shall be set accurately to the correct alignment and grade.

J. Ladder Rungs - Ladder rungs shall be installed in all manholes, spaced 12 inches on center vertically and staggered. Rungs shall be set securely in place during the construction of the masonry wall.

K. Precast Manhole - Precast manholes shall be installed only after Shop Drawings have been approved. Any manholes required by the appropriate utility shall be fabricated, bedded, located and backfilled in accordance with said utility requirements and recommendations.

L. The top grade of the precast concrete corbel section shall be set sufficiently below finished grade to permit a maximum of four and a minimum of two courses of eight inch brick to be used as risers to adjust the grade of casting. Manhole frames shall be set on a grout pad as specified herein above.

M. Bitumastic coating - The entire exterior surface of all manholes shall be coated with two coats of an approved bitumastic material to produce a dry film thickness of 0.07 inches (7 mils) per coat.

3.8 INTERFACE WITH EXISTING FACILITIES

A. Requirements: The Contractor shall make all required connections of the proposed sanitary sewer facilities into existing sanitary sewer facilities, where and as shown on the Contract Documents and/or as approved by the Owner's Engineer.

B. Compliance with Facility Owner Requirements: Connections made into existing sanitary sewer facilities shall be performed in accordance with the requirements of the Owner of the facility. The Contractor will be required to comply with all such requirements, including securing of all required permits, and paying the costs thereof. The cost of making the connections in accordance with the requirements of the Owner of the existing facility shall be included in the Contract Sum.

3.9 MODIFICATIONS OF EXISTING STRUCTURES

A. General: The Contractor shall alter, reconstruct and/or convert existing structures where and as shown on the Contract Documents, and/or as approved by the Owner's Engineer. In general, alterations shall be performed with the same type of material used in the original construction unless otherwise indicated on the Contract Documents of approved by the Owner's Engineer.

B. Damage to Existing Installations: The Contractor shall exercise extreme care during such alteration, reconstruction and/or conversions so as not to damage any portions of the structure and/or pipe shown to remain. Any Such damage shall be repaired by the Contractor at his own expense and to the satisfaction of the Owner's Engineer and Owner of the damaged structure.

C. All existing sanitary sewer manhole covers, rims, and structures to remain shall be adjusted to proposed grade.

3.10 SERVICE LINES

A. General - The Contractor shall terminate sanitary laterals five feet from the building.

B. Coordination with Building Contractor - The Contractor will be required to coordinate his work with the work of the Building Contractor to determine the exact location and elevation of the point of entry into the building. If the Building Contractor has installed his portion of the sanitary sewer service line, work under this contract shall also include final connection of the sanitary sewer service line five feet outside the building line to the building service line at no additional cost to the Owner. The Contractor shall consult the latest architectural/mechanical drawings to confirm lateral locations.

3.11 INSPECTION AND TESTING

A. General - The Contractor shall test the completed sewers, including manholes and laterals for leakage by low-pressure air test, infiltration and exfiltration tests as specified herein and any other testing required by the local sewer authority. The Contractor shall furnish all necessary equipment, materials and labor for performing the tests as specified. The Contractor shall notify the Owner's Representative and the sewage authority at least 48 hours prior to the start of testing. Sections of pipe tested for infiltration and exfiltration prior to completion of the project shall be subject to additional leakage tests, if warranted in the opinion of the Owner's Representative, and/or the sewage authority prior to acceptance of the project.

B. Infiltration and Exfiltration Testing - The test length intervals for either type of leakage test shall be approved by the Owner's Representative and the sewage authority, but in no event shall they exceed 1000 feet. In the case of sewers laid on steep grades, the length of line to be tested by exfiltration at any one time may be limited by the maximum allowable internal pressure on the pipe and joints at the lower end of the line.

C. The test period, wherein the measurements are taken shall not be less than four hours in either type of test.

D. Leakage Requirements - The total leakage of any section tested shall not exceed the rate of 50 gallons per day per mile per inch of nominal pipe diameter. For purposes of determining the maximum allowable leakage, manholes shall be considered as sections of 48 inch diameter pipe, five feet long, and the equivalent leakage allowance shall be 2.25 gallons per manhole per 24 hours. Depending on field conditions, the following test for leakage shall be employed:

1. Infiltration Test - The test may be used only when groundwater levels are at least four feet above the highest point of the crown of the sewer being tested and after the trench has been backfilled and compacted. The groundwater leakage into the pipe will be measured near the lower end of the section of sewer under test.
2. Exfiltration Test - This test consists of filling the pipe with water to provide a head of at least five feet above the top of the pipe or five feet above groundwater, whichever is higher, at the highest point of the pipe line under test, and measuring the loss of water from the line by the amount which must be added to maintain the original level. In this test, the line must remain filled with water for at lest 24 hours prior to the taking of measurements. Exfiltration shall be measured by the drop of water level in a closed-end standpipe or in one of the sewer manholes available for convenient measuring.When a standpipe and plug arrangement is used in the upper manhole of a line under test, there must be some positive method of releasing entrapped air in the sewer prior to taking measurements.

E. Low Pressure Air Testing - The sewer mains and/or laterals shall be tested for leakage by the use of low-pressure air as specified hereinafter or by the local sewage authority and as approved by the Owner's Representative. The test length shall not exceed one interval of pipe between two manholes. Air test procedures may be dangerous and the Contractor shall take all necessary precautions to prevent blowouts.

F. The proper procedure for air testing of sanitary sewers shall be as described in ASTM C-828, latest edition, entitled "Recommended Practice for Low-Pressure Air Test of Vitrified Clay Pipe Lines (4-12 inches)". Although the title specifies vitrified clay pipe, the same procedure maybe used for any other pipe material.

G. It is important that test plugs be properly installed to prevent blowouts. It is also important to maintain pressure relief devices to prevent system over pressurization.

H. Correction of Defective Work - If leakage exceeds the specified amount, the Contractor shall, at his own expense, make the necessary repairs or replacements required to permanently reduce the leakage to within the specified limit, and the tests shall be repeated until the leakage requirement is met.

I. Any defects found in the system are to be repaired at the expense of the Contractor so as to conform strictly to the Specifications and to the satisfaction of the Owner's Representative. All repairs shown necessary by the tests are to be made, broken or cracked pipe replaced, all deposits removed, and sanitary sewer left true to line and grade and entirely clean, free from lumps of cement, protruding gaskets, bulkheads, etc., and ready for use before final acceptance by the Owner.

J. Compliance with Agency Requirements - In the event of conflict between the leakage test requirements specified herein with the leakage test requirements of agencies having jurisdiction over all or any portion of the sanitary sewers installed under this Contract, the more restrictive requirements shall govern.

3.12 CLEANING AND REPAIR

A. The Contractor will be required to clean the entire sanitary sewer system of all debris and obstructions. This shall include, but not be limited to removal of all formwork from structures, concrete and mortar droppings, construction debris and dirt. The system shall be thoroughly flushed clean and the Contractor shall furnish all necessary hose, pumps, pipe and other equipment that may be required for this purpose. No debris shall be flushed into existing sanitary sewers or streams; all debris shall be removed from the system.

B. After the system has been cleaned, the Contractor shall thoroughly inspect the system and all repairs shown to be necessary shall be promptly performed by the Contractor.

C. All work of cleaning and repair as specified herein shall be performed at the Contractor's expense and to the complete satisfaction of the Owner's Representative.

3.13 FINAL INSPECTION

A. Upon completion of the Work and before final acceptance by the Owner, the entire sanitary sewer system shall be subjected to a final inspection in the presence of the Site Engineer and/or Owner's Representative and local sewerage authority. The Work shall not be considered as complete until all requirements for line, grade, cleanliness, leakage tests and workmanship have been met.

END OF SECTION 333000

SECTION 334100 – STORM SEWER SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawing and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

B. Section 320000 - General Requirements

C. Section 020100 - Protection of Existing Utilities

D. Section 310000 - Earthwork

E. Section 312333 - Trench Excavation and Backfill for Utilities

F. Section 312500 - Soil Erosion and Sediment Control

G. Section 333100 Sanitary Sewerage System

H. Section 321313 - Portland Cement Concrete Paving

I. Local governing authority and code requirements.

J. All necessary construction permits.

K. Contract Documents

L. Town of Greenwich standard requirements

1.2 SCOPE OF WORK

A. Work under this section shall consist of providing all labor, plant facilities, materials, tools, equipment, shop drawings and supervision necessary and required to install all of the storm drainage facilities as specified in accordance with the Contract Documents. This work shall include but not be limited to:

1. Installation of the drainage system consisting of manholes, catch basins, pipes, yard drains, cleanouts, flared end sections, stormwater management units, water quality units and all necessary and required accessory items and operations.
2. Connections to existing drainage facilities.

1.3 REFERENCE STANDARDS

A. American Society for Testing and Materials (ASTM) latest edition.

1. A706 Type 1R
2. C14 Concrete Sewer, Storm Drain, and Culvert Pipe.
3. C55 Concrete Building Brick.
4. C76 Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe.
5. C443 Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets.

6. C478 Precast Reinforced Concrete Manhole Sections.
7. C923 Resilient Connectors between Reinforced Concrete Manhole Structures and Pipes.
8. D1557 Test Methods for Moisture Density Relations of Soils and Soil Aggregate Mixtures Using 10 lb (4.54 Kg) Rammer and 18 inch (457 mm) Drop.
9. D2922 Test Methods for Density of Soil and Soil Aggregate in Place by Nuclear Methods (Shallow Depth).
10. D3017 Test Methods for Moisture Content of Soil and Soil Aggregate Mixtures.

B. American Association of State Highway and Transportation Officials (AASHTO) - latest edition

C. International Masonry Industry All-Weather Council (IMIAC): Recommended Practices and Guide Specification for Cold Weather Masonry Construction.

1.4 QUALITY ASSURANCE

A. An Engineer, selected and paid by the Owner (herein referenced to as “Owner’s Engineer”), may be retained to perform construction inspection on-site based on measurement, visual observation, and judgment.

B. Visual field confirmation may be performed by the Owner’s Engineer as part of the construction testing requirements.

C. All costs related to reinspection due to failures shall be paid for by the Contractor at no additional expense to Owner. The Owner reserves the right to direct any inspection that is deemed necessary. Contractor shall provide free access to site for inspection activities.

1.5 SUBMITTALS

A. Product Data: Provide manufacturer's certificate for castings, pipe and accessories to certify that products meet or exceed specified requirements.

B. Submit shop drawings of the precast structures to the Owner’s Engineer for review prior to fabrication. Shop drawings shall include dimensions, reinforcing, joint treatment, invert elevations and invert locations.

C. Submit shop drawings of structure tops including frames, covers, and/or grates.

D. Submit shop drawings of the below grade stormwater management system including material, layout, elevations, pipe connection locations, inspection ports, access locations, and backfill requirements.

1.6 PROJECT RECORD DOCUMENTS

A. Accurately record actual locations of pipe runs, connections, catch basins, cleanouts, and invert elevations.

B. Identify and describe unexpected variations to subsoil conditions and location of uncharted utilities.

1.7 COORDINATION

A. Coordinate the Work with termination of storm sewer connection outside building including connection to existing storm sewer system.

PART 2 - PRODUCTS

2.1 SEWER PIPE MATERIALS AND ACCESSORIES

A. Reinforced Concrete Pipe (RCP): Straight and flared end sections complying with requirements of ASTM C 76, Class III unless another class type is indicated on the Contract Documents, installed with flexible plastic (Bitumen) gaskets at all joints. Gaskets shall comply with AASHTO M 198 75I, Type B, and shall be installed in strict accordance with pipe manufacturer's recommendations.

B. Corrugated High Density Polyethylene Pipe (HDPE): Shall conform to AASHTO Designation M294 and M252. Pipe must be installed in accordance with pipe manufacturer’s installation Guidelines for Culvert Storm Drainage Applications. Acceptable manufacturers: Advanced Drainage Systems, Inc. “ADS N-12” and HANCOR, Inc. “Hi-Q” or approved equal.

C. Polyvinyl Chloride Pipe (PVC)

1. On-site pipe and fittings shall comply with ASTM D 3034, rated SDR 35 unless otherwise specified on the Contract Documents or required by the local utility. Pipe shall be continually marked with manufacturer's name, pipe size, cell classification, SDR rating, and ASTM D 3034 classification.
2. Pipe joints shall be integrally molded bell ends per ASTM D 3034, Table 2, with factory supplied elastomeric gaskets and lubricant.

2.2 CATCH BASINS, INLETS, MANHOLES AND COMPONENTS

A. General: All manholes, catch basins and drain inlets shall be built in accordance with, and in the locations shown on the Contract Documents. All structures will require shop drawings approved by the Owner's Engineer and Town Engineer.

B. No concrete or masonry shall be placed when the temperature is below forty (40) degrees Fahrenheit, or when indications are for lower temperatures within twenty-four (24) hours, unless protection of concrete and masonry is approved by the Owner's Engineer. Damage to the structure because of freezing shall be corrected by the Contractor at his own expense, to the satisfaction of the Owner's Engineer.

C. Manholes, catch basins and drain inlets shall be constructed as soon as the pipe laying reaches the location of the structures. Should the Contractor continue his pipe laying without making provisions for completion of the structures, the Owner's Engineer shall have the authority to stop the pipe laying operations until the structure is completed.

D. Any structure which is mislocated or oriented improperly shall be removed and re-built in its proper location, alignment and orientation at the Contractor's expense.

E. Precast Concrete Manholes: AASHTO M199-93/ASTM C478-90b. Manhole diameter shall be selected to accommodate the inflow and outflow pipes.

F. Pour-in-place or Precast Reinforced Concrete Catch Basins (Control Structures): AASHTO M199-93/ASTM C478-90b rated for H20 loading, with minimum concrete strength of 3,000 psi. Inlet size shall be selected to accommodate the inflow and outflow pipes.

1. Manhole Barrel: Reinforced precast concrete in accordance with ASTM C478 with gaskets in accordance with ASTM C923 & C361

    a. Construct manholes of precast concrete sections as required by Contract Documents to size, shape, and depth indicated, but never less than 4-ft inside diameter.

2. Mortar and Grout: Mortar for finishing and sealing shall be Class "C". Honeycombing less than two (2) inches deep shall be repaired using Class "D" mortar.
3. Brick Transition Reinforcement: Formed steel 8-gage wire with galvanized finish.
4. Foundations: All foundations shall rest on firm soil of uniform bearing and stone subbase as shown on Contract Documents.
5. Inverts: Brick or smooth concrete invert channels shall be constructed in all manholes and in all catch basins and drain inlets which do not have sumps, to insure a smooth flow of water through the structure.
6. The invert channel shall be constructed to the elevations shown on the Contract Documents and/or as approved by the Owner's Engineer. Channels shall slope smoothly and evenly from the entrance pipe to the outlet pipe.
7. Frames, Cover, and Gratings: Frames, Covers and/or gratings for manholes, catch basins, and drain inlets shall be of the type and size indicated on the Contract Documents. Frames shall be well bedded in mortar and shall be set accurately to the correct alignment and grade.
8. Ladder Rungs: Forged Aluminum to dimensions shown on Contract Documents to be Alco steps 6061T6 or approved equal.
9. Precast Structures: Precast structures shall be installed only after shop drawings have been approved by Owner’s Engineer and shall meet the requirements of ASTM C478.
10. Grout around pipes which protrude through the walls of the structure and on all joints shall contain "Antihydro", or other approved additive to insure water tightness. Cement grout shall contain two parts cement to one part sand and additive in accordance with manufacturer's recommendations. Mortar shall be applied to the bottom 1/3 of the opening before the pipe is inserted.
11. The top grade of the precast concrete corbel section shall be set sufficiently below finished grade to permit a maximum of seven (7) and a minimum of two (2) courses of 8-inch brick to be used as risers to adjust the grade of the casting. Manhole frames shall be set on a grout pad as specified herein above.
12. Provide precast manhole shaft construction with eccentric cone top section and lipped male/female rubber gasket joints or mortar joints.
13. Brick shall be new units conforming to AASHTO Designation M-91, latest revision, Grade MS.
14. Mortar shall conform to ASTM C270, Type M.
15. Pipe joints for rigid pipes shall be made with mortar, grout, gaskets, or as recommended by the pipe manufacturer.
16. Manholes and Pipe constructed within the Right-of-Way shall be manufactured and installed in accordance with all applicable Standard Specifications and the Contract Documents.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that trench cut and excavation is ready to receive work and excavations, dimensions, and elevations are as indicated on Contract Documents.

3.2 PREPARATION

A. Hand trim excavations to required elevations. Correct over excavation with fine aggregate.

B. Remove large stones or other hard matter which could damage piping or impede consistent backfilling or compaction.

C. Protect benchmarks, property corners, and other survey monuments from damage or displacement. If marker needs to be removed it shall be referenced by licensed land surveyor and replaced, as necessary, by same.

3.3 GENERAL

A. The Contractor shall install all drainage structures and pipe in the locations shown on the Contract Documents and/or as approved by the Owner's Engineer. Pipe shall be of the type and sizes specified and shall be laid accurately to line and grade. Structures shall be accurately located and properly oriented.

B. Excavation and Backfill shall be in accordance with Section 312333 of these specifications.

C. Storage and Handling of Pipe - All pipe shall be protected against impact, shock and free fall, and only equipment of sufficient capacity and proper design shall be used in the handling of the pipe. Storage of pipe on the job shall be in accordance with the pipe manufacturer's recommendations.

D. Damage to Pipe - Pipe which is defective from any cause, including damage caused by handling, and determined by the Owner's Engineer as unrepairable, shall be unacceptable for installation and shall be replaced at no cost to the Owner as directed by the Owner's Engineer.

E. Pipe that is damaged or disturbed through any cause prior to acceptance of the Work, shall be repaired, realigned or replaced as directed by the Owner's Engineer, at the Contractor's expense.

3.4 BEDDING

A. Excavate pipe trench and place bedding material in accordance with Section 31 23 33 for work of this Section.

3.5 INSTALLATION - PIPE

A. Laying Pipe: Each length of pipe shall be laid with firm, full and even bearing throughout the entire length, in a trench prepared and maintained in accordance with Section 31 23 33 of these Specifications and Contract Documents. Pipe shall be laid upgrade unless otherwise approved by the Owner’s Engineer.

B. Concrete pipe over 24-inches in diameter shall be laid with the lift holes on top of the pipe. After the pipe is installed, the lift holes shall be sealed with suitable concrete plugs to the satisfaction of the Owner's Representative. No lift holes will be permitted in pipes 24-inches in diameter and smaller.

C. Bell and spigot pipe shall be laid with the bell end upgrade. The pipe shall be joined so that there will be uniform space around the pipe. Trimming of the pipe shall not be allowed.

D. Every length of pipe shall be inspected and cleaned of all dirt and debris before being laid. Prior to placing a length of pipe, the end of the previously laid length shall be carefully and thoroughly wiped smooth and clean to obtain an even and close fitting joint.

E. No length of pipe shall be laid until the preceding lengths of pipe have been thoroughly embedded in place, so as to prevent movement or disturbance of the pipe.

F. Place pipe on minimum 6-inch thick bed of compacted bedding or as detailed on the Contract Documents.

G. Install pipe, fittings, and accessories in accordance with ASTM C12, ASTM D2321, manufacturer's instructions and/or state or local requirements. Seal joints to be watertight.

H. Lay pipe to slope gradients noted on Contract Documents with maximum variation from true slope of 1/8-inch in 10-ft.

I. Place and compact bedding aggregate at sides and to the springline of the pipe as per these Specifications.

J. Refer to Sections 310000 and 312333 of these Specifications for backfill requirements. Do not displace or damage pipe when compacting.

K. Full Lengths of Pipe: Only full lengths of pipe shall be used in the installation except that partial lengths of pipe may be used at the entrance to structures where necessary to obtain a proper connection to the structure.

L. Pipe Entrances to Structures: All pipe entering structures (e.g.: manholes, catch basins, etc.) shall be cut flush with the inside of the structure, and the cut ends of the pipe and surface of the structure shall be properly rounded and finished so that there will be no protrusion, ragged edges, or imperfections that will impede the flow of water or affect the hydraulic characteristics of the installation.

M. Only full sections of pipe shall be used where entering a structure which will be exposed to view, such as endwalls, headwalls, end sections, etc.

N. Bedding and Backfilling: The type of materials to be used in bedding and backfilling and the method and placement shall conform to the requirements of these Specifications.

O. Protection During Construction: The Contractor shall protect the installation at all times during construction, and movement of construction equipment, vehicles and loads over and or adjacent to any pipe shall be performed at the Contractor's risk.

P. Tolerance: Pipe shall be laid accurately to the line and grade shown on the Contract Documents and/or as approved by the Owner's Engineer. Allowable tolerances shall be 1/2-inch on grade and 1-inch on line in any section of pipe between structures. Deviations from these tolerances shall be a basis for rejection of the line of pipe by the Owner's Engineer. Any line which has been rejected shall be rebuilt to correct line and grade by the Contractor at his own expense.

3.6 INSTALLATION - CATCH BASINS, MANHOLES AND CONTROL STRUCTURES

A. Form bottom of excavation clean and smooth to correct elevation.

B. Form and place cast-in-place concrete base pad, with provision for storm sewer pipe to be placed at proper elevation.

C. Place precast reinforced concrete sections with provision for storm sewer pipe sections at the location and elevation specified on the Contract Documents.

D. Level top surface of each precast concrete shaft sections as assembly progresses.

E. Establish elevations and pipe inverts for inlets and outlets as indicated.

F. Lay brick masonry in running bond with full 3/8-inch mortar joints to receive casting assembly. Level casting frame in grout to receive grated inlet or manhole cover.

3.7 PLACING PRE-CAST MANHOLE BARREL SECTIONS

A. Place base pad to proper elevation and location and trowel top surface level for placement of manhole barrel.

B. Place manhole barrel plumb and level to correct elevations and anchor to base pad.
   1. After completion of slab foundation the first joint of manhole barrel shall be lowered into position, grooved end first, and set level and plumb on concrete base. Align and adjust to proper grade prior to placing and forming invert which shall be poured immediately after setting of first section of manhole barrel.
   2. Prior to setting subsequent manhole barrel sections, apply primer to tongue and groove ends and allow to set in accordance with manufacturer recommendations. Place "Ram-nek", or equivalent, plastic rope on tongue end. Lower next section into position, and remove excess material from interior of structure. Add additional material on exterior of joint, if necessary, for completely watertight joint.

3.8 PIPE JOINTS

A. Mortar Joints (RCP): After each length of RCP is laid, the lower portion of the bell shall be filled with mortar, and the succeeding length shall be laid in place so that the inner surfaces of the abutting lengths are flush. The remainder of the joint shall be completely filled with mortar and sufficient additional mortar used to form a bead around the joint flush with the outside diameter of the bell. The inside of the joint shall be wiped and finished smooth. Joints shall be thoroughly wet before the mortar is placed.

B. Cold Applied Joint Sealer (RCP): Bell and spigot or tongue and groove RCP shall be wiped clean and dry before applying the sealer to the pipe joint. Before the pipes are placed in contact with each other, the spigot end or tongue end of the pope shall be completely covered with an excess of sealer, and then the pipe shall be laid to the established line and grade so that the inside surfaces of abutting pipe are flush.

3.9 INTERFACE WITH EXISTING FACILITIES

A. Requirements: The Contractor shall make all required connections of the proposed drainage facilities into existing drainage facilities, where and as shown on the Contract Documents and/or as approved by the Owner's Engineer.

B. Compliance With Facility Owner Requirements: Connections made into existing drainage facilities shall be performed in accordance with the requirements of the Owner of the facility. The Contractor will be required to comply with all such requirements, including securing of all required permits, and paying the costs thereof. The cost of making the connections in accordance with the requirements of the Owner of the existing facility shall be included in the Contract Sum.

3.10 REMOVAL OF EXISTING UTILITIES

A. The Contractor shall remove and legally dispose of off-site all abandoned utilities encountered during installation of the storm drainage facilities. In particular, all components of the existing combined sewer shall be removed from the site and up to the nearest off-site manhole.

3.11 MODIFICATIONS OF EXISTING STRUCTURES

A. General: The Contractor shall alter, reconstruct and/or convert existing structures where and as shown on the Contract Documents, and/or as approved by the Owner's Engineer. In general, alterations shall be performed with the same type of material used in the original construction unless otherwise indicated on the Contract Documents or approved by the Owner's Engineer.

B. Damage to Existing Installations: The Contractor shall exercise extreme care during such alteration, reconstruction and/or conversions so as not to damage any portions of the structure and/or pipe shown to remain. Any such damage shall be repaired by the Contractor at his own expense and to the satisfaction of the Owner's Engineer and Owner of the damaged structure.

3.12 CLEANING AND REPAIR

A. The Contractor will be required to clean the entire drainage system of all debris and obstructions. This shall include, but not be limited to, removal of all formwork from structures, concrete and mortar droppings, construction debris and dirt. The system shall be thoroughly flushed clean and the Contractor shall furnish all necessary hose, pumps, pipe and other equipment that may be required for this purpose. No debris shall be flushed into existing storm drains or streams; all debris shall be removed from the system and disposed of in accordance with all governing agencies.

B. After the system has been cleaned, the Contractor shall thoroughly inspect the system along with the Owner’s Engineer and all repairs shown to be necessary shall be promptly made by the Contractor.

C. All Work of cleaning and repair as specified herein shall be performed at the Contractor's expense and to the complete satisfaction of the Owner's Engineer.

3.13 FINAL INSPECTION

A. Upon completion of the Work and before final acceptance by the Owner, the entire drainage system shall be subject to a final inspection in the presence of the Owner’s Engineer and Town Engineer. The Work shall not be considered as complete until all requirements for line, grade, cleanliness, and workmanship have been completed to the satisfaction of the Owner's Engineer and the Town Engineer.

END OF SECTION 334100

10 May 2023
Revised 24 May 2023

David Stein
Principal/Project Manager
Silver Petrucelli + Associates
3190 Whitney Avenue, Building 2
Hamden, CT 06518
Via Email: dstein@silverpetrucelli.com

Re: Geotechnical Engineering Study
Old Greenwich School
Old Greenwich, Connecticut
Langan Project No.: 140265801

Dear David:
This report presents our geotechnical engineering study for the proposed addition to Old Greenwich School at 285 Sound Beach Avenue in Old Greenwich, Connecticut. The purposes of this study were to explore subsurface conditions, evaluate feasible foundation options, and develop geotechnical engineering recommendations. Services were performed in accordance with our authorized proposal (revised 11 January 2023).

Our boring exploration approach was developed considering a sketch showing the proposed building footprint and boring locations by Silver Petrucelli + Associates (SP+A) sent via email on 9 March 2023. We note that a revised building footprint is shown in the drawing set entitled "Scheme D.2" (18 April 2023) by SP+A, which was received after our geotechnical field program. Changes to the design scheme must be reviewed by Langan for effects on our recommendations.

Elevations are referenced from a plan titled "Boundary & Topographic Survey" (01 May 2023) prepared by Langan referencing the North American Vertical Datum of 1988 (NAVD88).

SITE DESCRIPTION

The about 7.3-acre site is located at 285 Sound Beach Avenue in Old Greenwich, Connecticut. The site is bordered by commercial and residential properties to the north, Sound Beach Avenue to the east, residential properties to the south, and wetlands/marsh the west. The site is occupied by the existing Old Greenwich School, which is a three-story brick building at the east part of the site. The existing school has a footprint of about 39,600 square feet (SF) and no below-grade

levels. The finished floor elevation (FFE) varies between about el +11.3 and el +15.4. Associated site features surround the structure, including an asphalt parking lot to the north, asphalt sports courts and a playground area to the southwest, and grass sports fields to the west. Figure 1 shows the site location and surrounding properties.

Existing site grades gently slope down from east to west, from about el +15 to el +7. Site grades within the proposed building addition footprint vary between about el +13 to el +10.

Underground utilities are present throughout the site including stormwater, electric, gas, and sanitary.

PROPOSED DEVELOPMENT

The proposed project consists of renovations within the existing Old Greenwich School and the construction of an addition to the southwest of the existing structure. Interior renovations consist of two new elevator pits and infilling select portions of the building to raise the FFE.

The addition consists of a 1-story, about 7,260 SF footprint structure. The FFE of the proposed classrooms is el +14 and the FFE of the proposed hallways varies between about el +11.5 to +14. Cuts of up to about 5 feet are anticipated to reach the bottom of the proposed elevator pits and fills up 4 feet are expected to reach the FFE of the proposed addition.

Estimated building column and slab loads are currently unavailable. Based on our experience with similar buildings of this type, we estimate column loads of up to 100 kips and slab loads up to about 200 pounds per square foot (psf).

REVIEW OF AVAILABLE INFORMATION

Regional Geology

The 1992 "Surficial Materials Map of Connecticut" (Figure 2) indicates the overburden is predominantly sand and gravel within the proposed renovation and addition footprints, with thin till located along the east and west edges of the site. The 1985 "Bedrock Geological Map of Connecticut" (Figure 3) indicates that bedrock below the site is predominately Harrison gneiss (typically hard rock) with Golden Hill schist is located along the west edge of the site. Both maps were prepared by the Connecticut Geological and Natural Resource Survey.

Federal Emergency Management Agency Flood Map

We reviewed the Flood Insurance Rate Map (FIRM) for the town of Old Greenwich published by the Federal Emergency Management Agency (FEMA), Map Nos. 09001C0512G effective 8 July 2013 and 09001C0514G effective 8 July 2013 (Figure 4). The proposed renovations and addition

footprint are predominately located in Zone AE: shaded, "1% annual chance flood hazard" with a provided base flood elevation of el +13. The southeast corner of the site, and some renovation areas, are located in Zone X: unshaded, "areas of minimal flood hazard" (outside the 500-year floodplain).

SUBSURFACE EXPLORATION

Langan performed a subsurface exploration consisting of 3 borings. The exploration was overseen by a Langan field engineer. An exploration location plan is shown in Figure 5. We note that test pits were also proposed as part of the exploration scope and will be completed at a later date.

Borings

Three borings (LB-01 through LB-03 were drilled by SoilTesting, Inc. on 11 April 2023. The borings were advanced with a CME55 LC track-mounted rig using hollow-stem-auger drilling techniques. Borings were terminated from 25.9 to 27 feet below the existing grades (about el -13.9 to el -17).

Standard Penetration Test (SPT) N-values[1] were documented and soil samples were generally obtained continuously to a depth of about 12 feet and every 5 feet thereafter. Disturbed soil samples were obtained using a standard 2-inch-outer-diameter split-spoon sampler driven by a 140-pound safety hammer in accordance with ASTM D1586, Standard Penetration Test.

Recovered soil samples were visually examined and classified in the field in general accordance with the Unified Soil Classification System (USCS). Soil classifications, N-values, and other field observations were recorded on our field logs provided in Appendix A.

Lab Testing

Selected samples were sent to a testing laboratory to confirm visual classifications and to determine index properties (physical and mechanical). Five moisture-content determinations, three grain-size analyses, two Atterberg limits tests, and one organic content test were performed; the results are provided in Appendix B.

[1] The Standard Penetration Test (SPT) is an in situ testing technique used to infer soil density and consistency. The SPT N-value is defined as the number of blows required to drive a 2-inch-diameter split-barrel sampler 12 inches after an initial penetration of 6-inches using a 140-pound hammer falling freely from 30 inches.

SUBSURFACE CONDITIONS

The subsurface conditions generally consist of a surficial layer of asphalt or topsoil underlain by layers of fill, estuarine deposits, sand, decomposed rock, and bedrock. Bedrock was inferred from about 26 to 27 feet below existing grades (about el -14 to el -16). Groundwater was observed in all borings from about 7.5 to 8 feet below existing grades (between about el +4.5 and el +2). A detailed description of subsurface materials encountered is provided below in order of increasing depth.

Surficial Materials – A 5-inch-thick surficial layer of asphalt pavement was encountered in borings LB-02 and LB-03. A 9-inch-thick layer of topsoil was encountered in boring LB-01. The topsoil consists of brown silty fine to medium sand with vary proportions of gravel, organics, roots, asphalt fragments, and plastic debris.

Fill – An about 1- to- 4-foot-thick layer of fill was encountered below the surficial material in all borings. The fill is generally composed of brown fine to coarse sand, with varying proportions of fine to coarse gravel, silt, organics, roots, asphalt, and plastic debris. SPT N-values within the fill layer vary from about 6 blows per foot (bpf) to 11 bpf. Laboratory testing of one sample reported a fines content of about 23% and measured moisture content of about 9%. The fill layer is generally classified as silty sand with gravel (SM) in accordance with the Unified Soil Classification System (USCS).

Estuarine Deposits – An about 1.4- to- 4.5-foot-thick layer of estuarine (marsh) deposits (top of layer corresponding to about el +7.5 to el +8.5) was encountered below the fill in all borings. The estuarine layer is generally composed of dark brown dark to orangish gray silt or clayey sand with varying proportions of organics, fine to medium sand, silt, clay, gravel, roots, and mottling. SPT N-values within the estuarine layer vary from about 4 to 12 bpf. Laboratory testing of samples reported a liquid limit between about 24 to 34, a plastic limit between about 17 and 23, and a measured moisture content between about 24% to 34%. The measured organic content was about 3.6%. The estuarine layer is generally classified as clayey sand, clay, and clayey silt (SC, CL, and CL-ML) in accordance with the USCS.

Sand – An about 4- to- 21-foot-thick layer of sand (top of layer corresponding to about el +4 to el +6) was encountered below the estuarine layer in all borings. The sand layer is generally composed of light brown or orangish brown fine to coarse sand with varying proportions of gravel, and silt. SPT N-values within the sand layer vary from about 7 bpf to 52 bpf. Laboratory testing of samples reported a fines content of about 8% to 13% and a measured moisture content between about 5% to 19%. The sand layer is generally classified as well graded sand with silt and gravel (SW-SM) in accordance with the USCS.

Decomposed Rock – An about 0.7- to 16-foot-thick layer of decomposed rock (top of layer corresponding to about el -16 to el +2) was encountered below the sand layer in all borings. Lb-03 was terminated in the decomposed rock layer, and therefore thicknesses may be greater than reported herein. The decomposed rock layer is generally composed of brown to gray silty fine to coarse sand with varying amounts of gravel, weathered rock fragments, mica fragments and visible stratification. SPT N-values within the sand layer vary from about 17 bpf to split-spoon refusal (greater than 100 bpf). The decomposed rock displayed the structure of the parent rock but broke apart under the action of the split spoon.

Bedrock – Bedrock was inferred below the decomposed rock layer as evidenced by refusal of the drilling equipment (augers and split spoons) from about 26 to 27 feet below existing grades (top of rock between about el -14 to el -16) in borings LB-01 and LB-02.

Groundwater - Groundwater was first encountered in all borings from about 7.5 to 8 feet below existing grades (about el +2 to el +4.5). Groundwater was measured upon completion of each of the borings from about 9 to 18 feet below existing grades (about el +1 to el -6). We note that the drop in the groundwater measurements at the completion of the boring may be due to the groundwater having insufficient time to recharge through the denser decomposed rock layer. Due to the proximity of the nearby Greenwich Cove, we believe that groundwater levels may be tidally influenced. Groundwater, if encountered, should be expected to fluctuate with seasons, precipitation, construction activities, utility breaks, etc.

GEOTECHNICAL DESIGN RECOMMENDATIONS

The following key geotechnical issues have been identified:

- Loose uncontrolled fills and estuarine (marsh) deposits below the proposed building footprint,
- Fills up to 3 feet within the proposed building footprint over soft estuarine soils,
- Shallow groundwater,
- Proposed structure within FEMA zone AE, and
- The presence of loose sands below the groundwater table.

Additional Exploration

The proposed building addition footprint has been altered following our exploration. Additional borings or test pits should be coordinated with the proposed civil exploration work. We recommend additional exploration be performed within the western part of the building footprint to further understand fill and estuarine deposit thicknesses within the addition footprint, and to understand fill thicknesses adjacent to the existing building. Further exploration may also be

required at the proposed elevator pit locations to understand existing building foundations and pit bearing materials.

Seismic Design

This section presents seismic design recommendation, in accordance with the 2022 Connecticut State Building Code (International Building Code 2021). We have considered the soil conditions encountered in the borings to be consistent and representative of the soil conditions in the top 100 feet of soil at this site.

Table 1. Seismic Design Values

Description	Parameter	Recommended Value
Mapped Spectral Acceleration for short periods:	S_s	0.274
Mapped Spectral Acceleration for 1-sec period:	S_1	0.059
Site Class:	--	**D – Stiff soil profile**
Site Coefficient:	F_a	1.58
Site Coefficient:	F_v	2.4
5% damped design spectral response acceleration at short periods:	**S_{DS}**	**0.281**
5% damped design spectral response acceleration at 1-sec period:	**S_{D1}**	**0.094**
Anticipated Risk Category	--	**III**
Seismic Design Category	**--**	**B**

Based on the above spectral accelerations and the anticipated risk category, we have estimated the Seismic Design Category (SDC). The structural engineer is responsible for confirming the appropriate use group, occupancy category, and final SDC for the proposed structure.

Liquefaction

Due to the presence of loose sands (low N-values) below the groundwater table in LB-03, we evaluated the liquefaction potential of non-cohesive soil below the groundwater table up to 100 feet below the ground surface (as required by the Connecticut Building Code) using the procedure outlined by Youd et al. (2001). Our analysis included all Langan borings within the building footprint that were potentially susceptible to liquefaction. The Youd et al. method is considered to be the state-of-practice recommended by the National Earthquake Hazard Reduction Program. The method presents an empirical relationship between the earthquake demand, represented by the Cyclic Stress Ratio (CSR), and the soil's resistance to dynamic loading, represented by the Cyclic Resistance Ratio (CRR). Field N-values are converted to $N_{1,60,cs}$ by applying corrections for

hammer energy efficiency, soil overburden pressure, borehole diameter, rod length, sampler lining, and fines content.

Our analysis parameters included a peak ground acceleration of 0.161g and mean earthquake magnitude of 5.49 (from the Unified Hazard Tool[2]). Our analysis indicates that all SPT N-values evaluated have a factor of safety against liquefaction greater than one. It is our judgment that liquefaction need not be considered in the design. A plot showing factors of safety versus depth is provided as Figure 6.

Foundations

Removal and Replacement Program

The materials encountered at the anticipated footing elevation (estimated to be between about el +9 to el +11) consist of fill and estuarine deposits. The surficial materials, fill, and estuarine deposits are not suitable for foundation or slab support. A removal and replacement program should be performed to remove the fill and estuarine deposits to the native sands, and be replaced with structural fill to the bottom of proposed foundation elevation. Replacement fill materials should be placed in accordance with the Excavation, Fill Placement, and Compaction Criteria section of this report to support shallow foundation construction. We estimate over-excavations up to about 6 feet will be necessary to reach the native sandy soils. The proposed structure can be supported on shallow foundations bearing on structural fill or natural sands using an allowable bearing pressure of 4,000 psf. Footing subgrades should be prepared in accordance with the Subgrade Preparation section of this report.

Flood Conditions

Foundations should be designed to account for anticipated flooding associated with the design flood elevation (see the Ground Floor Slab and Permanent Groundwater Controls sections below) and ASCE 24 requirements. Foundations should also be designed to account for erosion or local scour where necessary.

General

All exterior footings should be constructed 42 inches or deeper below the lowest adjacent grade for frost protection. Interior footings in heated spaces may be constructed at a convenient depth below the slab; however, all bottoms of footings should be at least 1.5 feet below the finished-floor elevation. Isolated column footings should have a minimum dimension of 3 feet, and strip

[2] Unified Hazard Tool via U.S. Geological Survey – Earthquake Hazards Program

footings should have a minimum width of 2 feet even if smaller dimensions can be justified using the recommended allowable bearing pressure.

Foundations should not be located so that one foundation is within the zone of influence of an adjacent foundation. The zone of influence is taken as a 1H:1V projection extending outward and downward from the edge of the foundation. New foundation elements should match the bottom of footing elevation of the existing foundations for adjacent elements. Excavations to remove unsuitable materials should be sloped from the existing foundations or existing foundations should be underpinned to avoid undermining existing foundations. Additional information is included in the underpinning section below.

Foundation Settlement

Total settlement of the new structure is estimated to be on the order of 3/4 inch or less, provided the bearing pressure recommended here is used and the subgrade preparation work described here is performed. Differential settlements between the existing structure and new foundations are expected to be reach settlement limits of about 3/4 inch. A majority of the settlement is expected to take place during construction.

Ground Floor Slabs

Design Flood Elevation

The FEMA base flood elevation (BFE) of el +13 is above the proposed lowest ground floor FFE for the building addition. The building slab should be designed to account for anticipated flooding associated with the design groundwater elevation from the adjacent water bodies and ASCE 24 requirements.

The ground floor level should consider potential hydrostatic pressures from flood events. The BFE elevation is el +13, and the design flood elevation should be taken as BFE +1 feet for a design flood elevation (DFE) of el +14.

Scheme 1 – Slab-on-Grade

Slab-on-grade construction should consider the DFE and be designed in accordance with ASCE 24 requirements. A slab-on-grade can be constructed bearing on natural soils, structural fill, or compacted existing fill prepared in accordance with the recommendations here. Removal and replacement of estuarine soils should be performed below slab-on-grade areas prior to placement of any raise-in-grade fills to limit settlement of the slabs over time. Subgrades within the building footprint should be prepared in accordance with recommendations in the Subgrade Preparation section of this report prior to placing any additional fill materials. We anticipate that the existing

fill materials can be reused as structural fill provided the fill is placed in compacted lift as outlined herein. We recommend designing slab-on-grade for a modulus of subgrade reaction of 125 pounds per cubic inch.

We recommend a minimum 12-inch-thick layer of ¾-inch clean crushed stone be included beneath the slab to protect the prepared subgrade and to serve as a capillary break. We recommend any slab below the DFE have a waterproofing membrane below the ground-floor slab. The barrier should be coordinated with any environmental requirements for the development. Omission of a barrier can lead to floor-covering problems including delamination and mold.

Scheme 2 – Structural Slab

Slabs that cannot be designed to meet ASCE 24 requirements or resist uplift loads from the DGE should be designed as a structural slab. The structural slab can be designed to withstand hydrostatic pressures from flood conditions. The slab should be designed to account for anticipated flooding associated with the design flood elevation from the adjacent water bodies and ASCE 24 requirements.

Uplift Resistance

The slab should be designed to resist uplift pressures by increasing the dead load, through smaller structural spans, or uplift anchors. If anchors are necessary, we can provide a preliminary design. The anchors should be double corrosion protected to account for the marine environment and use below water.

Permanent Groundwater Controls

Waterproofing

The design groundwater elevation is el +14, and we recommend that all foundations, slabs, and pits below the DGE will be fully waterproofed to protect mechanical equipment and finishes against moisture. We recommend that a membrane-type waterproofing be used such as Preprufe and Bithuthene products by GCP. Bentonite is not recommended. The vertical waterproofing should be protected with a rigid barrier to prevent damage during backfilling. A drainage board can serve as protection as well. After installation of the waterproofing, care must be taken so as to not damage the waterproofing. Waterproofing damaged during construction should be repaired as determined by the manufacturer.

Additional Flood-proofing Measures

We understand existing and proposed portions of the structure lie below the design flood elevation. Additional measures may be necessary at existing building areas, structure entrances, utility penetrations, etc. to maintain dry conditions during high water events.

Below Grade Walls (Pits)

Permanent below-grade walls that are considered to be fixed against rotation should be designed to resist soil, groundwater, and surcharge pressures. Backfill should not be placed against below-grade walls until the wall concrete has reached its 28-day compressive design strength and has been approved by the structural engineer.

We recommend that the below-grade foundation walls (i.e., fixed walls) be designed using a triangular earth-pressure distribution having an equivalent fluid weight 90 lb/ft^2 per foot of depth below the design flood elevation. Above the design flood elevation, below grade foundation walls can be designed using 60 lb/ft^2 per foot of depth presuming that free-draining clean stone as backfill or a manufactured drain is used.

Surcharge loading on the below-grade foundation walls should be included by adding a uniform stress equal to one-half the surcharge load in addition to the soil loading.

Underpinning

We understand that one elevator pit will be added within the existing building footprint. Additionally, if removal and replacement is necessary next to the existing building foundations to construct the proposed addition, localized underpinning may be necessary to perform the removal and replacement program. Additional exploration (see additional exploration section above) or historic information will be necessary to understand the bottom of footing elevations of the existing adjacent foundation elements. Underpinning can be used to support the adjacent foundations and avoid undermining the adjacent foundation elements.

In locations where localized underpinning is necessary, conventional underpinning concrete piers can likely be constructed to transfer the loads to the same elevation of the proposed pit level or over-excavation limit and prevent undermining. Concrete underpinning piers are typically a maximum of 4 feet wide and constructed in sequence below the adjacent building foundations. Piers are typically constructed at a spacing of 12 feet on-center and allowed to set before the next sequence is constructed.

Concrete underpinning piers are permanent design features and should be designed by the site geotechnical engineer as part of the design phase. We can design the underpinning piers and

sequencing after further exploration or understanding of existing building foundations. The contractor should submit shop drawings for review to the design engineer prior to construction.

GEOTECHNICAL CONSTRUCTION RECOMMENDATIONS

Site Preparation

All existing foundations, floor slabs, and utilities should be completely removed within 10 feet of the proposed footprint. Below-grade structures outside of the building footprint can be abandoned in place provided they are removed to at least 3 feet below finished subgrade levels, 2 feet below proposed utilities, and to eliminate conflicts with new utilities or structures. Slabs left in place should be sufficiently broken up to allow water to drain, and so that a geotechnical engineer can observe if voids exist beneath the slab. Existing asphalt pavement and concrete walkways should be completely removed.

Existing utilities within the building footprint should be completely removed. Existing utilities outside of the proposed building footprint should be removed or abandoned in place by completely filling with grout.

Excavations made to remove below-grade elements should be backfilled with approved, compacted fill in accordance with the Excavation, Fill, Placement, and Compaction Criteria section of this report and any environmental requirements.

Clearing and grubbing of trees and vegetation designated for removal (including root systems) should be performed. Buried debris should be completely removed beneath proposed building slab and footing locations. Topsoil should be stripped from the proposed building and pavement areas and should be stockpiled and protected from erosion. Topsoil should be evaluated by a landscape architect for reuse in landscape areas (if permitted by the environmental engineer). All clearing and stripping activities should be performed in strict accordance with the approved soil-erosion and sediment-control plan and the environmental reports prepared for the project.

All demolition and site-clearing work should be performed in accordance with any environmental requirements established for the site, and all local, state, and federal regulations. All debris and trees and other vegetation should be properly disposed of offsite in accordance with applicable regulations. All construction work should be performed so as not to adversely impact the existing school, neighboring buildings, off-site structures or utilities, including the existing utilities and trees that are to remain. Protection of these elements should be provided as necessary. Before beginning grading or placing fill, any miscellaneous trash, debris, or other unsuitable materials should be removed from the site.

Subgrade Preparation

All footing and utility-trench subgrades, except rock subgrades, should be proofrolled with six overlapping coverages of a double-drum 1-ton walk-behind vibratory roller (such as a Bomag BW75 or equivalent). All slab subgrade areas should be proofrolled with six overlapping coverages of a vibratory drum roller having a minimum static drum weight of 5 tons.

Soft areas identified during proofrolling should be excavated and replaced with approved structural fill. The actual extent of necessary excavation and replacement should be determined by a qualified Langan geotechnical engineer. Care should be taken when proofrolling near any existing underground utilities of structures that are to remain.

Soil footing subgrades should be excavated level. If any cobbles or boulders are encountered at the footing subgrade such that a relatively level subgrade is not achieved, they should be removed and replaced with compacted structural fill, compacted ¾-inch crushed stone, or lean concrete. All soil subgrades for footings or slabs should be compacted to the project specified compaction criteria.

If foundations are not poured in a timely manner, the subgrade should be protected with a lean concrete mud mat to protect the footing subgrades.

Steps should be taken by the contractor to control and remove surface-water runoff and precipitation. When soil is wet and subjected to construction traffic, previously acceptable subgrades can soften and become unacceptable. A smooth drum roller should be used to seal the surface and provide for better drainage. We also recommend crowning or sloping the subgrade to provide positive drainage off the subgrades.

Excavation, Fill, Placement, and Compaction Criteria

Excavation through the fill, estuarine deposits and the underlying natural sands can likely be performed using conventional earthmoving equipment (e.g., backhoes, excavators, dozers, etc.). Excavations made for footings and utilities should be conducted to minimize disturbance to the subgrade (i.e., backhoe with a smooth-edge bucket).

All excavations should be properly sloped or braced and conform with applicable OSHA regulations including, but not limited to, temporary shoring, trench boxes, or proper benching.

All excavation and backfilling must be performed in accordance with the project environmental engineer's recommendations.

The following types of fill can be used.

Structural Fill – Structural fill should be well-graded sand and gravel having a maximum particle size of 3 inches and no more than 10% passing the No. 200 sieve. Additionally, the structural fill should be free of organics, clay, roots, concrete, other non-soil constituents, and other deleterious or compressible materials. Any approved imported structural fill should be "certified clean fill" free of hazardous substances and meeting all local, state, federal and the Connecticut Department of Energy and Environmental Protection Soil Waste regulations.

Material Reuse – The contractor may reuse the on-site fill or natural sand as structural fill provided the soil meet the requirements for structural fill outlined above and is approved by the environmental engineer. Note that samples obtained within the fill and natural sand layers have a fines content (material passing the No. 200 sieve) of about 13 to 23%; therefore, the soil may be sensitive to moisture. The overall amount of soil that can be reused will be dependent on the amount of fines present within the soil, the time of year the earthwork is carried out (e.g., potentially inclement weather), and the earthwork contractor's ability to stage, aerate and process the material to facilitate placement and compaction. We do not anticipate the estuarine deposits can be reused on-site.

General Fill – On-site soils not meeting the requirements for structural fill can be used as general fill for site landscape and other nonstructural areas if environmentally suitable for reuse.

Compaction Criteria – All fill should be placed in uniform 12-inch-thick loose lifts and compacted. Fill in landscaped areas should be compacted to 90% of its maximum dry unit weight as determined by ASTM D1557; all other fill should be compacted to at least 95%. In restricted areas where only hand-operated compactors can be used, the maximum lift thickness should be limited to 8 inches. The appropriate water content at the time of compaction should be plus or minus 2% of optimum as determined by the laboratory compaction tests of proposed fill. No backfill should be placed on areas where free water is standing or on frozen subsoil areas.

Temporary Groundwater Control

We anticipate that dewatering will be required during construction. Water infiltration to the foundation excavation and during the removal and replacement program can likely be controlled using gravity-fed sump pumps via gravel trenches or sumps assisted with collector trenches. The final dewatering measures required should be evaluated and designed by the contractor. The dewatering measures implemented should adequately dewater all foundation-related excavations such that compaction of footing subgrades is feasible.

Collection of rainwater runoff will also be needed during the excavation for the removal and replacement program and during the subgrade preparation work. Water runoff is expected to be controlled with the use of gravel-lined collection trenches, pits and submersible pumps. Care should be taken to ensure that drainage is provided during all phases of excavation work. Environmental pretreatment of groundwater, if necessary, is beyond the scope of this study. Collected water should be discharged in accordance with applicable regulations.

Monitoring

We understand that the existing school is to remain, will receive renovations, and is to be tied into the new addition, therefor damage to the existing school is to be avoided as much as possible. As such, we recommend that a monitoring program be developed and incorporated into the Contract Documents during construction. Monitoring should include means to measure vibrations from construction operations and ground movement. The type and locations of specific monitoring equipment, threshold values, and durations should be developed based on review of the anticipated construction means and methods in conjunction with proximity and type of existing structures and utilities. The purpose of performing monitoring is to provide reasonable feedback to the contractor with respect to protecting existing structures and utilities, and to assess any necessary changes to means and methods of construction.

We recommend developing a monitoring plan and project specifications prior to construction. These would detail the methods and equipment required for monitoring vibration and movement, and would provide limits along with requirements for frequency of readings and reporting. The monitoring program would likely include optical surveying, seismographs (vibration monitoring), and crack gauges. We recommend that all monitoring be performed by a third-party consultant independent of the contractor; however, the contractor should reserve the right to perform additional monitoring. Threshold criteria should be developed during deign and coordinated with the structural engineer.

SERVICES DURING DESIGN, CONSTRUCTION DOCUMENTS AND CONSTRUCTION QUALITY ASSURANCE

During final design, Langan should be retained to consult with the design team as geotechnical questions arise. Technical specifications and design drawings should incorporate our recommendations. When authorized, we will assist the design team in preparing specification sections related to geotechnical issues such as earthwork, shallow foundations, backfill, and excavation support. Langan should also, when authorized, review the project plans and contractor submittals relating to materials and construction procedures for geotechnical work to confirm the designs incorporate the intent of our recommendations.

Langan has explored and interpreted the site subsurface conditions and developed the foundation design recommendations contained here and is, therefore, best suited to perform quality-

assurance observation and testing of geotechnical-related work during construction. The work requiring quality-assurance confirmation or special inspections per the Building Code includes, but is not limited to, earthwork, shallow foundations, backfill, and excavation support.

Recognizing that construction observation is the final stage of geotechnical design, quality-assurance observation during construction by Langan is necessary to confirm the design assumptions and design elements, to maintain our continuity of responsibility on this project, and allow us to make changes to our recommendations, as necessary. The foundation system and general geotechnical construction methods recommended herein are predicated upon Langan's assisting with the final design and providing construction observation services for the owner. If Langan is not retained for these services, we cannot assume the role of geotechnical engineer of record, and the entity providing the final design and construction observation services must serve as the engineer of record.

LIMITATIONS

The conclusions and recommendations provided in this report result from our interpretation of the geotechnical conditions existing at the site inferred from a limited number of borings and information provided by the design team. Actual subsurface conditions may vary. Recommendations provided are dependent upon one another and no recommendation should be followed independent of the others.

Any proposed changes in structures or their locations should be brought to Langan's attention as soon as possible so we can determine whether such changes affect our recommendations. Information on subsurface strata and groundwater levels shown on the logs represent conditions encountered only at the locations indicated and at the time of our exploration. If different conditions are encountered during construction, they should immediately be brought to Langan's attention for evaluation because they might affect our recommendations.

This report has been prepared to assist the owner, architect, and structural engineer in the design process and is only applicable to the design of the specific project identified. The information in this report cannot be used or depended on by engineers or contractors involved in evaluations or designs of facilities (including underpinning, grouting, stabilization, etc.) on adjacent properties beyond the limits of that which is the specific subject of this report.

Environmental issues (such as permitting or potentially contaminated soil and groundwater) are outside the scope of this study and should be addressed in a separate evaluation.

CLOSING

We have appreciated being of service on this project, and look forward to working with you to successfully complete this project.

Sincerely,
Langan CT, Inc.

Taylor Dalling, P.E
Project Engineer

Clayton Patterson, P.E.
Associate

TSD:cp/jd/cpc

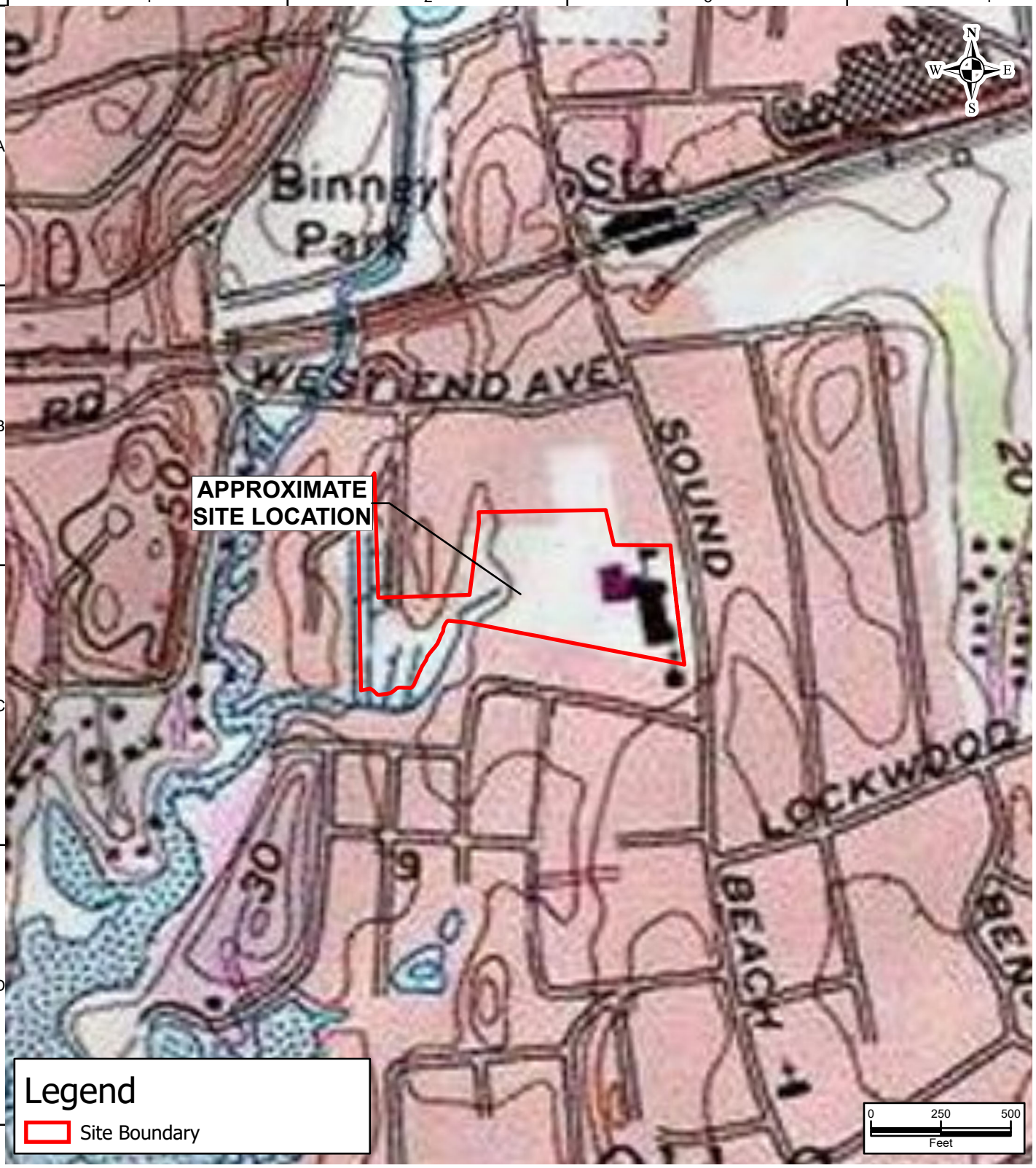
\\langan.com\data\NH\data8\140265801\Project Data_Discipline\Geotechnical\Reports\2023-05 Geotech Report\140265801 - Old Greenwich School_Geotech Report - AHM Edits.docx

Attachments:

Figure 1: Site Location
Figure 2: CT Surficial Materials Map
Figure 3: CT Bedrock Geology
Figure 4: Effective FEMA FIRM
Figure 5: Exploration Location Plan
Figure 6: Soil Liquefaction Evaluation

Appendix A: Boring Logs
Appendix B: Laboratory Test Results

FIGURES



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Project
Old Greenwich School
OLD GREENWICH
CONNECTICUT
WESTERN CONNECTICUT

Drawing Title
SITE LOCATION

Project No.	140265801
Date	4/27/2023
Scale	1:500
Drawn By	Site Analyzer
Submission Date	04/27/2023

Figure
1

Sheet 1 of 4

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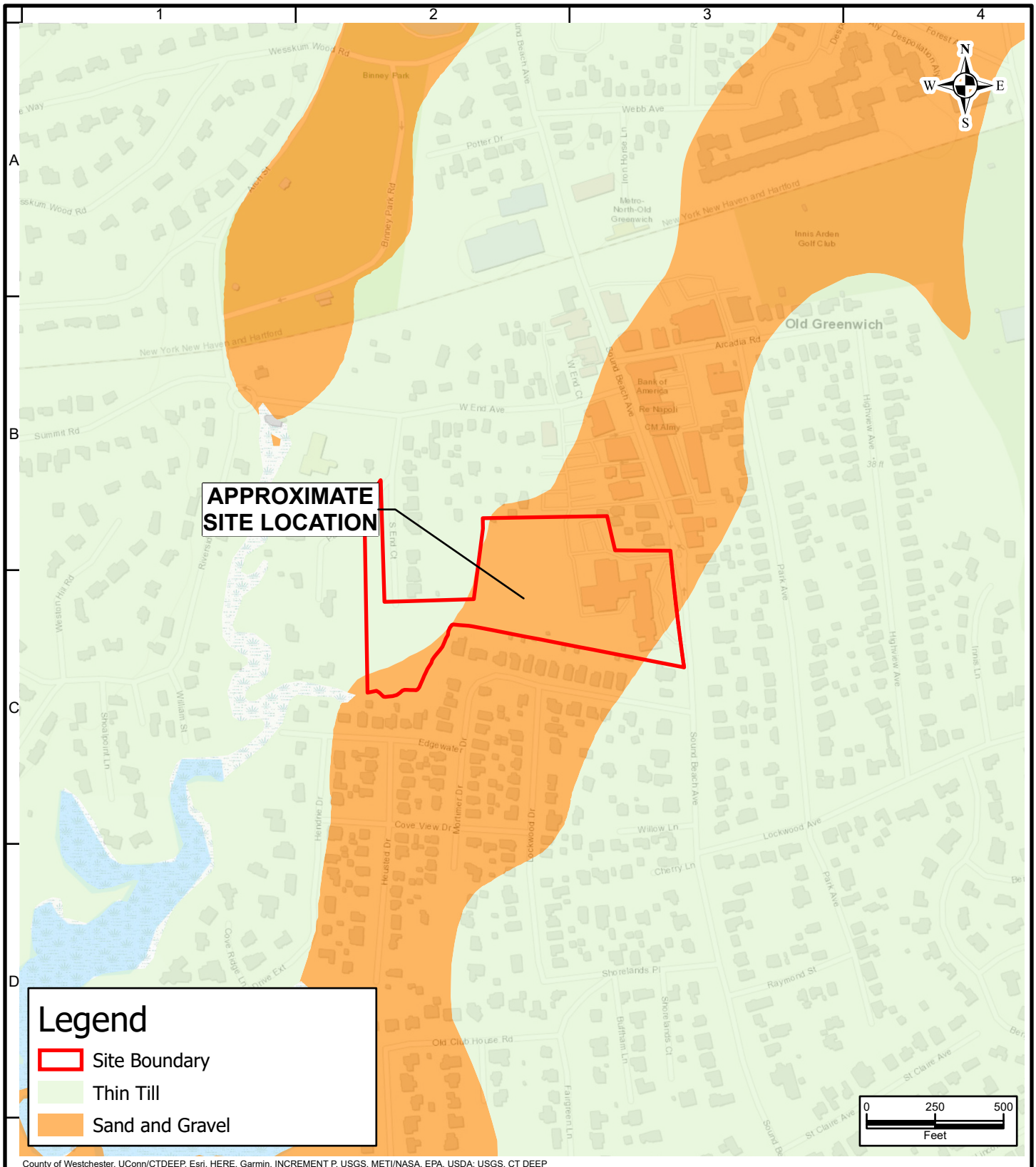

County of Westchester, UConn/CTDEEP, Esri, HERE, Garmin, INCREMENT P, USGS, METI/NASA, EPA, USDA; USGS, CT DEEP

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Project	**Old Greenwich School** OLD GREENWICH CONNECTICUT WESTERN CONNECTICUT
Drawing Title	**CT SURFICIAL MATERIALS MAP**
Project No.	140265801
Date	4/27/2023
Scale	1:500
Drawn By	Site Analyzer
Submission Date	04/27/2023
Figure	2
	Sheet 2 of 4

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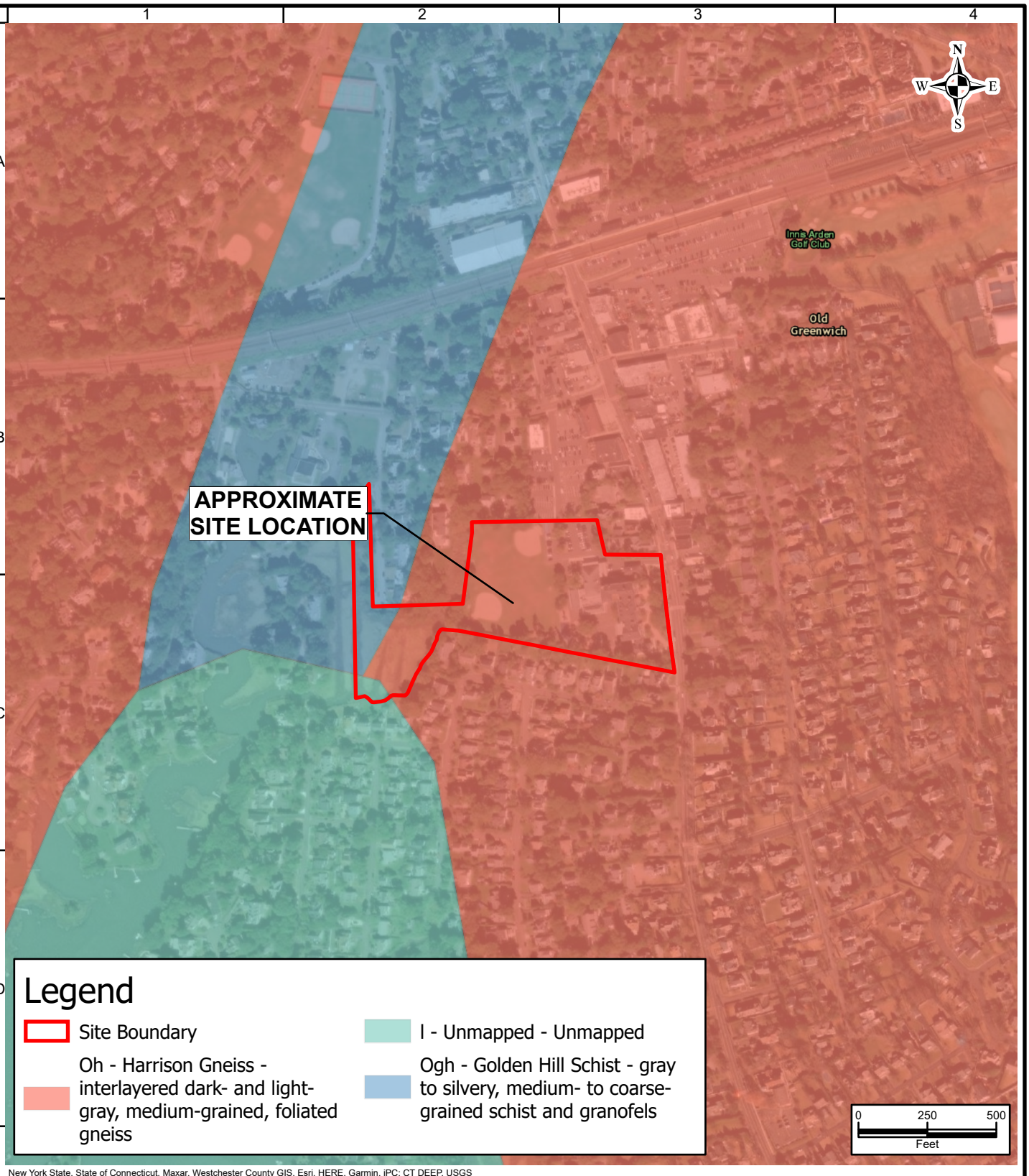
Spatial Reference: NAD 1983 StatePlane Connecticut FIPS 0600 Feet



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Drawing Title
CT BEDROCK GEOLOGY

Project No.	140265801
Date	4/27/2023
Scale	1:500
Drawn By	Site Analyzer
Submission Date	04/27/2023

Figure
3

Sheet 3 of 4

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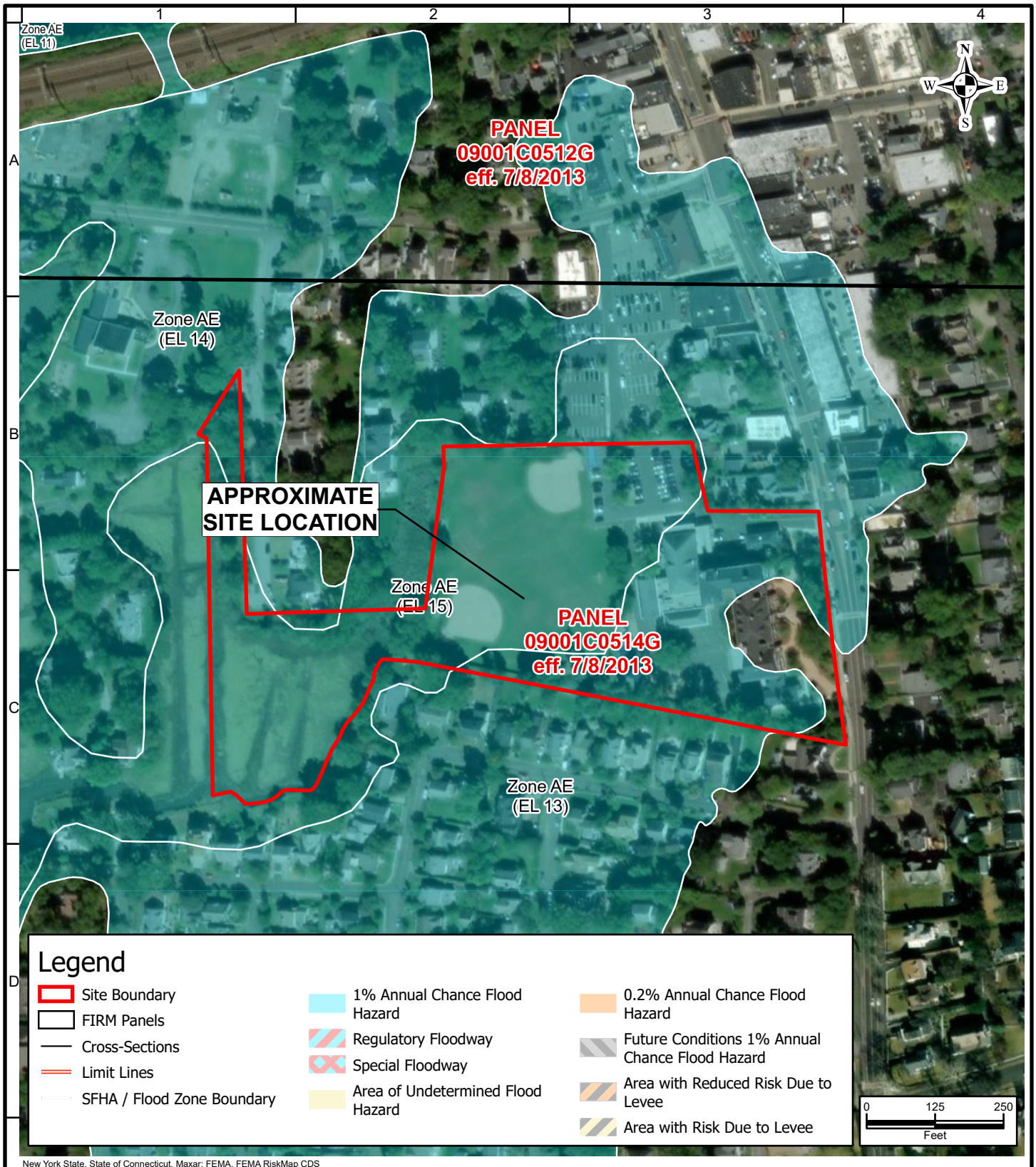

New York State, State of Connecticut, Maxar; FEMA, FEMA RiskMap CDS

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Drawing Title
EFFECTIVE FEMA FIRM

Project No.	140265801
Date	4/27/2023
Scale	1:250
Drawn By	Site Analyzer
Submission Date	04/27/2023

Figure
4

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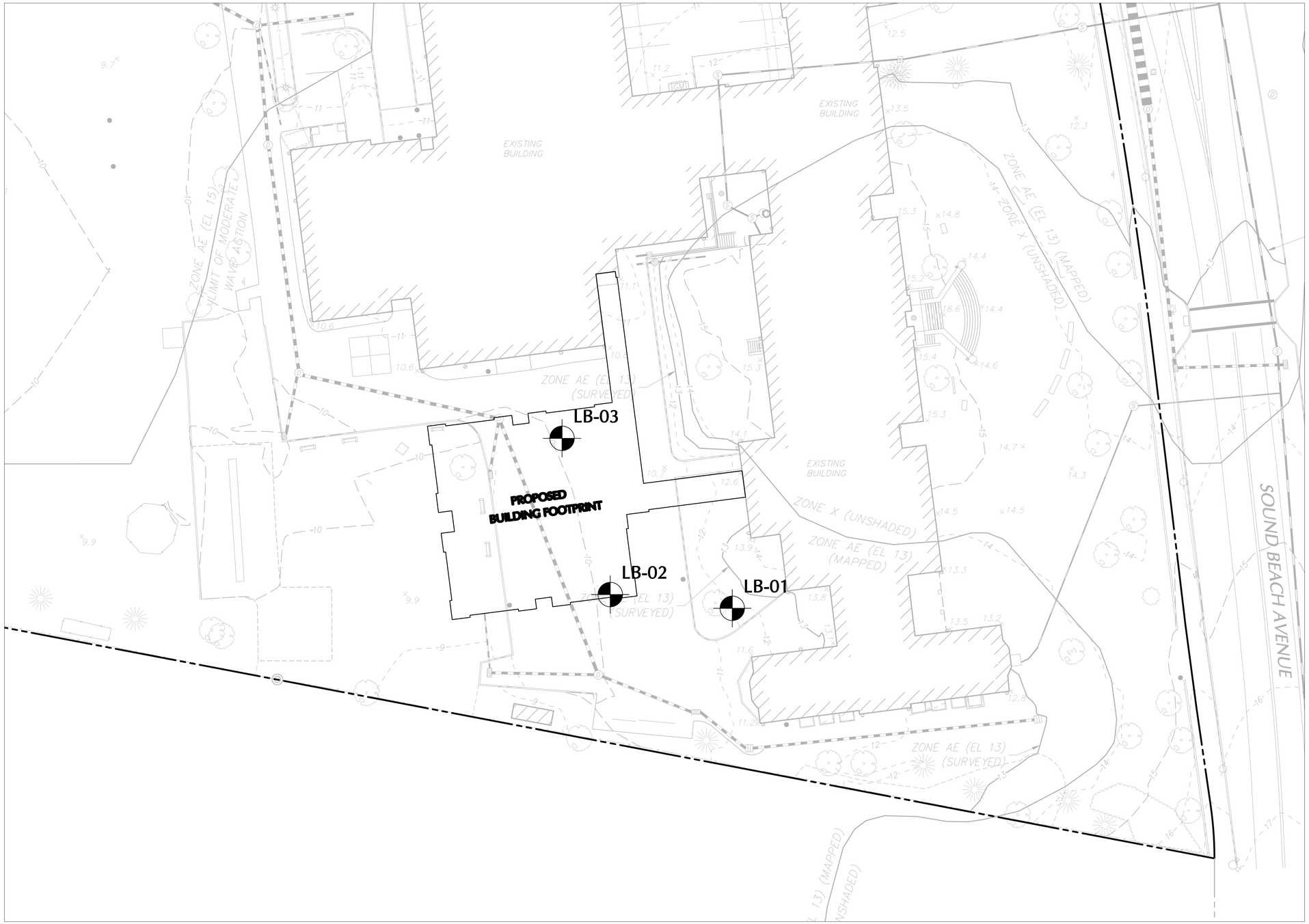

NOTES

1. ALL BORING LOCATIONS ARE APPROXIMATE.
2. ELEVATIONS REFERENCE NAVD88.
3. SURVEY INFORMATION REFERENCES THE SURVEY ENTITLED "BOUNDARY & TOPOGRAPHIC SURVEY" PREPARED BY LANGAN DATED 28 APRIL 2023.
4. BUILDING INFORMATION REFERENCES THE DRAWING ENTITLED "PROPOSED GROUND FLOOR SCHEME D.2" PREPARED BY SILVER PETRUCELLI + ASSOCIATES DATED 18 APRIL 2023.
5. BORINGS LB-01 THROUGH LB-03 WERE DRILLED BY SOILTESTING, INC. USING A CME55 LC TRACK-MOUNTED RIG UNDER THE FULL-TIME OBSERVATION OF A LANGAN FIELD ENGINEER ON 11 APRIL 2023.

LEGEND

PROPOSED SUBDIVISION LINE	
PROPOSED BUILDING LINE	
2023 LANGAN BORING LOCATION	LB-01

20 0 5 10 20
SCALE: 1 INCH = 20 FEET

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Project
OLD GREENWICH SCHOOL RENO & ADDITION/SPA
285 SOUND BEACH AVENUE
OLD GREENWICH
FAIRFIELD COUNTY CONNECTICUT

Drawing Title
EXPLORATION LOCATION PLAN

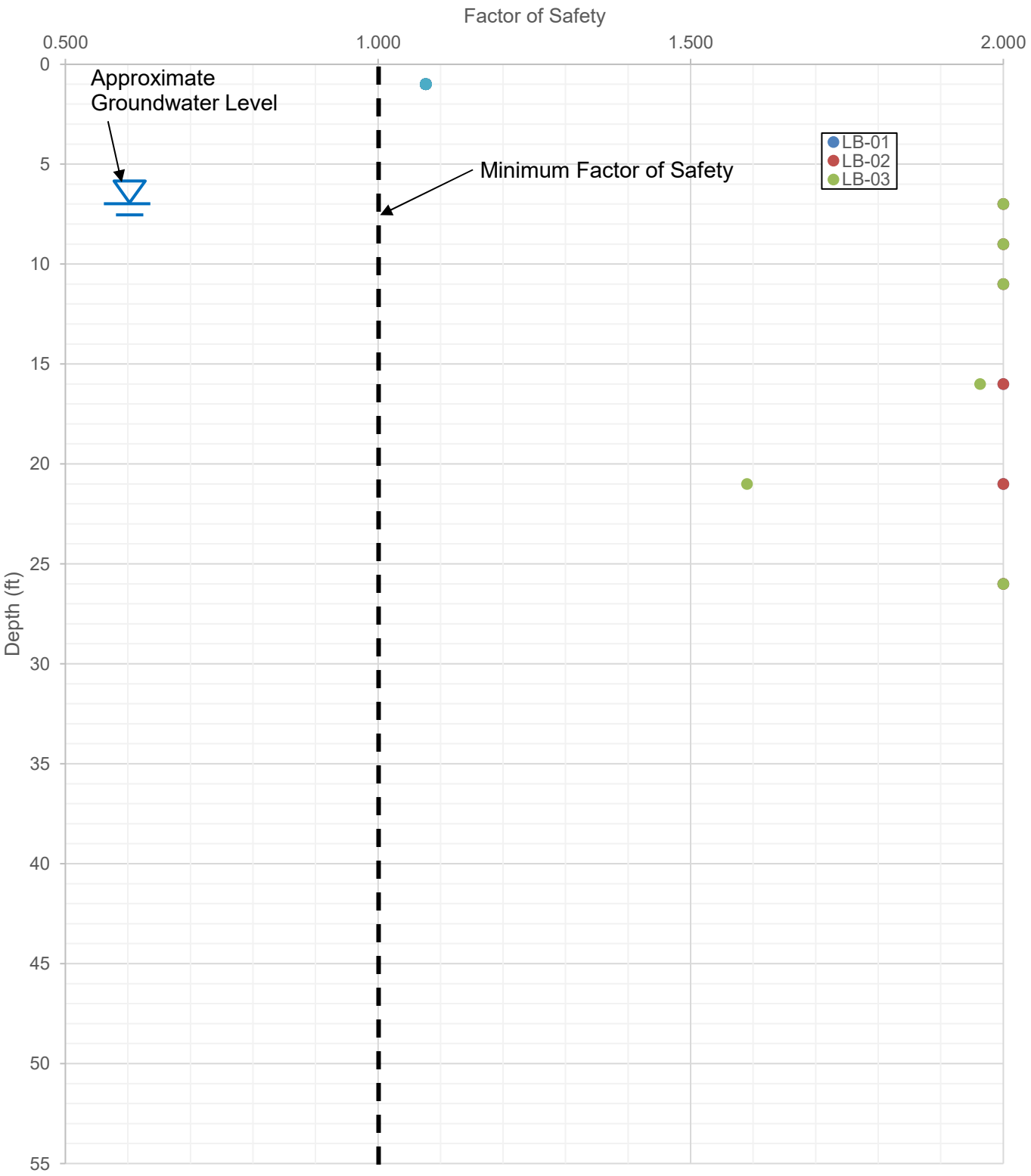
Project No.	140265801
Date	5/1/2023
Drawn By	MDW
Checked By	TSD

Figure 5

Sheet 5 of 5

LANGAN
Project No. 140265801
© 2018 Langan

Date: 5/1/2023 Time: 15:04 User: mwendland Style Table: Langan.stb Layout: Layout1 Document Code: FG05-140265801-0201-BL101-0101



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Project: OLD GREENWICH SCHOOL OLD GREENWICH FAIRFIELD COUNTY CONNECTICUT	Drawing Title: SOIL LIQUEFACTION EVALUATION	Project No.: 140265801 Date: 5/4/2023 Scale: N.T.S Drawn By: TSD	Figure No.: 6

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APPENDIX A
BORING LOGS

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Log of Boring **LB-01** Sheet 1 of 2

Project: Old Greenwich School		Project No.: 140265801	
Location: 285 Sound Beach Ave, Old Greenwich, CT		Elevation and Datum: Approx. el. 12.0 (NAVD 88)	
Drilling Company: Soiltesting, Inc.		Date Started: 4/11/2023	Date Finished: 4/11/2023
Drilling Equipment: CME55 LC		Completion Depth: 25.9 ft	Rock Depth: 25.9 ft
Size and Type of Bit: 4-1/4-inch hollow-stem auger		Number of Samples: Disturbed 9	Undisturbed 0 / Core 0
Casing Diameter (in): N/A	Casing Depth (ft): N/A	Water Level (ft.): First ▽ 7.5	Completion ▼ 18.3 / 24 HR. ▼ N/A
Casing Hammer: N/A	Weight (lbs): N/A / Drop (in): N/A	Drilling Foreman: Andy Koval	
Sampler: 2in OD Split Spoon		Field Engineer: Matthew Wendland	
Sampler Hammer: Automatic	Weight (lbs): 140 / Drop (in): 30		

Material Symbol	Elev. (ft)	Sample Description	Depth Scale	Number	Type	Recov. (in)	Penetr-resist BL/6in	N-Value (Blows/ft)	Remarks (Drilling Fluid, Casing Depth, Fluid Loss, Drilling Resistance, etc.)
	+12.0							10 20 30 40	
	+11.2	Brown Silty fine to medium SAND, trace fine gravel, trace organics, trace roots, trace asphalt, trace plastic debris (moist) [TOPSOIL]	0	S-1A	SS	5	2 6 7 5	13	
		Brown fine to coarse SAND, some coarse to fine gravel, some silt, trace organics, trace roots, trace asphalt, trace plastic debris (moist) [FILL]	1	S-1B					
		Brown fine to coarse SAND, some fine to coarse gravel, some silt, trace roots, trace asphalt (moist) [FILL]	2	S-2	SS	10	4 3 5 2	8	
	+7.4	Brown fine to coarse SAND, trace fine to coarse gravel, some silt, trace roots, trace asphalt (moist) [FILL]	3	S-3A	SS	17	2 4 8 14	12	Auger to 4ft. Brown cuttings
		Light brown to orangish brown Clayey fine SAND, some silt, some coarse to fine gravel, trace organics, trace roots, mottling (moist) [ESTUARINE]	4	S-3B					
	+6.0	Orangish brown to brown fine to coarse SAND with fine to coarse GRAVEL, trace silt, trace weathered rock fragments (moist) [SW]	5	S-4A	SS	18	19 21 17 17	38	
		Light brown fine to coarse SAND with fine to coarse GRAVEL, trace silt (wet) [SW] ▽	6	S-4B					Water level first at about 7.5ft. Note that water level at completion reading is much deeper at about 18.3ft. This could explain why samples below S-4B are moist - maybe this was not groundwater at 7.5ft
		Light brown to orangish brown fine to coarse SAND with fine to coarse GRAVEL, trace silt (wet) [SW]	7	S-5	SS	13	13 18 19 8	37	Auger to 8ft. Brown cuttings
	+2.0	Orangish brown to brown Silty fine to coarse SAND, some fine to coarse gravel, weathered rock fragments (wet) [DECOMPOSED ROCK]	8	S-6	SS	13	11 13 13 15	26	
			9						
			10						
			11						
			12						
			13						
			14						
		Brown Silty fine to medium SAND, trace coarse gravel, stratification visible (wet) [DECOMPOSED ROCK]	15	S-7	SS	8	10 13 9 11	22	Auger to 15ft. Medium augering. Light rig chatter at 10ft
			16						
			17						
		▼	18						
			19						
			20						

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Log of Boring **LB-01** Sheet 2 of 2

Project	Project No.
Old Greenwich School	140265801
Location	**Elevation and Datum**
	12.0

Material Symbol	Elev. (ft)	Sample Description	Depth Scale	Sample Data: Number	Type	Recov. (in)	Penetr-resist BL/6in	N-Value (Blows/ft)	Remarks (Drilling Fluid, Casing Depth, Fluid Loss, Drilling Resistance, etc.)
	-8.0	Brown to reddish brown Silty fine to coarse SAND, some fine to coarse gravel, stratification visible (wet) [DECOMPOSED ROCK]	20						Auger to 20ft Medium augering. Brown cuttings
			21	S-8	SS	15	9 9 9	18	
			22				14		
			23						
			24						
			25	S-9A	SS	10	7 50/5"	50/5"	Auger to 25ft. Medium augering. Brown cuttings
	-13.9	Light gray to dark gray Silty fine SAND, trace fine gravel, stratification visible (wet) [DECOMPOSED ROCK] Gray fine SAND, some silt, trace fine gravel (wet) [DECOMPOSED ROCK]	26	S-9B					Boring terminated at 25.92ft. Boring backfilled to grade with cuttings and cement
		End of Boring at 25.9ft.	27						
			28						
			29						
			30						
			31						
			32						
			33						
			34						
			35						
			36						
			37						
			38						
			39						
			40						
			41						
			42						
			43						
			44						
			45						

N-Value (Blows/ft) axis: 10 20 30 40

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Log of Boring **LB-02** Sheet 1 of 2

Project: Old Greenwich School	Project No.: 140265801
Location: 285 Sound Beach Ave, Old Greenwich, CT	Elevation and Datum: Approx. el. 10.0 (NAVD 88)
Drilling Company: Soiltesting, Inc.	Date Started: 4/11/2023 — Date Finished: 4/11/2023
Drilling Equipment: CME55 LC	Completion Depth: 26.4 ft — Rock Depth: 26.4 ft
Size and Type of Bit: 4-1/4-inch hollow-stem auger	Number of Samples: Disturbed 9, Undisturbed 0, Core 0
Casing Diameter (in): N/A — Casing Depth (ft): N/A	Water Level (ft.): First ▽ 7.5, Completion ▼ 9.2, 24 HR. ▼ N/A
Casing Hammer: N/A — Weight (lbs): N/A — Drop (in): N/A	Drilling Foreman: Andy Koval
Sampler: 2in OD Split Spoon	Field Engineer: Matthew Wendland
Sampler Hammer: Automatic — Weight (lbs): 140 — Drop (in): 30	

Material Symbol	Elev. (ft)	Sample Description	Depth Scale	Number	Type	Recov. (in)	Penetr-resist BL/6in	N-Value (Blows/ft)	Remarks (Drilling Fluid, Casing Depth, Fluid Loss, Drilling Resistance, etc.)
	+10.0							10 20 30 40	
	+9.6	5" asphalt	0						Boring offset about 8ft east of original marking
		Brown fine to coarse SAND, some fine to coarse gravel, some silt, trace asphalt (moist) [FILL]	1	S-1A	SS	8	14 5 6	11	
	+8.5	Dark brown to black Sandy SILT, trace fine gravel, some organics (moist) [ESTUARINE]		S-1B					
		Dark grayish brown Clayey fine SAND, some silt, trace fine gravel, trace organics (moist) [ESTUARINE]	2						
			3	S-2	SS	10	3 1 3 5	4	
		Dark grayish brown to gray Clayey fine SAND, some silt, mottling (moist) [ESTUARINE]	4						Auger to 4ft. Medium augering to 2ft. Light rig chatter to 2ft. Brown to dark grayish brown cuttings
			5	S-3	SS	20	3 3 4 10	7	
	+4.0	Grayish brown to orangish brown Silty fine to coarse SAND, some fine to coarse gravel (moist) [SW]	6	S-4A					
		Orangish brown fine to coarse SAND, some fine to coarse gravel, some silt, mottled (wet) [SW]	7	S-4B	SS	19	18 16 14 19	30	Groundwater first encountered at 7.5ft
		Orangish brown fine to coarse SAND, some coarse to fine gravel, some silt (wet) [SW]	8						Auger to 8ft. Brown cuttings
			9	S-5	SS	11	6 15 10 14	25	
		Orangish brown fine to coarse SAND, some fine to coarse gravel, some silt (wet) [SW]	10						
			11	S-6A	SS	24	18 14 8	22	
	-1.5	Light brown fine to coarse SAND, some silt, trace fine to coarse gravel (wet) [SW]		S-6B	SS		15		
		Brown Silty fine to medium SAND, trace fine gravel, weathered rock fragments (wet) [DECOMPOSED ROCK]	12	S-6C					
			13						
			14						
		Brown Silty fine to coarse SAND, trace fine to coarse gravel, stratification visible (wet) [DECOMPOSED ROCK]	15						Auger to 15ft. Medium to hard augering. Light rig chatter. Brown cuttings
			16	S-7	SS	8	11 15 11 9	26	
			17						
			18						
			19						Auger to 20ft. Hard augering. Brown cuttings
			20						

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Log of Boring **LB-02** Sheet 2 of 2

Project	Project No.
Old Greenwich School	140265801
Location	**Elevation and Datum**
	10.0

Material Symbol	Elev. (ft)	Sample Description	Depth Scale	Sample Data: Number	Type	Recov. (in)	Penetr-resist BL/6in	N-Value (Blows/ft)	Remarks (Drilling Fluid, Casing Depth, Fluid Loss, Drilling Resistance, etc.)
	-10.0	Dark brown to reddish brown Silty fine SAND, trace coarse gravel, stratification visible (wet) [DECOMPOSED ROCK]	20						
			21	S-8	SS	12	5 7 10 8	17	
			22						
			23						
			24						
		Dark gray to gray Silty fine to medium SAND, trace coarse to fine gravel, stratification visible (wet) [DECOMPOSED ROCK]	25				7		Auger to 25ft. Hard augering. Brown cuttings
	-16.4		26	S-9	SS	11	18 60/5"	60/5"	
		End of Boring at 26.4ft.	27						Boring terminated at 26.42ft. Boring backfilled to grade with cuttings and cement. Boring sealed with asphalt
			28						
			29						
			30						
			31						
			32						
			33						
			34						
			35						
			36						
			37						
			38						
			39						
			40						
			41						
			42						
			43						
			44						
			45						

N-Value (Blows/ft) scale: 10 20 30 40

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Log of Boring **LB-03** Sheet 1 of 2

Project: Old Greenwich School	Project No.: 140265801
Location: 285 Sound Beach Ave, Old Greenwich, CT	Elevation and Datum: Approx. el. 10.0 (NAVD 88)
Drilling Company: Soiltesting, Inc.	Date Started: 4/11/2023 — Date Finished: 4/11/2023
Drilling Equipment: CME55 LC	Completion Depth: 27.0 ft — Rock Depth: N/E
Size and Type of Bit: 4-1/4-inch hollow-stem auger	Number of Samples: Disturbed 9, Undisturbed 0, Core 0
Casing Diameter (in): N/A — Casing Depth (ft): N/A	Water Level (ft.): First ▽ 8.0, Completion ▼ 9.1, 24 HR. ▼ N/A
Casing Hammer: N/A — Weight (lbs): N/A — Drop (in): N/A	Drilling Foreman: Andy Koval
Sampler: 2in OD Split Spoon	Field Engineer: Matthew Wendland
Sampler Hammer: Automatic — Weight (lbs): 140 — Drop (in): 30	

Material Symbol	Elev. (ft)	Sample Description	Depth Scale	Sample Number	Type	Recov. (in)	Penetr-resist BL/6in	N-Value (Blows/ft)	Remarks (Drilling Fluid, Casing Depth, Fluid Loss, Drilling Resistance, etc.)
	+10.0							10 20 30 40	
	+9.6	5" asphalt	0						
		Brown fine to coarse SAND, some fine to coarse gravel, some silt, trace asphalt (moist) [FILL]	1	S-1A	SS	12	2		
		Dark grayish brown Silty fine to coarse SAND, trace coarse to fine gravel, some organics, trace roots (moist) [FILL]		S-1B			3 3	6	
	+8.0	Gray to orangish gray Clayey fine SAND, some silt, trace organics, trace roots, mottling (moist) [ESTUARINE]	2						
			3	S-2	SS	17	2 3 4 6	7	
		Gray to orangish gray Clayey fine SAND, some silt, trace organics, trace fine to coarse gravel, trace roots, mottling (moist) [ESTUARINE]	4						Auger to 4ft. Medium augering. Light rig chatter. Brown cuttings
	+4.8			S-3A	SS	16	2 3 7	10	
		Orangish brown Silty fine to medium SAND, trace fine gravel (moist) [SW]	5	S-3B			9		
		Grayish brown Gravelly fine to coarse SAND, trace silt (moist) [SW]	6						
			7	S-4	SS	13	14 14 13 14	27	
		Light brown fine to coarse SAND, some fine to coarse gravel, trace silt (wet) [SW]	8 ▽						Groundwater first encountered at about 8ft
			9 ▼	S-5	SS	14	9 9 8 8	17	
		Light brown fine to coarse SAND, trace silt (wet) [SW]	10						
			11	S-6A	SS	20	13 25 27	52	
		Light brown fine to coarse SAND, some fine gravel, some silt (wet) [SW]	12	S-6B			17		
			13						
			14						
		Light brown Silty fine to coarse SAND, some silt, trace fine to coarse gravel (wet) [SW]	15	S-7A			2		Auger to 15ft. Grayish brown cuttings
		Light brown Silty fine to medium SAND (wet) [SW]	16	S-7B	SS	16	4 4 4	8	
			17						
			18						
			19						
			20						

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Log of Boring **LB-03** Sheet 2 of 2

Project	Project No.
Old Greenwich School	140265801
Location	**Elevation and Datum**
	10.0

Material Symbol	Elev. (ft)	Sample Description	Depth Scale	Sample Data: Number	Type	Recov. (in)	Penetr-resist BL/6in	N-Value (Blows/ft) 10 20 30 40	Remarks (Drilling Fluid, Casing Depth, Fluid Loss, Drilling Resistance, etc.)
	-10.0	Light brown fine to coarse SAND, some silt, trace fine gravel (wet) [SW]	20	S-8A	SS	16	3 4	7	Auger to 20ft. Grayish brown cuttings
		Grayish brown fine SAND, some silt, trace fine gravel (wet) [SW]	21	S-8B			3 10		
			22						
			23						
			24						
		Grayish brown fine to medium SAND, some fine to coarse gravel, some silt (wet) [SW]	25	S-9A	SS	24	3 4	13	Auger to 25ft. Light rig chatter at 23ft.
	-16.3		26				9		
	-17.0	Gray Silty fine to coarse SAND, trace fine to coarse gravel, weathered rock fragments (wet) [DECOMPOSED ROCK]	27	S-9B			11		Boring terminated at 27ft. Boring backfilled to grade with cuttings and cement. Boring sealed with asphalt
		End of Boring at 27ft.	28						
			29						
			30						
			31						
			32						
			33						
			34						
			35						
			36						
			37						
			38						
			39						
			40						
			41						
			42						
			43						
			44						
			45						

APPENDIX B
LABORATORY DATA

Client:	Langan Engineering				
Project:	Old Greenwich School				
Location:	Old Greenwich, CT			Project No:	GTX-317070
Boring ID:	---	Sample Type:	---	Tested By:	ckg
Sample ID:	---	Test Date:	04/17/23	Checked By:	ank
Depth :	---	Test Id:	712172		

Moisture Content of Soil and Rock - ASTM D2216

Boring ID	Sample ID	Depth	Description	Moisture Content,%
LB-01	S- 2	2-4'	Moist, dark brown silty sand with gravel	8.8
LB-01	S- 4A	6-7'	Moist, brown gravel with silt and sand	5.1
LB-02	S- 2	2-4'	Moist, dark gray silty sand	34.2
LB-03	S- 3A	4-5.25'	Moist, brownish gray silty clay with sand	23.9
LB-03	S- 8A	20-20.75'	Moist, dark gray silty sand	18.9

Notes: Temperature of Drying : 110º Celsius

Client:	Langan Engineering				
Project:	Old Greenwich School				
Location:	Old Greenwich, CT			Project No:	GTX-317070
Boring ID:	LB-02	Sample Type:	jar	Tested By:	cam
Sample ID:	S-2	Test Date:	04/17/23	Checked By:	ank
Depth :	2-4'	Test Id:	712175		
Test Comment:	---				
Visual Description:	Moist, dark gray silty sand				
Sample Comment:	---				

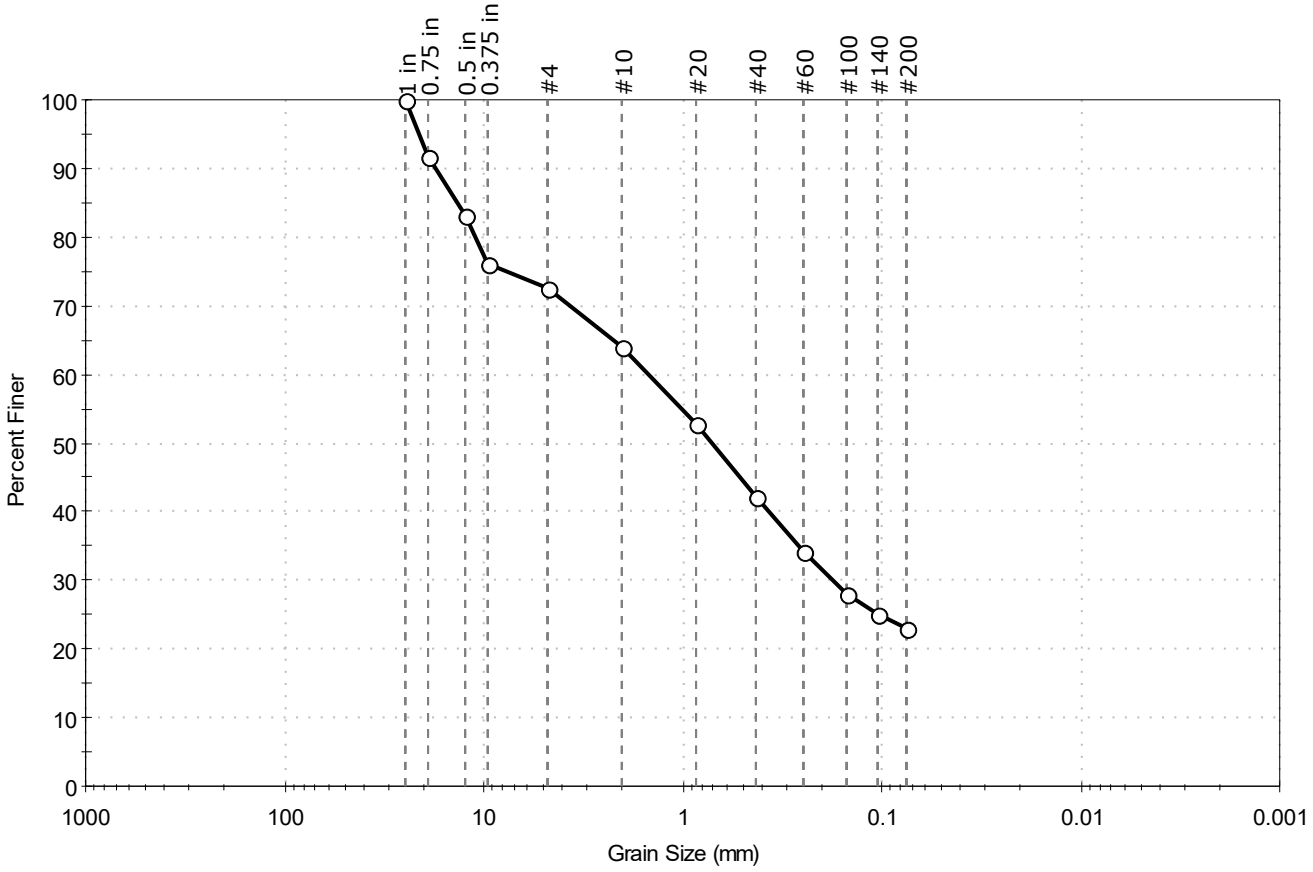
Moisture, Ash, and Organic Matter - ASTM D2974

Boring ID	Sample ID	Depth	Description	Moisture Content,%	Ash Content,%	Organic Matter,%
LB-02	S-2	2-4'	Moist, dark gray silty sand	34	96.4	3.6

Notes: Moisture content determined by Method A and reported as a percentage of oven-dried mass;
dried to a constant mass at temperature of 105º C
Ash content and organic matter determined by Method C; dried to constant mass at temperature 440º C

Client:	Langan Engineering				
Project:	Old Greenwich School				
Location:	Old Greenwich, CT			Project No:	GTX-317070
Boring ID:	LB-01	Sample Type:	jar	Tested By:	ckg
Sample ID:	S-2	Test Date:	04/18/23	Checked By:	ank
Depth :	2-4'	Test Id:	712165		
Test Comment:	---				
Visual Description:	Moist, dark brown silty sand with gravel				
Sample Comment:	---				

Particle Size Analysis - ASTM D6913



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	27.4	49.7	22.9

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
1 in	25.00	100		
0.75 in	19.00	92		
0.5 in	12.50	83		
0.375 in	9.50	76		
#4	4.75	73		
#10	2.00	64		
#20	0.85	53		
#40	0.42	42		
#60	0.25	34		
#100	0.15	28		
#140	0.11	25		
#200	0.075	23		

Coefficients

D_{85} = 13.6167 mm	D_{30} = 0.1751 mm
D_{60} = 1.4693 mm	D_{15} = N/A
D_{50} = 0.7058 mm	D_{10} = N/A
C_u = N/A	C_c = N/A

Classification

ASTM N/A

AASHTO Stone Fragments, Gravel and Sand (A-1-b (0))

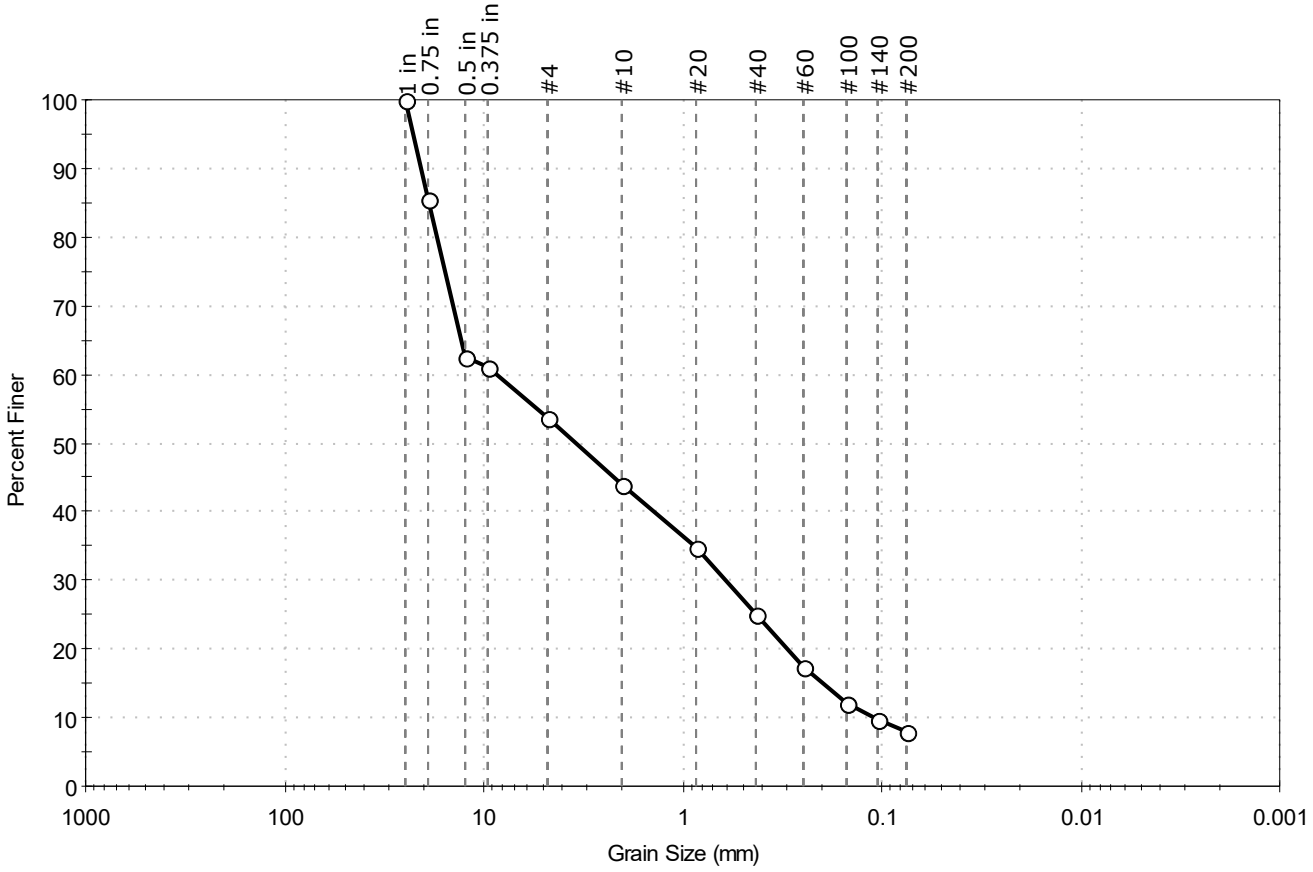
Sample/Test Description

Sand/Gravel Particle Shape : ANGULAR

Sand/Gravel Hardness : HARD

Client:	Langan Engineering				
Project:	Old Greenwich School				
Location:	Old Greenwich, CT			Project No:	GTX-317070
Boring ID:	LB-01	Sample Type:	jar	Tested By:	ckg
Sample ID:	S-4A	Test Date:	04/18/23	Checked By:	ank
Depth :	6-7'	Test Id:	712166		
Test Comment:	---				
Visual Description:	Moist, brown gravel with silt and sand				
Sample Comment:	---				

Particle Size Analysis - ASTM D6913



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	46.2	45.8	8.0

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
1 in	25.00	100		
0.75 in	19.00	86		
0.5 in	12.50	63		
0.375 in	9.50	61		
#4	4.75	54		
#10	2.00	44		
#20	0.85	35		
#40	0.42	25		
#60	0.25	17		
#100	0.15	12		
#140	0.11	10		
#200	0.075	8.0		

Coefficients

D_{85} = 18.7755 mm D_{30} = 0.6018 mm

D_{60} = 8.5663 mm D_{15} = 0.1979 mm

D_{50} = 3.4094 mm D_{10} = 0.1107 mm

C_u = 77.383 C_c = 0.382

Classification

ASTM N/A

AASHTO Stone Fragments, Gravel and Sand (A-1-a (1))

Sample/Test Description

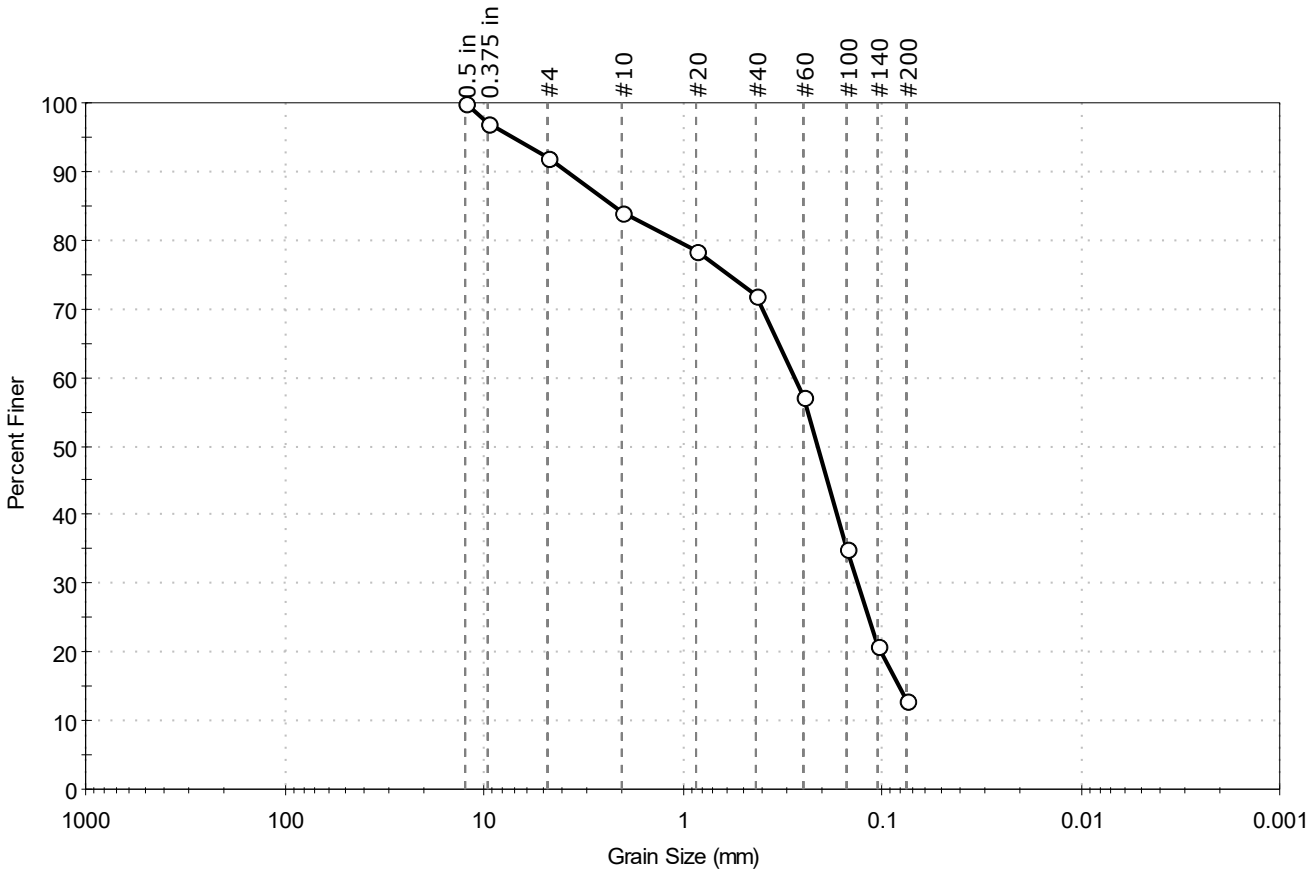
Sand/Gravel Particle Shape : ANGULAR

Sand/Gravel Hardness : HARD

GeoTesting EXPRESS

Client:	Langan Engineering				
Project:	Old Greenwich School				
Location:	Old Greenwich, CT			Project No:	GTX-317070
Boring ID:	LB-03	Sample Type:	jar	Tested By:	ckg
Sample ID:	S-8A	Test Date:	04/18/23	Checked By:	n/a
Depth :	20-20.75'	Test Id:	712167		
Test Comment:	---				
Visual Description:	Moist, dark gray silty sand				
Sample Comment:	---				

Particle Size Analysis - ASTM D6913



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	7.9	79.0	13.1

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
0.5 in	12.50	100		
0.375 in	9.50	97		
#4	4.75	92		
#10	2.00	84		
#20	0.85	79		
#40	0.42	72		
#60	0.25	57		
#100	0.15	35		
#140	0.11	21		
#200	0.075	13		

Coefficients

D_{85} = 2.1884 mm D_{30} = 0.1322 mm
D_{60} = 0.2755 mm D_{15} = 0.0817 mm
D_{50} = 0.2111 mm D_{10} = N/A
C_u = N/A C_c = N/A

Classification

ASTM N/A

AASHTO Silty Gravel and Sand (A-2-4 (0))

Sample/Test Description

Sand/Gravel Particle Shape : ANGULAR

Sand/Gravel Hardness : HARD

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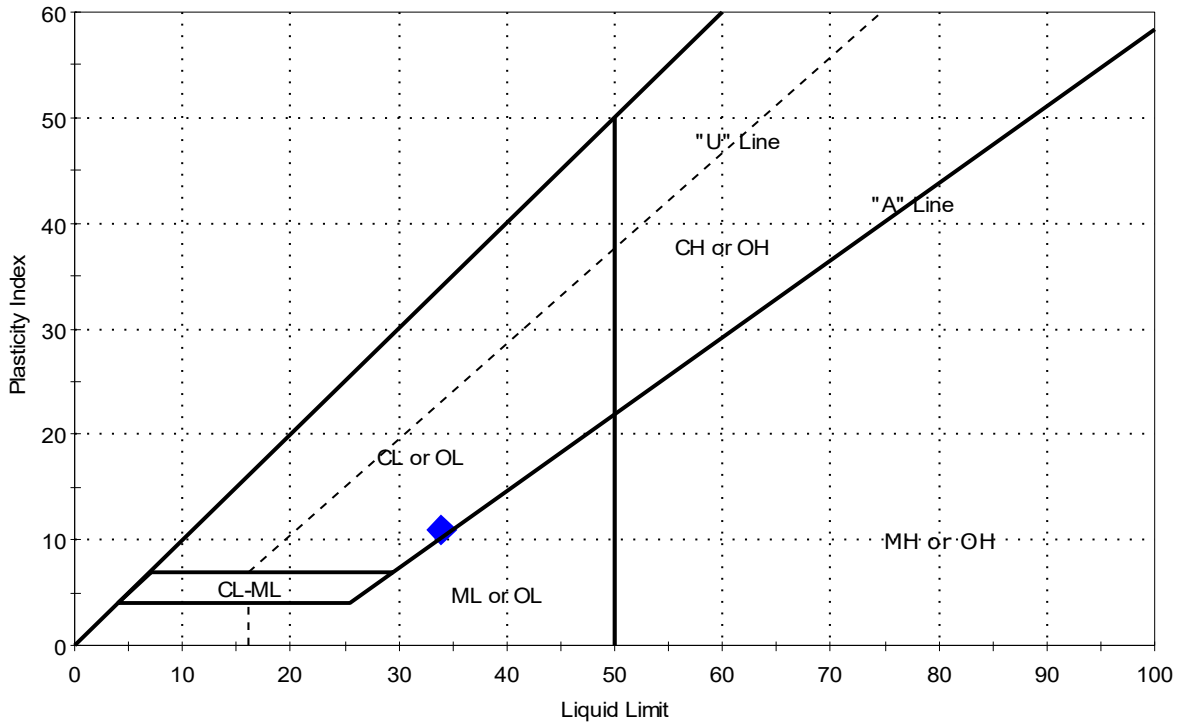
Client:	Langan Engineering				
Project:	Old Greenwich School				
Location:	Old Greenwich, CT			Project No:	GTX-317070
Boring ID:	LB-02	Sample Type:	jar	Tested By:	cam
Sample ID:	S-2	Test Date:	04/20/23	Checked By:	ank
Depth :	2-4'	Test Id:	712163		
Test Comment:	---				
Visual Description:	Moist, dark gray clayey sand				
Sample Comment:	---				

Atterberg Limits - ASTM D4318



Symbol	Sample ID	Boring	Depth	Natural Moisture Content,%	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	S-2	LB-02	2-4'	34	34	23	11	1	

Sample Prepared using the WET method

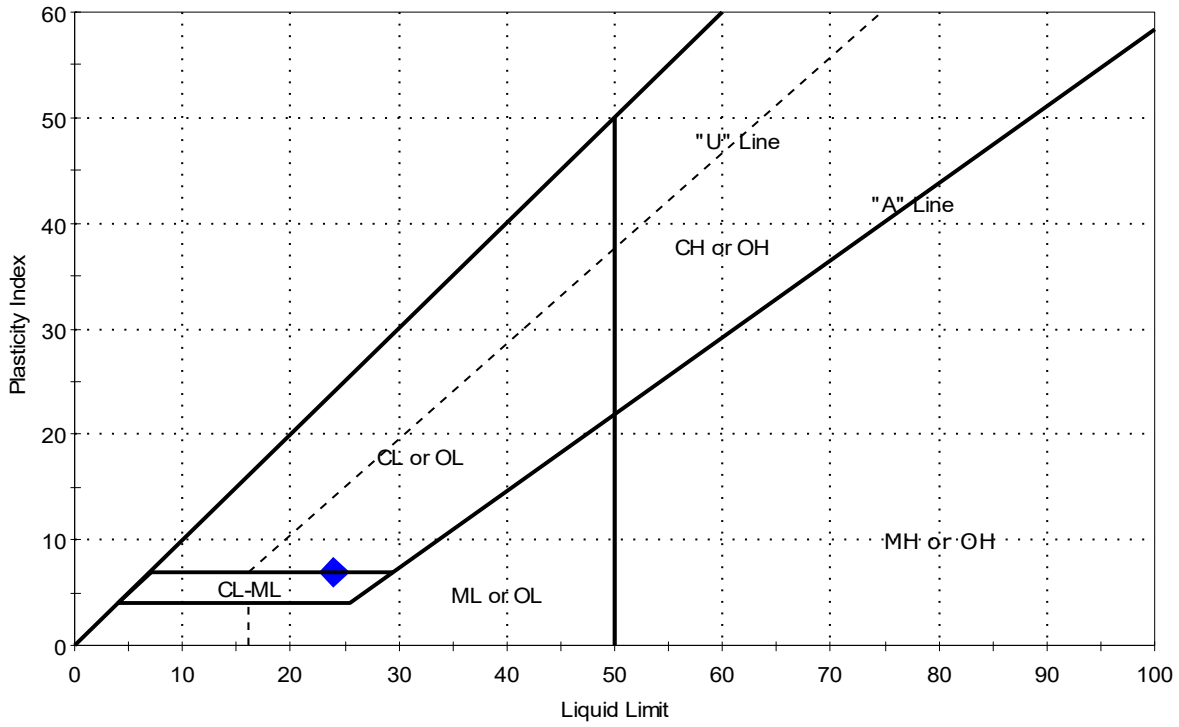
Dry Strength: VERY HIGH

Dilatancy: SLOW

Toughness: LOW

Client:	Langan Engineering				
Project:	Old Greenwich School				
Location:	Old Greenwich, CT			Project No:	GTX-317070
Boring ID:	LB-03	Sample Type:	jar	Tested By:	cam
Sample ID:	S-3A	Test Date:	04/20/23	Checked By:	ank
Depth :	4-5.25'	Test Id:	712164		
Test Comment:	---				
Visual Description:	Moist, brownish gray silty clayey sand				
Sample Comment:	---				

Atterberg Limits - ASTM D4318



Symbol	Sample ID	Boring	Depth	Natural Moisture Content,%	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	S-3A	LB-03	4-5.25'	24	24	17	7	1	

Sample Prepared using the WET method

Dry Strength: VERY HIGH

Dilatancy: SLOW

Toughness: LOW

REVISED LIMITED NESHAP PRE-RENOVATION HAZARDOUS BUILDING MATERIALS SURVEY REPORT

for

Old Greenwich School
285 Sound Beach Avenue
Greenwich, Connecticut 06870

Prepared For:

David J. Stein, AIA
Principal
Silver/Petrucelli + Associates
3190 Whitney Avenue
Building 2
Hamden, CT 06518-2340

Prepared By:

Langan CT, Inc.
555 Long Wharf Drive
New Haven, CT 06511



Matthew A. Myers
Senior Project Manager

13 September 2023
140265802

LANGAN

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Appendix B XRF Field Data Sheets
Appendix C Building Drawings
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ACRONYMS

US EPA	United States Environmental Protection Agency
AHERA	Asbestos Hazard Emergency Response Act
OSHA	Occupational Safety and Health Administration
CFR	Code of Federal Regulation
NESHAP	National Emission Standards for Hazardous Air Pollutants
HUD	Housing and Urban Development
CT DPH	Connecticut Department of Public Health
CTDEEP	Connecticut Department of Energy and Environmental Protection
RCRA	Resource Conservation and Recovery Act
PLM	Polarized Light Microscopy
TEM	Transmission Electron Microscopy
ACM	Asbestos Containing Materials
HBM	Hazardous Building Materials
LBP	Lead-Based Paint
PCB	Polychlorinated Biphenyls
SF	Square Feet
LF	Linear Feet
ppm	Parts per million
mg/cm^2	Milligrams per square centimeter
XRF	X-ray Fluorescence
TCLP	Toxicity Characteristic Leaching Procedure
AAS	Atomic Absorption Spectrometry

1.0 INTRODUCTION

Langan CT, Inc. (Langan) prepared this revised limited National Emissions Standards for Hazardous Air Pollutants (NESHAP) Pre-Renovation Hazardous Building Materials (HBM) Survey Report on behalf of the Town of Greenwich and Silver/Petrucelli + Associates to identify hazardous building materials that may exist at Old Greenwich School, 285 Sound Beach Avenue, Greenwich, Connecticut. The school was constructed in 1902 with additions in 1925, 1950, 1957 and 1995. The school is an approximately 68,500 square-foot (SF) three-story structure with classrooms, offices, gymnasium, media center, kitchen, cafeteria, toilet rooms, storage rooms, boiler/mechanical rooms, attic and tunnel/crawl space areas. The objectives of this survey/report is to identify the presence or absence of accessible asbestos-containing materials (ACM), lead-based paint (LBP), suspect assumed Polychlorinated biphenyl (PCB) containing sealant compounds and universal waste so these materials can be properly quantified and assessed in support of planned renovation of the building.

Details pertaining to the building subject to this survey are summarized in the following table.

PROJECT INFORMATION

Client Name:	Silver/Petrucelli + Associates 3190 Whitney Avenue Building 2 Hamden, CT 0518-2340	Property Visit Date:	10 – 13 April 2023 9 and 18 August 2023
Professional's Project #:	140265802	Construction Dates:	Original Building: 1902 Additions: 1925, 1950, 1957 and 1995
Consultant's Project Manager:	Matthew A. Myers	No. Buildings:	One
Phone No.:	203-562-5571	No. of Stories:	Three
Email:	mmyers@langan.com	Bldgs. Gross Footage:	68,500 Square Feet
Property Address:	285 Sound Beach Avenue		
Property Town, State:	Greenwich, Connecticut	Property Use:	Public School

The following sections summarize the HBM findings for the building surveyed.

2.0 ASBESTOS-CONTAINING MATERIALS

Terminology

Suspect Asbestos-Containing Materials

Asbestos was historically used in certain types of construction and building materials. Until a material is examined by using polarized light microscopy (PLM) or a similar technique, the building material is considered as a suspect asbestos-containing material. A few examples of these materials include wall and ceiling plasters, sheetrock/taping compound, flooring materials, ceiling panels, thermal system insulation, fireproofing insulation, adhesives, roofing materials, damp-proofing/waterproofing materials, caulking and glazing compounds, etc. Any suspect ACM and/or building material of unknown asbestos content should be assumed to be an asbestos containing material and handled and disposed of accordingly. Demolition, renovation, maintenance or daily activities should not disturb building materials that are found to contain asbestos, assumed to contain asbestos or that have not been tested for possible asbestos content.

Asbestos–Containing Material

A material with an asbestos concentration greater than 1% by weight is considered an ACM by the United States Environmental Protection Agency (EPA). Thus, a material which contains asbestos in concentrations greater than 1% by weight is considered "positive" while a material that does not contain asbestos or asbestos is detected in concentrations less than 1% by weight is considered "negative". The Connecticut Department of Public Health (CT DPH) revised the definition of an asbestos-containing material to be a concentration equal to or greater than 1% by weight. However, the Occupational Safety and Health Administration (OSHA) considers any amount of asbestos as regulated and some landfills/states consider building materials containing less than 1% asbestos as regulated asbestos-containing waste.

Regulatory Guidelines and Requirements

Federal

In accordance with the Clean Air Act (CAA), the U.S. Environmental Protection Agency established the National Emission Standards for hazardous Air Pollutants to protect the public from exposure to airborne pollutants. Asbestos was one of the air pollutants, which was addressed under the NESHAP 40 Code of Federal Regulations (CFR) Part 61. The purpose of the asbestos NESHAP regulations is to protect the public health by minimizing the release of asbestos when facilities, which contain ACM, are being renovated or demolished. EPA is

responsible for enforcing regulations related to asbestos during renovation and demolition activities, however, the CAA allows the EPA to delegate this authority to state and local agencies. Even after EPA delegates responsibility to a state or local agency, EPA retains the authority to oversee agency performance and to enforce NESHAP regulations as appropriate. OSHA considers any amount of asbestos to be regulated.

State

Asbestos in Connecticut is regulated by the State of Connecticut Department of Public Health, under Standards for Asbestos Abatement – Section 19a-333a-1 through 16 of Regulations of Connecticut State Agencies (RCSA) and Licensing and Training Requirements for Persons Engaged in Asbestos Abatement and Asbestos Consulting Services – Section 20-440-1 through 9 and Section 20-441 of RCSA.

Asbestos Survey

During this survey, suspect ACM were separated into three US EPA categories. These categories are: thermal system insulation (TSI), surfacing materials, and miscellaneous materials. TSI includes all materials used to prevent heat gain or loss or water condensation on mechanical systems. Typical examples of TSI are boiler, duct and tank insulation, pipe and pipe fitting insulation. Surfacing materials are sprayed, troweled or otherwise applied to an existing surface and common uses are fireproofing, decorative and acoustical plaster applications. Miscellaneous materials include all ACM not listed as TSI or surfacing and include: flooring materials, ceiling tiles, adhesives, transite cement board, sink undercoating, gypsum board/taping and joint compounds, cove base materials, caulking and glazing compounds, damp-proofing/tars/mastics, roofing materials and other materials. State of Connecticut DPH licensed asbestos inspectors Matthew Myers (#000041), Willie Thompson (#000673) and Ryan Murphy (#000937) performed the survey.

ACM Results Summary

Bulk sampling results are included as Tables 1 and 2 below. Analytical asbestos laboratory data can be found in Appendix A.

As required by EPA and CT DPH, samples were analyzed by individual layers (e.g. floor tile & the associated mastic were analyzed as two separate samples, rough and finish coat plasters, etc.). Bulk samples of suspect ACM were analyzed using the PLM analytical methodology in accordance with EPA Protocol 600/R-93/116 and possibly by PLM Point Count. Additional analysis

of non-friable organically bound (NOB) materials (e.g. flooring mastics) using NOB and transmission electron microscopy (TEM) was performed. The samples were analyzed by EMSL of Cinnaminson, New Jersey, accredited by the National Voluntary Laboratory Program (NVLAP) and American Industrial Hygiene Association (AIHA).

Utilizing the EPA and CT DPH protocols and criteria, the following materials **were determined to be ACM or assumed to be ACM:**

Table 1 – Summary of Asbestos-Containing Materials

Material	Location	% Asbestos and Sample ID	Estimated Quantity of ACM
1902 Original Building and 1925 Addition			
Pipe and Pipe Fitting Insulation – Thermal System Insulation	Inaccessible – Assumed Behind Walls, Ceilings and Chases and Possibly in Tunnels/Crawl Spaces	Assumed ACM	No Visible Insulation Noted Assume up to 900 Linear Feet Inaccessible Behind Walls, Ceilings and Chases and up to 800 Linear Feet in Possible Inaccessible Tunnels/Crawl Spaces
Interior Window Glazing Compound (White) – Miscellaneous Material	Classrooms 3 and 4 Corridor	ACM 3% Anthophyllite 041381A	Six Window Openings
9"x9" Floor Tiles and Black Mastic – Miscellaneous Materials	Ground Floor Custodial Closet (with Ramp) Adjacent Room 10 and Custodial Office Under Work Shelves Throughout Underneath Millwork, Cabinetry, Other Non-Moveable Objects	ACM 1.5%-8% Chrysotile 0413113A 0413114A 0413115A 080916	180 Square Feet Unknown – Assumed Throughout Each Room

Material	Location	% Asbestos and Sample ID	Estimated Quantity of ACM
White and Pink Sink Undercoating – Miscellaneous Materials	Classrooms 20, 22, 23, 28, 31, 33, 35, 36, 38, 40, 43 and 44	ACM 3% Chrysotile 0413151A 0413152A	12 Sinks
Interior Sink Backsplash Caulking Compound (White) – Miscellaneous Material	Classrooms 20, 22, 23, 25, 28, 31, 33, 35, 36, 38, 40, 43 and 44	ACM 3% Anthophyllite 0413158A	130 Linear Feet
Wall and Ceiling Plaster Finish/Rough Coats – Surfacing Materials	Throughout 1902 Original Building	ACM 1.5%-2.25% Chrysotile 0413191B 0413195A 0413226A And Previous Historical Results	77,000 Square Feet (Quantity Assumes Plaster is Located Above Sheetrock Ceilings Above Suspended Ceiling Tiles and Walls Behind Sheetrock and Other Wall Materials) (Quantity Does Not Include Plaster Located in Attic)
Bulletin Board, "Chalk" Board and Other Wall Adhesives – Miscellaneous Materials (Adjacent Materials/Substrates are Contaminated – Multiple Layers of Boards/Materials Also)	Throughout Original Building and 1925 Addition	Assumed ACM	Unknown – Estimate up to 3,750 Square Feet
Exterior/Interior Window Caulking Compounds – Miscellaneous Material	Exterior	ACM 4% Chrysotile 0413263A	93 Window Openings (Varying Sizes/Windows Per Opening)

Material	Location	% Asbestos and Sample ID	Estimated Quantity of ACM
Exterior/Interior Door and Door/Window Caulking Compounds (Glazing Compound Also at Main Front Entry Door) – Miscellaneous Materials	Exterior	ACM 3%-5% Chrysotile 0413264A 0413265A 0413266A	Eight Door and Door/Window Openings (Varying Sizes Per Opening)
Exterior Wall Expansion Caulking Compound – Miscellaneous Material	Exterior	ACM 4% Chrysotile 0413258A	60 Linear Feet
Exterior Vent Caulking Compound – Miscellaneous Materials	Exterior	ACM 4% Chrysotile 0413260A 0413261A	Seven Vent Openings
1950 Addition			
Pipe and Pipe Fitting Insulation – Thermal System Insulation	Exterior Storage Room Adjacent Classroom 3 Inaccessible – Assumed Behind Walls, Ceilings and Chases	Assumed ACM	40 Linear Feet Visible Assume up to 1,600 Linear Feet Inaccessible Behind Walls, Ceilings and Chases
9"x9" Floor Tiles and Black Mastic – Miscellaneous Materials	Throughout Underneath Millwork, Cabinetry, Other Non-Moveable Objects	ACM 6% Chrysotile 080918	Unknown – Assumed Throughout Each Room
White Sink Undercoating – Miscellaneous Material	Classrooms 1, 2, 12, 41 and 42	ACM 3% Chrysotile 041360A	Five Sinks

Material	Location	% Asbestos and Sample ID	Estimated Quantity of ACM
White Duct Insulation (Residue) – Thermal System Insulation (Substrates Contaminated)	Mechanical Room Above Room 29 (Above Gymnasium) (May Exist In Other Locations and Underneath Fiberglass Duct Insulation Throughout Addition – Checked Accessible Ducts in Several Locations)	ACM 12% Chrysotile 041364A	Unknown – Estimate 4,000 Square Feet above Gymnasium (Temporary Flooring May Need to be Installed Throughout the Attic to Make Abatement Work Safe (May Require Engineer for Additional Weight of Temporary Flooring)
Gray Duct Insulation – Thermal System Insulation (Substrates Contaminated)	Exterior Storage Room Adjacent Classroom 3	ACM 21% Chrysotile 041365A	225 Square Feet
Bulletin Board, "Chalk" Board and Other Wall Adhesives – Miscellaneous Materials (Adjacent Materials/Substrates are Contaminated – Multiple Layers of Boards/Materials Also)	Throughout 1950 Addition	Assumed ACM	Unknown – Estimate up to 1,850 Square Feet
Interior Door Window Glazing Compound (Black) – Miscellaneous Material	Classrooms 41 and 42	ACM 3% Chrysotile 041371A	Two Doors
Interior Window Caulking Compound – Miscellaneous Material	Stairwell Adjacent Classroom 42/29 and Gymnasium	ACM 4%-5% Chrysotile 041374A 041376A	Eight Large Window Openings

Material	Location	% Asbestos and Sample ID	Estimated Quantity of ACM
Interior Door Caulking Compounds – Miscellaneous Materials	Gymnasium Foyer/Lobby, Gymnasium and Boiler Room Corridors and Stairwell Corridor Adjacent Classroom 12	ACM 3%-4% Chrysotile 041377A-C	200 Linear Feet
Interior Door/Window Caulking Compound – Miscellaneous Material	Gymnasium Foyer/Lobby Perimeter Entry/Exit	ACM 3% Chrysotile 041378A	Two Door/Window Openings
Ceramic Wall Tile Adhesive (Dark Brown) – Miscellaneous Material (May be a Replacement Adhesive)	Girls Locker Room Rear Shower Room (May Exist In Other Locations Throughout Addition)	ACM 7% Chrysotile 0413142A	Estimate up to 100 Square Feet
Black Tar/Paper On/Inside Concrete Walls – Miscellaneous Materials	Tunnels/Crawl Spaces	ACM 12%-13% Chrysotile 0413245A 0413246A	Unknown – Should Not Be Affected By Planned Renovations
Exterior/Interior Window Caulking Compounds – Miscellaneous Materials	Exterior	ACM 4%-5% Chrysotile 0413254A 0413255A	85 Window Openings (Varying Sizes/Windows Per Opening)
Exterior/Interior Door and Door/Window Caulking Compounds – Miscellaneous Material	Exterior	ACM 4%-8% Chrysotile 0413256A 0413257A	Ten Door and Door/Window Openings (Varying Sizes Per Opening)

Material	Location	% Asbestos and Sample ID	Estimated Quantity of ACM
Exterior Wall Expansion Caulking Compound – Miscellaneous Material	Exterior	ACM 4% Chrysotile 0413258A	20 Linear Feet
Exterior Vent Caulking Compound – Miscellaneous Materials	Exterior	ACM 4% Chrysotile 0413260A 0413261A	Four Vent Openings
1957 Addition			
Pipe and Pipe Fitting Insulation – Thermal System Insulation	Classroom 6 Inaccessible – Assumed Behind Walls, Ceilings and Chases	Assumed ACM	Ten Linear Feet Visible Assume up to 200 Linear Feet Inaccessible Behind Walls, Ceilings and Chases
9"x9" Floor Tiles and Black Mastic – Miscellaneous Materials	Throughout Underneath Millwork, Cabinetry, Other Non-Moveable Objects	ACM 8% Chrysotile 080920	Unknown – Assumed Throughout Each Room
Bulletin Board, "Chalk" Board and Other Wall Adhesives – Miscellaneous Materials (Adjacent Materials/Substrates are Contaminated – Multiple Layers of Boards/Materials Also)	Throughout 1957 Addition	Assumed ACM	Unknown – Estimate up to 800 Square Feet
Black Damp-proofing Material(s) – Miscellaneous Material (Substrates Contaminated)	Perimeter Walls Throughout Addition	ACM 3% Chrysotile 041348A	5,000 Square Feet

Material	Location	% Asbestos and Sample ID	Estimated Quantity of ACM
Exterior Foundation Damp-proofing Tar Material – Miscellaneous Material (Substrates Contaminated)	Exterior Foundations	ACM 4% Chrysotile 0413249A	Unknown – Estimate up to 1,250 Square Feet
Exterior Vent Caulking Compound – Miscellaneous Material	Exterior	ACM 6% Anthophyllite 2% Chrysotile 0413251A	One Vent Opening
Exterior/Interior Window Caulking Compound – Miscellaneous Material	Exterior	ACM 4% Chrysotile 0413253A	Eight Window Openings (Varying Sizes/Windows Per Opening)
1995 Addition			
Interior Window Sill Caulking Compound – Miscellaneous Material	Classrooms 114 and 115	ACM 3% Anthophyllite 041306A	40 Linear Feet
Roofing Materials			
Copper Flashing/Wall Tar – Miscellaneous Material	Roofs Throughout Except 1995 Addition	ACM 4% - 6% Chrysotile 0413277A 0413298A	Unknown – Should Not Be Affected By Planned Renovations
Chimney Flashing Tar – Miscellaneous Material	Roofs Throughout Except 1995 Addition	ACM 8% Chrysotile 0413292A	450 Square Feet

Material	Location	% Asbestos and Sample ID	Estimated Quantity of ACM
Gutter Seam Flashing Tar – Miscellaneous Material	1950 Addition (May Exist on Other Roofs As Well – Could Not Access All Roofing Areas)	ACM 5% Chrysotile 0413300A	Unknown – Estimate 1,100 Square Feet for 1950 Addition

Utilizing the EPA and CT DPH protocols and criteria, the following materials **were determined to be non-ACM:**

Table 2 – Summary of Non-Asbestos-Containing Materials

Material	Location	Sample ID
1902 Original Building and 1925 Addition		
"Newer" Interior Door Caulking Compound (White) – Miscellaneous Material	Classrooms 3 and 4 Corridor	041379A,B
Interior Window Caulking Compound (Black) – Miscellaneous Material	Classrooms 3 and 4 Corridor	041380A,B
12"x12" Blue and Light Blue Floor Tiles and Black Mastic – Miscellaneous Materials	Throughout	0413117A-C 0413118A,B 0413202A,B 0413203A-C
Wood Wall Panel Adhesive – Miscellaneous Material	Classrooms 3 and 4 Corridor	0413128A,B
Gray Sink Undercoating – Miscellaneous Materials	Throughout Original Building	0413153A-C
Fire Door Insulation – Miscellaneous Materials	Corridor Closet Adjacent Classroom 37	0413154A,B
Red Fire Stop Caulking – Miscellaneous Material	Throughout	0413155A,B
Fiberglass Batt Insulation Backing – Miscellaneous Material	Attic	0413156A,B

Material	Location	Sample ID
Interior Window Glazing Compound – Miscellaneous Material	Above Corridor Entry Doors Throughout	0413157A,B
Interior Window and Window Sill Caulking Compound – Miscellaneous Material	Throughout	0413159A,B
"Newer" Interior Window and Door Window Glazing Compounds (Black) – Miscellaneous Materials	Media Center	0413160A,B 0413161A,B
Interior Door Window Glazing Compound (Black) - Miscellaneous Material	Throughout Corridors	0413162A,B
Blackboards – Miscellaneous Material	Throughout	0413163A,B
Countertop Adhesive – Miscellaneous Material	Throughout	0413164A,B
Bulletin Boards and Adhesives (Tan, Brown and Dark Brown) and Wall Adhesives (Yellow and White) – Miscellaneous Materials	Throughout	0413165A,B – 0413171A,B 0413175A,B 0413177A,B 0413178A,B
Sink Wall Materials (Gray and Black Layers) and Adhesive – Miscellaneous Materials	Throughout Classrooms	0413172A,B – 0413174A,B
Wall Adhesive (Brown) Behind Wall Panel/Board – Miscellaneous Materials	Media Center	0413176A,B
Multiple Types and Sizes of Ceiling Tiles – Miscellaneous Materials	Throughout	041386A,B 0413179A,B - 0413182A,B
Gypsum Board and Taping/Joint Compound – Miscellaneous and Surfacing Materials	Throughout	0413183A-C 0413184A-C
Ceiling Plaster One Coat – Surfacing Material	Throughout Addition	041396A-C

Material	Location	Sample ID
Wall and Ceiling Plaster Finish and Rough Coats – Surfacing Materials	Throughout Addition	0413106A 0413107A 0413108A 0413109A 0413188A 0413189A 0413190A 0413191A 0413192B,C 0413193B,C 0413194B,C 0413195B,C And Previous Historical Results
18"x18" Flooring Material, Gray Material and Yellow Mastic – Miscellaneous Materials	Main Office Areas	0413196A,B – 0413198A,B
Older Floor Tiles, Black Mastic and Floor Leveler – Miscellaneous Materials	Stairwells	0413199A,B – 0413201A,B
Red Flooring Material And Papers Under Wood/Plywood – Miscellaneous Materials	Throughout Original Building	0413204A,B 0413205A,B
Rubber Flooring Adhesive (Yellow) and Black Mastic – Miscellaneous Materials	Stairwells	0413206A,B 0413207
Carpet Adhesive – Miscellaneous Material	Media Center	0413208A,B
Epoxy Flooring – Miscellaneous Material	Toilet Room Adjacent Classroom 7	0413209A,B
Terrazzo Flooring and Mud Bed – Miscellaneous Materials	Throughout Corridors	0413210A,B 0413211A,B

Material	Location	Sample ID
Cove Base and Adhesives (Multiple Colors) – Miscellaneous Materials	Throughout	0413123A,B 0413124A,B 0413212A,B – 0413217
Dark Leveler/Floor Material, Beige and Gray Concrete Like Floor Materials – Miscellaneous Materials	Media Center	0413218A,B – 0413220A,B
Dark and White Thick Floor Leveler/Filler Materials – Miscellaneous Materials	Classroom 23, Assumed Throughout	080914A,B 080915A,B
Terracotta Wall and Mortar – Miscellaneous Materials	Attic and Assumed Throughout Behind Walls	080906A,B 080907A-C
Glazed Block Wall Mud Bed and Mortar – Miscellaneous Materials	Throughout	080908A,B - 080911A,B
Brick and Grout/Mortar – Miscellaneous Materials	Attic	0413221A,B – 0413224A,B
Hard Gray Floor Material – Miscellaneous Material	Attic	0413227A,B 0413228A,B
Ceramic Floor and Wall Tile Mud Beds, Grouts and Adhesives – Miscellaneous Materials	Throughout	0413229A,B – 0413242
1950 Addition		
Light and Dark Gray Sink Undercoating – Miscellaneous Materials	Throughout Addition	041361A,B 041362A,B
Duct Pin Adhesive (Brown) – Miscellaneous Material	Mechanical Room Above Room 29	041363A,B
"Newer" Pipe End Cap Insulation – Thermal System Insulation	Mechanical Room Above Room 29, Throughout Addition	041366A-C
Mineral Wool Loose Insulation – Thermal System Insulation	Attic	041367A-C
Spray Applied Fireproofing – Surfacing Material	Boiler Room	041368A-E

Material	Location	Sample ID
Red Fire Stop Caulking – Miscellaneous Material	Throughout Addition	041369A,B
"Newer" HVAC Duct Seam Sealant Compound – Miscellaneous Material	Mechanical Room Above Room 29, Throughout Addition	041370A,B
Interior Door Window Glazing Compound (Black) – Miscellaneous Material	Media Center	041372A,B
Interior Glass Block Window Grout – Miscellaneous Material	Stairwell Adjacent Classroom 42	041373A,B
"Newer" Interior Window Caulking Compound (White) – Miscellaneous Material (Contaminated with Asbestos-Containing Caulking Compound)	Gymnasium	041375A,B
Blackboards – Miscellaneous Material	Throughout Addition	041382A,B
Slate Window Sills – Miscellaneous Material	Throughout Addition	041383A,B
Countertop Adhesive – Miscellaneous Material	Throughout Addition	041384A,B
Multiple Types and Sizes of Ceiling Tiles and Glue Daubs – Miscellaneous Materials	Throughout Addition and Gymnasium	041385A,B 041387A,B - 041393A,B 080905A,B
Gypsum Board and Taping/Joint Compound – Miscellaneous and Surfacing Materials	Throughout Addition	041394A-C 041395A-C
Ceiling Plaster One Coat – Surfacing Material	Throughout Addition	041396A-C
Wall Plaster One Coat – Surfacing Material	Throughout Addition	041397A-C
Wall and Ceiling Plaster Finish and Rough Coats – Surfacing Materials	Throughout Addition	041398A-C – 0413109A-C

Material	Location	Sample ID
Black Paper Under Wood Floor – Miscellaneous Material	Stage	0413110A,B
Black Tar and Tar Paper on Block Walls – Miscellaneous Material	Under Stage	0413111A,B 0413112A,B
12"x12" White, Green/Blue Floor Tiles and Black Mastic – Miscellaneous Materials	Throughout Addition	0413119A,B – 0413122A,B
Sink Wall Materials (Gray and Black Layers) and Adhesive – Miscellaneous Materials	Throughout Addition Classrooms	0413125A,B – 0413127A,B
Bulletin Boards and Adhesives (Light and Dark Brown) – Miscellaneous Materials	Throughout Addition	0413129A,B – 0413133A,B
Terrazzo Flooring and Mud Bed – Miscellaneous Materials	Throughout Addition Corridors	0413134A,B - 0413136A,B
Glazed Block Wall Mud Bed and Mortar – Miscellaneous Materials	Throughout	080912A,B 080913A,B
Concrete Deck – Miscellaneous Material	Classroom 1	0413137A,B
Block Wall and Mortar – Miscellaneous and Surfacing Material	Exterior Storage Room Adjacent Classroom 3	0413138A,B 0413139A-C
Epoxy Flooring and Cove Base and Mud Bed – Miscellaneous Materials	Classroom 1 and 2 Toilet Room and Locker Room Toilet	0413140A,B 0413141A,B
Ceramic Floor and Wall Tile Mud Beds and Grouts – Miscellaneous Materials	Throughout Addition	0413143A,B – 0413150A,B
Fire Door Insulation – Miscellaneous Materials	Room 13	080901
Black and Tan Paper Debris – Miscellaneous Materials	Tunnels	0413243A,B 0413244A,B
Exterior "Newer" Vent Caulking Compound – Miscellaneous Material (Contaminated With Asbestos-Containing Caulking Compound)	Exterior	0413259A,B

Material	Location	Sample ID
Exterior Wall Paint – Surfacing Material	Exterior	0413262A-C
1957 Addition		
White and Gray Sink Undercoating – Miscellaneous Materials	Throughout Addition	041339A,B 041340A,B
Interior Window Glazing Compounds – Miscellaneous Material	Throughout Addition Above Doors	041341A,B
2'x2' Ceiling Tile – Miscellaneous Material	Throughout Addition	041342A,B
Gypsum Board and Taping/Joint Compound – Miscellaneous and Surfacing Materials	Throughout Addition	041343A,B 041344A-C
Wall Plaster Finish and Rough Coats – Surfacing Materials	Throughout Addition	041345A-G 041346A-G
Black Paper on Concrete Deck – Miscellaneous Material	Classroom 24	041347A,B
12"x12" Blue and Light Blue Floor Tiles and Black Mastic – Miscellaneous Materials	Throughout Addition	041349A,B – 041351A,B
Countertop Adhesive – Miscellaneous Material	Throughout Addition	041352A,B
Cove Base and Adhesive – Miscellaneous Materials	Throughout Addition	041353A,B 041354A,B
Bulletin Boards and Adhesives (Light Brown, Brown and Gray) – Miscellaneous Materials	Throughout Addition	041355A,B – 041359A,B
Exterior Wall Paint – Surfacing Material	Exterior Ground Floor Addition	0413250A-C
Exterior Door Caulking Compound – Miscellaneous Materials	Exterior	0413252A,B
1995 Addition		
Black and Gray Sink Undercoating – Miscellaneous Materials	Throughout Addition	041301A,B 041302A,B

Material	Location	Sample ID
Kiln and Kiln Roping – Miscellaneous Materials	Classroom 115 Closet	041303A,B 041304A,B
Sink Caulking Compound – Miscellaneous Material	Throughout Addition	041305A,B
Interior Window Sill Caulking Compound – Miscellaneous Material	Cafeteria	080903 080904
Interior Door Window Glazing Compound (Black) – Miscellaneous Material	Cafeteria/Corridor	041307A,B
HVAC Duct Seam Sealant Compound – Miscellaneous Material	Throughout Addition	041308A,B
2'x4' Ceiling Tiles – Miscellaneous Materials	Throughout Addition	041309A,B 041310A,B
Gypsum Board and Taping/Joint Compound – Miscellaneous and Surfacing Materials	Throughout Addition	041311A,B 041312A-C
Sheet Flooring, Adhesive and Gray Cement/Substrate/Leveler – Miscellaneous Materials	Kitchen	041313A,B – 041315A,B 041323A,B
12"x12" Pink, White and Blue Floor Tiles , Yellow Mastic and Floor Leveler – Miscellaneous Materials	Throughout Addition	041316A,B – 041320A,B
Rubber Sheet Flooring and Yellow Adhesive – Miscellaneous Materials	Entry/Exit Foyers	041321A,B 041322A,B
Cove Base and Adhesives (Multiple Colors) – Miscellaneous Materials	Throughout Addition	041324A,B – 041329A,B
Plastic Wall Adhesive – Miscellaneous Material	Kitchen	041330A,B
Wall/Bulletin Boards and Adhesives – Miscellaneous Materials	Throughout Addition	041331A,B – 041334A,B
Ceramic Floor and Wall Tile Mud Beds and Grouts – Miscellaneous Materials	Cafeteria, Corridor and Toilet Rooms	041335A,B – 041338A,B

Material	Location	Sample ID
Exterior Window Sill Caulking Compound – Miscellaneous Material	Exterior Throughout	0413247A,B
Exterior Window, Door, Wall Expansion and Vent Caulking Compound – Miscellaneous Material	Exterior Throughout	0413248A,B
Roofing Materials		
Exterior "Newer" Copper Flashing, Perimeter, Wall Expansion and HVAC Caulking Compounds – Miscellaneous Materials	Roofs Throughout	0413267A,B – 0413270A,B
Top and Bottom Layers Roof Shingles and Black Paper Under Shingles – Miscellaneous Materials	1995 Addition	0413271A,B – 0413273A,B
Roof Walk Mats – Miscellaneous Material	1995 and 1950 Additions	0413318A,B
Perimeter, Penetration and HVAC Flashing Tar and Tar Paper – Miscellaneous Materials	Roofs Throughout	0413274A,B - 0413276A,B 0413287 0413289A,B - 0413291A,B 0413310A,B – 0413317A,B
Copper Flashing Tar Patch – Miscellaneous Material	1995 Addition to 1950 Addition	0413278A,B
Rolled Roofing, Paper Layer and Soft Concrete Deck – Miscellaneous Materials	1995 Addition and 1957 Addition Roofs	0413279A,B - 0413282A,B 0413283 – 0413285 0413288
Bottom Layer Roof Field Tar – Miscellaneous Material	1957 Addition	0413286A,B
Three Layers of Roofing Shingles, Black Paper Under Shingles and Concrete Roof Deck– Miscellaneous Materials	1950 Addition	0413293A-D – 0413297A-C

Material	Location	Sample ID
Gutter Flashing Tar – Miscellaneous Material (Contaminated with Asbestos-Containing Gutter Seam Flashing Tar)	1950 Addition	0413299A,B
Three Layers of Roofing Shingles and Black Paper Under Shingles – Miscellaneous Materials	1902 Building and 1925 Addition	0413301A,B – 0413304A,B
Rolled Roofing, Soft Concrete, Paper Layers, Bottom Layer Tar and Tar on Deck – Miscellaneous Materials	1950 Addition	0413305A,B – 0413309A,B
Roof Field/Flashing Tar – Miscellaneous Material	1950 Addition Over Bay Windows	0413319A,B

NOTE: Materials that contain less than 1% asbestos are regulated by OSHA and some landfills may not accept the waste as clean construction debris. See appendix A for materials that contain less than 1% asbestos.

DISCLAIMERS: Reasonable care was taken to identify all suspect accessible asbestos containing materials through visual inspection and limited destructive sampling techniques. However, it is not feasible to uncover all materials that may exist. Additional materials may need to sampled after the building has been vacated and/or during the selective demolition/renovation process. Some locations/materials were not sampled during this survey due to occupancy, location and damage required to inspect certain materials/areas.

Flooring Materials Remaining (Hidden) – A majority of the flooring materials (tiles) were reported to have been abated throughout the building. Langan checked at least one location in each room and in common areas. Additional asbestos-containing flooring materials may exist and may be discovered during selective demolition and/or building renovation under gypsum board walls, under fixed cabinetry/millwork/non-moveable objects throughout all areas (confirmed to exist), under lockers, under multiple layers of flooring (wood, newer tiles/flooring materials, epoxy, rubber, etc.), under floor leveling compounds and/or soft concrete and underneath other materials. The gymnasium flooring materials were not investigated (currently not part of planned renovations). Suspect asbestos-containing materials could exist underneath the gymnasium flooring (tars, damp-proofing, paper, other materials).

Duct Insulation Residue – The mechanical space above room 29 (above gymnasium) was found to have HVAC duct work and the ducts had a white residue on them that was found to contain asbestos. This material may exist throughout the building in other locations (checked several locations) and may also exist underneath fiberglass duct insulation throughout.

Possible Additional Tunnel/Crawl Space and Inaccessible Areas – Accessible tunnel/crawl space areas were investigated. **Piping was found to be going into solid concrete walls and there may exist tunnel/crawl space areas under the 1902 original building and 1925 additions that are currently not accessible.** Additional asbestos-containing materials (pipe and pipe fitting insulation, etc.) could exist in these locations. The majority of the "higher" original building and 1925 additions roofing materials could not be accessed safely for visual inspection and bulk sampling (inspection and bulk sampling did occur on these roofs adjacent the roof hatch by the 1957 addition). There is a closet hatch door (corridor closet adjacent classroom 42) that could not be accessed due to the amount of stored materials inside the closet. Additional asbestos-containing materials may exist in this area which is currently assumed to be the boiler room exhaust chimney that runs from the ground floor to the second floor. Several areas in the previous locker rooms could also not be accessed due to materials stored in these areas and additional asbestos-containing materials may exist in these areas (pipe and pipe fitting insulation will be assumed inside walls/chases).

Previous Abatement Records – Existing recordkeeping documents stated that asbestos-containing roofing materials were abated. Previous abatement recordkeeping also state that the entire boiler room and tunnels/crawl spaces/mechanical spaces have been abated of several asbestos-containing materials as well as asbestos-containing residue found underneath fiberglass pipe insulation. Langan investigated representative areas and noted the boiler, boiler exhausts, pipe insulation, etc. were "newer" and did not find suspect asbestos-containing insulation materials or other materials abated to be present. Asbestos-containing materials may still exist in some locations, underneath fiberglass pipe insulation throughout as well as throughout the roofs. A window replacement project was reported to have occurred in 2012. The window caulking compounds were found to contain asbestos throughout the majority of the original building and 1925, 1950 and 1957 additions.

Interior Hidden Materials - Interior walls/ceilings/floors/other building materials were opened up/accessed in limited locations to investigate for suspect asbestos-containing materials. Additional suspect asbestos-containing materials may be discovered during selective demolition and/or renovation activities despite the inspectors investigating representative areas during the

survey. Additional asbestos containing materials may be found:

- Interiors of boilers, walk-in freezers, etc. (appear to be "newer" and should not have asbestos containing materials inside them but will need to be sampled prior to demolition);
- Behind water fountains (tar/damp-proofing and pipe insulation);
- Inside HVAC ducts, mechanical systems, chimneys and incinerators (damp-proofing, tars, adhesives, sealants, fire brick and thermal system insulation);
- Adhesives (and other materials) associated with millwork, cabinetry, shelving, window sills, behind gypsum board walls/ceilings, classroom sink walls areas, mirrors and wall materials (checked several locations and sampled limited materials – most bulletin boards and "chalk" boards were not able to be investigated behind), etc.;
- Behind custodian slop sinks (damp-proofing/tar behind);
- Behind ceilings, walls, chases and flooring throughout (duct insulation, pipe insulation, vibration isolation cloth, roofing debris, flooring, etc.) and underneath the stage (checked limited areas). There are multiple layers of wall, ceiling and flooring materials throughout original building and additions with inaccessible areas behind them;
- Vermiculite behind/inside walls, ceilings and chases (checked several areas in attic);
- Roofing materials and/or debris not found during this inspection (checked several locations throughout);
- Paints, cement, brick and masonry (typically not suspect);
- Transite cement board, adhesives, pipe insulation, other materials behind radiators, closets, wall paneling/materials, exterior, ceilings, soffits, etc.);
- HVAC duct adhesives, duct pin adhesive, seam and flange sealants and vibration isolation cloths (checked several locations) throughout;
- Additional fire door/door insulation;
- Behind ceramic walls and floors (damp-proofing/tars/etc.). Checked several locations throughout building. The girls locker room ceramic walls were found to have asbestos-containing adhesive behind the tiles in one location and this material may exist in additional areas in this room as well as other areas (checked several additional areas, including inside the girls locker room and did not find except for one location);
- Asbestos-containing pipe and/or pipe fitting residue/contamination underneath fiberglass insulation (checked several locations);
- Paper backing inside lights and electrical insulation (stage and other locations – stage lighting appeared to be "newer");
- Damp-proofing/tar/paper behind perimeter walls throughout and around perimeter wall window, door, vent openings throughout and

- Materials (adhesives, transite, etc.) behind exterior "stucco" textured walls.

Foundations/Soil and Buried Piping and Mechanical Conduits – Foundation damp-proofing/tars/mastics may exist under the soil on the building foundations (checked 1957 addition). Additional damp-proofing materials that have not been investigated/sampled, may exist in other locations, on the inside of foundation walls and underneath floor slabs throughout. It is not known if other materials are buried in the soil adjacent to the building (ex. transite and/or orangeburg piping, etc.). Asbestos containing damp-proofing/tars/mastics/other materials may also exist on piping and mechanical conduits in the subsurface.

Exterior Hidden Materials – Additional asbestos-containing materials (damp-proofing, etc.) may exist behind wall materials not investigated/in other locations that have not been opened up/sampled to date. Langan could not drill above door or window headers/lintels due to the damage that would occur. "Older" window/door/vent/wall sealant compounds may exist behind newer sealant compounds (checked several locations) and behind blocked/filled in window/other openings. Additional hidden suspect asbestos containing "older" roofing materials may exist that were not found by the limited roof cuts/sampling that has occurred to date.

Hidden Materials Between Original Building and All Building Additions – Additional asbestos-containing materials (damp-proofing, etc.) may exist behind walls, etc. between different ages of the building/additions.

3.0 LEAD-BASED PAINT XRF SCREENING

A limited lead-based paint XRF (X-ray Fluorescence) screening survey was performed throughout the building by Pavel Zayenchik, a CT DPH licensed lead inspector (CT license #002262). LBP was identified exceeding the HUD/EPA action level of equal to or greater than 1.0 mg/cm^2 in the materials listed below. Toxicity Characteristic Leaching Procedure (TCLP) lead waste characterization samples should be taken to classify the building materials for proper waste disposal after the building has been vacated or during the start of renovation activities. See Appendix B for XRF field data sheets.

Table 3 – XRF Lead-Based Paint Screening Results (>1 mg/cm^2)

Sample Number	Component	Substrate	Color	Test Location	Total Lead mg/cm^2	Results
20	Post Handrail	Metal	Blue	1950 Stairwell	1.6	Positive
21	Handrail	Metal	Blue	1950 Stairwell	3.2	Positive
29	Door Casing	Wood	Brown	Room 35	5.2	Positive
30	Door Casing	Wood	Brown	Room 38	11.3	Positive
34	Door Casing	Metal	Brown	1902 Stairwell	11.9	Positive
35	Door Casing	Metal	Blue	1902 Stairwell	2.3	Positive
36	Stair Post	Metal	Blue	1902 Stairwell	1.7	Positive
38	Stringer	Metal	Blue	1902 Stairwell	1.4	Positive
43	Window Casing	Wood	Off White	Room 33	13.1	Positive
44	Window Sill	Wood	Off White	Room 33	18	Positive
58	Ceiling	Plaster	Brown	Room 41	21	Positive
59	Ceiling	Plaster	Brown	Room 38	17	Positive
66	Window Casing	Wood	White	Media Center	12.7	Positive
80	Door Casing	Metal	Brown	1902 Corridor	12	Positive
84	Door Casing	Metal	Blue	1902 Stairwell	1.4	Positive
91	Window Casing	Wood	Yellow	Girls Toilet	22.8	Positive
98	Window Casing	Wood	White	Room 28	14.5	Positive
99	Window Sill	Wood	White	Room 28	13.3	Positive
101	Door Casing	Wood	White	Main Entry	20.3	Positive
111	Ceiling	Plaster	Brown	Room 25	18.5	Positive
175	Door Casing	Wood	White	Exterior Exit @ Boiler	3.3	Positive
183	Window Casing	Metal	White	Exterior Room 5	1.1	Positive

Sample Number	Component	Substrate	Color	Test Location	Total Lead mg/cm^2	Results
184	Window Casing	Metal	White	Exterior 1902 Stairwell	1.1	Positive
188	Door Casing	Wood	White	Exterior 1902 Under Stairs	3.2	Positive
194	Door Casing	Wood	White	Exterior Corridor to Room 2	2.9	Positive
207	Vent	Metal	Gray	Exterior Room 6	2.8	Positive
210	Door Casing	Metal	Black	Exterior Room 12	1.6	Positive
211	Door Casing	Wood	White	Exterior Room 8	2.8	Positive
222	Door Casing	Wood	White	Exterior Gym	7.3	Positive

Contractors should be aware that OSHA has not established a level of lead in a material below which 29 CFR 1926.62 does not apply. Contractor shall comply with exposure assessment criteria, interim worker protection and other requirements of the regulation as necessary to protect workers and occupants/residents.

The information in this report does not constitute a comprehensive lead inspection under the Connecticut Department of Public Health Regulations, Section 19a-111-1 to 11. The survey was an XRF lead screening utilizing an XRF and does not satisfy the testing requirements of US EPA's Renovation, Repair and Painting Rule (RRP) under 40 CFR 745.80 through 92. Reliance on this report for determining RRP or CT DPH applicability is not authorized by Langan.

4.0 PCB SEALANT SOURCE MATERIALS

In recent years, the Unites States Environmental Protection Agency (US EPA) has learned that building sealants (e.g. caulking, glazing, expansion joint and other sealant materials) containing potentially harmful PCBs were used in many buildings in the 1950s through the 1980s. PCBs were added to building sealants for durability, resistance to degradation, and as a softener/plasticizer for application.

Connecticut Department of Energy and Environmental Protection (CTDEEP) has a PCB regulatory limit of 1 ppm and EPA has a regulatory limit of 50 ppm for source materials. The following "older" PCB sealant source materials are assumed to have greater than 50 ppm PCB (PCB Bulk Product Waste):

Table 4 – Summary of Assumed PCB Source Sealant Materials	
Material	**Location**
1902 Original Building and 1925 Addition	
Interior Window Caulking, Glazing and Door Caulking Compounds	Classrooms 3 and 4 Corridor (Six Window and Two Door Openings)
Interior Sink Backsplash Caulking Compound	Classrooms 20, 22, 23, 25, 28, 31, 33, 35, 36, 38, 40, 43 and 44 (130 Linear Feet)
Interior Door Window Glazing Compound	Classroom 8 and 7/8 (Two Doors)
Interior Window Glazing Compound (Above Corridor Entry Doors)	Classrooms 20, 22, 23, 25, 28, 31, 32, 33, 38, 39, 40, 43 and 44 (13 Windows)
Exterior/Interior Window Caulking Compounds (Perimeter Walls)	Exterior (93 Window Openings - Varying Sizes/Windows Per Opening)
Exterior/Interior Door and Door/Window Caulking Compounds (Glazing Compound Also at Main Front Entry Door) (Perimeter Walls)	Exterior (Eight Door and Door/Window Openings - Varying Sizes Per Opening)
Exterior Wall Expansion Caulking Compound (Perimeter Walls)	Exterior (60 Linear Feet)
Exterior Vent Caulking Compound (Perimeter Walls)	Exterior (Seven Vent Openings)
1950 Addition	
Interior Door Window Glazing Compound	Classrooms 41 and 42 (Two Doors)
Interior Window Caulking Compound	Stairwell Adjacent Classroom 42/29 and Gymnasium (Eight Large Window Openings)

Material	Location
Interior Door Caulking Compounds	Gymnasium Foyer/Lobby, Gymnasium and Boiler Room Corridors and Stairwell Corridor Adjacent Classroom 12 (200 Linear Feet)
Interior Door/Window Caulking Compound	Gymnasium Foyer/Lobby Perimeter Entry/Exit (Two Door/Window Openings)
Exterior/Interior Window Caulking Compounds (Perimeter Walls)	Exterior (85 Window Openings - Varying Sizes/Windows Per Opening)
Exterior/Interior Door and Door/Window Caulking Compounds (Perimeter Walls)	Exterior (Ten Door and Door/Window Openings- Varying Sizes Per Opening)
Exterior Wall Expansion Caulking Compound (Perimeter Walls)	Exterior (20 Linear Feet)
Exterior Vent Caulking Compound (Perimeter Walls)	Exterior (Four Vent Openings)
1957 Addition	
Interior Window Glazing Compounds (Above Corridor Entry Doors)	Classroom 24 and 37 (Two Window Openings)
Exterior/Interior Window Caulking Compounds (Perimeter Walls)	Exterior (Eight Window Openings - Varying Sizes/Windows Per Opening)
Exterior/Interior Door Caulking Compounds (Perimeter Walls)	Exterior (One Door Opening)
Exterior Vent Caulking Compounds (Perimeter Walls)	Exterior (One Vent Opening)

Sealant compounds throughout the 1995 addition and throughout the roofs were not included in the PCB visual survey due to the age of construction/installation (not typically suspect).

PCBs can also be found in paints, damp-proofing materials, roofing materials, adhesives, glues, floor mastics, etc. Sampling of these materials and sealant compounds was not authorized at the time of the HBM survey.

5.0 UNIVERSAL WASTE ASSESSMENT

Completion of detailed Universal Waste Assessment (identifying the number and location of Universal Waste items) was not conducted as part of this survey. Universal wastes noted during the visual survey include suspect PCB/DEHP (di (2-ethylhexyl) phthalate) ballasts/capacitors associated with light fixtures, air conditioner and refrigerant coolants, rooftop HVAC units, window air conditioning units, mercury-containing florescent and other mixed used high intensity light bulbs, smoke detectors and other alarms/sensors containing suspect radioactive materials, batteries and emergency lighting, exit and other signage, possible mercury-containing thermostats, switches, gauges, electronics, paints, wiring, fire extinguishers, cleaning and other chemicals.

All universal waste that is present in the building that will be impacted by renovation activities, will need to be properly removed, recycled, and/or disposed of at a landfill permitted to accept such waste. The removal, handling, recycling, and disposal must be performed in accordance with applicable Federal, State, and local regulations.

6.0 CONCLUSIONS AND RECOMMENDATIONS

Langan provides the following conclusions and recommendations, based on the findings of this revised limited NESHAP Pre-Renovation Hazardous Building Materials Survey:

Both friable and non-friable ACM were identified/assumed throughout the original building and building additions. Prior to selective demolition/renovation activities, the identified ACM that will be disturbed/impacted by renovation activities must be properly removed and disposed in accordance with applicable Federal, State and Local regulations by a State of Connecticut DPH licensed asbestos abatement contractor. A State of Connecticut licensed Asbestos Designer should create abatement specifications and an Asbestos Project Monitor should perform project oversight and air testing in accordance with the Federal and State regulations. These are all requirements of the CT DPH Standards. Additional sampling/destructive sampling/visual investigation is required for materials that have not been sampled to date and the abatement

contractor will be required to perform selective demolition throughout the interior and exterior of the building.

Building materials identified to contain less than 1% asbestos are regulated by OSHA and some landfills may not accept this waste as clean construction debris. Contractors must comply with all applicable federal and state regulations, including OSHA, when handling/disturbing/disposing of materials that contain less than 1% asbestos.

Contractors completing demolition and/or abatement activities should be aware that OSHA has not established a level of lead in a material below which 29 CFR 1926.62 does not apply. All contractors working on the project are responsible for having adequate training (RRP or greater amount) and performing their own OSHA compliance requirements. Contractor shall comply with exposure assessment criteria, interim worker protection and other requirements of the regulation as necessary to protect workers and occupants/residents. All contractors must comply with all applicable State and Federal regulations, including but not limited to the lead OSHA regulations.

TCLP lead waste characterization sampling should be performed to determine the waste disposal method for painted components to be removed/disposed (normal construction debris versus regulated hazardous waste). Separate TCLP samples should be obtained for each different age of construction (original building and building additions) after the building has been vacated or during the start of renovation activities. Metal materials painted in lead-based paint may be recycled. Langan recommends completion of a lead-based paint awareness specification for the project.

The interior plaster materials and window/door/other interior/exterior components found to contain lead based paint that will be scheduled to be impacted by selective demolition activities in the original building, 1925 and 1950's additions should be demolished under controlled conditions (polyethylene sheeting, negative air machines, etc.) to avoid possibly contaminating building areas and exterior ground surfaces with lead debris and dust and the CT DPH lead regulations may apply if children under the age of six occupy the building.

"Older" caulking, glazing and sealant compounds to be disturbed by selective demolition/ renovation activities are assumed to contain greater than 50 ppm PCB bulk product waste. These materials and other suspect PCB containing materials could be tested at a later date or assumed to contain PCBs (and possibly adjacent building materials and ground surfaces). PCB abatement specification(s) will be required and if sampling is performed, a PCB performance based plan

(does not require EPA approval) or self-implementing plan (requires EPA approval – two to six months is typical for this process) may be required depending upon the sample results. The owner/owners representative and Langan should meet to discuss the testing parameters (what materials is Langan authorized to sample (if any) and when will sampling occur) or what assumptions will be in place to write specifications without sampling (types of source materials to be assumed, extent of adjacent building materials, etc.).

All universal waste that is present in the building that will require removal/replacement due to planned renovation activities, will need to be properly removed, recycled, and/or disposed of at a landfill permitted to accept such waste. The removal, handling, recycling and disposal must be performed in accordance with applicable Federal, State, and local regulations. Langan recommends completion of a universal waste recycling/disposal specification for the project.

7.0 LIMITATIONS

The conclusions and recommendations presented in this report are professional opinions based solely upon Langan's visual observations, laboratory test data, and current regulatory requirements. These conclusions and recommendations are intended exclusively for the purpose stated herein, at the site indicated, and for the project indicated.

It is important to recognize that even the most comprehensive scope of services may fail to detect all hazardous building materials that may be associated with the property. Therefore, Langan cannot act as insurers and cannot "certify" that all hazardous building materials associated with the property have been identified, and no expressed or implied representation or warranty is included or intended in our report, except that our services were performed, within the limits prescribed by our client, with the customary thoroughness and competence of our profession.

Any suspect material that is not listed in this report must be assumed as ACM, PCBs, LBP, etc. until confirmed otherwise via laboratory testing.

Appendix A

Asbestos Analytical Laboratory Results and Chain-of-Custody

LANGAN

EMSL Analytical, Inc.

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Customer ID: LANG78
Customer PO:
Project ID:

Attn: Matthew Myers
Langan Engineering
Long Wharf Maritime Center
555 Long Wharf Drive
New Haven, CT 06511

Proj: 140265802 / Old Greenwich School

Phone: (203) 562-5771
Fax: (203) 789-6142
Collected:
Received: 4/19/2023
Analyzed: 5/10/2023

Summary Test Report for Asbestos Analysis of Bulk Material

Client Sample ID: 041301A **Lab Sample ID:** **042309385-0001**
Sample Description: 1990's Addition - Classroom 115/Black Sink Undercoating

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	Black	0.0%	100.0%	None Detected	

Client Sample ID: 041301B **Lab Sample ID:** **042309385-0002**
Sample Description: 1990's Addition - Classroom 115/Black Sink Undercoating

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	Black	0.0%	100.0%	None Detected	

Client Sample ID: 041302A **Lab Sample ID:** **042309385-0003**
Sample Description: 1990's Addition - Classroom 115/Gray Sink Undercoating

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	Gray	20.0%	80.0%	None Detected	

Client Sample ID: 041302B **Lab Sample ID:** **042309385-0004**
Sample Description: 1990's Addition - Classroom 115/Gray Sink Undercoating

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	Gray	22.0%	78.0%	None Detected	

Client Sample ID: 041303A **Lab Sample ID:** **042309385-0005**
Sample Description: 1990's Addition - Classroom 115 - Closet/Kiln

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	Tan	0.0%	100.0%	None Detected	

Client Sample ID: 041303B **Lab Sample ID:** **042309385-0006**
Sample Description: 1990's Addition - Classroom 115 - Closet/Kiln

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	Tan	0.0%	100.0%	None Detected	

Client Sample ID: 041304A **Lab Sample ID:** **042309385-0007**
Sample Description: 1990's Addition - Classroom 115 - Closet/Kiln Roping

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	White	95.0%	5.0%	None Detected	

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Project ID:

Summary Test Report for Asbestos Analysis of Bulk Material

Client Sample ID: 041304B ***Lab Sample ID:*** **042309385-0008**

Sample Description: 1990's Addition - Classroom 115 - Closet/Kiln Roping

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	White	94.0%	6.0%	None Detected	

Client Sample ID: 041305A ***Lab Sample ID:*** **042309385-0009**

Sample Description: 1990's Addition - Classroom 115/Sink Caulking

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	Gray	0.0%	100.0%	None Detected	

Client Sample ID: 041305B ***Lab Sample ID:*** **042309385-0010**

Sample Description: 1990's Addition - Classroom 115/Sink Caulking

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	Gray	0.0%	100.0%	None Detected	

Client Sample ID: 041306A ***Lab Sample ID:*** **042309385-0011**

Sample Description: 1990's Addition - Classroom 115/Window Sill Caulking

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	White	0.0%	97.0%	**3% Anthophyllite**	

Client Sample ID: 041306B ***Lab Sample ID:*** **042309385-0012**

Sample Description: 1990's Addition - Classroom 115/Window Sill Caulking

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023				Positive Stop (Not Analyzed)	

Client Sample ID: 041307A ***Lab Sample ID:*** **042309385-0013**

Sample Description: 1990's Addition - Café/Corridor/Interior Door Window Glazing - Black

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	Black	0.0%	100.0%	None Detected	

Client Sample ID: 041307B ***Lab Sample ID:*** **042309385-0014**

Sample Description: 1990's Addition - Kitchen - Exit Door/Interior Door Window Glazing - Black

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	Black	0.0%	100.0%	None Detected	

Client Sample ID: 041308A ***Lab Sample ID:*** **042309385-0015**

Sample Description: 1990's Addition - Kitchen/HVAC Duct Seam Sealant

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	Gray	0.0%	100.0%	None Detected	

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Summary Test Report for Asbestos Analysis of Bulk Material

Client Sample ID: 041308B ***Lab Sample ID:*** **042309385-0016**

Sample Description: 1990's Addition - Kitchen/HVAC Duct Seam Sealant

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	Gray	0.0%	100.0%	None Detected	

Client Sample ID: 041309A ***Lab Sample ID:*** **042309385-0017**

Sample Description: 1990's Addition - Kitchen/2'x4' Ceiling Tile

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	Brown	85.0%	15.0%	None Detected	

Client Sample ID: 041309B ***Lab Sample ID:*** **042309385-0018**

Sample Description: 1990's Addition - Kitchen/2'x4' Ceiling Tile

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	Brown	82.0%	18.0%	None Detected	

Client Sample ID: 041310A ***Lab Sample ID:*** **042309385-0019**

Sample Description: 1990's Addition - Classrooms/Corridor/Café/2'x4' Ceiling Tile

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	Brown	79.0%	21.0%	None Detected	

Client Sample ID: 041310B ***Lab Sample ID:*** **042309385-0020**

Sample Description: 1990's Addition - Classrooms/Corridor/Café/2'x4' Ceiling Tile

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	Brown	75.0%	25.0%	None Detected	

Client Sample ID: 041311A ***Lab Sample ID:*** **042309385-0021**

Sample Description: 1990's Addition - Classroom 115/Gypsum Board

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	Brown/White	10.0%	90.0%	None Detected	

Client Sample ID: 041311B ***Lab Sample ID:*** **042309385-0022**

Sample Description: 1990's Addition - Classroom 114/Gypsum Board

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	Brown/White	11.0%	89.0%	None Detected	

Client Sample ID: 041312A ***Lab Sample ID:*** **042309385-0023**

Sample Description: 1990's Addition - Classroom 115/Gypsum Board Joint/Tape Compound

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	White	0.0%	100.0%	None Detected	

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Summary Test Report for Asbestos Analysis of Bulk Material

Client Sample ID: 041312B ***Lab Sample ID:*** **042309385-0024**

Sample Description: 1990's Addition - Classroom 114/Gypsum Board Joint/Tape Compound

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	White	0.0%	100.0%	None Detected	

Client Sample ID: 041312C ***Lab Sample ID:*** **042309385-0025**

Sample Description: 1990's Addition - Kitchen/Gypsum Board Joint/Tape Compound

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	White	0.0%	100.0%	None Detected	

Client Sample ID: 041313A ***Lab Sample ID:*** **042309385-0026**

Sample Description: 1990's Addition - Kitchen/Sheet Flooring

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	Blue	0.0%	100.0%	None Detected	

Client Sample ID: 041313B ***Lab Sample ID:*** **042309385-0027**

Sample Description: 1990's Addition - Kitchen/Sheet Flooring

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	Blue	0.0%	100.0%	None Detected	

Client Sample ID: 041314A ***Lab Sample ID:*** **042309385-0028**

Sample Description: 1990's Addition - Kitchen/Sheet Flooring Adhesive - Tan/Brown

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	Brown	0.0%	100.0%	None Detected	

Client Sample ID: 041314B ***Lab Sample ID:*** **042309385-0029**

Sample Description: 1990's Addition - Kitchen/Sheet Flooring Adhesive - Tan/Brown

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	Brown	0.0%	100.0%	None Detected	

Client Sample ID: 041315A ***Lab Sample ID:*** **042309385-0030**

Sample Description: 1990's Addition - Kitchen/Sheet Flooring - Gray Cement Substrate

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	Gray	0.0%	100.0%	None Detected	

Client Sample ID: 041315B ***Lab Sample ID:*** **042309385-0031**

Sample Description: 1990's Addition - Kitchen/Sheet Flooring - Gray Cement Substrate

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	Brown	0.0%	100.0%	None Detected	

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Summary Test Report for Asbestos Analysis of Bulk Material

Client Sample ID: 041316A ***Lab Sample ID:*** **042309385-0032**

Sample Description: 1990's Addition - Café/12"x12" Pink Floor Tile

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	White	0.0%	100.0%	None Detected	

Client Sample ID: 041316B ***Lab Sample ID:*** **042309385-0033**

Sample Description: 1990's Addition - Café/12"x12" Pink Floor Tile

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	White	0.0%	100.0%	None Detected	

Client Sample ID: 041317A ***Lab Sample ID:*** **042309385-0034**

Sample Description: 1990's Addition - Café/12"x12" White Floor Tile

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	White	0.0%	100.0%	None Detected	

Client Sample ID: 041317B ***Lab Sample ID:*** **042309385-0035**

Sample Description: 1990's Addition - Classroom 115 - Closet/12"x12" White Floor Tile

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	White	0.0%	100.0%	None Detected	

Client Sample ID: 041318A ***Lab Sample ID:*** **042309385-0036**

Sample Description: 1990's Addition - Classroom 115 - Closet/12"x12" Blue Floor Tile

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	Blue	0.0%	100.0%	None Detected	

Client Sample ID: 041318B ***Lab Sample ID:*** **042309385-0037**

Sample Description: 1990's Addition - Classroom 114/12"x12" Blue Floor Tile

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	Blue	0.0%	100.0%	None Detected	

Client Sample ID: 041318C ***Lab Sample ID:*** **042309385-0038**

Sample Description: 1990's Addition - Café/12"x12" Blue Floor Tile

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	Blue	0.0%	100.0%	None Detected	

Client Sample ID: 041319A ***Lab Sample ID:*** **042309385-0039**

Sample Description: 1990's Addition - Kitchen - Storage/Yellow Mastic

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	Yellow	0.0%	100.0%	None Detected	

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Summary Test Report for Asbestos Analysis of Bulk Material

Client Sample ID: 041319B ***Lab Sample ID:*** **042309385-0040**

Sample Description: 1990's Addition - Classroom 114/Yellow Mastic

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	Yellow	0.0%	100.0%	None Detected	

Client Sample ID: 041319C ***Lab Sample ID:*** **042309385-0041**

Sample Description: 1990's Addition - Kitchen - Storage/Yellow Mastic

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	Yellow	0.0%	100.0%	None Detected	

Client Sample ID: 041320A ***Lab Sample ID:*** **042309385-0042**

Sample Description: 1990's Addition - Classroom 115/Floor Tile Leveler

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	Brown	20.0%	80.0%	None Detected	

Client Sample ID: 041320B ***Lab Sample ID:*** **042309385-0043**

Sample Description: 1990's Addition - Classroom 114/Floor Tile Leveler

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	Brown	22.0%	78.0%	None Detected	

Client Sample ID: 041321A ***Lab Sample ID:*** **042309385-0044**

Sample Description: 1990's Addition - Exit Door Entry/Rubber Sheet Flooring

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	Gray	0.0%	100.0%	None Detected	

Client Sample ID: 041321B ***Lab Sample ID:*** **042309385-0045**

Sample Description: 1990's Addition - Exit Door Entry/Rubber Sheet Flooring

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	Gray	0.0%	100.0%	None Detected	

Client Sample ID: 041322A ***Lab Sample ID:*** **042309385-0046**

Sample Description: 1990's Addition - Exit Door Entry/Rubber Sheet Flooring - Yellow Adhesive

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	Yellow	0.0%	100.0%	None Detected	

Client Sample ID: 041322B ***Lab Sample ID:*** **042309385-0047**

Sample Description: 1990's Addition - Exit Door Entry/Rubber Sheet Flooring - Yellow Adhesive

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	Yellow	0.0%	100.0%	None Detected	

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Summary Test Report for Asbestos Analysis of Bulk Material

Client Sample ID: 041323A ***Lab Sample ID:*** **042309385-0048**
Sample Description: 1990's Addition - Kitchen/Gray Floor Leveler

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	Gray	0.0%	100.0%	None Detected	

Client Sample ID: 041323B ***Lab Sample ID:*** **042309385-0049**
Sample Description: 1990's Addition - Kitchen/Gray Floor Leveler

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	Gray	0.0%	100.0%	None Detected	

Client Sample ID: 041324A ***Lab Sample ID:*** **042309385-0050**
Sample Description: 1990's Addition - Cafeteria/Dark Cove Base

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	Black	0.0%	100.0%	None Detected	

Client Sample ID: 041324B ***Lab Sample ID:*** **042309385-0051**
Sample Description: 1990's Addition - Classroom 115/Dark Cove Base

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	Black	0.0%	100.0%	None Detected	

Client Sample ID: 041325A ***Lab Sample ID:*** **042309385-0052**
Sample Description: 1990's Addition - Cafeteria/Dark Cove Base - White Adhesive

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	White	0.0%	100.0%	None Detected	

Client Sample ID: 041325B ***Lab Sample ID:*** **042309385-0053**
Sample Description: 1990's Addition - Classroom 115/Dark Cove Base - White Adhesive

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	White	0.0%	100.0%	None Detected	

Client Sample ID: 041326A ***Lab Sample ID:*** **042309385-0054**
Sample Description: 1990's Addition - Classroom 115 - Closet/Pink Cove Base

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	Pink	0.0%	100.0%	None Detected	

Client Sample ID: 041326B ***Lab Sample ID:*** **042309385-0055**
Sample Description: 1990's Addition - Classroom 115 - Closet/Pink Cove Base

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	Pink	0.0%	100.0%	None Detected	

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Client Sample ID: 041327A ***Lab Sample ID:*** **042309385-0056**

Sample Description: 1990's Addition - Classroom 115 - Closet/Pink Cove Base - Yellow Adhesive

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	White	0.0%	100.0%	None Detected	

Client Sample ID: 041327B ***Lab Sample ID:*** **042309385-0057**

Sample Description: 1990's Addition - Classroom 115 - Closet/Pink Cove Base - Yellow Adhesive

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	White	0.0%	100.0%	None Detected	

Client Sample ID: 041328A ***Lab Sample ID:*** **042309385-0058**

Sample Description: 1990's Addition - Kitchen - Storage/White Cove Base

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	White	0.0%	100.0%	None Detected	

Client Sample ID: 041328B ***Lab Sample ID:*** **042309385-0059**

Sample Description: 1990's Addition - Kitchen - Storage/White Cove Base

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	White	0.0%	100.0%	None Detected	

Client Sample ID: 041329A ***Lab Sample ID:*** **042309385-0060**

Sample Description: 1990's Addition - Kitchen - Storage/White Cove Base - Tan Adhesive

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	Tan	0.0%	100.0%	None Detected	

Client Sample ID: 041329B ***Lab Sample ID:*** **042309385-0061**

Sample Description: 1990's Addition - Kitchen - Storage/White Cove Base - Tan Adhesive

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	Tan	0.0%	100.0%	None Detected	

Client Sample ID: 041330A ***Lab Sample ID:*** **042309385-0062**

Sample Description: 1990's Addition - Kitchen/Plastic Wall Adhesive

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	Tan	0.0%	100.0%	None Detected	

Client Sample ID: 041330B ***Lab Sample ID:*** **042309385-0063**

Sample Description: 1990's Addition - Kitchen/Plastic Wall Adhesive

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	Tan	0.0%	100.0%	None Detected	

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Summary Test Report for Asbestos Analysis of Bulk Material

Client Sample ID: 041331A ***Lab Sample ID:*** **042309385-0064**

Sample Description: 1990's Addition - Cafeteria and Corridor/Wall/Bulletin Board - Adhesive

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	Tan	0.0%	100.0%	None Detected	

Client Sample ID: 041331B ***Lab Sample ID:*** **042309385-0065**

Sample Description: 1990's Addition - Cafeteria and Corridor/Wall/Bulletin Board - Adhesive

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	Tan	0.0%	100.0%	None Detected	

Client Sample ID: 041332A ***Lab Sample ID:*** **042309385-0066**

Sample Description: 1990's Addition - Corridor/Wall/Bulletin Board - Fabric

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	White	70.0%	30.0%	None Detected	

Client Sample ID: 041332B ***Lab Sample ID:*** **042309385-0067**

Sample Description: 1990's Addition - Classroom 114/Wall/Bulletin Board - Fabric

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	White	73.0%	27.0%	None Detected	

Client Sample ID: 041333A ***Lab Sample ID:*** **042309385-0068**

Sample Description: 1990's Addition - Corridor/Wall/Bulletin Board - Gray Material

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	Gray	80.0%	20.0%	None Detected	

Client Sample ID: 041333B ***Lab Sample ID:*** **042309385-0069**

Sample Description: 1990's Addition - Classroom 114/Wall/Bulletin Board - Gray Material

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	Gray	78.0%	22.0%	None Detected	

Client Sample ID: 041334A ***Lab Sample ID:*** **042309385-0070**

Sample Description: 1990's Addition - Corridor/Wall/Bulletin Board - Brown Material

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	Brown	88.0%	12.0%	None Detected	

Client Sample ID: 041334B ***Lab Sample ID:*** **042309385-0071**

Sample Description: 1990's Addition - Corridor/Wall/Bulletin Board - Brown Material

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	Brown	92.0%	8.0%	None Detected	

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Client Sample ID: 041335A ***Lab Sample ID:*** **042309385-0072**

Sample Description: 1990's Addition - Caferteria/Corridor/Ceramic Wall Tile

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	Gray	0.0%	100.0%	None Detected	

Client Sample ID: 041335B ***Lab Sample ID:*** **042309385-0073**

Sample Description: 1990's Addition - Caferteria/Corridor/Ceramic Wall Tile

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	Gray	0.0%	100.0%	None Detected	

Client Sample ID: 041336A ***Lab Sample ID:*** **042309385-0074**

Sample Description: 1990's Addition - Toilet Rooms/Ceramic Floor Tile - Mud Bed

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	Gray	0.0%	100.0%	None Detected	

Client Sample ID: 041336B ***Lab Sample ID:*** **042309385-0075**

Sample Description: 1990's Addition - Toilet Rooms/Ceramic Floor Tile - Mud Bed

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	Gray	0.0%	100.0%	None Detected	

Client Sample ID: 041337A ***Lab Sample ID:*** **042309385-0076**

Sample Description: 1990's Addition - Toilet Rooms/Ceramic Floor Tile - Grout

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	Gray	0.0%	100.0%	None Detected	

Client Sample ID: 041337B ***Lab Sample ID:*** **042309385-0077**

Sample Description: 1990's Addition - Toilet Rooms/Ceramic Floor Tile - Grout

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	Gray	0.0%	100.0%	None Detected	

Client Sample ID: 041338A ***Lab Sample ID:*** **042309385-0078**

Sample Description: 1990's Addition - Toilet Rooms/Ceramic Wall Tile - Grout

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	White	0.0%	100.0%	None Detected	

Client Sample ID: 041338B ***Lab Sample ID:*** **042309385-0079**

Sample Description: 1990's Addition - Toilet Rooms/Ceramic Wall Tile - Grout

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	White	0.0%	100.0%	None Detected	

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Summary Test Report for Asbestos Analysis of Bulk Material

Client Sample ID: 041339A ***Lab Sample ID:*** **042309385-0080**

Sample Description: 1957 Addition - Classroom 37/White Sink Undercoating

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	White	30.0%	70.0%	None Detected	

Client Sample ID: 041339B ***Lab Sample ID:*** **042309385-0081**

Sample Description: 1957 Addition - Classroom 24/White Sink Undercoating

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	White	25.0%	75.0%	None Detected	

Client Sample ID: 041340A ***Lab Sample ID:*** **042309385-0082**

Sample Description: 1957 Addition - Classroom 6/Gray Sink Undercoating

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	Gray	32.0%	68.0%	None Detected	

Client Sample ID: 041340B ***Lab Sample ID:*** **042309385-0083**

Sample Description: 1957 Addition - Classroom 6/Gray Sink Undercoating

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	Gray	30.0%	70.0%	None Detected	

Client Sample ID: 041341A ***Lab Sample ID:*** **042309385-0084**

Sample Description: 1957 Addition - Classroom 37/Interior Window Glazing above Door

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Tan	0.0%	100.0%	None Detected	

Client Sample ID: 041341B ***Lab Sample ID:*** **042309385-0085**

Sample Description: 1957 Addition - Classroom 37/Interior Window Glazing above Door

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Tan	0.0%	100.0%	None Detected	

Client Sample ID: 041342A ***Lab Sample ID:*** **042309385-0086**

Sample Description: 1957 Addition - Classroom 37/2'x2' Ceiling Tile

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Brown	80.0%	20.0%	None Detected	

Client Sample ID: 041342B ***Lab Sample ID:*** **042309385-0087**

Sample Description: 1957 Addition - Classroom 24/2'x2' Ceiling Tile

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Brown	79.0%	21.0%	None Detected	

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Client Sample ID: 041343A ***Lab Sample ID:*** **042309385-0088**

Sample Description: 1957 Addition - Classroom 24/Gypsum Board

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Brown/White	10.0%	90.0%	None Detected	

Client Sample ID: 041343B ***Lab Sample ID:*** **042309385-0089**

Sample Description: 1957 Addition - Classroom 6/Gypsum Board

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Brown/White	12.0%	88.0%	None Detected	

Client Sample ID: 041344A ***Lab Sample ID:*** **042309385-0090**

Sample Description: 1957 Addition - Classroom 24/Gypsum Board Joint/Taping Compound

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	White	0.0%	100.0%	None Detected	

Client Sample ID: 041344B ***Lab Sample ID:*** **042309385-0091**

Sample Description: 1957 Addition - Classroom 6/Gypsum Board Joint/Taping Compound

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	White	0.0%	100.0%	None Detected	

Client Sample ID: 041344C ***Lab Sample ID:*** **042309385-0092**

Sample Description: 1957 Addition - Classroom 6/Gypsum Board Joint/Taping Compound

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	White	0.0%	100.0%	None Detected	

Client Sample ID: 041345A ***Lab Sample ID:*** **042309385-0093**

Sample Description: 1957 Addition - Classroom 37/Wall Plaster - White Finish Coat

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	White	0.0%	100.0%	None Detected	

Client Sample ID: 041345B ***Lab Sample ID:*** **042309385-0094**

Sample Description: 1957 Addition - Classroom 37/Wall Plaster - White Finish Coat

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	White	0.0%	100.0%	None Detected	

Client Sample ID: 041345C ***Lab Sample ID:*** **042309385-0095**

Sample Description: 1957 Addition - Classroom 37/Wall Plaster - White Finish Coat

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	White	0.0%	100.0%	None Detected	

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Client Sample ID: 041345D ***Lab Sample ID:*** **042309385-0096**

Sample Description: 1957 Addition - Classroom 24/Wall Plaster - White Finish Coat

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	White	0.0%	100.0%	None Detected	

Client Sample ID: 041345E ***Lab Sample ID:*** **042309385-0097**

Sample Description: 1957 Addition - Classroom 24/Wall Plaster - White Finish Coat

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	White	0.0%	100.0%	None Detected	

Client Sample ID: 041345F ***Lab Sample ID:*** **042309385-0098**

Sample Description: 1957 Addition - Classroom 6/Wall Plaster - White Finish Coat

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	White	0.0%	100.0%	None Detected	

Client Sample ID: 041345G ***Lab Sample ID:*** **042309385-0099**

Sample Description: 1957 Addition - Classroom 6/Wall Plaster - White Finish Coat

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	White	0.0%	100.0%	None Detected	

Client Sample ID: 041346A ***Lab Sample ID:*** **042309385-0100**

Sample Description: 1957 Addition - Classroom 37/Wall Plaster - Gray Rough Coat

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Brown	0.0%	100.0%	None Detected	

Client Sample ID: 041346B ***Lab Sample ID:*** **042309385-0101**

Sample Description: 1957 Addition - Classroom 37/Wall Plaster - Gray Rough Coat

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Brown	0.0%	100.0%	None Detected	

Client Sample ID: 041346C ***Lab Sample ID:*** **042309385-0102**

Sample Description: 1957 Addition - Classroom 37/Wall Plaster - Gray Rough Coat

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Brown	0.0%	100.0%	None Detected	

Client Sample ID: 041346D ***Lab Sample ID:*** **042309385-0103**

Sample Description: 1957 Addition - Classroom 24/Wall Plaster - Gray Rough Coat

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Brown	0.0%	100.0%	None Detected	

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Client Sample ID: 041346E ***Lab Sample ID:*** **042309385-0104**

Sample Description: 1957 Addition - Classroom 24/Wall Plaster - Gray Rough Coat

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Brown	0.0%	100.0%	None Detected	

Client Sample ID: 041346F ***Lab Sample ID:*** **042309385-0105**

Sample Description: 1957 Addition - Classroom 6/Wall Plaster - Gray Rough Coat

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Brown	0.0%	100.0%	None Detected	

Client Sample ID: 041346G ***Lab Sample ID:*** **042309385-0106**

Sample Description: 1957 Addition - Classroom 6/Wall Plaster - Gray Rough Coat

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Brown	0.0%	100.0%	None Detected	

Client Sample ID: 041347A ***Lab Sample ID:*** **042309385-0107**

Sample Description: 1957 Addition - Classroom 24/Black Paper on Concrete Deck

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Brown/Black	55.0%	45.0%	None Detected	

Client Sample ID: 041347B ***Lab Sample ID:*** **042309385-0108**

Sample Description: 1957 Addition - Classroom 24/Black Paper on Concrete Deck

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Brown	60.0%	40.0%	None Detected	

Client Sample ID: 041348A ***Lab Sample ID:*** **042309385-0109**

Sample Description: 1957 Addition - Classroom 37/Black Damp-Proofing - Perimeter Wall

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Black	0.0%	97.0%	**3% Chrysotile**	

Client Sample ID: 041348B ***Lab Sample ID:*** **042309385-0110**

Sample Description: 1957 Addition - Classroom 37/Black Damp-Proofing - Perimeter Wall

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023				Positive Stop (Not Analyzed)	

Client Sample ID: 041349A ***Lab Sample ID:*** **042309385-0111**

Sample Description: 1957 Addition - Classroom 37/12"x12" Light Blue Floor Tile

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Blue	0.0%	100.0%	None Detected	

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Client Sample ID: 041349B ***Lab Sample ID:*** **042309385-0112**

Sample Description: 1957 Addition - Classroom 24/12"x12" Light Blue Floor Tile

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Blue	0.0%	100.0%	None Detected	

Client Sample ID: 041350A ***Lab Sample ID:*** **042309385-0113**

Sample Description: 1957 Addition - Classroom 6/12"x12" Blue Floor Tile

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Blue	0.0%	100.0%	None Detected	

Client Sample ID: 041350B ***Lab Sample ID:*** **042309385-0114**

Sample Description: 1957 Addition - Classroom 6/12"x12" Blue Floor Tile

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Blue	0.0%	100.0%	None Detected	

Client Sample ID: 041351A ***Lab Sample ID:*** **042309385-0115**

Sample Description: 1957 Addition - Classroom 37/12"x12" Blue Floor Tile - Black Mastic

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Black	0.0%	100.0%	None Detected	
TEM Grav. Reduction	4/28/2023	Black	0.0%	100.0%	None Detected	

Client Sample ID: 041351B ***Lab Sample ID:*** **042309385-0116**

Sample Description: 1957 Addition - Classroom 6/12"x12" Blue Floor Tile - Black Mastic

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Black	0.0%	100.0%	None Detected	
TEM Grav. Reduction	4/28/2023	Black	0.0%	100.0%	None Detected	

Client Sample ID: 041352A ***Lab Sample ID:*** **042309385-0117**

Sample Description: 1957 Addition - Classroom 37/Formica Countertop Adhesive

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Brown	0.0%	100.0%	None Detected	

Client Sample ID: 041352B ***Lab Sample ID:*** **042309385-0118**

Sample Description: 1957 Addition - Classroom 37/Formica Countertop Adhesive

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Brown	0.0%	100.0%	None Detected	

Client Sample ID: 041353A ***Lab Sample ID:*** **042309385-0119**

Sample Description: 1957 Addition - Classroom 6/Cove Base

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Black	0.0%	100.0%	None Detected	

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Client Sample ID: 041353B ***Lab Sample ID:*** **042309385-0120**

Sample Description: 1957 Addition - Classroom 6/Cove Base

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Black	0.0%	100.0%	None Detected	

Client Sample ID: 041354A ***Lab Sample ID:*** **042309385-0121**

Sample Description: 1957 Addition - Classroom 6/Cove Base Adhesive - Light Brown

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	White	0.0%	100.0%	None Detected	

Client Sample ID: 041354B ***Lab Sample ID:*** **042309385-0122**

Sample Description: 1957 Addition - Classroom 6/Cove Base Adhesive - Light Brown

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	White	0.0%	100.0%	None Detected	

Client Sample ID: 041355A ***Lab Sample ID:*** **042309385-0123**

Sample Description: 1957 Addition - Classroom 37/Bulletin Board

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Brown	0.0%	100.0%	None Detected	

Client Sample ID: 041355B ***Lab Sample ID:*** **042309385-0124**

Sample Description: 1957 Addition - Classroom 37/Bulletin Board

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Brown	0.0%	100.0%	None Detected	

Client Sample ID: 041356A ***Lab Sample ID:*** **042309385-0125**

Sample Description: 1957 Addition - Classroom 37/Bulletin Board Adhesive

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Brown	10.0%	90.0%	None Detected	

Client Sample ID: 041356B ***Lab Sample ID:*** **042309385-0126**

Sample Description: 1957 Addition - Classroom 37/Bulletin Board Adhesive

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Brown	12.0%	88.0%	None Detected	

Client Sample ID: 041357A ***Lab Sample ID:*** **042309385-0127**

Sample Description: 1957 Addition - Classroom 37/Bulletin Board

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Brown	95.0%	5.0%	None Detected	

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Client Sample ID: 041357B ***Lab Sample ID:*** **042309385-0128**
Sample Description: 1957 Addition - Classroom 37/Bulletin Board

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Brown	96.0%	4.0%	None Detected	

Client Sample ID: 041358A ***Lab Sample ID:*** **042309385-0129**
Sample Description: 1957 Addition - Classroom 37/Bulletin Board Adhesive

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Brown	0.0%	100.0%	None Detected	

Client Sample ID: 041358B ***Lab Sample ID:*** **042309385-0130**
Sample Description: 1957 Addition - Classroom 37/Bulletin Board Adhesive

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Brown	0.0%	100.0%	None Detected	

Client Sample ID: 041359A ***Lab Sample ID:*** **042309385-0131**
Sample Description: 1957 Addition - Classroom 6/Bulletin Board Adhesive

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Gray	0.0%	100.0%	None Detected	

Client Sample ID: 041359B ***Lab Sample ID:*** **042309385-0132**
Sample Description: 1957 Addition - Classroom 6/Bulletin Board Adhesive

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Gray	0.0%	100.0%	None Detected	

Client Sample ID: 041360A ***Lab Sample ID:*** **042309385-0133**
Sample Description: 1950 Addition - Classroom 42/White Sink Undercoating

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	Gray	0.0%	97.0%	**3% Chrysotile**	

Client Sample ID: 041360B ***Lab Sample ID:*** **042309385-0134**
Sample Description: 1950 Addition - Classroom 2/White Sink Undercoating

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023				Positive Stop (Not Analyzed)	

Client Sample ID: 041361A ***Lab Sample ID:*** **042309385-0135**
Sample Description: 1950 Addition - Classroom 1/Light Gray Sink Undercoating

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	Gray	0.0%	100.0%	None Detected	

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Client Sample ID: 041361B ***Lab Sample ID:*** **042309385-0136**

Sample Description: 1950 Addition - Classroom 1/Light Gray Sink Undercoating

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	Gray	0.0%	100.0%	None Detected	

Client Sample ID: 041362A ***Lab Sample ID:*** **042309385-0137**

Sample Description: 1950 Addition - Classroom 4/Dark Gray Sink Undercoating

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	Gray	0.0%	100.0%	None Detected	

Client Sample ID: 041362B ***Lab Sample ID:*** **042309385-0138**

Sample Description: 1950 Addition - Classroom 4/Dark Gray Sink Undercoating

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	Gray	0.0%	100.0%	None Detected	

Client Sample ID: 041363A ***Lab Sample ID:*** **042309385-0139**

Sample Description: 1950 Addition - Mech. Rm./Duct Pin Adhesive

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	Brown	0.0%	100.0%	None Detected	

Client Sample ID: 041363B ***Lab Sample ID:*** **042309385-0140**

Sample Description: 1950 Addition - Mech. Rm./Duct Pin Adhesive

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	Brown	0.0%	100.0%	None Detected	

Client Sample ID: 041364A ***Lab Sample ID:*** **042309385-0141**

Sample Description: 1950 Addition - Mech. Rm./Duct Insulation Residue - White

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	Gray	46.0%	42.0%	**12% Chrysotile**	

Client Sample ID: 041364B ***Lab Sample ID:*** **042309385-0142**

Sample Description: 1950 Addition - Mech. Rm./Duct Insulation Residue - White

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023				Positive Stop (Not Analyzed)	

Client Sample ID: 041364C ***Lab Sample ID:*** **042309385-0143**

Sample Description: 1950 Addition - Mech. Rm./Duct Insulation Residue - White

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023				Positive Stop (Not Analyzed)	

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Client Sample ID: 041365A ***Lab Sample ID:*** **042309385-0144**

Sample Description: 1950 Addition - Outside Storage Room/Duct Insulation - Gray

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	Gray/White	13.0%	66.0%	**21% Chrysotile**	

Client Sample ID: 041365B ***Lab Sample ID:*** **042309385-0145**

Sample Description: 1950 Addition - Outside Storage Room/Duct Insulation - Gray

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Fibrous	Asbestos	Comment
PLM	4/25/2023			Positive Stop (Not Analyzed)		

Client Sample ID: 041365C ***Lab Sample ID:*** **042309385-0146**

Sample Description: 1950 Addition - Outside Storage Room/Duct Insulation - Gray

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Fibrous	Asbestos	Comment
PLM	4/25/2023			Positive Stop (Not Analyzed)		

Client Sample ID: 041366A ***Lab Sample ID:*** **042309385-0147**

Sample Description: 1950 Addition - Mech. Rm./Pipe End Cap Insulation

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	White/Yellow	21.0%	79.0%	None Detected	

Client Sample ID: 041366B ***Lab Sample ID:*** **042309385-0148**

Sample Description: 1950 Addition - Mech. Rm./Pipe End Cap Insulation

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	White/Yellow	26.0%	74.0%	None Detected	

Client Sample ID: 041366C ***Lab Sample ID:*** **042309385-0149**

Sample Description: 1950 Addition - Mech. Rm./Pipe End Cap Insulation

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	White/Yellow	19.0%	81.0%	None Detected	

Client Sample ID: 041367A ***Lab Sample ID:*** **042309385-0150**

Sample Description: 1950 Addition - Attic/Mineral Wool Loose Insulation

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	Gray	65.0%	35.0%	None Detected	

Client Sample ID: 041367B ***Lab Sample ID:*** **042309385-0151**

Sample Description: 1950 Addition - Mech. Rm./Mineral Wool Loose Insulation

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	Gray	65.0%	35.0%	None Detected	

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Client Sample ID: 041367C ***Lab Sample ID:*** **042309385-0152**

Sample Description: 1950 Addition - Mech. Rm./Mineral Wool Loose Insulation

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	Gray	66.0%	34.0%	None Detected	

Client Sample ID: 041368A ***Lab Sample ID:*** **042309385-0153**

Sample Description: 1950 Addition - Boiler Room/Spray-Applied Fireproofing

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	Gray	56.0%	44.0%	None Detected	

Client Sample ID: 041368B ***Lab Sample ID:*** **042309385-0154**

Sample Description: 1950 Addition - Boiler Room/Spray-Applied Fireproofing

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	Gray	52.0%	48.0%	None Detected	

Client Sample ID: 041368C ***Lab Sample ID:*** **042309385-0155**

Sample Description: 1950 Addition - Boiler Room/Spray-Applied Fireproofing

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	Gray	49.0%	51.0%	None Detected	

Client Sample ID: 041368D ***Lab Sample ID:*** **042309385-0156**

Sample Description: 1950 Addition - Boiler Room/Spray-Applied Fireproofing

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	Gray	60.0%	40.0%	None Detected	

Client Sample ID: 041368E ***Lab Sample ID:*** **042309385-0157**

Sample Description: 1950 Addition - Boiler Room/Spray-Applied Fireproofing

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	Gray	60.0%	40.0%	None Detected	

Client Sample ID: 041369A ***Lab Sample ID:*** **042309385-0158**

Sample Description: 1950 Addition - Locker Room/Red Fire Stop Caulking

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	Red	3.0%	97.0%	None Detected	

Client Sample ID: 041369B ***Lab Sample ID:*** **042309385-0159**

Sample Description: 1950 Addition - Locker Room/Red Fire Stop Caulking

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	Red	2.0%	98.0%	None Detected	

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Client Sample ID: 041370A ***Lab Sample ID:*** **042309385-0160**

Sample Description: 1950 Addition - Mech. Room./Duct Seam Caulking

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	Brown	0.0%	100.0%	None Detected	

Client Sample ID: 041370B ***Lab Sample ID:*** **042309385-0161**

Sample Description: 1950 Addition - Mech. Room./Duct Seam Caulking

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	Brown	0.0%	100.0%	None Detected	

Client Sample ID: 041371A ***Lab Sample ID:*** **042309385-0162**

Sample Description: 1950 Addition - Classroom 41/Interior Door Window Glazing

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	Black	0.0%	97.0%	**3% Chrysotile**	

Client Sample ID: 041371B ***Lab Sample ID:*** **042309385-0163**

Sample Description: 1950 Addition - Classroom 42/Interior Door Window Glazing

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023				Positive Stop (Not Analyzed)	

Client Sample ID: 041372A ***Lab Sample ID:*** **042309385-0164**

Sample Description: 1950 Addition - Room 29 - Media/Interior Door Window Glazing

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	Black	0.0%	100.0%	None Detected	

Client Sample ID: 041372B ***Lab Sample ID:*** **042309385-0165**

Sample Description: 1950 Addition - Room 29 - Media/Interior Door Window Glazing

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	Black	0.0%	100.0%	None Detected	

Client Sample ID: 041373A ***Lab Sample ID:*** **042309385-0166**

Sample Description: 1950 Addition - Stairwell/Interior Glass Block Window Grout

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	Gray	0.0%	100.0%	None Detected	

Client Sample ID: 041373B ***Lab Sample ID:*** **042309385-0167**

Sample Description: 1950 Addition - Stairwell/Interior Glass Block Window Grout

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	Gray	0.0%	100.0%	None Detected	

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Client Sample ID: 041374A ***Lab Sample ID:*** **042309385-0168**

Sample Description: 1950 Addition - Stairwell/Interior Window Caulk - Old Thick

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	Gray	0.0%	95.0%	**5% Chrysotile**	

Client Sample ID: 041374B ***Lab Sample ID:*** **042309385-0169**

Sample Description: 1950 Addition - Stairwell/Interior Window Caulk - Old Thick

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023			Positive Stop (Not Analyzed)		

Client Sample ID: 041375A ***Lab Sample ID:*** **042309385-0170**

Sample Description: 1950 Addition - Gymnasium/Interior Window Caulk - Newer

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	White	0.0%	100.0%	None Detected	

Client Sample ID: 041375B ***Lab Sample ID:*** **042309385-0171**

Sample Description: 1950 Addition - Gymnasium/Interior Window Caulk - Newer

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	White	0.0%	100.0%	None Detected	

Client Sample ID: 041376A ***Lab Sample ID:*** **042309385-0172**

Sample Description: 1950 Addition - Gymnasium/Interior Window Caulk - Old Thick

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	Black	0.0%	96.0%	**4% Chrysotile**	

Client Sample ID: 041376B ***Lab Sample ID:*** **042309385-0173**

Sample Description: 1950 Addition - Gymnasium/Interior Window Caulk - Old Thick

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023			Positive Stop (Not Analyzed)		

Client Sample ID: 041377A ***Lab Sample ID:*** **042309385-0174**

Sample Description: 1950 Addition - Stair/Hall by 12/Interior Door Caulk

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	Gray/Tan	0.0%	97.0%	**3% Chrysotile**	

Client Sample ID: 041377B ***Lab Sample ID:*** **042309385-0175**

Sample Description: 1950 Addition - Gym - Foyer Lobby/Interior Door Caulk

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	5/01/2023	Gray	0.0%	97.0%	**3% Chrysotile**	

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Client Sample ID: 041377C ***Lab Sample ID:*** **042309385-0176**

Sample Description: 1950 Addition - Gym - Foyer Lobby/Interior Door Caulk

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	5/01/2023	Gray	0.0%	96.0%	**4% Chrysotile**	

Client Sample ID: 041378A ***Lab Sample ID:*** **042309385-0177**

Sample Description: 1950 Addition - Gym - Foyer/Interior Door/Window Caulk

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	Gray/Tan	0.0%	97.0%	**3% Chrysotile**	

Client Sample ID: 041378B ***Lab Sample ID:*** **042309385-0178**

Sample Description: 1950 Addition - Gym - Foyer/Interior Door/Window Caulk

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023				Positive Stop (Not Analyzed)	

Client Sample ID: 041379A ***Lab Sample ID:*** **042309385-0179**

Sample Description: 1950 Addition - Classroom 3/4 - Corridor/Interior Door Caulk

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	Black	<1%	100.0%	None Detected	

Client Sample ID: 041379B ***Lab Sample ID:*** **042309385-0180**

Sample Description: 1950 Addition - Classroom 3/4 - Corridor/Interior Door Caulk

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	Black	3.0%	97.0%	None Detected	

Client Sample ID: 041380A ***Lab Sample ID:*** **042309385-0181**

Sample Description: 1950 Addition - Classroom 3/4 - Corridor/Interior Door Caulk

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Black	0.0%	100.0%	None Detected	

Client Sample ID: 041380B ***Lab Sample ID:*** **042309385-0182**

Sample Description: 1950 Addition - Classroom 3/4 - Corridor/Interior Door Caulk

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Black	0.0%	100.0%	None Detected	

Client Sample ID: 041381A ***Lab Sample ID:*** **042309385-0183**

Sample Description: 1950 Addition - Classroom 3/4 - Corridor/Interior Window Caulk

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Tan/White	0.0%	97.0%	**3% Anthophyllite**	

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Client Sample ID: 041381B ***Lab Sample ID:*** **042309385-0184**

Sample Description: 1950 Addition - Classroom 3/4 - Corridor/Interior Window Caulk

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023			Positive Stop (Not Analyzed)		

Client Sample ID: 041382A ***Lab Sample ID:*** **042309385-0185**

Sample Description: 1950 Addition - Classroom 41/Blackboard

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Gray	0.0%	100.0%	None Detected	

Client Sample ID: 041382B ***Lab Sample ID:*** **042309385-0186**

Sample Description: 1950 Addition - Classroom 42/Blackboard

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Gray	0.0%	100.0%	None Detected	

Client Sample ID: 041383A ***Lab Sample ID:*** **042309385-0187**

Sample Description: 1950 Addition - Classroom 41/Slate Window Sill

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Gray	0.0%	100.0%	None Detected	

Client Sample ID: 041383B ***Lab Sample ID:*** **042309385-0188**

Sample Description: 1950 Addition - Classroom 42/Slate Window Sill

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Gray	0.0%	100.0%	None Detected	

Client Sample ID: 041384A ***Lab Sample ID:*** **042309385-0189**

Sample Description: 1950 Addition - Classroom 42/Formica Counter Adhesive

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Brown/Tan	0.0%	100.0%	None Detected	

Client Sample ID: 041384B ***Lab Sample ID:*** **042309385-0190**

Sample Description: 1950 Addition - Classroom 42/Formica Counter Adhesive

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Brown/Tan	0.0%	100.0%	None Detected	

Client Sample ID: 041385A ***Lab Sample ID:*** **042309385-0191**

Sample Description: 1950 Addition - Classroom 41/2'x2' Ceiling Tile - Dark Brown Backing

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Gray/White	85.0%	15.0%	None Detected	

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Client Sample ID: 041385B ***Lab Sample ID:*** **042309385-0192**

Sample Description: 1950 Addition - Gym - Foyer Lobby/2'x2' Ceiling Tile - Dark Brown Backing

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Gray/White	88.0%	12.0%	None Detected	

Client Sample ID: 041386A ***Lab Sample ID:*** **042309385-0193**

Sample Description: 1950 Addition - Classroom 3/2'x2' Ceiling Tile - Light Tan Backing

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Gray/White	88.0%	12.0%	None Detected	

Client Sample ID: 041386B ***Lab Sample ID:*** **042309385-0194**

Sample Description: 1950 Addition - Classroom 4/2'x2' Ceiling Tile - Light Tan Backing

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Gray/White	85.0%	15.0%	None Detected	

Client Sample ID: 041387A ***Lab Sample ID:*** **042309385-0195**

Sample Description: 1950 Addition - Locker - Toilet/Gypusm Ceiling Tile

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Gray/White	3.0%	97.0%	None Detected	

Client Sample ID: 041387B ***Lab Sample ID:*** **042309385-0196**

Sample Description: 1950 Addition - Rm. 1 - Toilet/Gypusm Ceiling Tile

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Gray/White	2.0%	98.0%	None Detected	

Client Sample ID: 041388A ***Lab Sample ID:*** **042309385-0197**

Sample Description: 1950 Addition - Classroom 1/1'x1' Ceiling Tiles - Large Hole

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Gray/White	77.0%	23.0%	None Detected	

Client Sample ID: 041388B ***Lab Sample ID:*** **042309385-0198**

Sample Description: 1950 Addition - Classroom 1/1'x1' Ceiling Tiles - Large Hole

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Gray/White	89.0%	11.0%	None Detected	

Client Sample ID: 041389A ***Lab Sample ID:*** **042309385-0199**

Sample Description: 1950 Addition - Classroom 1/1'x1' Ceiling Tiles - Small Pin Hole

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Gray/White	81.0%	19.0%	None Detected	

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Client Sample ID: 041389B ***Lab Sample ID:*** **042309385-0200**

Sample Description: 1950 Addition - Classroom 1/1'x1' Ceiling Tiles - Small Pin Hole

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Gray	89.0%	11.0%	None Detected	

Client Sample ID: 041390A ***Lab Sample ID:*** **042309385-0201**

Sample Description: 1950 Addition - Classroom 1/1'x1' Ceiling Tiles - Smooth

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Gray	89.0%	11.0%	None Detected	

Client Sample ID: 041390B ***Lab Sample ID:*** **042309385-0202**

Sample Description: 1950 Addition - Classroom 1/1'x1' Ceiling Tiles - Smooth

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Gray/White	82.0%	18.0%	None Detected	

Client Sample ID: 041391A ***Lab Sample ID:*** **042309385-0203**

Sample Description: 1950 Addition - Teacher Room/Lounge/1'x1' Ceiling Tiles - Kitchenette

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Brown	92.0%	8.0%	None Detected	

Client Sample ID: 041391B ***Lab Sample ID:*** **042309385-0204**

Sample Description: 1950 Addition - Teacher Room/Lounge/1'x1' Ceiling Tiles - Kitchenette

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Brown	95.0%	5.0%	None Detected	

Client Sample ID: 041392A ***Lab Sample ID:*** **042309385-0205**

Sample Description: 1950 Addition - Classroom 1/1'x1' Ceiling Tiles Adhesive - Yellow

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Yellow	0.0%	100.0%	None Detected	

Client Sample ID: 041392B ***Lab Sample ID:*** **042309385-0206**

Sample Description: 1950 Addition - Classroom 1/1'x1' Ceiling Tiles Adhesive - Yellow

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Yellow	0.0%	100.0%	None Detected	

Client Sample ID: 041393A ***Lab Sample ID:*** **042309385-0207**

Sample Description: 1950 Addition - Classroom 1/1'x1' Ceiling Tiles Adhesive - Dark Brown

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Brown	0.0%	100.0%	None Detected	

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Client Sample ID: 041393B ***Lab Sample ID:*** **042309385-0208**

Sample Description: 1950 Addition - Classroom 1/1'x1' Ceiling Tiles Adhesive - Dark Brown

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Brown	0.0%	100.0%	None Detected	

Client Sample ID: 041394A ***Lab Sample ID:*** **042309385-0209**

Sample Description: 1950 Addition - Classroom 41/Gypsum Board

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Brown/Gray	4.0%	96.0%	None Detected	

Client Sample ID: 041394B ***Lab Sample ID:*** **042309385-0210**

Sample Description: 1950 Addition - Locker - Toilet/Gypsum Board

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Brown/Gray	2.0%	98.0%	None Detected	

Client Sample ID: 041394C ***Lab Sample ID:*** **042309385-0211**

Sample Description: 1950 Addition - Corridor/Gypsum Board

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Brown/Gray	2.0%	98.0%	None Detected	

Client Sample ID: 041395A ***Lab Sample ID:*** **042309385-0212**

Sample Description: 1950 Addition - Classroom 42 - Closet/Gypsum Board Taping/Joint Compound

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	White	0.0%	100.0%	None Detected	

Client Sample ID: 041395B ***Lab Sample ID:*** **042309385-0213**

Sample Description: 1950 Addition - Locker - Toilet/Gypsum Board Taping/Joint Compound

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	White	0.0%	100.0%	None Detected	

Client Sample ID: 041395C ***Lab Sample ID:*** **042309385-0214**

Sample Description: 1950 Addition - Corridor/Gypsum Board Taping/Joint Compound

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	White	0.0%	100.0%	None Detected	

Client Sample ID: 041396A ***Lab Sample ID:*** **042309385-0215**

Sample Description: 1950 Addition - Corridor Closet by 42/One Coat Ceiling Plaster

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Gray	0.0%	100.0%	None Detected	

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Client Sample ID: 041396B ***Lab Sample ID:*** **042309385-0216**

Sample Description: 1950 Addition - Utility Rm. by 10/One Coat Ceiling Plaster

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Gray	0.0%	100.0%	None Detected	

Client Sample ID: 041396C ***Lab Sample ID:*** **042309385-0217**

Sample Description: 1950 Addition - Utility Rm. by 10/One Coat Ceiling Plaster

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Gray	0.0%	100.0%	None Detected	

Client Sample ID: 041397A ***Lab Sample ID:*** **042309385-0218**

Sample Description: 1950 Addition - Outside Storage Rm. by 3/One Coat Wall Plaster

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Gray	0.0%	100.0%	None Detected	

Client Sample ID: 041397B ***Lab Sample ID:*** **042309385-0219**

Sample Description: 1950 Addition - Outside Storage Rm. by 3./One Coat Wall Plaster

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Gray	0.0%	100.0%	None Detected	

Client Sample ID: 041397C ***Lab Sample ID:*** **042309385-0220**

Sample Description: 1950 Addition - Outside Storage Rm by 3/One Coat Wall Plaster

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Gray	0.0%	100.0%	None Detected	

Client Sample ID: 041398A ***Lab Sample ID:*** **042309385-0221**

Sample Description: 1950 Addition - Classroom 1/Ceiling Plaster - White Finish Coat

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	White	0.0%	100.0%	None Detected	

Client Sample ID: 041398B ***Lab Sample ID:*** **042309385-0222**

Sample Description: 1950 Addition - Classroom 1/Ceiling Plaster - White Finish Coat

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	White	0.0%	100.0%	None Detected	

Client Sample ID: 041398C ***Lab Sample ID:*** **042309385-0223**

Sample Description: 1950 Addition - Janitor Closet/Storage/Ceiling Plaster - White Finish Coat

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	White	0.0%	100.0%	None Detected	

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Client Sample ID: 041399A ***Lab Sample ID:*** **042309385-0224**

Sample Description: 1950 Addition - Classroom 1/Ceiling Plaster - Tan/Gray Rough Coat

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Gray	0.0%	100.0%	None Detected	

Client Sample ID: 041399B ***Lab Sample ID:*** **042309385-0225**

Sample Description: 1950 Addition - Classroom 1/Ceiling Plaster - Tan/Gray Rough Coat

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Gray	0.0%	100.0%	None Detected	

Client Sample ID: 041399C ***Lab Sample ID:*** **042309385-0226**

Sample Description: 1950 Addition - anitor Closet/Storage/Ceiling Plaster - Tan/Gray Rough Coat

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Gray	0.0%	100.0%	None Detected	

Client Sample ID: 0413100A ***Lab Sample ID:*** **042309385-0227**

Sample Description: 1950 Addition - Classroom 1/Wall Plaster - White Finish Coat

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	White	0.0%	100.0%	None Detected	

Client Sample ID: 0413100B ***Lab Sample ID:*** **042309385-0228**

Sample Description: 1950 Addition - Janitor Closet/Wall Plaster - White Finish Coat

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	White	0.0%	100.0%	None Detected	

Client Sample ID: 0413100C ***Lab Sample ID:*** **042309385-0229**

Sample Description: 1950 Addition - Janitor Closet/Wall Plaster - White Finish Coat

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	White	0.0%	100.0%	None Detected	

Client Sample ID: 0413101A ***Lab Sample ID:*** **042309385-0230**

Sample Description: 1950 Addition - Classroom 1 - Janitor Closet/Wall Plaster - Tan/Gray Rough Coat

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Brown	0.0%	100.0%	None Detected	

Client Sample ID: 0413101B ***Lab Sample ID:*** **042309385-0231**

Sample Description: 1950 Addition - Classroom 1 - Janitor Closet/Wall Plaster - Tan/Gray Rough Coat

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Brown	0.0%	100.0%	None Detected	

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Client Sample ID: 0413101C ***Lab Sample ID:*** **042309385-0232**

Sample Description: 1950 Addition - Classroom 1 - Janitor Closet/Wall Plaster - Tan/Gray Rough Coat

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Brown	0.0%	100.0%	None Detected	

Client Sample ID: 0413102A ***Lab Sample ID:*** **042309385-0233**

Sample Description: 1950 Addition - Gym - Locker Rms./Ceiling Plaster - White Finish Coat

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	White	0.0%	100.0%	None Detected	

Client Sample ID: 0413102B ***Lab Sample ID:*** **042309385-0234**

Sample Description: 1950 Addition - Gym - Locker Rms./Ceiling Plaster - White Finish Coat

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	White	0.0%	100.0%	None Detected	

Client Sample ID: 0413102C ***Lab Sample ID:*** **042309385-0235**

Sample Description: 1950 Addition - Gym - Locker Rms./Ceiling Plaster - White Finish Coat

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	White	0.0%	100.0%	None Detected	

Client Sample ID: 0413103A ***Lab Sample ID:*** **042309385-0236**

Sample Description: 1950 Addition - Gym - Locker Rms./Ceiling Plaster - Gray/Tan Rough Coat

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Brown	0.0%	100.0%	None Detected	

Client Sample ID: 0413103B ***Lab Sample ID:*** **042309385-0237**

Sample Description: 1950 Addition - Gym - Locker Rms./Ceiling Plaster - Gray/Tan Rough Coat

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Brown	0.0%	100.0%	None Detected	

Client Sample ID: 0413103C ***Lab Sample ID:*** **042309385-0238**

Sample Description: 1950 Addition - Gym - Locker Rms./Ceiling Plaster - Gray/Tan Rough Coat

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Brown	0.0%	100.0%	None Detected	

Client Sample ID: 0413104A ***Lab Sample ID:*** **042309385-0239**

Sample Description: 1950 Addition - Gym - Locker Rms./Wall Plaster - White Finish Coat

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	White	0.0%	100.0%	None Detected	

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Client Sample ID: 0413104B **Lab Sample ID:** **042309385-0240**

Sample Description: 1950 Addition - Gym - Locker Rms./Wall Plaster - White Finish Coat

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	White	0.0%	100.0%	None Detected	

Client Sample ID: 0413104C **Lab Sample ID:** **042309385-0241**

Sample Description: 1950 Addition - Gym - Corridor/Wall Plaster - White Finish Coat

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	White	0.0%	100.0%	None Detected	

Client Sample ID: 0413105A **Lab Sample ID:** **042309385-0242**

Sample Description: 1950 Addition - Gym - Locker Rms./Wall Plaster - Gray/Tan Rough Coat

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Brown	0.0%	100.0%	None Detected	

Client Sample ID: 0413105B **Lab Sample ID:** **042309385-0243**

Sample Description: 1950 Addition - Gym - Locker Rms./Wall Plaster - Gray/Tan Rough Coat

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Brown	0.0%	100.0%	None Detected	

Client Sample ID: 0413105C **Lab Sample ID:** **042309385-0244**

Sample Description: 1950 Addition - Gym - Corridor/Wall Plaster - Gray/Tan Rough Coat

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Brown	0.0%	100.0%	None Detected	

Client Sample ID: 0413106A **Lab Sample ID:** **042309385-0245**

Sample Description: 1950 Addition - Media Center/Wall Plaster - White Finish Coat

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	White	0.0%	100.0%	None Detected	

Client Sample ID: 0413106B **Lab Sample ID:** **042309385-0246**

Sample Description: 1950 Addition - Corridor/Wall Plaster -White Finish Coat

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	White	0.0%	100.0%	None Detected	

Client Sample ID: 0413106C **Lab Sample ID:** **042309385-0247**

Sample Description: 1950 Addition - Classroom 41/Wall Plaster - White Finish Coat

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	White	0.0%	100.0%	None Detected	

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Client Sample ID: 0413107A ***Lab Sample ID:*** **042309385-0248**

Sample Description: 1950 Addition - Media Center/Wall Plaster Gray/Tan Rough Coat

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Brown	0.0%	100.0%	None Detected	

Client Sample ID: 0413107B ***Lab Sample ID:*** **042309385-0249**

Sample Description: 1950 Addition - Corridor/Wall Plaster Gray/Tan Rough Coat

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Brown	0.0%	100.0%	None Detected	

Client Sample ID: 0413107C ***Lab Sample ID:*** **042309385-0250**

Sample Description: 1950 Addition - Classroom 42/Wall Plaster Gray/Tan Rough Coat

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Brown	0.0%	100.0%	None Detected	

Client Sample ID: 0413108A ***Lab Sample ID:*** **042309385-0251**

Sample Description: 1950 Addition - Media Center/Ceiling Plaster White Finish Coat

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	White	0.0%	100.0%	None Detected	

Client Sample ID: 0413108B ***Lab Sample ID:*** **042309385-0252**

Sample Description: 1950 Addition - Stairwell/Ceiling Plaster White Finish Coat

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	White	0.0%	100.0%	None Detected	

Client Sample ID: 0413108C ***Lab Sample ID:*** **042309385-0253**

Sample Description: 1950 Addition - Stairwell/Ceiling Plaster White Finish Coat

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	White	0.0%	100.0%	None Detected	

Client Sample ID: 0413109A ***Lab Sample ID:*** **042309385-0254**

Sample Description: 1950 Addition - Media Center/Ceiling Plaster Gray/Tan Rough Coat

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Brown	0.0%	100.0%	None Detected	

Client Sample ID: 0413109B ***Lab Sample ID:*** **042309385-0255**

Sample Description: 1950 Addition - Stairwell/Ceiling Plaster Gray/Tan Rough Coat

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Brown	0.0%	100.0%	None Detected	

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Client Sample ID: 0413109C ***Lab Sample ID:*** **042309385-0256**

Sample Description: 1950 Addition - Stairwell/Ceiling Plaster Gray/Tan Rough Coat

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Brown	0.0%	100.0%	None Detected	

Client Sample ID: 0413110A ***Lab Sample ID:*** **042309385-0257**

Sample Description: 1950 Addition - Stage/Black Paper Underwood Floor

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Black	66.0%	34.0%	None Detected	

Client Sample ID: 0413110B ***Lab Sample ID:*** **042309385-0258**

Sample Description: 1950 Addition - Stage/Black Paper Underwood Floor

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Black	66.0%	34.0%	None Detected	

Client Sample ID: 0413111A ***Lab Sample ID:*** **042309385-0259**

Sample Description: 1950 Addition - Under Stage/Tar Black Block Wall

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	Black	0.0%	100.0%	None Detected	

Client Sample ID: 0413111B ***Lab Sample ID:*** **042309385-0260**

Sample Description: 1950 Addition - Under Stage/Tar Black Block Wall

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	Black	0.0%	100.0%	None Detected	

Client Sample ID: 0413112A ***Lab Sample ID:*** **042309385-0261**

Sample Description: 1950 Addition - Under Stage/Black Paper on Block Wall

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	Black	40.0%	60.0%	None Detected	

Client Sample ID: 0413112B ***Lab Sample ID:*** **042309385-0262**

Sample Description: 1950 Addition - Under Stage/Black Paper on Block Wall

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	Black	0.0%	100.0%	None Detected	

Client Sample ID: 0413113A ***Lab Sample ID:*** **042309385-0263**

Sample Description: 1950 Addition - Custodial Closet by 10/9"x9" Floor Tile

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	Tan	0.0%	92.0%	**8% Chrysotile**	

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Client Sample ID: 0413113B ***Lab Sample ID:*** **042309385-0264**

Sample Description: 1950 Addition - Custodial Closet by 10/9"x9" Floor Tile

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023				Positive Stop (Not Analyzed)	

Client Sample ID: 0413114A ***Lab Sample ID:*** **042309385-0265**

Sample Description: 1950 Addition - Custodial Closet by 10/9"x9" Floor Tile - Black Mastic

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	Black	0.0%	100.0%	None Detected	
TEM Grav. Reduction	5/02/2023	Black	0.0%	98.5%	**1.5% Chrysotile**	

Client Sample ID: 0413114B ***Lab Sample ID:*** **042309385-0266**

Sample Description: 1950 Addition - Custodial Closet by 10/9"x9" Floor Tile - Black Mastic

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	Black	0.0%	100.0%	None Detected	

Client Sample ID: 0413115A ***Lab Sample ID:*** **042309385-0267**

Sample Description: 1950 Addition - Custodial Office under Shelving/9"x9" Floor Tile

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	Brown	0.0%	96.0%	**4% Chrysotile**	

Client Sample ID: 0413115B ***Lab Sample ID:*** **042309385-0268**

Sample Description: 1950 Addition - Custodial Office under Shelving/9"x9" Floor Tile

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023				Positive Stop (Not Analyzed)	

Client Sample ID: 0413116A ***Lab Sample ID:*** **042309385-0269**

Sample Description: 1950 Addition - Custodial Office under Shelving/9"x9" Floor Tile - Black Mastic

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	Black	0.0%	100.0%	None Detected	
TEM Grav. Reduction	5/02/2023				**2.8% Chrysotile**	
					Positive Stop (Not Analyzed)	

Client Sample ID: 0413116B ***Lab Sample ID:*** **042309385-0270**

Sample Description: 1950 Addition - Custodial Office under Shelving/9"x9" Floor Tile - Black Mastic

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	Black	0.0%	100.0%	None Detected	

Client Sample ID: 0413117A ***Lab Sample ID:*** **042309385-0271**

Sample Description: 1950 Addition - Custodial Office/12"x12" Blue Floor Tile

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	Blue	0.0%	100.0%	None Detected	

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Client Sample ID: 0413117B ***Lab Sample ID:*** **042309385-0272**
Sample Description: 1950 Addition - Classroom 4/12"x12" Blue Floor Tile

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	Blue	0.0%	100.0%	None Detected	

Client Sample ID: 0413117C ***Lab Sample ID:*** **042309385-0273**
Sample Description: 1950 Addition - Classroom 4/12"x12" Blue Floor Tile

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	Blue	0.0%	100.0%	None Detected	

Client Sample ID: 0413118A ***Lab Sample ID:*** **042309385-0274**
Sample Description: 1950 Addition - Custodial Office/12"x12" Blue Floor Tile - Black Mastic

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	Black/Yellow	0.0%	100.0%	None Detected	
TEM Grav. Reduction	4/28/2023	Black/Yellow/Beige	0.0%	100.0%	**<0.1% Chrysotile**	

Client Sample ID: 0413118B ***Lab Sample ID:*** **042309385-0275**
Sample Description: 1950 Addition - Classroom 4/12"x12" Blue Floor Tile - Black Mastic

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	Brown/Black	0.0%	100.0%	None Detected	
TEM Grav. Reduction	4/28/2023	Brown/Black	0.0%	100.0%	None Detected	

Client Sample ID: 0413119A ***Lab Sample ID:*** **042309385-0276**
Sample Description: 1950 Addition - Gym Office/12"x12" White Floor Tile

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	White	0.0%	100.0%	None Detected	

Client Sample ID: 0413119B ***Lab Sample ID:*** **042309385-0277**
Sample Description: 1950 Addition - Gym Office/12"x12" White Floor Tile

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	White	0.0%	100.0%	None Detected	

Client Sample ID: 0413120A ***Lab Sample ID:*** **042309385-0278**
Sample Description: 1950 Addition - Gym Office/12"x12" White Floor Tile - Black Mastic

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	Black/Yellow	0.0%	100.0%	None Detected	
TEM Grav. Reduction	4/28/2023				Insufficient Material	

Client Sample ID: 0413120B ***Lab Sample ID:*** **042309385-0279**
Sample Description: 1950 Addition - Gym Office/12"x12" White Floor Tile - Black Mastic

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	Black/Yellow	0.0%	100.0%	None Detected	
TEM Grav. Reduction	4/28/2023				Insufficient Material	

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Client Sample ID: 0413121A ***Lab Sample ID:*** **042309385-0280**

Sample Description: 1950 Addition - Classroom 41/40/12"x12" Green/Blue Floor Tile

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	Blue/Green	0.0%	100.0%	None Detected	

Client Sample ID: 0413121B ***Lab Sample ID:*** **042309385-0281**

Sample Description: 1950 Addition - Classroom 41/40/12"x12" Green/Blue Floor Tile

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	Blue/Green	0.0%	100.0%	None Detected	

Client Sample ID: 0413122A ***Lab Sample ID:*** **042309385-0282**

Sample Description: 1950 Addition - Classroom 41/40/12"x12" Green/Blue Floor Tile - Black Mastic

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	Black	2.0%	98.0%	None Detected	
TEM Grav. Reduction	4/28/2023				Insufficient Material	

Client Sample ID: 0413122B ***Lab Sample ID:*** **042309385-0283**

Sample Description: 1950 Addition - Classroom 41/40/12"x12" Green/Blue Floor Tile - Black Mastic

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	Black	0.0%	100.0%	None Detected	
TEM Grav. Reduction	4/28/2023	Black	0.0%	100.0%	None Detected	

Client Sample ID: 0413123A ***Lab Sample ID:*** **042309385-0284**

Sample Description: 1950 Addition - Classroom 3/4 - Corridor/Cove Base

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	Black	0.0%	100.0%	None Detected	

Client Sample ID: 0413123B ***Lab Sample ID:*** **042309385-0285**

Sample Description: 1950 Addition - Classroom 4/Cove Base

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	Black	0.0%	100.0%	None Detected	

Client Sample ID: 0413124A ***Lab Sample ID:*** **042309385-0286**

Sample Description: 1950 Addition - Classroom 3/4 - Corridor/Cove Base Adhesive

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	Yellow	0.0%	100.0%	None Detected	

Client Sample ID: 0413124B ***Lab Sample ID:*** **042309385-0287**

Sample Description: 1950 Addition - Classroom 4/Cove Base Adhesive

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	White/Yellow	0.0%	100.0%	None Detected	

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Client Sample ID: 0413125A ***Lab Sample ID:*** **042309385-0288**

Sample Description: 1950 Addition - Classroom 42/Sink Wall - Gray Material

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	Gray/Blue	10.0%	90.0%	None Detected	

Client Sample ID: 0413125B ***Lab Sample ID:*** **042309385-0289**

Sample Description: 1950 Addition - Classroom 42/Sink Wall - Gray Material

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	Gray/Blue	20.0%	80.0%	None Detected	

Client Sample ID: 0413126A ***Lab Sample ID:*** **042309385-0290**

Sample Description: 1950 Addition - Classroom 42/Sink Wall - Black Material behind Gray

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	Black	55.0%	45.0%	None Detected	

Client Sample ID: 0413126B ***Lab Sample ID:*** **042309385-0291**

Sample Description: 1950 Addition - Classroom 42/Sink Wall - Black Material behind Gray

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	Black	55.0%	45.0%	None Detected	

Client Sample ID: 0413127A ***Lab Sample ID:*** **042309385-0292**

Sample Description: 1950 Addition - Classroom 42/Sink Wall - Adhesive behind Black

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	Brown	0.0%	100.0%	None Detected	

Client Sample ID: 0413127B ***Lab Sample ID:*** **042309385-0293**

Sample Description: 1950 Addition - Classroom 42/Sink Wall - Adhesive behind Black

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	Brown	0.0%	100.0%	None Detected	

Client Sample ID: 0413128A ***Lab Sample ID:*** **042309385-0294**

Sample Description: 1950 Addition - Corridor 3/4/Wood Panel Wall Adhesive

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	Brown/Yellow	0.0%	100.0%	None Detected	

Client Sample ID: 0413128B ***Lab Sample ID:*** **042309385-0295**

Sample Description: 1950 Addition - Corridor 3/4/Wood Panel Wall Adhesive

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	Brown/Yellow	0.0%	100.0%	None Detected	

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Client Sample ID: 0413129A ***Lab Sample ID:*** **042309385-0296**

Sample Description: 1950 Addition - Classroom 42 - Closet/Cork Bulletin Board Adhesive

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	Brown/Tan	0.0%	100.0%	None Detected	

Client Sample ID: 0413129B ***Lab Sample ID:*** **042309385-0297**

Sample Description: 1950 Addition - Classroom 41 - Closet/Cork Bulletin Board Adhesive

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	Brown/Tan	0.0%	100.0%	None Detected	

Client Sample ID: 0413130A ***Lab Sample ID:*** **042309385-0298**

Sample Description: 1950 Addition - Classroom 42/Bulletin Board

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	Brown/Tan	15.0%	85.0%	None Detected	

Client Sample ID: 0413130B ***Lab Sample ID:*** **042309385-0299**

Sample Description: 1950 Addition - Classroom 41/Bulletin Board

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	Brown/Tan	10.0%	90.0%	None Detected	

Client Sample ID: 0413131A ***Lab Sample ID:*** **042309385-0300**

Sample Description: 1950 Addition - Classroom 42/Bulletin Board - Adhesive

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	Brown	0.0%	100.0%	None Detected	

Client Sample ID: 0413131B ***Lab Sample ID:*** **042309385-0301**

Sample Description: 1950 Addition - Classroom 41/Bulletin Board - Adhesive

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	Brown	0.0%	100.0%	None Detected	

Client Sample ID: 0413132A ***Lab Sample ID:*** **042309385-0302**

Sample Description: 1950 Addition - Classroom 12/Bulletin Board - Adhesive

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	Brown	0.0%	100.0%	None Detected	

Client Sample ID: 0413132B ***Lab Sample ID:*** **042309385-0303**

Sample Description: 1950 Addition - Classroom 12/Bulletin Board - Adhesive

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	Black	0.0%	100.0%	None Detected	

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Client Sample ID: 0413133A ***Lab Sample ID:*** **042309385-0304**

Sample Description: 1950 Addition - Classroom 1/Gray Bulletin Board

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	Gray	85.0%	15.0%	None Detected	

Client Sample ID: 0413133B ***Lab Sample ID:*** **042309385-0305**

Sample Description: 1950 Addition - Teacher's Lounge/Gray Bulletin Board

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	Gray	82.0%	18.0%	None Detected	

Client Sample ID: 0413134A ***Lab Sample ID:*** **042309385-0306**

Sample Description: 1950 Addition - Corridor/Terrazzo Floor

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	Gray/Tan/White	0.0%	100.0%	None Detected	

Client Sample ID: 0413134B ***Lab Sample ID:*** **042309385-0307**

Sample Description: 1950 Addition - Corridor/Terrazzo Floor

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	Gray/Tan/White	0.0%	100.0%	None Detected	

Client Sample ID: 0413135A ***Lab Sample ID:*** **042309385-0308**

Sample Description: 1950 Addition - Corridor/Terrazzo Floor - Mud Bed

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	Gray	0.0%	100.0%	None Detected	

Client Sample ID: 0413135B ***Lab Sample ID:*** **042309385-0309**

Sample Description: 1950 Addition - Corridor/Terrazzo Floor - Mud Bed

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	Gray	0.0%	100.0%	None Detected	

Client Sample ID: 0413136A ***Lab Sample ID:*** **042309385-0310**

Sample Description: 1950 Addition - Corridor/Terrazzo Floor - Mud Bed

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	Gray/Tan	6.0%	94.0%	None Detected	

Client Sample ID: 0413136B ***Lab Sample ID:*** **042309385-0311**

Sample Description: 1950 Addition - Corridor/Terrazzo Floor - Mud Bed

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	Gray/Tan	10.0%	90.0%	None Detected	

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Client Sample ID: 0413137A ***Lab Sample ID:*** **042309385-0312**

Sample Description: 1950 Addition - Classroom 1/Concrete Deck

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	Gray/Black	0.0%	100.0%	None Detected	

Client Sample ID: 0413137B ***Lab Sample ID:*** **042309385-0313**

Sample Description: 1950 Addition - Classroom 1/Concrete Deck

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	Gray/Black	0.0%	100.0%	None Detected	

Client Sample ID: 0413138A ***Lab Sample ID:*** **042309385-0314**

Sample Description: 1950 Addition - Outside Storage Room/Block Wall

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	Gray/Black	0.0%	100.0%	None Detected	

Client Sample ID: 0413138B ***Lab Sample ID:*** **042309385-0315**

Sample Description: 1950 Addition - Outside Storage Room/Block Wall

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	Gray/Black	0.0%	100.0%	None Detected	

Client Sample ID: 0413139A ***Lab Sample ID:*** **042309385-0316**

Sample Description: 1950 Addition - Outside Storage Room/Block Wall - Mortar

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	Gray	0.0%	100.0%	None Detected	

Client Sample ID: 0413139B ***Lab Sample ID:*** **042309385-0317**

Sample Description: 1950 Addition - Outside Storage Room/Block Wall - Mortar

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	Gray	0.0%	100.0%	None Detected	

Client Sample ID: 0413139C ***Lab Sample ID:*** **042309385-0318**

Sample Description: 1950 Addition - Outside Storage Room/Block Wall - Mortar

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	Gray	0.0%	100.0%	None Detected	

Client Sample ID: 0413140A ***Lab Sample ID:*** **042309385-0319**

Sample Description: 1950 Addition - Class 1/2 - Toilet/Epoxy Floor/Cove

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	Brown/Tan/White	0.0%	100.0%	None Detected	

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Client Sample ID: 0413140B ***Lab Sample ID:*** **042309385-0320**

Sample Description: 1950 Addition - Locker - Toilet/Epoxy Floor/Cove

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	Brown/Tan/White	0.0%	100.0%	None Detected	

Client Sample ID: 0413141A ***Lab Sample ID:*** **042309385-0321**

Sample Description: 1950 Addition - Class 1/2 - Toilet/Epoxy Floor/Cove - White Mud Bed

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	White	0.0%	100.0%	None Detected	

Client Sample ID: 0413141B ***Lab Sample ID:*** **042309385-0322**

Sample Description: 1950 Addition - Class 1/2 - Toilet/Epoxy Floor/Cove - White Mud Bed

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	White	0.0%	100.0%	None Detected	

Client Sample ID: 0413142A ***Lab Sample ID:*** **042309385-0323**

Sample Description: 1950 Addition - Locker Shower Wall - Behind Stage/Ceramic Wall - Adhesive - Dark Brown

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	Brown	0.0%	93.0%	**7% Chrysotile**	

Client Sample ID: 0413142B ***Lab Sample ID:*** **042309385-0324**

Sample Description: 1950 Addition - Locker Shower Wall - Behind Stage/Ceramic Wall - Adhesive - Dark Brown

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023				Positive Stop (Not Analyzed)	

Client Sample ID: 0413143A ***Lab Sample ID:*** **042309385-0325**

Sample Description: 1950 Addition - Class 1 - Toilet/Ceramic Wall - Grout - Thin Tan

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	White/Beige	0.0%	100.0%	None Detected	

Client Sample ID: 0413143B ***Lab Sample ID:*** **042309385-0326**

Sample Description: 1950 Addition - Janitor Closet/Ceramic Wall - Grout - Thin Tan

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	White/Beige	0.0%	100.0%	None Detected	

Client Sample ID: 0413144A ***Lab Sample ID:*** **042309385-0327**

Sample Description: 1950 Addition - Class 4 - Toilet/Ceramic Wall - Grout - Thick White

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	White	0.0%	100.0%	None Detected	

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Client Sample ID: 0413144B ***Lab Sample ID:*** **042309385-0328**

Sample Description: 1950 Addition - Class 4 - Toilet/Ceramic Wall - Grout - Thick White

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	White	0.0%	100.0%	None Detected	

Client Sample ID: 0413145A ***Lab Sample ID:*** **042309385-0329**

Sample Description: 1950 Addition - Class 1 - Toilet/Ceramic Wall - Mud - White

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	White	0.0%	100.0%	None Detected	

Client Sample ID: 0413145B ***Lab Sample ID:*** **042309385-0330**

Sample Description: 1950 Addition - Class 4 - Toilet/Ceramic Wall - Mud - White

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	White	0.0%	100.0%	None Detected	

Client Sample ID: 0413146A ***Lab Sample ID:*** **042309385-0331**

Sample Description: 1950 Addition - Janitor Closet by Outside Rm./Ceramic Wall - Mud - Tan

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	Gray/White	0.0%	100.0%	None Detected	

Client Sample ID: 0413146B ***Lab Sample ID:*** **042309385-0332**

Sample Description: 1950 Addition - Gym - Shower/Ceramic Wall - Mud - Tan

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	Gray/White	0.0%	100.0%	None Detected	

Client Sample ID: 0413147A ***Lab Sample ID:*** **042309385-0333**

Sample Description: 1950 Addition - Janitor Closet by Outside Rm./Ceramic Floor - Grout - Gray

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	Gray	0.0%	100.0%	None Detected	

Client Sample ID: 0413147B ***Lab Sample ID:*** **042309385-0334**

Sample Description: 1950 Addition - Gym - Shower/Ceramic Floor - Grout - Gray

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	Gray/Beige	0.0%	100.0%	None Detected	

Client Sample ID: 0413148A ***Lab Sample ID:*** **042309385-0335**

Sample Description: 1950 Addition - Class 4 - Toilet/Ceramic Floor - Grout - White

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	White	0.0%	100.0%	None Detected	

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Client Sample ID: 0413148B ***Lab Sample ID:*** **042309385-0336**

Sample Description: 1950 Addition - Class 4 - Toilet/Ceramic Floor - Grout - White

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	White	0.0%	100.0%	None Detected	

Client Sample ID: 0413149A ***Lab Sample ID:*** **042309385-0337**

Sample Description: 1950 Addition - Class 4 - Toilet/Ceramic Floor - Mud Bed - Tan

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	White	0.0%	100.0%	None Detected	

Client Sample ID: 0413149B ***Lab Sample ID:*** **042309385-0338**

Sample Description: 1950 Addition - Gym - Shower/Ceramic Floor - Mud Bed - Tan

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	White	0.0%	100.0%	None Detected	

Client Sample ID: 0413150A ***Lab Sample ID:*** **042309385-0339**

Sample Description: 1950 Addition - Janitor Closet by Outside Rm./Ceramic Floor - Mud Bed - Brown

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	Gray/Beige	0.0%	100.0%	None Detected	

Client Sample ID: 0413150B ***Lab Sample ID:*** **042309385-0340**

Sample Description: 1950 Addition - Janitor Closet - Rm. 10/Ceramic Floor - Mud Bed - Brown

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	Gray/Tan	0.0%	100.0%	None Detected	

Client Sample ID: 0413151A ***Lab Sample ID:*** **042309385-0341**

Sample Description: 1902 Original Bldg. - Classroom 14/Sink Undercoating - Pink

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	Pink	0.0%	97.0%	**3% Chrysotile**	

Client Sample ID: 0413151B ***Lab Sample ID:*** **042309385-0342**

Sample Description: 1902 Original Bldg. - Classroom 38/Sink Undercoating - Pink

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023				Positive Stop (Not Analyzed)	

Client Sample ID: 0413152A ***Lab Sample ID:*** **042309385-0343**

Sample Description: 1902 Original Bldg. - Classroom 43/Sink Undercoating - White

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	White/Pink	0.0%	97.0%	**3% Chrysotile**	

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Client Sample ID: 0413152B **Lab Sample ID:** **042309385-0344**

Sample Description: 1902 Original Bldg. - Classroom 31/Sink Undercoating - White

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023				Positive Stop (Not Analyzed)	

Client Sample ID: 0413153A **Lab Sample ID:** **042309385-0345**

Sample Description: 1902 Original Bldg. - Classroom 7/Sink Undercoating - Gray

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	Gray	25.0%	75.0%	None Detected	

Client Sample ID: 0413153B **Lab Sample ID:** **042309385-0346**

Sample Description: 1902 Original Bldg. - Classroom 25/Sink Undercoating - Gray

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	Gray	20.0%	80.0%	None Detected	

Client Sample ID: 0413153C **Lab Sample ID:** **042309385-0347**

Sample Description: 1902 Original Bldg. - Nurses/Sink Undercoating - Gray

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	Gray	20.0%	80.0%	None Detected	

Client Sample ID: 0413154A **Lab Sample ID:** **042309385-0348**

Sample Description: 1902 Original Bldg. - Corridor by 37/Fire Door Insulation

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	Brown/White	38.0%	62.0%	None Detected	

Client Sample ID: 0413154B **Lab Sample ID:** **042309385-0349**

Sample Description: 1902 Original Bldg. - Corridor by 37/Fire Door Insulation

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	Brown/White	35.0%	65.0%	None Detected	

Client Sample ID: 0413155A **Lab Sample ID:** **042309385-0350**

Sample Description: 1902 Original Bldg. - Classroom 32/Red Fire Stop

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	Red/Black	2.0%	98.0%	None Detected	

Client Sample ID: 0413155B **Lab Sample ID:** **042309385-0351**

Sample Description: 1902 Original Bldg. - Classroom 39/Red Fire Stop

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	Red/Black	<1%	100.0%	None Detected	

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Client Sample ID: 0413156A ***Lab Sample ID:*** **042309385-0352**

Sample Description: 1902 Original Bldg. - Attic/Batt. Insulation Backing Paper - Black

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	Brown/Black/Yellow	55.0%	45.0%	None Detected	

Client Sample ID: 0413156B ***Lab Sample ID:*** **042309385-0353**

Sample Description: 1902 Original Bldg. - Attic/Batt. Insulation Backing Paper - Black

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	Brown/Black/Yellow	60.0%	40.0%	None Detected	

Client Sample ID: 0413157A ***Lab Sample ID:*** **042309385-0354**

Sample Description: 1902 Original Bldg. - Classroom 43/Interior Window Glazing - Hard - Thin - Old

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Gray/Tan/White	5.0%	95.0%	None Detected	

Client Sample ID: 0413157B ***Lab Sample ID:*** **042309385-0355**

Sample Description: 1902 Original Bldg. - Classroom 44/Interior Window Glazing - Hard - Thin - Old

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Gray/Tan/White	10.0%	90.0%	None Detected	

Client Sample ID: 0413158A ***Lab Sample ID:*** **042309385-0356**

Sample Description: 1902 Original Bldg. - Classroom 44/Sink Backsplash Caulk - White - Newer

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	White	0.0%	100.0%	None Detected	

Client Sample ID: 0413158B ***Lab Sample ID:*** **042309385-0357**

Sample Description: 1902 Original Bldg. - Classroom 22/Sink Backsplash Caulk - White - Newer

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	White	0.0%	97.0%	**3% Anthophyllite**	

Client Sample ID: 0413159A ***Lab Sample ID:*** **042309385-0358**

Sample Description: 1902 Original Bldg. - Classroom 30/Interior Window/Sill Caulk - White - Hard

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Tan/White	0.0%	100.0%	None Detected	

Client Sample ID: 0413159B ***Lab Sample ID:*** **042309385-0359**

Sample Description: 1902 Original Bldg. - Classroom 30/Interior Window/Sill Caulk - White - Hard

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Tan/White	0.0%	100.0%	None Detected	

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Client Sample ID: 0413160A ***Lab Sample ID:*** **042309385-0360**

Sample Description: 1902 Original Bldg. - Library Entry/Interior Window Glazing - Black - Sticky

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Black/Blue	0.0%	100.0%	None Detected	

Client Sample ID: 0413160B ***Lab Sample ID:*** **042309385-0361**

Sample Description: 1902 Original Bldg. - Library Room/Interior Window Glazing - Black - Sticky

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Black/Blue	5.0%	95.0%	None Detected	

Client Sample ID: 0413161A ***Lab Sample ID:*** **042309385-0362**

Sample Description: 1902 Original Bldg. - Library Entry/Interior Door/Window Glazing - Black - Sticky

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Black	0.0%	100.0%	None Detected	

Client Sample ID: 0413161B ***Lab Sample ID:*** **042309385-0363**

Sample Description: 1902 Original Bldg. - Library Entry/Interior Door/Window Glazing - Black - Sticky

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Black	0.0%	100.0%	None Detected	

Client Sample ID: 0413162A ***Lab Sample ID:*** **042309385-0364**

Sample Description: 1902 Original Bldg. - Corridor/Interior Door/Window Glazing - Black - Sticky

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Black	0.0%	100.0%	None Detected	

Client Sample ID: 0413162B ***Lab Sample ID:*** **042309385-0365**

Sample Description: 1902 Original Bldg. - Corridor/Interior Door/Window Glazing - Black - Sticky

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Black	6.0%	94.0%	None Detected	

Client Sample ID: 0413163A ***Lab Sample ID:*** **042309385-0366**

Sample Description: 1902 Original Bldg. - Classroom 43/Black Board

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Gray/Black	0.0%	100.0%	None Detected	

Client Sample ID: 0413163B ***Lab Sample ID:*** **042309385-0367**

Sample Description: 1902 Original Bldg. - Classroom 32/Black Board

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Gray/Black	0.0%	100.0%	None Detected	

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Client Sample ID: 0413164A ***Lab Sample ID:*** **042309385-0368**

Sample Description: 1902 Original Bldg. - Classroom 43/Countertop Adhesive

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Tan/Yellow	0.0%	100.0%	None Detected	

Client Sample ID: 0413164B ***Lab Sample ID:*** **042309385-0369**

Sample Description: 1902 Original Bldg. - Classroom 43/Countertop Adhesive

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Tan/Yellow	0.0%	100.0%	None Detected	

Client Sample ID: 0413165A ***Lab Sample ID:*** **042309385-0370**

Sample Description: 1902 Original Bldg. - Classroom 9/Gray Bulletin Board

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Gray	63.0%	37.0%	None Detected	

Client Sample ID: 0413165B ***Lab Sample ID:*** **042309385-0371**

Sample Description: 1902 Original Bldg. - Classroom 9/Gray Bulletin Board

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Gray	68.0%	32.0%	None Detected	

Client Sample ID: 0413166A ***Lab Sample ID:*** **042309385-0372**

Sample Description: 1902 Original Bldg. - Classroom 9/Gray Bulletin Board - Canvass Cover/Adhesive

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Yellow/Pink	15.0%	85.0%	None Detected	

Client Sample ID: 0413166B ***Lab Sample ID:*** **042309385-0373**

Sample Description: 1902 Original Bldg. - Classroom 9/Gray Bulletin Board - Canvass Cover/Adhesive

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Yellow/Pink	15.0%	85.0%	None Detected	

Client Sample ID: 0413167A ***Lab Sample ID:*** **042309385-0374**

Sample Description: 1902 Original Bldg. - Classroom 43/Bulletin Board

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Brown/Tan	5.0%	95.0%	None Detected	

Client Sample ID: 0413167B ***Lab Sample ID:*** **042309385-0375**

Sample Description: 1902 Original Bldg. - Classroom 31/Bulletin Board

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Brown/Tan	15.0%	85.0%	None Detected	

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Client Sample ID: 0413168A ***Lab Sample ID:*** **042309385-0376**

Sample Description: 1902 Original Bldg. - Classroom 43/Bulletin Board - Adhesive - Dark Brown

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Brown	0.0%	100.0%	None Detected	

Client Sample ID: 0413168B ***Lab Sample ID:*** **042309385-0377**

Sample Description: 1902 Original Bldg. - Classroom 31/Bulletin Board - Adhesive - Dark Brown

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Brown	0.0%	100.0%	None Detected	

Client Sample ID: 0413169A ***Lab Sample ID:*** **042309385-0378**

Sample Description: 1902 Original Bldg. - Classroom 20/Green Bulletin Board

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Tan/Green	10.0%	90.0%	None Detected	

Client Sample ID: 0413169B ***Lab Sample ID:*** **042309385-0379**

Sample Description: 1902 Original Bldg. - Classroom 20/Green Bulletin Board

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Tan/Green	10.0%	90.0%	None Detected	

Client Sample ID: 0413170A ***Lab Sample ID:*** **042309385-0380**

Sample Description: 1902 Original Bldg. - Classroom 20/Red Bulletin Board

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Tan/Red	15.0%	85.0%	None Detected	

Client Sample ID: 0413170B ***Lab Sample ID:*** **042309385-0381**

Sample Description: 1902 Original Bldg. - Classroom 20/Red Bulletin Board

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Tan/Red	10.0%	90.0%	None Detected	

Client Sample ID: 0413171A ***Lab Sample ID:*** **042309385-0382**

Sample Description: 1902 Original Bldg. - Classroom 20/Red Bulletin Board - Adhesive

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Brown/Tan	0.0%	100.0%	None Detected	

Client Sample ID: 0413171B ***Lab Sample ID:*** **042309385-0383**

Sample Description: 1902 Original Bldg. - Classroom 20/Red Bulletin Board - Adhesive

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Brown/Tan	0.0%	100.0%	None Detected	

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Client Sample ID: 0413172A ***Lab Sample ID:*** **042309385-0384**

Sample Description: 1902 Original Bldg. - Classroom 44/Sink Wall - Gray Layer

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Gray/Blue	15.0%	85.0%	None Detected	

Client Sample ID: 0413172B ***Lab Sample ID:*** **042309385-0385**

Sample Description: 1902 Original Bldg. - Classroom 44/Sink Wall - Gray Layer

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Gray/Blue	20.0%	80.0%	None Detected	

Client Sample ID: 0413173A ***Lab Sample ID:*** **042309385-0386**

Sample Description: 1902 Original Bldg. - Classroom 44/Sink Wall - Black Layer

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Black	45.0%	55.0%	None Detected	

Client Sample ID: 0413173B ***Lab Sample ID:*** **042309385-0387**

Sample Description: 1902 Original Bldg. - Classroom 44/Sink Wall - Black Layer

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Black	45.0%	55.0%	None Detected	

Client Sample ID: 0413174A ***Lab Sample ID:*** **042309385-0388**

Sample Description: 1902 Original Bldg. - Classroom 44/Sink Wall - Brown Adhesive

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Brown	0.0%	100.0%	None Detected	

Client Sample ID: 0413174B ***Lab Sample ID:*** **042309385-0389**

Sample Description: 1902 Original Bldg. - Classroom 44/Sink Wall - Brown Adhesive

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Brown/Tan	0.0%	100.0%	None Detected	

Client Sample ID: 0413175A ***Lab Sample ID:*** **042309385-0390**

Sample Description: 1902 Original Bldg. - Classroom 7/Bulletin Board Adhesive - Brown/Tan

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Brown	0.0%	100.0%	None Detected	

Client Sample ID: 0413175B ***Lab Sample ID:*** **042309385-0391**

Sample Description: 1902 Original Bldg. - Classroom 9/Bulletin Board Adhesive - Brown/Tan

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Brown	0.0%	100.0%	None Detected	

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Client Sample ID: 0413176A ***Lab Sample ID:*** **042309385-0392**

Sample Description: 1902 Original Bldg. - Library/Wall Adhesive - Brown

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Brown	0.0%	100.0%	None Detected	

Client Sample ID: 0413176B ***Lab Sample ID:*** **042309385-0393**

Sample Description: 1902 Original Bldg. - Library/Wall Adhesive - Brown

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Brown	0.0%	100.0%	None Detected	

Client Sample ID: 0413177A ***Lab Sample ID:*** **042309385-0394**

Sample Description: 1902 Original Bldg. - Classroom 7/Wall Adhesive - White

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	White	0.0%	100.0%	None Detected	

Client Sample ID: 0413177B ***Lab Sample ID:*** **042309385-0395**

Sample Description: 1902 Original Bldg. - Classroom 7/Wall Adhesive - White

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	White	0.0%	100.0%	None Detected	

Client Sample ID: 0413178A ***Lab Sample ID:*** **042309385-0396**

Sample Description: 1902 Original Bldg. - Classroom 8/Wall Adhesive - Yellow

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Brown/Yellow	0.0%	100.0%	None Detected	

Client Sample ID: 0413178B ***Lab Sample ID:*** **042309385-0397**

Sample Description: 1902 Original Bldg. - Classroom 8/Wall Adhesive - Yellow

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Brown/Yellow	0.0%	100.0%	None Detected	

Client Sample ID: 0413179A ***Lab Sample ID:*** **042309385-0398**

Sample Description: 1902 Original Bldg. - Classroom 44/2'x2'/2'x4' Ceiling Tile

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Tan/White	65.0%	35.0%	None Detected	

Client Sample ID: 0413179B ***Lab Sample ID:*** **042309385-0399**

Sample Description: 1902 Original Bldg. - Classroom 43/2'x2'/2'x4' Ceiling Tile

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Tan/White	60.0%	40.0%	None Detected	

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Client Sample ID: 0413180A ***Lab Sample ID:*** **042309385-0400**

Sample Description: 1902 Original Bldg. - Classroom 5/2'x4' Ceiling Tiles - Tan Backing

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Gray/White	50.0%	50.0%	None Detected	

Client Sample ID: 0413180B ***Lab Sample ID:*** **042309385-0401**

Sample Description: 1902 Original Bldg. - Classroom 5/2'x4' Ceiling Tiles - Tan Backing

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Gray/White	55.0%	45.0%	None Detected	

Client Sample ID: 0413181A ***Lab Sample ID:*** **042309385-0402**

Sample Description: 1902 Original Bldg. - Library/2'x4' Ceiling Tile

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Gray/White	55.0%	45.0%	None Detected	

Client Sample ID: 0413181B ***Lab Sample ID:*** **042309385-0403**

Sample Description: 1902 Original Bldg. - Library/2'x4' Ceiling Tile

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Gray/White	55.0%	45.0%	None Detected	

Client Sample ID: 0413182A ***Lab Sample ID:*** **042309385-0404**

Sample Description: 1902 Original Bldg. - Toilet by 9/2'x4' Gypsum Ceiling Tile

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Brown/White	30.0%	70.0%	None Detected	

Client Sample ID: 0413182B ***Lab Sample ID:*** **042309385-0405**

Sample Description: 1902 Original Bldg. - Toilet by 9/2'x4' Gypsum Ceiling Tile

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Brown/White	4.0%	96.0%	None Detected	

Client Sample ID: 0413183A ***Lab Sample ID:*** **042309385-0406**

Sample Description: 1902 Original Bldg. - Corridor/Gypsum Board

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Tan/White	35.0%	65.0%	None Detected	

Client Sample ID: 0413183B ***Lab Sample ID:*** **042309385-0407**

Sample Description: 1902 Original Bldg. - Nurse/Gypsum Board

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Tan/White	6.0%	94.0%	None Detected	

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Client Sample ID: 0413183C ***Lab Sample ID:*** **042309385-0408**

Sample Description: 1902 Original Bldg. - Classroom 7/Gypsum Board

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Tan/White	6.0%	94.0%	None Detected	

Client Sample ID: 0413184A ***Lab Sample ID:*** **042309385-0409**

Sample Description: 1902 Original Bldg. - Classroom 31 - Closet/Gypsum Board Joint/Tape Compound

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	White	0.0%	100.0%	None Detected	

Client Sample ID: 0413184B ***Lab Sample ID:*** **042309385-0410**

Sample Description: 1902 Original Bldg. - Library/Gypsum Board Joint/Tape Compound

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	White	0.0%	100.0%	None Detected	

Client Sample ID: 0413184C ***Lab Sample ID:*** **042309385-0411**

Sample Description: 1902 Original Bldg. - Classroom 7/Gypsum Board Joint/Tape Compound

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	White	0.0%	100.0%	None Detected	

Client Sample ID: 0413185A ***Lab Sample ID:*** **042309385-0412**

Sample Description: 1902 Original Bldg. - Classroom 9/One Coat Plaster Ceiling

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Gray	<1%	100.0%	None Detected	

Client Sample ID: 0413185B ***Lab Sample ID:*** **042309385-0413**

Sample Description: 1902 Original Bldg. - Classroom 5 - Closet/One Coat Plaster Ceiling

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Gray	<1%	100.0%	None Detected	

Client Sample ID: 0413185C ***Lab Sample ID:*** **042309385-0414**

Sample Description: 1902 Original Bldg. - Classroom 5 - Closet/One Coat Plaster Ceiling

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Gray	0.0%	100.0%	None Detected	

Client Sample ID: 0413186A ***Lab Sample ID:*** **042309385-0415**

Sample Description: 1902 Original Bldg. - Corridor/Wall Plaster - White Finish Coat

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	White	0.0%	100.0%	None Detected	

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Client Sample ID: 0413186B ***Lab Sample ID:*** **042309385-0416**

Sample Description: 1902 Original Bldg. - Corridor/Wall Plaster - White Finish Coat

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	White	0.0%	100.0%	None Detected	

Client Sample ID: 0413186C ***Lab Sample ID:*** **042309385-0417**

Sample Description: 1902 Original Bldg. - Classroom 7/Wall Plaster - White Finish Coat

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	White	0.0%	100.0%	None Detected	

Client Sample ID: 0413187A ***Lab Sample ID:*** **042309385-0418**

Sample Description: 1902 Original Bldg. - Corridor/Wall Plaster - Gray/Tan Rough Coat

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Gray	0.0%	100.0%	None Detected	

Client Sample ID: 0413187B ***Lab Sample ID:*** **042309385-0419**

Sample Description: 1902 Original Bldg. - Corridor/Wall Plaster - Gray/Tan Rough Coat

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Gray	0.0%	100.0%	None Detected	

Client Sample ID: 0413187C ***Lab Sample ID:*** **042309385-0420**

Sample Description: 1902 Original Bldg. - Classroom 7/Wall Plaster - Gray/Tan Rough Coat

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Gray	0.0%	100.0%	None Detected	

Client Sample ID: 0413188A ***Lab Sample ID:*** **042309385-0421**

Sample Description: 1902 Original Bldg. - Classroom 23/Wall Plaster - White Finish Coat

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	White	0.0%	100.0%	None Detected	

Client Sample ID: 0413188B ***Lab Sample ID:*** **042309385-0422**

Sample Description: 1902 Original Bldg. - Classroom 28/Wall Plaster - White Finish Coat

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	White	0.0%	100.0%	None Detected	

Client Sample ID: 0413188C ***Lab Sample ID:*** **042309385-0423**

Sample Description: 1902 Original Bldg. - Corridor/Wall Plaster - White Finish Coat

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	White	0.0%	100.0%	None Detected	

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Client Sample ID: 0413189A ***Lab Sample ID:*** **042309385-0424**

Sample Description: 1902 Original Bldg. - Classroom 23/Wall Plaster - Gray/Tan Rough Coat

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Gray	0.0%	100.0%	None Detected	

Client Sample ID: 0413189B ***Lab Sample ID:*** **042309385-0425**

Sample Description: 1902 Original Bldg. - Classroom 28/Wall Plaster - Gray/Tan Rough Coat

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Gray	0.0%	100.0%	None Detected	

Client Sample ID: 0413189C ***Lab Sample ID:*** **042309385-0426**

Sample Description: 1902 Original Bldg. - Corridor/Wall Plaster - Gray/Tan Rough Coat

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Gray	0.0%	100.0%	None Detected	

Client Sample ID: 0413190A ***Lab Sample ID:*** **042309385-0427**

Sample Description: 1902 Original Bldg. - Classroom 23/Ceiling Plaster - White Finish Coat

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	White	0.0%	100.0%	None Detected	

Client Sample ID: 0413190B ***Lab Sample ID:*** **042309385-0428**

Sample Description: 1902 Original Bldg. - Classroom 25/Ceiling Plaster - White Finish Coat

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	White	0.0%	100.0%	None Detected	

Client Sample ID: 0413190C ***Lab Sample ID:*** **042309385-0429**

Sample Description: 1902 Original Bldg. - Classroom 28/Ceiling Plaster - White Finish Coat

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	White	0.0%	100.0%	None Detected	

Client Sample ID: 0413191A ***Lab Sample ID:*** **042309385-0430**

Sample Description: 1902 Original Bldg. - Classroom 23/Ceiling Plaster - Gray/Tan Rough Coat

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Gray	0.0%	100.0%	None Detected	

Client Sample ID: 0413191B ***Lab Sample ID:*** **042309385-0431**

Sample Description: 1902 Original Bldg. - Classroom 25/Ceiling Plaster - Gray/Tan Rough Coat

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Gray/Tan	<1%	98.0%	**2% Chrysotile**	
400 PLM Pt Ct	4/26/2023	Gray/Tan	0.0%	98.3%	**1.75% Chrysotile**	

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Client Sample ID: 0413191C ***Lab Sample ID:*** **042309385-0432**

Sample Description: 1902 Original Bldg. - Classroom 28/Ceiling Plaster - Gray/Tan Rough Coat

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023				Positive Stop (Not Analyzed)	

Client Sample ID: 0413192A ***Lab Sample ID:*** **042309385-0433**

Sample Description: 1902 Original Bldg. - Classroom 31/Wall Plaster - White Finish Coat

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	White	0.0%	100.0%	None Detected	

Client Sample ID: 0413192B ***Lab Sample ID:*** **042309385-0434**

Sample Description: 1902 Original Bldg. - Classroom 43/Wall Plaster - White Finish Coat

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	White	0.0%	100.0%	None Detected	

Client Sample ID: 0413192C ***Lab Sample ID:*** **042309385-0435**

Sample Description: 1902 Original Bldg. - Classroom 44/Wall Plaster - White Finish Coat

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	White	0.0%	100.0%	None Detected	

Client Sample ID: 0413193A ***Lab Sample ID:*** **042309385-0436**

Sample Description: 1902 Original Bldg. - Classroom 31/Wall Plaster - Gray/Tan Rough Coat

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Gray/Tan	0.0%	100.0%	None Detected	

Client Sample ID: 0413193B ***Lab Sample ID:*** **042309385-0437**

Sample Description: 1902 Original Bldg. - Classroom 43/Wall Plaster - Gray/Tan Rough Coat

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Gray	0.0%	100.0%	None Detected	

Client Sample ID: 0413193C ***Lab Sample ID:*** **042309385-0438**

Sample Description: 1902 Original Bldg. - Classroom 44/Wall Plaster - Gray/Tan Rough Coat

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Gray	<1%	100.0%	None Detected	

Client Sample ID: 0413194A ***Lab Sample ID:*** **042309385-0439**

Sample Description: 1902 Original Bldg. - Classroom 31/Ceiling Plaster - White Finish Coat

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	White	0.0%	100.0%	None Detected	

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Client Sample ID: 0413194B **Lab Sample ID:** **042309385-0440**

Sample Description: 1902 Original Bldg. - Classroom 43/Ceiling Plaster - White Finish Coat

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	White	0.0%	100.0%	None Detected	

Client Sample ID: 0413194C **Lab Sample ID:** **042309385-0441**

Sample Description: 1902 Original Bldg. - Classroom 44/Ceiling Plaster - White Finish Coat

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	White	0.0%	100.0%	None Detected	

Client Sample ID: 0413195A **Lab Sample ID:** **042309385-0442**

Sample Description: 1902 Original Bldg. - Classroom 31/Ceiling Plaster - Gray/Tan Rough Coat

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Tan/White	<1%	98.0%	**2% Chrysotile**	
400 PLM Pt Ct	4/26/2023	Tan/White	0.0%	98.5%	**1.50% Chrysotile**	

Client Sample ID: 0413195B **Lab Sample ID:** **042309385-0443**

Sample Description: 1902 Original Bldg. - Classroom 43/Ceiling Plaster - Gray/Tan Rough Coat

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	5/10/2023	Brown	0.0%	100.0%	None Detected	

Client Sample ID: 0413195C **Lab Sample ID:** **042309385-0444**

Sample Description: 1902 Original Bldg. - Classroom 44/Ceiling Plaster - Gray/Tan Rough Coat

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	5/10/2023	Brown	0.0%	100.0%	None Detected	

Client Sample ID: 0413196A **Lab Sample ID:** **042309385-0445**

Sample Description: 1902 Original Bldg. - Main Office/18"x18" Floor Material

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	White	0.0%	100.0%	None Detected	

Client Sample ID: 0413196B **Lab Sample ID:** **042309385-0446**

Sample Description: 1902 Original Bldg. - Main Office/18"x18" Floor Material

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	White	0.0%	100.0%	None Detected	

Client Sample ID: 0413197A **Lab Sample ID:** **042309385-0447**

Sample Description: 1902 Original Bldg. - Main Office/18"x18" Floor - Gray Material

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Gray	0.0%	100.0%	None Detected	

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EMSL Order ID: 042309385
Customer ID: LANG78
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Summary Test Report for Asbestos Analysis of Bulk Material

Client Sample ID: 0413197B ***Lab Sample ID:*** **042309385-0448**

Sample Description: 1902 Original Bldg. - Main Office/18"x18" Floor - Gray Material

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Gray	0.0%	100.0%	None Detected	

Client Sample ID: 0413198A ***Lab Sample ID:*** **042309385-0449**

Sample Description: 1902 Original Bldg. - Main Office/18"x18" Floor - Yellow Mastic

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Yellow	3.0%	97.0%	None Detected	

Client Sample ID: 0413198B ***Lab Sample ID:*** **042309385-0450**

Sample Description: 1902 Original Bldg. - Main Office/18"x18" Floor - Yellow Mastic

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Brown/Yellow	2.0%	98.0%	None Detected	

Client Sample ID: 0413199A ***Lab Sample ID:*** **042309385-0451**

Sample Description: 1902 Original Bldg. - Lower Floor - Stairwell/Gray Floor Leveler

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Brown/Gray	0.0%	100.0%	None Detected	

Client Sample ID: 0413199B ***Lab Sample ID:*** **042309385-0452**

Sample Description: 1902 Original Bldg. - Lower Floor - Stairwell/Gray Floor Leveler

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Brown/Gray	0.0%	100.0%	None Detected	

Client Sample ID: 0413200A ***Lab Sample ID:*** **042309385-0453**

Sample Description: 1902 Original Bldg. - Stairwell 35/Older Floor Tile

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Gray	0.0%	100.0%	None Detected	

Client Sample ID: 0413200B ***Lab Sample ID:*** **042309385-0454**

Sample Description: 1902 Original Bldg. - Lower Level/Older Floor Tile

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Gray	0.0%	100.0%	None Detected	

Client Sample ID: 0413201A ***Lab Sample ID:*** **042309385-0455**

Sample Description: 1902 Original Bldg. - Stairwell 35/Older Floor Tile - Black Mastic

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Black	2.0%	98.0%	None Detected	

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Summary Test Report for Asbestos Analysis of Bulk Material

Client Sample ID: 0413201B ***Lab Sample ID:*** **042309385-0456**
Sample Description: 1902 Original Bldg. - Lower Level/Older Floor Tile - Black Mastic

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Brown/Black	0.0%	100.0%	None Detected	

Client Sample ID: 0413202A ***Lab Sample ID:*** **042309385-0457**
Sample Description: 1902 Original Bldg. - Classroom 43/12"x12" Light Blue Floor Tile

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	Green	3.0%	97.0%	None Detected	

Client Sample ID: 0413202B ***Lab Sample ID:*** **042309385-0458**
Sample Description: 1902 Original Bldg. - Lower Level - Corridor/12"x12" Light Blue Floor Tile

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	Green	5.0%	95.0%	None Detected	

Client Sample ID: 0413203A ***Lab Sample ID:*** **042309385-0459**
Sample Description: 1902 Original Bldg. - Classroom 43/12"x12" Light Blue Floor Tile - Black Mastic

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	Black	15.0%	85.0%	None Detected	
TEM Grav. Reduction	4/28/2023	Black	0.0%	100.0%	None Detected	

Client Sample ID: 0413203B ***Lab Sample ID:*** **042309385-0460**
Sample Description: 1902 Original Bldg. - Lower Level - Corridor/12"x12" Light Blue Floor Tile - Black Mastic

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	Black	14.0%	86.0%	None Detected	
TEM Grav. Reduction	4/28/2023	Black	0.00%	99.90%	**0.10% Chrysotile**	

Client Sample ID: 0413203C ***Lab Sample ID:*** **042309385-0461**
Sample Description: 1902 Original Bldg. - Classroom 9/12"x12" Light Blue Floor Tile - Black Mastic

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	Gray/Black	7.0%	93.0%	None Detected	
TEM Grav. Reduction	4/28/2023	Gray/Black	0.0%	100.0%	None Detected	

Client Sample ID: 0413204A ***Lab Sample ID:*** **042309385-0462**
Sample Description: 1902 Original Bldg. - Classroom 30/Red Floor Material under Plywood

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	Red	0.0%	100.0%	None Detected	

Client Sample ID: 0413204B ***Lab Sample ID:*** **042309385-0463**
Sample Description: 1902 Original Bldg. - Classroom 30/Red Floor Material under Plywood

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	Red	0.0%	100.0%	None Detected	

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Summary Test Report for Asbestos Analysis of Bulk Material

Client Sample ID: 0413205A ***Lab Sample ID:*** **042309385-0464**

Sample Description: 1902 Original Bldg. - Classroom 39/Paper under Plywood

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	Brown	88.0%	12.0%	None Detected	

Client Sample ID: 0413205B ***Lab Sample ID:*** **042309385-0465**

Sample Description: 1902 Original Bldg. - Classroom 39/Paper under Plywood

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	Brown/Tan	87.0%	13.0%	None Detected	

Client Sample ID: 0413206A ***Lab Sample ID:*** **042309385-0466**

Sample Description: 1902 Original Bldg. - Stairwell/Rubber Floor Adhesive - Yellow

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	Tan	5.0%	95.0%	None Detected	

Client Sample ID: 0413206B ***Lab Sample ID:*** **042309385-0467**

Sample Description: 1902 Original Bldg. - Stairwell/Rubber Floor Adhesive - Yellow

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	Gray/Tan/Black	4.0%	96.0%	None Detected	

Client Sample ID: 0413207 ***Lab Sample ID:*** **042309385-0468**

Sample Description: 1902 Original Bldg. - Stairwell/Black Mastic under Rubber Floor

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	Black	1.0%	99.0%	None Detected	
TEM Grav. Reduction	4/28/2023	Black	0.00%	99.83%	**0.17% Chrysotile**	

Client Sample ID: 0413208A ***Lab Sample ID:*** **042309385-0469**

Sample Description: 1902 Original Bldg. - Library/Carpet Adhesive - Yellow

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	Yellow	3.0%	97.0%	None Detected	

Client Sample ID: 0413208B ***Lab Sample ID:*** **042309385-0470**

Sample Description: 1902 Original Bldg. - Library/Carpet Adhesive Y- ellow

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	Yellow/Green	10.0%	90.0%	None Detected	

Client Sample ID: 0413209A ***Lab Sample ID:*** **042309385-0471**

Sample Description: 1902 Original Bldg. - Toilet Room by 7/Epoxy Floor

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	Brown/Tan	0.0%	100.0%	None Detected	

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Summary Test Report for Asbestos Analysis of Bulk Material

Client Sample ID: 0413209B ***Lab Sample ID:*** **042309385-0472**

Sample Description: 1902 Original Bldg. - Toilet Room by 7/Epoxy Floor

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	Brown/Tan	0.0%	100.0%	None Detected	

Client Sample ID: 0413210A ***Lab Sample ID:*** **042309385-0473**

Sample Description: 1902 Original Bldg. - 2nd Floor - Corridor/Terrazzo Floor

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	Gray	0.0%	100.0%	None Detected	

Client Sample ID: 0413210B ***Lab Sample ID:*** **042309385-0474**

Sample Description: 1902 Original Bldg. - 2nd Floor - Corridor/Terrazzo Floor

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	Gray	3.0%	97.0%	None Detected	

Client Sample ID: 0413211A ***Lab Sample ID:*** **042309385-0475**

Sample Description: 1902 Original Bldg. - 2nd Floor - Corridor/Terrazzo Floor - Mud Bed

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	Gray	3.0%	97.0%	None Detected	

Client Sample ID: 0413211B ***Lab Sample ID:*** **042309385-0476**

Sample Description: 1902 Original Bldg. - 2nd Floor - Corridor/Terrazzo Floor - Mud Bed

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	Gray	3.0%	97.0%	None Detected	

Client Sample ID: 0413212A ***Lab Sample ID:*** **042309385-0477**

Sample Description: 1902 Original Bldg. - Classroom 43/Dark Cove Base

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	Black	0.0%	100.0%	None Detected	

Client Sample ID: 0413212B ***Lab Sample ID:*** **042309385-0478**

Sample Description: 1902 Original Bldg. - Corridor at 5/Dark Cove Base

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	Black	0.0%	100.0%	None Detected	

Client Sample ID: 0413213A ***Lab Sample ID:*** **042309385-0479**

Sample Description: 1902 Original Bldg. - Classroom 43/Dark Cove Base - Adhesive - Yellow

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	Yellow	6.0%	94.0%	None Detected	

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Summary Test Report for Asbestos Analysis of Bulk Material

Client Sample ID: 0413213B ***Lab Sample ID:*** **042309385-0480**

Sample Description: 1902 Original Bldg. - Corridor at 5/Dark Cove Base - Adhesive - Yellow

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	Yellow	0.0%	100.0%	None Detected	

Client Sample ID: 0413214A ***Lab Sample ID:*** **042309385-0481**

Sample Description: 1902 Original Bldg. - Nurse Office/Cove Base

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	Black	0.0%	100.0%	None Detected	

Client Sample ID: 0413214B ***Lab Sample ID:*** **042309385-0482**

Sample Description: 1902 Original Bldg. - Library/Cove Base

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	Black	0.0%	100.0%	None Detected	

Client Sample ID: 0413214C ***Lab Sample ID:*** **042309385-0483**

Sample Description: 1902 Original Bldg. - Stairwell/Cove Base

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	Black	0.0%	100.0%	None Detected	

Client Sample ID: 0413215A ***Lab Sample ID:*** **042309385-0484**

Sample Description: 1902 Original Bldg. - Nurse Office/Cove Base - Adhesive - White/Tan

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	Tan/White	0.0%	100.0%	None Detected	

Client Sample ID: 0413215B ***Lab Sample ID:*** **042309385-0485**

Sample Description: 1902 Original Bldg. - Library/Cove Base - Adhesive - White/Tan

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	Tan	6.0%	94.0%	None Detected	

Client Sample ID: 0413215C ***Lab Sample ID:*** **042309385-0486**

Sample Description: 1902 Original Bldg. - Stairwell/Cove Base - Adhesive - White/Tan

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	Tan	0.0%	100.0%	None Detected	

Client Sample ID: 0413216 ***Lab Sample ID:*** **042309385-0487**

Sample Description: 1902 Original Bldg. - Lower Level - Corridor/Cove Base

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	Black	0.0%	100.0%	None Detected	

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Summary Test Report for Asbestos Analysis of Bulk Material

Client Sample ID: 0413217 ***Lab Sample ID:*** **042309385-0488**

Sample Description: 1902 Original Bldg. - Lower Level - Corridor/Cove Base Adhesive

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	Tan/Clear	3.0%	97.0%	None Detected	

Client Sample ID: 0413218A ***Lab Sample ID:*** **042309385-0489**

Sample Description: 1902 Original Bldg. - Library/Dark Leveler/Floor Material

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	Black	0.0%	100.0%	None Detected	

Client Sample ID: 0413218B ***Lab Sample ID:*** **042309385-0490**

Sample Description: 1902 Original Bldg. - Library/Dark Leveler/Floor Material

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/25/2023	Tan/Black	0.0%	100.0%	None Detected	

Client Sample ID: 0413219A ***Lab Sample ID:*** **042309385-0491**

Sample Description: 1902 Original Bldg. - Library/Beige Concrete Floor Material

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Tan	0.0%	100.0%	**<1% Tremolite**	
400 PLM Pt Ct	4/26/2023	Tan	0.00%	99.25%	**0.75% Tremolite**	

Client Sample ID: 0413219B ***Lab Sample ID:*** **042309385-0492**

Sample Description: 1902 Original Bldg. - Library/Beige Concrete Floor Material

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Tan	0.0%	100.0%	None Detected	

Client Sample ID: 0413220A ***Lab Sample ID:*** **042309385-0493**

Sample Description: 1902 Original Bldg. - Library/Gray Concrete Floor Material

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Gray	0.0%	100.0%	None Detected	

Client Sample ID: 0413220B ***Lab Sample ID:*** **042309385-0494**

Sample Description: 1902 Original Bldg. - Library/Gray Concrete Floor Material

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Gray	0.0%	100.0%	None Detected	

Client Sample ID: 0413221A ***Lab Sample ID:*** **042309385-0495**

Sample Description: 1902 Original Bldg. - Attic/Brick Wall

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Red	3.0%	97.0%	None Detected	

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Summary Test Report for Asbestos Analysis of Bulk Material

Client Sample ID: 0413221B ***Lab Sample ID:*** **042309385-0496**

Sample Description: 1902 Original Bldg. - Attic/Brick Wall

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Red	3.0%	97.0%	None Detected	

Client Sample ID: 0413222A ***Lab Sample ID:*** **042309385-0497**

Sample Description: 1902 Original Bldg. - Attic/Newer Brick

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Red	3.0%	97.0%	None Detected	

Client Sample ID: 0413222B ***Lab Sample ID:*** **042309385-0498**

Sample Description: 1902 Original Bldg. - Attic/Newer Brick

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Red	3.0%	97.0%	None Detected	

Client Sample ID: 0413223A ***Lab Sample ID:*** **042309385-0499**

Sample Description: 1902 Original Bldg. - Attic/Brick Wall Grout

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Tan/White	3.0%	97.0%	None Detected	

Client Sample ID: 0413223B ***Lab Sample ID:*** **042309385-0500**

Sample Description: 1902 Original Bldg. - Attic/Brick Wall Grout

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Tan	3.0%	97.0%	None Detected	

Client Sample ID: 0413224A ***Lab Sample ID:*** **042309385-0501**

Sample Description: 1902 Original Bldg. - Attic/Wall Mortar/Grout

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Tan	0.0%	100.0%	None Detected	

Client Sample ID: 0413224B ***Lab Sample ID:*** **042309385-0502**

Sample Description: 1902 Original Bldg. - Attic/Wall Mortar/Grout

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Tan	0.0%	100.0%	None Detected	

Client Sample ID: 0413225A ***Lab Sample ID:*** **042309385-0503**

Sample Description: 1902 Original Bldg. - Attic/Wall Plaster - White Finish Coat

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Tan/White	0.0%	100.0%	None Detected	

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Client Sample ID: 0413225B ***Lab Sample ID:*** **042309385-0504**

Sample Description: 1902 Original Bldg. - Attic/Wall Plaster - White Finish Coat

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	White	0.0%	100.0%	None Detected	

Client Sample ID: 0413225C ***Lab Sample ID:*** **042309385-0505**

Sample Description: 1902 Original Bldg. - Attic/Wall Plaster - White Finish Coat

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Tan/White	0.0%	100.0%	None Detected	

Client Sample ID: 0413226A ***Lab Sample ID:*** **042309385-0506**

Sample Description: 1902 Original Bldg. - Attic/Wall Plaster - Gray/Tan Rough Coat

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Tan	0.0%	98.0%	**2% Chrysotile**	
400 PLM Pt Ct	4/26/2023	Tan	0.0%	97.8%	**2.25% Chrysotile**	

Client Sample ID: 0413226B ***Lab Sample ID:*** **042309385-0507**

Sample Description: 1902 Original Bldg. - Attic/Wall Plaster - Gray/Tan Rough Coat

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023				Positive Stop (Not Analyzed)	

Client Sample ID: 0413226C ***Lab Sample ID:*** **042309385-0508**

Sample Description: 1902 Original Bldg. - Attic/Wall Plaster - Gray/Tan Rough Coat

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023				Positive Stop (Not Analyzed)	

Client Sample ID: 0413227A ***Lab Sample ID:*** **042309385-0509**

Sample Description: 1902 Original Bldg. - Attic/Hard Gray Floor Material Plaster

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Gray/Black	3.0%	97.0%	None Detected	

Client Sample ID: 0413227B ***Lab Sample ID:*** **042309385-0510**

Sample Description: 1902 Original Bldg. - Attic/Hard Gray Floor Material Plaster

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Gray/Black	0.0%	100.0%	None Detected	

Client Sample ID: 0413228A ***Lab Sample ID:*** **042309385-0511**

Sample Description: 1950 Addition - Attic/Hard Gray Floor Material Plaster

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Gray	0.0%	100.0%	None Detected	

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Client Sample ID: 0413228B ***Lab Sample ID:*** **042309385-0512**

Sample Description: 1950 Addition - Attic/Hard Gray Floor Material Plaster

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Gray	3.0%	97.0%	None Detected	

Client Sample ID: 0413229A ***Lab Sample ID:*** **042309385-0513**

Sample Description: 1902 Original Bldg. - 2nd Floor - Corridor Toilet/Ceramic Wall - Mud Bed - Brown/White

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	White	3.0%	97.0%	None Detected	

Client Sample ID: 0413229B ***Lab Sample ID:*** **042309385-0514**

Sample Description: 1902 Original Bldg. - 2nd Floor - Corridor Toilet/Ceramic Wall - Mud Bed - Brown/White

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	White	3.0%	97.0%	None Detected	

Client Sample ID: 0413230A ***Lab Sample ID:*** **042309385-0515**

Sample Description: 1902 Original Bldg. - 2nd Floor - Last Closet/Ceramic Wall - Mud Bed - Gray

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Tan	3.0%	97.0%	None Detected	

Client Sample ID: 0413230B ***Lab Sample ID:*** **042309385-0516**

Sample Description: 1902 Original Bldg. - 2nd Floor - Last Closet/Ceramic Wall - Mud Bed - Gray

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Tan	0.0%	100.0%	None Detected	

Client Sample ID: 0413231A ***Lab Sample ID:*** **042309385-0517**

Sample Description: 1902 Original Bldg. - Main Office - Toilet/Ceramic Wall Tile - Adhesive

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Tan	0.0%	100.0%	None Detected	

Client Sample ID: 0413231B ***Lab Sample ID:*** **042309385-0518**

Sample Description: 1902 Original Bldg. - Main Office - Toilet/Ceramic Wall Tile - Adhesive

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Tan/White	3.0%	97.0%	None Detected	

Client Sample ID: 0413231C ***Lab Sample ID:*** **042309385-0519**

Sample Description: 1902 Original Bldg. - Room 8 - Toilet/Ceramic Wall Tile - Adhesive

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Tan	3.0%	97.0%	None Detected	

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Client Sample ID: 0413232A ***Lab Sample ID:*** **042309385-0520**

Sample Description: 1902 Original Bldg. - Main Office - Toilet/Ceramic Wall Tile - Grout

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	White	3.0%	97.0%	None Detected	

Client Sample ID: 0413232B ***Lab Sample ID:*** **042309385-0521**

Sample Description: 1902 Original Bldg. - Main Office - Toilet/Ceramic Wall Tile - Grout

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	White	3.0%	97.0%	None Detected	

Client Sample ID: 0413233A ***Lab Sample ID:*** **042309385-0522**

Sample Description: 1902 Original Bldg. - Custodial Closet/Ceramic Wall Tile - Grout

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Tan/White	3.0%	97.0%	None Detected	

Client Sample ID: 0413233B ***Lab Sample ID:*** **042309385-0523**

Sample Description: 1902 Original Bldg. - Custodial Closet/Ceramic Wall Tile - Grout

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	White	3.0%	97.0%	None Detected	

Client Sample ID: 0413234A ***Lab Sample ID:*** **042309385-0524**

Sample Description: 1902 Original Bldg. - 2nd Men's Toilet/Ceramic Wall Tile - Grout

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Brown/Tan	3.0%	97.0%	None Detected	

Client Sample ID: 0413234B ***Lab Sample ID:*** **042309385-0525**

Sample Description: 1902 Original Bldg. - Women's Toilet/Ceramic Wall Tile - Grout

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Brown/Tan	3.0%	97.0%	None Detected	

Client Sample ID: 0413235 ***Lab Sample ID:*** **042309385-0526**

Sample Description: 1902 Original Bldg. - Classroom 8 - Toilet/Ceramic Wall Tile - Grout

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Tan/White	0.0%	100.0%	None Detected	

Client Sample ID: 0413236A ***Lab Sample ID:*** **042309385-0527**

Sample Description: 1902 Original Bldg. - Men's Toilet/Ceramic Floor - Mud Bed - White

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Tan/White	3.0%	97.0%	None Detected	

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Client Sample ID: 0413236B ***Lab Sample ID:*** **042309385-0528**

Sample Description: 1902 Original Bldg. - Men's Toilet/Ceramic Floor - Mud Bed - White

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Tan/White	0.0%	100.0%	None Detected	

Client Sample ID: 0413237A ***Lab Sample ID:*** **042309385-0529**

Sample Description: 1902 Original Bldg. - Custodial Closet/Ceramic Floor - Mud Bed - Tan/Gray

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Gray/Tan	3.0%	97.0%	None Detected	

Client Sample ID: 0413237B ***Lab Sample ID:*** **042309385-0530**

Sample Description: 1902 Original Bldg. - Custodial Closet/Ceramic Floor - Mud Bed - Tan/Gray

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Gray/Tan	0.0%	100.0%	None Detected	

Client Sample ID: 0413238A ***Lab Sample ID:*** **042309385-0531**

Sample Description: 1902 Original Bldg. - Main Office - Toilet/Ceramic Floor - Mud Bed - Thin Gray

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Gray	3.0%	97.0%	None Detected	

Client Sample ID: 0413238B ***Lab Sample ID:*** **042309385-0532**

Sample Description: 1902 Original Bldg. - Main Office - Toilet/Ceramic Floor - Mud Bed - Thin Gray

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Tan	0.0%	100.0%	None Detected	

Client Sample ID: 0413239A ***Lab Sample ID:*** **042309385-0533**

Sample Description: 1902 Original Bldg. - Main Office - Toilet/Ceramic Floor Tile - Adhesive

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Tan	0.0%	100.0%	None Detected	

Client Sample ID: 0413239B ***Lab Sample ID:*** **042309385-0534**

Sample Description: 1902 Original Bldg. - Main Office - Toilet/Ceramic Floor Tile - Adhesive

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Tan	3.0%	97.0%	None Detected	

Client Sample ID: 0413239C ***Lab Sample ID:*** **042309385-0535**

Sample Description: 1902 Original Bldg. - Classroom 8 - Toilet/Ceramic Floor Tile - Adhesive

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	White	0.0%	100.0%	None Detected	

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Client Sample ID: 0413240A ***Lab Sample ID:*** **042309385-0536**

Sample Description: 1902 Original Bldg. - Custodial Closet/Ceramic Floor Tile - Grout - Dark Gray

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Gray	3.0%	97.0%	None Detected	

Client Sample ID: 0413240B ***Lab Sample ID:*** **042309385-0537**

Sample Description: 1902 Original Bldg. - Main Office - Toilet/Ceramic Floor Tile - Grout - Dark Gray

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Gray	0.0%	100.0%	None Detected	

Client Sample ID: 0413241A ***Lab Sample ID:*** **042309385-0538**

Sample Description: 1902 Original Bldg. -Men's Toilet/Ceramic Floor Tile Grout

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Tan	3.0%	97.0%	None Detected	

Client Sample ID: 0413241B ***Lab Sample ID:*** **042309385-0539**

Sample Description: 1902 Original Bldg. -Men's Toilet/Ceramic Floor Tile Grout

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Tan	0.0%	100.0%	None Detected	

Client Sample ID: 0413242 ***Lab Sample ID:*** **042309385-0540**

Sample Description: 1902 Original Bldg. -Class 8 - Toilet/Ceramic Floor Grout

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Gray/Tan	0.0%	100.0%	None Detected	

Client Sample ID: 0413243A ***Lab Sample ID:*** **042309385-0541**

Sample Description: Tunnels/Debris - Black Paper

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Brown	15.0%	85.0%	None Detected	

Client Sample ID: 0413243B ***Lab Sample ID:*** **042309385-0542**

Sample Description: Tunnels/Debris - Black Paper

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Brown	34.0%	66.0%	None Detected	

Client Sample ID: 0413244A ***Lab Sample ID:*** **042309385-0543**

Sample Description: Tunnels - Gym Office Area/Debris - Tan Paper

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Brown	50.0%	50.0%	None Detected	

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Client Sample ID: 0413244B ***Lab Sample ID:*** **042309385-0544**

Sample Description: Tunnels - Gym Office Area/Debris - Tan Paper

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Brown/Tan	70.0%	30.0%	None Detected	

Client Sample ID: 0413245A ***Lab Sample ID:*** **042309385-0545**

Sample Description: Tunnels - Perimeter at Ceiling - Gym/Black Tar Paper

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Brown/Black	8.0%	79.0%	**13% Chrysotile**	

Client Sample ID: 0413245B ***Lab Sample ID:*** **042309385-0546**

Sample Description: Tunnels - Perimeter at Ceiling - Gym/Black Tar Paper

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023				Positive Stop (Not Analyzed)	

Client Sample ID: 0413246A ***Lab Sample ID:*** **042309385-0547**

Sample Description: Tunnels - BR/10 Area/Black Tar Paper

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Black	9.0%	79.0%	**12% Chrysotile**	

Client Sample ID: 0413246B ***Lab Sample ID:*** **042309385-0548**

Sample Description: Tunnels - BR/10 Area/Black Tar Paper

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023				Positive Stop (Not Analyzed)	

Client Sample ID: 0413247A ***Lab Sample ID:*** **042309385-0549**

Sample Description: 1990s Addition/Exterior Window Sill Caulk

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	White	0.0%	100.0%	None Detected	

Client Sample ID: 0413247B ***Lab Sample ID:*** **042309385-0550**

Sample Description: 1990s Addition/Exterior Window Sill Caulk

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	White	0.0%	100.0%	None Detected	

Client Sample ID: 0413248A ***Lab Sample ID:*** **042309385-0551**

Sample Description: 1990s Addition/Exterior Wall - Window/Door/Exp/Vent Caulk - Beige

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Tan	0.0%	100.0%	None Detected	

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Client Sample ID: 0413248B **Lab Sample ID:** **042309385-0552**

Sample Description: 1990s Addition/Exterior Wall - Window/Door/Exp/Vent Caulk - Beige

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Tan	0.0%	100.0%	None Detected	

Client Sample ID: 0413249A **Lab Sample ID:** **042309385-0553**

Sample Description: 1957 Addition/Foundation Tar Damp-Proofing

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Black	10.0%	86.0%	**4% Chrysotile**	

Client Sample ID: 0413249B **Lab Sample ID:** **042309385-0554**

Sample Description: 1957 Addition/Foundation Tar Damp-Proofing

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Fibrous	Asbestos	Comment
PLM	4/26/2023				Positive Stop (Not Analyzed)	

Client Sample ID: 0413250A **Lab Sample ID:** **042309385-0555**

Sample Description: 1957 Addition/Ext. Wall/Paint - Lower Floor

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Gray	0.0%	100.0%	None Detected	

Client Sample ID: 0413250B **Lab Sample ID:** **042309385-0556**

Sample Description: 1957 Addition/Ext. Wall/Paint - Lower Floor

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Gray	0.0%	100.0%	None Detected	

Client Sample ID: 0413250C **Lab Sample ID:** **042309385-0557**

Sample Description: 1957 Addition/Ext. Wall/Paint - Lower Floor

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Gray	0.0%	100.0%	None Detected	

Client Sample ID: 0413251A **Lab Sample ID:** **042309385-0558**

Sample Description: 1957 Addition/Ext. Vent Caulk - Old

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Gray/Tan	0.0%	92.0%	**6% Anthophyllite**	
					2% Chrysotile	

Client Sample ID: 0413251B **Lab Sample ID:** **042309385-0559**

Sample Description: 1957 Addition/Ext. Vent Caulk - Old

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Fibrous	Asbestos	Comment
PLM	4/26/2023				Positive Stop (Not Analyzed)	

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Client Sample ID: 0413252A ***Lab Sample ID:*** **042309385-0560**
Sample Description: 1957 Addition/Ext. Door Caulk - Newer

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Gray/Tan	3.0%	97.0%	None Detected	

Client Sample ID: 0413252B ***Lab Sample ID:*** **042309385-0561**
Sample Description: 1957 Addition/Ext. Door Caulk - Newer

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Gray/Tan	7.0%	93.0%	None Detected	

Client Sample ID: 0413253A ***Lab Sample ID:*** **042309385-0562**
Sample Description: 1957 Addition/Ext. Window Caulk

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Tan	6.0%	90.0%	**4% Chrysotile**	

Client Sample ID: 0413253B ***Lab Sample ID:*** **042309385-0563**
Sample Description: 1957 Addition/Ext. Window Caulk

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023				Positive Stop (Not Analyzed)	

Client Sample ID: 0413254A ***Lab Sample ID:*** **042309385-0564**
Sample Description: 1950 Addition/Ext. Glass Block Window Caulk

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Gray/Tan	3.0%	92.0%	**5% Chrysotile**	

Client Sample ID: 0413254B ***Lab Sample ID:*** **042309385-0565**
Sample Description: 1950 Addition/Ext. Glass Block Window Caulk

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023				Positive Stop (Not Analyzed)	

Client Sample ID: 0413255A ***Lab Sample ID:*** **042309385-0566**
Sample Description: 1950 Addition/Ext. Window Caulk

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Tan	3.0%	93.0%	**4% Chrysotile**	

Client Sample ID: 0413255B ***Lab Sample ID:*** **042309385-0567**
Sample Description: 1950 Addition/Ext. Window Caulk

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023				Positive Stop (Not Analyzed)	

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Client Sample ID: 0413256A ***Lab Sample ID:*** **042309385-0568**
Sample Description: 1950 Addition/Ext. Door Caulk

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Gray/Tan	0.0%	92.0%	**8% Chrysotile**	

Client Sample ID: 0413256B ***Lab Sample ID:*** **042309385-0569**
Sample Description: 1950 Addition/Ext. Door Caulk

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023				Positive Stop (Not Analyzed)	

Client Sample ID: 0413257A ***Lab Sample ID:*** **042309385-0570**
Sample Description: 1950 Addition/Ext. Door Caulk

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/27/2023	Tan	0.0%	96.0%	**4% Chrysotile**	

Client Sample ID: 0413257B ***Lab Sample ID:*** **042309385-0571**
Sample Description: 1950 Addition/Ext. Door Caulk

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/27/2023				Positive Stop (Not Analyzed)	

Client Sample ID: 0413258A ***Lab Sample ID:*** **042309385-0572**
Sample Description: 1950 Addition/Ext. Wall Expansion Caulk

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/27/2023	Gray/Tan	3.0%	93.0%	**4% Chrysotile**	

Client Sample ID: 0413258B ***Lab Sample ID:*** **042309385-0573**
Sample Description: 1950 Addition/Ext. Wall Expansion Caulk

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/27/2023				Positive Stop (Not Analyzed)	

Client Sample ID: 0413259A ***Lab Sample ID:*** **042309385-0574**
Sample Description: 1950 Addition - Boiler Room/Ext. Vent Caulk - Newer

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/27/2023	Gray/Tan	3.0%	97.0%	None Detected	

Client Sample ID: 0413259B ***Lab Sample ID:*** **042309385-0575**
Sample Description: 1950 Addition - Boiler Room/Ext. Vent Caulk - Newer

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/27/2023	Gray/Tan	2.0%	98.0%	None Detected	

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Client Sample ID: 0413260A ***Lab Sample ID:*** **042309385-0576**
Sample Description: 1950 Addition/Ext. Vent Caulk - Older

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/27/2023	Tan	0.0%	96.0%	**4% Chrysotile**	

Client Sample ID: 0413260B ***Lab Sample ID:*** **042309385-0577**
Sample Description: 1950 Addition/Ext. Vent Caulk - Older

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/27/2023				Positive Stop (Not Analyzed)	

Client Sample ID: 0413261A ***Lab Sample ID:*** **042309385-0578**
Sample Description: 1950 Addition/Ext. Vent Caulk - Older

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/27/2023	Gray/Black	0.0%	96.0%	**4% Chrysotile**	

Client Sample ID: 0413261B ***Lab Sample ID:*** **042309385-0579**
Sample Description: 1950 Addition/Ext. Vent Caulk - Older

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/27/2023				Positive Stop (Not Analyzed)	

Client Sample ID: 0413262A ***Lab Sample ID:*** **042309385-0580**
Sample Description: 1950 Addition - Front Building/Ext. Wall/Paint - Front

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/27/2023	Gray/Tan	2.0%	98.0%	None Detected	

Client Sample ID: 0413262B ***Lab Sample ID:*** **042309385-0581**
Sample Description: 1950 Addition - Front Building/Ext. Wall/Paint - Front

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/27/2023	Gray/Tan	3.0%	97.0%	None Detected	

Client Sample ID: 0413262C ***Lab Sample ID:*** **042309385-0582**
Sample Description: 1950 Addition - Front Building/Ext. Wall/Paint - Front

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/27/2023	Gray/Tan	2.0%	98.0%	None Detected	

Client Sample ID: 0413263A ***Lab Sample ID:*** **042309385-0583**
Sample Description: 1902 Orginal Bldg./Ext. Window Caulk

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/27/2023	Tan	5.0%	91.0%	**4% Chrysotile**	

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Client Sample ID: 0413263B **Lab Sample ID:** **042309385-0584**
Sample Description: 1902 Orginal Bldg./Ext. Window Caulk

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/27/2023			Positive Stop (Not Analyzed)		

Client Sample ID: 0413264A **Lab Sample ID:** **042309385-0585**
Sample Description: 1902 Orginal Bldg./Ext. Door Caulk

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/27/2023	Tan/White	4.0%	93.0%	**3% Chrysotile**	

Client Sample ID: 0413264B **Lab Sample ID:** **042309385-0586**
Sample Description: 1902 Orginal Bldg./Ext. Door Caulk

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/27/2023			Positive Stop (Not Analyzed)		

Client Sample ID: 0413265A **Lab Sample ID:** **042309385-0587**
Sample Description: 1902 Orginal Bldg./Ext. Door Caulk

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/27/2023	Gray	3.0%	92.0%	**5% Chrysotile**	

Client Sample ID: 0413265B **Lab Sample ID:** **042309385-0588**
Sample Description: 1902 Orginal Bldg./Ext. Door Caulk

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/27/2023			Positive Stop (Not Analyzed)		

Client Sample ID: 0413266A **Lab Sample ID:** **042309385-0589**
Sample Description: 1902 Orginal Bldg. - Main Entry/Front Door and Window Caulk and Glaze

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/27/2023	Brown/Tan	0.0%	95.0%	**5% Chrysotile**	

Client Sample ID: 0413266B **Lab Sample ID:** **042309385-0590**
Sample Description: 1902 Orginal Bldg. - Main Entry/Front Door and Window Caulk and Glaze

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/27/2023			Positive Stop (Not Analyzed)		

Client Sample ID: 0413267A **Lab Sample ID:** **042309385-0591**
Sample Description: 1957 Roof/Copper Flashing Caulk

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/27/2023	Gray	0.0%	100.0%	None Detected	

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Client Sample ID: 0413267B ***Lab Sample ID:*** **042309385-0592**

Sample Description: 1957 Roof/Copper Flashing Caulk

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/27/2023	Gray/Tan	0.0%	100.0%	**<1% Chrysotile**	
400 PLM Pt Ct	4/27/2023	Gray/Tan	0.00%	99.25%	**0.75% Chrysotile**	Point Count performed on NOB material without gravimetric reduction at client request. Asbestos results may be under-reported.

Client Sample ID: 0413268A ***Lab Sample ID:*** **042309385-0593**

Sample Description: 1990s Roof/Copper Flashing Caulk

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/27/2023	Gray	0.0%	100.0%	None Detected	

Client Sample ID: 0413268B ***Lab Sample ID:*** **042309385-0594**

Sample Description: 1950 Roof/Copper Flashing Caulk

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/27/2023	Gray	4.0%	96.0%	None Detected	

Client Sample ID: 0413269A ***Lab Sample ID:*** **042309385-0595**

Sample Description: 1950 Roof/Perimeter Caulk

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/27/2023	Gray/Black	3.0%	97.0%	None Detected	

Client Sample ID: 0413269B ***Lab Sample ID:*** **042309385-0596**

Sample Description: 1990's Roof/Perimeter Caulk

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/27/2023	Tan/Black	3.0%	97.0%	None Detected	

Client Sample ID: 0413270A ***Lab Sample ID:*** **042309385-0597**

Sample Description: 1990's Roof/Building EXP Caulk and HVAC Caulk

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/27/2023	Gray	0.0%	100.0%	None Detected	

Client Sample ID: 0413270B ***Lab Sample ID:*** **042309385-0598**

Sample Description: 1950 Roof/Building EXP Caulk and HVAC Caulk

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/27/2023	Gray	0.0%	100.0%	None Detected	

Client Sample ID: 0413271A ***Lab Sample ID:*** **042309385-0599**

Sample Description: 1990's Roof/Top Layer - Roof Shingle

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/27/2023	Black	10.0%	90.0%	None Detected	

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Client Sample ID: 0413271B ***Lab Sample ID:*** **042309385-0600**

Sample Description: 1990's Roof/Top Layer - Roof Shingle

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/27/2023	Black	12.0%	88.0%	None Detected	

Client Sample ID: 0413272A ***Lab Sample ID:*** **042309385-0601**

Sample Description: 1990's Roof/Bottom Layer - Roof Shingle

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/27/2023	Black	6.0%	94.0%	None Detected	

Client Sample ID: 0413272B ***Lab Sample ID:*** **042309385-0602**

Sample Description: 1990's Roof/Bottom Layer - Roof Shingle

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/27/2023	Black	5.0%	95.0%	None Detected	

Client Sample ID: 0413273A ***Lab Sample ID:*** **042309385-0603**

Sample Description: 1990's Roof/Black Paper under Shingles

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/27/2023	Black	10.0%	90.0%	None Detected	

Client Sample ID: 0413273B ***Lab Sample ID:*** **042309385-0604**

Sample Description: 1990's Roof/Black Paper under Shingles

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/27/2023	Black	10.0%	90.0%	None Detected	

Client Sample ID: 0413274A ***Lab Sample ID:*** **042309385-0605**

Sample Description: 1990's Roof/Perimeter Flashing Tar

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/27/2023	Black	0.0%	100.0%	None Detected	

Client Sample ID: 0413274B ***Lab Sample ID:*** **042309385-0606**

Sample Description: 1990's Roof/Perimeter Flashing Tar

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/27/2023	Black	0.0%	100.0%	None Detected	

Client Sample ID: 0413275A ***Lab Sample ID:*** **042309385-0607**

Sample Description: 1990's Roof/Perimeter Flashing Tar

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/27/2023	Black	0.0%	100.0%	None Detected	

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Client Sample ID: 0413275B ***Lab Sample ID:*** **042309385-0608**
Sample Description: 1990's Roof/Perimeter Flashing Tar

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/27/2023	Black	0.0%	100.0%	None Detected	

Client Sample ID: 0413276A ***Lab Sample ID:*** **042309385-0609**
Sample Description: 1990's Roof/HVAC Tar (Under Caulk)

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/27/2023	Black	0.0%	100.0%	None Detected	

Client Sample ID: 0413276B ***Lab Sample ID:*** **042309385-0610**
Sample Description: 1990's Roof/HVAC Tar (Under Caulk)

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/27/2023	Black	0.0%	100.0%	None Detected	

Client Sample ID: 0413277A ***Lab Sample ID:*** **042309385-0611**
Sample Description: 1990's Roof/Copper Flash Tar

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/27/2023	Black	0.0%	94.0%	**6% Chrysotile**	

Client Sample ID: 0413277B ***Lab Sample ID:*** **042309385-0612**
Sample Description: 1990's Roof/Copper Flash Tar

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/27/2023				Positive Stop (Not Analyzed)	

Client Sample ID: 0413278A ***Lab Sample ID:*** **042309385-0613**
Sample Description: 1990's Roof/Tar Patach Copper Flash Tar

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/27/2023	Black	15.0%	85.0%	None Detected	

Client Sample ID: 0413278B ***Lab Sample ID:*** **042309385-0614**
Sample Description: 1990's Roof/Tar Patach Copper Flash Tar

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/27/2023	Black	15.0%	85.0%	None Detected	

Client Sample ID: 0413279A ***Lab Sample ID:*** **042309385-0615**
Sample Description: 1990's Roof/Rolled Roof

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/27/2023	Black	5.0%	95.0%	None Detected	

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Client Sample ID: 0413279B ***Lab Sample ID:*** **042309385-0616**
Sample Description: 1990's Roof/Rolled Roof

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/27/2023	Black	8.0%	92.0%	None Detected	

Client Sample ID: 0413280A ***Lab Sample ID:*** **042309385-0617**
Sample Description: 1990's Roof/Soft Concrete

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/27/2023	White	0.0%	100.0%	None Detected	

Client Sample ID: 0413280B ***Lab Sample ID:*** **042309385-0618**
Sample Description: 1990's Roof/Soft Concrete

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/27/2023	White	0.0%	100.0%	None Detected	

Client Sample ID: 0413281A ***Lab Sample ID:*** **042309385-0619**
Sample Description: 1990's Roof/Foamboard Paper Layer

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Brown/Gray	95.0%	5.0%	None Detected	

Client Sample ID: 0413281B ***Lab Sample ID:*** **042309385-0620**
Sample Description: 1990's Roof/Foamboard Paper Layer

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Brown/Gray	95.0%	5.0%	None Detected	

Client Sample ID: 0413282A ***Lab Sample ID:*** **042309385-0621**
Sample Description: 1990's Roof/Soft Concrete Deck

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Tan/White	16.0%	84.0%	None Detected	

Client Sample ID: 0413282B ***Lab Sample ID:*** **042309385-0622**
Sample Description: 1990's Roof/Soft Concrete Deck

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Tan/White	18.0%	82.0%	None Detected	

Client Sample ID: 0413283 ***Lab Sample ID:*** **042309385-0623**
Sample Description: 1957 Roof/Rolled Roof

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Gray/White/Black	19.0%	81.0%	None Detected	

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Client Sample ID: 0413284 ***Lab Sample ID:*** **042309385-0624**
Sample Description: 1957 Roof/Soft Concrete

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	White	18.0%	82.0%	None Detected	

Client Sample ID: 0413285 ***Lab Sample ID:*** **042309385-0625**
Sample Description: 1957 Roof/Foam Board Paper

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Brown/Gray	97.0%	3.0%	None Detected	

Client Sample ID: 0413286A ***Lab Sample ID:*** **042309385-0626**
Sample Description: 1957 Roof/Bottom - Layer Tar

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Brown/White/Black	17.0%	83.0%	None Detected	

Client Sample ID: 0413286B ***Lab Sample ID:*** **042309385-0627**
Sample Description: 1957 Roof/Bottom - Layer Tar

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Brown/White/Black	15.0%	85.0%	None Detected	

Client Sample ID: 0413287 ***Lab Sample ID:*** **042309385-0628**
Sample Description: 1957 Roof/Perimeter Flashing

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Gray/Various/Black	18.0%	82.0%	None Detected	

Client Sample ID: 0413288 ***Lab Sample ID:*** **042309385-0629**
Sample Description: 1957 Roof/Soft Concrete

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Tan/White	10.0%	90.0%	None Detected	

Client Sample ID: 0413289A ***Lab Sample ID:*** **042309385-0630**
Sample Description: 1957 Roof/Perimeter Wall Tar

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Brown/Black	15.0%	85.0%	None Detected	

Client Sample ID: 0413289B ***Lab Sample ID:*** **042309385-0631**
Sample Description: 1957 Roof/Perimeter Wall Tar

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Brown/Black	13.0%	87.0%	None Detected	

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Client Sample ID: 0413290A ***Lab Sample ID:*** **042309385-0632**

Sample Description: 1957 Roof/Perimeter Wall Tar Paper

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Tan/Black	12.0%	88.0%	None Detected	

Client Sample ID: 0413290B ***Lab Sample ID:*** **042309385-0633**

Sample Description: 1957 Roof/Perimeter Wall Tar Paper

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/26/2023	Tan/Black	10.0%	90.0%	None Detected	

Client Sample ID: 0413291A ***Lab Sample ID:*** **042309385-0634**

Sample Description: 1957 Roof/Tar on Brick Perimeter Wall

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/27/2023	Gray/Black	0.0%	100.0%	None Detected	

Client Sample ID: 0413291B ***Lab Sample ID:*** **042309385-0635**

Sample Description: 1957 Roof/Tar on Brick Perimeter Wall

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/27/2023	Gray/Black	0.0%	100.0%	None Detected	

Client Sample ID: 0413292A ***Lab Sample ID:*** **042309385-0636**

Sample Description: 1957 Roof/Chimney Roof Flashing

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/27/2023	Black	0.0%	92.0%	**8% Chrysotile**	

Client Sample ID: 0413292B ***Lab Sample ID:*** **042309385-0637**

Sample Description: 1957 Roof/Chimney Roof Flashing

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/27/2023				Positive Stop (Not Analyzed)	

Client Sample ID: 0413293A ***Lab Sample ID:*** **042309385-0638**

Sample Description: 1950 Roof - Roof 3/Top Layer - Roof Shingle

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/27/2023	Black	5.0%	95.0%	None Detected	

Client Sample ID: 0413293B ***Lab Sample ID:*** **042309385-0639**

Sample Description: 1950 Roof - Roof 5/Top Layer - Roof Shingle

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/27/2023	Black	8.0%	92.0%	None Detected	

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Client Sample ID: 0413293C ***Lab Sample ID:*** **042309385-0640**
Sample Description: 1950 Roof - Roof 6/Top Layer - Roof Shingle

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/27/2023	Black	10.0%	90.0%	None Detected	

Client Sample ID: 0413293D ***Lab Sample ID:*** **042309385-0641**
Sample Description: 1950 Roof - Roof 7/Top Layer - Roof Shingle

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/27/2023	Black	8.0%	92.0%	None Detected	

Client Sample ID: 0413294A ***Lab Sample ID:*** **042309385-0642**
Sample Description: 1950 Roof - Roof 3/2nd Layer - Roof Shingle

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/27/2023	Black	6.0%	94.0%	None Detected	

Client Sample ID: 0413294B ***Lab Sample ID:*** **042309385-0643**
Sample Description: 1950 Roof - Roof 5/2nd Layer - Roof Shingle

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/27/2023	Black	8.0%	92.0%	None Detected	

Client Sample ID: 0413294C ***Lab Sample ID:*** **042309385-0644**
Sample Description: 1950 Roof - Roof 6/2nd Layer - Roof Shingle

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/27/2023	Black	4.0%	96.0%	None Detected	

Client Sample ID: 0413294D ***Lab Sample ID:*** **042309385-0645**
Sample Description: 1950 Roof - Roof 7/2nd Layer - Roof Shingle

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/27/2023	Black	8.0%	92.0%	None Detected	

Client Sample ID: 0413295A ***Lab Sample ID:*** **042309385-0646**
Sample Description: 1950 Roof - Roof 3/3rd Layer - Roof Shingle

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/27/2023	Black	0.0%	100.0%	None Detected	

Client Sample ID: 0413295B ***Lab Sample ID:*** **042309385-0647**
Sample Description: 1950 Roof - Roof 3/3rd Layer - Roof Shingle

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/27/2023	Black	0.0%	100.0%	None Detected	

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Client Sample ID: 0413296A **Lab Sample ID:** **042309385-0648**
Sample Description: 1950 Roof - Roof 3/Black Paper under Shingles

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/27/2023	Black	2.0%	98.0%	None Detected	

Client Sample ID: 0413296B **Lab Sample ID:** **042309385-0649**
Sample Description: 1950 Roof - Roof 5/Black Paper under Shingles

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/27/2023	Black	6.0%	94.0%	None Detected	

Client Sample ID: 0413296C **Lab Sample ID:** **042309385-0650**
Sample Description: 1950 Roof - Roof 6/Black Paper under Shingles

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/27/2023	Black	5.0%	95.0%	None Detected	

Client Sample ID: 0413296D **Lab Sample ID:** **042309385-0651**
Sample Description: 1950 Roof - Roof 7/Black Paper under Shingles

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/27/2023	Black	5.0%	95.0%	None Detected	

Client Sample ID: 0413297A **Lab Sample ID:** **042309385-0652**
Sample Description: 1950 Roof - Roof 3/Concrete Roof Deck

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/27/2023	Gray	0.0%	100.0%	None Detected	

Client Sample ID: 0413297B **Lab Sample ID:** **042309385-0653**
Sample Description: 1950 Roof - Roof 5/Concrete Roof Deck

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/27/2023	Gray	0.0%	100.0%	None Detected	

Client Sample ID: 0413297C **Lab Sample ID:** **042309385-0654**
Sample Description: 1950 Roof - Roof 6/Concrete Roof Deck

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/27/2023	Gray	0.0%	100.0%	None Detected	

Client Sample ID: 0413298A **Lab Sample ID:** **042309385-0655**
Sample Description: 1950 Roof - Roof 5/Copper Flashing Tar

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/27/2023	Black	0.0%	96.0%	**4% Chrysotile**	

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Summary Test Report for Asbestos Analysis of Bulk Material

Client Sample ID: 0413298B **Lab Sample ID:** **042309385-0656**
Sample Description: 1950 Roof - Roof 5/Copper Flashing Tar

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/27/2023			Positive Stop (Not Analyzed)		

Client Sample ID: 0413299A **Lab Sample ID:** **042309385-0657**
Sample Description: 1950 Roof - Roof 3/Gutter Tar

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/27/2023	Black	0.0%	100.0%	None Detected	

Client Sample ID: 0413299B **Lab Sample ID:** **042309385-0658**
Sample Description: 1950 Roof - Roof 3/Gutter Tar

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/27/2023	Black	0.0%	100.0%	None Detected	

Client Sample ID: 0413300A **Lab Sample ID:** **042309385-0659**
Sample Description: 1950 Roof - Roof 3/Gutter Seam Tar

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/27/2023	Black	0.0%	95.0%	**5% Chrysotile**	

Client Sample ID: 0413300B **Lab Sample ID:** **042309385-0660**
Sample Description: 1950 Roof - Roof 3/Gutter Seam Tar

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/27/2023			Positive Stop (Not Analyzed)		

Client Sample ID: 0413301A **Lab Sample ID:** **042309385-0661**
Sample Description: 1902 Roof - Roof 9/Top Layer - Shingle

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/27/2023	Black	2.0%	98.0%	None Detected	

Client Sample ID: 0413301B **Lab Sample ID:** **042309385-0662**
Sample Description: 1902 Roof - Roof 9/Top Layer - Shingle

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/27/2023	Black	2.0%	98.0%	None Detected	

Client Sample ID: 0413302A **Lab Sample ID:** **042309385-0663**
Sample Description: 1902 Roof - Roof 9/2nd Layer - Shingle

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/27/2023	Black	3.0%	97.0%	None Detected	

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Summary Test Report for Asbestos Analysis of Bulk Material

Client Sample ID: 0413302B ***Lab Sample ID:*** **042309385-0664**
Sample Description: 1902 Roof - Roof 9/2nd Layer - Shingle

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/27/2023	Black	3.0%	97.0%	None Detected	

Client Sample ID: 0413303A ***Lab Sample ID:*** **042309385-0665**
Sample Description: 1902 Roof - Roof 9/3rd Layer - Shingle

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/27/2023	Black	2.0%	98.0%	None Detected	

Client Sample ID: 0413303B ***Lab Sample ID:*** **042309385-0666**
Sample Description: 1902 Roof - Roof 9/3rd Layer - Shingle

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/27/2023	Black	2.0%	98.0%	None Detected	

Client Sample ID: 0413304A ***Lab Sample ID:*** **042309385-0667**
Sample Description: 1902 Roof - Roof 9/Black Paper under Shingle

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/27/2023	Black	2.0%	98.0%	None Detected	

Client Sample ID: 0413304B ***Lab Sample ID:*** **042309385-0668**
Sample Description: 1902 Roof - Roof 9/Black Paper under Shingle

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/27/2023	Black	3.0%	97.0%	None Detected	

Client Sample ID: 0413305A ***Lab Sample ID:*** **042309385-0669**
Sample Description: 1950's Roof - Roof 1/Top Layer - Roll Roof

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/27/2023	Black	2.0%	98.0%	None Detected	

Client Sample ID: 0413305B ***Lab Sample ID:*** **042309385-0670**
Sample Description: 1950's Roof - Roof 2/Top Layer - Roll Roof

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/27/2023	Black	2.0%	98.0%	None Detected	

Client Sample ID: 0413306A ***Lab Sample ID:*** **042309385-0671**
Sample Description: 1950's Roof - Roof 1/Soft Concrete

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/27/2023	Gray	0.0%	100.0%	None Detected	

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Summary Test Report for Asbestos Analysis of Bulk Material

Client Sample ID: 0413306B ***Lab Sample ID:*** **042309385-0672**

Sample Description: 1950's Roof - Roof 2/Soft Concrete

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/27/2023	Gray	0.0%	100.0%	None Detected	

Client Sample ID: 0413307A ***Lab Sample ID:*** **042309385-0673**

Sample Description: 1950 Roof - Roof 1/Field - Paper Layers

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/27/2023	Gray	83.0%	17.0%	None Detected	

Client Sample ID: 0413307B ***Lab Sample ID:*** **042309385-0674**

Sample Description: 1950 Roof - Roof 2/Field - Paper Layers

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/27/2023	Gray	89.0%	11.0%	None Detected	

Client Sample ID: 0413308A ***Lab Sample ID:*** **042309385-0675**

Sample Description: 1950 Roof - Roof 1/Field - Bottom Layer Tar

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/27/2023	Black	<1%	100.0%	None Detected	

Client Sample ID: 0413308B ***Lab Sample ID:*** **042309385-0676**

Sample Description: 1950 Roof - Roof 2/Field - Bottom Layer Tar

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/27/2023	Black	<1%	100.0%	None Detected	

Client Sample ID: 0413309A ***Lab Sample ID:*** **042309385-0677**

Sample Description: 1950 Roof - Roof 2/Tar on Deck

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/27/2023	Silver	0.0%	100.0%	None Detected	

Client Sample ID: 0413309B ***Lab Sample ID:*** **042309385-0678**

Sample Description: 1950 Roof - Roof 2/Tar on Deck

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/27/2023	Silver	0.0%	100.0%	None Detected	

Client Sample ID: 0413310A ***Lab Sample ID:*** **042309385-0679**

Sample Description: 1950 Roof - Roof 1/Penetration Flashing - Top Layer

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/27/2023	Black	2.0%	98.0%	None Detected	

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Summary Test Report for Asbestos Analysis of Bulk Material

Client Sample ID: 0413310B ***Lab Sample ID:*** **042309385-0680**

Sample Description: 1950 Roof - Roof 1/Penetration Flashing - Top Layer

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/27/2023	Black	2.0%	98.0%	None Detected	

Client Sample ID: 0413311A ***Lab Sample ID:*** **042309385-0681**

Sample Description: 1950 Roof - Roof 1/Penetration Flashing - 2nd Layer

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/27/2023	Black	8.0%	92.0%	None Detected	

Client Sample ID: 0413311B ***Lab Sample ID:*** **042309385-0682**

Sample Description: 1950 Roof - Roof 1/Penetration Flashing - 2nd Layer

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/27/2023	Black	9.0%	91.0%	None Detected	

Client Sample ID: 0413312A ***Lab Sample ID:*** **042309385-0683**

Sample Description: 1950 Roof - Roof 1/Penetration Flashing - Bottom on Concrete

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/27/2023	Gray/Black	0.0%	100.0%	None Detected	

Client Sample ID: 0413312B ***Lab Sample ID:*** **042309385-0684**

Sample Description: 1950 Roof - Roof 1/Penetration Flashing - Bottom on Concrete

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/27/2023	Gray/Black	8.0%	92.0%	None Detected	

Client Sample ID: 0413313A ***Lab Sample ID:*** **042309385-0685**

Sample Description: 1950 Roof - Roof 1/Perimeter Flashing - Top Tar

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/27/2023	Black	8.0%	92.0%	None Detected	

Client Sample ID: 0413313B ***Lab Sample ID:*** **042309385-0686**

Sample Description: 1950 Roof - Roof 2/Perimeter Flashing - Top Tar

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/27/2023	Tan/Red/Black	8.0%	92.0%	None Detected	

Client Sample ID: 0413314A ***Lab Sample ID:*** **042309385-0687**

Sample Description: 1950 Roof - Roof 1/Perimeter Flashing - Bottom Tar

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/27/2023	Black	7.0%	93.0%	None Detected	

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Summary Test Report for Asbestos Analysis of Bulk Material

Client Sample ID: 0413314B ***Lab Sample ID:*** **042309385-0688**

Sample Description: 1950 Roof - Roof 1/Perimeter Flashing - Bottom Tar

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/27/2023	Black	8.0%	92.0%	None Detected	

Client Sample ID: 0413315A ***Lab Sample ID:*** **042309385-0689**

Sample Description: 1950 Roof - Roof 1/Perimeter Flashing - Tar on Metal

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/27/2023	Black	48.0%	52.0%	None Detected	

Client Sample ID: 0413315B ***Lab Sample ID:*** **042309385-0690**

Sample Description: 1950 Roof - Roof 1/Perimeter Flashing - Trim and Wood Deck

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/27/2023	Black	0.0%	100.0%	None Detected	

Client Sample ID: 0413316A ***Lab Sample ID:*** **042309385-0691**

Sample Description: 1950 Roof - Roof 1/Perimeter Wall at Gym - Top Tar Flashing

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/27/2023	Black	14.0%	86.0%	None Detected	

Client Sample ID: 0413316B ***Lab Sample ID:*** **042309385-0692**

Sample Description: 1950 Roof - Roof 2/Perimeter Wall at Gym - Top Tar Flashig

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/27/2023	Black	13.0%	87.0%	None Detected	

Client Sample ID: 0413317A ***Lab Sample ID:*** **042309385-0693**

Sample Description: 1950 Roof - Roof 1/Perimeter Wall at Gym - 2nd Layer Tar Flashing

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/27/2023	Black	16.0%	84.0%	None Detected	

Client Sample ID: 0413317B ***Lab Sample ID:*** **042309385-0694**

Sample Description: 1950 Roof - Roof 2/Perimeter Wall at Gym - 2nd Layer Tar Flashig

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/27/2023	Red/Black	9.0%	91.0%	None Detected	

Client Sample ID: 0413318A ***Lab Sample ID:*** **042309385-0695**

Sample Description: 1950 Roof - Roof 2/Roofing Wall Mats

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/27/2023	Black	8.0%	92.0%	None Detected	

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Summary Test Report for Asbestos Analysis of Bulk Material

Client Sample ID: 0413318B ***Lab Sample ID:*** **042309385-0696**

Sample Description: 1950 Roof - Roof 2/Roofing Wall Mats

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/27/2023	Red/Black	8.0%	92.0%	None Detected	

Client Sample ID: 0413319A ***Lab Sample ID:*** **042309385-0697**

Sample Description: 1950 Roof - Roof 2/Roofing Field/Flash

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/27/2023	Black	45.0%	55.0%	None Detected	

Client Sample ID: 0413319B ***Lab Sample ID:*** **042309385-0698**

Sample Description: 1950 Roof - Roof 2/Roofing Field/Flash

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	4/27/2023	Black	36.0%	64.0%	None Detected	

Analyst(s):

April Schmuck	PLM (26)
Erick Rosa	PLM (134)
Jimmy Encalada	PLM (133) 400 PLM Pt Ct (3)
Luisa Vargas	TEM Grav. Reduction (9)
Rosemary Ortega	TEM Grav. Reduction (1)
Sawyer Fries	PLM (177)
Steve Jusczuk	PLM (173) 400 PLM Pt Ct (2)
Tomas Montes De Oca	PLM (15)

Reviewed and approved by:

Samantha Rundstrom, Laboratory Manager
or Other Approved Signatory

EMSL maintains liability limited to cost of analysis. Interpretation and use of test results are the responsibility of the client. This is a summary report; official reports are available on LabConnect or upon request and relates only to the samples reported above, and may not be reproduced, except in full, without written approval by EMSL. EMSL bears no responsibility for sample collection activities or analytical method limitations. The report reflects the samples as received. Results are generated from the field sampling data (sampling volumes and areas, locations, etc.) provided by the client on the Chain of Custody. Samples are within quality control criteria and met method specifications unless otherwise noted. The above analyses were performed in general compliance with Appendix E to Subpart E of 40 CFR (previously EPA 600/M4-82-020 "Interim Method") but augmented with procedures outlined in the 1993 ("final") version of the method. This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST or any agency of the federal government. Non-friable organically bound materials present a problem matrix and therefore EMSL recommends gravimetric reduction prior to analysis. Unless requested by the client, building materials manufactured with multiple layers (i.e. linoleum, wallboard, etc.) are reported as a single sample. Estimation of uncertainty is available on request.

Samples analyzed by EMSL Analytical, Inc. Carle Place, NY NVLAP Lab Code 101048-10, CA ELAP 2339

Report amended: 05/10/202316:43:00 Replaces amended report from: 05/02/202313:09:00 Reason Code: Client-Additional Analysis

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Asbestos Bulk Building Material Chain of Custody

EMSL Order Number (Lab Use Only): 042309385

EMSL-Bill to: ☐ Same ☒ Different
If Bill to is Different note instructions in Comments:
Langan_InvoiceCapture@ConcurSolutions.com
Third Party Billing requires written authorization from third party

Company: Langan CT			
Street: 555 Long Wharf Drive			
City: New Haven	State/Province: CT	Zip/Postal Code: 06511	Country: USA
Report To (Name): Matthew Myers		Telephone #: 203.562.5771	
Email Address: MMyers@Langan.com		Fax #: 203.789.6142	Purchase Order:
Project Name/Number: 140265802		Please Provide Results: ☐ Fax ☒ Email	Public School
U.S. State Samples Taken: CT		CT Samples: ☐ Commercial/Taxable ☒ Residential/Tax Exempt	

Turnaround Time (TAT) Options* – Please Check

☐ 3 Hour ☐ 6 Hour ☐ 24 Hour ☐ 48 Hour ☐ 72 Hour ☐ 96 Hour ☒ 1 Week ☐ 2 Week

*For TEM Air 3 hr through 6 hr, please call ahead to schedule.*There is a premium charge for 3 Hour TEM AHERA or EPA Level II TAT. You will be asked to sign an authorization form for this service. Analysis completed in accordance with EMSL's Terms and Conditions located in the Analytical Price Guide.

PLM - Bulk (reporting limit)

☒ PLM EPA 600/R-93/116 (<1%)
☐ PLM EPA NOB (<1%)
Point Count ☒ 400 (<0.25%) ☐ 1000 (<0.1%) If <3%
Point Count w/Gravimetric ☐ 400 (<0.25%) ☐ 1000 (<0.1%)
☐ NIOSH 9002 (<1%)
☐ NY ELAP Method 198.1 (friable in NY)
☐ NY ELAP Method 198.6 NOB (non-friable-NY)
☐ OSHA ID-191 Modified
☐ Standard Addition Method

TEM – Bulk

☐ TEM EPA NOB – EPA 600/R-93/116 Section 2.5.5.1
☐ NY ELAP Method 198.4 (TEM)
☐ Chatfield Protocol (semi-quantitative)
☐ TEM % by Mass – EPA 600/R-93/116 Section 2.5.5.2
☐ TEM Qualitative via Filtration Prep Technique
☐ TEM Qualitative via Drop Mount Prep Technique

Other

☐ Old Greenwich School

☒ Check For Positive Stop – Clearly Identify Homogenous Group

Date Sampled: 4/10 - 4/13/23

Samplers Name: Willie Thompson & Matt Myers

Samplers Signature: [signature]

Sample #	HA #	Sample Location	Material Description
04B01A		1990's Addition Classroom 115	Black Sink Undercoating
B			+
02A			Gray Sink undercoating
B		114	+
03A		115 Closet	Kiln
B			+
04A			Kiln Roping
B			+
03A		115	Sink Caulking
B		+	+

Client Sample # (s): -

Total # of Samples: 697

Relinquished (Client): [signature] Date: 4/17/23 Time:

Received (Lab): Dan Stamp FXE Date: 4-19-23 Time: 9:40 am

Comments/Special Instructions:

Controlled Document – Asbestos COC – R6 – 11/29/2012

699 ns

OrderID: 042309385

Asbestos Bulk Building Material Chain of Custody

EMSL Order Number (*Lab Use Only*): 042309385

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EMSL
CINNAMINSON, NJ
2023 OCT 19 P 3:40

Sample #	HA #	Sample Location	Material Description
041306A		1990's Addition Classroom 115	Window Sill Caulking
B		↓	↓
07A		Cafe / Corridor	Interior Door Window Glazing (Black gasket)
B		Kitchen Exit Door	↓
08A		Kitchen	HVAC Duct Seam Sealant
B		↓	↓
09A		↓	2x4 Ceiling tile
B		↓	↓
10A		Classrooms (*) / Corridor / Cafe	↓
B		↓	↓
11A		Classroom 115	Gypsum Board
B		↓ 114	↓
12A		115	Joint Taping Compound
B		114	↓
C		Kitchen	
13A		Kitchen	Sheet Flooring
B		↓	↓
14A		↓	Adhesive (Tan) Brown
B		↓	↓
15A		↓	Grey Cement Substrate
B		↓	↓
16A		Cafe	12x12 Pink Floor Tile
B		↓	↓
17A		↓	12x12 White Floor Tile
B		classroom 115 Closet	↓

***Comments/Special Instructions:**

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Asbestos Bulk Building Material Chain of Custody

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Sample #	HA #	Sample Location	Material Description
041358A		1990's Addition Classroom 114	12x12 Blue Floor Tile
B		Cafe	↓
C		Kitchen Storage	↓
19A		Classroom 114	↓ yellow mastic
B		Cafe [redacted]	↓ ↓
C		Kitchen Storage	↓
20A		Classroom 115	Floor Tile Leveler
B		114	↓
21A		Exit Door Entry	Rubber Sheet Flooring
B		↓	↓
22A		↓	↓ Yellow Adhesive
B		↓	↓ ↓
23A		Kitchen	Grey Floor Leveler ONLY
B		↓	↓
24A		Cafeteria	Dark Cove Base
B		Classroom 115	↓ ↓
25A		Cafeteria	↓ White Adhesive
B		Classroom 115	↓ ↓
26A		Classroom 115 Closet	Pink Cove Base
B		↓	↓
27A		↓	↓ Yellow Adhesive
B		↓	↓ ↓
28A		Kitchen Storage	White Cove Base
B		↓	↓

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Sample #	HA #	Sample Location	Material Description
041329A		1990's Addition Kitchen Storage	White Cove Base Tan Adhesive
B		↓	↓
30A		Kitchen	Plastic Wall Adhesive
B		↓	↓
31A		Cafeterium & Corridor	Wall/Bulletin Board Adhesive
B		↓	↓
32A		Corridor	↓ Fabric Cover
B		Classroom 114	↓
33A		Corridor	↓ Gray Material
B		Classroom 114	↓
34A		Corridor	↓ Brown Material
B		↓	↓
35A		Cafeterium/Corridor Toilet Rooms	Ceramic Wall Tile Hard Gray Mud Material ONLY
B		~~[illegible]~~ ↓	↓
36A		Toilet Rooms	Ceramic Floor Tile Mud Bed
B			↓ ↓
37A			Grout
B			↓ ↓
38A			Ceramic Wall Tile Grout
B		↓ ↓	↓
39A		1957 Addition Classroom 37	White Sink Undercoating
B		24	↓
40A		6	Gray Sink Undercoating
B		6	↓

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041341A		1957 Addition Classroom 37	Interior Window Glazing Above Doors (PCB)
B			
42A		37	2x2 Ceiling Tile
B		24	
43A		24	Gypsum Board
B		6	
44A		24	Joint/ Taping Compound
B		6	
C		1	
45A		Classroom 37	Wall Plaster Finish White Coat
B			
C			
D		24	
E			
F		6	
G		1	
46A		Classroom 37	Gray Rough Coat
B			
C			
D		24	
E			
F		6	
G		1	
47A		24	Black Paper on Concrete Deck
B		1	

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Sample #	HA #	Sample Location	Material Description
0413 48A		1957 Addition Classroom 37	Black Damppooting Perimeter wall
B			
49A		37	12x12 Light Blue Floor Tile
B		24	
50A		6	12x12 Blue Floor Tile
B			
51A		37	Black Mastic
B		6	
52A		37	Formica Countertop Adhesive
B			
53A		6	Core Base
B			
54A			Adhesive White Tan
B			
55A		Classroom 37	Bulletin Board Top Layer
B			
56A			Light Brown Adhesive
B			
57A			Second Layer
B			
58A			Brown Adhesive
B			
59A		Classroom 6	Adhesive Gray
B			

NoB [illegible]

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Sample #	HA #	Sample Location	Material Description
041360A		1950 Addition Classroom 42 (41 also)	White Sink undercoating
B		2	⊥
61A		1 Toilet	Light Grey Sink undercoating
B		1 ⊥	⊥ ⊥
62A		4	Dark Grey ⊥
B		4	⊥ ⊥
63A		Mech Rm Above 29 media	Duct Pin Adhesive Brown
B		⊥	⊥
64A			Duct Insulation Residue White
B			⊥
C		⊥	
65A		Outside Storage Room (3 bag)	Duct Insulation Grey
B		⊥	⊥
C		⊥	
66A		Mech Rm Above 29 media in Brick Pipe	Pipe End Cap Insulation
B		⊥	⊥
C		⊥	
67A		Attic (4 area)	Mineral Wool Loose Insulation
B		Mech Rm Above 29 media	⊥
C		⊥	
68A		Boiler Room	Spray Applied Fireproofing
B C		⊥	⊥
D			
E		⊥	⊥

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Sample #	HA #	Sample Location	Material Description
041369A		1950 Addition Locker Rm	Red Fire Stop Caulking newer
B			
70A		Mech Rm Above 29 media	Duct Seam Caulking newer
B			
71A		Classroom 41	Interior Door Window Glazing Black PCB
B		42	
72A		Room 29 media	
B			
73A		Stairwell by 41 & 29	Interior Glass Block Window Grout
B			
74A			Interior Window Caulk old Thick Hard PCB
B			
75A		Gymnasium	Interior Window Caulk newer white
B			
76A			older black Thick PCB
B			
77A		Stair/hall by 12	Interior Door Caulk hard Thin white PCB
B		Gym Foyer Lobby	
C		Corridor	
78A		Gym Foyer ~~Corridor~~	Interior Door/Window Caulk Perimeter Exit
B			
79A		Classroom 3/4 Corridor	Interior Door Caulk white newer
B			
80A			Interior Window Caulk Black sticky Age?
B			

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Sample #	HA #	Sample Location	Material Description
041381A		1950 Addition Classroom 3/4 Corridor	Interior Window Glaze Putty white
B		〃	〃
82A		Classroom 41	Blackboard Asbestos Glue
B		〃 42	〃
83A		〃 41	Slate Window Sill Glue?
B		〃 42	〃
84A		〃 〃	Formica Counter Adhesive
B		〃 〃	〃
85A		〃 41	2x2 Ceiling Tiles Dark Brown Backing
B		Gym Foyer Lobby	〃 〃
86A		Classroom 3	Light Tan Backing
B		〃 4	〃 〃
87A		Locker Toilet	Gypsum ceiling tile
B		Rm 1 Toilet	〃
88A		Classroom 1	1x1 Ceiling tiles Large Hole
B		〃	〃 〃
89A		〃	Small pin hole
B		〃	〃 〃
90A		〃	Smooth
B		〃	〃
91A		Teacher Room/Lounge	Kitchenette
B		〃	〃
92A		Classroom 1	1x1 ceiling tile Adhesive Yellow
B		〃	〃 〃

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Sample #	HA #	Sample Location	Material Description
041393A		1950 Addition Classroom 1	9x1 Ceiling tile Adhesive Dark Brown
B		↓	↓ ↓
94A		Classroom 41	Gypsum Board
B		Locker Toilet	↓
C		Corridor (Rm 2)	
95A		Classroom 42 Closet	Taping/Joint compound
B		Locker Toilet	↓
C		Corridor (Rm 2)	
96A		Corridor Closet by 42	One Coat Ceiling Plaster
B		Utility Rm by 10	↓
C		↓	
97A		Outside Storage Rm by 3	One Coat Wall Plaster (Cement?)
B		↓	↓
C		↓	↓
98A		Classroom 1	Ceiling Plaster White Finish Coat
B		↓	↓ ↓
C		Janitor Closet / Storage adjacent outside Am	↓ ↓
99A		Classroom 1	Rough Coat tan/gray
B		↓	↓
C		Janitor Closet / Storage adjacent outside Am	↓
100A		Classroom 1	Wall Plaster White Finish Coat
B		Janitor Closet	↓
C		↓	Rough Coat tan/gray
101 A B C		Classroom 1 Janitor Closet	↓ ↓

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Sample #	HA #	Sample Location	Material Description
041302A		1958 Addition — Gym Locker Rms	Ceiling Plaster — White Finish Coat
B		↓	↓
C		↓	↓
103A		↓	Gray/Tan Rough Coat
B		↓	↓
C		↓	↓
104A		↓	Wall Plaster — White Finish Coat
B		↓	↓
C		Gym Corridor	↓
105A		Gym Locker Rms	↓ — Gray/Tan Rough Coat
B		↓	↓
C		Gym Corridor	↓ — White Finish Coat
106A		Media Center Data Rm	Wall Plaster
B		Corridor (41)	↓
C		Classroom 41	↓
107A		Media Center Data Room	↓ — Gray/Tan Rough Coat
B		Corridor (41)	↓
C		Classroom 42	↓ — White Finish Coat
108A		Media Center Data Rm	Ceiling Plaster
B		Stairwell (42)	↓
C		↓	↓ — Gray/Tan Rough Coat
109A		Media Center Data Rm	↓
B		Stairwell (42)	↓
C		↓	↓

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Sample #	HA #	Sample Location	Material Description
04131104		1950 Addition Stage	Black Paper under Wood Floor
B			
111A		under Stage	Black Tar on Block wall
B			
112A			Black Paper on Block wall
B			
113A		(ramp) by Cust Closet 10	9x9 Floor tile
B			
114A			Black mastic
B			
115A		Custodial office	
B		under Shelving	
116A			Black Mastic
B			
117A		Custodial office	12x12 Blue Floor tile
B		Classroom 4	
C			(4)
118A		Custodial office	Black Mastic
B		Classroom 4	
119A		Gym office	12x12 White Floor tile
B			
120A			Black mastic
B			

NOB TEM f neg by PLM

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Sample #	HA #	Sample Location	Material Description
0413121 A		1950 Addition Classroom 41/40	12X12 Green/Blue Floor tile
B			
122 A			Black mastic
B			
123 A		Classroom 3/4/corridor	Cove Base
B		Classroom 4	
124 A		Classroom 3/4/corridor	Adhesive
B		Classroom 4	
125 A		Classroom 42	Sink wall Gray material
B			
126 A			Black Material behind gray
B			
127 A			Adhesive behind black
B			
128 A		Corridor 3/4 rooms	Wood Panel Wall Adhesive Yellow Brown
B			
129 A		Classroom 42 Closet	Cork Bull. Board Adhesive Dark Brown Thin
B		41	
130 A		same as 12 Classroom 42	Bulk Board
B		41	
131 A		42	Adhesive Dark Brown
B		41	
132 A		Classroom 12	Bull Board Adhesive Light Brown
B			

NOB TEM if negative by PLM

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Sample #	HA #	Sample Location	Material Description
041313314		1950's Addition Classroom 1	Grey Bulletin Board (on black)
B		Teachers Lounge	"
134A		Corridor (41)	Terrazzo Floor
B		"	"
135A		"	" Mud Bed
B		"	"
136A		Corridor (13)	" "
B		"	" "
137A		Classroom 1	Concrete Deck
B		"	"
138A		outside storage Rm	Block Wall
B		"	"
139A		"	Mortar
B		"	"
C		"	"
140A		Class 1/2 tolled	Epoxy Floor Cove
B		Locker "	"
141A		Class 1/2 toilet	" White Mud Bed
B		"	"
142A		Locker Shower Wall Behind Stage	Ceramic Wall Adhesive Dark Brown
B		"	"
143A		Class 1 toilet	Ceramic Wall Grout Thin Tan
B		Janitor Closet by outside Class 4 toilet	" " Thick White
144A B		"	"

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Sample #	HA #	Sample Location	Material Description
0413145A		1950's Addition Class 1 toilet	Ceramic Wall Mud white
B		4	
146 A		Janitor Closet by outside Rm	Tan
B		Gym Shower	
147A		Janitor Closet by outside Rm	Ceramic Floor Grout Gray
B		Gym Shower	
148 A		Class 4 toilet	White
B			
149 A			Ceramic Floor Mudbed tan
B		Gym Shower	
150 A		Janitor Closet by outside Rm	Brown
B		Am 10	
151 A		1902 Original Bldg Classroom 14	Sink Undercoating Pink
B		38	
152 A		43	White
B		31	
153 A		7	Gray
B		25	
C		Nurses	
154A		Corridor By 37	Fire Door Insulation Disc All Doors
B			
155A		Classroom 32	Red Fire Stop
B		39'	
156 A		Attic	Batt Insulation Backing Black paper
B			

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Sample #	HA #	Sample Location	Material Description
0413157A		1902 original Bldg Classroom 43	Interior Window Glazing hard thin old (PCB)
B		44	
158A		44	many room Sink Backsplash Caulk white newer
B		22	
159A		30 (other rooms)	Interior Window/Sill Caulk white hard age?
B			
160A		Library entry	Interior Window Glazing Black sticky 90s?
B		Room	
161A		Library entry	Interior Door/Window Glazing
B			
162A		Corridor (8)	
B		(3/4) to 6	
163A		Classroom 43	Black board (assume glue daubs)
B		32	
164A		Classroom 43	Countertop Adhesive
B			
165A		Classroom 9	Gray Bulletin Board
B			
166A			Canvass Cover Adhesive
B			
167A		Classroom 43	Bulletin Board
B		31	
168A		43	Adhesive Dark Brown
B		31	

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Sample #	HA #	Sample Location	Material Description
841 3/6A		1902 Original Bldg Classroom 20	Green Bull Board
B		↓	↓
170A		↓	Red Bulletin Board
B		↓	↓
171A		↓	↓ Brown Adhesive
B		↓	↓
172A		Classroom 44	Sink Wall Gray Layer
B		↓	↓
173A		↓	Black Layer
B		↓	↓
174A		↓	Brown Adhesive
B		↓	↓
175A		↓ 7	Ball Board Adhesive Brown Mastic
B		↓ 9	↓ ↓
176A		Library	Wall Adhesive Brown
B		↓	↓ ↓
177A		Classroom 7	↓ White
B		↓	↓
178A		↓ 8	↓ Yellow
B		↓	↓
179A		↓ 44	2x2/2x4 Ceiling Tiles Dark Backing
B		↓ 43	↓
180A		↓ 5	2x4 Ceiling Tile Tan Backing
B		↓ 1	↓ ↓

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Sample #	HA #	Sample Location	Material Description
041318 1A		1902 Original Bldg Library	2x4 Ceiling Tile
B		⊥	⊥
180A		Toilet by 9	Gypsum ceiling tile 2x4
B		⊥	⊥
183A		Corridor (44)	Gypsum Board
B		Nurse	⊥
C		Class Room 7	⊥
184A		⊥ 31 Closet	↓ Joint Tape Compound
B		Library	↓
C		Classroom 7	↓
185A		⊥ 9	One Coat Ceiling Plaster
B		↓ 5 Closet	⊥
C		⊥	⊥
186A		Corridor (8)	Wall Plaster White Finish Coat
B		(5)	⊥ ⊥
C		Classroom 7 Beam	⊥ ⊥
187A		Corridor (8)	↓ Rough Coat Gray/tan
B		⊥ (5)	⊥
C		Classroom 7 Beam	↓
188A		⊥ 23	Wall Plaster White Finish Coat
B		⊥ 28	↓ ⊥
C		Corridor	↓
189A		Classroom 23 28	Rough Coat Gray/tan
B		↓	↓
C		Corridor	⊥

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Sample #	HA #	Sample Location	Material Description
043190A		1902 Original Bldg Classroom 23	Ceiling Plaster White Finish Coat
B		27	↓
C		28	↓
191A		23	Gray/Tan Rough Coat
B		25	↓
C		28	↓
192A		31	Wall Plaster White Finish Coat
B		43	↓
C		44	↓
193A		31	Gray/Tan Rough Coat
B		43	↓
C		44	↓
194A		31	Ceiling Plaster White Finish Coat
B		43	↓
C		44	↓
195A		31	Gray/Tan Rough Coat
B		43	↓
C		44	↓
196A		Main Office	18" x 18" Floory Material
B		↓	↓
197A		↓	↓ Gray material
B		↓	↓ ↓
198A		↓	↓ yellow mastic
B		↓	↓ ↓

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EMSL ANALYTICAL, INC.
LABORATORY • PRODUCTS • TRAINING

Asbestos Bulk Building Material Chain of Custody

EMSL Order Number *(Lab Use Only)*: 042309385

EMSL ANALYTICAL, INC.
200 ROUTE 130 NORTH
CINNAMINSON, NJ 08077
PHONE: (800) 220-3675
FAX: (856) 786-5974

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Sample #	HA #	Sample Location	Material Description
0413199A		1962 Original Bldg Lower Floor Starwell	Gray Floor Leveler
B		↓	↓
200A		Starwell 35	Older Floor Tile
B		↓ ~~[illegible]~~ Lower Level	↓
201A		↓ 35	↓ Black Mastic
B		↓ Lower Level	↓ ↓
202A		Classroom 43	12x12 Light Blue Floor Tile
B		Lower Level Corridor	↓
203A		Classroom 43	↓ Black mastic
B		Lower Level Corridor	↓ ↓
C		Classroom 9	
204A		↓ 30	Red Floor Material under Plywood
B		↓	↓
205A		↓ 39	Paper under Plywood Floor T
B		↓ ↓	↓ w
206A		(some Black mastic middle landing) Starwell (44)	Rubber Floor Adhesive yellow
B		↓	↓
207		↓	Black mastic under Rubber Floor
208A		02 Library	Olera Carpet Adhesive yellow
B		50's ↓	↓
209A		toilet room by 7	Epoxy Floor
B			↓
210A		2nd Floor Corridor	Terrazo Floor
B		↓	↓

NOB TEM if negative by PLM

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Sample #	HA #	Sample Location	Material Description
042311A		1902 Original Bldg 2nd Flr Corridor	Terrazzo Floor Mud Bed
B		↓	↓
212A		Classroom 43	Dark Cove base
B		Corridor at 5	↓
213A		Classroom 43	Adhesive Yellow
03 B*		Corridor at 5	↓ ↓
214A		(most areas) Nurse Office	Cove base
B		Library	↓
C		Stair well	↓
215A		Nurse office	↓ Adhesive white/tan
B		Library	↓
C		Stairwell	↓
216		Lower Level Corridor	↓
217		↓	↓ Adhesive
218A		Library	Dark leveler / Floor Material
B		↓	↓
219A			Beige concrete Floor Material
B			↓
220A			Gray Concrete Floor Material
B			↓
221A		Attic	Brick wall
B		↓	↓
222A			Newer Brick
B		↓	↓

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Sample #	HA #	Sample Location	Material Description
0413223A		1902 Orignal Bldg Attic	Brick wall Grout
B			
224A			new Wall Mortar/Grout
B			
225A			Wall Plaster White Finish Coat
B			
C			
226A			Gray/Tan rough coat
B			
C			
227A			Hard Gray Floor Material Plaster ?
B			
228A		1950 Addition	
B			
229A		1902 Orignal Bldg 2nd Floor Corridor Toilet	Ceramic wall Mud Bed Bomb whi
B			
230A		? last closet	gray
B			
231A		Main office toilet	Ceramic wall tile Adhesive
B			
C		Room 8 toilet	
232A		main office toilet	Ceramic wall tile Grout Thick white
B			
233A		Custodial closet	thin white
B			

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Sample #	HA #	Sample Location	Material Description
041237-1A		1902 Original Bldg 2nd Mens toilet	Ceramic Wall tile Grout tan
B		womens ⊥	⊥ ⊥
235		Classroom 8 toilet	Ceramic wall tile Grout tan
236A		Mens toilet 2nd	Ceramic Floor Mud Bed unit
B		⊥	⊥
237A		Industrial 2nd closet or 1st?	⊥ ⊥ tan Gray
B		⊥	⊥
238A		Main Office toilet	⊥ ⊥ Tan Gray
B		⊥	⊥
239A		⊥	Ceramic Floor? tile Adhesive
B		⊥	⊥
C		Classroom 8 toilet	
240A		Cust. Closet	Ceramic Floor Grout Dark Gray
B		main Office toilet	⊥ ⊥
241A		Mens toilet 2nd	⊥
B		⊥	⊥
242		Class 8 toilet	Ceramic Floor Grout
243A		tunnels 1x3 2? 3'x3'	Black Paper Debris
B		⊥ ⊥	⊥
244A		Gym office Area 1'SF	Debris Tan Paper
B		⊥	⊥
245A		perimeter at ceiling Gym	Black Tar Paper
B		⊥	⊥
246A + B		BR/10 Area → Brick concrete Found wall?	Black Tar Paper ⊥

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Sample #	HA #	Sample Location	Material Description
0413247A		1990's Addition	Exterior Window Sill Caulk White
B			↓
248A			Exterior wall Wind/Door R/ Exp/vent Caulk Beige
B			↓
249A		1957 Addition	Foundation Tar Damp-Proofing
B			↓
250A			Ext wall/Paint Lower Floor
B			↓
C			↓
251A			Ext. vent Caulk old PCB
B			↓
252A			Ext Door Caulk newer
B			↓ ↓
253A			Ext Window Caulk newer
B			↓ ↓
254A		1950 Addition	Ext Window Caulk Glass Block Thick OLD PCB
B			
255A			Ext Window Caulk white/yellow newer Cant Find old
B			↓
256A		PARM & residue adj Door	Ext Door Caulk older PCB
B			↓ ↓
257A			↓ newer on top of white
B			↓ ↓
258 A			Ext wall Expansion Caulk OLD
B			↓ PCB

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Sample #	HA #	Sample Location		Material Description
041325911		1958 Addition Boiler Room		Ext vent Caulk newer
B		↓		↓
260A				OLDER PCB
B				
261A				OLDER PCB
B		Lower		
262A		Front Bldg		Ext wall / Paint Front
B		↓		↓
C		↓ vent same?		↓
263A		1902 Original Bldg		Ext Window Caulk newer white/yellow Caulk and old
B		↓		↓
264A				Ext Door Caulk newer
B				↓
265A				older PCB
B				↓
266A		Main Entry		Front Door + Windows Caulk OLDE & glaze PCB
B		↓		↓
267A		1957 Roof		Copper Flashing Caulk newer
B		↓		↓ ↓
268A		1905 Roof	4A	newer
B		50 ↓	5	↓ ↓
269A		50 Roof	1	Perimeter Caulk newer
B		90's ↓	4A	↓ ↓
270A B		90S Roof & 50S ↓		Building Exp Caulk & HVAC Caulk newer Gray

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Sample #	HA #	Sample Location	Material Description
041327IA		1990s Roofs 14B	Top Layer Roof Shingle
B			⊥
272A			Bottom Layer Roof Shingle
B			⊥
273A			Black paper under Shingles
B			⊥
274A		— 4A	Perimeter Flashing tar (on wood)
B			⊥
275A			Penetration Flashing tar
B			⊥
276A		3x3	HVAC Tar (under caulk)
B			⊥
277A		4A & 5? 20 SF	Copper Flash tar
B			⊥
278A		cable	Tar Patch Copper Flash tar
B			⊥
279A			Rolled Roof (top)
B			⊥
280A			Soft Concrete (2nd layer)
B			⊥
281A			Fiberboard paper layer (3rd)
B			⊥
282A			Soft Concrete Deck
B			⊥

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Sample #	HA #	Sample Location		Material Description
0413283A		1957 Roof		Rolled Roof same as 4
284				Soft Concrete
285				Fourboard Paper
286A				Bottom Layer Tar
286B				
287A				Perimeter Flashing (rolled roof same)
288				Soft Concrete
289A				Perimete Wall Tar (Top Thick)
B				
290A				Tar paper (Bottom)
B				
291A				Tar on Brick perimeter wall
B				
292A			others same	Chimney Roof Flashing
B				
293A		1950 Roof	Roof 3	Top Layer Roof Shingle
B			5	
C			6	
D			7	
294A			3	2nd Layer Roof Shingle
B			5	
C			6	
D			7	
295A B			Roof 3	3rd Layer

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Sample #	HA #	Sample Location		Material Description
0413296A		1950 Roof	Roof 3	Black paper under shingles
B			5	
C			6	
D			7	
297A			3	Concret Roof Deck
B			5	
C			6	
298A			5	Copper Flushing tar
B				
299A			3	Gutter tar
B				
300A				Gutter seam tar
B				
301A		1902 Roof	9	Top Layer Shingle
B				
302A				2nd Layer
B				
303A				3rd Layer
B				
304A				Black Paper under Shingle
B				
305A		1950's Roof	1	Top Layer Metal Roll Roof
B			2	
306A			1	soft concrete (Hardpan M. weld)
B			2	

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Sample #	HA #	Sample Location		Material Description
0413307A		1950 Roof	Roof 1	Field Paper Layers
B			2	↓
308A			1	Field Bottom Layer Tar
B			2	↓
309A			2	Tar on Deck
B			2	↓ perimeter
310A			1	Penetration Flashing top Layer
B			1	↓
311A			1	2nd layer
B			1	↓
312A			1	Bottom on Concrete
B			1	↓
313A			1	Perimeter Flash Top Tar
B			2	↓ ↓
314A			1	Bottom tar
B			1	↓ ↓
315A			1	Tar on metal Trim
B			1	& wood Deck
316A			1	Perimeter wall at Gym top tar Flash
B			2	↓ ↓ ↓
317A			1	at Gym 2nd layer Perimeter tar Flash
B			2	↓ ↓
318A B		3x5 12, 5, 33 1, 2, 4A etc	Roof over Bay windows	4A Roofing walk mats
319A B			↓	Roofing Field / Flash

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Asbestos Bulk Building Material Chain of Custody

EMSL Order Number (Lab Use Only): 042309385

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Company: Langan CT	**EMSL-Bill to:** ☐ Same ☒ Different If Bill to is Different note instructions in Comments** Langan_InvoiceCapture@ConcurSolutions.com *Third Party Billing requires written authorization from third party*
Street: 555 Long Wharf Drive	
City: New Haven **State/Province:** CT	**Zip/Postal Code:** 06511 **Country:** USA
Report To (Name): Matthew Myers	**Telephone #:** 203.562.5771
Email Address: MMyers@Langan.com	**Fax #:** 203.789.6142 **Purchase Order:**
Project Name/Number: 140265802	**Please Provide Results:** ☐ Fax ☒ Email Public School
U.S. State Samples Taken: CT	**CT Samples:** ☐ Commercial/Taxable ☒ Residential/Tax Exempt

Turnaround Time (TAT) Options* – Please Check

☐ 3 Hour ☐ 6 Hour ☐ 24 Hour ☐ 48 Hour ☐ 72 Hour ☐ 96 Hour ☒ 1 Week ☐ 2 Week

*For TEM Air 3 hr through 6 hr, please call ahead to schedule.*There is a premium charge for 3 Hour TEM AHERA or EPA Level II TAT. You will be asked to sign an authorization form for this service. Analysis completed in accordance with EMSL's Terms and Conditions located in the Analytical Price Guide.

PLM - Bulk (reporting limit)

☒ PLM EPA 600/R-93/116 (<1%)
☐ PLM EPA NOB (<1%)
PointCount ☒ 400 (<0.25%) ☐ 1000 (<0.1%) If <3%
Point Count w/Gravimetric ☐ 400 (<0.25%) ☐ 1000 (<0.1%)
☐ NIOSH 9002 (<1%)
☐ NY ELAP Method 198.1 (friable in NY)
☐ NY ELAP Method 198.6 NOB (non-friable-NY)
☐ OSHA ID-191 Modified
☐ Standard Addition Method

TEM – Bulk

☐ TEM EPA NOB – EPA 600/R-93/116 Section 2.5.5.1
☐ NY ELAP Method 198.4 (TEM)
☐ Chatfield Protocol (semi-quantitative)
☐ TEM % by Mass – EPA 600/R-93/116 Section 2.5.5.2
☐ TEM Qualitative via Filtration Prep Technique
☐ TEM Qualitative via Drop Mount Prep Technique

Other

☐ Old Greenwich School

☒ Check For Positive Stop – Clearly Identify Homogenous Group | **Date Sampled:** 4/10 - 4/13/23

Samplers Name: Willie Thompson, Matt Myers | **Samplers Signature:** [signature]

Sample #	HA #	Sample Location	Material Description
041301A		1990's Addition Classroom 115	Black Sink Undercoating
B			+
02A			Gray Sink Undercoating
B		114	+
03A		115 Closet	Kiln
B			+
04A			Kiln Roping
B			+
03A		115	Sink Caulking
B		+	+

Client Sample # (s): **Total # of Samples:** 697

Relinquished (Client): [signature] **Date:** 4/17/23 **Time:**

Received (Lab): David Stepp FYE **Date:** 4-19-23 **Time:** 9:40 am

Comments/Special Instructions:

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[signature] 4/25/23 [signature] 4/27/23 [signature] 4/27/23 [signature] 4/28/23 699 NS [signature] 4/28/23 Jamie Montes De Oca 4/26/23

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Asbestos Bulk Building Material Chain of Custody

EMSL Order Number (*Lab Use Only*):

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Sample #	HA #	Sample Location	Material Description
041306A		1990's Addition Classroom 115	Window Sill Caulking
B		↓	↓
07A		Cafe/Corridor	Interior Door Window Glazing Black gooey
B		Kitchen Exit Door	↓
08A		Kitchen	HVAC Duct Seam Sealant
B		↓	↓
09A		↓	2x4 Ceiling tile
B		↓	↓
10A		Classrooms/Corridor/Cafe	↓
B		↓	↓
11A		Classroom 115	Gypsum Board
B		↓ 114	↓
12A		↓ 115	↓ Joint/Taping Compound
B		↓ 114	↓ ↓
C		Kitchen	
13A		Kitchen	Sheet Flooring
B		↓	↓
14A		↓	↓ Adhesive Tan Brown
B		↓	↓ ↓
15A		↓	↓ Gray Cement Substrate
B		↓	↓ ↓
16A		Cafe	12x12 Pink Floor Tile
B		↓	↓
17A		↓	12x12 White Floor Tile
B		Classroom 115 Closet	↓

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Sample #	HA #	Sample Location	Material Description
041318A		1990's Addition Classroom 114	12x12 Blue Floor Tile
B		Cafe	
C		Kitchen Storage	
19A		Classroom 114	yellow mastic
B		Cafe	
C		Kitchen Storage	
20A		Classroom 115	Floor Tile Leveler
B		114	
21A		Exit Door Entry	Rubber Sheet Flooring
B			
22A			Yellow Adhesive
B			
23A		Kitchen	Gray Floor Leveler ONLY
B			
24A		Cafeteria	Dark Cove Base
B		Classroom 115	
25A		Cafeteria	White Adhesive
B		Classroom 115	
26A		Classroom 115 Closet	Pink Cove Base
B			
27A			Yellow Adhesive
B			
28A		Kitchen Storage	White Cove Base
B			

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Sample #	HA #	Sample Location	Material Description
041329A		1990's Addition Kitchen Storage	White Cove Base Tan Adhesive
B		↓	↓
30A		Kitchen	Plastic Wall Adhesive
B		↓	↓
31A		Cafeterium & Corridor	Wall/Bulletin Board Adhesive
B		↓	↓
32A		Corridor	↓ Fabric Cover
B		Classroom 114	↓
33A		Corridor	↓ Gray Material
B		Classroom 114	↓
34A		Corridor	↓ Brown Material
B		↓	↓
35A		Cafeterium/Corridor Toilet Rooms	Ceramic Wall Tile Hard Gray Mud Material ONLY
B		~~[illegible]~~ ↓	↓
36A		Toilet Rooms	Ceramic Floor Tile Mud Bed
B		↓	↓
37A		↓	↓ Grout
B		↓	↓
38A		↓	Ceramic Wall Tile Grout
B		↓	↓
39A		1957 Addition Classroom 37	White Sink Undercoating
B		24	↓
40A		6	Gray Sink Undercoating
B		6	↓

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[signature] 4/27/23 [signature] 4/27/23 Page 4 of 29 pages [signature] 4/26/23

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Sample #	HA #	Sample Location	Material Description
041341A		1957 Addition Classroom 37	Interior Windows Glazing, Interior Doors (PCB)
B		1	1
42A		37	2x2 Ceiling Tile
B		24	1
43A		1 1 24	Gypsum Board
B		6	1
44A		24	Joint/ Taping Compound
B		6	
C		1	1
45A		Classroom 37	Wall Plaster, Finish White Coat
B		1 1	
C			
D		24	
E		1	
F		6	
G		1	
46A		Classroom 37	Brick, Rough Coat
B			
C		1	
D		24	
E		1	
F		6	
G		1	
47A		1 24	Black Paper on Concrete Deck
B		1	1

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Sample #	HA #	Sample Location	Material Description
0413 48A		1957 Addition Classroom 37	Black Damppoofing Perimeter wall
B			
49A		37	12x12 Light Blue Floor Tile
B		24	
50A		6	12x12 Blue Floor Tile
B			
51A		37	Black Mastic
B		6	
52A		37	Formica Countertop Adhesive
B			
53A		6	Core Base
B			
54A			Adhesive White Tan
B			
55A		Classroom 37	Bulletin Board Top Layer
B			
56A			Light Brown Adhesive
B			
57A			Second Layer
B			
58A			Brown Adhesive
B			
59A		Classroom 6	Adhesive Gray
B			

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Sample #	HA #	Sample Location	Material Description
041360A		1950 Addition Classroom 42 (41 also)	white Sink undercoating
B		2	⊥
61A		1 Toilet	Light Grey Sink undercoating
B		1 ⊥	⊥ ⊥
62A		4	Dark Grey ⊥
B		4 ⊥	⊥ ⊥
63A		Mech Rm Above 29 media	Duct Pan Adhesive Brown
B		⊥	⊥
64A		⊥	Duct Insulation Residue white
B		⊥	⊥
C		⊥	⊥
65A		Outside Storage Room (3rd)	Duct Insulation Grey
B		⊥	⊥
C		⊥	⊥
66A		Mech Rm Above 29 media in Brother place	Pipe End Cap Insulation
B		⊥	⊥
C		⊥	⊥
67A		Attic (4 area)	Mineral Wool Loose Insulation
B		Mech Rm Above 29 media	⊥
C		⊥	⊥
68A		Boiler Room	Spray Applied Fireproofing
B		⊥	⊥
C		⊥	⊥
D		⊥	⊥
E		⊥	⊥

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Sample #	HA #	Sample Location	Material Description
041369A		1950 Midtown Locker Rm	Reed Fire Stop Caulking never
B		⊥	⊥
70A		Mech Rm Above 29 needed	Duct Seam Caulking never
B		⊥	⊥
71A		Classroom 41	Interior Door Window Glazing Black (PCB)
B		⊥ 42	⊥ ⊥
72A		Room 29 media	⊥ ⊥
B		⊥	⊥ ⊥
73A		Stairwell bet 41 & 29	Interior Glass Block Window Grout
B		⊥	⊥ ⊥
74A		⊥	Interior Window Caulk old thick black (PCB)
B		⊥	⊥
75A		Gymnasium	Interior Window Caulk never white
B		⊥	⊥
76A		⊥	⊥ older black thick (PCB)
B		⊥	⊥ ⊥
77A		Stair/Hall bet 12	Interior Door Caulk hard thin white (PCB)
B		Gym Foyer Lobby Corridor	⊥ ⊥
78A		Gym Foyer	Interior Door/Window Caulk Perimeter Duct
B		⊥	⊥ ⊥
79A		Classroom 3/4 Corridor	Interior Door Caulk white never
B		⊥ ⊥	⊥ ⊥
80A		⊥ ⊥	Interior Window Caulk Black sticky Age?
B		⊥ ⊥	⊥ ⊥

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Sample #	HA #	Sample Location	Material Description
041381A		1950 Addition Classroom 3/4 Corridor	Interior Window Glaze Never white
B			
82A		Classroom 41	Blackboard Assume Glue
B		42	
83A		41	Slate Window Sill Glue?
B		42	
84A			Formica Counter Adhesive
B			
85A		41	2x2 Ceiling Tiles Dark Brown Backing
B		Gym Foyer Lobby	
86A		Classroom 3	Light Tan Backing
B		4	
87A		Locker Toilet	Gypsum ceiling tile
B		Rm 1 Toilet	
88A		Classroom 1	1x1 Ceiling Tiles Large Hole
B			
89A			Small pin hole
B			
90A			Smoothness
B			
91A		Teacher Room/Lounge	Kitchenette
B			
92A		Classroom 1	1x1 ceiling tile Adhesive Yellow
B			

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Sample #	HA #	Sample Location	Material Description
041393A		1950 Addition Classroom 1	9x1 Ceiling tile Adhesive Dark Brown
B			
94A		Classroom 41	Gypsum Board
B		Locker toilet	
C		Corridor (Rm 2)	
95A		Classroom 42 Closet	Taping/Joint compound
B		Locker toilet	
C		Corridor (Rm 2)	
96A		Corridor Closet by 42	One Coat Ceiling Plaster
B		Utility Rm by 10	
C			
97A		Outside Storage Rm by 3	One Coat Wall Plaster (cement?)
B			
C			
98A		Classroom 1	Ceiling Plaster white Finish Coat
B			
C		Janitor Closet / Storage adjacent outside Rm	
99A		Classroom 1	Rough Coat tan/gray
B			
C		Janitor Closet / Storage adjacent outside Rm	
100A		Classroom 1	Wall Plaster white Finish Coat
B		Janitor Closet	
C			
101 A		classroom 1	Rough Coat tan/gray
B		Janitor Closet	
C			

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Sample #	HA #	Sample Location	Material Description
0413102A		1958 Addition Gym Locker Rms	Ceiling Plaster White Finish Coat
B			
C			
103A			Gray/Tan Rough Coat
B			
C			
104A			Wall Plaster White Finish Coat
B			
C		Gym Corridor	
105A		Gym Locker Rms	Gray/Tan Rough Coat
B			
C		Gym Corridor	
106A		Media Center Data Rm	Wall Plaster White Finish Coat
B		Corridor (41)	
C		Classroom 41	
107A		Media Center Data Rm	Gray/Tan Rough Coat
B		Corridor (41)	
C		Classroom 42	
108A		Media Center Data Rm	Ceiling Plaster White Finish Coat
B		Stairwell (42)	
C			
109A		Media Center Data Rm	Gray/Tan Rough Coat
B		Stairwell (42)	
C			

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Sample #	HA #	Sample Location	Material Description
04131104		1950 Addition Stage	Black Paper Under Wood Floor
B			
111A		under stage	Black Tar on Block wall
B			
112A			Black Paper on Block wall
B			
113A		Cust Closet (ramp) by 10	9x9 Floor tile
B			
114A			Black mastic
B			
115A		Custodial office	
B		under shelving	
116A			Black Mastic
B			
117A		Custodial office	12x12 Blue Floor tile
B		Classroom 4	
C			(L)
118A		Custodial office	Black mastic
B		Classroom 4	
119A		Gym office	12x12 white Floor tile
B			
120A			Black mastic
B			

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Sample #	HA #	Sample Location	Material Description
0413121 A		1950 Addition Classroom 41/40	12X12 Green/Blue Floor tile
B			
122 A			Black Mastic
B			
123 A		Classroom 3/4/corridor	Cove Base
B		Classroom 4	
124 A		Classroom 3/4/corridor	Adhesive
B		Classroom 4	
125 A		Classroom 42	Sink wall Gray material
B			
126 A			Black Material behind gray
B			
127 A			Adhesive behind black
B			
128 A		Corridor 3/4 rooms	Wood Wall Panel Adhesive Yellow Brown
B			
129 A		Classroom 42 Closet	Cork Bull. Board Adhesive Dark Brown Thin
B		41	
130 A		same as 12 Classroom 42	Bulk Board
B		41	
131 A		42	Adhesive Dark Brown
B		41	
132 A		Classroom 12	Bull Board Adhesive Light Brown
B			

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Sample #	HA #	Sample Location	Material Description
0413133A		1950's Addition Classroom 1	Gray Bulletin Board (on black)
B		Teachers Lounge	
134A		Corridor (41)	Terazzo Floor
B			
135A			Mud Bed
B			
136A		Corridor (12)	
B			
137A		Classroom 1	Concrete Deck
B			
138A		outside storage Rm	Block Wall
B			
139A			Mortar
B			
C			
140A		Class 1/2 toilet	Epoxy Floor/Cove
B		Locker	
141A		Class 1/2 toilet	White Mud Bed only
B			
142A		Locker Shower wall Behind stage	Ceramic Wall Adhesive Dark Brown
B			
143A		Class 1 toilet	Ceramic Wall Grout Thin Tan
B		Janitor Closet by outside Rm	
144A B		Class 4 toilet	Thick white

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Sample #	HA #	Sample Location	Material Description
041314SA		1980's Addition Class 4 toilet	Ceramic wall Mud white
B		4	↓ ↓
146A		Janitor Closet by outside Rm	↓ Tan
B		Gym Shower	↓ ↓
147A		Janitor Closet by outside Rm	ceramic floor Grout Gray
B		Gym Shower	↓ ↓
148A		Class 4 toilet	↓ white
B		↓	↓ ↓
149A		↓	Ceramic Floor Mudbed tan
B		Gym Shower	↓ ↓
150A		Janitor Closet by outside Rm	↓ Brown
B		↓ Rm 10	↓ ↓
151A		1980 Original Bldg Classroom 4	Sink Undercoating Pink
B		↓ 38	↓ ↓
152A		↓ 43	↓ white
B		↓ 31	↓ ↓
153A		↓ 7	↓ Gray
B		↓ 25	↓ ↓
C		nurses	↓ ↓
154A		Corridor By 37	Fire Door Insulation Disc All Doors
B		↓	↓
155A		Classroom 32	Red Fire Stop
B		↓ 39	↓
156 A B		Attic	Boot Insulation Backing Black paper ↓

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Sample #	HA #	Sample Location	Material Description
0413157A		1902 original Bldg Classroom 43	Interior Window Glazing hard thin old (PCB)
B		44	
158A		44	many room Sink Backsplash Caulk white newer
B		22	
159A		30 (other rooms)	Interior Window/Sill Caulk white hard age?
B			
160A		Library entry	Interior Window Glazing Black 90s? sticky
B		Room	
161A		Library entry	Interior Door/Window Glazing
B			
162A		Corridor (B)	
B		(3/4) to 6	
163A		Classroom 43	Black board (assume glue daubs)
B		32	
164A		Classroom 43	Counter top Adhesive
B			
165A		Classroom 9	Gray Bulletin Board
B			
166A			Canvass Cover Adhesive
B			
167A		Classroom 43	Bulletin Board
B		31	
168A		43	Adhesive Dark Brown
B		31	

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Sample #	HA #	Sample Location	Material Description
841316A		1902 Original Bldg Classroom 20	Green Bull Board
B		↓	↓
170A		↓	Red Bulletin Board
B		↓	↓
171A		↓	↓ Brown Adhesive
B		↓	↓ ↓
172A		Classroom 44	Sink Wall Gray Layer
B		↓	↓ ↓
173A		↓	↓ Black Layer
B		↓	↓ ↓
174A		↓	↓ Brown Adhesive
B		↓	↓ ↓
175A		↓ 7	Bull Board Adhesive Brown Stain
B		↓ 9	↓ ↓
176A		Library	Wall Adhesive Brown
B		↓	↓ ↓
177A		Classroom 7	↓ White
B		↓	↓ ↓
178A		↓ 8	↓ Yellow
B		↓	↓ ↓
179A		↓ 44	2x2/2x4 Ceiling tiles Dark Backing
B		↓ 43	↓
180A		↓ 5	2x4 Ceiling tile Tan Backing
B		↓ ↓	↓ ↓

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Sample #	HA #	Sample Location	Material Description
0413181A		1902 Original Bldg Library	2x4 Ceiling Tile
B		↓	↓
182A		Toilet by 9	Gypsum Ceiling tile 2x4
B		↓	↓
183A		Corridor (44)	Gypsum Board
B		Nurse	↓
C		Class Room 7	↓
184A		↓ 31 Closet	↓ Joint/Tape Compound
B		Library	↓
C		Classroom 7	↓
185A		↓ 9	One Coat Ceiling Plaster
B		↓ 5 Closet	↓
C		↓ ↓	↓
186A		Corridor (8)	Wall Plaster White Finish Coat
B		(5)	↓ ↓
C		Classroom 7 Beam	↓ ↓
187A		Corridor (8)	↓ Rough Coat Gray/tan
B		↓ (5)	↓ ↓
C		Classroom 7 Beam	↓ ↓
188A		↓ 23	Wall Plaster White Finish Coat
B		↓ 28	↓ ↓
C		Corridor	↓ ↓
189A		Classroom 23	↓ Rough Coat Gray/tan
B		28	↓ ↓
C		Corridor	↓ ↓

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Sample #	HA #	Sample Location		Material Description	
0413190A		1902 Original Bldg	Classroom 23	Ceiling Plaster	White Finish Coat
B			25		
C			28		
191A			23		Gray/Tan Rough Coat
B			25		
C			28		
192A			31	Wall Plaster	White Finish Coat
B			43		
C			44		
193A			31		Gray/Tan Rough Coat
B			43		
C			44		
194A			31	Ceiling Plaster	White Finish Coat
B			43		
C			44		
195A			31		Gray/Tan Rough Coat
B			43		
C			44		
196A			Main Office	18"x18"	Floorng Material
B					
197A					Gray material
B					
198A					yellow mastic
B					

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OrderID: 042309385

EMSL ANALYTICAL, INC.
LABORATORY•PRODUCTS•TRAINING

Asbestos Bulk Building Material Chain of Custody

EMSL Order Number *(Lab Use Only)*: 042309385

EMSL ANALYTICAL, INC.
200 ROUTE 130 NORTH
CINNAMINSON, NJ 08077
PHONE: (800) 220-3675
FAX: (856) 786-5974

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Sample #	HA #	Sample Location	Material Description
0413199A		1962 Original Bldg Lower Floor Starwell	Gray Floor Leveler
B		↓	↓
200A		Starwell 35	Older Floor Tile
B		↓ Lower Level	↓
201A		↓ 35	↓ Black Mastic
B		↓ Lower Level	↓ ↓
202A		Classroom 43	12x12 Light Blue Floor Tile
B		Lower Level Corridor	↓
203A		Classroom 43	↓ Black Mastic
B		Lower Level Corridor	↓ ↓
C		Classroom 9	
204A		↓ 30	Red Floor Material under Plywood
B		↓	↓
205A		↓ 39	Paper under Plywood Floor T
B		↓ ↓	↓ w
206A		(some Black mastic middle landing) Starwell (44)	Rubber Floor Adhesive Yellow
B		↓	↓
207		↓	Black Mastic under Rubber Floor
208A		02 Library	Olera Carpet Adhesive Yellow
B		50's ↓	↓
209A		Toilet Room by 7	Epoxy Floor
B			↓
210A		2nd Floor Corridor	Terrazo Floor
B		↓	↓

NOB TLM 1&7 negative BY PLM

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Sample #	HA #	Sample Location	Material Description
0413211A		1902 Original Bldg 2nd Flr Corridor	Terrazzo Floor Mud Bed
B		↓	↓
212A		Classroom 43	Dark Cove base
B		Corridor at 5	↓
213A		Classroom 43	↓ Adhesive yellow
B A		Corridor at 5	↓ ↓
214A		(most areas) Nurse Office	Cove base
B		Library	↓
C		Stair well	↓
215A		Nurse office	↓ Adhesive white/tan
B		Library	↓
C		Stairwell	↓
216		Lower Level Corridor	↓
217		↓	↓ Adhesive
218A		Library	Dark leveler / Floor Material
B		↓	↓
219A		↓	Beige concrete Floor Material
B		↓	↓
220A		↓	Gray Concrete Floor Material
B		↓	↓
221A		Attic	Brick wall
B		↓	↓
222A		↓	Newer Brick
B		↓	↓

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Sample #	HA #	Sample Location	Material Description
0413223A		1902 Original Bldg Attic	Brick wall Grout
B			
224A			Wall Mortar/Grout
B			
225A			Wall Plaster White Finish Coat
B			
C			
226A			Gray/Tan rough coat
B			
C			
227A			Hard Gray Floor Material Plaster ?
B			
228A		1950 Addition	
B			
229A		1902 Original Bldg 2nd Floor Corridor Toilet	Ceramic Wall Mud Bed Bomb whi
B			
230A		? Cast closet	gray
B			
231A		Main office toilet	Ceramic wall tile Adhesive
B			
C		Room 8 toilet	
232A		Main office toilet	Ceramic wall tile Grout Thick white
B			
233A		Custodial closet	Thin white
B			

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Sample #	HA #	Sample Location	Material Description
041334A		1902 Original Bldg 2nd Mens toilet	Ceramic Wall tile Grout tan
B		womens ↓	↓ ↓
235		Classroom 8 toilet	Ceramic Wall tile Grout tan
236A		Mens toilet 2nd	Ceramic Floor Mud Bed wnck
B		↓	↓
237A		custodial 2nd closet or 1st?	↓ tan Gray
B		↓	↓ ↓
238A		Main Office toilet	↓ thin Gray
B		↓	↓ ↓
239A		↓	Ceramic Floor tile Adhesive
B		↓	↓
C		Classroom 8 toilet	↓
240A		Cust. Closet	Ceramic Floor Grout Dark Gray
B		main office toilet	↓ ↓
241A		boys Mens toilet 2nd	↓
B		↓	↓
242		Class 8 toilet	Ceramic Floor Grout
243A		tunnels 1x3 2? 3'x3'	Black Paper Debris
B		↓ ↓	↓
244A		Gym office Area 1'SF	Debris Tan Paper
B		↓	↓
245A		perimeter at Ceiling Gym	Black Tar Paper
B		↓	↓
246A + B		BR/10 Area → Brick concrete Found wall?	Black Tar Paper ↓

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Sample #	HA #	Sample Location	Material Description
0413247A		1990's Addition	Exterior Window Sill Caulk white
B			
248A			Exterior wall Exp/vent Caulk Beige (Wind/Door R1)
B			
249A		1957 Addition	Foundation tar Damp-proofing
B			
250A			Ext wall/Paint Lower Floor
B			
C			
251A			Ext. vent Caulk old PCB
B			
252A			Ext Door Caulk newer
B			
253A			Ext Window Caulk newer
B			
254A		1950 Addition	Ext Window Caulk Glass Block Thick OLD PCB
B			
255A			Ext Window Caulk white/yellow newer Cant Find old
B			
256A		PARM & residue adj Door	Ext Door Caulk older PCB
B			
257A			newer white
B			
258A			Ext wall Expansion Caulk OLD PCB
B			

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Sample #	HA #	Sample Location	Material Description
0413259A		1958 Addition Boiler Room	Ext Vent Caulk newer
B		↓	↓
260A			↓ OLDER PCB
B			↓
261A			↓ OLDER PCB
B		Lower	↓
262A		Front Bldg	Ext wall / Paint Front
B		↓	↓
C		↓	↓
263A		1902 Original Bldg vent same?	Ext Window Caulk newer white/yellow Cant find old
B		↓	↓
264A			Ext Door Caulk newer
B			↓
265A			↓ older PCB
B			↓
266A		Main Entry	Front Door & Window Caulk & glaze OLDE PCB
B		↓	↓
267A		1957 Roof	Copper Flashing Caulk newer
B		↓	↓ ↓
268A		1905 Roof 4A	↓ newer
B		50 ↓ 5	↓ ↓
269A		50 Roof 1	Perimeter Caulk newer
B		90S ↓ 4A	↓ ↓
270 A B		90S Roof & 50S ↓	Building Exp Caulk & HVAC Caulk newer Gray

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Sample #	HA #	Sample Location	Material Description
0413271A		1990S Roofs 14B	Top Layer Roof Shingle
B			⊥
272A			Bottom Layer Roof Shingle
B			⊥
273A			Black paper under Shingles
B			⊥
274A		4A	Perimeter Flashing tar (on wood)
B			⊥
275A			Penetration Flashing tar
B			⊥
276A		3x3	HVAC Tar (under Caulk)
B			⊥
277A		4A & 57 20SF	Copper Flash tar
B			⊥
278A		cable	Tar Patch Copper Flash tar
B			⊥
279A			Rodded Roof (top)
B			⊥
280A			Soft Concrete (2nd layer)
B			⊥
281A			Foamboard paper layer (3rd)
B			⊥
282A			Soft Concrete Deck
B			⊥

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Additional Pages of the Chain of Custody are only necessary if needed for additional sample information

Sample #	HA #	Sample Location	Material Description
041328 3A		1957 Roof	Rolled Roof (same as 4A)
284 B			Soft Concrete
285			Fourboard Paper
286A			Bottom Layer Tar
286B			
287A			Perimeter Flashing (rolled roof same)
288 B			Soft Concrete
289A			Perimeter Wall Tar (Thick) Top
B			
290A			Tar paper (Bottom)
B			
291A			Tar on Brick perimeter wall
B			
292A		others same	Chimney Roof Flashing
B			
293A		1950 Roof Roof 3	Top Layer Roof Shingle
B		5	
C		6	
D		7	
294A		8	2nd Layer Roof Shingle
B		5	
C		6	
D		7	
295A B		Roof 3	3rd Layer

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Asbestos Bulk Building Material Chain of Custody

EMSL Order Number *(Lab Use Only)*: 0412309385

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Sample #	HA #	Sample Location		Material Description
0413296A		1950 Roof	Roof 3	Black paper under shingles
B			5	
C			6	
D			7	
297A			3	Concrete Roof Deck
B			5	
C			6	
298A			5	Copper Flashing tar
B				
299A			3	Gutter tar
B				
300A				Gutter Seam tar
B				
301A		1902 Roof	9	Top Layer Shingle
B				
302A				2nd Layer
B				
303A				3rd Layer
B				
304A				Black Paper under Shingle
B				
305A		1950's Roof	1	Top Layer Metal Roll Roof
B			2	
306A			1	soft concrete (Handpermi. [illegible])
B			2	

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Asbestos Bulk Building Material Chain of Custody

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Sample #	HA #	Sample Location		Material Description
0413307A		1950 Roof	1	Field Paper Layers
B			2	↓
308A			1	Field Bottom Layer Tar
B			2	↓
309A			2	Tar on Deck
B			2	↓ perimeter
310A			1	Penetration Flashing top Layer
B			1	↓
311A			1	2nd layer
B			1	↓
312A			1	Bottom on Concrete
B			1	↓
313A			1	Perimeter Flash Top Tar
B			2	↓ ↓
314A			1	Bottom tar
B			1	↓ ↓
315A			1	Tar on metal
B			1	Trim & wood Deck
316A			1	Perimeter wall at Gym Top tar Flash
B			2	↓ ↓ ↓
317A			1	2nd layer at Gym Perimeter tar Flash
B			2	↓ ↓
318A B		3x5 12, 5, 33 1, 2, 4A etc	Roof over Bay windows	1 4A Roofing walk mats
319A B			↓	Roofing Field / Flash

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EMSL Analytical, Inc.

165 Gracey Avenue Meriden, CT 06451

Tel/Fax: (203) 284-5948 / (203) 284-5978

http://www.EMSL.com / meridenlab@emsl.com

EMSL Order:	242304166
Customer ID:	LANG78
Customer PO:	
Project ID:	

Attention:	Matthew Myers	**Phone:**	(203) 562-5771
	Langan Engineering	**Fax:**	(203) 789-6142
	Long Wharf Maritime Center	**Received Date:**	08/09/2023 3:25 PM
	555 Long Wharf Drive	**Analysis Date:**	08/16/2023
	New Haven, CT 06511	**Collected Date:**	
Project:	140265802/OLD GREENWICH SCHOOL		

Test Report: Asbestos Analysis of Bulk Materials via AHERA Method 40CFR 763 Subpart E Appendix E supplemented with EPA 600/R-93/116 using Polarized Light Microscopy

			Non-Asbestos		Asbestos
Sample	**Description**	**Appearance**	**% Fibrous**	**% Non-Fibrous**	**% Type**
080901 *242304166-0001*	Room 13 - Ground Floor - Firewood door insulation	Gray Fibrous Homogeneous	40% Cellulose	60% Non-fibrous (Other)	None Detected
080902 *242304166-0002*	Classroom 115 - Interior window caulking	White Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
080903 *242304166-0003*	Café - Interior window caulking	White Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
080904 *242304166-0004*	Café - Interior window caulking	White Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
080905A *242304166-0005*	Gymnasium - Ceiling tile white layer on fiberboard	Brown/White Fibrous Homogeneous	75% Cellulose	25% Non-fibrous (Other)	None Detected
080905B *242304166-0006*	Gymnasium - Ceiling tile white layer on fiberboard	Brown/White Fibrous Homogeneous	75% Cellulose	25% Non-fibrous (Other)	None Detected
080906A *242304166-0007*	Attic - Terracotta wall	Red Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
080906B *242304166-0008*	Attic - Terracotta wall	Brown/Red Non-Fibrous Homogeneous		6% Quartz 94% Non-fibrous (Other)	None Detected
080907A *242304166-0009*	Attic - Mortar	Gray Non-Fibrous Homogeneous		8% Quartz 92% Non-fibrous (Other)	None Detected
080907B *242304166-0010*	Attic - Mortar	Gray Non-Fibrous Homogeneous		8% Quartz 92% Non-fibrous (Other)	None Detected
080907C *242304166-0011*	Attic - Mortar	Gray Non-Fibrous Homogeneous	2% Cellulose	8% Quartz 90% Non-fibrous (Other)	None Detected
080908A *242304166-0012*	Original Bldg Corridor (38) - Glazed block wall mud bed	Gray Non-Fibrous Homogeneous		8% Quartz 92% Non-fibrous (Other)	None Detected
080908B *242304166-0013*	Original Bldg Corridor (38) - Glazed block wall mud bed	Gray Non-Fibrous Homogeneous		8% Quartz 92% Non-fibrous (Other)	None Detected
080909A *242304166-0014*	Original Bldg Corridor (38) - Mortar	Gray Non-Fibrous Homogeneous		8% Quartz 92% Non-fibrous (Other)	None Detected
080909B *242304166-0015*	Original Bldg Corridor (38) - Mortar	Gray Non-Fibrous Homogeneous		8% Quartz 92% Non-fibrous (Other)	None Detected
080910A *242304166-0016*	1925 Addition (41) - Wall mud bed	Gray Non-Fibrous Homogeneous		8% Quartz 92% Non-fibrous (Other)	None Detected

Initial report from: 08/16/2023 14:21:08

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EMSL Order: 242304166
Customer ID: LANG78
Customer PO:
Project ID:

Test Report: Asbestos Analysis of Bulk Materials via AHERA Method 40CFR 763 Subpart E Appendix E supplemented with EPA 600/R-93/116 using Polarized Light Microscopy

			Non-Asbestos		Asbestos
Sample	**Description**	**Appearance**	**% Fibrous**	**% Non-Fibrous**	**% Type**
080910B *242304166-0017*	1925 Addition (41) - Wall mud bed	Gray Non-Fibrous Homogeneous		8% Quartz 92% Non-fibrous (Other)	None Detected
080911A *242304166-0018*	1925 Addition (41) - Mortar	Gray Non-Fibrous Homogeneous		8% Quartz 92% Non-fibrous (Other)	None Detected
080911B *242304166-0019*	1925 Addition (41) - Mortar	Gray Non-Fibrous Homogeneous		8% Quartz 92% Non-fibrous (Other)	None Detected
080912A *242304166-0020*	1950 Addition (1/2) - Wall mud bed	Gray Non-Fibrous Homogeneous		8% Quartz 92% Non-fibrous (Other)	None Detected
080912B *242304166-0021*	1950 Addition (1/2) - Wall mud bed	Gray Non-Fibrous Homogeneous		8% Quartz 92% Non-fibrous (Other)	None Detected
080913A *242304166-0022*	1950 Addition (1/2) - Mortar	Gray Non-Fibrous Homogeneous		8% Quartz 92% Non-fibrous (Other)	None Detected
080913B *242304166-0023*	1950 Addition (1/2) - Mortar	Gray Non-Fibrous Homogeneous		8% Quartz 92% Non-fibrous (Other)	None Detected
080914A *242304166-0024*	1925 Addition Rm 23 - Dark floor thick filler material	Brown Non-Fibrous Homogeneous		8% Quartz 92% Non-fibrous (Other)	None Detected
080914B *242304166-0025*	1925 Addition Rm 23 - Dark floor thick filler material	Brown/Black Non-Fibrous Homogeneous		8% Quartz 92% Non-fibrous (Other)	None Detected
080915A *242304166-0026*	1925 Addition Rm 23 - White floor thick filler material	Gray Non-Fibrous Homogeneous		5% Vermiculite 95% Non-fibrous (Other)	None Detected
080915B *242304166-0027*	1925 Addition Rm 23 - White floor thick filler material	Gray/Tan Non-Fibrous Homogeneous	2% Cellulose	5% Vermiculite 93% Non-fibrous (Other)	None Detected
080916 *242304166-0028*	1925 Addition Rm 23 - Green old floor tile	Green Non-Fibrous Homogeneous		94% Non-fibrous (Other)	6% Chrysotile
080917 *242304166-0029*	1925 Addition Rm 23 - Green old floor tile black mastic	Black Non-Fibrous Homogeneous	3% Cellulose	3% Quartz 94% Non-fibrous (Other)	None Detected
080918 *242304166-0030*	1925 Addition Rm 41 - Green old floor tile	Green Non-Fibrous Homogeneous		94% Non-fibrous (Other)	6% Chrysotile
080919 *242304166-0031*	1925 Addition Rm 41 - Green old floor tile black mastic	Tan/Black Non-Fibrous Homogeneous	5% Cellulose 2% Synthetic	93% Non-fibrous (Other)	None Detected
080920 *242304166-0032*	Original Bldg Rm 24 - Green old floor tile	Green Non-Fibrous Homogeneous		92% Non-fibrous (Other)	8% Chrysotile
080921 *242304166-0033*	Original Bldg Rm 24 - Green old floor tile black mastic	Black Non-Fibrous Homogeneous	5% Cellulose	95% Non-fibrous (Other)	None Detected

Initial report from: 08/16/2023 14:21:08

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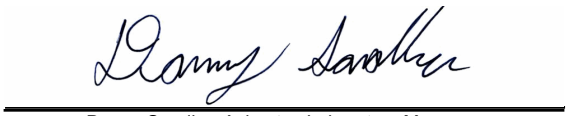
Analyst(s)

Shannon Halloran (11)
Sara Poppa (22)



Danny Sandhu, Asbestos Laboratory Manager
or Other Approved Signatory

EMSL maintains liability limited to cost of analysis. Interpretation and use of test results are the responsibility of the client. This report relates only to the samples reported above, and may not be reproduced, except in full, without written approval by EMSL. EMSL bears no responsibility for sample collection activities or analytical method limitations. The report reflects the samples as received. Results are generated from the field sampling data (sampling volumes and areas, locations, etc.) provided by the client on the Chain of Custody. Samples are within quality control criteria and met method specifications unless otherwise noted. The above analyses were performed in general compliance with Appendix E to Subpart E of 40 CFR (previously EPA 600/M4-82-020 “Interim Method”) but augmented with procedures outlined in the 1993 (”final”) version of the method. This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST or any agency of the federal government. Non-friable organically bound materials present a problem matrix and therefore EMSL recommends gravimetric reduction prior to analysis. Unless requested by the client, building materials manufactured with multiple layers (i.e. linoleum, wallboard, etc.) are reported as a single sample. Estimation of uncertainty is available on request.

Samples analyzed by EMSL Analytical, Inc. Meriden, CT NVLAP Lab Code 200700-0,

Initial report from: 08/16/2023 14:21:08

EMSL ANALYTICAL, INC.
LABORATORY • PRODUCTS • TRAINING

Asbestos Bulk Building Material Chain of Custody

EMSL Order Number *(Lab Use Only)*: 242304166

Company: Langan CT	**EMSL-Bill to:** ☐ Same ☒ Different If Bill to is Different note instructions in Comments: Langan_InvoiceCapture@ConcurSolutions.com *Third Party Billing requires written authorization from third party*
Street: 555 Long Wharf Drive	
City: New Haven **State/Province:** CT	**Zip/Postal Code:** 06511 **Country:** USA
Report To (Name): Matthew Myers	**Telephone #:** 203.562.5771
Email Address: MMyers@Langan.com	**Fax #:** 203.789.6142 **Purchase Order:**
Project Name/Number: 140265802	**Please Provide Results:** ☐ Fax ☒ Email Public School
U.S. State Samples Taken: CT	**CT Samples:** ☐ Commercial/Taxable ☒ Residential/Tax Exempt

Turnaround Time (TAT) Options* – Please Check

☐ 3 Hour ☐ 6 Hour ☐ 24 Hour ☐ 48 Hour ☐ 72 Hour ☐ 96 Hour ☒ 1 Week ☐ 2 Week

**For TEM Air 3 hr through 6 hr, please call ahead to schedule. *There is a premium charge for 3 Hour TEM AHERA or EPA Level II TAT. You will be asked to sign an authorization form for this service. Analysis completed in accordance with EMSL's Terms and Conditions located in the Analytical Price Guide.*

PLM - Bulk (reporting limit)

- ☒ PLM EPA 600/R-93/116 (<1%)
- ☐ PLM EPA NOB (<1%)
- Point Count ☒ 400 (<0.25%) ☐ 1000 (<0.1%) If <3%
- Point Count w/Gravimetric ☐ 400 (<0.25%) ☐ 1000 (<0.1%)
- ☐ NIOSH 9002 (<1%)
- ☐ NY ELAP Method 198.1 (friable in NY)
- ☐ NY ELAP Method 198.6 NOB (non-friable-NY)
- ☐ OSHA ID-191 Modified
- ☐ Standard Addition Method

TEM – Bulk

- ☐ TEM EPA NOB – EPA 600/R-93/116 Section 2.5.5.1
- ☐ NY ELAP Method 198.4 (TEM)
- ☐ Chatfield Protocol (semi-quantitative)
- ☐ TEM % by Mass – EPA 600/R-93/116 Section 2.5.5.2
- ☐ TEM Qualitative via Filtration Prep Technique
- ☐ TEM Qualitative via Drop Mount Prep Technique

Other

- ☐ Old Greenwich School

☒ **Check For Positive Stop – Clearly Identify Homogenous Group** **Date Sampled:** 8/9/23

Samplers Name: Willie Thompson & Matt Myers **Samplers Signature:** [signature]

Analyze All

Sample #	HA #	Sample Location	Material Description
080901		Room 13 - Ground Floor	Wood Fire Door Insulation
02		Classroom 115	Interior Window Caulking
03		Cafe	↓
04		↓	↓
05 A		Gymnasium	Ceiling Tile White Layer or Fiber board
B		↓	↓
06 A		Attic	Terra Cotta Wall
B		↓	↓
07 A B		↓	MORTAR
C		↓	↓

Client Sample # (s): **Total # of Samples:** 33

Relinquished (Client): [signature] **Date:** 8/9/23 **Time:**

Received (Lab): **Date:** **Time:**

Comments/Special Instructions:

RECEIVED AUG 09 2023 By [initials] 15:25 WQ

Controlled Document – Asbestos COC – R6 – 11/29/2012

Page 1 of 2 pages

OrderID: 242304166

EMSL ANALYTICAL, INC.
LABORATORY • PRODUCTS • TRAINING

Asbestos Bulk Building Material Chain of Custody

EMSL Order Number *(Lab Use Only)*:

EMSL ANALYTICAL, INC.
200 ROUTE 130 NORTH
CINNAMINSON, NJ 08077
PHONE: (800) 220-3675
FAX: (856) 786-5974

Additional Pages of the Chain of Custody are only necessary if needed for additional sample information

Sample #	HA #	Sample Location	Material Description
080908A		Original Bldg Corridor (38)	Glazed Block Wall Mud Bed
B			Mortar
09A			
B			
10A		1925 Addition (41)	Wall Mud Bed
B			Mortar
11A			
B			
12A		1950 Addition (1/2)	Wall Mud Bed
B			Mortar
13A			
B			
14A		1925 Addition Rm 23	Dark Floor Thinset Filler Material
B			
15A			White Floor
B			
16		1925 Addition Rm 23	Green 9x9 Floor Tile
17		Rm 41	Black Mastic
18			
19			Black Mastic
20		Original Bldg Rm 24	
21			Black Mastic

Analysis: All

***Comments/Special Instructions:**

RECEIVED
AUG 09 2023
By 15:25

Page 2 of 2 pages

Controlled Document – Asbestos COC – R6 – 11/29/2012

Appendix B

XRF Field Data Sheets

(1)

PRELIMINARY XRF
LBP TESTING DATA SHEET

Client Name:

Site Address

Project No. Old Greenwich school

Survey Date 4-10-23

Total Assays Reported:

Survey ID#	Component	Substrate	Paint Color	Test Location	XRF Readings K Shell mg/cm2	XRF Readings L Shell mg/cm2	XRF Readings K-Fe mg/cm2	Results	Comments
1950 01	wall	plaster	white	2nd floor Hallway				-0.2	
2	1	1	1	1				-0.1	
3	door	wood	stained	ROOM 41				0	
4	1	1	1	ROOM 42				0	
5	door casing	metal	brown	ROOM 41				-0.3	
6	1	1	1	ROOM 42				-0.2	
7	calibration							0.9	
8	1							1.0	
9								1.0	
10	wall	plaster	offwhite	ROOM 41				-0.2	
11	cabinet	wood	stained	1				0.1	
12	Base board	wood	1	1				0	
13	electrical conduit	plastic	white	1				0.7	
14	molding	wood	white	1				0	
15	storage door	wood	brown	CORRIDOR				0	
16	1 door casing	metal	1	1				0.2	
17	~~storage door~~	~~door~~ wood	stained	staircase				0	
18	door casing	~~door~~ metal ~~casing~~	brown	1				0.3	
19	1	1	blue	1				0.7	
20	post (Handrail)	1	1	1				1.6	
21	1	1	1	1				3.2	
22	stair	Concrete	grey	1				0.3	
23	wall tile	ceramic	brown	CORRIDOR				0.3	
1902 24	wall	plaster	white	1				0.1	
25	1	white	1	1				0.1	

Notes: N = Negative
P = Positive

(2)

PRELIMINARY XRF
LBP TESTING DATA SHEET

Client Name:

Site Address

Project No.

Survey Date

Total Assays Reported:

Survey ID#	Component	Substrate	Paint Color	Test Location	XRF Readings K Shell mg/cm2	XRF Readings L Shell mg/cm2	XRF Readings K-Fe mg/cm2	Results	Comments
				2nd Floor					
[902] 26	wall	ceramic tile	brown	corridor				0	
27	"	"	"	"				-0.1	
28	door	wood	stained	Room 35				0	
29	door casing	"	brown	"				5.2	
30	door casing	"	"	Room 38				11.3	
31	door	"	stained	"				0	
32	fire extinguisher box	metal	red	corridor				0.5	
33	door	wood	stained	staircase				0	
34	door casing	metal	brown	"				11.9	
35	"	"	blue	"				2.3	
36	stair post	"	"	"				1.7	
37	stair handrail	"	"	"				0.5	
38	stringer	"	"	"				1.4	
39	wall	plaster	off white	Room 33				0.1	
40	cabinet	wood	stained	"				0	
41	electrical conduit	plastic	off white	"				0.1	
42	"	metal	"	"				0	
43	window casing	wood	"	"				13.1	
44	window sill	"	"	"				~~15~~ 18	
45	locker	metal	grey	corridor				0	
46	Radiator cover	"	off white	Room 39				0.1	
47	wall molding	wood	"	Room 38				0.3	
48	door	"	stained	Boys Bath.				-0.1	
49	door casing	"	brown	"				-0.1	
50	wall	plaster	off white	"				0.0	

Notes: N = Negative
P = Positive

(3)

PRELIMINARY XRF
LBP TESTING DATA SHEET

Client Name:

Site Address

Project No.

Survey Date

Total Assays Reported:

	Survey ID#	Component	Substrate	Paint Color	Test Location	XRF Readings K Shell mg/cm2	XRF Readings L Shell mg/cm2	XRF Readings K-Fe mg/cm2	Results	Comments
					2nd floor					
1902	51	wall	ceramic tile	brown	boys bath				-0.3	
1957	52	door	wood	stained	room 37				-0.1	
	53	door casing	|	brown	|				-0.2	
	54	~~door~~ window casing	metal	off white	|				0.1	
	55	window sill	wood	|	|				0	
	56	wall	plaster	|	|				-0.3	
	57	cabinet	wood	stained	|				-0.1	
1902	58	ceiling	plaster	brown	room 41				21	
1950	59	|	|	|	room 38				17	
	60	struct. beam	metal	red	attic				-0.1	
	61	wall	plaster	|	|				-0.3	
1902	62	door	wood	stained	1st floor library				-0.1	
	63	door casing	metal	blue	|				-0.1	
	64	column	S.R	yellow	|				-0.1	
	65	wall	|	|	|				-0.1	
	66	window casing	wood	white	|				12.7	
	67	window sill	|	stained	|				0	
	68	door	metal	blue	|				0.2	
	69	door casing	metal	blue	|				0.4	
	70	window casing	|	white	↓				0	
1950	71	door	wood	stained	computer lab				-0.1	
	72	door casing	metal	blue	|				-0.1	
	73	inter. window casing	metal	blue	|				0	
	74	ext. window sill	|	stained	|				-0.1	
	75	wall	S.R	yellow	|				0	

Notes: N = Negative
P = Positive

(4)

PRELIMINARY XRF
LBP TESTING DATA SHEET

Client Name:

Site Address

Project No.

Survey Date

Total Assays Reported:

Survey ID#	Component	Substrate	Paint Color	Test Location	XRF Readings K Shell mg/cm2	XRF Readings L Shell mg/cm2	XRF Readings K-Fe mg/cm2	Results	Comments
				1st floor					
1850 1902 76	Radiator cover	metal	white	computer lab				0	
77	wall	plaster	yellow	corridor				0.2	
78	"	tile	brown	"				0	
79	door	wood	stained	"				0	
80	door casing	metal	brown	"				12	
81	handrail	"	blue	staircase				0.4	
82	Rail post	"	"	"				0.5	
83	wall	plaster	white	"				0.2	
84	door casing	metal	blue	"				1.4	
85	door	wood	stained	girls bath				-0.1	
86	door casing	metal	brown	"				0.5	
87	wall	SR	yellow	"				0.2	
88	wall	tile	"	"				-0.4	
89	floor	tile	"	"				0.1	
90	partition	plastic	"	"				0	
91	window casing	wood	"	"				22.8	
92	door	wood	stained	room 28				0	
93	door casing	wood	brown	"				0.4	
94	wall	plaster	off white	"				0	
95	cabinet	wood	stained	"				0	
96	wall molding	"	off white	"				0	
97	Radiator cover	metal	white	"				0.1	
98	window casing	wood	"	"				14.5	
99	window sill	wood	"	"				13.3	
100	door	wood	white	main entry				-0.1	

Notes: N = Negative
P = Positive

(5)

PRELIMINARY XRF
LBP TESTING DATA SHEET

Client Name:

Site Address

Project No.

Survey Date

Total Assays Reported:

	Survey ID#	Component	Substrate	Paint Color	Test Location	XRF Readings K Shell mg/cm2	XRF Readings L Shell mg/cm2	XRF Readings K-Fe mg/cm2	Results	Comments
					1st floor					
1902	101	door casing	wood	white	main entry				20.3	
	102	wall	plaster	white	"				0.2	
	103	"	"	"	corridor				-0.1	
1957	104	door	wood	stained	room 24				0	
	105	door casing	"	brown	"				0	
	106	wall	plaster	off white	"				-0.1	
	107	cabinet	wood	stained	"				-0.3	
	108	window sill	"	white	"				0	
	109	baseboard	wood	stained	"				-0.1	
	110	Radiator cover	metal	brown	"				0	
1902	111	ceiling	plaster	brown	room 25				18.5	
1957	112	door	wood	stained	ground room 6				0	
	113	" casing	"	brown	"				-0.1	
	114	wall	S.R	white	"				0	
	115	soffit	"	"	"				0	
	116	door	wood	white	"				0	
	117	" casing	"	"	"				-0.1	
	118	window sill	"	"	"				0	
	119	Radiator cover	metal	"	"				0	
1950	120	ceiling	plaster	white	closet @ room 2				-0.2	
	121	wall	"	"	"				-0.1	
	122	fire ladder	metal	brown	"				0.4	
	123	door	wood	white	"				0.1	
	124	door casing	metal	"	"				0.1	
	125	Radiator cover	"	"	corridor				-0.1	

Notes: N = Negative
P = Positive

(6)

PRELIMINARY XRF
LBP TESTING DATA SHEET

Client Name:

Site Address

Project No.

Survey Date

Total Assays Reported:

Survey ID#	Component	Substrate	Paint Color	Test Location	XRF Readings K Shell mg/cm2	XRF Readings L Shell mg/cm2	XRF Readings K-Fe mg/cm2	Results	Comments
1950 126	wall	plaster	white	ground floor corridor				0	
127	door	wood	white	|				-0.1	
128	door casing	|	|	|				-0.3	
129	door	wood	stained	Room 2				-0.1	
130	| casing	wood	white	|				-0.2	
131	wall	plaster	white	|				0.3	
132	radiator cover	metal	white	|				-0.1	
133	door	metal	grey	Room 2 Bath				0	
134	| casing	|	|	|				0.2	
135	wall	SR	Beige	|				0.1	
136	|	tile	white	|				-0.3	
137	partition	plastic	|	|				-0.4	
138	wall	S.R	White	corridor				0.1	
139	|	wood	stained	|				0.1	
140	calibration			—				0.9	
141	|			~				0.9	
142	|			—				1.0	
143	window casing	metal	white	corridor				0.1	
144	door	wood	stained	Room 3				-0.2	
145	| casing	metal	white	|				-0.1	
146	wall	SR	white	|				0.1	
147	ceiling	plaster	Brown	|				-0.2	
148	door	metal	white	corridor @ #6				0	
149	| casing	|	|	|				0	
150	|	|	Brown	|				0	

Notes: N = Negative
P = Positive

(7)

PRELIMINARY XRF
LBP TESTING DATA SHEET

Client Name:

Site Address

Project No.

Survey Date

Total Assays Reported:

	Survey ID#	Component	Substrate	Paint Color	Test Location	XRF Readings K Shell mg/cm2	XRF Readings L Shell mg/cm2	XRF Readings K-Fe mg/cm2	Results	Comments
1950	151	Locker	metal	beige	ground CORRIDOR				0	
	152	fire ext. box	metal	red	"				0.2	
	153	post	"	blue	staircase				0.4	
	154	riser	"	"	"				0.3	
	155	handrail	"	"	"				0.2	
	156	wall	plaster	white	men room				0	
	157	ceiling	"	"	"				0	
1990	158	door	wood	white	CORRIDOR @ cafe				-0.2	
	159	" casing	metal	"	"				-0.1	
	160	"	"	brown	"				0	
	161	" casing	"	"	"				0	
	162	wall	S.R	white	"				0	
	163	"	tile	"	"				-0.5	
	164	door	metal	brown	cafe				-0.1	
	165	" casing	"	"	"				0	
	166	wall	SR	white	"				0.1	
	167	Radiator cover	metal	grey	"				0.1	
	168	window sill	metal	white	"				0	
	169	door	wood	stained	gym				0	
	170	" casing	metal	brown	"				0.2	
	171	wall	CMU	white	"				-0.3	
	172	"	tile	brown	"				-0.1	
	173	floor	wood	stained	"				"	
1950	174	door	"	white	ext @ boiler				0	
	175	door casing	"	"	"				3.3	

Notes: N = Negative
P = Positive

(8)

PRELIMINARY XRF
LBP TESTING DATA SHEET

Client Name:

Site Address

Project No.

Survey Date

Total Assays Reported:

Survey ID#	Component	Substrate	Paint Color	Test Location	XRF Readings K Shell mg/cm2	XRF Readings L Shell mg/cm2	XRF Readings K-Fe mg/cm2	Results	Comments
1950 176	window casing	metal	white	exterior boiler room				0.4	North
177	wall	concrete	grey	custodian				0.2	|
178	window casing	metal	white	utility office				0.2	|
179	|	|	|	Room 11				0.3	|
180	|	|	|	|				0	east
181	wall	concrete	Beige	teach. lounge				0	|
182	|	|	|	Room 10				0.1	|
183	window casing	metal	white	Room 5				1.1	|
184	|	|	|	on other side of stairs				1.1	|
185	hand rail	Black ↔ metal		side of main entry				0	|
186	|	metal	Black	other side of main entry				0	|
187	door	wood	white	under main stair				0	|
188	door casing	|	|	~~main entry~~	|			3.2	|
189	door	|	|	main entry				-0.1	|
190	door casing	|	|	|				1.00	|
191	wall	concrete	Beige	Room 4				0.2	|
192	window casing	metal	white	|				0	|
193	door	wood	white	corridor to room 2				0	|
194	door casing	|	|	|				2.9	|
195	window casing	metal	|	|				0	|
196	|	|	|	Room 2				0.3	|
197	door	plastic	white	|				-0.1	south
198	door casing	wood	|	|				-0.1	|
199	|	~~plastic~~ metal	|	Room 1 - hallway to				0.1	west
200	| casing	wood	|	|				0	|

Notes: N = Negative
P = Positive

PRELIMINARY XRF
LBP TESTING DATA SHEET

Client Name:

Site Address

Project No.

Survey Date

Total Assays Reported:

	Survey ID#	Component	Substrate	Paint Color	Test Location	XRF Readings K Shell mg/cm2	XRF Readings L Shell mg/cm2	XRF Readings K-Fe mg/cm2	Results	Comments
					exterior					
1957	201	wall	concrete	grey	Room 6				0	west
	202	window casing	metal	white	"				0	"
	203	door	metal	"	"				-0.1	"
	204	" casing	"	"	"				-0.1	"
1950	205	wall	concrete	grey	Room 3				0.2	"
	206	window casing	metal	white	"				-0.1	"
1957	207	vent (wall)	metal	grey	Room 6				2.8	"
1950	208	Hand Rail	metal	black	Room 3				0	"
	209	"	"	"	Room 8				0.3	"
	210	"	"	"	Room 12				1.6	"
	211	door casing	wood	white	Room 3				2.8	"
1990	212	window casing	metal	white	Room 114				0.2	"
	213	vent grill	"	black	"				0	"
	214	door	wood	white	cafeteria corridor				0.1	"
	215	door casing	wood	white	"				0.1	"
	216	door	wood	white	Cafeteria				-0.1	north
	217	door casing	~~wood~~ metal	"	"				0.2	"
	218	window casing	"	"	"				-0.1	"
	219	vent grill	metal	grey	"				0	"
	220	yellow post	"	yellow	"				0.1	"
	221	door	wood	white	gym				0	"
	222	door casing	"	"	"				7.3	"
	223	calibration							1.0	"
	224	"							1.0	"
	225	"							0.9	"

Notes: N = Negative
P = Positive

PRELIMINARY XRF
LBP TESTING DATA SHEET

Client Name: OLD Greenwich school

Project No. 140265803

Site Address

Survey Date 8/9/23

Total Assays Reported:

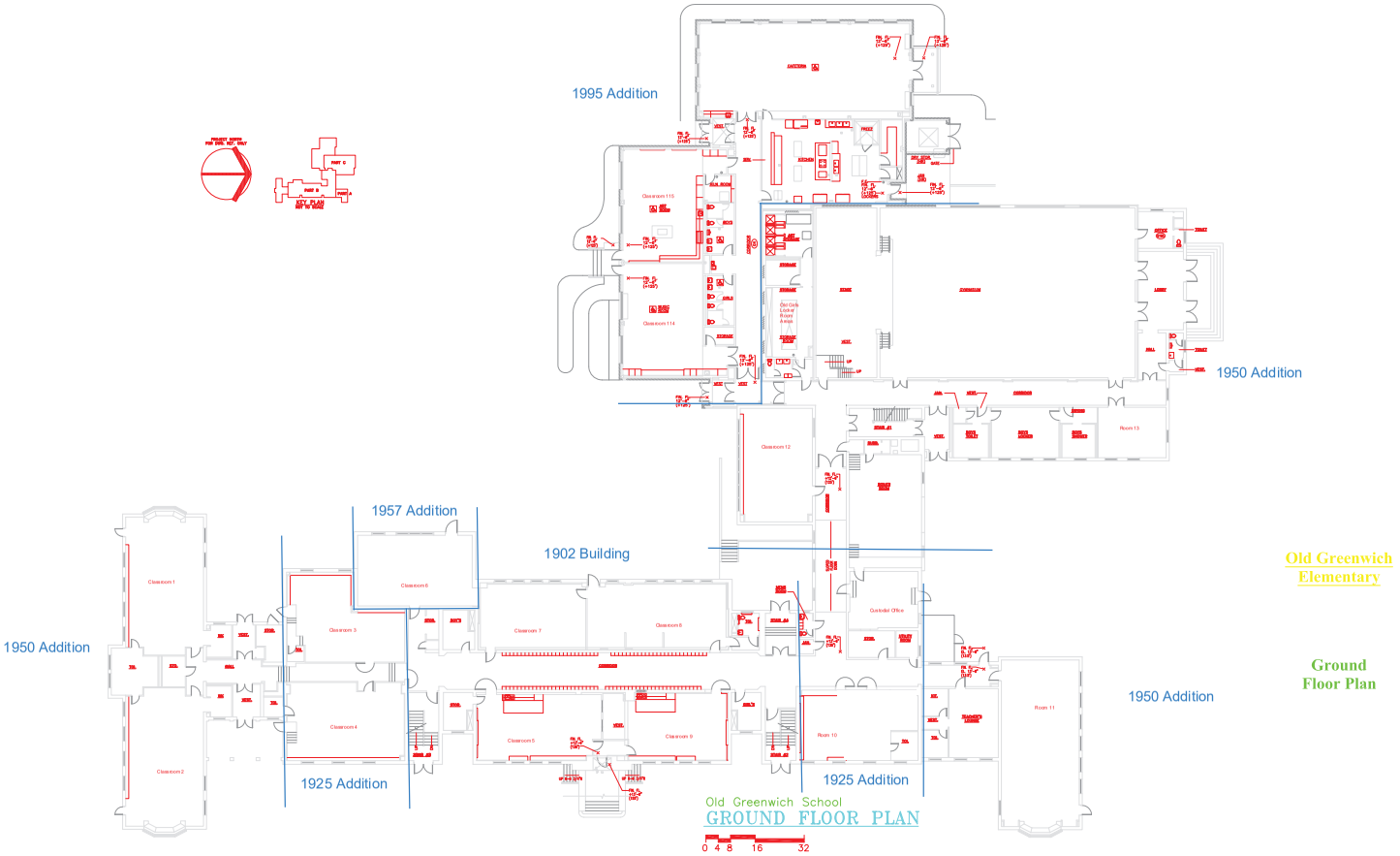
Survey ID#	Component	Substrate	Paint Color	Test Location	XRF Readings			Results	Comments
					K Shell mg/cm2	L Shell mg/cm2	K-Fe mg/cm2		
1	calibrate							1.1	
2	"							1.1	
3	"							1.1	
4	structural steel	metal	~~Green~~ Yellow	Rm 24 Mid Floor				0.2	
5	"	"	Red	Attic				0.1	
6	"	"	Black	Rm 29 mech Space				0.3	
7	"	"	"	"				0.1	
8	calibrate							1.0	
9	"							1.1	
10	"							1.1	

Notes: N = Negative
P = Positive

Appendix C

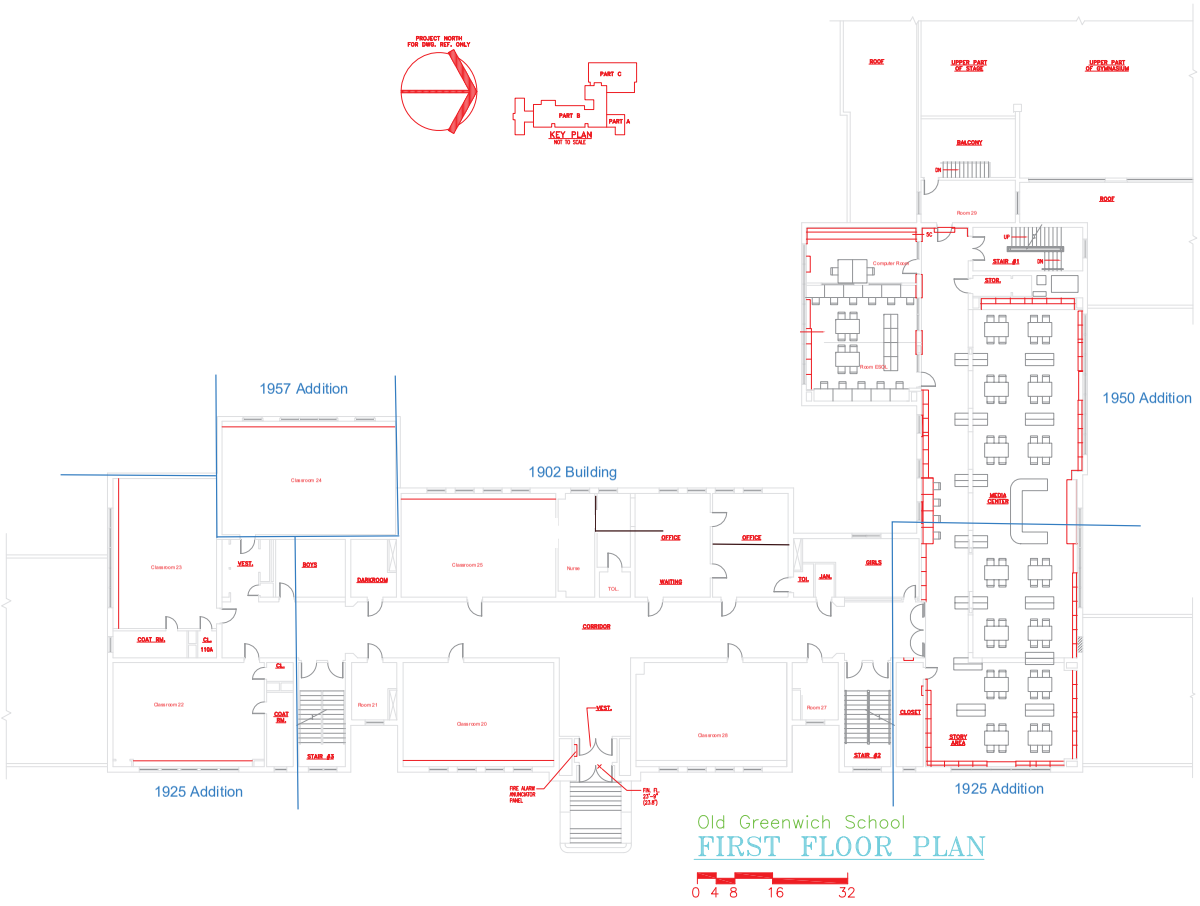
Building Drawings

LANGAN



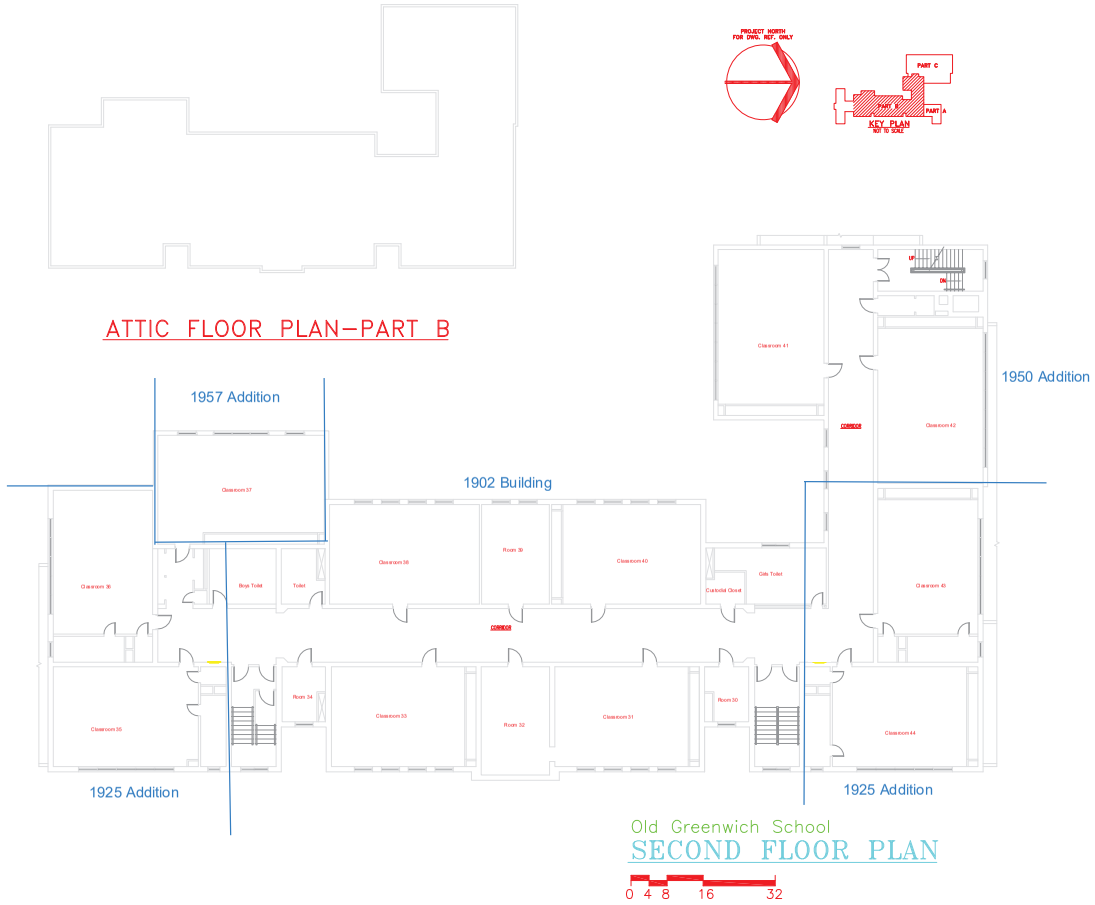
Old Greenwich Elementary

Ground Floor Plan



Old Greenwich Elementary

First Floor Plan



Old Greenwich Elementary

Attic and Second Floor Plan

Appendix D

Langan Certifications and Accreditations

LANGAN

SIGNATURE COMMISSIONER

STATE OF CONNECTICUT
DEPARTMENT OF PUBLIC HEALTH

PURSUANT TO THE PROVISIONS OF THE GENERAL STATUTES OF CONNECTICUT

THE INDIVIDUAL NAMED BELOW IS CERTIFIED
BY THIS DEPARTMENT AS A
ASBESTOS CONSULTANT-INSPECTOR

WILLIE L. THOMPSON

CERTIFICATE NO.
000673

CURRENT THROUGH
08/31/23

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PROFESSION
ASBESTOS CONSULTANT-INSPECTOR

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ATC GROUP SERVICES LLC

104 East 25th Street, New York, NY 10010
(212) 353-8280

This certifies that

Willie L Thompson III

has successfully completed the

4-hour EPA-AHERA/ASHARA Training, accredited under TSCA Title II 40 CFR 763, and the New York State Department of Health Approved Course and Examination for

Asbestos Site Inspector Refresher

on

January 10, 2023

**** Please note that the official record of successful completion is the DOH 2832 Certificate of Asbestos Safety Training****

Course Location: Online Course

Certificate#: NYS - RHIIIR – 23177

Examination Date: January 10, 2023

Expiration Date: January 10, 2024

Signed: _____

John P. Springston, CIH, CSP, FAIHA

1004697 SP 0964 C01-P04703-I

RYAN M MURPHY
605 PLYMOUTH COLONY
BRANFORD CT 06405

Dear RYAN M MURPHY,

Attached you will find your validated certificate for the coming year. Should you have any questions about your certificate renewal, please do not hesitate to write or call:

Department of Public Health
P.O. Box 340308
M.S.#12MQA
Hartford, CT 06134-0308

(860) 509-7603
oplc.dph@ct.gov
www.ct.gov/dph/license

Sincerely,

MANISHA JUTHANI, MD, COMMISSIONER
DEPARTMENT OF PUBLIC HEALTH

1004697-0004710-0000001 of 0000001-C01-aldc0101-0964-04703

STATE OF CONNECTICUT
DEPARTMENT OF PUBLIC HEALTH

PURSUANT TO THE PROVISIONS OF THE GENERAL STATUTES OF CONNECTICUT

THE INDIVIDUAL NAMED BELOW IS CERTIFIED
BY THIS DEPARTMENT AS A
ASBESTOS CONSULTANT-INSPECTOR

RYAN M MURPHY

CERTIFICATE NO.
000937

CURRENT THROUGH
04/30/23

VALIDATION NO.
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SIGNATURE

COMMISSIONER

EMPLOYER'S COPY

STATE OF CONNECTICUT
DEPARTMENT OF PUBLIC HEALTH

NAME
RYAN M MURPHY

VALIDATION NO.	CERTIFICATE NO.	CURRENT THROUGH
03-958154	000937	04/30/23

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ASBESTOS CONSULTANT-INSPECTOR

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STATE OF CONNECTICUT
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NAME
RYAN M MURPHY

VALIDATION NO.	CERTIFICATE NO.	CURRENT THROUGH
03-958154	000937	04/30/23

PROFESSION
ASBESTOS CONSULTANT-INSPECTOR

SIGNATURE

COMMISSIONER

CERTIFICATE OF ACHIEVEMENT

This certifies that

Ryan Murphy

has successfully completed the

4 Hour Asbestos Site Inspector Refresher Training
Asbestos Accreditation Under TSCA Title II
40 CFR Part 763



Training held via a Live Webinar

Score: 88%

conducted by:
ATC Group Services LLC dba ATLAS Technical
73 William Franks Drive
West Springfield, MA 01089
(413) 781-0070

Gregory J. Morsch

Principal Instructor: Gregory Morsch

January 19, 2023
Date of Course

January 19, 2024
Expiration Date

Gregory J. Morsch

Regional Training Director: Gregory Morsch

SIAR - 7345
Certificate Number

January 19, 2023
Examination Date

STATE OF CONNECTICUT

DEPARTMENT OF PUBLIC HEALTH

PURSUANT TO THE PROVISIONS OF THE GENERAL STATUTES OF CONNECTICUT

THE INDIVIDUAL NAMED BELOW IS CERTIFIED
BY THIS DEPARTMENT AS A

ASBESTOS CONSULTANT-INSP/MGMT PLANNER

MATTHEW A. MYERS

CERTIFICATE NO.
000041

CURRENT THROUGH
04/30/24

VALIDATION NO.
03-034250

SIGNATURE

COMMISSIONER

MATTHEW A MYERS
10 LEWIS ST
MILFORD, CT 06460-6333

Dear Certified Professional: This is your validated certificate for the coming year. Should you have any questions about your certificate, please email oplc.dph@ct.gov.

Department of Public Health
P.O. Box 340308
Hartford, CT 06134-0308
ct.gov/dph/license

Sincerely,

Manisha Juthani, MD
Commissioner

EMPLOYER'S COPY

STATE OF CONNECTICUT
DEPARTMENT OF PUBLIC HEALTH

NAME
MATTHEW A. MYERS

VALIDATION NO.	CERTIFICATE NO.	CURRENT THROUGH
20500892	191	04/30/2024

PROFESSION
Lead Inspector Risk Assessor
ACTIVE

SIGNATURE — **COMMISSIONER**

STATE OF CONNECTICUT
DEPARTMENT OF PUBLIC HEALTH

THE INDIVIDUAL NAMED BELOW IS CERTIFIED BY THIS DEPARTMENT AS A
Lead Inspector Risk Assessor
ACTIVE

MATTHEW A. MYERS

CERTIFICATE NO. 191
CURRENT THROUGH 04/30/2024
VALIDATION NO. 20500892

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STATE OF CONNECTICUT
DEPARTMENT OF PUBLIC HEALTH

NAME
MATTHEW A. MYERS

VALIDATION NO.	CERTIFICATE NO.	CURRENT THROUGH
20500892	191	04/30/2024

PROFESSION
Lead Inspector Risk Assessor
ACTIVE

SIGNATURE — **COMMISSIONER**

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Quality Environmental Solutions & Technologies, Inc.
1376 Route 9, Wappingers Falls, NY 12590
Phone (845) 298-6031 Fax (845) 298-6251

HEREBY CERTIFIES THAT

MATTHEW A. MYERS

HAS SUCCESSFULLY COMPLETED A TRAINING SEMINAR IN:

NYS/EPA INSPECTOR REFRESHER

MEETING THE REQUIREMENTS OF NYSDOH 10 NYCRR, PART 73 AND TSCA TITLE II AND HAS BEEN AWARDED THIS CERTIFICATE BY:

Michael J. O'Rourke

MICHAEL O'ROURKE
TRAINING DIRECTOR

NOTE: Official record of successful completion is DOH 2832 Certificate of Completion of Asbestos Safety Training

NOTE: DOH 2832 - A $20 fee shall be charged for replacement of Certificate of Completion DOH 2832

ON THIS DATE:7/20/2022

CERTIFICATE NUMBER:911276

EXPIRATION DATE: 7/20/2023

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NYS/EPA INSPECTOR REFRESHER

MEETING THE REQUIREMENTS OF NYSDOH 10 NYCRR, PART 73 AND TSCA TITLE II AND HAS BEEN AWARDED THIS CERTIFICATE BY:

Michael J. O'Rourke

MICHAEL O'ROURKE
TRAINING DIRECTOR

NOTE: Official record of successful completion is DOH 2832 Certificate of Completion of Asbestos Safety Training

NOTE: DOH 2832 - A $20 fee shall be charged for replacement of Certificate of Completion DOH 2832

ON THIS DATE:06/07/2023

CERTIFICATE NUMBER:931528

EXPIRATION DATE: 06/07/2024

CERT#: L-600-Virtual.1270

CHEMSCOPE TRAINING DIVISION

LEAD INSPECTOR/RISK ASSESSOR REFRESHER 8-HOUR TRAINING CERTIFICATE

Matthew A. Myers

10 Lewis Street, Milford CT

Has attended an 8-hour course on the subject discipline on

12/09/2022 and has passed a written examination.

The above individual has successfully completed the above training course approved in accordance with the Department of Public Health Standards established pursuant to Section 20-477 of the Connecticut General Statutes.

Course topics include all required topics of State of Connecticut DPH and EPA.

Under civil and criminal penalties of law for the making or submission of false or fraudulent statements or representations (U.S.C. 1001 and 15 U.S. C. 2615), I certify that this training complies with all applicable requirements of Title IV of TSCA, 40 CFR part 745 and any other applicable Federal, State or local requirements.

Examination Score: 98%
Exam Date: 12/09/2022
Expiration Date: 12/09/2023

Daniel Sullivan
Training Manager

Chem Scope, Inc.
15 Moulthrop Street
North Haven CT 06473
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PAVEL ZAYENCHIK

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License Type	License Number	Expiration Date	Granted Date	License Name	License Status		Licensure Actions or Pending Charges
Lead Inspector Risk Assessor	2262	10/31/2023	08/04/2015	PAVEL ZAYENCHIK	ACTIVE	CURRENT	None

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License Type	License Number	Expiration Date	Granted Date	License Name	License Status		Licensure Actions or Pending Charges
Lead Inspector Risk Assessor	2262	10/31/2023	08/04/2015	PAVEL ZAYENCHIK	ACTIVE	CURRENT	None

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CERT#: L-600-Virtual.1262

CHEMSCOPE TRAINING DIVISION

LEAD INSPECTOR/RISK ASSESSOR REFRESHER

8-HOUR TRAINING CERTIFICATE

Pavel Zayenchik

125 Tunxis Village, Farmington CT

Has attended an 8-hour course on the subject discipline on

10/13/2022 and has passed a written examination.

The above individual has successfully completed the above training course approved in accordance with the Department of Public Health Standards established pursuant to Section 20-477 of the Connecticut General Statutes.

Course topics include all required topics of State of Connecticut DPH and EPA.

Under civil and criminal penalties of law for the making or submission of false or fraudulent statements or representations (U.S.C. 1001 and 15 U.S. C. 2615), I certify that this training complies with all applicable requirements of Title IV of TSCA, 40 CFR part 745 and any other applicable Federal, State or local requirements.

Examination Score: 96%
Exam Date: 10/13/2022
Expiration Date: 10/13/2023

Daniel Sullivan
Training Manager

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CHEMSCOPE TRAINING DIVISION

LEAD INSPECTOR/RISK ASSESSOR REFRESHER

8-HOUR TRAINING CERTIFICATE

Pavel Zayenchik

125 Tunxis Village, Farmington CT

Has attended an 8-hour course on the subject discipline on

10/13/2022 and has passed a written examination.

The above individual has successfully completed the above training course approved in accordance with the Department of Public Health Standards established pursuant to Section 20-477 of the Connecticut General Statutes.

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Examination Score: 96%
Exam Date: 10/13/2022
Expiration Date: 10/13/2023

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Training Manager

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levels. The finished floor elevation (FFE) varies between about el +11.3 and el +15.4. Associated site features surround the structure, including an asphalt parking lot to the north, asphalt sports courts and a playground area to the southwest, and grass sports fields to the west. Figure 1 shows the site location and surrounding properties.

Existing site grades gently slope down from east to west, from about el +15 to el +7. Site grades within the proposed building addition footprint vary between about el +13 to el +10.

Underground utilities are present throughout the site including stormwater, electric, gas, and sanitary.

PROPOSED DEVELOPMENT

The proposed project consists of renovations within the existing Old Greenwich School and the construction of an addition to the southwest of the existing structure. Interior renovations consist of two new elevator pits and infilling select portions of the building to raise the FFE.

The addition consists of a 1-story, about 7,260 SF footprint structure. The FFE of the proposed classrooms is el +14 and the FFE of the proposed hallways varies between about el +11.5 to +14. Cuts of up to about 5 feet are anticipated to reach the bottom of the proposed elevator pits and fills up 4 feet are expected to reach the FFE of the proposed addition.

Estimated building column and slab loads are currently unavailable. Based on our experience with similar buildings of this type, we estimate column loads of up to 100 kips and slab loads up to about 200 pounds per square foot (psf).

REVIEW OF AVAILABLE INFORMATION

Regional Geology

The 1992 "Surficial Materials Map of Connecticut" (Figure 2) indicates the overburden is predominantly sand and gravel within the proposed renovation and addition footprints, with thin till located along the east and west edges of the site. The 1985 "Bedrock Geological Map of Connecticut" (Figure 3) indicates that bedrock below the site is predominately Harrison gneiss (typically hard rock) with Golden Hill schist is located along the west edge of the site. Both maps were prepared by the Connecticut Geological and Natural Resource Survey.

Federal Emergency Management Agency Flood Map

We reviewed the Flood Insurance Rate Map (FIRM) for the town of Old Greenwich published by the Federal Emergency Management Agency (FEMA), Map Nos. 09001C0512G effective 8 July 2013 and 09001C0514G effective 8 July 2013 (Figure 4). The proposed renovations and addition

footprint are predominately located in Zone AE: shaded, "1% annual chance flood hazard" with a provided base flood elevation of el +13. The southeast corner of the site, and some renovation areas, are located in Zone X: unshaded, "areas of minimal flood hazard" (outside the 500-year floodplain).

SUBSURFACE EXPLORATION

Langan performed a subsurface exploration consisting of 3 borings. The exploration was overseen by a Langan field engineer. An exploration location plan is shown in Figure 5. We note that test pits were also proposed as part of the exploration scope and will be completed at a later date.

Borings

Three borings (LB-01 through LB-03 were drilled by SoilTesting, Inc. on 11 April 2023. The borings were advanced with a CME55 LC track-mounted rig using hollow-stem-auger drilling techniques. Borings were terminated from 25.9 to 27 feet below the existing grades (about el -13.9 to el -17).

Standard Penetration Test (SPT) N-values[1] were documented and soil samples were generally obtained continuously to a depth of about 12 feet and every 5 feet thereafter. Disturbed soil samples were obtained using a standard 2-inch-outer-diameter split-spoon sampler driven by a 140-pound safety hammer in accordance with ASTM D1586, Standard Penetration Test.

Recovered soil samples were visually examined and classified in the field in general accordance with the Unified Soil Classification System (USCS). Soil classifications, N-values, and other field observations were recorded on our field logs provided in Appendix A.

Lab Testing

Selected samples were sent to a testing laboratory to confirm visual classifications and to determine index properties (physical and mechanical). Five moisture-content determinations, three grain-size analyses, two Atterberg limits tests, and one organic content test were performed; the results are provided in Appendix B.

[1] The Standard Penetration Test (SPT) is an in situ testing technique used to infer soil density and consistency. The SPT N-value is defined as the number of blows required to drive a 2-inch-diameter split-barrel sampler 12 inches after an initial penetration of 6-inches using a 140-pound hammer falling freely from 30 inches.

SUBSURFACE CONDITIONS

The subsurface conditions generally consist of a surficial layer of asphalt or topsoil underlain by layers of fill, estuarine deposits, sand, decomposed rock, and bedrock. Bedrock was inferred from about 26 to 27 feet below existing grades (about el -14 to el -16). Groundwater was observed in all borings from about 7.5 to 8 feet below existing grades (between about el +4.5 and el +2). A detailed description of subsurface materials encountered is provided below in order of increasing depth.

Surficial Materials – A 5-inch-thick surficial layer of asphalt pavement was encountered in borings LB-02 and LB-03. A 9-inch-thick layer of topsoil was encountered in boring LB-01. The topsoil consists of brown silty fine to medium sand with vary proportions of gravel, organics, roots, asphalt fragments, and plastic debris.

Fill – An about 1- to- 4-foot-thick layer of fill was encountered below the surficial material in all borings. The fill is generally composed of brown fine to coarse sand, with varying proportions of fine to coarse gravel, silt, organics, roots, asphalt, and plastic debris. SPT N-values within the fill layer vary from about 6 blows per foot (bpf) to 11 bpf. Laboratory testing of one sample reported a fines content of about 23% and measured moisture content of about 9%. The fill layer is generally classified as silty sand with gravel (SM) in accordance with the Unified Soil Classification System (USCS).

Estuarine Deposits – An about 1.4- to- 4.5-foot-thick layer of estuarine (marsh) deposits (top of layer corresponding to about el +7.5 to el +8.5) was encountered below the fill in all borings. The estuarine layer is generally composed of dark brown dark to orangish gray silt or clayey sand with varying proportions of organics, fine to medium sand, silt, clay, gravel, roots, and mottling. SPT N-values within the estuarine layer vary from about 4 to 12 bpf. Laboratory testing of samples reported a liquid limit between about 24 to 34, a plastic limit between about 17 and 23, and a measured moisture content between about 24% to 34%. The measured organic content was about 3.6%. The estuarine layer is generally classified as clayey sand, clay, and clayey silt (SC, CL, and CL-ML) in accordance with the USCS.

Sand – An about 4- to- 21-foot-thick layer of sand (top of layer corresponding to about el +4 to el +6) was encountered below the estuarine layer in all borings. The sand layer is generally composed of light brown or orangish brown fine to coarse sand with varying proportions of gravel, and silt. SPT N-values within the sand layer vary from about 7 bpf to 52 bpf. Laboratory testing of samples reported a fines content of about 8% to 13% and a measured moisture content between about 5% to 19%. The sand layer is generally classified as well graded sand with silt and gravel (SW-SM) in accordance with the USCS.

Decomposed Rock – An about 0.7- to 16-foot-thick layer of decomposed rock (top of layer corresponding to about el -16 to el +2) was encountered below the sand layer in all borings. Lb-03 was terminated in the decomposed rock layer, and therefore thicknesses may be greater than reported herein. The decomposed rock layer is generally composed of brown to gray silty fine to coarse sand with varying amounts of gravel, weathered rock fragments, mica fragments and visible stratification. SPT N-values within the sand layer vary from about 17 bpf to split-spoon refusal (greater than 100 bpf). The decomposed rock displayed the structure of the parent rock but broke apart under the action of the split spoon.

Bedrock – Bedrock was inferred below the decomposed rock layer as evidenced by refusal of the drilling equipment (augers and split spoons) from about 26 to 27 feet below existing grades (top of rock between about el -14 to el -16) in borings LB-01 and LB-02.

Groundwater - Groundwater was first encountered in all borings from about 7.5 to 8 feet below existing grades (about el +2 to el +4.5). Groundwater was measured upon completion of each of the borings from about 9 to 18 feet below existing grades (about el +1 to el -6). We note that the drop in the groundwater measurements at the completion of the boring may be due to the groundwater having insufficient time to recharge through the denser decomposed rock layer. Due to the proximity of the nearby Greenwich Cove, we believe that groundwater levels may be tidally influenced. Groundwater, if encountered, should be expected to fluctuate with seasons, precipitation, construction activities, utility breaks, etc.

GEOTECHNICAL DESIGN RECOMMENDATIONS

The following key geotechnical issues have been identified:

- Loose uncontrolled fills and estuarine (marsh) deposits below the proposed building footprint,
- Fills up to 3 feet within the proposed building footprint over soft estuarine soils,
- Shallow groundwater,
- Proposed structure within FEMA zone AE, and
- The presence of loose sands below the groundwater table.

Additional Exploration

The proposed building addition footprint has been altered following our exploration. Additional borings or test pits should be coordinated with the proposed civil exploration work. We recommend additional exploration be performed within the western part of the building footprint to further understand fill and estuarine deposit thicknesses within the addition footprint, and to understand fill thicknesses adjacent to the existing building. Further exploration may also be

required at the proposed elevator pit locations to understand existing building foundations and pit bearing materials.

Seismic Design

This section presents seismic design recommendation, in accordance with the 2022 Connecticut State Building Code (International Building Code 2021). We have considered the soil conditions encountered in the borings to be consistent and representative of the soil conditions in the top 100 feet of soil at this site.

Table 1. Seismic Design Values

Description	Parameter	Recommended Value
Mapped Spectral Acceleration for short periods:	S_s	0.274
Mapped Spectral Acceleration for 1-sec period:	S_1	0.059
Site Class:	--	**D – Stiff soil profile**
Site Coefficient:	F_a	1.58
Site Coefficient:	F_v	2.4
5% damped design spectral response acceleration at short periods:	**S_{DS}**	**0.281**
5% damped design spectral response acceleration at 1-sec period:	**S_{D1}**	**0.094**
Anticipated Risk Category	--	**III**
Seismic Design Category	**--**	**B**

Based on the above spectral accelerations and the anticipated risk category, we have estimated the Seismic Design Category (SDC). The structural engineer is responsible for confirming the appropriate use group, occupancy category, and final SDC for the proposed structure.

Liquefaction

Due to the presence of loose sands (low N-values) below the groundwater table in LB-03, we evaluated the liquefaction potential of non-cohesive soil below the groundwater table up to 100 feet below the ground surface (as required by the Connecticut Building Code) using the procedure outlined by Youd et al. (2001). Our analysis included all Langan borings within the building footprint that were potentially susceptible to liquefaction. The Youd et al. method is considered to be the state-of-practice recommended by the National Earthquake Hazard Reduction Program. The method presents an empirical relationship between the earthquake demand, represented by the Cyclic Stress Ratio (CSR), and the soil's resistance to dynamic loading, represented by the Cyclic Resistance Ratio (CRR). Field N-values are converted to $N_{1,60,cs}$ by applying corrections for

hammer energy efficiency, soil overburden pressure, borehole diameter, rod length, sampler lining, and fines content.

Our analysis parameters included a peak ground acceleration of 0.161g and mean earthquake magnitude of 5.49 (from the Unified Hazard Tool[2]). Our analysis indicates that all SPT N-values evaluated have a factor of safety against liquefaction greater than one. It is our judgment that liquefaction need not be considered in the design. A plot showing factors of safety versus depth is provided as Figure 6.

Foundations

Removal and Replacement Program

The materials encountered at the anticipated footing elevation (estimated to be between about el +9 to el +11) consist of fill and estuarine deposits. The surficial materials, fill, and estuarine deposits are not suitable for foundation or slab support. A removal and replacement program should be performed to remove the fill and estuarine deposits to the native sands, and be replaced with structural fill to the bottom of proposed foundation elevation. Replacement fill materials should be placed in accordance with the Excavation, Fill Placement, and Compaction Criteria section of this report to support shallow foundation construction. We estimate over-excavations up to about 6 feet will be necessary to reach the native sandy soils. The proposed structure can be supported on shallow foundations bearing on structural fill or natural sands using an allowable bearing pressure of 4,000 psf. Footing subgrades should be prepared in accordance with the Subgrade Preparation section of this report.

Flood Conditions

Foundations should be designed to account for anticipated flooding associated with the design flood elevation (see the Ground Floor Slab and Permanent Groundwater Controls sections below) and ASCE 24 requirements. Foundations should also be designed to account for erosion or local scour where necessary.

General

All exterior footings should be constructed 42 inches or deeper below the lowest adjacent grade for frost protection. Interior footings in heated spaces may be constructed at a convenient depth below the slab; however, all bottoms of footings should be at least 1.5 feet below the finished-floor elevation. Isolated column footings should have a minimum dimension of 3 feet, and strip

[2] Unified Hazard Tool via U.S. Geological Survey – Earthquake Hazards Program

footings should have a minimum width of 2 feet even if smaller dimensions can be justified using the recommended allowable bearing pressure.

Foundations should not be located so that one foundation is within the zone of influence of an adjacent foundation. The zone of influence is taken as a 1H:1V projection extending outward and downward from the edge of the foundation. New foundation elements should match the bottom of footing elevation of the existing foundations for adjacent elements. Excavations to remove unsuitable materials should be sloped from the existing foundations or existing foundations should be underpinned to avoid undermining existing foundations. Additional information is included in the underpinning section below.

Foundation Settlement

Total settlement of the new structure is estimated to be on the order of 3/4 inch or less, provided the bearing pressure recommended here is used and the subgrade preparation work described here is performed. Differential settlements between the existing structure and new foundations are expected to be reach settlement limits of about 3/4 inch. A majority of the settlement is expected to take place during construction.

Ground Floor Slabs

Design Flood Elevation

The FEMA base flood elevation (BFE) of el +13 is above the proposed lowest ground floor FFE for the building addition. The building slab should be designed to account for anticipated flooding associated with the design groundwater elevation from the adjacent water bodies and ASCE 24 requirements.

The ground floor level should consider potential hydrostatic pressures from flood events. The BFE elevation is el +13, and the design flood elevation should be taken as BFE +1 feet for a design flood elevation (DFE) of el +14.

Scheme 1 – Slab-on-Grade

Slab-on-grade construction should consider the DFE and be designed in accordance with ASCE 24 requirements. A slab-on-grade can be constructed bearing on natural soils, structural fill, or compacted existing fill prepared in accordance with the recommendations here. Removal and replacement of estuarine soils should be performed below slab-on-grade areas prior to placement of any raise-in-grade fills to limit settlement of the slabs over time. Subgrades within the building footprint should be prepared in accordance with recommendations in the Subgrade Preparation section of this report prior to placing any additional fill materials. We anticipate that the existing

fill materials can be reused as structural fill provided the fill is placed in compacted lift as outlined herein. We recommend designing slab-on-grade for a modulus of subgrade reaction of 125 pounds per cubic inch.

We recommend a minimum 12-inch-thick layer of ¾-inch clean crushed stone be included beneath the slab to protect the prepared subgrade and to serve as a capillary break. We recommend any slab below the DFE have a waterproofing membrane below the ground-floor slab. The barrier should be coordinated with any environmental requirements for the development. Omission of a barrier can lead to floor-covering problems including delamination and mold.

Scheme 2 – Structural Slab

Slabs that cannot be designed to meet ASCE 24 requirements or resist uplift loads from the DGE should be designed as a structural slab. The structural slab can be designed to withstand hydrostatic pressures from flood conditions. The slab should be designed to account for anticipated flooding associated with the design flood elevation from the adjacent water bodies and ASCE 24 requirements.

Uplift Resistance

The slab should be designed to resist uplift pressures by increasing the dead load, through smaller structural spans, or uplift anchors. If anchors are necessary, we can provide a preliminary design. The anchors should be double corrosion protected to account for the marine environment and use below water.

Permanent Groundwater Controls

Waterproofing

The design groundwater elevation is el +14, and we recommend that all foundations, slabs, and pits below the DGE will be fully waterproofed to protect mechanical equipment and finishes against moisture. We recommend that a membrane-type waterproofing be used such as Preprufe and Bithuthene products by GCP. Bentonite is not recommended. The vertical waterproofing should be protected with a rigid barrier to prevent damage during backfilling. A drainage board can serve as protection as well. After installation of the waterproofing, care must be taken so as to not damage the waterproofing. Waterproofing damaged during construction should be repaired as determined by the manufacturer.

Additional Flood-proofing Measures

We understand existing and proposed portions of the structure lie below the design flood elevation. Additional measures may be necessary at existing building areas, structure entrances, utility penetrations, etc. to maintain dry conditions during high water events.

Below Grade Walls (Pits)

Permanent below-grade walls that are considered to be fixed against rotation should be designed to resist soil, groundwater, and surcharge pressures. Backfill should not be placed against below-grade walls until the wall concrete has reached its 28-day compressive design strength and has been approved by the structural engineer.

We recommend that the below-grade foundation walls (i.e., fixed walls) be designed using a triangular earth-pressure distribution having an equivalent fluid weight 90 lb/ft^2 per foot of depth below the design flood elevation. Above the design flood elevation, below grade foundation walls can be designed using 60 lb/ft^2 per foot of depth presuming that free-draining clean stone as backfill or a manufactured drain is used.

Surcharge loading on the below-grade foundation walls should be included by adding a uniform stress equal to one-half the surcharge load in addition to the soil loading.

Underpinning

We understand that one elevator pit will be added within the existing building footprint. Additionally, if removal and replacement is necessary next to the existing building foundations to construct the proposed addition, localized underpinning may be necessary to perform the removal and replacement program. Additional exploration (see additional exploration section above) or historic information will be necessary to understand the bottom of footing elevations of the existing adjacent foundation elements. Underpinning can be used to support the adjacent foundations and avoid undermining the adjacent foundation elements.

In locations where localized underpinning is necessary, conventional underpinning concrete piers can likely be constructed to transfer the loads to the same elevation of the proposed pit level or over-excavation limit and prevent undermining. Concrete underpinning piers are typically a maximum of 4 feet wide and constructed in sequence below the adjacent building foundations. Piers are typically constructed at a spacing of 12 feet on-center and allowed to set before the next sequence is constructed.

Concrete underpinning piers are permanent design features and should be designed by the site geotechnical engineer as part of the design phase. We can design the underpinning piers and

sequencing after further exploration or understanding of existing building foundations. The contractor should submit shop drawings for review to the design engineer prior to construction.

GEOTECHNICAL CONSTRUCTION RECOMMENDATIONS

Site Preparation

All existing foundations, floor slabs, and utilities should be completely removed within 10 feet of the proposed footprint. Below-grade structures outside of the building footprint can be abandoned in place provided they are removed to at least 3 feet below finished subgrade levels, 2 feet below proposed utilities, and to eliminate conflicts with new utilities or structures. Slabs left in place should be sufficiently broken up to allow water to drain, and so that a geotechnical engineer can observe if voids exist beneath the slab. Existing asphalt pavement and concrete walkways should be completely removed.

Existing utilities within the building footprint should be completely removed. Existing utilities outside of the proposed building footprint should be removed or abandoned in place by completely filling with grout.

Excavations made to remove below-grade elements should be backfilled with approved, compacted fill in accordance with the Excavation, Fill, Placement, and Compaction Criteria section of this report and any environmental requirements.

Clearing and grubbing of trees and vegetation designated for removal (including root systems) should be performed. Buried debris should be completely removed beneath proposed building slab and footing locations. Topsoil should be stripped from the proposed building and pavement areas and should be stockpiled and protected from erosion. Topsoil should be evaluated by a landscape architect for reuse in landscape areas (if permitted by the environmental engineer). All clearing and stripping activities should be performed in strict accordance with the approved soil-erosion and sediment-control plan and the environmental reports prepared for the project.

All demolition and site-clearing work should be performed in accordance with any environmental requirements established for the site, and all local, state, and federal regulations. All debris and trees and other vegetation should be properly disposed of offsite in accordance with applicable regulations. All construction work should be performed so as not to adversely impact the existing school, neighboring buildings, off-site structures or utilities, including the existing utilities and trees that are to remain. Protection of these elements should be provided as necessary. Before beginning grading or placing fill, any miscellaneous trash, debris, or other unsuitable materials should be removed from the site.

Subgrade Preparation

All footing and utility-trench subgrades, except rock subgrades, should be proofrolled with six overlapping coverages of a double-drum 1-ton walk-behind vibratory roller (such as a Bomag BW75 or equivalent). All slab subgrade areas should be proofrolled with six overlapping coverages of a vibratory drum roller having a minimum static drum weight of 5 tons.

Soft areas identified during proofrolling should be excavated and replaced with approved structural fill. The actual extent of necessary excavation and replacement should be determined by a qualified Langan geotechnical engineer. Care should be taken when proofrolling near any existing underground utilities of structures that are to remain.

Soil footing subgrades should be excavated level. If any cobbles or boulders are encountered at the footing subgrade such that a relatively level subgrade is not achieved, they should be removed and replaced with compacted structural fill, compacted ¾-inch crushed stone, or lean concrete. All soil subgrades for footings or slabs should be compacted to the project specified compaction criteria.

If foundations are not poured in a timely manner, the subgrade should be protected with a lean concrete mud mat to protect the footing subgrades.

Steps should be taken by the contractor to control and remove surface-water runoff and precipitation. When soil is wet and subjected to construction traffic, previously acceptable subgrades can soften and become unacceptable. A smooth drum roller should be used to seal the surface and provide for better drainage. We also recommend crowning or sloping the subgrade to provide positive drainage off the subgrades.

Excavation, Fill, Placement, and Compaction Criteria

Excavation through the fill, estuarine deposits and the underlying natural sands can likely be performed using conventional earthmoving equipment (e.g., backhoes, excavators, dozers, etc.). Excavations made for footings and utilities should be conducted to minimize disturbance to the subgrade (i.e., backhoe with a smooth-edge bucket).

All excavations should be properly sloped or braced and conform with applicable OSHA regulations including, but not limited to, temporary shoring, trench boxes, or proper benching.

All excavation and backfilling must be performed in accordance with the project environmental engineer's recommendations.

The following types of fill can be used.

Structural Fill – Structural fill should be well-graded sand and gravel having a maximum particle size of 3 inches and no more than 10% passing the No. 200 sieve. Additionally, the structural fill should be free of organics, clay, roots, concrete, other non-soil constituents, and other deleterious or compressible materials. Any approved imported structural fill should be "certified clean fill" free of hazardous substances and meeting all local, state, federal and the Connecticut Department of Energy and Environmental Protection Soil Waste regulations.

Material Reuse – The contractor may reuse the on-site fill or natural sand as structural fill provided the soil meet the requirements for structural fill outlined above and is approved by the environmental engineer. Note that samples obtained within the fill and natural sand layers have a fines content (material passing the No. 200 sieve) of about 13 to 23%; therefore, the soil may be sensitive to moisture. The overall amount of soil that can be reused will be dependent on the amount of fines present within the soil, the time of year the earthwork is carried out (e.g., potentially inclement weather), and the earthwork contractor's ability to stage, aerate and process the material to facilitate placement and compaction. We do not anticipate the estuarine deposits can be reused on-site.

General Fill – On-site soils not meeting the requirements for structural fill can be used as general fill for site landscape and other nonstructural areas if environmentally suitable for reuse.

Compaction Criteria – All fill should be placed in uniform 12-inch-thick loose lifts and compacted. Fill in landscaped areas should be compacted to 90% of its maximum dry unit weight as determined by ASTM D1557; all other fill should be compacted to at least 95%. In restricted areas where only hand-operated compactors can be used, the maximum lift thickness should be limited to 8 inches. The appropriate water content at the time of compaction should be plus or minus 2% of optimum as determined by the laboratory compaction tests of proposed fill. No backfill should be placed on areas where free water is standing or on frozen subsoil areas.

Temporary Groundwater Control

We anticipate that dewatering will be required during construction. Water infiltration to the foundation excavation and during the removal and replacement program can likely be controlled using gravity-fed sump pumps via gravel trenches or sumps assisted with collector trenches. The final dewatering measures required should be evaluated and designed by the contractor. The dewatering measures implemented should adequately dewater all foundation-related excavations such that compaction of footing subgrades is feasible.

Collection of rainwater runoff will also be needed during the excavation for the removal and replacement program and during the subgrade preparation work. Water runoff is expected to be controlled with the use of gravel-lined collection trenches, pits and submersible pumps. Care should be taken to ensure that drainage is provided during all phases of excavation work. Environmental pretreatment of groundwater, if necessary, is beyond the scope of this study. Collected water should be discharged in accordance with applicable regulations.

Monitoring

We understand that the existing school is to remain, will receive renovations, and is to be tied into the new addition, therefor damage to the existing school is to be avoided as much as possible. As such, we recommend that a monitoring program be developed and incorporated into the Contract Documents during construction. Monitoring should include means to measure vibrations from construction operations and ground movement. The type and locations of specific monitoring equipment, threshold values, and durations should be developed based on review of the anticipated construction means and methods in conjunction with proximity and type of existing structures and utilities. The purpose of performing monitoring is to provide reasonable feedback to the contractor with respect to protecting existing structures and utilities, and to assess any necessary changes to means and methods of construction.

We recommend developing a monitoring plan and project specifications prior to construction. These would detail the methods and equipment required for monitoring vibration and movement, and would provide limits along with requirements for frequency of readings and reporting. The monitoring program would likely include optical surveying, seismographs (vibration monitoring), and crack gauges. We recommend that all monitoring be performed by a third-party consultant independent of the contractor; however, the contractor should reserve the right to perform additional monitoring. Threshold criteria should be developed during deign and coordinated with the structural engineer.

SERVICES DURING DESIGN, CONSTRUCTION DOCUMENTS AND CONSTRUCTION QUALITY ASSURANCE

During final design, Langan should be retained to consult with the design team as geotechnical questions arise. Technical specifications and design drawings should incorporate our recommendations. When authorized, we will assist the design team in preparing specification sections related to geotechnical issues such as earthwork, shallow foundations, backfill, and excavation support. Langan should also, when authorized, review the project plans and contractor submittals relating to materials and construction procedures for geotechnical work to confirm the designs incorporate the intent of our recommendations.

Langan has explored and interpreted the site subsurface conditions and developed the foundation design recommendations contained here and is, therefore, best suited to perform quality-

assurance observation and testing of geotechnical-related work during construction. The work requiring quality-assurance confirmation or special inspections per the Building Code includes, but is not limited to, earthwork, shallow foundations, backfill, and excavation support.

Recognizing that construction observation is the final stage of geotechnical design, quality-assurance observation during construction by Langan is necessary to confirm the design assumptions and design elements, to maintain our continuity of responsibility on this project, and allow us to make changes to our recommendations, as necessary. The foundation system and general geotechnical construction methods recommended herein are predicated upon Langan's assisting with the final design and providing construction observation services for the owner. If Langan is not retained for these services, we cannot assume the role of geotechnical engineer of record, and the entity providing the final design and construction observation services must serve as the engineer of record.

LIMITATIONS

The conclusions and recommendations provided in this report result from our interpretation of the geotechnical conditions existing at the site inferred from a limited number of borings and information provided by the design team. Actual subsurface conditions may vary. Recommendations provided are dependent upon one another and no recommendation should be followed independent of the others.

Any proposed changes in structures or their locations should be brought to Langan's attention as soon as possible so we can determine whether such changes affect our recommendations. Information on subsurface strata and groundwater levels shown on the logs represent conditions encountered only at the locations indicated and at the time of our exploration. If different conditions are encountered during construction, they should immediately be brought to Langan's attention for evaluation because they might affect our recommendations.

This report has been prepared to assist the owner, architect, and structural engineer in the design process and is only applicable to the design of the specific project identified. The information in this report cannot be used or depended on by engineers or contractors involved in evaluations or designs of facilities (including underpinning, grouting, stabilization, etc.) on adjacent properties beyond the limits of that which is the specific subject of this report.

Environmental issues (such as permitting or potentially contaminated soil and groundwater) are outside the scope of this study and should be addressed in a separate evaluation.

CLOSING

We have appreciated being of service on this project, and look forward to working with you to successfully complete this project.

Sincerely,
Langan CT, Inc.

Taylor Dalling, P.E
Project Engineer

Clayton Patterson, P.E.
Associate

TSD:cp/jd/cpc

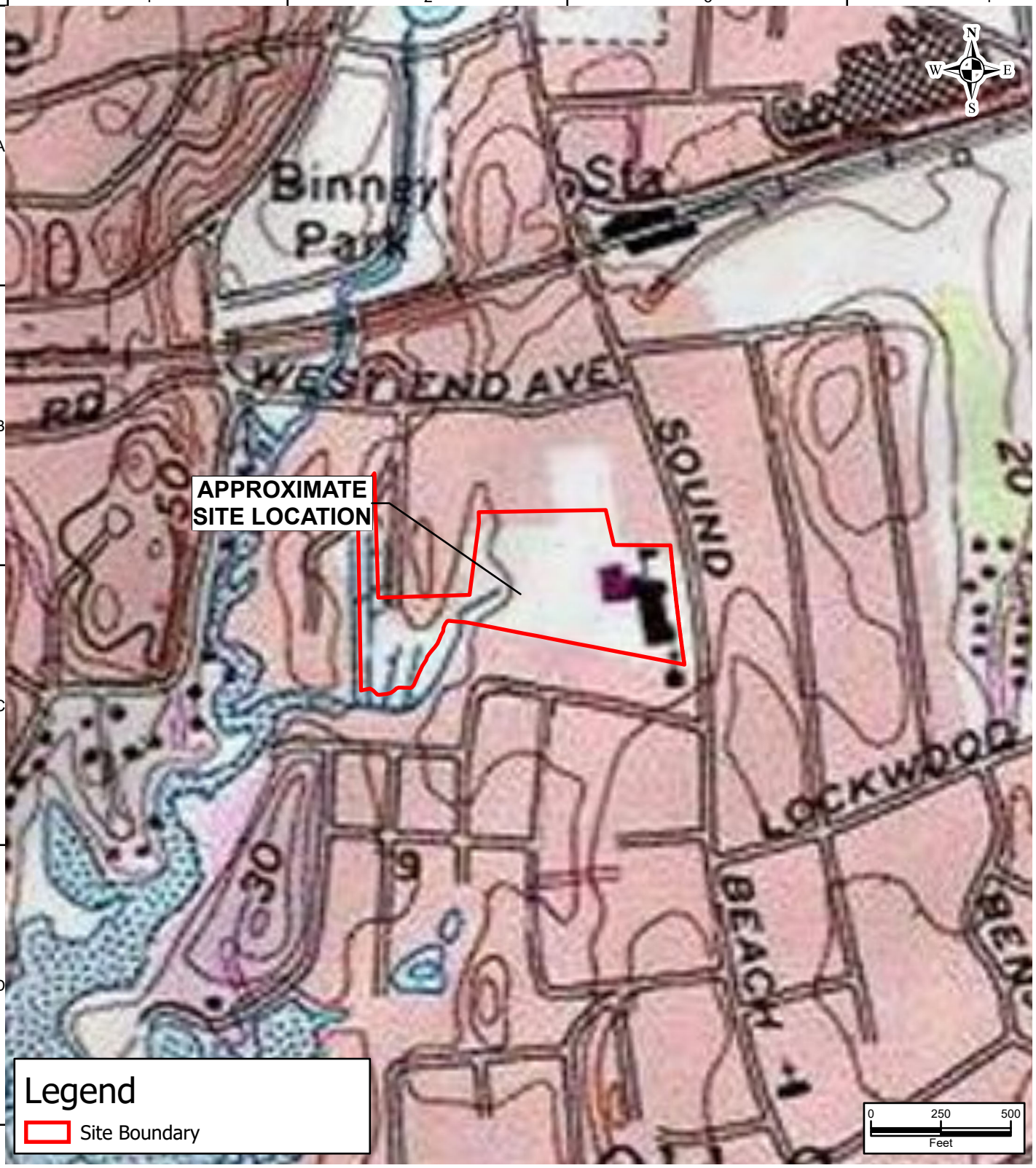
\\langan.com\data\NH\data8\140265801\Project Data_Discipline\Geotechnical\Reports\2023-05 Geotech Report\140265801 - Old Greenwich School_Geotech Report - AHM Edits.docx

Attachments:

Figure 1: Site Location
Figure 2: CT Surficial Materials Map
Figure 3: CT Bedrock Geology
Figure 4: Effective FEMA FIRM
Figure 5: Exploration Location Plan
Figure 6: Soil Liquefaction Evaluation

Appendix A: Boring Logs
Appendix B: Laboratory Test Results

FIGURES



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Project
Old Greenwich School
OLD GREENWICH
CONNECTICUT
WESTERN CONNECTICUT

Drawing Title
SITE LOCATION

Project No.	140265801
Date	4/27/2023
Scale	1:500
Drawn By	Site Analyzer
Submission Date	04/27/2023

Figure
1

Sheet 1 of 4

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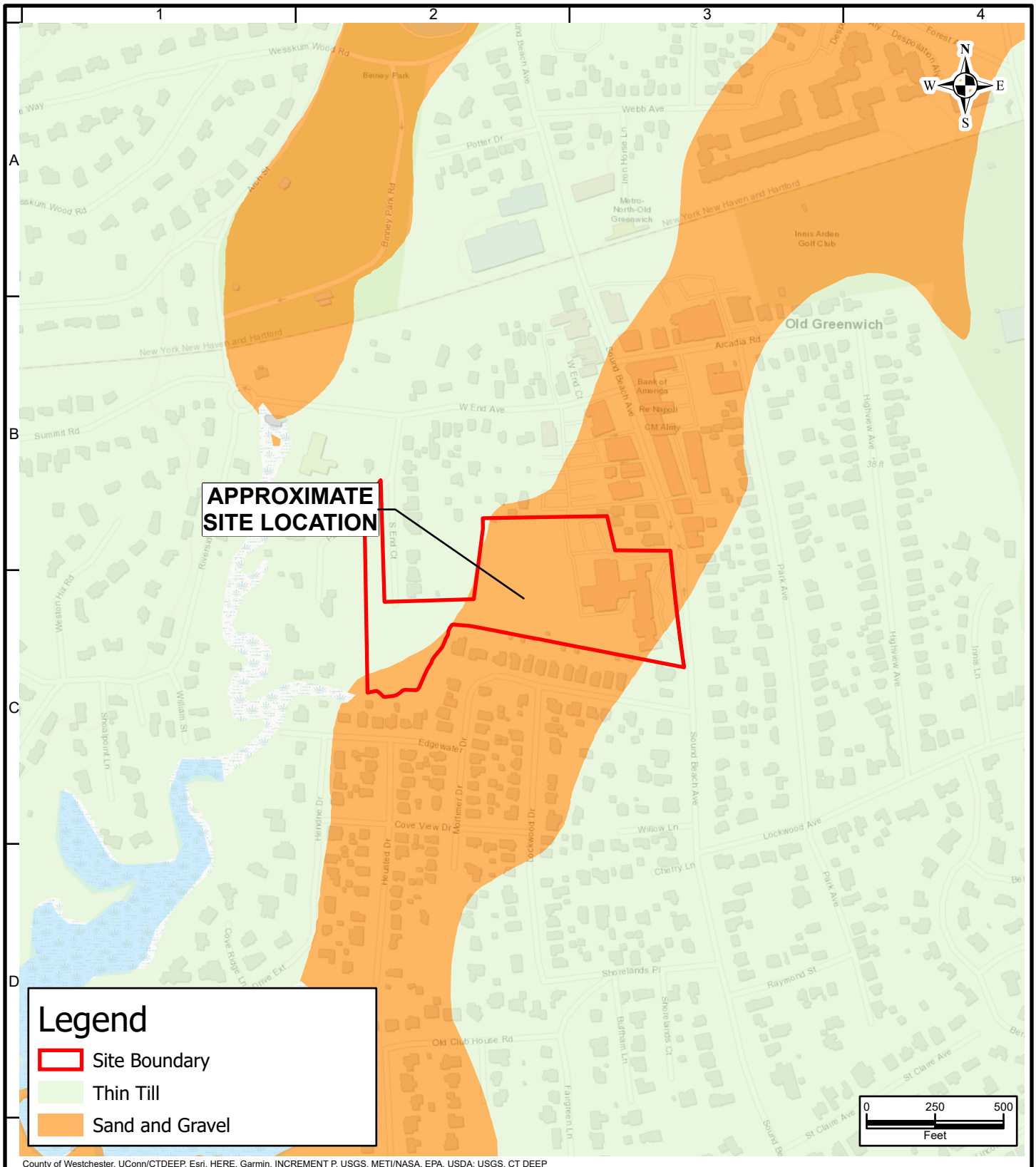

County of Westchester, UConn/CTDEEP, Esri, HERE, Garmin, INCREMENT P, USGS, METI/NASA, EPA, USDA; USGS, CT DEEP

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Project	**Old Greenwich School** OLD GREENWICH CONNECTICUT WESTERN CONNECTICUT
Drawing Title	**CT SURFICIAL MATERIALS MAP**
Project No.	140265801
Date	4/27/2023
Scale	1:500
Drawn By	Site Analyzer
Submission Date	04/27/2023
Figure	2
	Sheet 2 of 4

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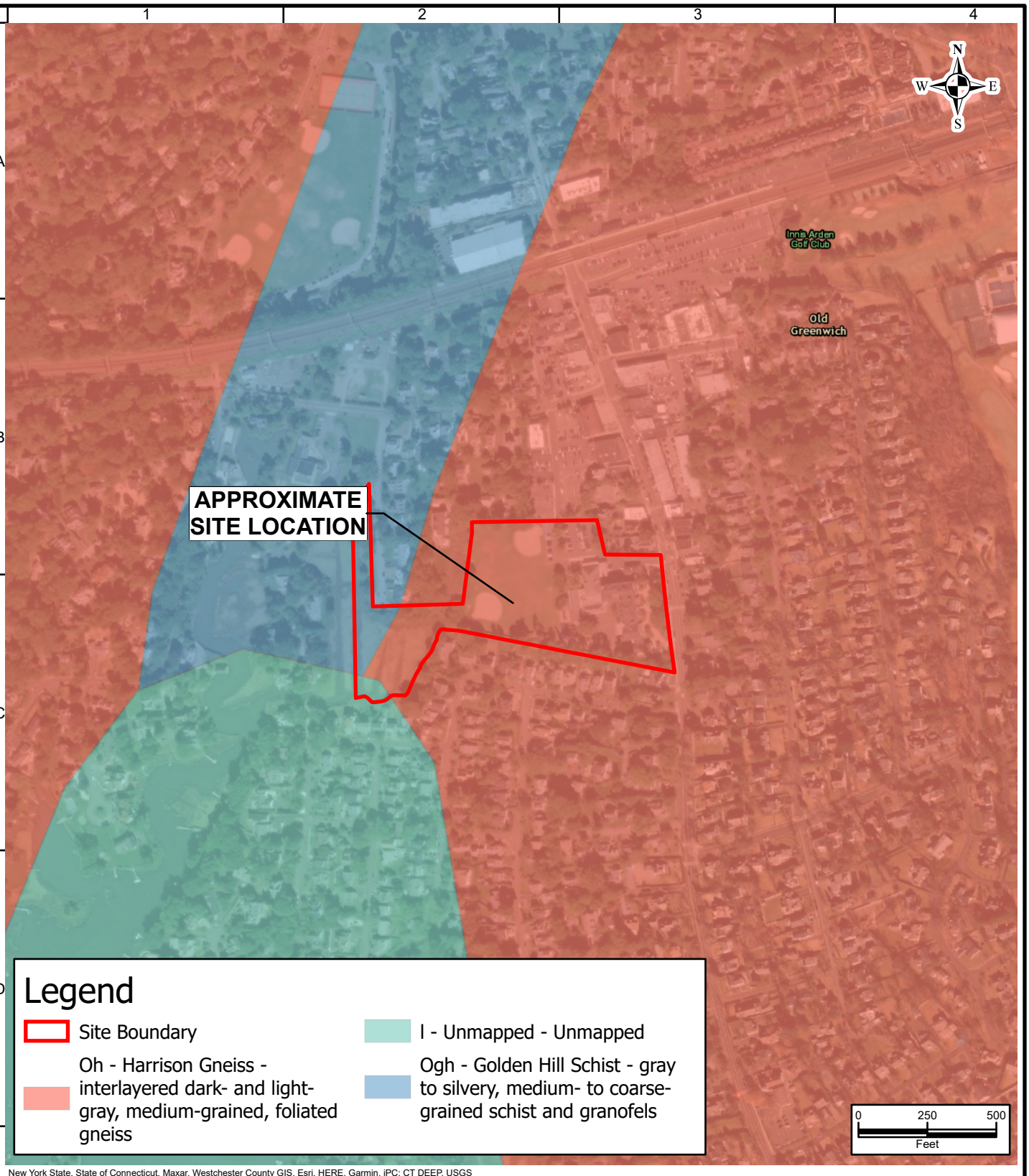
Spatial Reference: NAD 1983 StatePlane Connecticut FIPS 0600 Feet



New York State, State of Connecticut, Maxar, Westchester County GIS, Esri, HERE, Garmin, iPC; CT DEEP, USGS

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Drawing Title
CT BEDROCK GEOLOGY

Project No.	140265801
Date	4/27/2023
Scale	1:500
Drawn By	Site Analyzer
Submission Date	04/27/2023

Figure
3

Sheet 3 of 4

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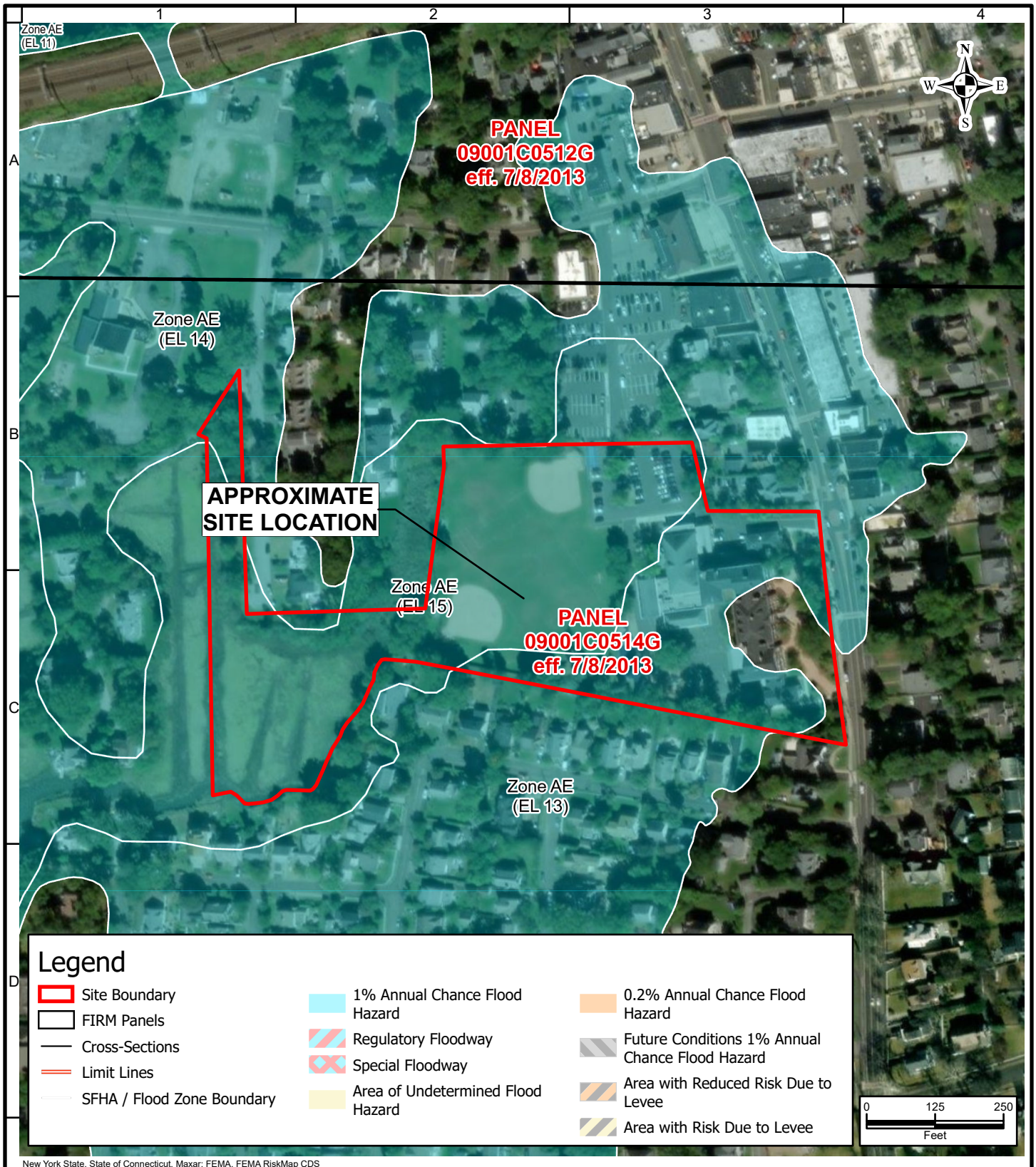

New York State, State of Connecticut, Maxar; FEMA, FEMA RiskMap CDS

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Drawing Title
EFFECTIVE FEMA FIRM

Project No.	140265801
Date	4/27/2023
Scale	1:250
Drawn By	Site Analyzer
Submission Date	04/27/2023

Figure
4

Sheet 4 of 4

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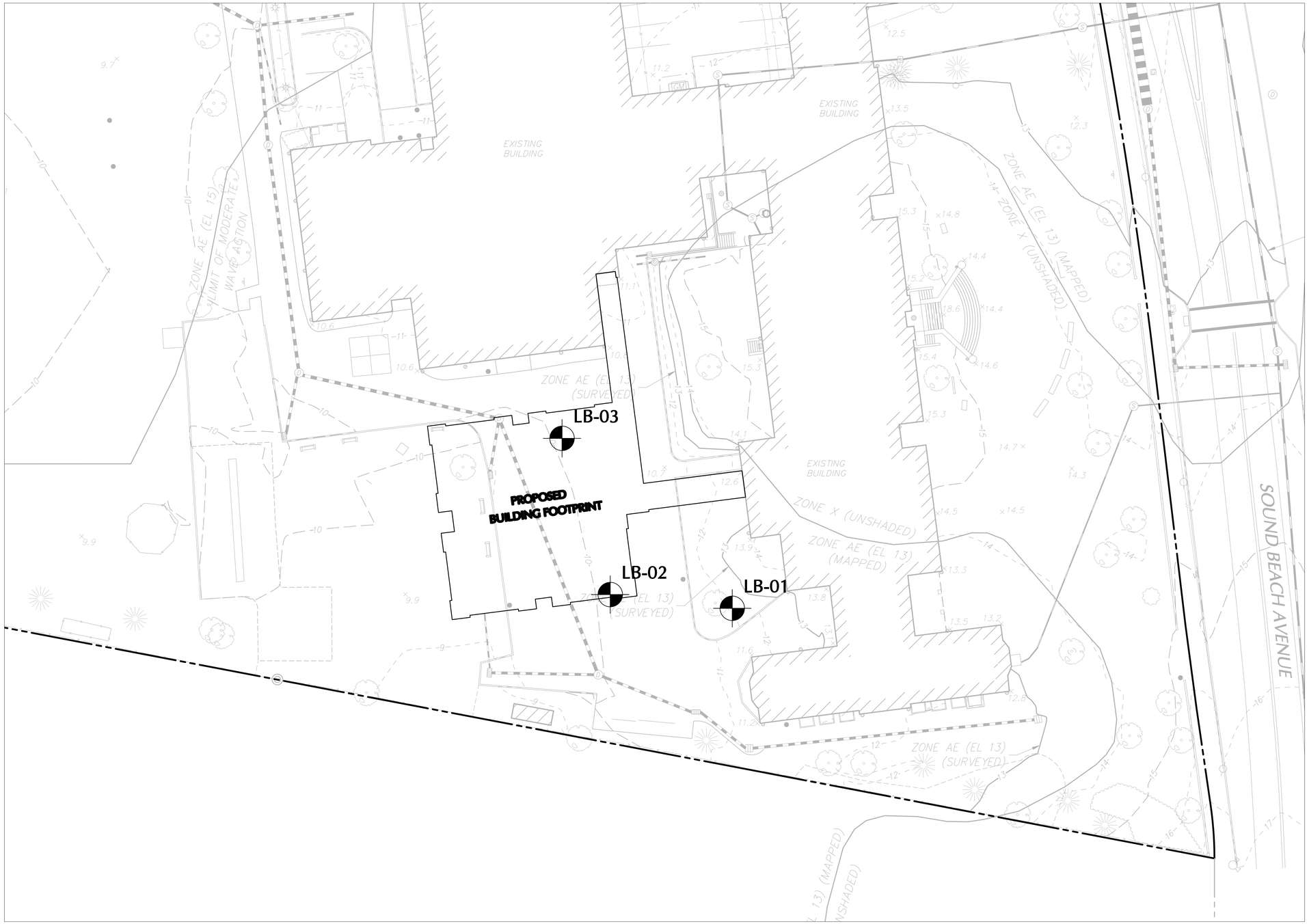

NOTES

1. ALL BORING LOCATIONS ARE APPROXIMATE.
2. ELEVATIONS REFERENCE NAVD88.
3. SURVEY INFORMATION REFERENCES THE SURVEY ENTITLED "BOUNDARY & TOPOGRAPHIC SURVEY" PREPARED BY LANGAN DATED 28 APRIL 2023.
4. BUILDING INFORMATION REFERENCES THE DRAWING ENTITLED "PROPOSED GROUND FLOOR SCHEME D.2" PREPARED BY SILVER PETRUCELLI + ASSOCIATES DATED 18 APRIL 2023.
5. BORINGS LB-01 THROUGH LB-03 WERE DRILLED BY SOILTESTING, INC. USING A CME55 LC TRACK-MOUNTED RIG UNDER THE FULL-TIME OBSERVATION OF A LANGAN FIELD ENGINEER ON 11 APRIL 2023.

LEGEND

PROPOSED SUBDIVISION LINE	
PROPOSED BUILDING LINE	
2023 LANGAN BORING LOCATION	LB-01

20 0 5 10 20
SCALE: 1 INCH = 20 FEET

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Project
OLD GREENWICH SCHOOL RENO & ADDITION/SPA
285 SOUND BEACH AVENUE
OLD GREENWICH
FAIRFIELD COUNTY CONNECTICUT

Drawing Title
EXPLORATION LOCATION PLAN

Project No.	140265801
Date	5/1/2023
Drawn By	MDW
Checked By	TSD

Figure 5

Sheet 5 of 5

LANGAN
Project No. 140265801
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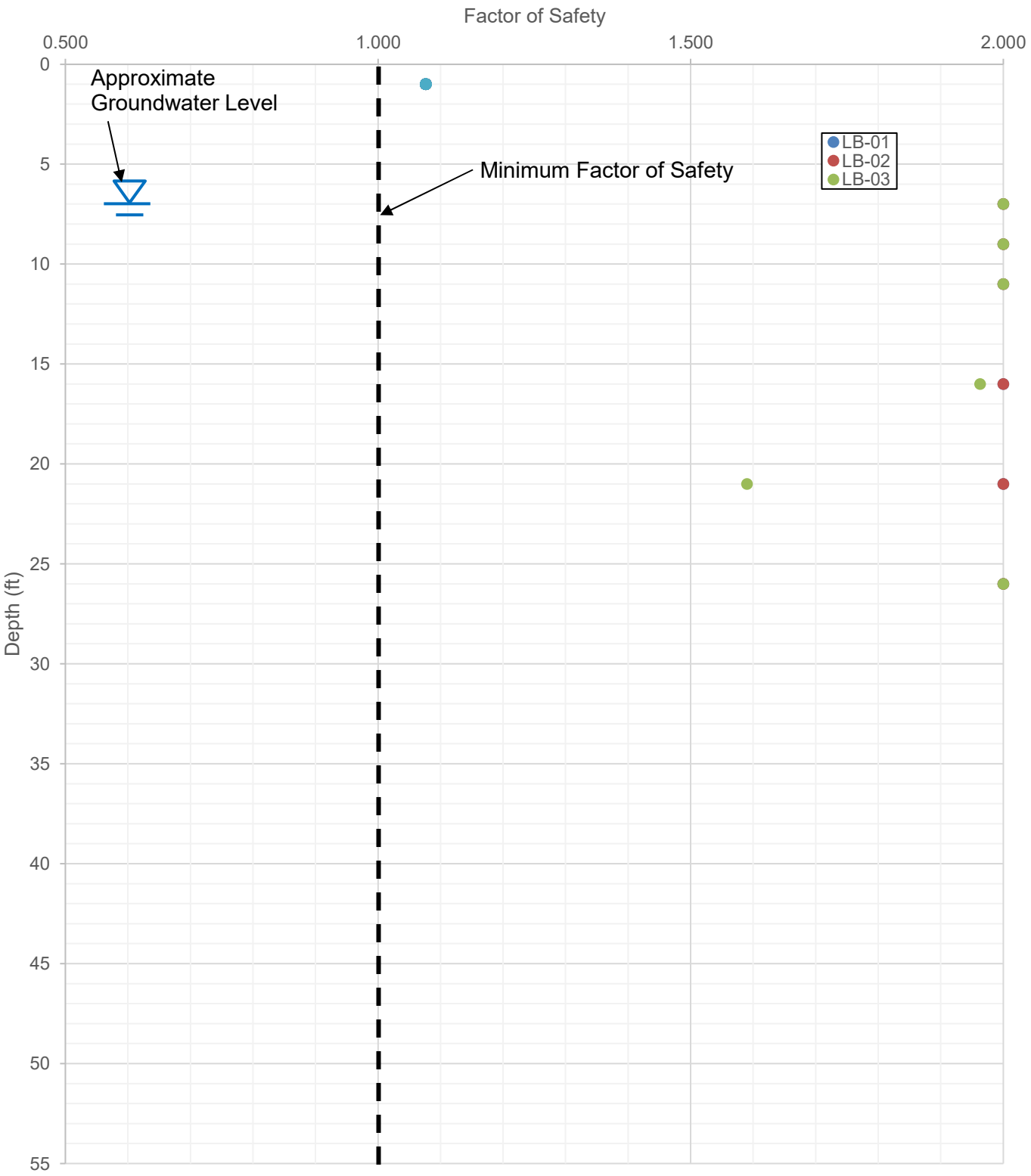
Date: 5/1/2023 Time: 15:04 User: mwendland Style Table: Langan.stb Layout: Layout1 Document Code: FG05-140265801-0201-BL101-0101



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Project: OLD GREENWICH SCHOOL OLD GREENWICH FAIRFIELD COUNTY CONNECTICUT	Drawing Title: SOIL LIQUEFACTION EVALUATION	Project No.: 140265801 Date: 5/4/2023 Scale: N.T.S Drawn By: TSD	Figure No.: 6

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APPENDIX A
BORING LOGS

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Log of Boring **LB-01** Sheet 1 of 2

Project: Old Greenwich School		Project No.: 140265801	
Location: 285 Sound Beach Ave, Old Greenwich, CT		Elevation and Datum: Approx. el. 12.0 (NAVD 88)	
Drilling Company: Soiltesting, Inc.		Date Started: 4/11/2023	Date Finished: 4/11/2023
Drilling Equipment: CME55 LC		Completion Depth: 25.9 ft	Rock Depth: 25.9 ft
Size and Type of Bit: 4-1/4-inch hollow-stem auger		Number of Samples: Disturbed 9	Undisturbed 0 / Core 0
Casing Diameter (in): N/A	Casing Depth (ft): N/A	Water Level (ft.): First ▽ 7.5	Completion ▼ 18.3 / 24 HR. ▼ N/A
Casing Hammer: N/A	Weight (lbs): N/A / Drop (in): N/A	Drilling Foreman: Andy Koval	
Sampler: 2in OD Split Spoon		Field Engineer: Matthew Wendland	
Sampler Hammer: Automatic	Weight (lbs): 140 / Drop (in): 30		

Material Symbol	Elev. (ft)	Sample Description	Depth Scale	Number	Type	Recov. (in)	Penetr-resist BL/6in	N-Value (Blows/ft)	Remarks (Drilling Fluid, Casing Depth, Fluid Loss, Drilling Resistance, etc.)
	+12.0							10 20 30 40	
	+11.2	Brown Silty fine to medium SAND, trace fine gravel, trace organics, trace roots, trace asphalt, trace plastic debris (moist) [TOPSOIL]	0	S-1A	SS	5	2 6 7 5	13	
		Brown fine to coarse SAND, some coarse to fine gravel, some silt, trace organics, trace roots, trace asphalt, trace plastic debris (moist) [FILL]	1	S-1B					
		Brown fine to coarse SAND, some fine to coarse gravel, some silt, trace roots, trace asphalt (moist) [FILL]	2	S-2	SS	10	4 3 5 2	8	
	+7.4	Brown fine to coarse SAND, trace fine to coarse gravel, some silt, trace roots, trace asphalt (moist) [FILL]	3	S-3A	SS	17	2 4 8 14	12	Auger to 4ft. Brown cuttings
		Light brown to orangish brown Clayey fine SAND, some silt, some coarse to fine gravel, trace organics, trace roots, mottling (moist) [ESTUARINE]	4	S-3B					
	+6.0	Orangish brown to brown fine to coarse SAND with fine to coarse GRAVEL, trace silt, trace weathered rock fragments (moist) [SW]	5	S-4A	SS	18	19 21 17 17	38	
		Light brown fine to coarse SAND with fine to coarse GRAVEL, trace silt (wet) [SW] ▽	6	S-4B					Water level first at about 7.5ft. Note that water level at completion reading is much deeper at about 18.3ft. This could explain why samples below S-4B are moist - maybe this was not groundwater at 7.5ft
		Light brown to orangish brown fine to coarse SAND with fine to coarse GRAVEL, trace silt (wet) [SW]	7	S-5	SS	13	13 18 19 8	37	Auger to 8ft. Brown cuttings
	+2.0	Orangish brown to brown Silty fine to coarse SAND, some fine to coarse gravel, weathered rock fragments (wet) [DECOMPOSED ROCK]	8	S-6	SS	13	11 13 13 15	26	
			9						
			10						
			11						
			12						
			13						
			14						
		Brown Silty fine to medium SAND, trace coarse gravel, stratification visible (wet) [DECOMPOSED ROCK]	15	S-7	SS	8	10 13 9 11	22	Auger to 15ft. Medium augering. Light rig chatter at 10ft
			16						
			17						
		▼	18						
			19						
			20						

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Log of Boring **LB-01** Sheet 2 of 2

Project	Project No.
Old Greenwich School	140265801
Location	**Elevation and Datum**
	12.0

Material Symbol	Elev. (ft)	Sample Description	Depth Scale	Sample Data: Number	Type	Recov. (in)	Penetr-resist BL/6in	N-Value (Blows/ft)	Remarks (Drilling Fluid, Casing Depth, Fluid Loss, Drilling Resistance, etc.)
	-8.0	Brown to reddish brown Silty fine to coarse SAND, some fine to coarse gravel, stratification visible (wet) [DECOMPOSED ROCK]	20						Auger to 20ft Medium augering. Brown cuttings
			21	S-8	SS	15	9 9 9	18	
			22				14		
			23						
			24						
			25	S-9A	SS	10	7 50/5"	50/5"	Auger to 25ft. Medium augering. Brown cuttings
	-13.9	Light gray to dark gray Silty fine SAND, trace fine gravel, stratification visible (wet) [DECOMPOSED ROCK] Gray fine SAND, some silt, trace fine gravel (wet) [DECOMPOSED ROCK]	26	S-9B					Boring terminated at 25.92ft. Boring backfilled to grade with cuttings and cement
		End of Boring at 25.9ft.	27						
			28						
			29						
			30						
			31						
			32						
			33						
			34						
			35						
			36						
			37						
			38						
			39						
			40						
			41						
			42						
			43						
			44						
			45						

N-Value (Blows/ft) axis: 10 20 30 40

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Log of Boring **LB-02** Sheet 1 of 2

Project: Old Greenwich School	Project No.: 140265801
Location: 285 Sound Beach Ave, Old Greenwich, CT	Elevation and Datum: Approx. el. 10.0 (NAVD 88)
Drilling Company: Soiltesting, Inc.	Date Started: 4/11/2023 — Date Finished: 4/11/2023
Drilling Equipment: CME55 LC	Completion Depth: 26.4 ft — Rock Depth: 26.4 ft
Size and Type of Bit: 4-1/4-inch hollow-stem auger	Number of Samples: Disturbed 9, Undisturbed 0, Core 0
Casing Diameter (in): N/A — Casing Depth (ft): N/A	Water Level (ft.): First ▽ 7.5, Completion ▼ 9.2, 24 HR. ▼ N/A
Casing Hammer: N/A — Weight (lbs): N/A — Drop (in): N/A	Drilling Foreman: Andy Koval
Sampler: 2in OD Split Spoon	Field Engineer: Matthew Wendland
Sampler Hammer: Automatic — Weight (lbs): 140 — Drop (in): 30	

Material Symbol	Elev. (ft)	Sample Description	Depth Scale	Number	Type	Recov. (in)	Penetr-resist BL/6in	N-Value (Blows/ft)	Remarks (Drilling Fluid, Casing Depth, Fluid Loss, Drilling Resistance, etc.)
	+10.0							10 20 30 40	
	+9.6	5" asphalt	0						Boring offset about 8ft east of original marking
		Brown fine to coarse SAND, some fine to coarse gravel, some silt, trace asphalt (moist) [FILL]	1	S-1A	SS	8	14 5 6	11	
	+8.5	Dark brown to black Sandy SILT, trace fine gravel, some organics (moist) [ESTUARINE]		S-1B					
		Dark grayish brown Clayey fine SAND, some silt, trace fine gravel, trace organics (moist) [ESTUARINE]	2						
			3	S-2	SS	10	3 1 3 5	4	
		Dark grayish brown to gray Clayey fine SAND, some silt, mottling (moist) [ESTUARINE]	4						Auger to 4ft. Medium augering to 2ft. Light rig chatter to 2ft. Brown to dark grayish brown cuttings
			5	S-3	SS	20	3 3 4 10	7	
	+4.0	Grayish brown to orangish brown Silty fine to coarse SAND, some fine to coarse gravel (moist) [SW]	6	S-4A					
		Orangish brown fine to coarse SAND, some fine to coarse gravel, some silt, mottled (wet) [SW]	7	S-4B	SS	19	18 16 14 19	30	Groundwater first encountered at 7.5ft
		Orangish brown fine to coarse SAND, some coarse to fine gravel, some silt (wet) [SW]	8						Auger to 8ft. Brown cuttings
			9	S-5	SS	11	6 15 10 14	25	
		Orangish brown fine to coarse SAND, some fine to coarse gravel, some silt (wet) [SW]	10						
			11	S-6A	SS	24	18 14 8	22	
	-1.5	Light brown fine to coarse SAND, some silt, trace fine to coarse gravel (wet) [SW]		S-6B	SS		15		
		Brown Silty fine to medium SAND, trace fine gravel, weathered rock fragments (wet) [DECOMPOSED ROCK]	12	S-6C					
			13						
			14						
		Brown Silty fine to coarse SAND, trace fine to coarse gravel, stratification visible (wet) [DECOMPOSED ROCK]	15						Auger to 15ft. Medium to hard augering. Light rig chatter. Brown cuttings
			16	S-7	SS	8	11 15 11 9	26	
			17						
			18						
			19						Auger to 20ft. Hard augering. Brown cuttings
			20						

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Log of Boring **LB-02** Sheet 2 of 2

Project	Project No.
Old Greenwich School	140265801
Location	**Elevation and Datum**
	10.0

Material Symbol	Elev. (ft)	Sample Description	Depth Scale	Sample Data: Number	Type	Recov. (in)	Penetr-resist BL/6in	N-Value (Blows/ft)	Remarks (Drilling Fluid, Casing Depth, Fluid Loss, Drilling Resistance, etc.)
	-10.0							10 20 30 40	
		Dark brown to reddish brown Silty fine SAND, trace coarse gravel, stratification visible (wet) [DECOMPOSED ROCK]	20						
			21	S-8	SS	12	5 7 10 8	17	
			22						
			23						
			24						
			25						Auger to 25ft. Hard augering. Brown cuttings
		Dark gray to gray Silty fine to medium SAND, trace coarse to fine gravel, stratification visible (wet) [DECOMPOSED ROCK]	26	S-9	SS	11	7 18 60/5"	60/5"	
	-16.4	End of Boring at 26.4ft.	27						Boring terminated at 26.42ft. Boring backfilled to grade with cuttings and cement. Boring sealed with asphalt
			28						
			29						
			30						
			31						
			32						
			33						
			34						
			35						
			36						
			37						
			38						
			39						
			40						
			41						
			42						
			43						
			44						
			45						

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Log of Boring **LB-03** Sheet 1 of 2

Project: Old Greenwich School	Project No.: 140265801
Location: 285 Sound Beach Ave, Old Greenwich, CT	Elevation and Datum: Approx. el. 10.0 (NAVD 88)
Drilling Company: Soiltesting, Inc.	Date Started: 4/11/2023 — Date Finished: 4/11/2023
Drilling Equipment: CME55 LC	Completion Depth: 27.0 ft — Rock Depth: N/E
Size and Type of Bit: 4-1/4-inch hollow-stem auger	Number of Samples: Disturbed 9, Undisturbed 0, Core 0
Casing Diameter (in): N/A — Casing Depth (ft): N/A	Water Level (ft.): First ▽ 8.0, Completion ▼ 9.1, 24 HR. ▼ N/A
Casing Hammer: N/A — Weight (lbs): N/A — Drop (in): N/A	Drilling Foreman: Andy Koval
Sampler: 2in OD Split Spoon	Field Engineer: Matthew Wendland
Sampler Hammer: Automatic — Weight (lbs): 140 — Drop (in): 30	

Material Symbol	Elev. (ft)	Sample Description	Depth Scale	Sample Number	Type	Recov. (in)	Penetr-resist BL/6in	N-Value (Blows/ft)	Remarks (Drilling Fluid, Casing Depth, Fluid Loss, Drilling Resistance, etc.)
	+10.0							10 20 30 40	
	+9.6	5" asphalt	0						
		Brown fine to coarse SAND, some fine to coarse gravel, some silt, trace asphalt (moist) [FILL]	1	S-1A	SS	12	2		
		Dark grayish brown Silty fine to coarse SAND, trace coarse to fine gravel, some organics, trace roots (moist) [FILL]		S-1B			3 3	6	
	+8.0	Gray to orangish gray Clayey fine SAND, some silt, trace organics, trace roots, mottling (moist) [ESTUARINE]	2						
			3	S-2	SS	17	2 3 4 6	7	
		Gray to orangish gray Clayey fine SAND, some silt, trace organics, trace fine to coarse gravel, trace roots, mottling (moist) [ESTUARINE]	4						Auger to 4ft. Medium augering. Light rig chatter. Brown cuttings
	+4.8			S-3A	SS	16	2 3 7	10	
		Orangish brown Silty fine to medium SAND, trace fine gravel (moist) [SW]	5	S-3B			9		
		Grayish brown Gravelly fine to coarse SAND, trace silt (moist) [SW]	6						
			7	S-4	SS	13	14 14 13 14	27	
		Light brown fine to coarse SAND, some fine to coarse gravel, trace silt (wet) [SW]	8						Groundwater first encountered at about 8ft
			9	S-5	SS	14	9 9 8 8	17	
		Light brown fine to coarse SAND, trace silt (wet) [SW]	10						
			11	S-6A	SS	20	13 25 27	52	
		Light brown fine to coarse SAND, some fine gravel, some silt (wet) [SW]	12	S-6B			17		
			13						
			14						
		Light brown Silty fine to coarse SAND, some silt, trace fine to coarse gravel (wet) [SW]	15	S-7A			2		Auger to 15ft. Grayish brown cuttings
		Light brown Silty fine to medium SAND (wet) [SW]	16	S-7B	SS	16	4 4 4	8	
			17						
			18						
			19						
			20						

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Log of Boring **LB-03** Sheet 2 of 2

Project	Project No.
Old Greenwich School	140265801
Location	**Elevation and Datum**
	10.0

Material Symbol	Elev. (ft)	Sample Description	Depth Scale	Sample Data: Number	Type	Recov. (in)	Penetr-resist BL/6in	N-Value (Blows/ft) 10 20 30 40	Remarks (Drilling Fluid, Casing Depth, Fluid Loss, Drilling Resistance, etc.)
	-10.0	Light brown fine to coarse SAND, some silt, trace fine gravel (wet) [SW]	20	S-8A	SS	16	3 4	7	Auger to 20ft. Grayish brown cuttings
		Grayish brown fine SAND, some silt, trace fine gravel (wet) [SW]	21	S-8B			3 10		
			22						
			23						
			24						
		Grayish brown fine to medium SAND, some fine to coarse gravel, some silt (wet) [SW]	25	S-9A	SS	24	3 4	13	Auger to 25ft. Light rig chatter at 23ft.
	-16.3		26				9		
	-17.0	Gray Silty fine to coarse SAND, trace fine to coarse gravel, weathered rock fragments (wet) [DECOMPOSED ROCK]	27	S-9B			11		Boring terminated at 27ft. Boring backfilled to grade with cuttings and cement. Boring sealed with asphalt
		End of Boring at 27ft.	28						
			29						
			30						
			31						
			32						
			33						
			34						
			35						
			36						
			37						
			38						
			39						
			40						
			41						
			42						
			43						
			44						
			45						

APPENDIX B
LABORATORY DATA

Client:	Langan Engineering				
Project:	Old Greenwich School				
Location:	Old Greenwich, CT			Project No:	GTX-317070
Boring ID:	---	Sample Type:	---	Tested By:	ckg
Sample ID:	---	Test Date:	04/17/23	Checked By:	ank
Depth :	---	Test Id:	712172		

Moisture Content of Soil and Rock - ASTM D2216

Boring ID	Sample ID	Depth	Description	Moisture Content,%
LB-01	S- 2	2-4'	Moist, dark brown silty sand with gravel	8.8
LB-01	S- 4A	6-7'	Moist, brown gravel with silt and sand	5.1
LB-02	S- 2	2-4'	Moist, dark gray silty sand	34.2
LB-03	S- 3A	4-5.25'	Moist, brownish gray silty clay with sand	23.9
LB-03	S- 8A	20-20.75'	Moist, dark gray silty sand	18.9

Notes: Temperature of Drying : 110º Celsius

Client:	Langan Engineering				
Project:	Old Greenwich School				
Location:	Old Greenwich, CT			Project No:	GTX-317070
Boring ID:	LB-02	Sample Type:	jar	Tested By:	cam
Sample ID:	S-2	Test Date:	04/17/23	Checked By:	ank
Depth :	2-4'	Test Id:	712175		
Test Comment:	---				
Visual Description:	Moist, dark gray silty sand				
Sample Comment:	---				

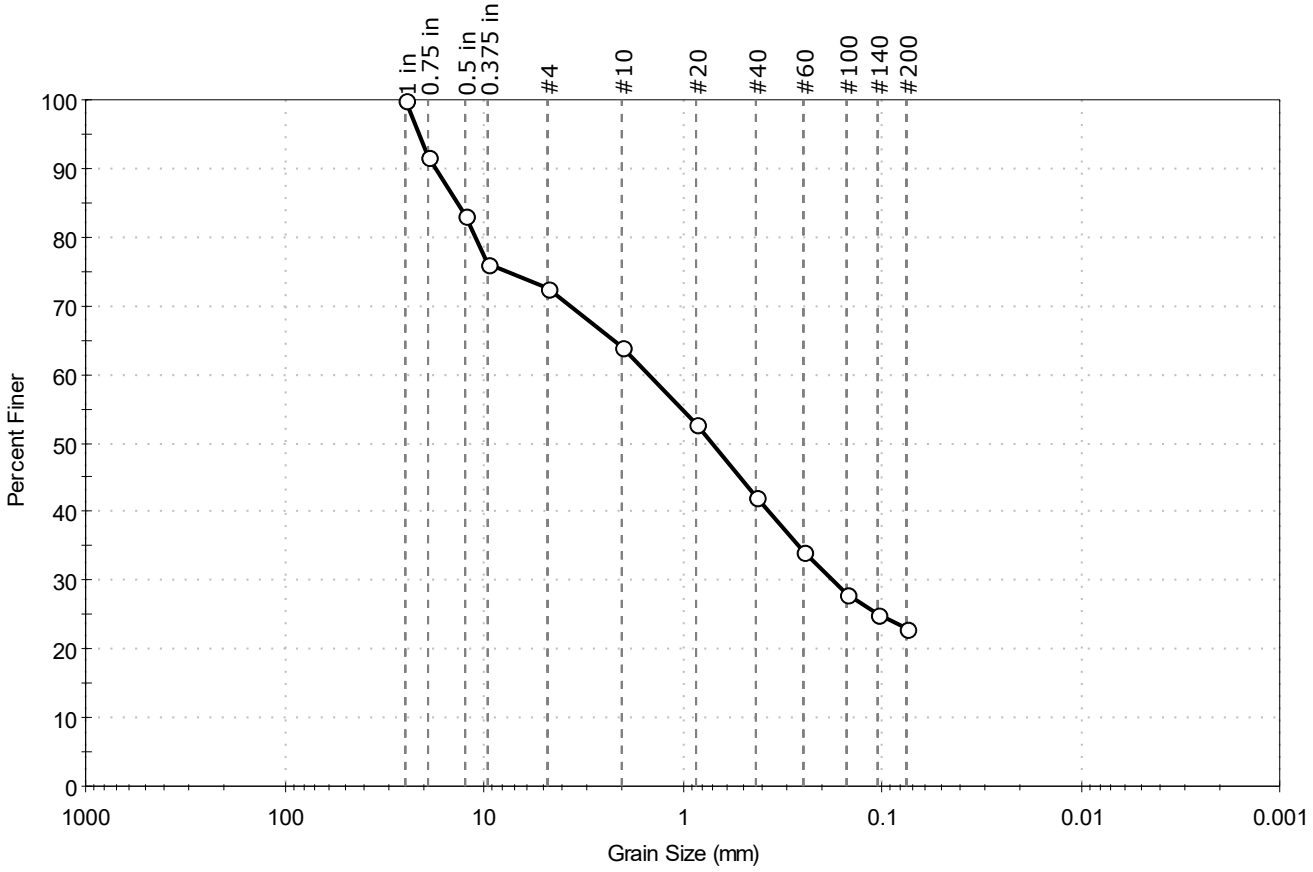
Moisture, Ash, and Organic Matter - ASTM D2974

Boring ID	Sample ID	Depth	Description	Moisture Content,%	Ash Content,%	Organic Matter,%
LB-02	S-2	2-4'	Moist, dark gray silty sand	34	96.4	3.6

Notes: Moisture content determined by Method A and reported as a percentage of oven-dried mass;
dried to a constant mass at temperature of 105º C
Ash content and organic matter determined by Method C; dried to constant mass at temperature 440º C

Client:	Langan Engineering				
Project:	Old Greenwich School				
Location:	Old Greenwich, CT			Project No:	GTX-317070
Boring ID:	LB-01	Sample Type:	jar	Tested By:	ckg
Sample ID:	S-2	Test Date:	04/18/23	Checked By:	ank
Depth :	2-4'	Test Id:	712165		
Test Comment:	---				
Visual Description:	Moist, dark brown silty sand with gravel				
Sample Comment:	---				

Particle Size Analysis - ASTM D6913



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	27.4	49.7	22.9

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
1 in	25.00	100		
0.75 in	19.00	92		
0.5 in	12.50	83		
0.375 in	9.50	76		
#4	4.75	73		
#10	2.00	64		
#20	0.85	53		
#40	0.42	42		
#60	0.25	34		
#100	0.15	28		
#140	0.11	25		
#200	0.075	23		

Coefficients

D_{85} = 13.6167 mm	D_{30} = 0.1751 mm
D_{60} = 1.4693 mm	D_{15} = N/A
D_{50} = 0.7058 mm	D_{10} = N/A
C_u = N/A	C_c = N/A

Classification

ASTM N/A

AASHTO Stone Fragments, Gravel and Sand (A-1-b (0))

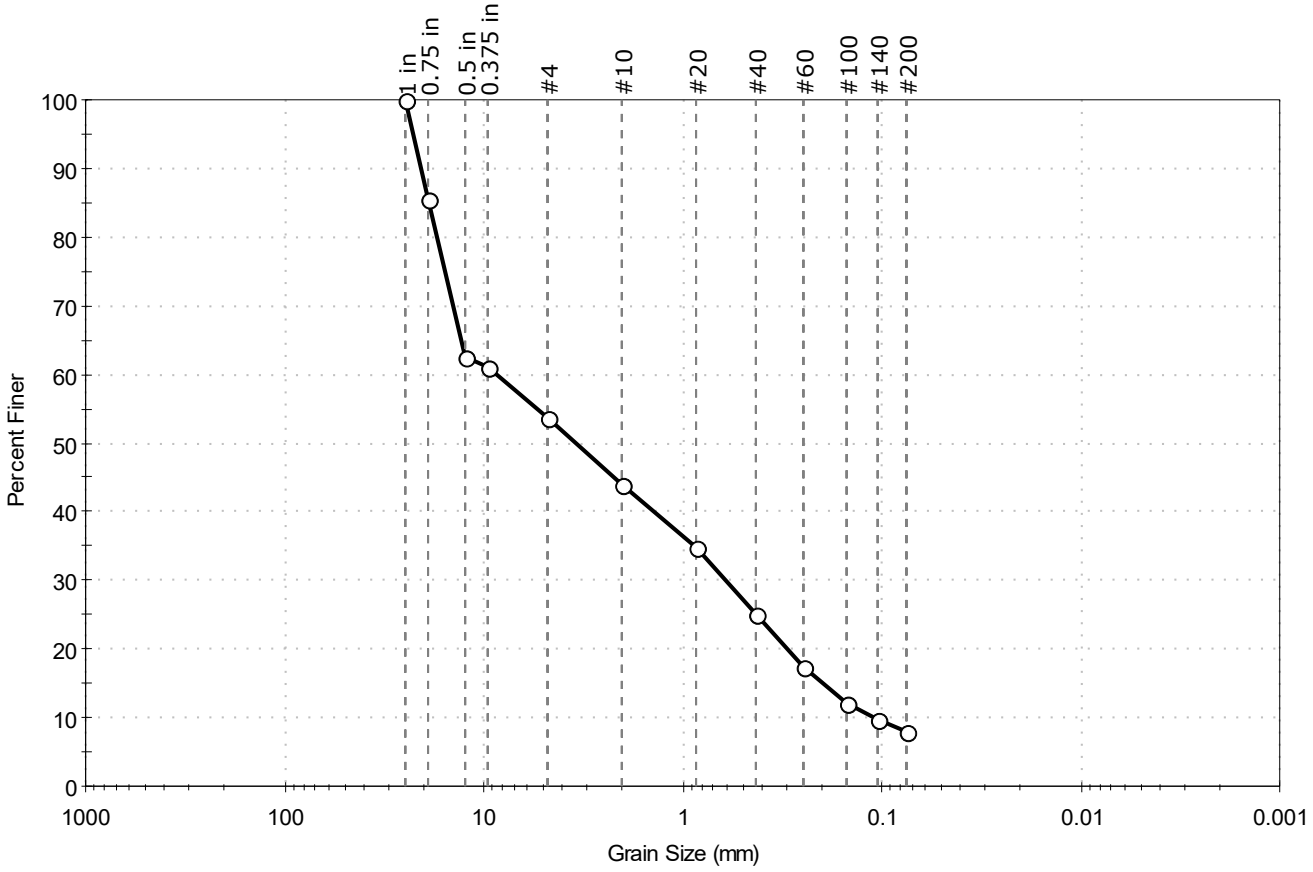
Sample/Test Description

Sand/Gravel Particle Shape : ANGULAR

Sand/Gravel Hardness : HARD

Client:	Langan Engineering				
Project:	Old Greenwich School				
Location:	Old Greenwich, CT			Project No:	GTX-317070
Boring ID:	LB-01	Sample Type:	jar	Tested By:	ckg
Sample ID:	S-4A	Test Date:	04/18/23	Checked By:	ank
Depth :	6-7'	Test Id:	712166		
Test Comment:	---				
Visual Description:	Moist, brown gravel with silt and sand				
Sample Comment:	---				

Particle Size Analysis - ASTM D6913



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	46.2	45.8	8.0

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
1 in	25.00	100		
0.75 in	19.00	86		
0.5 in	12.50	63		
0.375 in	9.50	61		
#4	4.75	54		
#10	2.00	44		
#20	0.85	35		
#40	0.42	25		
#60	0.25	17		
#100	0.15	12		
#140	0.11	10		
#200	0.075	8.0		

Coefficients

D_{85} = 18.7755 mm D_{30} = 0.6018 mm

D_{60} = 8.5663 mm D_{15} = 0.1979 mm

D_{50} = 3.4094 mm D_{10} = 0.1107 mm

C_u = 77.383 C_c = 0.382

Classification

ASTM N/A

AASHTO Stone Fragments, Gravel and Sand (A-1-a (1))

Sample/Test Description

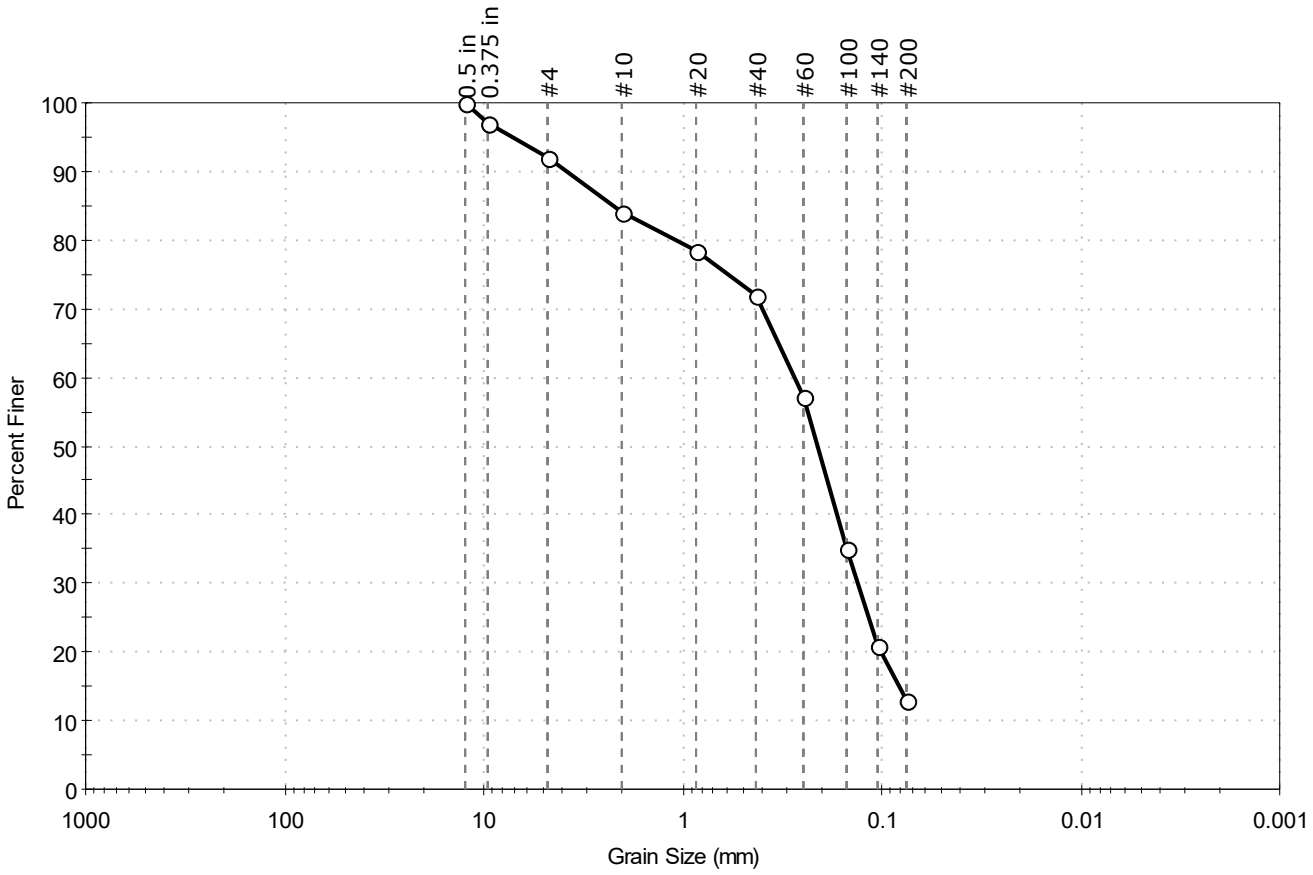
Sand/Gravel Particle Shape : ANGULAR

Sand/Gravel Hardness : HARD

GeoTesting EXPRESS

Client:	Langan Engineering				
Project:	Old Greenwich School				
Location:	Old Greenwich, CT			Project No:	GTX-317070
Boring ID:	LB-03	Sample Type:	jar	Tested By:	ckg
Sample ID:	S-8A	Test Date:	04/18/23	Checked By:	n/a
Depth :	20-20.75'	Test Id:	712167		
Test Comment:	---				
Visual Description:	Moist, dark gray silty sand				
Sample Comment:	---				

Particle Size Analysis - ASTM D6913



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	7.9	79.0	13.1

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
0.5 in	12.50	100		
0.375 in	9.50	97		
#4	4.75	92		
#10	2.00	84		
#20	0.85	79		
#40	0.42	72		
#60	0.25	57		
#100	0.15	35		
#140	0.11	21		
#200	0.075	13		

Coefficients

D_{85} = 2.1884 mm D_{30} = 0.1322 mm
D_{60} = 0.2755 mm D_{15} = 0.0817 mm
D_{50} = 0.2111 mm D_{10} = N/A
C_u = N/A C_c = N/A

Classification

ASTM N/A

AASHTO Silty Gravel and Sand (A-2-4 (0))

Sample/Test Description

Sand/Gravel Particle Shape : ANGULAR

Sand/Gravel Hardness : HARD

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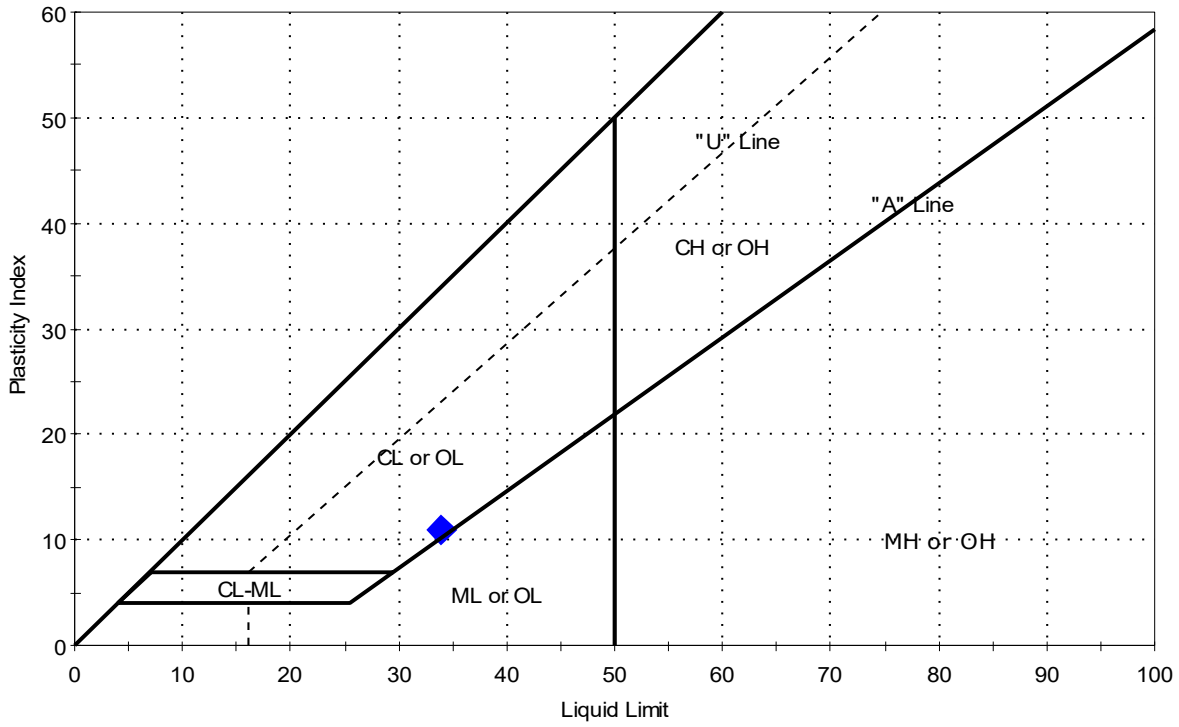
Client:	Langan Engineering				
Project:	Old Greenwich School				
Location:	Old Greenwich, CT			Project No:	GTX-317070
Boring ID:	LB-02	Sample Type:	jar	Tested By:	cam
Sample ID:	S-2	Test Date:	04/20/23	Checked By:	ank
Depth :	2-4'	Test Id:	712163		
Test Comment:	---				
Visual Description:	Moist, dark gray clayey sand				
Sample Comment:	---				

Atterberg Limits - ASTM D4318



Symbol	Sample ID	Boring	Depth	Natural Moisture Content,%	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	S-2	LB-02	2-4'	34	34	23	11	1	

Sample Prepared using the WET method

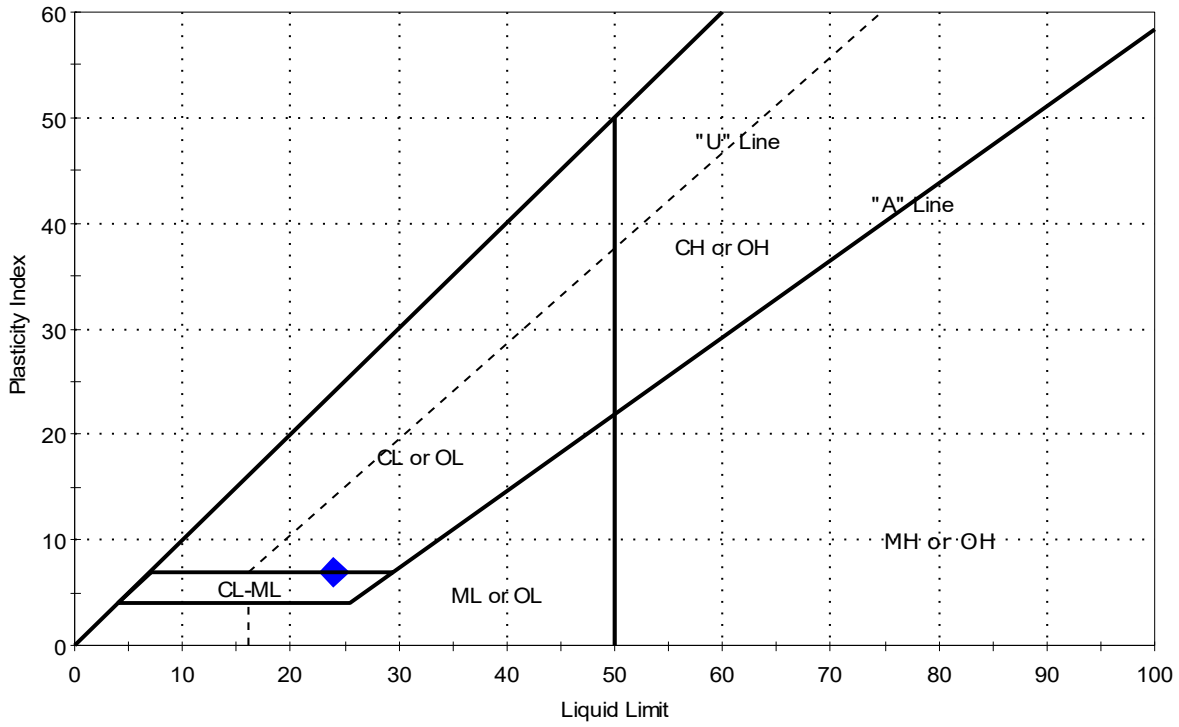
Dry Strength: VERY HIGH

Dilatancy: SLOW

Toughness: LOW

Client:	Langan Engineering				
Project:	Old Greenwich School				
Location:	Old Greenwich, CT			Project No:	GTX-317070
Boring ID:	LB-03	Sample Type:	jar	Tested By:	cam
Sample ID:	S-3A	Test Date:	04/20/23	Checked By:	ank
Depth :	4-5.25'	Test Id:	712164		
Test Comment:	---				
Visual Description:	Moist, brownish gray silty clayey sand				
Sample Comment:	---				

Atterberg Limits - ASTM D4318



Symbol	Sample ID	Boring	Depth	Natural Moisture Content,%	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	S-3A	LB-03	4-5.25'	24	24	17	7	1	

Sample Prepared using the WET method

Dry Strength: VERY HIGH

Dilatancy: SLOW

Toughness: LOW