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SPECIFICATIONS

EDGEMONT UNION FREE SCHOOL DISTRICT



SED PROJECT NO.: 66-04-06-03-0-002-016

F&D PROJECT NO.: 24529.04

OWNER: EDGEMONT UNION FREE SCHOOL DISTRICT
ADDRESS: 300 WHITE OAK LANE
CITY: SCARSDALE, NEW YORK 10583

PROJECT NAME EDGEMONT HIGH SCHOOL BUILDING "A"
INTERIOR RENOVATIONS

ARCHITECTS:

FULLER AND D'ANGELO, P.C.
Architects and Planners
45 Knollwood Road - Suite 401
Elmsford, NY 10523

MECHANICAL:

LANDMARK FACILITIES GROUP, INC
252 East Avenue
Norwalk, CT 06855

STRUCTURAL ENGINEER:
RYAN BIGGS CLARK DAVIS
257 Ushers Rd.
Clifton Park, NY 12065

ENVIRONMENTAL:
EISENBACH & RUHNKE
Four Oxford Crossing, Suite 104
New Hartford, NY 13413

The undersigned certifies that to the best of his knowledge, information and belief, the plans and specifications are in accordance with applicable requirements of the New York State Uniform Fire Prevention and Building Code, The State Energy Conservation and Construction Code Standards of the Department of Education.

BID

Date: October 7, 2025

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SECTION 00 0115
LIST OF DRAWING SHEETS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 1 Specification Sections, apply to this Section.

1.2 DRAWING INDEX

A. Drawings are listed on Drawing G-1 for all contracts.

B. Drawings are the property of the Fuller and D'Angelo, Architects and Planners and shall not be used for any other purpose other than contemplated by the Drawings and Project Manual

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

SECTION 00 1113
INVITATION TO BID

SEALED PROPOSALS FOR THE:

EDGEMONT SCHOOL DISTRICT

HIGH SCHOOL BUILDING "A"

INTERIOR RENOVATIONS

Will Be Received By:

EDGEMONT UNION FREE SCHOOL DISTRICT

Facilities Department Office 300 White Oak Lane Scarsdale, New York , 10583

Proposals must be submitted on the forms provided by the Architect with all blanks appropriately filled in and along with the required documentation.

Proposals must be received on or before 11:00 AM, local time, on November 4th, 2025 and must be in accordance with the requirements of the Bidding Documents to receive consideration.

Bidding Documents, including drawings and specifications, will be available beginning on October 7th, 2025.

Bidding Documents will be available at www.revplans.com or www.bidnetdirect.com

The bids will be opened and read aloud immediately following the bid receipt at the EDGEMONT

UNION FREE SCHOOL DISTRICT, Facilities Department Office, 300 White Oak Lane, Scarsdale, New York, 10583.

Bidders wishing to drop off their bid proposals may do so at the EDGEMONT UNION FREE SCHOOL DISTRICT, Facilities Department Office, 300 White Oak Lane, Scarsdale, New York, 10583. If bid proposals are shipped and/or mailed, bidders are strongly advised to ship or mail bid proposals via USPS, UPS, FedEx or any other authorized carrier able to track bidders' bid proposal package. Bids must be submitted to the Owner at the location and the address above before the hour and date of the bid opening. Bidders shall be responsible for timely delivery of their bid proposals in advance of the bid opening date. All bids received after the time stated in the Notice to Bidders will not be considered and will be returned to the bidder unopened. All bidders assume the risk of any delay in the mail, delivery or handling of the mail by employees of the Owner. Regardless of whether the bid proposal is sent by mail or by means of personal delivery, bidders assume responsibility for having bid proposals deposited on time at the place specified.

The Board of Education reserves the right to reject any or all bids, or portions thereof, or alternates, or alternatives, to waive any informality; and to accept such bids, or portions thereof, which, in the Board of Education's judgment, is in the best interest of the school district

All bid prices shall be filled in, both in words and figures. Signatures shall be in ink and in longhand.

Bidders shall be required to furnish at their own expense, a bid bond in the amount of ten percent (10%) of the bid amount together with the bid. Proof of the ability to furnish a labor and material payment bond and a performance bond in the amount of 100% of the bid shall be submitted with the bid.

Proposals which are incomplete, conditional, or obscure may be rejected as nonresponsive to the bid specifications. Additional copies of the proposal will be furnished by the Architect upon request.

No oral or telephonic or email proposals or modifications of proposals will be considered.

A non-mandatory pre-bid conference will be held on October 21, 2025 at 3:30PM. Bidders are requested to meet at the front entrance of the Edgemont Jr./Sr. High School, Administration Building located at 200 White Oak Lane, Scarsdale, NY 10583. All bidders are strongly encouraged to attend the pre-bid conference.

Lump Sum Bids will be received for four (4) Prime Contracts:

Contract #1 General Construction including asbestos abatement.

Contract #2 Plumbing

Contract #3 Mechanical

Contract #4 Electrical

END OF SECTION

SECTION 00 2113
INSTRUCTIONS TO BIDDERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 1 Specification Sections, apply to this Section.

1.2 DOCUMENT INCLUDES

A. Bid Documents and Contract Documents
   1. Definition
   2. Contract Documents Identification
   3. Availability
   4. Examination
   5. Inquiries/Addenda
   6. Product/Assembly/System Substitutions

B. Site Assessment
   1. Prebid Conference

C. Qualifications
   1. Qualifications

D. Bid Submission
   1. Bid Depository
   2. Bid Ineligibility

E. Bid Enclosures/Requirements (See also Section 00 4301)
   1. Security Deposit
   2. Consent of Surety
   3. Performance Assurance
   4. Bid Form Signature
   5. Additional Bid Information

F. Offer Acceptance/Rejection
   1. Duration of Offer
   2. Acceptance of Offer

1.3 RELATED DOCUMENTS

A. Section 01 1000 - Summary of Contracts

B. Section 00 1113 - Invitation To Bid.

C. Section 00 4100 - Bid Form Contract #1 General Construction Contractor .

D. Section 00 4110 - Bid Form Contract # 2 Plumbing Contractor

E. Section 00 4120 - Bid Form Contract #3 Mechanical

F. Section 00 4130 - Bid Form Contract # 4 Electrical Contractor

G. Section 00 4301 - Bid Form Supplements. (All attachments)

H. Section 00 5200 - Form of Agreement.

I. Section 00 6000 - Bonds and Certificates.

J. Section 00 7200 - General Conditions.

K. Section 01 2100 - Allowances.

L. Section 01 5000 - Temporary Facilities and Controls.

M. Section 01 7000 - Execution.

N. Section 01 7800 - Closeout Submittals

1.4 BID SUBMISSION

A. Sealed bid proposals shall be signed, dated and submitted in the form required by these bid specifications to the Edgemont Union Free School District, Facilities Department Office, 300 White Oak Lane , Scarsdale, NY 10583 before **11:00** AM local time on the **4th day** of **November**, **2025** at which time bid proposals will be publicly opened and read aloud.

B. Offers submitted after the above time will be returned to the bidder unopened.

1.5 INTENT

A. The intent of this bid solicitation is to obtain sealed bids to provide all labor and materials necessary to complete the work of the High School Building "A" Interior Renovations in accordance with the Contract Documents for a stipulated sum.

1.6 LUMP SUM BIDS

A. Bids will be received for four (4) separate Prime Contracts as follows:

1. General Construction , including asbestos abatement.
2. Plumbing .
3. Mechanical .
4. Electrical .

1.7 WORK IDENTIFIED IN THE CONTRACT DOCUMENTS

A. Work of this proposed Contract comprises building construction, including related General Construction, Plumbing, and Mechanical and Electrical Work, including site work as reflected in each of the prime contracts.

B. Project Location:

300 White Oak Lane,.
Scarsdale, NY 10583, NY 10583

1.8 CONTRACT TIME

A. Perform the Work within the time stated in Section 01 1000 Summary of Contract(s).

B. All work for this project shall not commence prior to the issuance of Letter of Award by the Owner. The items of work shall be scheduled and completed as stated in Section 01 1000 Summary of Contract(s). Failure to complete either date listed in Section 01 1000 Summary of Contract(s), shall subject the Contractor(s) to be assessed liquidated damages list in Article 13 of the General Conditions and any additional costs incurred by the Owner, including but not limited to, Construction Manager, Fuller and D'Angelo, P.C., Consultants, Owner's staff, overtime, and legal costs as required to complete the scheduled item.

C. The attention of the bidders is specifically directed to the provisions of the General Conditions of the Contract Article13 of the General Conditions that time is of the essence to the Contract and that on no account will the Contactor(s) be permitted to assert a claim for damages for delays.

D. The bidder, in submitting an offer, accepts the Contract Time period stated for performing the Work. The completion date stated in the Agreement and Section 01 1000 Summary of Contract(s) .

1.9 BID DOCUMENTS AND CONTRACT DOCUMENTS

A. Definitions: All definitions set forth in the General Conditions of the Contract are applicable to these Instructions to Bidders.

B. Bid Documents: Contract Documents Instruction to Bidders, Bid Form, Supplements To Bid Forms, Bid Securities, Allowance Breakdown, and Issued Addenda.

C. Contract Documents: Defined in General Conditions.

D. Bid, Offer, or Bidding: Act of submitting an offer under seal.

E. Bid Amount: Monetary sum identified by the Bidder in the Bid Form.

1.10 AVAILABILITY

A. Bidding Documents, drawings and specifications, may be obtained online at www.recplans.com or www.bidnetdirect.com .

B. Please note **www. revplans.com** or **www.bidnetdirect.com** are the designated location and means for distributing and obtaining all bid package information. Only those Contract Documents obtained in this manner will enable a prospective bidder to be identified as an official plan holder of record. The Provider takes no responsibility for the completeness of Contract Documents obtained from other sources. Contract Documents obtained from other sources may not be accurate, may be incomplete, may or may not contain addenda that may have been issued. Bidders assume the risk of inaccuracies in documents obtained fromany other source. Notwithstanding, bidders are responsible for all information contained in the bid specifications including addenda regardless of actual receipt.

C. All bid addenda will be transmitted to registered plan holders via email and will be available at revplans.com.or bidnet.com . Plan holders who have paid for hard copies of the bid documents will need to make the determination if hard copies of the addenda are required for their use, and coordinate directly with the printer for hard copies of addenda to be issued. There will be no charge for registered plan holders to obtain hard copies of the bid addenda.

1.11 EXAMINATION

A. Bid Documents may be viewed at the office of Fuller and D'Angelo, P.C. 45 Knollwood Road, Elmsford, NY 10523.

B. Immediately notify the Construction Manager and Architect in writing any discrepancies or omissions identified in the Bid Documents.

C. Should any conflict occur in or between the Drawings and Specifications, the Contractor shall be deemed to have estimated on the more costly method of doing the work, unless he shall have asked for and obtained a decision in writing from the Construction Manager before the submission of his bid, as to what shall govern.

1.12 INQUIRIES/ADDENDA

A. Questions: Any and all questions about the interpretation or clarification of the Bid Documents, or about any other matter affecting the Work or pertaining to the bid must be directed in writing on the form in Section 00 2115 - RFI Form to the: Architect.

Fuller and D'Angelo, P.C.
45 Knollwood Road .
Elmsford, NY 10523 .
Attention: William Means, RA .
Voice: 914-592-4444
E-mail: WilliamM@fullerdangelo.com

B. Answers: The Architect will issue addenda, if necessary, to answer such questions. Bidders shall rely on answers contained in such addenda and **shall not** rely upon any oral answers given by any employee or agent of the Owner's Representative, Architect, Architect's Consultants, and Construction Manager.

1. RFI's not resulting in an addendum may be issued to all plan holders at the discretion of Architect.

C. Addenda are written or graphic instruments issued prior to the Bid Date which modify or interpret the bidding documents, including Drawings and Specifications, by additions, deletions, clarifications or corrections. Addenda will become part of the Bid Documents and the resultant Contract Documents once the Construction Contract is executed.

D. Addenda issued will become part of the bid documents and the resultant Contract Documents once the Construction Contract is executed. Written addenda may be issued during the bid process. Any addenda

so issued shall become part of the bid documents. Bidders are responsible for including any resultant costs into the bid sum. All addenda shall become part of the Contract Documents.

E. Verbal answers are not binding on any party. Any oral representations or statements made by any officer or employee of the Architect, Architect's consultants, and construction manager, or Owner shall not be binding on the Owner.

F. Clarifications requested by bidders must be in writing not less than 5 working days before date set for receipt of bids. The reply will be in the form of an Addendum, if required, a copy of which will be forwarded to known recipients .

1.13 PRODUCT/ASSEMBLY/SYSTEM SUBSTITUTIONS

A. Refer to Section 01 2500 - Substitution Procedures and Section 00 4301 - General Conditions Article 6.X for substitution requirements.

1.14 SITE EXAMINATION

A. The bidder shall examine and familiarize itself with the project site before submitting a bid.

B. The bidder may inspect the site at the time of the pre-bid conference, if one is scheduled, or at other times by advance agreement with the Construction Manager on an appointment basis. No inspections of the project site will be permitted.

1. The submission of a bid shall constitute acknowledgement that the bidder has satisfied the above requirement. Bidders who do not inspect the site shall be nevertheless responsible for such information as might have been obtained from a reasonable site inspection and such failure will not relieve the bidder from any requirements and/or obligations incurred as a result of its bid.

1.15 PREBID CONFERENCE

A. A non-mandatory Pre-Bid Conference has been scheduled for 3:30 PM on **October 21, 2025**. Bidders shall meet at the front entrance of the Edgemont Jr./Sr. High School, Administration Building located at 200 White Oak Lane, Scarsdale, NY.10583.

B. Attendance is non mandatory. Bidder are strongly advised to attend.

C. All bidders, subcontractors and suppliers are invited.

D. Representatives of Owner, Architect, Architect's Consultants, and Construction Manager will be in attendance. Questions will not be answered at the pre-bid conference. Bidders must submit any questions or requests for clarification in accordance with Paragraph 1.12 of these Instructions to Bidders.

E. Summarized minutes of this meeting may be circulated to all known bidders. These minutes will not form part of the Contract Documents.

F. Information relevant to the Bid Documents will be recorded in an Addendum, issued to plan holders.

1.16 QUALIFICATIONS

A. Evidence of qualifications:

1. Bidder shall submit with their bid proposal a properly **typewritten and executed Qualification of Bidders. Refer Section 00 4301.**

B. The Owner reserves the right to require additional information it deems appropriate concerning the history of the contractor’s performance of each such contract.

C. All Prime Contractors bidding on this project must submit official certification of registration with New York State Department of Labor as required by Labor Law Section 220-i. Include Certification with this Bid package. See attachment, Section 00 4301. Note that certification will be required of all subcontractors prior to commencement of any work.

D. In accordance with the requirements of General Municipal Law §103-g, the bidder is required to include with its bid “ Iran Divestment Act Certification" Refer - Contractor’s Qualification Statement and Section 00 4301.

1.17 SUBCONTRACTORS/SUPPLIERS/OTHERS

A. Owner's Representaive, Architect, and Construction Manager reserves the right to reject a proposed subcontractor for reasonable cause.

B. Refer to Article 5 of the General Conditions regarding subcontractors.

1.18 SUBMISSION PROCEDURE

A. Bidders shall be solely responsible for the delivery of their bids in the manner and time prescribed. Bidders wishing to drop off their bid proposals may do so at the EDGEMONT UNION FREE SCHOOL DISTRICT, Facilities Department Office, 300 White Oak Lane, Scarsdale, New York 10583. If bid proposals are shipped and/or e-mailed, bidders are strongly advised to ship or mail bid proposals via USPS, UPS, FedEx or any other authorized carrier able to track bidders bid proposal package. Bids must be submitted before the hour and date of the bid opening. Bidders shall be responsible for timely delivery of their bid proposals in advance of the bid opening date. All bids received after the time stated in the Notice to Bidders will not be considered and will be returned to the bidder. All bidders assume the risk of any delay in the mail, delivery or handling of the mail by employees of the Owner. Regardless of whether the bid proposal is sent by mail or by means of personal delivery, bidders assume responsibility for having bid proposals deposited on time at the place specified.

The Board of Education reserves the right to reject any or all bids, or portions thereof, or alternates, or alternatives, to waive any informality; and to accept such bids, or portions thereof, which, in the Board of Education's judgment, is in the best interest of the school district

All bid prices shall be filled in, both in words and figures. Signatures shall be in ink and in longhand.

Bidders shall be required to furnish at their own expense, a bid bond in the amount of ten percent (10%) of the bid amount together with the bid. Proof of the ability to furnish a labor and material payment bond and a performance bond in the amount of 100% of the bid shall be submitted with the bid.

Proposals which are incomplete, conditional, or obscure may be rejected as nonresponsive to the bid specifications. Additional copies of the proposal will be furnished by the Architect upon request.

B. Submit two copies of the executed offer on the Bid Forms included in the project manual, signed and sealed with the required security in a closed opaque envelope, clearly identified with title of the project, trade, name, address, and telephone number of the bidder and Edgemont Union Free School District's name clearly on the outside.

C. Improperly completed bid information, incomplete submissions, irregularities in the completion or submission of the bid an/or security deposit, may be cause not to open the Bid Form envelope to remain unopened and the bid declared to be invalid or informal.

D. To submit a bid for a bid package, the bidder shall photo copy or remove the proposal form **from the Project Manual. Then the bidder shall complete, sign and submit the form as required therein The bidder should not submit the entire Project Manual with the bid proposal.**

E. All bid prices shall be filled in, both in words and figures. Signatures shall be in ink and in longhand. Proposals which are incomplete, conditional or obscure may be rejected.

1. In case of a discrepancy between the words and figures, **the written word, not the figures,** will govern.
2. Make no erasures, cross-outs, whiteouts, write-overs, obliteration's, or changes of any kind in the Bid Form phraseology, in the entry of unit prices, or anywhere on the Bid form. Fill in all blanks spaces legibly. An illegible entry may disqualify the bid in its entirety. If a mistake is made, use a new Bid Form. No post bid meetings will be afforded to any bidder to explain or clarify illegible or changed entries.

F. Bidder's shall not rely on oral statements made by any employee or agent of the Owner, Owner's Representative, Architect, and Architect's Consultants. Before submitting a proposal, bidders shall fully

inform themselves as to all existing conditions and limitations and shall include in the Proposal a sum to cover the cost of all items included in the Contract

G. No oral or telephonic proposals or modifications of proposals will be considered.

1.19 BID INELIGIBILITY

A. Bids that are unsigned, improperly signed or sealed, conditional, illegible, obscure, contain arithmetical errors, erasures, alterations, blanks, or irregularities of any kind, may be deemed nonresponsive.

B. Bid proposals which include bid forms, appendices, certifications and enclosures that are improperly prepared or missing may be deemed nonresponsive.

C. Failure to provide security deposit, bonding or insurance requirements or other documentation required by the bid specifications may result in the bid proposal being deemed nonresponsive.

D. Failure to provide all costs, including the cost of any base bid or total base bids will result in the bid being deemed nonresponsive.

1.20 SECURITY DEPOSIT

A. Bids shall be accompanied by a security deposit as follows:
   1. Bid Bond of a sum no less than 10 percent of the Bid Amount on AIA A310 Bid Bond Form, will be required for all Proposals.
   2. Refer to Section 00 6000 - Bonds and Certificates for additional requirements.

B. Endorse the Bid Bond in the name of the Edgemont Union Free School District as obligee, signed and sealed by the principal (Contractor) and surety.

C. The bid security deposit will be returned after the delivery of the required performance and labor and material payment bonds by the successful bidder to the Edgemont Union Free School District and the execution of the Owner-Contractor Agreement.

D. Include the cost of bid security in the Bid Amount.

E. After a bid has been accepted, all securities will be returned to the respective bidders .

F. If no contract is awarded, all security deposits will be returned.

1.21 CONSENT OF SURETY

A. Submit with the Bid: The attorney in fact who executes the required bonds on behalf of the surety to affix thereto an original certified and current copy of his power of attorney indicating the monetary limit of such power.

1.22 PERFORMANCE ASSURANCE

A. Accepted Bidder: Shall provide a Performance and Payment Bonds bond, as described in Section 00 6000 - Bonds and Certificates prior to the execution of the Contract, the bidder to furnish bonds covering the faithful performance of the Contract and the payment of all obligations arising thereunder in such form and amount as the Owner may prescribe and with such sureties secured through the bidder's usual sources as may be agreeable to the parties. Refer to Article 11 of the General Conditions for bond requirements.

B. Include the cost of Performance and Payment Bonds in the Bid Amount.

C. The bidder shall require the attorney in fact who executes the required bonds on behalf of the surety to affix thereto an original certified and current copy of his power of attorney indicating the monetary limit of such power

1.23 INSURANCE

A. Provide an executed Insurance Coverage Certification attached as a supplement to the proposal.

B. There are special insurance requirements on this project. Refer to Article 10 of the General Conditions for a summary description of the required coverages. The Owner reserves the right to refuse the award of a Contract to any apparent low bidder who fails to provide the specified insurance certificates at the required time. Bidders must execute the enclosed Insurance Coverage Certification.

C. The Owner, Architect, Consultants, and Construction Manager shall be listed as "Additionally Insured" on all applicable policies.

D. All insurance purchased by Contractor shall constitute primary insurance and primary coverage for all risks insured and that any other liability insurance that Owner, Architect, and Construction Manager may procure or maintain is secondary and that there shall be no contribution by such insurance until insurance provided by the Contractor is exhausted.

1.24 BID FORM REQUIREMENTS

A. Complete all requested information in the Bid Form and Appendices.

1.25 SALES AND USE TAXES

A. The Owner is a tax exempt entity, therefore there shall be no charge for sales or use taxes. The Owner will document this status as requested.

1.26 FEES FOR CHANGES IN THE WORK

A. Refer to Article 8 of the General Conditions .

1.27 BID FORM SIGNATURE

A. The Bid Form shall be signed by the bidder, as follows:

1. Sole Proprietorship: Signature of sole proprietor in the presence of a witness who will also sign. Insert the words "Sole Proprietor" under the signature. Affix seal.
2. Partnership: Signature of all partners in the presence of a witness who will also sign. Insert the word "Partner" under each signature. Affix seal to each signature.
3. Corporation: Signature of a duly authorized signing officer(s) in their normal signatures. Insert the officer's capacity in which the signing officer acts, under each signature. Affix the corporate seal. If the bid is signed by officials other than the president and secretary of the company, or the president/secretary/treasurer of the company, a copy of the by-law resolution of their board of directors authorizing them to do so, must also be submitted with the Bid Form in the bid envelope.
4. Joint Venture: Each party of the joint venture shall execute the Bid Form under their respective seals in a manner appropriate to such party as described above, similar to the requirements of a Partnership.

1.28 EQUIVALENCY CLAUSE

A. Where, in these specifications, certain kinds, types, brands, or manufacturers of material are named, they shall be regarded as the standard of quality. Where two or less are named the Contractor may select one of those items, subject to meeting the requirements of the specified product. If the contractor desires to use any kind, type, brand, or manufacture of material other than those named in the specification, he shall indicate in writing, and fourteendays after Letter of Award, what kind, type, brand, or manufacture is requesting in lieu of the the specified items. Submit information describing in specific detail, wherein it differs from the quality and performance required by the base specifications, and such other information as may be requested by the Owner.

B. Refer to Article 6.W of the General Conditions for additional information concerning Equivalents.

C. Contractor shall refer to Form in Section 01 2500 - Substitution Procedures.

1.29 NONDISCRIMINATION

A. All Contractors and Subcontractors of all tiers and all vendors shall comply with all pertinent provisions of the State, Local and Federal law against discrimination in employment practices. Refer to Section 01 3306 - Non-Discrimination Clauses.

1.30 PREVAILING WAGES

A. New York State law requires the payment of prevailing wages on the project, as listed in Section 01 3554 - Prevailing Wage Rates.

1.31 ADDITIONAL BID INFORMATION

A. Submit the following Supplements concurrent with bid submission:
   1. Refer to 00 4301 - Bid Form Supplements for listing of required items and other contract attachments.
   2. Section 00 6000 - Bonds and Certificates for Bid Bond, Performance and Payment Bond.
   3. Section 01 2100 - Allowances.
   4. Section 01 2500 - Proposed substitutions if applicable

B. Each bidder by making his bid represents that he has read and understands the bidding documents.

C. The bidder by making his bid represents that he has visited the site and familiarized himself with the local conditions under which the work is to be performed. Visits to the site shall be arranged through the Owner's Representative.

1.32 DURATION OF OFFER

A. Bids shall remain open to acceptance and shall be irrevocable for a period of 45 days after the bid closing date, except as otherwise provided in General Municipal Law §103 (11).

1.33 ACCEPTANCE OF OFFER

A. The bidder acknowledges the right of the Edgemont Union Free School District to reject any or all bids and to waive any informality or irregularity in any bid received. In addition, the bidder recognizes the right of the Owner, at its discretion to reject a bid if the bidder fails to furnish any required bid security, or to submit the information required by the bidding documents, including "Qualifications of Bidders", or if the bid is incomplete or irregular.

B. The contract will be awarded to the lowest responsible bidder(s) furnishing the required security and whose bid is responsive to the bid specifications as may be determined in the best interests of the Owner.

1.34 POST-BID PROCEDURE

A. The bid proposal, allowances and information received from owners of other projects will be considered to determine whether the contractor is the "lowest responsible bidder" in making the award. The Owner, Architect and Construction Manager may make such investigation as the Owner, Architect and Construction Manager deems necessary to determine the responsibility of any bidder or to determine the ability of any bidder to perform the Work. Such investigation shall begin with a review of Qualifications of Bidder and shall include such additional information as shall be required herein.

B. The Owner, Architect, and Construction Manager reserves the right to disapprove the use of any proposed Subcontractor, and in such event, the bidder shall submit the name of another Subcontractor in like manner within the time specified by the Architect, as set forth in the Agreement.
   1. To the fullest extent allowed by law, the Owner, Architect, and Construction Manager reserves the right to reject any bid if the evidence required by the Architect and Construction Manager is not submitted or fails to satisfy the Architect and Construction Manager that the bidder is responsible, able and qualified to carry out the obligations of the Owner Contract or to complete the Work as contemplated. The Construction Manager will consider the information received in determining whether or not to accept a proposal.
   2. Acceptance of a proposal will be a notice in writing signed by a duly authorized representative of the Owner.
   3. Any bidder whose proposal is accepted will be required to sign the Owner/Contractor Agreement no later than ten (10) days after notification of Award of Bid or five (5) days following receipt of Contract, whichever is later.

4. In the event that the Owner, Architect, and Construction Manager should reject the proposal of the bidder, the Owner may elect to meet with the next lowest bidder and to consider the information as provided above. In the event that the proposal of the next lowest bidder is rejected, the Construction Manager may elect to meet with the third lowest bidder and repeat the above process. At all times the Owner retains the right to reject all bids.

END OF SECTION

SECTION 00 2115
RFI FORM

CONTRACTOR'S REQUEST FOR INTERPRETATION NO. ____ F&D RFI NO:_____ (F&D USE)

NAME OF PROJECT: High School Building "A" Interior Renovations
NAME OF OWNER: Edgemont Union Free School District
FACILITY: Edgemont High School
DATE: _____
A/E PROJECT NO: 24529.04
ARCHITECT: Fuller and D'Angelo, P.C.
45 Knollwood Road, Elmsford, NY 10523
Tel: 914-592-4444; Fax: 914-592-1717
William Means, RA WilliamM@fullerdangelo.com

Refer to Section 00 2113 Par 1.13 for additional requirements.

FROM (CO. NAME):_____
CONTACT NAME: _____ Tel: _____
Tel: _____ E-mail: _____
SUBJECT: _____
DISCIPLINE/TRADE: _____
DWG./SPEC. REFERENCE: _____
QUESTION: _____
_____
_____
_____

___FIELD CONDITION_____
___ DRAWING/SPEC _____
___ DISCREPANCY_____
___ OWNER CHANGE_____
___ CLARIFICATION _____
___ CONTRACTOR'S SUGGESTION (IF APPLICABLE): _____

ANSWER

_____
_____
_____
_____

ARCHITECT'S SIGNATURE: _____DATE:_____

Note: review and any responses to this request for information by the architect/engineer is strictly for design intent only and does not constitute acknowledgement or acceptance of any cost or schedule implications unless specifically presented by the contractor. By submission of this request for information, the contractor assumes all responsibility in the absence of an approved change order or work directive.

END OF SECTION

SECTION 00 4100
BID FORM CONTRACT #1 GENERAL CONSTRUCTION

THE PROJECT AND THE PARTIES

TO:

Edgemont School District
300 White Oak Lane:
Scarsdale, NY 10583

FOR:

High School Building "A" Interior Renovations
Edgemont High School
300 White Oak Lane
Scarsdale, NY

DATE: _____ (Bidder to enter date)

All information must be typewritten. Handwritten Bid Form will be rejected.

SUBMITTED BY: _____

Bidder's Full Name _____

Address_____

City, State, Zip_____

Contact Individual _____

Telephone No. _____ E-mail: _____

1.1 OFFER

A. Having examined the Place of The Work and all matters referred to in the Bidding Requirements and the Contract Documents prepared by Fuller and D'Angelo, P.C. for the Building A Renovations Work, we, the undersigned, hereby offer to enter into a Contract to perform Contract No.1 General Construction Work for the Sum of:

1. **BASE BID**
   a. The Base Bid of this Proposal for all work required by the Contract Documents for Contract No.1 General Construction for the Work is as follows:
   _____($_____) DOLLARS

2. TOTAL UNIT COST ALLOWANCES
   a. The Total unit cost allowances as indicated in Section 01 2100 - Allowances is as follows:
   _____$_____ DOLLARS
   Note: Attach Section 01 2100 - Allowances itemized list to bid proposal.

3. TOTALBASE BID (Include all allowances)
   The Total Base Bid of this Proposal for all work required by the Contract Documents for Contract No.1 General Construction for the Work is as follows:
   _____ ($_____) DOLLARS

B. The undersigned further understands and agrees that he is to furnish and provide all the necessary material, machinery, plant, implements, tools, labor, services, skill and other items of whatever nature required, and to do and perform all the work necessary under the Contract, to complete the work in accordance with the drawings and specifications and any addenda thereto, and to accept in full

compensation therefore the amount of the Total Base Bid stated, modified by such additive- or deductive alternatives, if any as are accepted by the Owner.

C. We have included the required Performance and Payment bonds **costs** in the Bid Amount.

1.2 ACCEPTANCE

A. This offer shall be open to acceptance and is irrevocable for forty-five (45) days from the date of bid opening during which time the Owner has the right to enter into a contract, and the bid securities of the three (3) lowest responsible bidders shall be held until the executive of the Contract. Once the bid proposal has been submitted in the sealed envelope, there shall be no alterations or amendments; external markings or separate supplementary information shall, in no way, affect the sealed bid information. The contract will be awarded to the lowest responsible bidder meeting the specifications and furnishing the required security.

B. Upon award by the the Edgemont Union Free School District within the time period stated above, we will:
   1. Execute the Agreement within ten (10) days of receipt of Notice of Award or five (5)days following receipt of Contract, whichever is later.
   2. Furnish the required Performance and Payment bonds within ten (10) days of receipt of Notice of Award or with the executed Contract.

C. If this contract is accepted within the time stated, and we fail to commence the Work or we fail to provide the required Bonds, the security deposit shall be forfeited as damages to Edgemont Union Free School District by reason of our failure, limited in amount to the lesser of the face value of the security deposit or the difference between this bid and the bid upon which a Contract is signed.

D. In the event our bid is not accepted within the time stated above, the required security deposit shall be returned to the undersigned, in accordance with the provisions of the Instructions to Bidders; unless a mutually satisfactory arrangement is made for its retention and validity for an extended period of time.

1.3 REJECTION OF BIDS

A. The Owner reserves the right to reject any or all proposals and to waive non-material variances in bid submissions as it deems in the best interests of the Owner.

1.4 CONTRACT TIME

A. If this Bid is accepted, we will:
   1. Complete all the work covered by this Proposal with a commencement date of NO EARLIER THAN Award of Contract by Owner. Work shall be phased as indicated in 01 1000 Summary of Contract. Failure to complete each phase of work by dates indicated will result in liquidated damages as stated in the General Conditions.

1.5 CHANGES TO THE WORK

A. Refer to Article 8 of the General Conditions .

1.6 ADDENDA

A. The following Addenda have been received. The modifications to the Bid Documents noted below have been considered and all costs are included in the Bid Sum.
   1. Addendum # _____ Dated _____.
   2. Addendum # _____ Dated _____.
   3. Addendum # _____ Dated _____.
   4. Addendum # _____ Dated _____.

1.7 BID FORM SUPPLEMENTS

A. Refer to Section 00 4301 - Bid Form Supplements.

1.8 BIDDER'S FURTHER AFFIRMATION AND DECLARATION

A. The above name bidder and should this bid be a joint bid each party thereto, further affirm and declares:

1. That said bidder is of lawful age and the only one interested in this bid; and that no other person, firm or corporation, except those herein above named, has any interest in this bid or in the contract proposed to be entered into.
2. That this bid is made without any understanding, agreement or connection with any other person, firm, or corporation making a bid for the same work, and is in all respects fair and without collusion or fraud.
3. That said bidder is not in arrears to the Edgemont Union Free School District upon debt or contract, and is not a defaulter, as surety or otherwise upon any obligation to the said Edgemont Union Free School District
4. That no member of the Edgemont Union Free School District or any officer or employee of the Edgemont Union Free School District or person whose salary is payable in whole or in part from the Edgemont Union Free School District treasury, or the spouse of any foregoing is or shall be or become interested, directly or indirectly, as a contracting party, partner, stockholder, surety or otherwise, in this bid, or in the performance of the Contract, or in the supplies, materials or equipment and work or labor to which it relates, or in any portion of the profits thereof.
5. That he/she has carefully examined the site of the work and that, from his/her own investigations, he/she has satisfied him/herself as to the nature and location of the work, and character, quality and quantity of materials, and all difficulties likely to be encountered, the kind and extent of equipment and other facilities needed for the performance of the work, the general and local conditions, and all other items which may, in any way, affect the work or its performance.
6. That if a corporation, this bid or proposal containing the Non-Collusive Binding Certification and the foregoing Affirmation and Declaration has been authorized by the Board of Directors of such Corporation, which authorization includes the signing and submission of this bid or proposal and the inclusion therein of the said Certificate of Non-Collusion and Affirmation and Declaration as the Act and Deed of the Corporation.

1.9 BID FORM SIGNATURE(S)

The Corporate Seal of

_____

(Bidder - print the full name of your firm)

was hereunto affixed in the presence of:

_____

(Authorized signing officer, Title)

(Seal)

If the Bid is a joint venture or partnership, add additional forms of execution for each member of the joint venture in the appropriate form or forms as above.

Subscribed and sworn before me this day of____ 202_____

Notary Public: _____

My Commission Expire: _____

END OF BID FORM

SECTION 00 4110
BID FORM CONTRACT #2 PLUMBING

THE PROJECT AND THE PARTIES

TO:

Edgemont School District
300 White Oak Lane:
Scarsdale, NY 10583

FOR:

High School Building "A" Interior Renovations
Edgemont High School
300 White Oak Lane
Scarsdale, NY

DATE: _____ (Bidder to enter date)

All information must be typewritten. Handwritten Bid Form will be rejected.

SUBMITTED BY: _____

Bidder's Full Name _____

Address_____

City, State, Zip_____

Contact Individual _____

Telephone No. _____ E-mail: _____

1.1 OFFER

A. Having examined the Place of The Work and all matters referred to in the Bidding Requirements and the Contract Documents prepared by Fuller and D'Angelo, P.C. for the Building A Renovations Work, we, the undersigned, hereby offer to enter into a Contract to perform Contract No. 2 Work for the Sum of:

1. **TOTAL BASE BID**

   a. The Total Base Bid of this Proposal for all work required by the Contract Documents for Contract No. 2 Plumbing and Related Work work for the Work is as follows:

   _____ ($_____) DOLLARS

B. The undersigned further understands and agrees that he is to furnish and provide all the necessary material, machinery, plant, implements, tools, labor, services, skill and other items of whatever nature required, and to do and perform all the work necessary under the Contract, to complete the work in accordance with the drawings and specifications and any addenda thereto, and to accept in full compensation therefore the amount of the Total Base Bid stated, modified by such additive- or deductive alternatives, if any as are accepted by the Owner.

1.2 ACCEPTANCE

A. This offer shall be open to acceptance and is irrevocable for forty-five (45) days from the bid closing date, during which time the Owner has the right to enter into a contract, and the bid securities of the three (3) lowest responsible bidders shall be held until the execution of the Contract. Once the bid proposal has been submitted in the sealed envelope, there shall be no alterations or amendments; external markings or separate supplementary information shall, in no way, affect the sealed bid information. The contract will be awarded to the lowest responsible bidder meeting, the specifications and furnishing the required security.

B. Upon award by the Edgemont Union Free School District within the time period stated above, we will:

1. Execute the Agreement within ten (10) days of receipt of Notice of Award or five (5)days following receipt of Contract, whichever is later.
2. Furnish the required Performance and Payment bonds within ten (10) days of receipt of Notice of Award or with the executed Contract.

C. If this contract is awarded to us and we fail to commence the Work or we fail to provide the required Bonds, the security deposit shall be forfeited as damages to Edgemont Union Free School District by reason of our failure, limited in amount to the lesser of the face value of the security deposit or the difference between this bid and the bid upon which a Contract is signed.

D. In the event our bid is not accepted within the time stated above, the required security deposit shall be returned to the undersigned, in accordance with the provisions of the Instructions to Bidders; unless a mutually satisfactory arrangement is made for its retention and validity for an extended period of time.

1.3 REJECTION OF BIDS

A. The Owner reserves the right to reject any or all proposals and to waive non-material variances in bid submissions as it deems in the best interests of the Owner.

1.4 CONTRACT TIME

A. If this Bid is accepted, we will:
1. Complete all the work covered by this Proposal with a commencement date of NO EARLIER THAN Award of Contract by Owner. Work shall be phased as indicated in 01 1010 Milestone Schedule. Failure to complete each phase of work by dates indicated will result in liquidated damages as stated in the General Conditions.

1.5 CHANGES TO THE WORK

A. Refer to Article 8 of the General Conditions .

1.6 ADDENDA

A. The following Addenda have been received. The modifications to the Bid Documents noted below have been considered and all costs are included in the Bid Sum.
1. Addendum # _____ Dated _____.
2. Addendum # _____ Dated _____.
3. Addendum # _____ Dated _____.
4. Addendum # _____ Dated _____.

1.7 BID FORM SUPPLEMENTS

A. Refer to Section 00 4301 - Bid Form Supplements.

1.8 BIDDER'S FURTHER AFFIRMATION AND DECLARATION

A. The above name bidder and should this bid be a joint bid each party thereto, further affirm and declares:
1. That said bidder is of lawful age and the only one interested in this bid; and that no other person, firm or corporation, except those herein above named, has any interest in this bid or in the contract proposed to be entered into.
2. That this bid is made without any understanding, agreement or connection with any other person, firm, or corporation making a bid for the same work, and is in all respects fair and without collusion or fraud.
3. That said bidder is not in arrears to the Edgemont Union Free School District upon debt or contract, and is not a defaulter, as surety or otherwise upon any obligation to the said Edgemont Union Free School District
4. That no member of the Edgemont Union Free School District or any officer or employee of the Edgemont Union Free School District or person whose salary is payable in whole or in part from the Edgemont Union Free School District treasury, or the spouse of any foregoing is or shall be or become interested, directly or indirectly, as a contracting party, partner, stockholder, surety or

otherwise, in this bid, or in the performance of the Contract, or in the supplies, materials or equipment and work or labor to which it relates, or in any portion of the profits thereof.

5. That he/she has carefully examined the site of the work and that, from his/her own investigations, he/she has satisfied him/herself as to the nature and location of the work, and character, quality and quantity of materials, and all difficulties likely to be encountered, the kind and extent of equipment and other facilities needed for the performance of the work, the general and local conditions, and all other items which may, in any way, affect the work or its performance.
6. That if a corporation, this bid or proposal containing the Non-Collusive Binding Certification and the foregoing Affirmation and Declaration has been authorized by the Board of Directors of such Corporation, which authorization includes the signing and submission of this bid or proposal and the inclusion therein of the said Certificate of Non-Collusion and Affirmation and Declaration as the Act and Deed of the Corporation.

1.9 BID FORM SIGNATURE(S)

The Corporate Seal of

_____

(Bidder - print the full name of your firm)

was hereunto affixed in the presence of:

_____

(Authorized signing officer, Title)

(Seal)

If the Bid is a joint venture or partnership, add additional forms of execution for each member of the joint venture in the appropriate form or forms as above.

Subscribed and sworn before me this day of____ 202__

Notary Public: _____

My Commission Expire: _____

END OF BID FORM

SECTION 00 4120
BID FORM CONTRACT #3 MECHANICAL

THE PROJECT AND THE PARTIES

TO:

Edgemont School District
300 White Oak Lane:
Scarsdale, NY 10583

FOR:

High School Building "A" Interior Renovations
Edgemont High School
300 White Oak Lane
Scarsdale, NY

DATE: _____ (Bidder to enter date)

All information must be typewritten. Handwritten Bid Form will be rejected.

SUBMITTED BY: _____

Bidder's Full Name _____

Address_____

City, State, Zip_____

Contact Individual _____

Telephone No. _____ E-mail: _____

1.1 OFFER

A. Having examined the Place of The Work and all matters referred to in the Bidding Requirements and the Contract Documents prepared by Fuller and D'Angelo, P.C. for the Building A Renovations Work, we, the undersigned, hereby offer to enter into a Contract to perform Contract No. 3 Mechanical Work for the Sum of:

1. **BASE BID**
   a. The Base Bid of this Proposal for all work required by the Contract Documents for Contract No. 3 Mechanical for the Work is as follows:
   _____($_____) DOLLARS

2. TOTAL ALLOWANCES
   a. The Total Commissioning Allowance as indicated in Section 01 2100 - Allowances is as follows:
   Twenty Thousand _____($20,000.00) DOLLARS

3. **TOTAL BASE BID (Include all allowances)**
   a. The Total Base Bid of this Proposal for all work required by the Contract Documents for Contract No. 3 Mechanical Work is as follows:
   _____ ($_____) DOLLARS

Note: Attach Section 01 2100 - Allowances itemized list to bid proposal.

B. The undersigned further understands and agrees that he is to furnish and provide all the necessary material, machinery, plant, implements, tools, labor, services, skill and other items of whatever nature required, and to do and perform all the work necessary under the Contract, to complete the work in accordance with the drawings and specifications and any addenda thereto, and to accept in full

compensation therefore the amount of the Total Base Bid stated, modified by such additive- or deductive alternatives, if any as are accepted by the Owner.

C. All Allowances described in Section - 01 2100 - Allowances are included in the Total Bid Sum.

1.2 ACCEPTANCE

A. This offer shall be open to acceptance and is irrevocable for forty-five (45) days from the bid closing date during which time the Owner has the right to enter into a contract, and the bid securities of the three (3) lowest responsible bidders shall be held until the execution of the Contract. Once the bid proposal has been submitted in the sealed envelope, there shall be no alterations or amendments; external markings or separate supplementary information shall, in no way, affect the sealed bid information. The contract will be awarded to the lowest responsible bidder meeting the specifications and furnishing the required security.

B. Upon award by the Edgemont Union Free School District within the time period stated above, we will:
   1. Execute the Agreement within ten (10) days of receipt of Notice of Award or five (5)days following receipt of Contract, whichever is later.
   2. Furnish the required Performance and Payment bonds within ten (10) days of receipt of Notice of Award or with the executed Contract.

C. If this contract is awarded to us and we fail to commence the Work or we fail to provide the required Bonds, the security deposit shall be forfeited as damages to Edgemont Union Free School District by reason of our failure, limited in amount to the lesser of the face value of the security deposit or the difference between this bid and the bid upon which a Contract is signed.

D. In the event our bid is not accepted within the time stated above, the required security deposit shall be returned to the undersigned, in accordance with the provisions of the Instructions to Bidders; unless a mutually satisfactory arrangement is made for its retention and validity for an extended period of time.

1.3 REJECTION OF BIDS

A. The Owner reserves the right to reject any or all proposals and to waive non-material variances in bid submissions as it deems in the best interests of the Owner.

1.4 CONTRACT TIME

A. If this Bid is accepted, we will:
   1. Complete all the work covered by this Proposal with a commencement date of NO EARLIER THAN Award of Contract by Owner. Work shall be performed as indicated in 01 1000 Summary of Contract. Failure to complete each phase of work by dates indicated will result in liquidated damages as stated in the General Conditions

1.5 CHANGES TO THE WORK

A. Refer to Article 8 of the General Conditions

1.6 ADDENDA

A. The following Addenda have been received. The modifications to the Bid Documents noted below have been considered and all costs are included in the Bid Sum.
   1. Addendum # _____ Dated _____.
   2. Addendum # _____ Dated _____.
   3. Addendum # _____ Dated _____.
   4. Addendum # _____ Dated _____.

1.7 BID FORM SUPPLEMENTS

A. Refer to Section 00 4301 - Bid Form Supplements.

1.8 BIDDER'S FURTHER AFFIRMATION AND DECLARATION

A. The above name bidder and should this bid be a joint bid each party thereto, further affirm and declares:

1. That said bidder is of lawful age and the only one interested in this bid; and that no other person, firm or corporation, except those herein above named, has any interest in this bid or in the contract proposed to be entered into.
2. That this bid is made without any understanding, agreement or connection with any other person, firm, or corporation making a bid for the same work, and is in all respects fair and without collusion or fraud.
3. That said bidder is not in arrears to the Edgemont Union Free School District upon debt or contract, and is not a defaulter, as surety or otherwise upon any obligation to the said Edgemont Union Free School District
4. That no member of the Edgemont Union Free School District or any officer or employee of the Edgemont Union Free School District or person whose salary is payable in whole or in part from the Edgemont Union Free School District treasury, or the spouse of any foregoing is or shall be or become interested, directly or indirectly, as a contracting party, partner, stockholder, surety or otherwise, in this bid, or in the performance of the Contract, or in the supplies, materials or equipment and work or labor to which it relates, or in any portion of the profits thereof.
5. That he/she has carefully examined the site of the work and that, from his/her own investigations, he/she has satisfied him/herself as to the nature and location of the work, and character, quality and quantity of materials, and all difficulties likely to be encountered, the kind and extent of equipment and other facilities needed for the performance of the work, the general and local conditions, and all other items which may, in any way, affect the work or its performance.
6. That if a corporation, this bid or proposal containing the Non-Collusive Binding Certification and the foregoing Affirmation and Declaration has been authorized by the Board of Directors of such Corporation, which authorization includes the signing and submission of this bid or proposal and the inclusion therein of the said Certificate of Non-Collusion and Affirmation and Declaration as the Act and Deed of the Corporation.

1.9 BID FORM SIGNATURE(S)

The Corporate Seal of

_____

(Bidder - print the full name of your firm)

was hereunto affixed in the presence of:

_____

(Authorized signing officer, Title)

(Seal)

If the Bid is a joint venture or partnership, add additional forms of execution for each member of the joint venture in the appropriate form or forms as above.

Subscribed and sworn before me this day of____ 202_

Notary Public: _____

My Commission Expire: _____

END OF BID FORM

SECTION 00 4130
BID FORM CONTRACT #4 ELECTRICAL

THE PROJECT AND THE PARTIES

TO:

Edgemont School District
300 White Oak Lane:
Scarsdale, NY 10583

FOR:

High School Building "A" Interior Renovations
Edgemont High School
300 White Oak Lane
Scarsdale, NY

DATE: _____ (Bidder to enter date)

All information must be typewritten. Handwritten Bid Form will be rejected.

SUBMITTED BY: _____

Bidder's Full Name _____

Address_____

City, State, Zip_____

Contact Individual _____

Telephone No. _____ E-mail: _____

1.1 OFFER

A. Having examined the Place of The Work and all matters referred to in the Bidding Requirements and the Contract Documents prepared by Fuller and D'Angelo, P.C. for Building A Renovations, we, the undersigned, hereby offer to enter into a Contract to perform Contract No. 4 Electrical Work for the Sum of:

1. **BASE BID**
   a. The Base Bid of this Proposal for all work required by the Contract Documents for Contract No. 4 Electrical Work is as follows:
   _____$_____ DOLLARS

2. TOTAL ALLOWANCES
   a. The Total of all Allowances as indicated in Section 01 2100 - Allowances is as follows:
   _____($_____DOLLARS

3. TOTALBASE BID (Include all allowances)
   a. The Total Base Bid of this Proposal for all work required by the Contract Documents for Contract No. 4 Electrical for the Work is as follows:
   _____($_____)DOLLARS
   Note: Attached Section 01 2100 - Allowances itemized list to bid proposal.

B. The undersigned further understands and agrees that he is to furnish and provide all the necessary material, machinery, plant, implements, tools, labor, services, skill and other items of whatever nature required, and to do and perform all the work necessary under the Contract, to complete the work in

accordance with the drawings and specifications and any addenda thereto, and to accept in full compensation therefore the amount of the Total Base Bid stated, modified by such additive- or deductive alternatives, if any as are accepted by the Owner.

C. All Allowances described in Section - 01 2100 - Allowances are included in the Total Bid Sum.

1.2 ACCEPTANCE

A. This offer shall be open to acceptance and is irrevocable for forty-five (45) days from the bid closing date during which time the Owner has the right to enter into a contract, and the bid securities of the three (3) lowest responsible bidders shall be held until the execution of the Contract. Once the bid proposal has been submitted in the sealed envelope, there shall be no alterations or amendments; external markings or separate supplementary information shall, in no way, affect the sealed bid information. The contract will be awarded to the lowest responsible bidder meeting the specifications and furnishing the required security.

B. Upon award by the Edgemont Union Free School District within the time period stated above, we will:
   1. Execute the Agreement within ten (10) days of receipt of Notice of Award or five (5)days following receipt of Contract, whichever is later.
   2. Furnish the required Performance and Payment bonds within ten (10) days of receipt of Notice of Award or with the executed Contract.

C. If this contract is awarded to us and we fail to commence the Work or we fail to provide the required Bonds, the security deposit shall be forfeited as damages to Edgemont Union Free School District by reason of our failure, limited in amount to the lesser of the face value of the security deposit or the difference between this bid and the bid upon which a Contract is signed.

D. In the event our bid is not accepted within the time stated above, the required security deposit shall be returned to the undersigned, in accordance with the provisions of the Instructions to Bidders; unless a mutually satisfactory arrangement is made for its retention and validity for an extended period of time.

1.3 REJECTION OF BIDS

A. The Owner reserves the right to reject any or all proposals and to waive non-material variances in bid submissions as it deems in the best interests of the Owner.

1.4 CONTRACT TIME

A. If this Bid is accepted, we will:
   1. Complete all the work covered by this Proposal with a commencement date of NO EARLIER THAN Award of Contract by Owner. Work shall be phased as indicated in 01 1000 Summary of Contract. Failure to complete each phase of work by dates indicated will result in liquidated damages as stated in the General Conditions.

1.5 CHANGES TO THE WORK

A. Refer to Article 8 of the General Conditions.

1.6 ADDENDA

A. The following Addenda have been received. The modifications to the Bid Documents noted below have been considered and all costs are included in the Bid Sum.
   1. Addendum # _____ Dated _____.
   2. Addendum # _____ Dated _____.
   3. Addendum # _____ Dated _____.
   4. Addendum # _____ Dated _____.

1.7 BID FORM SUPPLEMENTS

A. Section 00 4301 - Bid Form Supplements.

1.8 BIDDER'S FURTHER AFFIRMATION AND DECLARATION

A. The above name bidder and should this bid be a joint bid each party thereto, further affirm and declares:

1. That said bidder is of lawful age and the only one interested in this bid; and that no other person, firm or corporation, except those herein above named, has any interest in this bid or in the contract proposed to be entered into.
2. That this bid is made without any understanding, agreement or connection with any other person, firm, or corporation making a bid for the same work, and is in all respects fair and without collusion or fraud.
3. That said bidder is not in arrears to the Edgemont Union Free School District upon debt or contract, and is not a defaulter, as surety or otherwise upon any obligation to the said Edgemont Union Free School District
4. That no member of the Edgemont Union Free School District or any officer or employee of the Edgemont Union Free School District or person whose salary is payable in whole or in part from the Edgemont Union Free School District treasury, or the spouse of any foregoing is or shall be or become interested, directly or indirectly, as a contracting party, partner, stockholder, surety or otherwise, in this bid, or in the performance of the Contract, or in the supplies, materials or equipment and work or labor to which it relates, or in any portion of the profits thereof.
5. That he/she has carefully examined the site of the work and that, from his/her own investigations, he/she has satisfied him/herself as to the nature and location of the work, and character, quality and quantity of materials, and all difficulties likely to be encountered, the kind and extent of equipment and other facilities needed for the performance of the work, the general and local conditions, and all other items which may, in any way, affect the work or its performance.
6. That if a corporation, this bid or proposal containing the Non-Collusive Binding Certification and the foregoing Affirmation and Declaration has been authorized by the Board of Directors of such Corporation, which authorization includes the signing and submission of this bid or proposal and the inclusion therein of the said Certificate of Non-Collusion and Affirmation and Declaration as the Act and Deed of the Corporation.

1.9 BID FORM SIGNATURE(S)

The Corporate Seal of

_____

(Bidder - print the full name of your firm)

was hereunto affixed in the presence of:

_____

(Authorized signing officer, Title)

(Seal)

If the Bid is a joint venture or partnership, add additional forms of execution for each member of the joint venture in the appropriate form or forms as above.

Subscribed and sworn before me this day of____ 202_

Notary Public: _____

My Commission Expire: _____

END OF BID FORM

SECTION 00 4301
BID FORM SUPPLEMENTS

PARTICULARS

TO: **Edgemont Union Free School District**

Architect's Project Number **24529.04**

Project Description: **High School Building "A" Interior Renovations**

Date: _____

Please type form.

Submitted By: (Bidder to insert full name and address)

_____

_____

_____

Tel: _____E-Mail: _____

A. In accordance with Section 00 2113 - Instructions to Bidders and Bid Form - we include the Supplements To Bid Form items listed below. The information provided shall be considered an integral part of the Bid Form.

B. Each of the following documents **must be included** in the Bidder's Bid package and must be completed , signed and notarized where indicated. The Owner reserves the right to reject as nonresponsive any bid submission that does not contain all required documents.

1.1 SUPPLEMENTS TO BID FORM

A. Section - 00 4100, 00 4110, 00 4120, or Section 00 4130 - Bid Form. (submit per contract being bid)

B. Security- Bid Bond or Certified Check. See Section 00 6000

C. Section 01 2100 - Allowances

D. Section 00 4301 - Bid Form Supplements. The following Forms and Certifications attached are part of this Section:

1. Insurance Coverage Certification
2. Form of Disclosure
3. Hold Harmless Agreement
4. Certification of Compliance with Iran Divestment Act
5. Declaration of Bidders Inability to Provide Certification of Compliance with Iran Divestment Act
6. Labor Law 220-I Certification Form
7. Non-Collusive Form
8. Qualifications of Bidders
9. Statement of Bidders Qualifications
10. Sexual Harassment Prevention Certificate

END OF SECTION

INSURANCE COVERAGE CERTIFICATION

_____ (name), President/CEO/Owner/Managing Member of _____ (bidder), hereby represents that the bidder currently has, or immediately upon being awarded the contract, will obtain insurance coverage, from an insurer licensed and admitted to do business in the State of New York, that meets the following requirements:

1. **Workers' Compensation, Paid Family Leave and NYS Disability Insurance**
   Statutory Workers' Compensation (C-105.2 or U-26.3), NYS Paid Leave and NYS Disability Insurance (DB-120.1) for all employees. Proof of coverage must be on the approved specific form, as required by the New York State Workers' Compensation Board. ACORD certificates are not acceptable. A person seeking an exemption must file a CE-200 Form with the state. The form can be completed and submitted directly to the WC Board online.

2. **Commercial General Liability Insurance**
   $1,000,000 per Occurrence/$2,000,000
   $2,000,000 Products and Completed Operations
   $1,000,000 Personal and Advertising Injury
   $100,000 Fire Damage
   $10,000 Medical Expense
   The general aggregate shall apply on a per-project basis.

3. **Owners Contractors Protective (OCP) Insurance**:
   For Projects less than or equal to $1,000,000 and work on 1 story (10 feet) only: $1,000,000 per occurrence, $2,000,000 aggregate with the Owner as the named insured.

   For Projects greater than $1,000,000 and/or work above one story (10 feet): $2,000,000 per occurrence, $4,000,000 aggregate with the Owner as the named insured.

   The Owner will be the named insured on OCP Policies. There will be no additional insureds on any OCP Policies.

4. **Automobile Liability**
   $1,000,000 combined single limit for owned, hired, borrowed and non-owned motor vehicles.

5. **Umbrella/Excess Insurance**
   $5,000,000 each occurrence and aggregate for general construction (including plumbing, electrical and HVAC) and no work at elevation (1 story or 10 feet) or Project values less than or equal to $1,000,000.

$10,000,000 each occurrence and aggregate for high-risk construction, work at elevation (>1 story or 10 feet) or Project values greater than $1,000,000.

Umbrella/Excess coverage shall be on a follow-form basis or provide broader coverage over the General Liability and Automobile Liability coverages.

6. **Asbestos/Lead Abatement/Pollution Liability Insurance**
If the Project requires the removal of asbestos and/or hazardous materials, Contractor shall provide hazardous material liability insurance as follows:

$2,000,000 per occurrence/$2,000,000 aggregate, including products and completed operations. Such insurance shall include coverage for the Contractor's operations including, but not limited to, removal, replacement, enclosure, encapsulation and/or disposal of asbestos, or any other hazardous material, along with any related pollution events, including coverage for third-party liability claims for bodily injury, property damage and clean-up costs. If a retroactive date is used, it shall pre-date the inception of the Contract.

If the Contractor is using motor vehicles for transporting hazardous materials, the Contractor shall provide pollution liability broadened coverage (ISO endorsement CA 9948 or CA 01 12), as well as proof of MCS 90. Coverage shall fulfill all requirements of this Article 10 and shall extend for a period of three (3) years following acceptance by the Owner of the Certificate of Completion.

7. **Testing Company Errors and Omission Insurance**
$1,000,000 per occurrence/$2,000,000 aggregate for the testing and other professional acts of the Contractor performed under the Contract with the Owner.

Insurance Representative's Acknowledgment:

We have reviewed the insurance requirements set forth in the Bidding Documents and are capable of providing such insurance to our insured in accordance with such requirements in the event the contract is awarded to our insured and provided our insured pays the appropriate premium.

Insurance Representative: _____

Address: _____

_____

Are you an agent for the companies providing the coverage: Yes _____ No _____

Date: _____ _____

Insurance Representative

Bidder's Acknowledgment:

I acknowledge that I have reviewed the insurance requirements for this bid and have considered the costs, if any, of procuring the required insurance and will be able to supply the insurance required in accordance with the bid, if it is awarded. I understand that a certificate of insurance must be submitted with my bid; and if it is not, the Owner may reject my bid and award to the next lowest bidder.

Firm Name: _____

Address: _____

_____

Date: _____ _____

Bidder's Signature

-FORM OF DISCLOSURE-

THE UNDERSIGNED AFFIRMS THAT THE FOLLOWING CONSTITUTE ALL OFFICERS, DIRECTORS, PARTNERS, OR CONTROLLING PRINCIPALS OF THE FIRM:

Name	Title
_____	_____
_____	_____

1. Does any School District Board Member, administrator, or employee possess any financial interest, directly or indirectly, in the firm?_____ If yes, set forth the basis upon which a financial interest exists in the firm:

   _____

   _____

2. Has the firm or any of its officers, directors, partners, or controlling principals possessed any interest in transactions heretofore entered into with the School District?_____ If yes, please describe transaction(s):

   _____

   _____

3. Does any direct relative of a member of the Board, administrators, or staff possess any financial interest, directly or indirectly, in the firm (For purpose of this inquiry a direct relative is to be defined as a parent, spouse, child or sibling)._____If yes, set forth below the School District Board Member, administrator, or staff member whose relation possess an interest and the relationship:

   _____

   _____

THE UNDERSIGNED AFFIRMS THAT THE ABOVE STATEMENTS ARE TRUE AND UNDERSTANDS THAT ANY FALSE STATEMENT SHALL CONSTITUTE A VIOLATION OF THE PENAL CODE OR GENERAL MUNICIPAL LAW AS APPLICABLE.

Firm: _____

Signature: _____

Print Name: _____

Title: _____

Date: _____

HOLD HARMLESS AGREEMENT

In accordance with Article 12 of the General Conditions ("Indemnification"), the Contractor agrees as follows to the following indemnification obligations under its Agreement with the Owner:

A. The Contractor and its SubContractors shall defend, indemnify, and hold harmless: (1) the Owner, its consultants, employees, officers, members of the Board of Education, and agents; (2) the Architect and its consultants, employees, officers, and agents; and (3) the Construction Manager, its consultants, employees, officers, and agents from and against any and all claims, damages, losses, suits, obligations, fines, penalties, costs, charges, and expenses, including but not limited to attorney's fees, which may be imposed upon or incurred by or asserted against any of them by reason of any act or omission of such contractor or any of its subcontractors or any person or firm directly or indirectly employed by such contractor, for the act(s) and/or omission(s) of any contractor or subcontractor in connection with the work of the Project.

B. To the fullest extent permitted by law, the Contractor and its SubContractors shall defend, indemnify and hold harmless: (1) the Owner, its consultants, employees, officers, members of the Board of Education, and agents; (2) the Architect and its consultants, employees, officers, and agents; and (3) the Construction Manager, its consultants, employees, officers, and agents from and against claims, damages, losses, and expenses, including but not limited to attorney's fees, arising out of or resulting from performance of its work, provided that such claim, damage, loss or expense is attributable to bodily injury, sickness, disease, or death, or to injury to or destruction, of tangible property including loss of use resulting therefrom, but only to the extent caused in whole or in part by negligent acts or omissions of the Contractor, a SubContractor, anyone directly or indirectly employed by them or anyone for whose acts they may be liable, regardless of whether or not such claim, damage, loss, or expense is caused in part by a party indemnified hereunder. Such obligation shall not be construed to negate, abridge, or reduce other rights or obligations of indemnity which would otherwise exist as to a party or person described in this Paragraph B. The Contractor's indemnity obligations under this Paragraph B shall, but not by way of limitation, specifically include all claims and judgments which may be made against the Owner, the Architect, the Architect's consultants and agents and employees of any of them under any applicable statute, rule or regulation including the New York Statute, Occupational Safety and Hazardous Act, and the Federal Occupational Safety and Hazardous Act. In claims against any person or entity indemnified under this Paragraph B by an employee of the Contractor, a SubContractor, anyone directly or indirectly employed by them or anyone for whose acts they may be liable, the indemnification obligation under this Paragraph B shall not be limited by a limitation on amount or type of damages, compensation or benefits payable by or for the Contractor or a SubContractor under workers' or workmen's compensation acts, disability benefit acts or other employee benefit acts.

C. The Contractor and its SubContractors shall defend, indemnify and hold harmless: (1) the Owner, its consultants, employees, officers, members of the Board of Education, and its agents; (2) the Architect and its consultants, employees, officers, and agents; and (3) the Construction Manager, its consultants, employees, officers and agents from and against any fines, penalties, judgments, or damages, including reasonable attorney's fees, imposed on or incurred by the parties indemnified hereunder which are incurred as a result of the Contractor's failure to give the notices required by Article 6(T) of these General Conditions of the Contract for Construction.

D. The Contractor and its SubContractors shall defend, indemnify and hold harmless: (1) the Owner, its consultants, employees, officers, members of the Board of Education, and agents; (2)

the Architect and its consultants, employees, officers, and agents; and (3) the Construction Manager, its consultants, employees, officers, and agents from and against any actions, lawsuits, or proceedings or claims of liens brought against each or any of them as a result of liens filed against the Contractor's Project funds, including all the cost and expense of said liens, and including but not limited to attorney's fees incurred by each or any of them.

E. The Contractor and its SubContractors shall defend, indemnify and hold harmless: (1) the Owner, its consultants, employees, officers, members of the Board of Education, and agents; (2) the Architect and its consultants, employees, officers, and agents; and (3) the Construction Manager, its consultants, employees, officers, and agents from and against any and all liability for violation of all federal, state, and local laws, ordinances, regulations, rules, codes, orders, and policies applicable to the Contractor's work and shall defend any claims or actions which may be brought against the Owner as the result thereof.

F. The Contractor and its SubContractors shall defend, indemnify and hold harmless: (1) the Owner, its consultants, employees, officers, members of the Board of Education, and agents; (2) the Architect and its consultants, employees, officers, and agents; and (3) the Construction Manager, its consultants, employees, officers, and agents from and against any and all liability for claims made by third parties, including SubContractors, in connection with this Agreement and shall defend any claims or actions which may be brought against the Owner as the result thereof.

G. The Contractor shall indemnify and hold harmless: (1) the Owner, its consultants, employees, officers, members of the Board of Education, and agents; (2) the Architect and its consultants, employees, officers, and agents; and (3) the Construction Manager, its consultants, employees, officers, and agents from any and all claims, damages, losses, suits, obligations, fines, penalties, costs, charges, and expenses which may be imposed upon or incurred by or asserted against any of them by reason of any act or omission of such contractor or any subcontractor or any person or firm directly or indirectly or indirectly employed by such contractor, with respect to violations of OSHA requirements, rules, and/or regulations.

H. The indemnification obligations set forth herein shall become effective upon the Owner, the Architect or the Construction Manager's receipt of a claim for which the Contractor is required to provide indemnification to the Owner, the Architect, or the Construction Manager. In the event that the Contractor shall fail to refuse to defend any such action, the Contractor shall be liable to the Owner for all costs of the Owner in defending such claim or action and all costs of the Owner, including attorney's fees, in recovering such defense costs from the Contractor. In the event the Owner, the Architect, or the Construction Manager is required to bring an action to enforce the indemnification obligations set forth herein, the Contractor shall be liable to the Owner, the Architect, and/or the Construction Manager for all costs associated with said action including attorney's fees.

By: _____

Signature of Authorized Representative of Contractor

_____

(Print Name and Title)

_____

(Date)

CERTIFICATION OF COMPLIANCE WITH THE IRAN DIVESTMENT ACT

As a result of the Iran Divestment Act of 2012 (the "Act"), Chapter 1 of the 2012 Laws of New York, a new provision has been added to State Finance Law (SFL) § 165-a and New York General Municipal Law § 103-g, both effective April 12, 2012. Under the Act, the Commissioner of the Office of General Services (OGS) will be developing a list of "persons" who are engaged in "investment activities in Iran" (both are defined terms in the law) (the "Prohibited Entities List"). Pursuant to SFL § 165-a(3)(b), the initial list is expected to be issued no later than 120 days after the Act's effective date at which time it will be posted on the OGS website.

By submitting a bid in response to this solicitation or by assuming the responsibility of a Contract awarded hereunder, each Bidder/Contractor, any person signing on behalf of any Bidder/Contractor and any assignee or subcontractor and, in the case of a joint bid, each party thereto, certifies, under penalty of perjury, that once the Prohibited Entities List is posted on the OGS website, that to the best of its knowledge and belief, that each Bidder/Contractor and any subcontractor or assignee is not identified on the Prohibited Entities List created pursuant to SFL § 165-a(3)(b).

Additionally, Bidder/Contractor is advised that once the Prohibited Entities List is posted on the OGS Website, any Bidder/Contractor seeking to renew or extend a Contract or assume the responsibility of a Contract awarded in response to this solicitation must certify at the time the Contract is renewed, extended or assigned that it is not included on the Prohibited Entities List.

During the term of the Contract, should the School District receive information that a Bidder/Contractor is in violation of the above-referenced certification, the School District will offer the person or entity an opportunity to respond. If the person or entity fails to demonstrate that he/she/it has ceased engagement in the investment which is in violation of the Act within 90 days after the determination of such violation, then the School District shall take such action as may be appropriate including, but not limited to, imposing sanctions, seeking compliance, recovering damages or declaring the Bidder/Contractor in default. The School District reserves the right to reject any bid or request for assignment for a Bidder/Contractor that appears on the Prohibited Entities List prior to the award of a contract and to pursue a responsibility review with respect to any Bidder/Contractor that is awarded a contract and subsequently appears on the Prohibited Entities List.

I, _____, being duly sworn, deposes and says that he/she is the

_____ of the _____ Corporation and that neither the

Bidder/ Contractor nor any proposed subcontractor is identified on the Prohibited Entities List.

_____

SIGNED

SWORN to before me this

_____ day of _____

20___

Notary Public: _____

DECLARATION OF BIDDER'S INABILITY TO PROVIDE CERTIFICATION OF COMPLIANCE WITH THE IRAN DIVESTMENT ACT

Bidders shall complete this form if they cannot certify that the bidder /contractor or any proposed subcontractor is not identified on the Prohibited Entities List. The District reserves the right to undertake any investigation into the information provided herein or to request additional information from the bidder.

Name of the Bidder: _____

Address of Bidder: _____

Has bidder been involved in investment activities in Iran? _____
Describe the type of activities including but not limited to the amounts and the nature of the investments (*e.g.* banking, energy, real estate)_____
_____
_____
_____

If so, when did the first investment activity occur? _____

Have the investment activities ended? _____

If so, what was the date of the last investment activity?_____

If not, have the investment activities increased or expanded since April 12, 2012? _____

Has the bidder adopted, publicized, or implemented a formal plan to cease the investment activities in Iran and to refrain from engaging in any new investments in Iran?_____

If so, provide the date of the adoption of the plan by the bidder and proof of the adopted resolution, if any and a copy of the formal plan. _____

In detail, state the reasons why the bidder cannot provide the Certification of Compliance with the Iran Divestment Act below (additional pages may be attached):
_____
_____
_____
_____
_____
_____

I, _____ being duly sworn, deposes and says that he/she is the _____ of

the _____ Corporation and the foregoing is true and accurate.

_____
SIGNED

SWORN to before me this

_____ day of _____

20___
Notary Public: _____

Labor Law 220-i Certification Form

By submission of this bid, the person signing on behalf of the bidder certifies, under penalty of perjury, that: the bidder has registered with the New York State Department of Labor pursuant to Section 220-I of the Labor Law and that each of the subcontractors to be used on the project has similarly registered and has attached confirmation of said registration to its bid.

Bidder Name: _____

Bidder Address: _____

Print Name and Title: _____

Signature: _____

Date: _____

Sworn to before me this _____
day of _____, 20____

_____
Notary Public

NON-COLLUSIVE FORM
BID PROPOSAL CERTIFICATIONS

Firm Name _____

Business Address _____

Telephone Number _____ Date of Bid _____

I. General Bid Certification

The bidder certifies that he will furnish, at the prices quoted, the materials, equipment and/or services as proposed on this Bid.

II. Non-Collusive Bidding Certification

The following statement is made pursuant to Section 103-D of the General Municipal Law, as amended by Chapter 675 of the Laws of 1966, and Section 139-D of the State Finance Law, as amended by Chapter 675 of the Laws of 1966, and Section 2604 of the Public Authorities Law, as amended by Chapter 675 of the Laws of 1966.

By submission of this bid proposal, the bidder certifies that he/she is complying with Section 103-d of the General Municipal Law as follows:

Statement of non-collusion in bids and proposals to political subdivision of the state. Every bid or proposal hereafter made to a political subdivision of the state or any public department, agency or official thereof where competitive bidding is required by statute, rule, regulation, or local law, for work or services performed or to be performed or goods sold or to be sold, shall contain the following statement subscribed by the bidder and affirmed by such bidder as true under the penalties of perjury:

Non-collusive bidding certification.

(a) By submission of this bid, each bidder and each person signing on behalf of any bidder certifies, and in the case of a joint bid each party thereto certifies as to its own organization, under penalty of perjury, that to the best of its knowledge and belief:

1. The prices in this bid have been arrived at independently without collusion, consultation, communication, or agreement, for the purpose of restricting competition, as to any matter relating to such prices with any other bidder or with any competitor;

2. Unless otherwise required by law, the prices which have been quoted in this bid have not been knowingly disclosed by the bidder and will not knowingly be

disclosed by the bidder prior to opening, directly or indirectly, to any other bidder or to any competitor; and,

3. No attempt has been made or will be made by the bidder to induce any other person, partnership or corporation to submit or not to submit a bid for the purpose of restricting competition.

(b) A bid shall not be considered for award nor shall any award be made where (a) (1) (2) and (3) above have not been complied with; provided, however, that if in any case the bidder cannot make the foregoing certification, the bidder shall so state and shall furnish with the reasons therefor. Where (a) (1) (2) and (3) above have not been complied with, the bid shall not be considered for award nor shall any award be made unless the head of the purchasing unit of the political subdivision, public department agency or official thereof to which the bid is made or his designee, determines that such disclosure was not made for the purpose of restricting competition.

The fact that a bidder (a) has published price lists, rates, or tariffs covering items being procured, (b) has informed prospective customers of proposed or pending publication of new or revised price lists for such items, or (c) has sold the same items to other customers at the same prices being bid, does not constitute, without more, a disclosure within the meaning of subparagraph one (a).

Any bid hereafter made to any political subdivision of the state or any public department, agency or official thereof by a corporate bidder for work or services performed or to be performed or goods sold or to be sold, where competitive bidding is required by statute, rule, regulation, or local law, and where such bid contains the certifications referred to in subdivision II of this section, shall be deemed to have been authorized by the board of directors of the bidder, and such authorization shall be deemed to include the signing, and submission of the bid and the inclusion therein of the certificate as to non-collusion as the act and deed of corporation.

The bidder affirms the above statement as true under the penalties of perjury.

Signature of Bidder: _____
(Signature of bidder or authorized representative of a corporation)

Title: _____

Sworn to before me this _____ day
of _____, 20____

_____
Notary Public

QUALIFICATIONS OF BIDDERS

Experience and Qualifications of the Bidder: Each bidder is required to submit the following documentation to demonstrate its experience and qualifications for the work of the Project for which a bid is submitted:

a. A description of its experience with projects of comparative size, complexity, and cost, together with documentary evidence showing that said projects were completed to the Owner's satisfaction and were completed in a timely fashion;

b. Documentation from each of the projects it has performed capital work in the last five (5) years concerning the bidder's:

   i. timeliness of performance of the work of the project

   ii. evidence that the project was completed to the Owner's satisfaction;

   iii. whether or not any extensions of time were requested by the contractor and whether or not such requests were granted;

   iv. whether litigation and/or arbitration was commenced by either the Owner or the bidder as a result of the work of the project performed by the bidder;

   v. whether any liens were filed on the project by subcontractors or material suppliers of the bidder;

   vi. whether the bidder was defaulted on the project by the owner;

   vii. whether the bidder made any claims for extra work on the project, including whether said claim resulted in a change order;

c. Documentation evidencing the bidder's financial responsibility, including a certified financial statement prepared by a certified public accountant.

d. Documentation evidencing the bidder's existence under the same name for the last five (5) years.

e. Documentation evidencing the bidder's Worker's Compensation Experience Modification.

STATEMENT OF BIDDER'S QUALIFICATIONS

IMPORTANT: BIDDERS ARE REQUIRED TO FURNISH A COMPLETE ANSWER TO ALL OF THE QUESTIONS IN THIS STATEMENT. IF ADDITIONAL SPACE IS REQUIRED TO FURNISH A COMPLETE ANSWER, BIDDER MAY ATTACH PAGES AS NECESSARY. IN THE EVENT THAT COMPLETE ANSWERS ARE NOT PROVIDED TO EVERY QUESTION, THE BID WILL BE REJECTED.

1. Name of Bidder

_____

2. Type of Business Entity

_____

3. If the bidder is a corporation, state the date and place of incorporation of the corporation.

_____

4. For how many years has the bidder done business under its present name?

_____

5. List the persons who are directors, officers, owners, managerial employees, or partners in the bidder's business.

_____

_____

_____

_____

_____

6. Have any of the persons listed in Number 5 owned/operated/been shareholders in any other companies? If so, please state the names of the other companies and the individuals who owned, operated, or have been shareholders:

_____

_____

_____

7. Has any director, officer, owner, or managerial employee had any professional license suspended or revoked? If the answer to this question is yes, list the name of the individual, the professional license he/she formerly held, whether said license was revoked or suspended and the date of the revocation or suspension.

8. Has the bidder been found guilty of any OSHA Violations? If the answer to this question is yes, describe the nature of the OSHA violation, an explanation of remediation or other steps taken regarding such violation(s).

9. Has the bidder been charged with any claims pertaining to unlawful intimidation or discrimination against any employee by reason of age, race, creed, color, national origin, citizenship or immigration status, sexual orientation, gender identity or expression, military status, sex, disability, predisposing genetic characteristics, familial status, or status as a victim of domestic violence, and/or violations of an employee's civil rights or equal employment opportunities? If the answer to this question is yes, list the persons making such claim against the bidder, a description of the claim, the status of the claim, and what disposition (if any) has been made regarding such claim.

10. Has the bidder been named as a party in any lawsuit arising from performance of work related to any project in which it has been engaged? If the answer to this question is yes, list all such lawsuits, the index number associated with said suit and the status of the lawsuit at the time of the submission of this bid.

11. Has the bidder been the subject of an investigation and/or proceedings before the Department of Labor for alleged violations of the Labor Law as it relates to the payment of prevailing wages and/or supplemental payment requirements? If the answer to this question is yes, please list each such instance of the commencement of a Department of Labor proceeding, for which project such proceeding was commenced, and the status of the proceeding at the time of the submission of this bid.

12. Has the bidder been the subject of an investigation and/or proceeding before any law enforcement agency, including, but not limited to any District Attorney's Office? If the answer to this question is yes, please list each such instance, the law enforcement agency, the nature of the proceeding, the project for which such proceeding was commenced, if applicable to a project, and the status of the proceeding at the time of the submission of this bid.

13. Has the bidder been the subject of proceedings involving allegations that it violated the Workers' Compensation Law, including but not limited to, the failure to provide proof of worker's compensation or disability coverage and/or any lapses thereof? If the answer to this question is yes, list each such instance of violation and the status of the claimed violation at the time of the submissions of this bid.

14. Has the bidder, its officers, directors, owner and/or managerial employees been convicted of a crime or been the subject of a criminal indictment? If the answer to this question is yes, list the name of the individual convicted or indicted, the charge against the individual and the date of disposition of the charge.

15. Has the bidder been charged with and/or found guilty of any violations of federal, state, or municipal environmental and/or health laws, codes, rules and/or regulations? If the answer to this question is yes, list the nature of the charge against the bidder, the date of the charge, and the status of the charge at the time of the submission of this bid.

16. Has the bidder bid on any projects in the last five years preceding the date of this bid submission? If the answer to this question is yes, list the projects bid on, whether said bid was awarded to the bidder and the expected date of commencement of the work for said project. For those projects listed, if the bidder was not awarded the contract, state whether the bidder was the lowest monetary bidder.

IMPORTANT: BIDDERS ARE REQUIRED TO FURNISH A COMPLETE LIST OF PROJECTS AS REQUIRED BY THIS QUESTION #16 WITH ITS BID. IN THE EVENT THE LIST REQUESTED IS NOT SUBMITTED WITH THE BIDDER'S BID, THE BID WILL BE REJECTED.

17. Does the bidder have any projects ongoing at the time of the submission of this bid? If the answer to this question is yes, list the projects on which the bidder is currently working, and the expected date of completion of said project.

IMPORTANT: BIDDERS ARE REQUIRED TO FURNISH A COMPLETE LIST OF PROJECTS AS REQUIRED BY THIS QUESTION #17 WITH ITS BID. IN THE EVENT THE LIST REQUESTED IS NOT SUBMITTED WITH THE BIDDER'S BID, THE BID WILL BE REJECTED.

18. Have the bidder and its bond surety ever been notified by a project Owner that the Owner is contemplating declaring a default and requested a conference to discuss the performance of the contract? If the answer to this question is yes, list the projects on which such a conference was held, and the result of the conference, and the status of the project in question.

19. Has the bidder ever been terminated from a Project by the Owner? If the answer to this question is yes, list the projects on which the bidder was terminated, the nature of the termination (convenience, suspension, for cause), and the date of said termination.

IMPORTANT: BIDDERS ARE REQUIRED TO FURNISH A COMPLETE LIST OF PROJECTS AS REQUIRED BY THIS QUESTION #19 WITH ITS BID. IN THE EVENT THE LIST REQUESTED IS NOT SUBMITTED WITH THE BIDDER'S BID, THE BID WILL BE REJECTED.

20. Has the bidder's surety ever been contacted to provide supervisory services in connection with an on-going project. If the answer to this question is yes, list the project(s) for which the surety provided supervisory services.

IMPORTANT: BIDDERS ARE REQUIRED TO FURNISH A COMPLETE LIST OF PROJECTS AS REQUIRED BY THIS QUESTION #20 WITH ITS BID. IN THE EVENT THE LIST REQUESTED IS NOT SUBMITTED WITH THE BIDDER'S BID, THE BID WILL BE REJECTED.

_____

_____

21. Bidder's Worker's Compensation Experience Modifier: _____

Dated: _____

By: _____
(Signature)

_____
(Print Name and Title)

Sworn to before me this _____
day of _____, 20_____.

_____
Notary Public

Sexual Harassment Prevention Certification Form

By submission of this bid, the person signing on behalf of the bidder certifies, under penalty of perjury, that: the bidder has and has implemented a written policy addressing sexual harassment prevention in the workplace; the bidder provides annual sexual harassment prevention training to all of its employees; and that the principal(s) and all employees of the bidder have completed the sexual harassment prevention training in the last twelve (12) months. Such policy shall, at a minimum, meet the requirements of Section 201-g of the Labor Law.

Bidder Name: _____

Bidder Address: _____

Print Name and Title: _____

Signature: _____

Date: _____

Sworn to before me this _____
day of _____, 20____

_____
Notary Public

SECTION 00 5200
FORM OF AGREEMENT

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 FORM OF AGREEMENT

A. The Agreement to be executed is attached following this page.

1.3 RELATED REQUIREMENTS

A. Section 00 7200 - General Conditions.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

AGREEMENT made as of the ___ day of _____ in the year of Two Thousand Twenty _____.

BETWEEN the Owner
(Name and address)

and the Contractor:
(Name and address)

The Project is:
(Name and location)

The Architect is:
(Name and address)

The Construction Manager is:
(Name and address)

The Owner and Contractor agree as set forth below.

ARTICLE 1
THE CONTRACT DOCUMENTS

The Contract Documents consist of this Agreement, Conditions of the Contract (General, Supplementary, and other Conditions), Drawings, specifications, Addenda issued prior to execution of this Agreement, other documents listed in Article 9 of this Agreement and Modifications issued after execution of this Agreement; these form the Contract and are a part of the Contract as if attached to this Agreement or repeated herein. The Contract represents the entire and integrated agreement between the parties hereto and supersedes prior negotiations, representations, or agreements, either written or oral. An enumeration of the Contract Documents, other than Modifications, appears in Article 9.

ARTICLE 2
THE WORK OF THIS CONTRACT

The Contractor shall execute the entire Work described in the Contract Documents or reasonably inferable by the Contractor as necessary to produce the results intended by the Contract Documents, except to the extent specifically indicated in the Contract Documents to be the responsibility of others.

ARTICLE 3
DATE OF COMMENCEMENT AND SUBSTANTIAL COMPLETION

3.1 The date of commencement of the work and substantial completion of the work of this contract shall be in accordance with the schedule set forth in the Project Manual.

3.2 Time is of the essence respecting the contract documents and all obligations thereunder.

3.3 Upon the execution of this Agreement, the Contractor shall provide the Owner with copies of all contracts entered into between the Contractor and subcontractors or material suppliers. The Contractor's obligation to provide the Owner with said contracts shall continue for the duration of the Project.

ARTICLE 4
CONTRACT SUM

4.1 The Owner shall pay the Contractor in current funds for the Contractor's performance of the Contract the Contract Sum of $_____, subject to additions and deductions as provided in the Contract Documents.

4.2 The Contract Sum is based upon the following alternates, if any, which are described in the Bid Proposal Form (attached hereto) and are hereby accepted by the Owner:

4.3 Unit prices are as set forth in Exhibit A hereto.

ARTICLE 5
PROGRESS PAYMENTS

5.1 Based upon Applications for Payment submitted to the Architect by the Contractor and Certificates for Payment issued by the Architect, the Owner shall make progress payments on account of the Contract Sum to the Contractor as provided below and elsewhere in the Contract Documents.

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

All progress payments shall be based upon an estimate and a certificate, made by the Architect, of the materials furnished, installed, and suitably stored at the site and the work done by the Contractor, and payment shall be made in installments of ninety-five percent (95%) of the amount certified as earned so that, at the completion of the work, there will be a retainage of five percent (5%) of the Total Contract Sum. Retainage shall be paid to the Contractor upon final completion of the work of this contract. All progress payments made previous to the last and final payment shall be based on estimates and the right is hereby reserved by the Architect for the Owner to make all due and proper corrections in any payment for any previous error.

The Contractor shall submit with each application for payment the following:

5.2.1 A current Sworn Statement from the Contractor setting forth all subcontractors and materialmen with whom the Contractor has subcontracted, the amount of such subcontract, the amount requested for any subcontractor or materialman in the application for payment and the amount to be paid to the Contractor from such progress payment.

5.2.2 Commencing with the second (2nd) Application for Payment submitted by the Contractor, duly executed so-called "after the fact" waivers of mechanics' and materialmen's liens from all subcontractors, materialmen and, when appropriate, from lower tier subcontractors, establishing receipt of payment or satisfaction of payment of all amounts requested on behalf of such entities and disbursed prior to submittal by the Contractor of the current Application for Payment, plus sworn statements from all subcontractors, materialmen and, where appropriate, from lower tier subcontractors, covering all amounts described in this Paragraph 5.2.

5.2.3 Such other information, documentation and materials as the Owner or the Architect may require.

5.3 Payment shall not be released to the Contractor until the Owner receives the following documentation:

5.3.1 Certified payroll for employees and employees of subcontractors performing work on the Project.

5.3.2 Copies of invoices submitted to the Contractor by its subcontractors and/or material suppliers.

ARTICLE 6
FINAL PAYMENT

Final payment, constituting the entire unpaid balance of the Contract Sum, shall be made by the Owner to the Contractor when (1) the Contract has been fully performed including compliance with all provisions of the Contract Documents except for the Contractor's responsibility to correct nonconforming Work under Article 15(B) of the General Conditions and to satisfy other requirements, if any, which necessarily survive final payment; and (2) a final Certificate for Payment has been issued by the Architect; such final payment shall be made by the Owner not more than 30 days after the issuance of the Architect's final Certificate for Payment, or as follows or as soon thereafter as is practicable.

ARTICLE 7
MISCELLANEOUS PROVISIONS

7.1 Where reference is made in this Agreement to a provision of the General Conditions or another Contract Document, the reference refers to that provision as amended or supplemented by other provisions of the Contract Documents.

7.2 The Contractor represents and warrants the following to the Owner (in addition to any other representations and warranties contained in the Contract Documents) as an inducement to the Owner to execute this Agreement, which representations and warranties shall survive the execution and delivery of this Agreement, any termination of this Agreement and the final completion of the Work:

7.2.1 that it and its Subcontractors are financially solvent, able to pay all debts as they mature and possessed of sufficient working capital to complete the Work and perform all obligations hereunder;

7.2.2 that it is able to furnish the plant, tools, materials, supplies, equipment and labor required to complete the Work and perform its obligations hereunder;

7.2.3 that it is authorized to do business in the State of New York and the United States and properly licensed by all necessary governmental and public and quasi-public authorities having jurisdiction over it and over the Work and the Project;

7.2.4 that its execution of this Agreement and its performance thereof is within its duly authorized powers;

7.2.5 that its duly authorized representative has visited the site of the Project, is familiar with the local and special conditions under which the Work is to be performed and has correlated on-site observations with the requirements of the Contact Documents; and

7.2.6 that it possesses a high level of experience and expertise in the business administration, construction, construction management and superintendence or projects of the size, complexity, and nature of the particular Project, and that it will perform the Work with the care, skill, and diligence of such a contractor.

The foregoing warranties are in addition to, and not in lieu of, any and all other liability imposed upon the Contractor by law with respect to the Contractor's duties, obligations, and performance hereunder. The Contractor's liability hereunder shall survive the Owner's final acceptance of and payment for the Work. All representations and warranties set forth in this Agreement, including without limitation, this Paragraph 7.2, shall survive the final completion of the Work or the earlier termination of this Agreement. The Contractor acknowledges that the Owner is relying upon the Contractor's skill and experience in connection with the Work called for hereunder.

ARTICLE 8
TERMINATION OR SUSPENSION

8.1 The Contract may be terminated by the Owner as provided in the General Conditions.

8.2 The Work may be suspended by the Owner as provided in the General Conditions.

ARTICLE 9
ENUMERATION OF CONTRACT DOCUMENTS

9.1 The Contract Documents, except for Modifications issued after execution of this Agreement, are enumerated as follows:

9.1.1 The Agreement is this executed Agreement between Owner and Contractor.

9.1.2 The General Conditions are the General Conditions of the Contract for Construction as set forth in the Project Manual and attached hereto.

9.1.3 The Specifications are as set forth in the Project Manual and indexed in Exhibit "B" hereto.

9.1.4 The Drawings are those as indexed in Exhibit "C" hereto.

9.1.5 The Addenda, if any, are as follows:

Addendum No.	Date	Number of Pages

This Agreement is entered into as of the day and year first written above and is executed in at least three original copies of which one is to be delivered to the Contractor, one to the Architect for use in the administration of the Contract, and the remainder to the Owner.

OWNER	CONTRACTOR
By: _____	By: _____
_____ (printed name and title)	_____ (printed name and title)

SECTION 00 6000
BONDS AND CERTIFICATES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 BID BOND:

A. A Bid Bond will be required for this project. Each individual bid shall be accompanied by a check upon a duly authorized State, National Bank or Trust Company, duly certified in the sum equal to TEN (10%) percent of the total amount of the bid, , or a Bid Bond in the amount of TEN (10%) of the bid, , payable to the Edgemont Union Free School District and shall be enclosed in an envelope containing the bid; as a guarantee that the Bidder will, after the award is made to him, enter into a bona fide contract with the Owner for the work, and furnish the bonds and liability policies as required under the specifications. The AIA 310 - 2010 edition entitled "Bid Bond" shall be the contract bond form for this project. A draft copy is attached.

1. Each bid bond must also be accompanied by the written consent of the Surety Company authorized to do business in the State of New York and be A.M Best "Secured" rated or better.
2. Attorney-in-fact who execute said bonds on behalf of a surety must affix thereto a certified and effectively dated copy of their Power of Appointment and Certification of an officer of the surety that the Power of Attorney continues in effect.

B. If, for any reason, whatsoever, the Bidder fails to enter into a proper contract and to execute the proper bonds, as required by these specifications, the amount of said guarantee retained by the Owner shall be larger amount of (a) the Bid Bond or (b) the difference between the amount specified in said bid and such larger amount for which the Owner may in good faith contract with another party to perform the Work

C. All certified checks, except the check of the Bidder to whom a contract is awarded, will be returned to the respective Bidders, as soon as the Letter of Award has been issued by the Owner.

1. The check of the Bidder, to whom a contract has been awarded, shall be retained until the contract has been executed and all bonds together with an approved liability insurance policy are filed with the Owner.

1.3 PERFORMANCE BOND, LABOR AND MATERIAL PAYMENT BOND AND MAINTENANCE BOND.

A. Refer to Section 00 7200 - General Conditions, Article 11 for bonding requirements.

END OF SECTION

AIA® Document A310™ – 2010

Bid Bond

CONTRACTOR: **SURETY:**

OWNER:
Edgemont Union Free School District
300 White Oak Lane
Scarsdale NY, 10583

BOND AMOUNT: $

PROJECT:
Edgemont Union Free School District
High School Building "A"
Interior Renovations

The Contractor and Surety are bound to the Owner in the amount set forth above, for the payment of which the Contractor and Surety bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, as provided herein. The conditions of this Bond are such that if the Owner accepts the bid of the Contractor within the time specified in the bid documents, or within such time period as may be agreed to by the Owner and Contractor, and the Contractor either (1) enters into a contract with the Owner in accordance with the terms of such bid, and gives such bond or bonds as may be specified in the bidding or Contract Documents, with a surety admitted in the jurisdiction of the Project and otherwise acceptable to the Owner, for the faithful performance of such Contract and for the prompt payment of labor and material furnished in the prosecution thereof; or (2) pays to the Owner the difference, not to exceed the amount of this Bond, between the amount specified in said bid and such larger amount for which the Owner may in good faith contract with another party to perform the work covered by said bid, then this obligation shall be null and void, otherwise to remain in full force and effect. The Surety hereby waives any notice of an agreement between the Owner and Contractor to extend the time in which the Owner may accept the bid. Waiver of notice by the Surety shall not apply to any extension exceeding sixty (60) days in the aggregate beyond the time for acceptance of bids specified in the bid documents, and the Owner and Contractor shall obtain the Surety's consent for an extension beyond sixty (60) days.

If this Bond is issued in connection with a subcontractor's bid to a Contractor, the term Contractor in this Bond shall be deemed to be Subcontractor and the term Owner shall be deemed to be Contractor.

When this Bond has been furnished to comply with a statutory or other legal requirement in the location of the Project, any provision in this Bond conflicting with said statutory or legal requirement shall be deemed deleted herefrom and provisions conforming to such statutory or other legal requirement shall be deemed incorporated herein. When so furnished, the intent is that this Bond shall be construed as a statutory bond and not as a common law bond.

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

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

Any singular reference to Contractor, Surety, Owner or other party shall be considered plural where applicable.

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User Notes: (1484415307)

Signed and sealed this day of ,

	(Contractor as Principal) *(Seal)*
(Witness)	*(Title)*
	(Surety) *(Seal)*
(Witness)	*(Title)*

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Payment Bond

CONTRACTOR:
(Name, legal status and address)

SURETY:
Name, legal status and principal place of business)

(Row deleted)
OWNER:

Edgemont Union Free School District
300 White Oak Lane
Scarsdale NY, 10583

CONSTRUCTION CONTRACT
Date:
Amount: $ 0.00
(Row deleted)
Description:

Edgemont Union Free School District
Administration Building Cafeteria Addition,
Site Improvements
High School Building "A"Interior Renovations

BOND
Date:
(Not earlier than Construction Contract Date)

Amount: $
Modifications to this Bond: ☐ None ☐ See Section 18

CONTRACTOR AS PRINCIPAL		**SURETY**	
Company:	*(Corporate Seal)*	Company:	*(Corporate Seal)*
Signature:	_____	Signature:	_____
Name and Title:		Name and Title:	

(Any additional signatures appear on the last page of this Payment Bond.)

(FOR INFORMATION ONLY — Name, address and telephone)

AGENT or **BROKER:**	**OWNER'S REPRESENTATIVE:**
	(Architect, Engineer or other party:)

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

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

Any singular reference to Contractor, Surety, Owner or other party shall be considered plural where applicable.

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User Notes: (1363572346)

§ 1 The Contractor and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors and assigns to the Owner to pay for labor, materials and equipment furnished for use in the performance of the Construction Contract, which is incorporated herein by reference, subject to the following terms.

§ 2 If the Contractor promptly makes payment of all sums due to Claimants, and defends, indemnifies and holds harmless the Owner from claims, demands, liens or suits by any person or entity seeking payment for labor, materials or equipment furnished for use in the performance of the Construction Contract, then the Surety and the Contractor shall have no obligation under this Bond.

§ 3 If there is no Owner Default under the Construction Contract, the Surety's obligation to the Owner under this Bond shall arise after the Owner has promptly notified the Contractor and the Surety (at the address described in Section 13) of claims, demands, liens or suits against the Owner or the Owner's property by any person or entity seeking payment for labor, materials or equipment furnished for use in the performance of the Construction Contract and tendered defense of such claims, demands, liens or suits to the Contractor and the Surety.

§ 4 When the Owner has satisfied the conditions in Section 3, the Surety shall promptly and at the Surety's expense defend, indemnify and hold harmless the Owner against a duly tendered claim, demand, lien or suit.

§ 5 The Surety's obligations to a Claimant under this Bond shall arise after the following:

§ 5.1 Claimants, who do not have a direct contract with the Contractor,

.1 have furnished a written notice of non-payment to the Contractor, stating with substantial accuracy the amount claimed and the name of the party to whom the materials were, or equipment was, furnished or supplied or for whom the labor was done or performed, within ninety (90) days after having last performed labor or last furnished materials or equipment included in the Claim; and

.2 have sent a Claim to the Surety (at the address described in Section 13).

§ 5.2 Claimants, who are employed by or have a direct contract with the Contractor, have sent a Claim to the Surety (at the address described in Section 13).

§ 6 If a notice of non-payment required by Section 5.1.1 is given by the Owner to the Contractor, that is sufficient to satisfy a Claimant's obligation to furnish a written notice of non-payment under Section 5.1.1.

§ 7 When a Claimant has satisfied the conditions of Sections 5.1 or 5.2, whichever is applicable, the Surety shall promptly and at the Surety's expense take the following actions:

§ 7.1 Send an answer to the Claimant, with a copy to the Owner, within sixty (60) days after receipt of the Claim, stating the amounts that are undisputed and the basis for challenging any amounts that are disputed; and

§ 7.2 Pay or arrange for payment of any undisputed amounts.

§ 7.3 The Surety's failure to discharge its obligations under Section 7.1 or Section 7.2 shall not be deemed to constitute a waiver of defenses the Surety or Contractor may have or acquire as to a Claim, except as to undisputed amounts for which the Surety and Claimant have reached agreement. If, however, the Surety fails to discharge its obligations under Section 7.1 or Section 7.2, the Surety shall indemnify the Claimant for the reasonable attorney's fees the Claimant incurs thereafter to recover any sums found to be due and owing to the Claimant.

§ 8 The Surety's total obligation shall not exceed the amount of this Bond, plus the amount of reasonable attorney's fees provided under Section 7.3, and the amount of this Bond shall be credited for any payments made in good faith by the Surety.

§ 9 Amounts owed by the Owner to the Contractor under the Construction Contract shall be used for the performance of the Construction Contract and to satisfy claims, if any, under any construction performance bond. By the Contractor furnishing and the Owner accepting this Bond, they agree that all funds earned by the Contractor in the performance of the Construction Contract are dedicated to satisfy obligations of the Contractor and Surety under this Bond, subject to the Owner's priority to use the funds for the completion of the work.

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User Notes: (1363572346)

§ 10 The Surety shall not be liable to the Owner, Claimants or others for obligations of the Contractor that are unrelated to the Construction Contract. The Owner shall not be liable for the payment of any costs or expenses of any Claimant under this Bond and shall have under this Bond no obligation to make payments to, or give notice on behalf of, Claimants or otherwise have any obligations to Claimants under this Bond.

§ 11 The Surety hereby waives notice of any change, including changes of time, to the Construction Contract or to related subcontracts, purchase orders and other obligations.

§ 12 No suit or action shall be commenced by a Claimant under this Bond other than in a court of competent jurisdiction in the state in which the project that is the subject of the Construction Contract is located or after the expiration of one year from the date (1) on which the Claimant sent a Claim to the Surety pursuant to Section 5.1.2 or 5.2, or (2) on which the last labor or service was performed by anyone or the last materials or equipment were furnished by anyone under the Construction Contract, whichever of (1) or (2) first occurs. If the provisions of this Paragraph are void or prohibited by law, the minimum period of limitation available to sureties as a defense in the jurisdiction of the suit shall be applicable.

§ 13 Notice and Claims to the Surety, the Owner or the Contractor shall be mailed or delivered to the address shown on the page on which their signature appears. Actual receipt of notice or Claims, however accomplished, shall be sufficient compliance as of the date received.

§ 14 When this Bond has been furnished to comply with a statutory or other legal requirement in the location where the construction was to be performed, any provision in this Bond conflicting with said statutory or legal requirement shall be deemed deleted herefrom and provisions conforming to such statutory or other legal requirement shall be deemed incorporated herein. When so furnished, the intent is that this Bond shall be construed as a statutory bond and not as a common law bond.

§ 15 Upon request by any person or entity appearing to be a potential beneficiary of this Bond, the Contractor and Owner shall promptly furnish a copy of this Bond or shall permit a copy to be made.

§ 16 Definitions

§ 16.1 Claim. A written statement by the Claimant including at a minimum:

- **.1** the name of the Claimant;
- **.2** the name of the person for whom the labor was done, or materials or equipment furnished;
- **.3** a copy of the agreement or purchase order pursuant to which labor, materials or equipment was furnished for use in the performance of the Construction Contract;
- **.4** a brief description of the labor, materials or equipment furnished;
- **.5** the date on which the Claimant last performed labor or last furnished materials or equipment for use in the performance of the Construction Contract;
- **.6** the total amount earned by the Claimant for labor, materials or equipment furnished as of the date of the Claim;
- **.7** the total amount of previous payments received by the Claimant; and
- **.8** the total amount due and unpaid to the Claimant for labor, materials or equipment furnished as of the date of the Claim.

§ 16.2 Claimant. An individual or entity having a direct contract with the Contractor or with a subcontractor of the Contractor to furnish labor, materials or equipment for use in the performance of the Construction Contract. The term Claimant also includes any individual or entity that has rightfully asserted a claim under an applicable mechanic's lien or similar statute against the real property upon which the Project is located. The intent of this Bond shall be to include without limitation in the terms "labor, materials or equipment" that part of water, gas, power, light, heat, oil, gasoline, telephone service or rental equipment used in the Construction Contract, architectural and engineering services required for performance of the work of the Contractor and the Contractor's subcontractors, and all other items for which a mechanic's lien may be asserted in the jurisdiction where the labor, materials or equipment were furnished.

§ 16.3 Construction Contract. The agreement between the Owner and Contractor identified on the cover page, including all documents..

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§ 16.4 Owner Default. Failure of the Owner, which has not been remedied or waived, to allow Contractor access to site to complete project in accordance with the contract schedule.

§ 16.5 Contract Documents. All the documents that comprise the agreement between the Owner and Contractor.

§ 17 If this Bond is issued for an agreement between a Contractor and subcontractor, the term Contractor in this Bond shall be deemed to be Subcontractor and the term Owner shall be deemed to be Contractor.

§ 18 Modifications to this bond are as follows:

.1 Surety further agrees that in event of any default by the Owner in the performance of the Owner's obligations to the Contractor under the Contract, the Contractor or Surety shall cause written notice of such default (specifying said default in detail) to be given to the Owner and the Owner shall have thirty (30) days from the time after receipt of such notice within which to cure such default, or such additional reasonable period of time as may be required if the nature of such default is such that it cannot be cured within thirty (30) days. Such Notice of Default shall be sent by certified or registered U.S. Mail, return receipt requested, first-class postage prepaid to Owner.

.2 Surety agrees that it is obligated under the bonds to any successor, grantee or assignee of the Owner

.3 Each material or equipment supplier or subcontractor shall provide a partial release of liens every 60 days or as otherwise agreed upon between Owner and Contractor.

(Space is provided below for additional signatures of added parties, other than those appearing on the cover page.)

CONTRACTOR AS PRINCIPAL		**SURETY**	
Company:	*(Corporate Seal)*	Company:	*(Corporate Seal)*
Signature:	_____	Signature:	_____
Name and Title:		Name and Title:	
Address:		Address:	

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Performance Bond

CONTRACTOR:
(Name, legal status and address)

SURETY:
(Name, legal status and principal place of business)

(Row deleted)
OWNER:

Edgemont Union Free School District
300 White Oak Lane
Scarsdale NY, 10583

CONSTRUCTION CONTRACT
Date:
Amount: $ 0.00
(Row deleted)
Description:

Edgemont Union Free School District
High School Building "A"
Interior Renovations

BOND
Date:
(Not earlier than Construction Contract Date)

Amount: $
Modifications to this Bond: ☐ None ☐ See Section 16

CONTRACTOR AS PRINCIPAL		**SURETY**	
Company:	*(Corporate Seal)*	Company:	*(Corporate Seal)*
Signature:	_____	Signature:	_____
Name and Title:		Name and Title:	

(Any additional signatures appear on the last page of this Performance Bond.)

(FOR INFORMATION ONLY — Name, address and telephone)
AGENT or **BROKER:**

OWNER'S REPRESENTATIVE:
(Architect, Engineer or other party:)

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

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

Any singular reference to Contractor, Surety, Owner or other party shall be considered plural where applicable.

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§ 1 The Contractor and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors and assigns to the Owner for the performance of the Construction Contract, which is incorporated herein by reference.

§ 2 If the Contractor performs the Construction Contract, the Surety and the Contractor shall have no obligation under this Bond, except when applicable to participate in a conference as provided in Section 3.

§ 3 If there is no Owner Default under the Construction Contract, the Surety's obligation under this Bond shall arise after

.1 the Owner first provides notice to the Contractor and the Surety that the Owner is considering declaring a Contractor Default. Such notice shall indicate whether the Owner is requesting a conference among the Owner, Contractor and Surety to discuss the Contractor's performance. If the Owner does not request a conference, the Surety may, within five (5) business days after receipt of the Owner's notice, request such a conference. If the Surety timely requests a conference, the Owner shall attend. Unless the Owner agrees otherwise, any conference requested under this Section 3.1 shall be held within ten (10) business days of the Surety's receipt of the Owner's notice. If the Owner, the Contractor and the Surety agree, the Contractor shall be allowed a reasonable time to perform the Construction Contract, but such an agreement shall not waive the Owner's right, if any, subsequently to declare a Contractor Default;

.2 the Owner declares a Contractor Default, terminates the Construction Contract and notifies the Surety; and

.3 the Owner has agreed to pay the Balance of the Contract Price in accordance with the terms of the Construction Contract to the Surety or to a contractor selected to perform the Construction Contract.

§ 4 Failure on the part of the Owner to comply with the notice requirement in Section 3.1 shall not constitute a failure to comply with a condition precedent to the Surety's obligations, or release the Surety from its obligations, except to the extent the Surety demonstrates actual prejudice.

§ 5 When the Owner has satisfied the conditions of Section 3, the Surety shall promptly and at the Surety's expense take one of the following actions:

§ 5.1 Arrange for the Contractor, with the consent of the Owner, to perform and complete the Construction Contract;

§ 5.2 Undertake to perform and complete the Construction Contract itself, through its agents or independent contractors;

§ 5.3 Obtain bids or negotiated proposals from qualified contractors acceptable to the Owner for a contract for performance and completion of the Construction Contract, arrange for a contract to be prepared for execution by the Owner and a contractor selected with the Owner's concurrence, to be secured with performance and payment bonds executed by a qualified surety equivalent to the bonds issued on the Construction Contract, and pay to the Owner the amount of damages as described in Section 7 in excess of the Balance of the Contract Price incurred by the Owner as a result of the Contractor Default; or

§ 5.4 Waive its right to perform and complete, arrange for completion, or obtain a new contractor and with reasonable promptness under the circumstances:

.1 After investigation, determine the amount for which it may be liable to the Owner and, as soon as practicable after the amount is determined, make payment to the Owner; or

.2 Deny liability in whole or in part and notify the Owner, citing the reasons for denial.

§ 6 When the Claimant has satisfied the conditions of Paragraph 4, and has submitted all supporting documentation and any proof of claim requested by the Surety, the Surety shall, with reasonable promptness, notify the Claimant of the amounts that are undisputed and the basis for challenging any amounts that are disputed, including, but not limited to, the lack of substantiating documentation to support the claim as to entitlement or amount, and the Surety shall, with reasonable promptness, pay or make arrangements for payment of any undisputed amount; provided, however, that the failure of the Surety to timely discharge its obligations under this paragraph or to dispute or identify any specific defense to all or any part of a claim shall not be deemed to be an admission of liability by the Surety as to such claim or otherwise constitute a waiver of the Contractor's or Surety's defenses to, or right to dispute, such claim. Rather, the

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Claimant shall have the immediate right, without further notice, to bring suit against the Surety to enforce any remedy available to it under this Bond.

§ 7 If the Surety elects to act under Section 5.1, 5.2 or 5.3, then the responsibilities of the Surety to the Owner shall not be greater than those of the Contractor under the Construction Contract, and the responsibilities of the Owner to the Surety shall not be greater than those of the Owner under the Construction Contract. Subject to the commitment by the Owner to pay the Balance of the Contract Price, the Surety is obligated, without duplication, for

.1 the responsibilities of the Contractor for correction of defective work and completion of the Construction Contract;

.2 additional legal, design professional and delay costs resulting from the Contractor's Default, and resulting from the actions or failure to act of the Surety under Section 5; and

.3 liquidated damages, or if no liquidated damages are specified in the Construction Contract, actual damages caused by delayed performance or non-performance of the Contractor.

§ 8 If the Surety elects to act under Section 5.1, 5.3 or 5.4, the Surety's liability is limited to the amount of this Bond.

§ 9 The Surety shall not be liable to the Owner or others for obligations of the Contractor that are unrelated to the Construction Contract, and the Balance of the Contract Price shall not be reduced or set off on account of any such unrelated obligations. No right of action shall accrue on this Bond to any person or entity other than the Owner or its heirs, executors, administrators, successors and assigns.

§ 10 The Surety hereby waives notice of any change, including changes of time, to the Construction Contract or to related subcontracts, purchase orders and other obligations.

§ 11 Any proceeding, legal or equitable, under this Bond may be instituted in any court of competent jurisdiction in the location in which the work or part of the work is located and shall be instituted within two years after a declaration of Contractor Default or within two years after the Contractor ceased working or within two years after the Surety refuses or fails to perform its obligations under this Bond, whichever occurs first. If the provisions of this Paragraph are void or prohibited by law, the minimum period of limitation available to sureties as a defense in the jurisdiction of the suit shall be applicable.

§ 12 Notice to the Surety, the Owner or the Contractor shall be mailed or delivered to the address shown on the page on which their signature appears.

§ 13 When this Bond has been furnished to comply with a statutory or other legal requirement in the location where the construction was to be performed, any provision in this Bond conflicting with said statutory or legal requirement shall be deemed deleted herefrom and provisions conforming to such statutory or other legal requirement shall be deemed incorporated herein. When so furnished, the intent is that this Bond shall be construed as a statutory bond and not as a common law bond.

§ 14 Definitions

§ 14.1 Balance of the Contract Price. The total amount payable by the Owner to the Contractor under the Construction Contract after all proper adjustments have been made, including allowance to the Contractor of any amounts received or to be received by the Owner in settlement of insurance or other claims for damages to which the Contractor is entitled, reduced by all valid and proper payments made to or on behalf of the Contractor under the Construction Contract.

§ 14.2 Construction Contract. The agreement between the Owner and Contractor identified on the cover page, including all Contract Documents and changes made to the agreement and the Contract Documents.

§ 14.3 Contractor Default. Failure of the Contractor, which has not been remedied or waived, to perform or otherwise to comply with a material term of the Construction Contract.

§ 14.4 Owner Default. Failure of the Owner, which has not been remedied or waived, to pay the Contractor as required under the Construction Contract or to perform and complete or comply with the other material terms of the Construction Contract.

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§ 14.5 Contract Documents. All the documents that comprise the agreement between the Owner and Contractor.

§ 15 If this Bond is issued for an agreement between a Contractor and subcontractor, the term Contractor in this Bond shall be deemed to be Subcontractor and the term Owner shall be deemed to be Contractor.

§ 16 Modifications to this bond are as follows:

.1 Surety hereby agrees that it consents to and waives notice of any addition, alteration, omission, change or other modification of the Contract Documents. Such addition, alteration, change, extension of time, or other modification of the Contract Documents, or a forbearance on the part of either the Owner or the Contractor to the other, shall not release the Surety of its obligations hereunder ad notice to the Surety of such matters is hereby waived.

.2 Surety further agrees that in event of any default by the Owner in the performance of the Owner's obligations to the Contractor under the Contract, the Contractor or Surety shall cause written notice of such default (specifying said default in detail) to be given to the Owner and the Owner shall have thirty (30) days from the time after receipt of such notice within which to cure such default, or such additional reasonable period of time as may be required if the nature of such default is such that it cannot be cured within thirty (30) days. Such Notice of Default shall be sent by certified or registered U.S. Mail, return receipt requested, first-class postage prepaid to Owner.

.3 Surety agrees that it is obligated under the bonds to any successor, grantee or assignee of the Owner

(Space is provided below for additional signatures of added parties, other than those appearing on the cover page.)

CONTRACTOR AS PRINCIPAL		**SURETY**	
Company:	*(Corporate Seal)*	Company:	*(Corporate Seal)*
Signature:	_____	Signature:	_____
Name and Title:		Name and Title:	
Address:		Address:	

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SECTION 00 7200
GENERAL CONDITIONS

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 FORM OF GENERAL CONDITIONS

A. The General Conditions applicable to this contract is attached following this page.

1.3 RELATED REQUIREMENTS

A. Section 00 5200 - Form of Agreement

END OF DOCUMENT

GENERAL CONDITIONS

of the

CONTRACT for CONSTRUCTION

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GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION

The within document includes detailed provisions concerning the capital improvement work to be performed by the Contractors engaged by the Owner. This document contains provisions which relate particularly to capital improvement projects in the school district setting in New York State. The document is incorporated by reference into all contracts to be awarded and should be reviewed carefully by the Contractor and SubContractors to whom the award of contract is made. Consultation with an attorney and insurance representative is advised.

ARTICLE 1
DEFINITIONS

A. "Addendum" or "Addenda" refers to revised Drawings and/or written requirements for the capital improvement work issued by the Architect prior to the time indicated for submission of a bid by a contractor.

B. The "Architect" is the design professional engaged by the School District respecting the capital improvement projects to be performed in the School District.

C. "Board" refers to the Board of the School District.

D. "Central Administration" refers to the Superintendent of Schools or designee.

E. The "Construction Manager" is the entity engaged by the School District to act as its representative during the course of construction of the Project.

F. The "Contract Documents" are the Agreement between the Owner and the Contractor, Conditions of the Contract (General, Supplementary, and other Conditions), Drawings, Specifications, and Addenda which have been issued.

G. The "Contractor" refers to the entity engaged by the School District to perform all or a part of the capital improvement project on its behalf.

H. Where a contractor other than the General Contractor is the only contractor engaged to perform work, the responsibilities allocated to the General Contractor in these General Conditions shall be performed by such other contractor.

I. The "Drawings" are the plans, elevations, sections, details, schedules, and diagrams developed by the Architect for the capital improvement projects to be performed in accordance with the Project manual of which these General Conditions of the Contract for Construction ("General Conditions") form a part.

J. The "Project" refers to the entire capital improvement project to be performed in accordance with the Project Manual.

K. The "Project Manual" is the document which is issued simultaneously with the Drawings and includes the Notice to Bidders, Information to Bidders, Bid Proposal Form, Prevailing Wage Rate schedule and the written requirements for labor, materials, equipment, construction systems and the like necessary for the Contractor to complete the capital improvement work for which it has been engaged.

L. The "Owner" refers to the School District, the Board of Education, its officers, agents, and employees.

M. A "SubContractor" is a person or entity who has a direct contract with the Contractor to provide material and/or labor for the Project on or off the site, or to otherwise furnish labor, material or other services with respect to a portion of the Contractor's work. A "Sub-SubContractor" is a person or entity who has a direct or indirect contract with a SubContractor engaged by the Contractor to perform a portion of the SubContractor's work at the site, or to otherwise furnish labor, material, or other services with respect to a portion of the SubContractor's work.

N. Accepted," "directed," "permitted," "requested," "required," and "selected" mean, unless otherwise explained, "accepted by the Architect and/or the Owner" "directed by the Architect and/or the Owner," "permitted by the Architect and/or the Owner," "requested by the Architect and/or the Owner," "required by the Architect and/or the Owner," and "selected by the Architect and/or the Owner." However, no such implied meaning will be interpreted to extend the Architect's or the Owner's responsibility into the Contractor's area of construction supervision.

O. "As accepted" "or acceptable substitute," and "for review" mean the Architect is the sole judge of the quality and suitability of the proposed substitutions. Where used in conjunction with the Architect's response to submittals, requests, applications, inquiries, reports, and claims by the Contractor, the meaning will be held to the limitations of the Architect's responsibilities and duties as stated in the General Conditions. In no case will "accepted by the Architect" be interpreted as an assurance to the Contractor that the requirements of the Contract Documents have been fulfilled.

P. "Furnish" means: (1) supply and deliver to the Project or other designated location, ready for unloading, unpacking, storing, assembly, installation, application, erection, or other form of incorporation into the Project, and ready for use; and (2) supply and deliver products requiring additional or supplemental fitting, assembly, fabrication, or incorporation into other elements of the Project directly to the fabricator, installer, or manufacturer as required.

Q. "Install" means unload, unpack, use, fit, attach, assemble, apply, place, anchor, erect, finish, cure, protect, clean, and similar operations required to properly incorporate work into the Project.

R. "Provide" means furnish and install.

S. "Replace" means remove designated, damaged, rejected, defective, unacceptable, or non-conforming work from the Project and provide new work meeting the requirements of the Contract Documents in place thereof.

T. The word "include," in any form other than "inclusive," is non-limiting and is not intended to mean all-inclusive.

ARTICLE 2
CONTRACTOR'S REPRESENTATIONS

A. Upon submission of its bid to the Owner, the Contractor expressly represents:

1. The Contractor represents and warrants that it performed a detailed investigation of the site(s) and that such investigation was sufficient to disclose the conditions of the site(s) at which work is to be performed by it and all improvements thereon, and the conditions under which the work is to be performed, including, but not limited to (a) the location, condition, layout and nature of the Project and surrounding areas; (b) the cost of labor, materials and equipment necessary to perform the work, the availability; (c) the areas of the work which will cause a disruption to the necessary and proper operation of the facilities by the Owner; and (d) other pertinent limitations on the performance of its work.

2. The Contractor represents and warrants that it has carefully studied and compared the Drawings and pertinent provisions of the Project Manual and that any errors, omissions, ambiguities, discrepancies, or conflicts found in said documents have been brought to the attention of the Architect for clarification prior to the Contractor's submission of its bid. If, in the interpretation of Contract Documents, requirements within the Drawings and Specifications conflict, or it appears that the Drawings and Specifications are not in the Agreement, the requirement to be followed shall be decided by the Architect. Where there is a discrepancy in quantity, the Contractor shall provide the greater quantity; where there is a discrepancy in quality, the Contractor shall provide the superior quality. Addenda supersede the provisions that they amend.

3. Each contractor certifies that it is experienced and familiar with the requirements and conditions imposed during the construction of similar work in the area. This includes, but is not limited to, "out of sequence" or "come back" work for the removal of plant, equipment, temporary wiring, or plumbing, etc. This "out of sequence" work may also include phasing of construction activities to accommodate the installation of the work at various locations and orderly fashion and the completion of work at various locations and/or levels at various times. This "phasing," "out of sequence," or "come back" work shall be done at no cost to other contractors, the Owner, the Architect, or the Construction Manager.

B. The Contractor warrants to the Owner that: (1) the materials and equipment furnished under its contract will be of good quality and new, and of recent manufacture, unless otherwise required or permitted by the Contract Documents; (2) that its work will be free from defects not inherent in the quality required or permitted; and (3) that its work will conform with the terms

and conditions of the Agreement with the Owner. Work not conforming to these requirements, including substitutions not properly approved and authorized, shall be considered defective and shall be removed and replaced at the Contractor's cost and expense. If required by the Architect, the Contractor shall furnish satisfactory evidence as to the kind and quality of materials and equipment.

C. Except as to any reported errors, inconsistencies, or omissions, and to concealed or unknown conditions, by executing the Agreement, the Contractor represents the following:

1. The Drawings and the Specifications found in the Project Manual issued simultaneously with said Drawings are sufficiently complete and detailed for the Contractor to: (a) perform the work required to produce the results intended by the Owner; and (b) comply with all the requirements of its contract with the Owner.

2. The work required to be performed by the Contractor including, without limitation, all construction details, construction means, methods, procedures and techniques necessary to perform its work, use of materials, selection of equipment and requirements of product manufacturers are consistent with: (a) good and prevailing and accepted industry standards applicable to its work; (b) requirements of any warranties applicable to its work; and (c) all federal, state, and local laws, ordinances, regulations, rules, codes, orders, and policies which bear upon the Contractor's performance of its work.

3. The Drawings and the Specifications for the Contract have been prepared with care and are intended to show as clearly as is practicable the work required to be done. Work under all items in the Contract Documents must be carried out to meet field conditions to the satisfaction of the Architect and the Owner and in accordance with his instructions and the Drawings and the Specifications.

4. All dimensions shown on the Drawings are for bidding purposes only. It is the responsibility of the Contractor to verify all dimensions in the field to ensure proper and accurate fit of materials and items to be installed.

D. The representations set forth herein shall survive expiration and/or termination of the Contractor's Agreement with the Owner.

ARTICLE 3
CONTRACTOR'S CONSTRUCTION PROCEDURES

A.

1. The Contractor shall be solely responsible for and have control over construction means, methods, techniques, sequences, and procedures required for the proper execution of its work on the Project. Where the Drawings, the Specifications, and/or the Project Manual make reference to particular construction means, methods, techniques, sequences or procedures or indicate or imply that such are to be used in connection with the Contractor's work, such reference is intended only to indicate that the Contractor's work is to produce at least the quality

of the work implied by the operations described, but the actual determination as to whether or not the described operations may be safely or suitably employed in the performance of the Contractor's work shall be the sole responsibility of the Contractor. All loss, damage, liability, or cost of correcting defective work arising from the employment of a specific construction means, method, technique, sequence, or procedure shall be borne solely by the Contractor.

2. Neither the Architect, the Construction Manager or the Owner will have control over or charge of and will not be responsible for construction means, methods, techniques, sequences, or procedures, or for safety precautions and programs in connection with the Work, since these are solely the Contractor's responsibility as provided herein.

3. The Contractor shall provide and pay for all labor, materials, equipment, tools, construction equipment and machinery, rigging, water, heat, utilities, light, transportation, and other facilities and services necessary for proper execution and completion of its work, whether temporary or permanent and whether or not incorporated or to be incorporated in its work.

B. The Contractor shall be responsible for coordinating the work of its own forces and the work of SubContractors engaged by it to perform the work of the Project on its behalf. The Contractor shall supply to its own work forces, and SubContractors engaged by it to perform portions of its work, copies of the Drawings, the Specifications, and the Project Manual for the work to be performed by such individuals/entities on its behalf. The Contractor shall review any specified or installation procedure with its employees and/or SubContractors, including those recommended by any product manufacturer, prior to the commencement of the relevant portion of the work to be performed. The Contractor shall be responsible to the Owner for the acts and/or omissions of the Contractor's employees, the Contractor's SubContractors, the Contractor's material suppliers, and/or their respective agents and employees, and any other persons performing portions of the work on behalf of the Contractor.

C. The Contractor shall be responsible for the inspection of portions of the Project performed by its own work force and/or SubContractors engaged by it for the purpose of determining that said work is in proper condition to receive subsequent work.

D. The Contractor shall perform its work in accordance with the standards of the construction industry applicable to work in the locale in which work is to be performed.

E. The Contractor shall only employ labor on the Project or in connection with its work capable of working harmoniously will all trades, crafts and any other individuals associated with the capital improvement work to be performed. There shall be no strikes, picketing, work stoppages, slowdowns, or other disruptive activity at the Project for any reason by anyone employed or engaged by the Contractor to perform its portion of the work. There shall be no lockout at the Project by the Contractor. The Contractor shall be responsible for providing the manpower required to proceed with the work under any circumstance. Should it become necessary to create and maintain a separate entrance for a contractor involved in a labor dispute, all costs associated with creating and maintaining that entrance shall be borne by the contractor involved in the dispute. Such costs shall include, but not be limited to, signage, fencing,

temporary roads, and security personnel as deemed necessary by the Owner for the safety of the occupants of the site.

F.

1. If the Contractor has engaged the services of workers and/or SubContractors who are members of trade unions, the Contractor shall make all necessary arrangements to reconcile, without delay, damage, or cost to the Owner and without recourse to the Architect, the Construction Manager, or the Owner, any conflict between its Agreement with the Owner and any agreements or regulations of any kind at any time in force among members or councils which regulate or distinguish what activities shall not be included in the work of any particular trade.

2. In case the progress of the capital improvement work to be performed by the Contractor is effected by any undue delay in furnishing or installing any items or materials or equipment required pursuant to its Agreement with the Owner because of a conflict involving any such labor agreement or regulation, the Owner may require that other material or equipment of equal kind and quality be provided pursuant to a Change Order or Construction Change Directive but in no case shall the amount of such change be charged by the Contractor to the Owner as an additional cost to perform the capital improvement work pursuant to its contract.

3. The Contractor shall ensure that its work continues uninterrupted during the pendency of a labor dispute.

4. The Contractor shall be liable to the Owner for all damages suffered by the Owner occurring as a result of work stoppages, slowdowns, disputes, or strikes.

G. The Contractor shall enforce strict discipline and good order among the Contractor's employees and its SubContractors' work forces and other persons carrying out the performance of its work. The Contractor shall not permit employment of unfit persons or persons not skilled in tasks assigned to them. The Owner reserves the right to object to any person to be hired or who is employed by the Contractor. Upon the request of the Owner, said person shall be removed from the Project and not again be assigned to perform the Contractor's work without the prior written permission of the Owner.

H. Within one (1) week after receiving notice of its award of the Contract, the Contractor shall employ a competent, full-time Project Manager and On Site Superintendent to be approved by the Owner or its representative, and such necessary assistants who shall be in attendance at each Project site whenever and wherever work is in progress to provide for the expeditious completion of the work. Said Project Manager and On Site Superintendent shall be employed until punch list and closeout of the Project. To the extent work is being performed contemporaneously at different facilities within the School District, the Contractor shall assign different superintendents for each facility at which work is being performed. The Project Manager and On Site Superintendent assigned by the Contractor shall not be changed except with the prior written consent of the Owner, unless the Project Manager or On Site superintendent or such assistant proves to be unsatisfactory to the Contractor and/or ceases to be in its employ. The Project Manager and On Site Superintendent shall represent the Contractor, and communications given to the Project

Manager or On Site Superintendent, whether verbal or written, shall be as binding as if given to the Contractor. Oral communications to the Superintendent(s) or his/her assistant(s) and/or Project Manager shall be confirmed in writing by the Owner or the Architect. The Contractor shall forward to the Owner a copy of the resumes for each of its superintendents, Project Managers, and their assistants. The Owner, the Construction Manager or the Architect shall have the right to have any supervisory or management staff removed from the Project with or without cause.

I. Each Contractor shall provide, or otherwise see that, the Project Manager, or On Site Superintendent Site Managers, and/or responsible workers of each contractor and major subcontractor are equipped with cellular phones and radios. Each contractor shall provide the Owner, the Construction Manager, and the Architect with the cellular telephone number for each phone and worker.

J. The Contractor's supervisory personnel, including superintendents and their assistants, shall be versed in the English language. In the event the Contractor's supervisory personnel, the superintendents, Project Managers, and/or their assistants are not versed in the English language, the Contractor shall employ the services of a full-time on-site interpreter to facilitate communications with such supervisory personnel, superintendents and/or assistants.

K. Prior to the commencement of work, the Contractor shall provide the Construction Manager and the Architect with:

1. a written list of the names, addresses and telephone numbers of the members of its organization who can be contacted in the event of an off-hours emergency at the building site, including cellular telephone numbers and personal/home telephone numbers.

2. a written list of SubContractors, Sub-SubContractors, suppliers and vendors with names, addresses, telephone numbers, and descriptions of the work they shall perform or furnish.

3. The name, address and telephone number of the bonding company, banking, and insurance company for the Prime Contractor including the name, address, and telephone number of each bonding company's primary contact representative for the Project.

4. Detailed subcontractor schedules indicating the approximate quantity of shop drawings, sequence, timing, and man loading.

5. A cash flow projection for the life of the Project, including a schedule and graph showing the amount of work projected to be completed each month or billing period and a dollar value for the anticipated billings each month or billing period. This shall be completed after an agreed upon schedule of values has been approved by the Construction Manager.

L.

1. Tests, inspections, and approvals of portions of the Contractor's work required by the Drawings and/or the Specifications shall be made at an appropriate time. Unless otherwise provided, the Contractor shall consult with the Architect and the Construction Manager

concerning the need for testing and/or inspection of its work pursuant to the Contract Documents and, after consulting with the Architect and the Construction Manager, the Construction Manager shall advise the Owner to make arrangements for such tests, inspections and approvals with an independent testing laboratory or entity acceptable to the Owner, or with the appropriate public authority. The Owner shall bear all costs associated with the tests, inspections or approvals required by the Drawings and/or the Specifications, except as set forth in subparagraph 3 hereof.

2. Tests, inspections, and approval of portions of the Contractor's work required by all federal, state, and local laws, ordinances, regulations, rules, codes, orders, and policies of public authorities or governmental agencies having jurisdiction shall be made at an appropriate time. The Contractor shall consult with the Architect and the Construction Manager concerning the need for testing and/or inspection of its work pursuant to law, ordinance, regulation or orders of public authorities or governmental agencies and shall advise the Owner in writing that it has made arrangements for such tests, inspections and approvals with the appropriate public authority or governmental agency. The Contractor shall be solely responsible for making timely notice of the need for a test, inspection and/or approval with the relevant public authority or governmental agencies and shall bear all costs associated with such testing, inspection, or approval required by such public authority or governmental agency.

3. If the Architect, the Construction Manager, the Owner, or public authorities or governmental agencies having jurisdiction determine that portions of the Contractor's work require additional testing, inspection, or approval due to the Contractor's failure to perform its work in accordance with the requirements of the Contract Documents and/or all federal, state, and local laws, ordinances, regulations, rules, codes, orders, and policies of public authorities or governmental agencies having jurisdiction, the Architect and the Construction Manager will advise the Owner of the need for such additional inspections or tests and the Owner shall make arrangements for such additional testing, inspection or approval by an entity acceptable to the Owner. The Contractor shall bear the costs of such additional testing as provided in Article 14(B).

M. The Contractor shall, if required by all federal, state, and local laws, ordinances, regulations, rules, codes, orders, and policies of public authorities or governmental agencies having jurisdiction over the Project, retain a licensed professional engineer to supervise the construction of the Project including, but not limited to, foundations, structural work, soils, welding, reinforced masonry, and the like.

N. The Contractor recognizes and acknowledges that the Project is governed by and subject to the provisions of New York State General Municipal Law, Section 101, governing the award of contracts on public improvement projects. As such, the Contractor recognizes and acknowledges that other contractors will be performing work on the Project in conjunction with it. As such, the Contractor agrees to cooperate with such other contractors performing work on the Project and shall perform its work as follows:

1. The Contractor shall not interfere with the erection, installation, or storage upon the premises of any work, materials, supplies, or equipment which is to be performed and

furnished by other contractors, and the Contractor shall properly connect and coordinate its work therewith.

2. The Contractor shall not commit or permit any act which will interfere with the performance of the work of any other Contractor performing work on the Project. If the Contractor sustains any damage through any act or omission of other contractors having a contract with the Owner for the performance of work upon the site or of work which may be necessary to be performed for the proper execution of the work to be performed hereunder, or through any act or omission of a SubContractor of such contractor, the Contractor shall promptly notify the Owner and the Construction Manager of such damage.

3. When the work of the Contractor or its SubContractors overlap or dovetail with that of other contractors, materials shall be delivered and operations conducted to carry on the work continuously, in an efficient, workmanlike manner.

4. In case of interference between the operations of different contractors, the Construction Manager will be the sole judge of the rights of each contractor and shall have the authority to decide in what manner the work may proceed, and in all cases its decision shall be final. Any decision as to the method and times of conducting the work or the use of space as required in this paragraph shall not be basis of any claim for delay or damages by the Contractor.

5. The Contractor, including its SubContractors, shall keep itself informed of the progress of other contractors and shall notify the Architect or the Construction Manager immediately in writing of lack of progress on the part of other contractors where such delay will interfere with its own operations. Failure of the Contractor to keep informed of the work progressing on the Project and failure to give notice of lack of progress by others shall be construed as acceptance by the Contractor of the status of the work as being satisfactory for proper coordination with the Contractor's own work.

6. Delays or oversights on the part of any contractor or subcontractor in getting any or all of their work done in the proper way, thereby causing cutting, removing, and replacing work already in place, shall not be the basis for a claim for extra compensation.

7. If part of the Contractor's work depends upon construction or operations by the Owner or another contractor, the Contractor shall, prior to proceeding with that portion of its work, promptly report to the Architect and the Construction Manager apparent discrepancies or defects in such other construction that would render it unsuitable for such proper execution and results. Failure of the Contractor so to report shall constitute an acknowledgment that the Owner's or other contractor's completed or partially completed construction is fit and proper to receive the Contractor's work.

8. The Contractor shall promptly correct discrepancies or defects in its work which have been identified by other contractors as affecting proper execution and results of the work of such other contractor.

O.

1. The Contractor shall comply with and give notices required by all federal, state, and local laws, ordinances, regulations, rules, codes, orders, and policies of public authorities or governmental agencies bearing on performance of the Work. If the Contractor fails to give such notices, it shall be liable for and shall defend, indemnify, and hold harmless: (a) the Owner, its consultants, employees, members of the Board, officers, and agents; (b) the Architect and its consultants, employees, officers, and agents; and/or (c) the Construction Manager and its consultants, employees, officers, and agents from and against any resulting fines, penalties, judgments, or damages, including reasonable attorney's fees, imposed on or incurred by the parties indemnified hereunder. The Contractor shall pay any costs or fees incurred in such compliance and any fines or penalties imposed for violation thereof and any costs or fees incurred by the Owner due to such violation.

2. The Contractor shall pay any costs or fees incurred in such compliance and any fines or penalties imposed for violation thereof and any costs or fees incurred by the Owner due to such violation. If the Contractor observes that portions of the Contract Documents are at variance therewith, the Contractor shall promptly notify the Architect and the Owner in writing, and necessary changes shall be accomplished by appropriate modification to the Drawings and/or the Specifications.

3. If the Contractor performs Work knowing it to be contrary to all federal, state, and local laws, ordinances, regulations, rules, codes, orders, and policies of public authorities or governmental agencies without such notice to the Architect, the Construction Manager, and the Owner, the Contractor shall assume full responsibility for such Work and shall bear the attributable costs and shall bear the total cost for correction of same.

P. The Contractor recognizes and acknowledges that job meetings will be held at the job site as designated by the Owner or the Construction Manager, unless otherwise designated by the Owner or the Architect. The Contractor shall have responsible representation at the MANDATORY weekly job meetings held at the Construction Manager's job office. These meetings will be held to arrange for satisfactory coordination of all trades on the Project so as not to impede job progress. Contractors or SubContractors failing to attend job meetings shall be responsible for delays and/or expenses incurred due to coordination difficulty.

Q. The Contractor shall provide copies of its daily construction reports to the Construction Manager's Field Superintendent. These reports shall be submitted no later than 10:00 am the following workday. The daily reports shall provide detailed information concerning the Contractor's activities and operations, including work activities on site and manpower. A "Daily Construction" form shall be used for reporting these activities. In addition, the Contractor is required to submit a Two Week Look Ahead schedule for upcoming work.

ARTICLE 4
CONTRACTOR'S USE OF SITE

A. The Contractor shall confine operations at the site to the areas at which construction is to be performed and to such areas permitted by law, ordinances, permits and as set forth in detail in the Project Manual and the Drawings, the Specifications, and the Project Manual.

B. Five (5) days after receipt of the Notice to Proceed, the Contractor shall provide two (2) copies of a videotaped recording of all existing conditions to the Construction Manager. This taping shall provide a record of all existing buildings, grounds, exterior conditions, and interior conditions. The Contractor shall schedule a representative of both the Owner and the Construction Manager to be present at this taping. In the absence of this record, the Contractor shall be responsible for paying the costs associated with any and all repairs in an area where the Contractor is working or has worked, as may be deemed necessary by the Owner or the Construction Manager.

C. The occupied portion of any school building shall always comply with the minimum requirements necessary to maintain a certificate of occupancy.

D. General Safety and Security Standards for Construction Projects:

1. All construction materials shall be stored in a safe and secure manner.

2. Fences around construction supplies or debris shall be maintained.

3. Gates shall always be locked unless a worker is in attendance to prevent unauthorized entry.

4. During exterior renovation work, overhead protection shall be provided for any sidewalks or areas immediately beneath the work site or such areas shall be fenced off and provided with warning signs to prevent entry.

5. The Contractor shall exert utmost care and diligence when working in or near any existing buildings or sitework. The absence of protection around such items shall not excuse the Contractor from its liability to provide protection. Any damage to existing buildings, sitework, or facilities shall be repaired and charged to the Contractor responsible for the damage.

6. The Contractor shall be responsible for the removal and replacement of existing ceiling tiles and grid in areas of the existing building where its work is required, and new ceilings are not scheduled for installation. In the event that the existing ceilings are damaged and cannot be replaced to the satisfaction of the Owner, the responsible contractor shall be liable for the costs of replacing in kind, the existing ceilings with new tile and grid.

7. All disconnect and/or tie-in work involving any utilities that would interfere with the ongoing operations of the Owner shall be completed after hours when the facility is not in

use. The performance of this work shall be projected on all schedules required to be prepared by the Contractor. Additionally, the Contractor shall give the Construction Manager and the Owner at least forty-eight (48) hours advance written notice of its intention to perform this type of work. All overtime and standby personnel necessary to complete these tie-ins shall be the responsibility of the Contractor performing the work.

E.

1. Separation of construction areas from occupied spaces: Construction areas which are under the control of a contractor and therefore not occupied by district staff or students shall be separated from occupied areas. Provisions shall be made to prevent the passage of dust and contaminants into occupied parts of the building. Periodic inspection and repairs of the containment barriers must be made to prevent exposure to dust or contaminants. Gypsum board must be used in exit ways or other areas that require fire rated separation. Heavy duty plastic sheeting may be used only for a vapor, fine dust, or air infiltration barrier, and shall not be used to separate occupied spaces from construction areas. Methods of dust and fume control shall include, but not be limited to:

a. adequate ventilation;

b. wetting down;

c. keeping bags of insulating materials, cement, etc., closed and sealed;

d. controlled mixing of materials under field conditions;

e. special attention should be utilized in sawing of insulation and certain acoustical materials and storage of materials;

f. job housekeeping must be maintained; and

g. advising all personnel of hazardous conditions, including supervisors and workers.

Each contractor is responsible for instituting the above policies to ensure minimal impact to surrounding occupied areas.

2. A specific stairwell and/or elevator should be assigned for construction worker use during work hours. In general, workers may not use corridors, stairs, or elevators designated for students or school staff.

3. Large amounts of debris must be removed by using enclosed chutes or a similar sealed system. There shall be no movement of debris through halls of occupied spaces of the building. No material shall be dropped or thrown outside the walls of the building.

4. All occupied parts of the building affected by renovation activity shall be cleaned at the close of each workday. School buildings occupied during a construction project shall maintain required health, safety, and educational capabilities at all times that classes are in session.

F.

1. Storage space will be allotted to the Contractor by the Owner to the extent such space, in the sole discretion of the Owner, is available. The Contractor shall be responsible for securing appropriate space for its material with the Construction Manager prior to delivery. If insufficient space is available on the site, the Contractor shall provide local off-site storage, storage containers, etc. at its own cost and expense. Should any of the material stored on-site obstruct the progress of any portion of the work or the Project, this material shall be removed by the Contractor without reimbursement of cost, from place to place or from the premises, as the Construction Manager may direct.

2. The Contractor shall schedule delivery of materials and equipment to minimize long term storage at the Project, to prevent overcrowding of construction spaces, and to ensure that under no circumstances will materials that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses be stored on site.

3. The Contractor shall deliver materials and equipment to the Project in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installation. The Contractor shall inspect materials and equipment upon delivery to ensure compliance with the Contract Documents and to ensure that products are undamaged and properly protected. The Contractor shall store products to allow for inspection and measurement of quantity or counting of units. The Contractor shall store materials in a manner that will not endanger the project structure. The Contractor shall store products that are subject to damage by the elements, under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation. The Contractor shall comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.

4. The Contractor shall not unreasonably encumber the site with materials or equipment during the performance of its work. Only materials and equipment which are to be used directly in the performance of the Contractor's work shall be brought to and stored on the premises of the School District. After equipment is no longer required for its work, the Contractor shall promptly remove such equipment from the premises of the School District. The Contractor shall be solely responsible for the protection of construction materials and equipment stored on the premises from weather, theft, damage, and all other adversity. The Contractor shall at all times provide the proper housekeeping to minimize potential fire hazards and shall provide approved spark arresters on all steam engines, internal combustion engines and flues.

5. A construction entrance will be designated for deliveries. A separate entrance will be established for entering and exiting the site only. All deliveries shall be scheduled and

coordinated with the Construction Manager and the Owner. Unexpected or uncoordinated deliveries may be turned away by the Owner or the Construction Manager at the discretion or necessity of the Owner. The Owner's enforcement of this provision shall not be construed by any contractor or subcontractor as the basis for a claim of delay in time or monetary damages alleged to have been incurred as a result of refusal of delivery.

6. The Contractor for General Construction shall provide necessary and required security measures to adequately safeguard the construction site from vandalism and intrusion of unauthorized persons. The Contractor for General Construction shall submit its means and methods of security to the Construction Manager for review and comment. The Project must be secured twenty-four (24) hours a day, seven (7) days a week including holidays. The General Construction Contractor's failure to secure the site as required by this paragraph will result in the Owner engaging the services of such necessary personnel so as to provide such security. No notice will be given the Contractor for General Construction of the Owner's intention to engage such security services and all costs and expenses associated with the Owner's security of the site in this regard will be back charged to the Contractor for General Construction. While the Owner may have security guards patrolling the Project, the function of such security guards is not for the purpose of specifically guarding the Contractor's property or operations of work.

G. The Contractor's right to entry and use of the School District premises arises solely from the permission granted by the Owner pursuant to the Agreement between the Contractor and the Owner. This permission shall be deemed to be withdrawn upon the termination of the Contractor's Agreement with the Owner.

H.

1. The Contractor shall be required to perform its work with no interruption to the School District's operations, including its administrative and business operations. Any work which will interfere with the School District's operations and/or which is to be performed when the School District's facilities are in operation shall be performed on evenings and weekends. Additionally, the Contractor shall conduct its work in compliance with federal, state, county, or local ordinances. All costs incurred by the Owner to make the facilities available during evening and weekends shall be borne by the Contractor. The Owner reserves the right to determine what work will "interfere" with its operations and said determination shall be final.

2. The Contractor may request access to the site during times beyond the work hours permitted. Approval is solely at the discretion of the Owner. If approval is given, the Contractor is responsible for paying all additional costs incurred by the Owner, the Architect, and the Construction Manager for providing the site to the Contractor during the additional time periods.

3. In the event the Contractor fails to complete all work under the Contract Documents by said scheduled dates, the Contractor will not be permitted to perform any work during normal school hours. Such work shall only be performed after school hours, Saturdays, Sundays, holidays, or periods when school is unoccupied at no additional cost of any kind to the Owner. In addition to damages incurred by the Owner in connection with the Contractor's delay, the Contractor shall be liable for all costs incurred by the Owner to provide staff and the

Architect's and the Construction Manager's personnel as required to make facility accessible by the Contractor and perform inspections during such off hours.

4. The Owner shall not be responsible for any overtime charges incurred by the Contractor during the course of the Project. Any and all costs associated with work which is performed at hours requiring the payment of such overtime by the Contractor to its workers shall be the Contractor's responsibility.

I. Construction and maintenance operations shall not produce noise in excess of 60 dba in occupied spaces or shall be scheduled for times when the building or affected building spaces are not occupies or acoustical abatement measures shall be taken.

J. The Contractor shall provide all required temporary access walkways, both interior and exterior, and the like necessary to complete its work. The Contractor shall maintain an unobstructed condition at all entrances and/or exits from present buildings. No equipment, other than equipment with rubber tires, will be allowed on any existing or new pavement, UNLESS THE CONTRACTOR HAS OBTAINED THE PRIOR WRITTEN APPROVAL OF THE CONSTRUCTION MANAGER AND THE PAVEMENT HAS BEEN FIRST PROTECTED WITH PLANKING OR BY OTHER MEANS APPROVED BY THE CONSTRUCTION MANAGER.

K. The Contractor and any entity for whom the Contractor is responsible shall not erect any sign on the premises of the School District without the prior written consent of the Owner, which consent may be withheld at the sole discretion of the Owner.

L.

1. Without the prior approval of the Owner, the Contractor shall not permit any workers to use any existing School District facilities, including, without limitation, lavatories, toilets, entrances, and parking areas other than those designated by the Owner. Employees, vehicles, and equipment of the Contractor and of all others engaged by the Contractor for the performance of its work shall enter onto the premises of the School District for which construction work is to be performed only at those locations designated or approved by the Construction Manager. The parking for construction personnel shall be limited to the designated trailer park area only. Failure to abide by this rule will result in towing of cars at the expense of the Contractor who employs the individual.

2. The Contractor shall ensure that its work, at all times, is performed in a manner that affords reasonable access to both vehicles and individuals, to the premises of the School District and all adjacent areas. The Contractors' work shall be performed, to the fullest extent possible, in such a manner that areas in and around the construction area shall be free from all debris, building materials and equipment likely to cause hazardous conditions, and do not close or obstruct walkways, roadways, pathways, or other occupied facilities or facilities to be used by the Owner. Without limitation to any other provision of the Agreement between the Contractor and the Owner, the Contractor shall use its best efforts to minimize any interference with the occupancy of areas, buildings, entrances, and parking areas in and around the premises at which work is being performed. Free access to fire hydrants and standpipe connections shall be

maintained at all times during construction operations, and portable fire extinguishers shall be provided by the Contractor and made conveniently available throughout the construction site.

3. The Construction Manager, in conjunction with the Owner and the Architect, shall designate locations at the site at which the Contractor, its SubContractors and employees may utilize in connection with its work. The Contractor's employees and the employees of the Contractor's SubContractors and others engaged by the Contractor to perform its work are prohibited from trespassing or leaving any vehicle on any property not assigned by the Owner as set aside for the use of the Contractor. The Contractor's employees and the employees of the Contractor's SubContractors and others engaged by the Contractor to perform its work are restricted to the immediate area at which work is to be performed. Only persons having official business will be admitted to the construction site. NO COMMUNICATION BETWEEN THE CONTRACTOR, ITS EMPLOYEES, SUBCONTRACTORS' EMPLOYEES, OR OTHERS ENGAGED BY THE CONTRACTOR FOR THE PERFORMANCE OF ITS WORK AND STUDENTS OR STAFF WILL BE PERMITTED.

4. The Contractor, its SubContractors, their respective employees or agents, and all others engaged by the Contractor in connection with the performance of its work are required to wear photographic identification badges at all times. The Contractor shall provide such individuals with said photographic identification badges. These badges shall be worn so as to be readily and easily visible. All workers and representatives of the Contractor, its SubContractors, or suppliers shall wear these badges while on school property. The information on these badges shall be as prescribed by the Owner and the Construction Manager. Each person seen without a photo identification badge (or otherwise failing to comply with this requirement in the opinion of the Owner or the Construction Manager) shall be ordered to leave school property. No warnings shall be necessary. The Contractor(s) and their SubContractor(s) employing the offending person(s) shall be solely responsible for making-up and paying for any loss of production or required progress in the Work resulting from this action (including any claims by other Contractors dependent on the work of this Contractor). All parties agree that any action taken to enforce this requirement shall not be construed by any Contractor or its SubContractors or suppliers as the basis for a claim (for either time or money) for delay to the Work or to the Contractor, its SubContractors, or Suppliers.

5. Without limitation of any other provision of the Agreement between the Owner and Contractor, the Contractor shall use its best efforts to comply with all rules, regulations, and policies promulgated by the Owner in connection with the use and occupancy of the premises of the School District. The Contractor shall immediately notify the Owner in writing if during the performance of its work, the Contractor finds compliance with any portion of such rules, regulations, and policies to be impracticable, setting forth the problems of such compliance and suggesting alternative through which the same results intended by such portion of the rules, regulations, and policies can be achieved. The Owner may, in the Owner's sole discretion, adopt such suggestions, develop new alternatives, or require compliance with the existing requirements of the rules, regulations, and policies.

M. No drinking of alcoholic beverages, smoking, or use of cannabis, cannabinoid hemp, personal vaporizing devices, or controlled substances is permitted on the grounds. The Contractor shall ensure that none of its or its SubContractors, their respective employees, agents, and/or consultants report to the site impaired by alcohol, cannabis/cannabinoid hemp, or controlled substances. The Contractor bears the responsibility of determining if its, or its SubContractors' employees are in any way impaired and whether the safety of the public, the employees of other Contractors and their SubContractors, the Owner, the Architect, or the Construction Manager are jeopardized. Each contractor shall provide drinking water for its own employees.

N. The Contractor's employees, representatives, agents, and consultants, and all of its SubContractors' employees, representatives, agents, and consultants at the site are to refrain from using indecent language. All doing so will be removed from the site. Artwork or decoration found on vehicles belonging to the Contractor or the SubContractors' employees parked on or near the school property which contain indecent language or pictures shall either be covered or removed from the location.

O. The Contractor's employees, representative, agents, and consultants, and all of its SubContractors' employees, representatives, agents, and consultants at the site are to wear shirts, long pants, and proper footwear.

P. Each contractor shall keep the premises and surrounding area in which it is working free from accumulation of waste materials or rubbish caused by the performance of all of the work being performed on-site and in the buildings. On a daily basis at the conclusion of work on the Project, each contractor shall clean the areas in which it has performed work and shall remove all waste, materials, rubbish, its tools, construction equipment, machinery, and surplus materials. Each contractor shall broom sweep all construction areas in which it has performed worked every day. The Construction Manager shall perform an inspection each afternoon to determine that the work areas of the Contractors have been properly cleaned. In the event the work areas are not cleaned, the Construction Manager shall advise the offending contractor to provide cleaning as required herein. If any Contractor fails to keep the site safe and clean within four (4) hours of being notified by the Construction Manager, either verbally or in writing, the Construction Manager will have the clean-up work performed and back charged to the offending contractor without further notification to the Contractor. The cost of such cleaning company, together with the cost of any custodial costs of the School District, at prevailing overtime rates plus fifteen percent (15%) will be charged to the offending Contractor. Notice to field personnel shall be deemed notice to the Contractor.

Q. The Contractor shall provide ventilation of enclosed areas during construction as may be required to permit proper curing and drying out and to prevent excessive humidity, moisture, and condensation. Ventilation shall be by natural or artificial means as required by conditions involved.

R. The Contractor shall be responsible for the control of chemical fumes, gases, and other contaminates produced by welding, gasoline or diesel engines, roofing, paving, painting, etc. to ensure that they do not enter occupied portions of the building or air intakes.

S. The Contractor shall be responsible for ensuring that activities and materials which result in "off-gassing" of volatile organic compounds such as glues, paints, furniture, carpeting, wall covering, drapery, etc. are scheduled, cured, or ventilated in accordance with manufacturers' recommendations before a space can be occupied.

T. From the commencement to the completion of the Project, the Contractor shall keep the parts of the work and the buildings free from accumulation of water no matter what the source or cause of water.

U.

1. The General Contractor shall construct temporary partitions where shown on the Contract Documents or where otherwise required for safety of the public or to prevent dust from entering occupied areas. Partitions shall be dust-proof from floor to slab or structure above (if existing condition is a drop in tile ceiling, the Contractor shall remove tile and install partition to structure above). In addition to framing and sheetrock, the Contractor shall install fire resistant plastic partitions on the work area side of its work. If an access door is required, an alternating three-layer plastic system shall be used. The door shall be a standard hollow metal door with lockset and closer. Keys shall be distributed to the Owner's other contractors, the Owner, and the Architect.

2. All cutting and welding performed within an occupied building or adjacent to a window or intake vent shall be performed during off hours.

V.

1. The Contractor shall control the safe handling and storage of all welding materials, acetylene and oxygen tanks, and other equipment required for welding and cutting work at the job site. Such storage shall be in compliance with the Occupational Safety and Health Administration ("OSHA") regulations.

2. Welding materials and equipment shall be removed promptly from the premises upon completion of the welding and cutting work.

W. The Contractor shall be responsible for all costs incurred by the Owner caused by false security/fire alarms set off by the Contractor. Costs shall include custodial response charges etc.

X. The Contractor shall be responsible for broken glass, and at the completion of the Work shall replace such damaged or broken glass. After damaged or broken glass has been replaced, the Contractor shall remove all labels, wash and polish both sides of all glass. In addition to general broom cleaning, the General Contractor shall perform the following final cleaning for all trades at completion of the Work:

1. remove temporary protections;

2. remove marks, stains, fingerprints and other soil or dirt from painted, decorated and natural finished woodwork and other Work;

3. remove spots, plaster, soil and paint from ceramic tile, marble and other finished materials, and wash or wipe clean;

4. clean fixtures, cabinet work and equipment, removing stains, paint, dirt and dust, and leave same in undamaged, new condition;

5. clean aluminum in accordance with recommendations of the manufacturer; and

6. clean all floors thoroughly in accordance with recommendations of the manufacturer.

ARTICLE 5
SUBCONTRACTORS

A.

1. As soon as practicable after receipt of Letter of Intent to Award, Notice to Proceed or other form of official notice of award of the Contract, but not more than ten (10) days after receipt of official notice of award of the Contract, the Contractor shall furnish the Owner and the Architect, in writing, with: (1) the name, trade, and subcontract amount for each SubContractor; and (2) the names of all persons or entities proposed as manufacturers of the products identified in the Specifications (including those who are to furnish materials or equipment fabricated to a special design) and, where applicable, the name of the installing SubContractor. Copies of all SubContractor contracts, fully executed, are to be provided to the Construction Manager, including but not limited to all addenda, appendices, and/or exhibits including scope of work sheets. All such subcontracts shall be submitted to the Construction Manager within ten (10) days of the Owner's award of the contract to the Contractor.

2. Upon review of the Contractor's list of SubContractors, the Architect will advise the Contractor in writing stating whether or not the Owner, the Construction Manager or the Architect, after due investigation, accepts or rejects, any proposed SubContractor. SubContractors will not be acceptable unless, when requested by the Architect, evidence is furnished that the proposed subcontractor has satisfactorily completed similar subcontracts as contemplated under this prime contract, and has the necessary experience, personnel, equipment, plant, and financial ability to complete the subcontract in accordance with the intent of the Documents. As verification of financial ability, the Owner reserves the right to request and receive up to five (5) years' worth of financial statements, bank references, bond/insurance company references and all other information required to assess financial ability.

3. If the Owner, the Construction Manager, or the Architect has reasonable objection to a person or entity proposed by the Contractor, the Contractor shall propose another to whom

the Owner, the Construction Manager, and the Architect have no objection. No increase in the Contract Sum shall be allowed where a SubContractor is rejected by the Architect, the Construction Manager, or the Owner who is: (1) deemed unqualified to perform the particular work subcontracted by the Contractor; (2) does not have the necessary experience, personnel, equipment, plant, and financial ability to complete the subcontract; (3) has a history of poor performance in work of similar nature; or (4) does not otherwise meet the requirements of this General Conditions. Upon receipt of a rejection of a SubContractor by the Architect, the Contractor shall have the right to request a meeting with the Architect, the Construction Manager, and the Owner to discuss the reasons it believes the SubContractor is or is not qualified to perform the work. Upon review of such reasons, the Architect shall re-consider its determination and shall advise the Contractor of its determination upon such review. If the Architect still finds that such SubContractor does not meet the requirements above stated, it shall advise the Contractor. The Architect's determination upon such review shall be final and binding on the Contractor and its SubContractor and the Contractor hereby waives any and all claims it or its SubContractor might have against the Owner, the Construction Manager, and/or the Architect concerning the rejection of such Contractor and shall require its SubContractors to execute such similar waiver in its Agreement with the Contractor.

4. The Contractor shall not change a SubContractor, person, or entity previously selected if the Owner, the Construction Manager, or the Architect makes reasonable objection to such change.

B. By appropriate Agreement, the Contractor shall require each SubContractor to be bound to the Contractor by terms of the Contractor's Agreement with the Owner, and to assume toward the Contractor all the obligations and responsibilities which the Contractor, by said Agreement, assumes toward the Owner and the Architect. Each subcontract agreement shall preserve and protect the rights of the Owner, the Construction Manager, and the Architect under the Contractor's Agreement with the Owner so that subcontracting thereof will not prejudice such rights, and shall allow the SubContractor, unless specifically provided otherwise in the subcontract Agreement, the benefit of all rights, remedies, and redress against the Contractor that the Contractor, by its Agreement with the Owner, has against the Owner. However, the Subcontract Agreement between the Contractor and SubContractor shall not provide, nor shall this Agreement be deemed to provide any rights, remedies or redress by the SubContractor(s) against the Owner. Where appropriate, the Contractor shall require each subcontractor to enter into similar agreements with Sub-SubContractors.

C. The Contractor shall promptly notify the Owner, the Construction Manager, and the Architect of any material defaults by any SubContractors and/or whether it has terminated its Agreement with any of its subcontractors for any reason.

D. The Contractor hereby assigns all of its rights in its Agreements with its SubContractor(s) and hereby does assign, transfer, and set over to the Owner all of its rights and/or interests in its Agreements with its SubContractor(s), but only in the event of termination of the Contractor's Agreement with the Owner pursuant to Article 17, paragraph A of these General Conditions and only to the extent the Owner implements its rights to take such assignment of contract by

notifying the SubContractor in writing of its intention to do so. Such an assignment is subject to the prior rights of the surety, if any, obligated to the Owner pursuant to a performance bond submitted in connection with the Contractor's work.

E. If the Work in connection with a subcontract has been suspended for more than ninety (90) days after termination of the Contract by the Owner and the Owner accepts assignment of such subcontract, the SubContractor's compensation shall not be adjusted for any increase in direct costs incurred by such SubContractor as a result of the suspension.

F. It shall be the Contractor's responsibility, when subcontracting any portion of his work, to arrange or group items of work under particular trades to conform with then-prevailing customs of the trade, regardless of the particular Divisions and Sections of the Specifications in which the work is described.

G. All subcontracts must be in writing.

ARTICLE 6
CONTRACTOR'S USE OF DRAWINGS/SPECIFICATIONS

A. The Agreement between the Owner and the Contractor, and all documents incorporated therein by reference, including but not limited to, the Drawings and the Project Manual shall be signed by the Contractor and the Owner.

B. The intent of the Agreement between the Owner and the Contractor is to include all items necessary for the proper execution and completion of the work to be performed by the Contractor. The documents comprising the Agreement between the Contractor and the Owner are complementary, and what is required by one shall be as binding as if required by all.

C.

1. In the event of inconsistencies within or between parts of the Agreement between the Contractor and the Owner or between the Agreement between the Contractor and the Owner and applicable standards, codes, and ordinances, the Contractor shall (a) provide the better quality or greater quantity of Work or (b) comply with the more stringent requirement; either or both in accordance with the Architect's interpretation.

2. On the Drawings, given dimensions shall take precedence over scaled measurements and large-scale Drawings over small scale Drawings.

3. Before ordering any materials or performing any of its work, the Contractor and each SubContractor shall verify measurements at the Project and shall be responsible for the correctness of such measurements. No extra charge or compensation will be allowed on account of differences between actual dimensions and the dimensions indicated on the Drawings. Any difference which may be found shall be submitted to the Architect for resolution before proceeding with the performance of the work.

4. If a minor change in the Work is found necessary due to actual field conditions, the Contractor shall submit detailed drawings of such departure for the approval by the Architect before making the change.

5. Drawings, in general, are made to scale, but all working dimensions shall be taken from the figured dimensions or by actual measurements at the job and in no case by scaling. The Contractor shall study and compare all drawings and verify all figures before laying out or constructing the work and shall be responsible for any and all errors in his work which might have been avoided thereby. Whether or not an error is believed to exist, deviation from the Drawings and the dimensions given thereon shall be made only after approval in writing is obtained from the Architect.

6. In the event addendum(a) are issued and contain changes to the Drawings and/or the Specifications, the provisions in the addendum(a) supersede previously issued Drawings and/or the Specifications.

D. Organization of the Specifications into divisions, sections, and articles, and arrangement of the Drawings shall not control the Contractor in dividing the work among the SubContractor or in establishing the extent of the Work to be performed by any trade.

E. Unless otherwise stated in the Agreement, words and abbreviations which have well-known technical or construction industry meanings are used in the Agreements in accordance with such recognized meanings.

F. The Contractor, and all SubContractors, shall refer to all of the Drawings, including those showing the work of others performing work in connection with the Project, including but not limited to the General Contractor (if any), the Plumbing Contractor, the Heating, Ventilation, Air Conditioning Contractor, Electrical Contractor and other specialized trades, and to all of the Divisions of the Project Manual, and shall perform all work reasonably inferable therefrom as being necessary to produce the indicated results.

G. All indications or notations on the Drawings which apply to one of a number of similar situations, materials or processes shall be deemed to apply to all such situations, materials, or processes wherever they appear in the Work, except where a contrary result is clearly indicated by the Drawings or the Project Manual. All work mentioned or indicated in the Drawings or the Project Manual shall be performed by the Contractor unless it is specifically indicated therein that the work is to be performed by others.

H. The Drawings, the Specifications, and other documents prepared by the Architect are instruments of the Architect's service through which the Contractor's work is to be performed. The Contractor may retain one contract record set during the course of the Project. Neither the Contractor nor any SubContractor, Sub-SubContractor or material or equipment supplier shall own or claim a copyright in the Drawings, the Specifications, and other documents prepared by the Architect, and unless otherwise indicated, the Architect shall be deemed the author of them and will retain all common law, statutory, and other reserved rights, in addition to the copyright.

All copies of them, except the Contractor's record set, shall be returned or suitably accounted for to the Architect, on request, upon completion of the Work.

I. The Drawings, the Specifications, and other documents prepared by the Architect, and copies thereof furnished to the Contractor, are for use solely with respect to this Project. They are not to be used by the Contractor or any SubContractor, Sub-SubContractor or material or equipment supplier on other Projects without the specific prior written consent of the Owner and the Architect. The Contractor, SubContractors, Sub-SubContractors and material or equipment suppliers are granted a limited license to use and reproduce applicable portions of the Drawings, the Specifications, and other documents prepared by the Architect appropriate to and for use in the performance of its work pursuant to its Agreement with the Owner. All copies made under this license shall bear the statutory copyright notice, if any, shown on the Drawings, the Specifications, and other documents prepared by the Architect. Submittal or distribution to meet official regulatory requirements or for other purposes in connection with the Project is not to be construed as publication in derogation of the Architect's copyright or other reserved rights.

J. The Owner shall furnish surveys describing physical characteristics of the site, upon written request of the Contractor and to the extent such survey is in existence at the time of said request, legal limitations, and utility locations for the Project. Nothing herein shall be construed as requiring the Owner to generate any document which it does not possess at the time of the request by the Contractor. In the event that the survey provided does not clearly delineate the metes and bounds of the Owner's property, the Contractor shall stop work and immediately notify the Architect, the Construction Manager, and the Owner. The Contractor shall NOT proceed with its work until it receives written permission from the Construction Manager and/or the Architect. The Contractor shall be fully responsible for all costs arising from non-compliance with this provision. Any delays associated with this provision shall not serve as a basis for a claim by the Contractor.

K. From the basic data established by the Owner, the General Contractor shall establish reference control points and complete the layout of the work. Each contractor is responsible for utility markouts as it pertains to the scope of their work and maintaining markout during work. Sketch of layout with reference points to be given to the Construction Manager and the Architect at the time of markout.

L. The Contractor shall be responsible for all measurements that may be required for execution of the work to the exact position and elevation as prescribed in the Specifications, shown on the Drawings, or as the same may be modified at the direction of the Architect to meet changed conditions.

M. The General Contractor shall be responsible for the establishment of points, wall, and partition lines required by the various Prime Contractors and their respective SubContractors in laying out their work.

N. Each contractor shall furnish such stakes and other required equipment, tools, and materials, and all labor as may be required in laying out any part of the work from the base lines and benchmarks established by the Owner.

O.

1. The General Construction Contractor shall establish a baseline and benchmark system for each building addition, area of renovation or component using the services of a licensed professional surveyor. The surveyor(s) employed to establish this system or to extend and maintain an existing benchmark system for the work of other trades shall have not less than five (5) years of experience in performing construction surveys similar to the work they will perform for the Project. The remaining contractors and their respective subcontractors shall be responsible for extending these lines, levels, and grades, and for performing all layout for their own work. The Contractor is solely responsible for any damage or loss due to incorrect extension of lines, level, or grades in their layout. The Contractor and its SubContractors shall be responsible for the accuracy with respect to the layout of their work. Any discrepancies or errors in the Drawings, perceived by another contractor or subcontractor shall be immediately reported to the Construction Manager. If any corrections are necessary, they shall be executed in accordance with the terms and provisions of these General Conditions.

2. The Contractor and its SubContractors shall be responsible to offset or to protect their markings from anything that may disturb them.

3. Every contractor shall work off the lines and elevations established and maintained as the baseline and benchmark system.

4. Each contractor is responsible for the accuracy of his own work.

P. The Architect may require that construction work be suspended at any time when location and limit marks established by the Contractor are not reasonably adequate to permit checking completed work or the work in progress.

Q. Except for the basic building permit, and other permits that the Architect may be required to obtain on behalf of the Owner, the Contractor shall be responsible for securing and maintaining for the life of the Project: all permits, P.E. Licenses, connection fees, inspections, etc. applicable to, or customarily secured for the work. This provision includes any permits to be issued in the name of the Contractor required for the work. Originals of all permits are to be issued in the name of the Contractor as required for the work. The Contractor shall furnish the Construction Manager with original copies of all permits prior to the commencement of the work, and shall prominently display a copy of all permits at a location approved by the Construction Manager.

R. The Contractor shall take field measurements and verify field conditions and shall carefully compare such field measurements and conditions and other information known to the Contractor with the Contract Documents before commencing activities. Errors, inconsistencies, or omissions discovered shall be reported to the Architect in writing at once.

S. The exactness of grades, elevations, dimensions, or locations given on any drawings issued by the Architect, or the work installed by other contracts, is not guaranteed by the Architect or the Owner. The Contractor shall, therefore, satisfy itself as to the accuracy of all grades, elevations, dimensions, utilities, and locations. In all cases of interconnection of its Work with existing or other work, it shall verify at the site all dimensions relating to such existing or other work. Any errors due to the Contractor's failure to so verify all such grades, elevations, locations, or dimensions shall be promptly rectified by the Contractor without any additional cost to the Owner.

T.

1. The Contractor shall give the Architect timely written notice of any additional design drawings, specifications, or instructions required to define its work in greater detail, or to permit the proper progress of its work. To the extent the Architect advises the Contractor that the Drawings, the Specifications and/or instructions given are sufficiently detailed for the Contractor to perform its work, the Architect shall be under no obligation to further clarify or define the work to be performed. In all other circumstances, the Architect shall issue a field order which responds to the request for information.

2. Requests for Information (RFIs) are for requests on clarifications or questions on the Drawings and/or the Specifications, not contract terms, scheduling items, or general correspondence nor, as a means to describe or request approval of alternate construction means, methods or concepts or substitution or materials, systems means and methods. The Contractor shall fill all RFIs out in accordance with the provisions of the Project Manual. Neither the Architect nor the Construction Manager shall fill said forms out on the Contractor's behalf.

U. The Contractor shall, prior to the start of any portion of the Work:

1. review any specified construction or installation procedures, including those as may be recommended by the proposed manufacturer;

2. advise the Architect if the specified procedure(s) deviates from good construction practice;

3. advise the Architect if following said procedure(s) will affect any warranty, including the Contractor's general warranty;

4. advise the Architect of any objections the Contractor may have to the specified procedure(s); and

5. propose any alternative procedure(s) which the Contractor will warrant.

V.

1. To the fullest extent possible, the Contractor shall provide products of the same kind, from a single source. When two or more items of same material or equipment are required (pumps, valves, air conditioning units, etc.), they shall be of the same manufacturer. Product

manufacturer uniformity does not apply to raw materials, bulk materials, pipe, tube, fittings (except flanged and grooved types), sheet metal, wire, steel bar stock, welding rods, solder, fasteners, motors for dissimilar equipment units, and similar items used in the work, except as otherwise indicated. The Contractor shall provide products which are compatible within systems and other connected items. If the Contractor is given option of selecting between two or more products for use on the Project, the product selected shall be compatible with products previously selected, even if previously selected products were also options.

2. The Contractor is responsible for providing products and construction methods compatible with products and construction methods of other Contractors. If a dispute arises between contractors over concurrently selectable but incompatible products, the Architect will determine which products shall be used.

3. With respect to sitework materials, all products submitted for use and incorporated into the Project shall be on the Approved List of Materials and Equipment published by the NYSDOT Materials Bureau, most recent edition.

4. All products submitted for use and incorporated into the Project shall be asbestos free.

W. Equivalents. In the Specifications, one or more kinds, types, brands, or manufacturers or materials are regarded as the required standard of quality and are presumed to be equal. The Contractor may select one of these items or, if the Contractor desires to use any kind type, brand, or manufacturer or material other than those named in the Specifications, they shall indicate in writing, and prior to award of contract, what kind, type, brand or manufacturer is included in the base bid for the specified item. The Contractor shall follow the submission requirements for substitutions as set forth in Article 6.X below.

X.

1. Substitutions. If the Contractor desires to substitute any kind, type, brand, or manufacturer of material other than those named in the Specifications, the Contractor shall indicate the desired substitution in its bid, including the following:

a. For which specified material or equipment the request for substitution is being made.

b. What kind, type, brand, or manufacturer is sought to be substituted for the specified items.

c. Written documentation evidencing that the substituted material or equipment meets or exceeds the Specifications for materials and/or equipment set forth in the Project Manual. Such documentation shall include, but not limited to, a full explanation of the proposed substitution, together with a submittal of all supporting data including technical information, catalog cuts, warranties, test results, installation instructions,

operating procedures, significant qualities of proposed substitution (*e.g.*, performance, weight, size, durability and visual effects), and other like information necessary for a complete evaluation of the substitution. Additionally, the Contractor shall provide material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated. All such data shall be provided to the Architect and the Owner at the Contractor's sole expense. The Contractor's written explanation shall also include a list of reasons the substitution is advantageous and necessary, including the benefits to the Owner and the Project in the event the substitution is acceptable. Additionally, the Contractor shall submit to the Architect information describing in specific detail how the proposed substituted product differs from the quality and performance required by the Specifications, and such other information as may be required by the Owner or the Architect.

d. Coordination information, including a list of changes or modifications needed to other parts of the Work and to construction performed by the Owner and separate contractors that will be necessary to accommodate proposed substitution.

e. Samples, where applicable or requested.

f. Detailed comparison of the Contractor's Construction Schedule using proposed substitution with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating lack of availability or delays in delivery.

g. Detailed comparison of the difference in cost between the specified product and the proposed substitution, including any and all costs associated with changes or modifications needed to other parts of the work and to construction performed by the Owner and/or separate contractors that will be necessary to accommodate proposed substitution. In the event the substitution is accepted, the Contractor proposing the use of the substitution shall bear all costs associated with said changes or modifications.

2. By making said requests in conformance with procedures established herein and elsewhere in the Project Manual, the Contractor:

a. represents that a representative of it has personally investigated the proposed substitute product and has determined that it is equal to or superior in all respects to that specified;

b. represents that the warranty for the substitution will be the same, or greater than, that applicable to the specified product;

c. certifies that the cost data is complete and includes all related costs under this contract, including professional services necessary and/or required for the Architect/Engineer to implement said substitution and waives any and all claims for additional costs related to the substitution which subsequently become apparent;

d. represents that it will coordinate the installation of the accepted substitute, making all such changes to the Drawings effected by the change, including but not limited to the electrical, plumbing, site work, and heating and ventilating specifications as may be required for the work to be complete in all respects;

e. will provide an affidavit stating that: (1) the proposed substitution conforms and meets all the requirements of the pertinent specifications and the requirements shown on the Drawings; and (2) the Contractor accepts the warranty and correction obligations in connection with the proposed substitution as if originally specified by the Architect; and the proposed substitution will have no effect on the construction schedule.

3. Proposals for substitutions shall be submitted with the Contractor's bid.

4. No substitutions will be considered or allowed without the Contractor's submittal of complete substantiating data and information as stated hereinbefore.

Y.

1. Submittal of shop drawings, product data, material safety data sheets, samples, or similar submittals shall be in accordance with the provisions of the Project Manual.

2. The Contractor represents and warrants that all shop drawings have been prepared by persons and entities possessing expertise and experience in the trade for which the shop drawing is prepared and, if required by the Architect or applicable law, by a licensed engineer, job specific, reviewed by the Contractor and stamped by the Contractor.

3. If the Contractor elects to perform its work without approvals, such work shall be at the Contractor's own risk and expense.

4. By approving and submitting shop drawings, product data, samples and similar submittals, the Contractor represents that the Contractor has determined and verified materials, field measurements and field construction criteria related thereto and has checked and coordinated the information contained within such submittals with the requirements of its work.

5. The Contractor shall not be relieved of responsibility for deviations from requirements of its work by the Architect's approval of shop drawings, product data, samples, or similar submittals, unless the Contractor has specifically informed the Architect in writing of such deviation at the time of submittal and the Architect has given written approval to the specific deviation. The Contractor shall not be relieved of responsibility for errors and/or omissions in the shop Drawings, product data, samples or other of its submittals to the Architect, by the Architect's approval thereof.

6. The Architect shall review, approve, reject, or take other appropriate action respecting submittals made by the Contractor as set forth in the Project Manual. The Architect shall check for conformance with information given in the Drawings and Project Manual and the design concept expressed in the Agreement between the Owner and the Contractor. Review of such submittals is not conducted for the purpose of determining the accuracy and completeness of other details such as dimensions and quantities or for substantiating instructions for installation or performance of equipment or systems designed by the Contractor, all of which remain the responsibility of the Contractor. Further, the Architect's review shall not constitute approval of safety precautions or, unless otherwise specifically stated by the Architect, of construction means, methods, techniques, sequences, or procedures.

The Architect's approval of a specific item shall not indicate approval of an assembly of which the item is a component. When professional certification of performance characteristics of materials, systems or equipment is required by the Contract Documents, the Architect shall be entitled to rely upon such certification to establish that the materials, systems, or equipment will meet the performance criteria required by the Contract Documents.

7. Upon the Architect's rejection of the Contractor's shop drawings, product data, samples, and/or other documentation submitted by the Contractor to the Architect, the Contractor shall review the rejection and re-submit such shop drawing, product data, sample and or other document in accordance with the Architect's instruction. The Contractor shall direct the Architect's specific attention in writing or on re-submitted shop drawings, product data, samples, or similar submittals, to revision which have been made, including revisions not specifically requested by the Architect. Resubmission of rejected documents shall be performed within two (2) calendar days. No claim for delay or cost shall be accepted as a result of rejected documents.

8. When professional certification of performance criteria of materials, systems, or equipment is required of the Contractor, the Architect shall be entitled to rely in a reasonable and professional fashion upon the accuracy and completeness of such calculations and certifications provided, however, if the Architect, in its reasonable and professional judgment considers it advisable, the Architect shall verify the accuracy and completeness of any and all such calculations and/or certifications. In the event any and all such calculations and/or certifications are found to be inaccurate and/or incomplete by the Architect, the Contractor shall assume full responsibility and bear all costs attributable or related thereto, including, without limitation, the expense of the Architect's additional services associated with the verification of such calculations and/or certifications and the expense of the Architect's additional service made necessary by the failure of such calculations and/or certifications to be accurate or complete.

9. If the Architect is required to review the Contractor's submittal more than twice, the Contractor shall bear the cost and expense associated with such additional review as set forth in the Project Manual.

Z. The Architect will interpret and decide matters concerning performance under and requirements of the Drawings and/or the Specifications on written request of the Contractor. Such interpretations may, at the Architect's option, be issued in the form of additional drawings or instructions indicating in greater detail the construction or design of the various parts of the Contractor's work. Such drawings or instructions may be forwarded by the Architect to the Contractor by field order, construction change directive or other notice to the Contractor. The Contractor shall execute the work for which it requested an interpretation in accordance with such additional drawings or instructions without additional cost or extension of its contract time. After a decision has been rendered by the Architect on a matter for which the Contractor sought the Architect's interpretation of the Drawings and/or the Specifications, the Contractor shall proceed with the work as directed by the Architect. Failure to proceed with the work in accordance with the Architect's interpretation may be used as a basis for termination of the Contractor's contract pursuant to Article 17 of these General Conditions.

AA. The Contractor shall maintain at the site one record copy of the Drawings, the Specifications, Addenda, Change Orders, and other Modifications, in good order and marked currently to record changes and selections made during construction, and in addition approved shop drawings, Product Data, Samples and similar required submittals. These shall be available to the Architect and the Construction Manager and shall be delivered to the Construction Manager for submittal to the Owner upon the completion of its work.

BB. The Contractor shall maintain at the site, and shall make available to the Owner, the Construction Manager, and the Architect, one record copy of the Drawings (the "Record Drawings") in good order. The record drawings shall be prepared and updated during the prosecution of the Contractor's work. The prints for record drawing use will be a set of black line prints provided by the Architect to the Contractor at the start of construction. The Contractor shall maintain said set in good condition and shall use colored pencils to mark up said set with "record information" in a legible manner to show: (i) deviations from the Drawings made during construction; (ii) details in the work not previously shown; (iii) changes to existing conditions or existing conditions found to differ from those shown on any existing drawings; (iv) the actual installed position of equipment, piping, conduits, light switches, electric fixtures, circuiting, ducts, dampers, access panels, control valves, drains, openings, and stub-outs, etc.; (v) architectural and/or structural changes in the design; and (vi) such other information as either the Owner or the Architect may reasonably request. At the completion of the work, the Contractor shall transfer all information on record drawings to reproducible drawings with new information clouded and noted. Such drawings shall be stamped with the Contractor's name and "AS-BUILT" in the lower right hand corner. The colored record drawing and the as-built reproducible drawing shall be forwarded to the Construction Manager for delivery to the Owner. Final payment and any retainage shall not be due and owing to the Contractor until the record and/or as built drawings receive the approval from the Architect and the Owner (and all other closeout requirements are met).

CC. The Contractor shall maintain all approved permit drawings in a manner so as to make them accessible to government inspectors and other authorized agencies. All approved drawings shall be wrapped, marked, and delivered to the Owner within sixty (60) days of final completion of the Contractor's work.

DD. Each Prime Contractor shall be furnished, free of charge, three (3) copies of the Contract Documents and Project Manuals, including all Addenda. Any and all additional copies will be furnished to the Contractor at the cost of reproduction, postage, and handling.

ARTICLE 7
CONTRACTOR'S SAFETY/SECURITY PROGRAM

A.

1. The Contractor shall be responsible for initiating, maintaining, and supervising all safety precautions and programs in connection with the performance of its work. Prior to beginning any work, the Contractor shall submit a copy of its corporate safety plan to the Owner and the Architect. Two (2) weeks after receipt of the Notice to Proceed, the Contractor shall provide a Site Safety/Logistics Plan to the Owner and the Architect. The site logistics plan should minimally include locations of the eight-foot high temporary fence and gates, traffic plans for deliveries and removals, refuse container locations, crane locations, pick locations, boom radium, and lift locations, stockpiles, toilet locations, site water and power locations, and safety. This plan shall also show the location of all staging and storage areas, clearly separating construction and school areas. The logistical information represented by the construction documents shall serve as a minimal guide. Each contractor is required to submit their corporate safety policy within ten (10) days of receipt of the Notice to Proceed. Said policy must minimally meet OSHA standards and define details concerning the maintenance of a safe work environment and shall also define practices for the maintenance of hygiene and minimizing the spread of infectious/contagious diseases. The Contractor shall make the participation of its SubContractors in its safety program mandatory. A list of key personnel, with addresses and telephone numbers for emergency purposes shall be forwarded to the Owner and the Architect. The Owner and the Architect shall establish a fire coordination procedure and shall forward same to the Contractor for its use during the performance of its work.

2. Where applicable, the Contractor shall provide its COVID-19 Safety Plan to the Owner prior to the start of any work. The Contractor shall designate a person on its staff to be responsible for monitoring the wearing of Personal Protective Equipment ("PPE") by each person on site working with or for the Contractor. The Contractor shall strictly follow and ensure that its SubContractors follow Contractor's COVID-19 Safety Plan, as well as all applicable Center for Disease Control guidelines and Local, State & Federal Orders.

3. All laborers, workers, and mechanics employed in the performance of the work of the Project shall be certified as having successfully completed a course in construction safety and health approved by the United States Department of Labor's Occupational Safety and Health Administration that is at least ten (10) hours in duration.

4. The Contractor and its SubContractors shall conduct their operation in accordance with the Safety Guides for Construction as issued by the New York State Education Department ("NYSED"), and the Contractors' Safety Program.

5. All safety equipment, including hard hats and weather protective gear required for the Contractor to perform its work, are to be supplied by the Contractor and/or its SubContractors. Within the designated construction areas, the Contractor's employees, superintendents, and/or other agents, and its SubContractors, employees, superintendents, and/or other agents are required to wear hard hats and other required and/or essential safety equipment. Each person seen without a hard hat, or otherwise failing to comply with this requirement, will be ordered to leave the Project. No prior warnings will be given by the Owner, the Construction Manager, and/or the Architect. The Contractor and its SubContractors shall be solely responsible for making up and paying for any loss of production or required progress resulting from the removal of personnel from the Project as set forth herein including any costs incurred by the Owner in connection with the work of other contractors.

6. The Contractor and its SubContractors shall provide blankets and auxiliary fire protection as part of its construction safety program to prevent damage to adjacent work or materials as a result of its welding or burning operations. Additionally, as part of its construction safety program, the Contractor and its SubContractors shall provide a fire watch, with a fire extinguisher, which is acceptable to the Owner and the Construction Manager.

7. The Construction Manager and/or the Owner reserve the right to have all operating equipment periodically inspected by an independent inspector whose finding will be binding. The Contractor, at its own expense, must make corrections within two (2) working days of receiving a written report.

8. All flagmen required for deliveries to the site are to be furnished by the Contractor or its SubContractors responsible for the delivery. Any and all deliveries crossing the site or student traffic areas shall be escorted by flagmen. All flagmen shall wear orange vests.

B. The Contractor shall schedule weekly safety meetings and each of its SubContractors must be properly represented at such meetings. The Contractor shall designate a responsible member of the Contractor's organization at the site whose duty shall be the prevention of accidents. The Contractor shall notify the Construction Manager in writing of its "OSHA Competent Person Regarding Safety." Said person must be an individual capable of identifying existing and predictable hazards in the surroundings or working conditions which are unsanitary, hazardous, or dangerous to employees, and who has authorization to take prompt corrective measures to eliminate them. This person shall be the Contractor's Superintendent, unless otherwise designated by the Contractor in writing to the Construction Manager and the Architect. The Contractor shall take all necessary steps to prevent its employees from disturbing and/or damaging the facility and shall be responsible for preventing the escape of fires set in connection with the construction. The Contractor shall notify its employees and its SubContractors of the location of the nearest fire alarm box at all locations where the work is in progress. On a weekly

basis, the Contractor shall submit to the Construction Manager and the Architect minutes of its safety meetings, which minutes shall include a list of the individuals present at such meetings.

C. The Contractor and each of its SubContractors shall conduct its/their operation in accordance with all applicable federal, state, and local laws, ordinances, regulations, rules, codes, orders, and policies. The Contractor agrees, in order that the work will be completed with the greatest degree of safety to conform to the requirements of the Occupational Safety and Health Act of 1970 and the Construction Safety Act of 1969, including all standards and regulations that have been since or shall be promulgated by the governmental authorities which administer such acts.

D. The Contractor shall give notices and comply with applicable federal, state, and local laws, ordinances, regulations, rules, codes, orders, and policies, of public authorities or governmental agencies bearing on safety of persons or property or their protection from damage, injury, or loss.

E. The Contractor shall erect and maintain, as required by existing conditions and performance of the Contract, reasonable safeguards for surety and protection, including posting danger signs and other warnings against hazards, promulgating safety regulations, and notifying owners and users of adjacent sites and utilities.

F. The Contractor shall take reasonable precautions for the safety and protection of employees at the Project and other person who may be affected by its work, including but not limited to students, staff, employees and agents of the Owner, the Construction Manager, and the Architect.

G. The Contractor shall protect and secure its work and the materials and/or equipment to be utilized in connection with its work, whether stored on or off the site and whether in its care, custody and control or that of its SubContractors, subcontractors to its subcontractors, or material suppliers.

H. The Contractor shall take all steps necessary to protect all property at or adjacent to the site, including but not limited to trees, shrubs, lawns, walks, pavements, roadways, structures, and utilities not designated for removal, relocation or replacement in the course of construction.

I. All delivery vehicles/trucks/machinery/etc. permitted on the site must be equipped with back-up alarms and enter through the designated access points. The Contractor's failure to demonstrate this ability will result in cancellation of delivery or stoppage of work. All delays associated with this cancellation will be the responsibility of the Contractor responsible for the work involved.

J. All crane picks, materials delivery, etc. must be coordinated so as not to lift over any occupied area of the building. If absolutely necessary, this work shall be done on off hours to ensure the safety of the building occupants. Crane location must be approved by the Construction Manager and the Owner in writing prior to the use of same to ensure the safety of building occupants.

K. The Owner or the Construction Manager reserves the right to have all hoisting equipment periodically inspected by an independent inspector whose findings will be binding. The Contractor, at its own expense, must make corrections cited by the inspector before continuing work. The Owner or the Construction Manager will not assume any responsibility for the safe operation of any hoisting equipment by exercising this right. The Contractor and/or its SubContractor(s) shall cooperate with the inspector by allowing time for the inspection. The Contractor shall be notified twenty-four (24) hours prior to the time of the inspection. These inspections do not release the Contractor if its responsibility to provide all engineering, permits and inspections as required by OSHA or the NYSED prior to use of any hoisting equipment.

L. The Contractor shall use the entrances designated on the site logistic plans and Drawings for personal vehicles, trucks, equipment, deliveries, and the like.

M. All interior temporary partitions and emergency egress barriers (if required) are to be installed on an after-hours basis (weekends/school holidays).

N.

1. When use or storage of hazardous materials or equipment or unusual construction methods are necessary to perform its Work, the Contractor shall obtain the Owner and the Construction Manager's consent for the use of such materials, equipment, or unusual construction methods. In the event the Owner determines that the use of such hazardous material or equipment or unusual construction methods can be performed by the Contractor with alternative means, methods and/or techniques, the Contractor shall employ such alternate means of prosecuting its work at no additional cost to the Owner.

2. In the event the Owner approves the use or storage of such hazardous materials, equipment or unusual construction methods, the Contractor shall provide for the Owner's and the Construction Manager's use a full set of safety instructions relating to all such materials. Additionally, when the Owner and/or the Construction Manager reviews the use of storage of such hazardous materials, equipment, and or unusual construction methods, the Contractor shall exercise the highest degree of care and carry on such activities under supervision of properly qualified personnel.

3. Transportation, storage, and use of explosives shall be in strict accordance with all federal, state, and local laws, ordinances, regulations, rules, codes, orders, and policies of public authorities or governmental agencies. All safety precautions as set forth in the "Manual of Accident Prevention in Construction" published by the Associated General Contractors of America, Inc. shall be observed.

4. The Contractor is responsible for its own storage and personnel trailers at the site. The Contractor will be required to supply man trailers and storage box trailers as required. All costs related to delivery, construction, protection, power, etc. for said trailers are the responsibility of the Contractor utilizing the space. The Owner WILL NOT PROVIDE STORAGE SPACE. The placement of personnel and/or storage trailer will be strictly limited to pre-

determined locations. The Contractor shall obtain the prior written approval of the placement of any trailer or storage box from the Construction Manager.

O. During construction, the General Contractor shall be responsible for maintaining a watertight structure. This shall include additions and existing buildings. The General Contractor shall be responsible for temporary roofing, tarps, and other protection at roofs, cavity walls, etc. Should the General Contractor fail to provide adequate protection, causing flooding, damage, or other disturbance to the existing building, the Contractor shall be responsible for all costs associated with clean up and repairs. Inasmuch as flooding and damage have safety implications to the general public, clean up, and repairs may be made by the Owner without warning to the General Contractor. Administration costs incurred by the Owner and Architect will also be back charged to the General Contractor. The General Contractor, by entering into contract with the Owner agrees to be liable for these costs.

P. When all or a portion of the Contractor's work is suspended for any reason, the Contractor shall securely fasten down all coverings and protect the work, as necessary, from injury or damage by any cause.

Q.

1. The Contractor shall promptly remedy damage and loss to all property of the Owner, or adjacent to the Owner's property (other than damage or loss covered by insurance) caused in whole or in part by the Contractor, a SubContractor, a Sub-SubContractor, or anyone directly or indirectly employed by any of them, or by anyone for whose acts they may be liable, except damage or loss attributable to acts or omissions of the Owner or the Architect or anyone directly or indirectly employed by either of them, or by anyone for whose acts either of them may be liable, and not attributable to the fault or negligence of the Contractor.

2. Title to all completed or partially completed work at the job site, and to all materials delivered to and stored at said job site which are intended to become a part of the completed work covered by the Agreement between the Contractor and the Owner, shall be in the name of the Owner. Notwithstanding the foregoing, and prior to acceptance of the completed work by the Owner, the Contractor shall be liable for all loss of or damage to said completed work, partially completed work, materials furnished by the Contractor, and/or materials or equipment furnished by others, the custody of which has been given to the Contractor, arising from any cause other than those against which the Owner herein undertakes to carry insurance. In the event of loss or damage caused by the Contractor, the Contractor shall replace or repair same at its own cost and expense, to the satisfaction of the Owner, the Construction Manager, and the Architect.

R. The Contractor shall promptly report in writing to the Owner, the Architect, and the Construction Manager all accidents arising out of or in connection with the Work which cause death, person injury, or property damage, giving full details and statements or any witnesses. In addition, if death, serious personal injuries, or serious property damages are caused, the accident shall be reported immediately by telephone or messenger to the Owner, the Construction Manager, and the Architect.

S. In an emergency affecting safety of persons or property, the Contractor shall act, at the Contractor's discretion, to prevent threatened damage, injury, or loss.

T. Any and all fines or citations levied against the Owner, the Architect, or the Construction Manager due to the failure of the Contractor to comply with regulations of any governing authority, shall be paid for by the Contractor. This shall include any interest or late charges which accrue due to the Contractor's failure to remit payment upon receipt of such levies.

U. The Contractor acknowledges that the Labor Law of the State of New York, and regulations adopted thereunder, place upon both the Owner and the Contractor certain duties and that liability for failure to comply therewith is imposed on both the Owner and the Contractor regardless of their respective fault. The Contractor hereby agrees that, as between the Owner and the Contractor, and to the extent permitted by law, the Contractor is solely responsible for compliance with all such federal, state, and local laws, ordinances, regulations, rules, codes, orders, and policies imposed for the protection of persons performing the Contract.

V. The Construction Manager, the Owner, and/or the Architect will not assume any responsibility for the safe operation of any cranes or equipment. The Contractor and its SubContractors shall cooperate with the inspector by allowing time for inspection. The Contractor will be notified twenty-four (24) hours prior to the time of the actual inspection. The Contractor is obligated to perform all engineering, obtain all permits (except as otherwise noted in Article 6(Q), and to have all hoisting equipment inspected as required by OSHA, Village, Town, County, State, and Federal regulations as well as any other agency having jurisdiction. Copies of all inspection reports and certificates must be transmitted to the Construction Manager as soon as possible.

ARTICLE 8
CHANGES IN THE WORK

A. Without invalidating the Agreement between the Owner and the Contractor, and without notice to the Contractor's surety, the Owner may, at any time or from time to time, order additions, deletions, or revisions in the Contractor's work. Such additions, deletions or revisions will be authorized by field order, change order, or construction change directive.

B. Field orders are an interpretation of the Drawings and/or the Specifications which order minor changes in the Contractor's work which will not result in an increase or decrease in the Contractor's total contract sum. From time to time, the Architect may issue field orders to the Contractor. The work included in such field order shall be performed by the Contractor at no additional cost to the Owner and shall not form the basis for a claim for an extension of time of the Contractor's time to complete its work. Hence, the Contractor shall perform the work included in field orders so as to cause no delay to its work and/or the work of other contractors engaged by the Owner in connection with the Project. All field orders shall be given to the Contractor and the Construction Manager by the Architect in writing.

C.

1. When the Owner or the Architect (in association with the Construction Manager) request that the Contractor perform work which is not included in the contract Drawings or the Specifications and which will result in additional cost to the Owner, the Architect/Construction Manager shall issue a PCO Number and shall request that the Contractor submit its proposal for performing such additional work. The Contractor shall submit its proposal to the Construction Manager and the Architect for review. The Contractor's proposal shall include a complete itemization of the costs associated with performing its work including labor and materials. All proposals for any work that a contractor, its subcontractor(s) or subcontractor(s) of subcontractor(s) perform in connection with additional work shall be submitted using the following format and in no event shall the total for overhead and profit (Contractor and SubContractor Costs) on any change order exceed fifteen percent (15%) of the cost of the work.

1.	Materials (Itemized Breakdown) including quantities and cost	
2.	Labor (Itemized Breakdown)	
3.	Subtotal (Add lines 1 and 2)	
4.	Credit for work not required due to additional or changes to the work reflected in the within change order (if any)	
5.	Overhead (10% x line 3)	
6.	Subtotal (Add lines 3 through 5)	
7.	Sub-Contract Work (Include itemized breakdown. Sub-Contractor(s) overhead and profit allowed is 10%)	
8.	Subtotal (Add lines 6 and 7)	
9.	Profit (5% x line 8)	
10.	Subtotal (Add lines 8 and 9)	
11.	Rental Value of Equipment (Itemized Breakdown)	
12.	Actual additional charges for bonds	
13.	TOTAL CHANGE ORDER (Add lines 10, 11 and 12)	

2. All proposals submitted by the Contractor without the itemization indicated herein will be returned to the Contractor for re-submission by the Contractor. For any work performed by the Contractor's own forces, fifteen percent (15%) for overhead and profit will be allowed for labor and material related costs. Costs to which overhead is to be applied shall be limited to cost of labor and materials including the cost of delivery. Under no circumstances shall any change order proposal exceed fifteen percent (15%) of the cost of overhead and profit.

The Contractor shall not be entitled to recover overhead and profit on the rental value of equipment and machinery. "Equipment and machinery" shall not include: (1) tools customarily used by the Contractor's trade, including but not limited to hand tools; and/or (2) equipment and machinery already on site and being utilized by the Contractor for the original scope of work.

The Contractor shall submit with its change order proposals actual invoices from its insurance broker reflecting actual additional costs associated with the procurement of bonds.

3. The Contractor's SubContractor's proposal for any work it is to perform in connection with the additional work shall only include ten percent (10%) for the SubContractor's overhead and profit including sub-subcontracted work. The Contractor is entitled to five percent (5%) on work performed by its SubContractor in accordance with paragraph C(1) of this Article 8. Costs to which overhead is to be applied shall be limited to cost of labor and materials including the cost of delivery. Under no circumstances shall the Contractor or the Contractor's SubContractor(s) be entitled to be reimbursed for overtime, except when specifically approved by the Owner in writing and not as an Extraordinary Measure as set forth in Article 13, and in such event the Contractor shall be paid for by the Owner on the basis of premium payment.

4. Notwithstanding the foregoing, work which is performed pursuant to an allowance included in the Contractor's base contract, the provisions of Article 9, paragraph B, concerning itemization of such work shall be controlling.

5.

a. A change in the Contract Sum shall be accomplished only by a written Change Order. Accordingly, no course of conduct or dealings between the parties, nor express or implied acceptance of alterations or additions to the Work, whether or not there is, in fact, any unjust enrichment to the Work, shall be the basis of any claim as defined in Article 18 of these General Conditions to an increase in any amounts due under the Contract Documents or a change in any time period provided for in the Contract Documents. **No amount shall be payable by the Owner to the Contractor for performance of work without a written and fully executed Change Order.**

b. Upon the Contractor's completion of the Change Order work, and prior to payment being made to the Contractor for such work, the Contractor shall provide the Owner with the following information:

(1) Certified payrolls itemizing the labor actually utilized in connection with the change order work.

(2) Copies of invoices from SubContractors supplying work in connection with the change order work.

D.

1. When the Owner or the Architect request that portions of the Contractor's work originally included in the Drawings or the Specifications be deleted and which will result in a reduction of the Contractor's original contract sum, the Architect shall request that the Contractor submit its proposal for deleting the scope of such work from its contract. The Contractor's proposal shall include a complete itemization of the costs associated with deducting such work including labor and materials and shall be submitted using the format set forth in Article 8, paragraph C(1) or the schedule of values, whichever is greater. The Contractor shall not be entitled to retain its overhead and/or profit for such work nor shall any of its SubContractors which were to perform the work being deducted from the Contractor's scope of work.

Additionally, the Contractor shall reflect the reduced cost of premiums on bonds which are to be supplied herein as a result of such change. When both additions and credits covering related Work or substitutions are involved in a change, the allowance for overhead and profit shall be figured on the basis of net increase/decrease with respect to that change.

2. The Owner may in its sole discretion deduct and/or reduce the scope of the Contractor's contract with or without any specific reasons therefor.

E.

1. In the event the Contractor and the Owner cannot agree on the sum by which its contract with the Owner is to be increased or reduced based upon changes to the scope of the work as described in this Article 8, the Architect shall issue a construction change directive reflecting the deduction and/or reduction of the scope of the Contractor's contract and the Contractor will (a) in the case of additional work to be performed by the Contractor, perform such additional work in an expeditious manner so as not to delay the work of this or other contractors working at the site, and (b) in the case of work to be deducted from the scope of the Contractor's work, refrain from taking any steps in connection with the work associated with the deduction and/or reduction of the scope of the Contractor's work. The construction change directive shall include (a) a description of the work being added or deducted from the Contractor's scope of work; (b) the amount the Owner has determined to be the cost associated with the additional work or deduction and/or reduction of the scope of the Contractor's contract until the Owner and the Contractor agree upon the increase or decrease in the Contractor's contract sum, or until a claim filed by the Contractor has been determined; (c) the extent to which the contract time will be adjusted as a result of the change in the scope of work. Any claims must be filed in accordance with the requirements set forth in Article 18 of these General Conditions. Failure to timely file any claim in accordance with requirements set forth therein shall constitute a waiver of such claim.

2. In the event the Contractor and the Owner reach Agreement on the amount by which the Contractor's contract sum is to be increased or decreased based upon changes to the scope of the Contractor's work as described in this Article 8, the Architect, the Owner, the Construction Manager, and the Contractor shall sign a change order reflecting such agreement. The change order shall include: (a) the description of the change in the scope of the Contractor's work; (b) the amount of the adjustment to the Contractor's contract sum, if any; and (c) the length of time by which the time to complete the contract will be adjusted, if any. Agreement between the Owner and the Contractor in connection with any change order shall constitute a final settlement of all matters relating to the change in the Contractor's work as reflected in said change order, including but not limited to, all direct and indirect costs associated with such change and any and all adjustments to the Contractor's contract sum and the construction schedule. All such change orders for which the Owner and the Contractor have reached agreement shall be included as a separate line item in the Contractor's applications for payment as if originally part of the Contractor's agreement with the Owner.

F. Neither the Owner, the Construction Manager nor the Architect may issue instructions to the Contractor to change the amount of the Contract, except by properly executed Change Orders

or Construction Change Directive. Instructions are issued by the Owner or the Construction Manager through the Architect, to the Contractor. The instructions shall not be carried out by the Contractor prior to a written order in the form of a Change Order, signed by the Owner, the Architect and the Contractor, authorizing a change in the Contract amount or an adjustment to the Contract Sum. No amount shall be payable by the Owner to the Contractor for performance of work without an executed Change Order.

ARTICLE 9
PAYMENTS

A.

1. Prior to commencing its work on the Project and within one (1) week of receipt of a Notice to Proceed, the Contractor shall submit to the Construction Manager and the Architect, a schedule of values which includes the amount of money it has allocated in its bid price for the following items of work which are applicable to the Contractor's work. Said schedule of values shall include each of the CSI division sections reflected in the Specifications and applicable to the contract for which the Contractor has been awarded the contract, together with the requirements for bonds/insurance (based upon actual invoice amount), general conditions, meeting attendance and meeting documentation (at least two percent (2%) of the contract sum), shop drawing/product data/sample submissions (at least one percent (1%) of contract sum), labor and materials on line items as applicable, temporary utilities and services, HVAC balance reports, coordination drawings, punch list (at least one percent (1%) of the contract sum), warranties/guarantees and close out of the Project (at least three percent (3%) of the contract sum), and allowance, where applicable.

2. Any schedule of values which fails to include sufficient detail, is unbalanced or exhibits "front loading" of the value of the Contractor's work will be rejected. Furthermore, if the schedule of values has been approved by the Construction Manager and the Architect and is subsequently used, but later is found by the Construction Manager or the Architect to be improper for any reason, sufficient funds shall be withheld from the Contractors' future applications for payment to ensure an adequate reserve (exclusive of normal retainage) to complete the Contractor's work.

3. The schedule of values shall be drafted so as to reflect multiple construction sites, multiple locations within each site, additions versus renovations of work, and the like so as to satisfy any NYSED requirements for the Project.

4. The schedule of values prepared by the Contractor must be approved by the Construction Manager and the Architect prior to the payment of any sums due the Contractor.

B. The Contractor shall include in its contract sum all allowances stated in the Specifications. However, the Contractor's costs for unloading and handling at the site, overhead, profit, and other expenses contemplated for the stated allowance amounts shall be included in its contract sum and not in the allowances.

C. The Contractor shall submit its applications for payment to the Construction Manager and the Architect on a periodic basis. The form to be used by the Contractor shall be AIA G732 and 703/CMa approved by the Construction Manager, the Architect, and the Owner for use in connection with the Contractor's work. The form shall be divided in sufficiently in the same form as the Contractor's schedule of values and shall reflect in separate line items for the work:

1. Total value of the work listing labor and material separately.

2. Percentage of work completed at the time of submission of the application for payment.

3. Value of the work completed at the time of submission of the application for payment.

4. Percent of previous amount billed.

5. Previous amount billed.

6. Current percent completed.

7. Value of work completed to date.

8. Percent remaining to be completed by the Contractor.

9. Value of work remaining to be completed by the Contractor.

D.

1. Payments to the Contractor shall be based upon materials and equipment delivered and suitably stored at the site and/or incorporated into the Contractor's work, together with the labor utilized by the Contractor in connection with its work. The Contractor may be paid for materials and/or equipment which has been delivered to the Owner's facilities but which, at the time of submission of its application for payment, has not yet been incorporated into the Contractor's work upon such conditions and requirements as the Owner, the Construction Manager and/or the Architect may advise the Contractor it must satisfy.

2. The Construction Manager and the Architect shall review the application for payment submitted by the Contractor and shall advise the Contractor of any adjustments to be made thereto. The Construction Manager and/or the Architect may make such adjustments under the following circumstances:

a. the Contractor's failure to remedy defective work;

b. the filing of third-party claims or reasonable evidence that there is a probability that such claims will be filed;

c. receipt by the Owner of a notice of withholding from the New York State Department of Labor or other administrative agencies having jurisdiction over the Project;

d. the Contractor's failure to make proper payments to its SubContractors or material suppliers for labor, materials and/or equipment;

e. reasonable evidence that the Contractor will not complete its work for the unpaid balance of the remaining monies on its contract;

f. damages caused to the Owner, the Construction Manager, the Architect or another contractor as a result of the Contractor's performance of its work;

g. reasonable evidence that the Contractor will not complete its work in accordance with its Agreement with the Owner, and/or that the remaining monies available on the Contractor's contract will not be sufficient to cover actual or liquidated damages for the anticipated delay;

h. the Contractor's failure to carry out its work in accordance with the Drawings and/or the Specifications;

i. the Contractor's failure to notify the Architect of errors or inconsistencies between and among the Drawings and the Specifications;

j. the Contractor's and/or its SubContractors' failure to comply with the requirements for maintaining record drawings;

k. the Architect's and/or the Construction Manager's discovery or observation of work which has been previously paid for by the Owner which is defective and/or incomplete;

l. such other acts and/or omissions by the Contractor in connection with the performance of its work;

m. the amount requested exceeds the percent completion of work on the site.

3. After any such adjustments are made to the Contractor's application for payment, the Contractor shall submit four (4) copies of the final draft of its application for payment to the Construction Manager and the Architect, which shall be accompanied by the following documentation:

a. A current Contractor's lien waiver and duly executed and acknowledged sworn statement showing all SubContractors and material suppliers with whom the Contractor has entered into subcontracts, the amount of each such subcontract, the amount requested for any SubContractor and

material suppliers in the requested progress payment and the amount to be paid to the Contractor from such progress payment, together with similar sworn statements from all such SubContractors and material suppliers;

b. Duly executed waivers of public improvement liens from all SubContractors and material suppliers and lower tiered SubContractors or material suppliers establishing payment or satisfaction of payment of all amounts requested by the Contractor on behalf of such entities or persons in any previous application for payment; and AIA Form G706 or G706A.

c. Certified payroll for employees of the Contractor and employees of SubContractors performing work on the Project.

d. Copies of invoices submitted to the Contractor by its SubContractors and/or material suppliers.

e. Such other information which the Owner, the Construction Manager and/or the Architect request the Contractor furnish in connection with its application for payment, including but not limited to, Contractor change order log, Contractor submittal log and as built drawings to date.

4. Upon submission of its application for payment, the Contractor represents that it is entitled to payment in the amount for which it seeks payment.

5. In addition to the right to make adjustments to the amount the Contractor claims is due (as set forth in subparagraph 2 of this Paragraph D), the Owner may withhold payment from the Contractor and the Architect and/or the Construction Manager may withhold certification for payment, if any of the reasons set forth in subparagraph 2 exist.

6. The Owner shall make payment to the Contractor within forty-five (45) days of receipt of the Contractor's requisition of payment unless such requisition of payment is not in accordance with the terms of the Construction Documents.

7. Upon receipt of payment by the Owner, the Contractor shall promptly make payment to each of its SubContractors and/or material suppliers for which it has received payment from the Owner. This provision does not obligate the Architect, the Construction Manager, and/or the Owner to ensure payment to the Contractor's SubContractors and/or material suppliers.

8.

a. In the event a subcontractor and/or material supplier files with the Owner a public improvement lien, the Owner shall withhold payment on previously certified applications for payment which have not yet been paid or subsequent applications for payment submitted by the Contractor an amount equal to one hundred fifty percent (150%) of the amount set forth in such public improvement lien. This provision is in addition to and does not supersede the indemnity provisions set forth in Article 12 of these General Conditions.

b. The Owner may release any payment withheld due to the filing of a public improvement lien if the Contractor obtains security acceptable to the Owner or a lien bond which is: (1) issued by a surety acceptable to the Owner; (2) in form and substance satisfactory to the Owner; and (3) in an amount not less the one hundred fifty percent (150%) of such lien claim. The cost of the premiums for any such bond posted shall be borne solely by the Contractor. By posting a lien bond or other acceptable security, however, the Contractor shall not be relieved of its obligations pursuant to these General Conditions, including but not limited to the indemnity provisions set forth in Article 12 of these General Conditions.

E.

1. The Contractor shall not be entitled to payment for materials and/or equipment stored off the site unless previously approved in writing by the Owner, the Architect, and/or the Construction Manager and upon the Contractor meeting any and all conditions which the Owner, the Architect, and/or the Construction Manager may impose in connection with such materials and/or equipment, including but not limited to insurance for such materials and cost of storage and transportation associated with such materials and/or equipment. No payment will be made for "commodity type" stored materials such as block, studs, sheetrock, roofing, insulation, piping, fittings, conduit work, etc.

2. In connection with materials and/or equipment stored off the Project site, the Contractor must submit with its application for payment the following information:

a. Type of material must be specifically identified by the Contractor;

b. The Contractor must furnish an invoice from its supplier showing the total value of material and/or equipment being stored off site and must provide the bill of lading for such material and/or equipment;

c. The Contractor must provide a Certificate of Insurance in a form approved by the Owner for the full value of the item plus ten percent (10%).

d. The Contractor must execute a security agreement, together with an executed UCC-1 form;

e. The materials must be stored in a bonded warehouse;

f. The Contractor must furnish a bill of sale for stored material and/or equipment;

g. The Contractor still has liability for all materials whether paid or not until installed.

3. Any and all materials and/or equipment for which the Contractor has been paid shall be titled in the Owner upon installation by the Contractor and shall be stored in a bonded facility. For payment to be made to the Contractor, the Contractor must provide the Owner with a waiver of lien and general release from its supplier in connection with its provisions of such materials and/or equipment. Notwithstanding payment by the Owner, any and all warranties and/or guarantees required to be provided shall not begin to run until the Contractor has completed all of its work.

4. Prior to payment by the Owner, the Contractor may be required to provide the Architect and the Construction Manager with an opportunity to visually inspect the materials and/or equipment for the purpose of determining that such materials are in fact in storage, are the materials specified for the Contractor's work and for any other purpose which the Owner, Construction Manager, and/or the Architect deem necessary for payment to be made to the Contractor.

F. If the Owner is entitled to reimbursement or payment from the Contractor under or pursuant to its Agreement with the Owner, including but not limited to these General Conditions, such payment shall be made promptly upon demand by the Owner. Notwithstanding anything contained herein to the contrary, if the Contractor fails to promptly make any payment due the Owner, or the Owner incurs any costs and expenses to cure any default of the Contractor or to correct defective work, the Owner shall have an absolute right to offset such amount against the Contract Sum and may, in the Owner's sole discretion, elect either to: (1) deduct an amount equal to that which the Owner is entitled from any payment then or thereafter due the Contractor from the Owner, or (2) issue a written notice to the Contractor reducing the Contractor's contract sum by an amount equal to that which the Owner is entitled.

G. The Contractor may not assign any monies due or to become due to it pursuant to its Agreement with the Owner without the Owner's prior written consent. Any such assignment shall be in a form acceptable to the Owner. If the Contractor attempts to make such an assignment without such consent from the Owner, the Contractor shall nevertheless remain legally responsible for all obligations under its Agreement with the Owner.

H. Progress payments and all other payments shall be made in accordance with Section 106 (b) of the General Municipal Law.

I. At the same time the Contractor submits its insurance certificate to the Owner and the Construction Manager, it shall also submit to the Construction Manager the labor rates of each

category of labor for which it and/or its SubContractors shall employ (either directly or indirectly).

This information shall be itemized in the format shown below:

Contractor's Name					
Contractor's Address					
Contractor's Office Phone					
Contractor's Fax Number					
Contractor's Email Address					
Labor Rate Breakdown					
Worker's Title		**Journeyman**	**1.5 Rate**	**Foreman**	**1.5 Rate**
Base Hourly Rate					
Payroll Tax & Insurance:	**$ Per Hr.**				
FICA					
Federal Unemployment					
State					
Workers Compensation					
Disability					
Other (Explanation Required)					
Subtotal					
Benefits:	**$ Per Hr**				
Vacation					
Health & Welfare					
Pension					
Annuity					
401K Fund					
Other (Explanation Required)					
Other Explanation Required)					
Subtotal					
Hourly Labor Rate					

ARTICLE 10
INSURANCE REQUIREMENTS

A. Within ten (10) days of the award of the bid, the Contractor, at its sole cost and expense, shall provide the Owner with the following insurance coverage whether the operations to be covered thereby are through the Contractor or by a SubContractor, or by anyone directly or indirectly employed by any of them, or by anyone for whose acts any of them may be liable.

The insurance required to be procured pursuant to this Article shall be purchased from and maintained by an insurance carrier licensed and admitted to do business in the State of New York, with an AM Best rating of A-, VIII, or better. The Contractor must submit the Certificate of Insurance to the Construction Manager for the Owner's approval prior to the commencement of any work. EXCESS OR SURPLUS LINE INSURANCE CARRIERS WILL NOT BE ACCEPTED.

1. **Workers' Compensation, Paid Family Leave and NYS Disability Insurance**
   Statutory Workers' Compensation (C-105.2 or U-26.3), NYS Paid Leave and NYS Disability Insurance (DB-120.1) for all employees. Proof of coverage must be on the approved specific form, as required by the New York State Workers' Compensation Board. ACORD certificates are not acceptable. A person seeking an exemption must file a CE-200 Form with the state. The form can be completed and submitted directly to the WC Board online.

2. **Commercial General Liability Insurance**
   $1,000,000 per Occurrence/$2,000,000 aggregate
   $2,000,000 Products and Completed Operations
   $1,000,000 Personal and Advertising Injury
   $100,000 Fire Damage
   $10,000 Medical Expense
   The general aggregate shall apply on a per-project basis.

3. **Owners Contractors Protective (OCP) Insurance**:
   For Projects less than or equal to $1,000,000 and work on 1 story (10 feet) only: $1,000,000 per occurrence, $2,000,000 aggregate with the Owner as the named insured.

   For Projects greater than $1,000,000 and/or work above one story (10 feet): $2,000,000 per occurrence, $4,000,000 aggregate with the Owner as the named insured.

   The Owner will be the named insured on OCP Policies. There will be no additional insureds on any OCP Policies.

4. **Automobile Liability**
$1,000,000 combined single limit for owned, hired, borrowed and non-owned motor vehicles.

5. **Umbrella/Excess Insurance**
$5,000,000 each occurrence and aggregate for general construction (including plumbing, electrical, and HVAC) and no work at elevation (<1 story or 10 feet) or Project values less than or equal to $1,000,000.

$10,000,000 each occurrence and aggregate for high-risk construction, work at elevation (>1 story or 10 feet) or Project values greater than $1,000,000.

Umbrella/Excess coverage shall be on a follow-form basis or provide broader coverage over the General Liability and Automobile Liability coverages.

6. **Asbestos/Lead Abatement/Pollution Liability Insurance**
If the Project requires the removal of asbestos and/or hazardous materials, the Contractor shall provide hazardous material liability insurance as follows:

$2,000,000 per occurrence/$2,000,000 aggregate, including products and completed operations. Such insurance shall include coverage for the Contractor's operations including, but not limited to, removal, replacement, enclosure, encapsulation and/or disposal of asbestos, or any other hazardous material, along with any related pollution events, including coverage for third-party liability claims for bodily injury, property damage and clean-up costs. If a retroactive date is used, it shall pre-date the inception of the Contract.

If the Contractor is using motor vehicles for transporting hazardous materials, the Contractor shall provide pollution liability broadened coverage (ISO endorsement CA 9948 or CA 01 12), as well as proof of MCS 90. Coverage shall fulfill all requirements of this Article 10 and shall extend for a period of three (3) years following acceptance by the Owner of the Certificate of Completion.

7. **Testing Company Errors and Omission Insurance**
$1,000,000 per occurrence/$2,000,000 aggregate for the testing and other professional acts of the Contractor performed under the Contract with the Owner.

B. Notwithstanding any terms, conditions, or provisions, in any other writing between the parties, the Contractor hereby agrees to effectuate the naming of the Owner, the Architect, and the Construction Manager as an additional insured on the Contractor's Commercial General Liability and Excess/Umbrella insurance policies.

1. The policies naming the Owner, the Architect, and the Construction Manager as named insured or additional insured, as applicable, shall:

a. be an insurance policy from an A.M. Best A- rated insurer, licensed and admitted to conduct business in New York State; and

b. state that the coverage shall be primary and non-contributory coverage for the Owner, its Board, employees, and volunteers with a waiver of subrogation in favor of the Owner for all coverages including Workers Compensation.

2. Additional insured status for General Liability coverage shall be provided by standard or other endorsements that extend coverage to the Owner for on-going operations (CG 20 38 or equivalent) and products and completed operations (CG 20 37 or equivalent). The decision to accept an alternative endorsement rests solely with the Owner. A completed copy of the endorsement must be attached to the certificate of insurance to include General Liability, Automobile Liability and Umbrella/Excess coverages.

3. The certificate of insurance must describe all services provided by the Contractor (e.g., roofing, carpentry or plumbing) that are covered by the liability policies.

4. At the Owner's request, the Contractor shall provide a copy of the declaration page of the liability and excess policies with a list of endorsements and forms. If so requested, the Contractor will provide a copy of the policy endorsements and forms.

5. There will be no coverage restrictions and/or exclusions involving New York State Labor Law statutes or gravity-related injuries.

6. No policies containing escape clauses or exclusions contrary to the Owner's interests will be accepted.

7. The Contractor agrees to indemnify the Owner, the Architect and the Construction Manager for any applicable deductibles and/or self-insured retentions.

If written on a "claims-made" basis, the retroactive date must pre-date the inception of the Agreement. Coverage shall remain in effect for three (3) years following the completion of work. The Contractor shall also provide proof of Workers' Compensation and New York State Disability Benefits Insurance, Commercial General Liability and Excess Liability with limits of $2,000,000 each occurrence and in the aggregate.

C. Coverages shall be maintained without interruption from the date of commencement of the work until the date of final payment and termination of any coverage required to be maintained after final payment.

D. The Contractor will be permitted to commence work on the Project with the insurance certificates currently on file with the Owner. On or before July 15 of each year, the Contractor will substitute said insurance certificates with insurance in strict compliance with Article 10. In addition to any other rights or remedies that the Owner may have in law, equity or pursuant to the General Conditions of Construction set forth in the Agreement between the Owner and the Contractor, in the event the Contractor fails to provide evidence of the insurance required by Article 10 by July 15, the Owner shall assess liquidated damages of $1,000.00 for every day the Contractor fails to meet the requirements for insurance as set forth in Article 10 through final completion of the Project or the date the required insurance is submitted, whichever is earlier.

E. All insurance coverage to be provided by the Contractor, pursuant to paragraph A of this Article 10, shall include a cancellation notice to the Owner pursuant to the policy terms and conditions. All insurance coverage to be provided by the Contractor shall name the Owner, the Architect, and the Construction Manager as additional insureds on the policy, with the exception of Owners Contractors Policies. Additionally, the insurance coverage to be provided by the Contractor, pursuant to paragraph A of this Article 10, shall state that the Contractor's coverage shall be the primary and non-contributory coverage for the Contractor's work. A fully completed New York Construction Certificate of Liability Insurance Addendum (ACCORD 855 2014/15) must be included with the certificates of insurance. For any "Yes" answers on Items A through L on this Form -- additional details must be provided in writing. Policy exclusions may not be accepted.

F. The Contractor acknowledges that its failure to obtain or keep current the insurance coverage required by paragraph A of this Article 10 shall constitute a material breach of Contract and subjects the Contractor to liability for damages, including but not limited to direct, indirect, consequential, special, and such other damages the Owner sustains as a result of such breach. In addition, the Contractor shall be responsible for the indemnification to the Owner, the Architect, and the Construction Manager, of any and all costs associated with such lapse in coverage, including but not limited to reasonable attorney's fees.

G. In the event that any of the insurance coverage to be provided by the Contractor to the Owner contains a deductible, or a self-insured retention, or the insurance provided by the Owner contains a deductible, the Contractor shall indemnify and hold the Owner and the Architect harmless from the payment of such deductible or self-insured retention, which deductible shall in all circumstances remain the sole obligation and expense of the Contractor. The failure of the Owner, Construction Manager or Architect to object to the contents of the certificate or the absence of same shall not be deemed a waiver of any rights held by the Owner.

H. SubContractors are subject to the same terms and conditions as stated above and must submit same to the Owner for approval prior to the start of any work. In the event the Contractor fails to obtain the required certificates of insurance from the SubContractor and a claim is made or suffered, the Contractor shall defend, indemnify, defend, and hold harmless the Owner, Construction Manager, the Architect, Engineers, Consultants, and Sub-consultants and their officers, members of the Board, agents or employees from any and all claims for which the

required insurance would have provided coverage. This indemnity obligation is in addition to any other indemnity obligation provided in the Contract.

I. The Contractor assumes responsibility for all injury or destruction of the Contractor's materials, tools, machinery, equipment, appliances, shoring, scaffolding, false and form work, and personal property of the Contractor's employees from whatever cause arises. Any policy of insurance secured covering the Contractor or SubContractors leased or hired by them and any policy of insurance covering the Contractor or SubContractors against physical loss or damage to such property shall include an endorsement waiving the right of subrogation against the Owner for any loss or damage to such property.

J. The Owner in good faith may adjust and settle a loss with the Contractor's insurance carrier.

K. The Owner and the Contractor waive all rights against each other and any of their SubContractors, Sub-SubContractors, agents, and employees for damages caused by fire or other perils to the extent of actual recovery of any insurance proceeds under any property insurance policy procured, pursuant to paragraph A of this Article 10, or other property insurance applicable to the Contractor's work.

L. Before commencement of its work, the Contractor shall obtain and pay for such insurance as may be required to comply with the indemnification and hold harmless provisions outlined under Article 12 of these General Conditions of the Contract for Construction.

M. If the terms of policies expire, or the lives of the insurance companies terminate, before the Contract is completed or during the period of completed operations coverage, and the Contractor fails to maintain continuance of such insurance, the Owner is entitled to provide protection for itself, to pay premiums, and to charge the cost to the Contractor.

ARTICLE 11
REQUIRED BONDS FOR THE PROJECT

A. Within ten (10) days of the award of the bid, the Contractor shall furnish a Performance Bond, Labor and Material Payment Bond and Maintenance Bond (to be in effect during the warranty period) meeting all statutory requirements of the State of New York.

B. All Surety companies are subject to the approval of the Owner and may be rejected by the Owner without cause.

C. Except as otherwise required by statute, the form and substance of such bonds shall be satisfactory to the Owner in the Owner's sole judgment.

D. Bonds shall be executed by a responsible surety licensed to do business in New York with an A.M. Best Rating of "A-" or better as to Policy Holder Ratings, and "VIII" or better as to

"Financial Size Category." Such bonds shall remain in effect for a period not less than three (3) years following final completion of the work by the Contractor.

E. Bonds shall further be executed by a surety that is currently listed on the U.S. Treasury Department Circular 570 entitled "Companies Holding Certificates of Authority as Acceptable Sureties on Federal Bonds and as Acceptable Reinsuring Companies," as amended.

F. The Performance Bond and the Labor and Material Payment Bond shall each be in an amount equal to one hundred percent (100%) of the Contract Sum. The value of each bond shall be adjusted during the Project construction period to reflect changes in the Contract Sum.

G. Every Bond must display the Surety's Bond Number.

H. Each bond must be accompanied by an original Power of Attorney, giving the names of Attorneys-in-fact, and the extent of their bonding capacity.

I. A rider including the following provisions shall be attached to each Bond:

1. Surety hereby agrees that it consents to and waives notice of any addition, alteration, omission, change, or other modification of the Contract Documents. Such addition, alteration, change, extension of time, or other modification of the Contract Documents, or a forbearance on the part of either the Owner or the Contractor to the other, shall not release the Surety of its obligations hereunder and notice to the Surety of such matters is hereby waived.

2. Surety further agrees that in event of any default by the Owner in the performance of the Owner's obligations to the Contractor under the Contract, the Contractor or Surety shall cause written notice of such default (specifying said default in detail) to be given to the Owner, and the Owner shall have thirty (30) days from time after receipt of such notice within which to cure such default, or such additional reasonable period of time as may be required if the nature of such default is such that it cannot be cured within thirty (30) days. Such Notice of Default shall be sent by certified or registered U.S. Mail, return receipt requested, first class postage prepaid, to Lender and the Owner.

3. Any proceeding, legal or equitable, under this Bond may be instituted in any court of competent jurisdiction in the location in which the work or part of the work is located and shall be instituted within three (3) years after termination by the Owner of the Contractor's contract or within three years after final completion by the Contractor. In the event the Contractor files for bankruptcy, the commencement of the three-year period shall not start to run until the bankruptcy proceeding is finalized or the Owner obtains relief from an automatic stay, whichever is later.

J. The Contractor shall deliver the required bonds to the Owner prior to beginning construction activity at the site, but no later than ten (10) days of issue date of Notice of Award of Contract. Said bonds shall be in the form set forth in the Project Manual. No work shall be performed by the Contractor until such bonds have been reviewed and approved.

K. The Owner may, in the Owner's sole discretion and without prior notice to the Contractor, inform surety of the progress of the Contractor's work and obtain consents as necessary to protect the Owner's rights, interest, privileges and benefits under and pursuant to any bond issued in connection with the Contractor's work.

L. If the surety on any bond furnished by the Contractor is declared a bankrupt or becomes insolvent or its right to do business is terminated in any state where any part of the Project is located or it ceases to meet the requirements of this Article, the Contractor shall within ten (10) days thereafter substitute another Performance and Payment Bond and surety, both of which must be acceptable to the Owner.

ARTICLE 12
INDEMNIFICATION

A. The Contractor and its SubContractors shall defend, indemnify and hold harmless: (1) the Owner, its consultants, employees, officers, members of the Board of Education, and agents; (2) the Architect and its consultants, employees, officers and agents; and (3) the Construction Manager, its consultants, employees, officers and agents from and against any and all claims, damages, losses, suits, obligations, fines, penalties, costs, charges and expenses, including but not limited to attorney's fees, which may be imposed upon or incurred by or asserted against any of them by reason of any act or omission of such contractor or any of its subcontractors or any person or firm directly or indirectly employed by such contractor, for the act(s) and/or omission(s) of any contractor or subcontractor in connection with the work of the Project.

B. To the fullest extent permitted by law, the Contractor and its SubContractors shall defend, indemnify and hold harmless: (1) the Owner, its consultants, employees, officers, members of the Board of Education, and agents; (2) the Architect and its consultants, employees, officers, and agents; and (3) the Construction Manager, its consultants, employees, officers, and agents from and against claims, damages, losses, and expenses, including but not limited to attorney's fees, arising out of or resulting from performance of its work, provided that such claim, damage, loss or expense is attributable to bodily injury, sickness, disease, or death, or to injury to or destruction, of tangible property including loss of use resulting therefrom, but only to the extent caused in whole or in part by negligent acts or omissions of the Contractor, a SubContractor, anyone directly or indirectly employed by them or anyone for whose acts they may be liable, regardless of whether or not such claim, damage, loss, or expense is caused in part by a party indemnified hereunder. Such obligation shall not be construed to negate, abridge, or reduce other rights or obligations of indemnity which would otherwise exist as to a party or person described in this Paragraph B. The Contractor's indemnity obligations under this Paragraph B shall, but not by way of limitation, specifically include all claims and judgments which may be made against the Owner, the Architect, the Architect's consultants and agents and employees of any of them under any applicable statute, rule or regulation including the New York Statute, Occupational Safety and Hazardous Act, and the Federal Occupational Safety and Hazardous Act. In claims against any person or entity indemnified under this Paragraph B by an employee of the Contractor, a SubContractor, anyone directly or indirectly employed by them or anyone for whose acts they may be liable, the indemnification obligation under this Paragraph B shall not be

limited by a limitation on amount or type of damages, compensation or benefits payable by or for the Contractor or a SubContractor under workers' or workmen's compensation acts, disability benefit acts or other employee benefit acts.

C. The Contractor and its SubContractors shall defend, indemnify and hold harmless: (1) the Owner, its consultants, employees, officers, members of the Board of Education, and its agents; (2) the Architect and its consultants, employees, officers, and agents; and (3) the Construction Manager, its consultants, employees, officers, and agents from and against any fines, penalties, judgments, or damages, including reasonable attorney's fees, imposed on or incurred by the parties indemnified hereunder which are incurred as a result of the Contractor's failure to give the notices required by Article 6(T) of these General Conditions of the Contract for Construction.

D. The Contractor and its SubContractors shall defend, indemnify and hold harmless: (1) the Owner, its consultants, employees, officers, members of the Board of Education, and agents; (2) the Architect and its consultants, employees, officers, and agents; and (3) the Construction Manager, its consultants, employees, officers and agents from and against any actions, lawsuits, or proceedings or claims of liens brought against each or any of them as a result of liens filed against the Contractor's Project funds, including all the cost and expense of said liens, and including but not limited to attorney's fees incurred by each or any of them.

E. The Contractor and its SubContractors shall defend, indemnify and hold harmless: (1) the Owner, its consultants, employees, officers, members of the Board of Education, and agents; (2) the Architect and its consultants, employees, officers, and agents; and (3) the Construction Manager, its consultants, employees, officers, and agents from and against any and all liability for violation of all federal, state, and local laws, ordinances, regulations, rules, codes, orders, and policies applicable to the Contractor's work and shall defend any claims or actions which may be brought against the Owner as the result thereof.

F. The Contractor and its SubContractors shall defend, indemnify and hold harmless: (1) the Owner, its consultants, employees, officers, members of the Board of Education, and agents; (2) the Architect and its consultants, employees, officers, and agents; and (3) the Construction Manager, its consultants, employees, officers, and agents from and against any and all liability for claims made by third parties, including SubContractors, in connection with this Agreement and shall defend any claims or actions which may be brought against the Owner as the result thereof.

G. The Contractor shall defend, indemnify and hold harmless (1) the Owner, its consultants, employees, officers, members of the Board of Education, and agents; (2) the Architect and its consultants, employees, officers, and agents; and (3) the Construction Manager, its consultants, employees, officers, and agents from and against any and all claims, damages, losses, suits, obligations, fines, penalties, costs, charges, and expenses which may be imposed upon or incurred by or asserted against any of them by reason of any act or omission of such contractor or any subcontractor or any person or firm directly or indirectly or indirectly employed by such contractor, with respect to violations of OSHA requirements, rules, and/or regulations.

H. The indemnification obligations set forth herein shall become effective upon the Owner, the Architect or the Construction Manager's receipt of a claim for which the Contractor is required to provide indemnification to the Owner, the Architect, or the Construction Manager. In the event that the Contractor shall fail to refuse to defend any such action, the Contractor shall be liable to the Owner for all costs of the Owner in defending such claim or action and all costs of the Owner, including attorney's fees, in recovering such defense costs from the Contractor. In the event the Owner, the Architect, or the Construction Manager is required to bring an action to enforce the indemnification obligations set forth herein, the Contractor shall be liable to the Owner, the Architect, and/or the Construction Manager for all costs associated with said action including attorney's fees.

ARTICLE 13
TIME FOR COMPLETION OF WORK

A. The date of commencement of the Contractor's work shall be as indicated in the Agreement between the Contractor and the Owner. The date shall not be postponed or extended by the failure to act of the Contractor or of persons or entities for whom the Contractor is responsible to act. Time limits stated in the Agreement between the Owner and the Contractor are of the essence of the Contract. By executing the Agreement, the Contractor confirms that the Contract Time is a reasonable period for performing the Work.

B. The Contractor shall not commence work on the site until two certified copies of all insurance policies and bonds required by Articles 10 and 11 of these General Conditions are provided to the Owner and accepted by the Owner. The date of commencement and/or completion of the Contractor's work shall not be changed by the effective date of such insurance. The Contractor shall not knowingly, except by agreement or instruction of the Owner in writing, prematurely commence operations on the site or elsewhere prior to the acceptance of the insurance and bonds required by Article 10 and Article 11 of these General Conditions.

C. The Contractor shall proceed expeditiously with adequate forces and shall achieve substantial completion of the work in accordance with the schedule set forth in the Agreement. The Contractor shall cooperate with the Owner, the Architect, the Construction Manager, and other contractors on the Project, making every reasonable effort to reduce the contract time.

D.

1. In the event the Owner determines that the performance of the Contractor's work, as of a milestone date, has not progressed or reached the level of completion required by its contract, the Owner shall have the right to order the Contractor to take corrective measures necessary to expedite the progress of construction, including, without limitation: (1) working additional shifts or overtime; (2) supplying additional manpower, equipment, facilities; and/or (3) other similar measures (hereinafter referred to collectively as "Extraordinary Measures"). Such Extraordinary Measures shall continue until the Contractor progresses its work in compliance with the stage of completion required by the Agreement with the Owner. The Owner's right to require Extraordinary Measures is solely for the purpose of ensuring the Contractor's compliance with the construction schedule.

2. The Contractor shall not be entitled to an adjustment in its contract sum in connection with Extraordinary Measures ordered by the Owner under or pursuant to Paragraph D(1).

3. The Owner may exercise the rights furnished the Owner under or pursuant to Paragraph D(1) as frequently as the Owner deems necessary to ensure that the Contractor's performance of its work will comply with any Milestone Date or completion date set forth in the Contractor's Agreement with it.

4. The Owner reserves the right to withhold payment from the Contractor until such time as the Contractor submits a daily schedule showing work to be again on schedule with the Construction Schedule and/or until its work is being installed according to the Project construction schedule, without additional cost to the Owner.

E. The Contractor shall achieve substantial completion of its work in accordance with the schedule for the work set forth in the Project Manual included as part of the Agreement with the Owner. Milestone Dates are dates critical to the Owner's operations that establish when a part of the work is to commence or be complete. All Milestone Dates are of the essence and shall have the same meaning as Substantial Completion for the purpose of Liquidated Damages in this Article 13.

F. Substantial completion shall be achieved by the Contractor when the Contractor has completed ninety-eight percent (98%) of its work. Work remaining to be completed after substantial completion shall be limited to items which can ordinarily be completed within the period between the payment at the time of substantial completion and final payment.

G.

1. The Project is to be physically completed in accordance with the time limits set forth in the Agreement between the Owner and the Contractor and as further set forth in the Project Manual and/or bidding documents. Liquidated damages will be assessed in the amount of One Thousand Two Hundred Fifty Dollars ($1,250.00) for each and every calendar day after such time allowed for completion.

2. The Contractor realizes that time is of the essence on this Contract and the completion date and milestone date for each work item in its Agreement, a Milestone Date reflected on the Project schedule, or the date of substantial completion of the Contractor's work shall be no later than the date indicated therein. In the event the Contractor fails to complete any work or substantially complete the work under this contract by said schedule date, the sum per calendar day for each date not met, as delineated above, will be subtracted from the payment due the Contractor (or, if the amount due the Contractor as payment is insufficient, any deficiency shall be paid by the Contractor to the Owner), except in cases where the Contractor has applied for and been granted an extension of time in accordance with the provisions of this Article 13.

3. The said sum per calendar day shall constitute the Liquidated Damages incurred by the Owner for each day of delay beyond the agreed upon dates of substantial completion. Such

Liquidated Damages shall be in addition to any other damages (other than by reason of delay) the Owner may incur as a result of the Contractor's breach of contract. In the event that substantial completion of its work is not achieved in accordance with the Project schedule, inspections will be performed once each week unless the Owner or the Architect determines, at their sole discretion, that additional inspections are not needed. All costs incurred by the Owner, the Construction Manager, and the Architect and the cost of additional inspections, at the rate of One Thousand Two Hundred Fifth Dollars ($1,250.00) per inspection, will be subtracted from payment due the Contractor. If the amount due the Contractor for payment is insufficient, any deficiency shall be paid by the Contractor to the Owner.

H.

1. Within five (5) calendar days from the occurrence of same, the Contractor must apply in writing to the Owner, the Architect or the Construction Manager for an extension of time to complete its work where it has been delayed as a result of: unforeseeable causes beyond the control and without the fault or negligence of the Contractor, including acts of God, acts of the public enemy, acts of the federal or state government in either their sovereign or contractual capacities, fires, floods, pandemics, epidemics, quarantine restrictions, priority or allocation orders duly issued by the federal government; and/or freight embargoes. The Contractor may not apply for an extension of time for delays in acquisitions of materials other than by reason of freight embargoes. All other delays of the Project, including but not limited to, the Architect's review and/or approval of shop Drawings and/or submittals, requests for information, clarifications, samples, and change orders; Owner schedule; Architect certification of payment; payment by the Owner of the Contractor's application for payment; coordination amongst contractors; unavailability of materials and/or equipment; surveying/testing; closeout, etc. are deemed to be foreseeable and, therefore shall not form the basis for a claim for an extension of time by the Contractor.

2. All claims for additional time shall be supported by documentation which demonstrates to the Architect's and the Construction Manager's satisfaction that the critical path of the Work has been significantly altered by the delays to the activities in question, and that the schedule cannot be maintained by re-ordering other activities within the Project at no cost. Upon receipt of the Contractor's request for an extension of time, the Owner will ascertain the facts and extent of the delay, and may, in its sole discretion, extend the time for completion of the Contractor's work when in its judgment such an extension is justified. The Owner's determination will be final and binding in any litigation commenced by the Contractor against the Owner which arises out of the Owner's denial of an extension of time to the Contractor. Any approval of an extension of the Contractor's time to complete its work shall be memorialized by written change order, signed by the Owner, the Contractor, the Architect, and the Construction Manager. Where the Owner determines that the Contractor will be granted an extension of time, such extension shall be computed in accordance with the following:

> For each day of delay in the completion of its work, the Contractor shall be allowed one day of additional time to complete its contract. The Contractor shall not be entitled to receive a separate extension of time for each one of several causes of delay operating

concurrently; only the actual period of delay as determined by the Owner or its Architect may be allowed.

3. The Owner reserves the right to delay the commencement of Work or to otherwise modify the construction schedule set forth in the bid documents in order to comply with applicable federal, state, and local laws, ordinances, regulations, rules, codes, orders, and policies related to the COVID-19 pandemic. Contractor's remedies for any schedule modifications or delays caused directly or indirectly by the COVID-19 pandemic shall be an extension of time only, as further delineated in Article 13(H)(4), below.

4. Notwithstanding anything to the contrary in the Contract Documents, an extension in the contract time, to the extent permitted under this Article 13(H), shall be the sole remedy of the Contractor for any: (1) delay in the commencement, prosecution, or completion of the Work; (2) hindrance or obstruction in the performance of the Work; (3) loss of productivity or acceleration; (4) supply chain delays; or (5) other similar claims (collective referred to herein as "delay(s)"), unless a delay is caused by the Owner's active interference with the Contractor's performance of the Work, and only to the extent such acts continue after the Contractor furnishes the Owner with three (3) days' written notice of such interference. In no event shall the Contractor be entitled to any compensation or recovery of any damages in connection with any delay, including, but not limited to, consequential damages, lost opportunity costs, impact damages, or other similar remuneration. The Owner's exercise of any of its rights or remedies under the Contract Documents (including, but not limited to, ordering changes in the Work, or directing suspension, rescheduling or correction of the Work), regardless of the extent or frequency of the Owner's exercise of such rights or remedies, shall not be construed as active interference with the Contractor's performance of the Work.

ARTICLE 14
DEFICIENT AND INCOMPLETE WORK

A. The Owner, through the Architect or the Construction Manager, will have the authority to reject work performed by the Contractor which does not conform to the requirements of the Drawings and/or the Specifications.

B. The Owner, through the Architect or the Construction Manager, shall have the authority to require additional inspection or testing of the Contractor's work whether or not such work is fabricated, installed, or completed. However, neither this authority of the Architect nor a decision made in good faith either to exercise or not to exercise such authority shall give rise to a duty or responsibility of the Architect to the Contractor, its SubContractors, material and equipment suppliers, their agents or employees, or other persons performing portions of the work to have performed additional inspection or testing of the work.

C.

1. If a portion of the Contractor's work is covered contrary to the Architect's request or to requirements specifically expressed in the Drawings and/or the Specifications, upon request by the Architect or the Construction Manager, the Contractor shall uncover such work for the Architect's or any governmental authority's observation and be replaced at the Contractor's sole expense without change in the Contract Time or Contract Sum.

2. If a portion of the Contractor's work has been covered which the Architect or any governmental authority has not specifically requested to observe prior to its being covered, the Architect or any governmental authority may request to see such work and it shall be uncovered by the Contractor. If such work is in accordance with the Drawings and/or the Specifications, costs of uncovering and replacement shall, by appropriate Change Order, be charged to the Owner. If such Work is not in accordance with the Contract Documents, the Contractor, at its sole cost and expense, shall uncover and replace such work.

D. The Contractor shall promptly correct work rejected by the Owner, through the Architect or the Construction Manager, which fails to conform to the requirements of its contract with the Owner, whether observed before or after Substantial Completion and whether or not fabricated, installed, or completed. The Contractor shall bear the all costs of correcting such rejected work, including but not limited to the cost of said additional testing and/or inspection, the cost of the Architect's services incurred in conjunction with such additional testing, and any cost, loss or damages to the Owner resulting from such actions. If prior to the date of Substantial Completion, the Contractor, a SubContractor or anyone for whom either is responsible uses or damages any portion of the Work or premises, including, without limitation, mechanical, electrical, plumbing and other building systems, machinery, equipment or other mechanical device, the Contractor shall cause such item to be restored to "like new" condition at no expense to the Owner.

E. If the Contractor: (1) fails to correct work which is not in accordance with the requirements of its Agreement with the Owner; or (2) fails to carry out its work in accordance with the requirements of its Agreement with the Owner; or (3) fails or refuses to provide a sufficient amount of properly supervised and coordinated labor, materials, or equipment so as to be able to complete the work within the contract time; or (4) fails to remove and discharge (within ten (10) days) any lien filed upon the Owner's property by anyone claiming by, through, or under the Contractor; or (5) disregards the instructions of the Architect, the Owner or the Construction Manager, the Construction Manager, on behalf of the Owner may order the Contractor to stop its work, or any portion thereof, until the cause for such order has been eliminated; however, the right of the Owner to stop the Work shall not give rise to a duty on the part of the Owner to exercise this right for the benefit of the Contractor or any other person or entity. This right shall be in addition to, and not in restriction of, other rights the Owner may have pursuant to these General Conditions or at law.

F.

1. If the Contractor defaults or neglects to carry out its work in accordance with its Agreement with the Owner and fails within a three (3) day period after receipt of written notice from the Construction Manager to commence and continue correction of such default or neglect

with diligence and promptness, the Owner may, without prejudice to other remedies the Owner may have, correct such deficiencies. In such case, an appropriate Change Order shall be issued deducting from payments then or thereafter due the Contractor the cost of correcting such deficiencies, including compensation for the Architect, the Construction Manager and the Owner and such other consultants whose participation is deemed necessary by the Architect, for additional services and expenses made necessary by such default, neglect, or failure. Such action by the Construction Manager, including the amounts to be charged to the Contractor as a result of such action are subject to the prior approval of the Owner. If payments then or thereafter due the Contractor are not sufficient to cover such amounts, the Contractor shall pay the difference to the Owner.

2. Where the Contractor's default and/or neglect to carry out its work in accordance with its Agreement with the Owner threatens the health, safety and/or welfare of the occupants of the School District's facilities and/or threatens the structural integrity and/or preservation of the School District's facilities, the Owner may proceed to carry out the Contractor's work upon twenty-four (24) hours' notice of its intention to do so to the Contractor.

G. If the Owner prefers to accept work which is not in accordance with the terms and conditions of the Agreement between the Owner and the Contractor, the Owner may, in its discretion, accept such work and reduce the Contractor's contract sum accordingly.

ARTICLE 15
FINAL COMPLETION AND CLOSEOUT OF THE PROJECT

A.

1. When advised by the Construction Manager that the Contractor's work is near substantial completion, the Architect shall visit the site to determine whether the Contractor's work is substantially complete. If the Architect's observations of the Contractor's work discloses any item which has not been performed in accordance with the requirements of the Drawings and/or the Specifications and/or which has not been completed to the point indicated in Article 13(F) of these General Conditions, the Contractor shall complete or correct such items upon receipt of notification from the Architect that a deficiency exists. The Architect shall not issue a certificate of substantial completion for the work of the Contractor until the work has been completed in accordance with Article 13(F). Upon completion of the work outlined by the Architect to it in accordance with this paragraph A(1), the Contractor shall advise the Architect of the need for an inspection of the work. If the Architect is required to inspect the Contractor's work more than twice, the Contractor shall be liable to the Owner for cost of the services performed by the Architect or the Construction Manager as a result of additional inspections.

2. Upon determining that the Contractor's work has progressed to the point of Substantial Completion, the Architect shall prepare a punch list of the Contractor's work which shall include only minor items of work remaining to be performed by the Contractor to bring its work into compliance with the requirements of the Drawings and/or the Specifications. The Contractor shall proceed promptly to complete and correct items on the punch list issued by the Architect and shall complete said items within thirty (30) days of its receipt of the punch list from

the Architect. At the time of substantial completion, the Owner shall retain two hundred percent (200%) of the value of the punch list items from the Contractor's remaining contract sum. The value of said remaining work shall be determined by the Architect. Upon completion of the work reflected in the final punch list, the Owner shall release the monies withheld pursuant to this paragraph to the Contractor.

3. The Architect's failure to include an item of deficiency on the punch list issued to the Contractor shall not relieve the Contractor of its responsibility to perform its work in accordance with the Drawings and/or the Specifications.

B.

1. If within three (3) years after the date of Substantial Completion of the Contractor's work or designated portion thereof, or after the date for commencement of warranties established pursuant to these General Conditions, or by terms of in applicable special warranty required by the Agreement between the Owner and the Contractor, any of the Work is found to be not in accordance with the requirements of the Contract Documents, the Contractor shall correct it promptly after receipt of written notice from the Owner, unless the Owner has previously given the Contractor a written acceptance of such condition. This period of three (3) years shall be extended with respect to portions of the Contractor's work first performed after Substantial Completion by the period of time between Substantial Completion and the actual performance of such work. The obligation set forth hereunder shall survive acceptance by the Owner of the Contractor's and/or termination of the Contractor's Agreement with the Owner. The Owner shall give such notice within a reasonable period of time after discovery of the condition.

2. The Contractor shall, within a reasonable time after receipt of written notice thereof, but in no event no later than seventy-two (72) hours after receipt of such notice, commence to correct, repair, and make good any defects in its work.

3. The obligations of the Contractor pursuant to this paragraph shall cover any repairs to or replacement of work affected by the defective work.

4. In the case of any work performed in correcting defects pursuant to this paragraph, the guarantee periods specified herein shall begin anew from the date of acceptance by the Owner of such work.

C. Upon receipt of written notice from the Construction Manager that the Contractor's work is ready for final inspection and acceptance and upon receipt of a final Application for Payment, the Architect will promptly make such inspection. When the Architect finds the Contractor's work acceptable pursuant to the terms and conditions of its Agreement with the Owner and the Contract fully performed and upon receipt of the closeout documentation required by the Contract Documents and elsewhere in the Agreement between the Owner and the Contractor, the Architect will certify to the Owner that the Contractor is entitled to final payment on the Project.

D.

1. Prior to receipt of final payment from the Owner, the Contractor shall provide to the Architect the close out documentation required by the Contract Documents.

2. The Contractor shall schedule a close out meeting with the Architect and the Construction Manager for the purpose of delivering the close out documents required pursuant to the Contract Documents and elsewhere in the Agreement between the Owner and the Contractor.

E. If the Contractor's work is not accepted by the Owner after final inspection and additional time is required to complete items identified during the final inspection, the date starting the warranty periods described in the Contract Documents shall be set by the Architect at his discretion.

F. If the Architect is required to perform more than one final inspection because the Contractor's work fails to comply with the requirements of the contract, the amount of compensation paid to the Architect by the Owner for additional services shall be deducted from the final payment to the Contractor.

G. Acceptance of final payment by the Contractor, a SubContractor or material supplier shall constitute a waiver of claims by that payee except those claims previously made in writing in accordance with the terms of Article 18 hereof and identified by that payee as unsettled at the time of final Application for Payment.

H. The Contractor shall submit all documentation identified in this section within ninety (90) days from the date of Substantial Completion. If the documentation has not been submitted, the Owner will obtain same through whatever means necessary. The Contractor shall solely be responsible for all expenses incurred by the Owner in securing such documentation.

ARTICLE 16
RELEVANT STATUTORY PROVISIONS

A. The Contractor shall at all times observe and comply with all federal, state, and local laws, ordinances, regulations, rules, codes, orders, and policies, in any manner affecting the work and all such orders decreed as exist at present and those which may be enacted later, by bodies or tribunals having jurisdiction or authority over the work, and in addition to any other indemnification set forth herein, the Contractor shall indemnify and save harmless the Owner, and its officers, members of the Board, agents, or servants against any claim or liability arising from, or based on, a violation of any such law, ordinances, regulation, order or decree, whether by its or by its employees or agents.

B. The Contractor and each of its SubContractors shall comply with prevailing wage rates as issued by the of New York State Department of Labor for the location and duration of the Project and shall comply with all requirements governing its payments to its employees as set forth in Labor Law, Section 220, *et seq.* of the New York State Labor Law.

C. The Contractor and each of its SubContractors shall post a notice at the beginning of the performance of every public work contract on each job site that includes the telephone number and addresses for the Department of Labor and a statement informing laborers, workers, or mechanics of their right to contact the Department of Labor if he/she is not receiving the proper prevailing rate of wages and/or supplements for his/her particular job classification.

D. The Contractor specifically agrees, as required by Labor Law, Sections 220 and 220-d, as amended, that:

1. No laborer, workman or mechanic in the employ of the Contractor, SubContractor or other person doing or contracting to do the whole or any part of the work contemplated by the Contract, shall be permitted or required to work more than eight (8) hours in any one calendar day or more than five (5) days in any one week, except in the emergencies set forth in the Labor Law.

2. The wages paid for a legal day's work shall not be less than the prevailing rate of wages as defined by law.

3. The minimum hourly rate of wages to be paid shall not be less than that stated in the Project Manual, and any re-determination of the prevailing rate of wages after the Contract is approved shall be deemed to be incorporated herein by reference as of the effective date of re-determination and shall form a part of this Contract. The Labor Law provides that the Contract may be forfeited and no sum paid for any work done thereunder on a second conviction for willfully paying less than:

a. the stipulated wage scale as provided in Labor Law, Section 220, Subdivision 3, as amended; or

b. the stipulated minimum hourly wage scale as provided in Labor Law, Section 220-d, as amended.

E. The Contractor specifically agrees, as required by the provisions of the Labor Law of New York, Section 220-E, as amended that:

1. In the hiring of employees for the performance of this contract or any subcontractor hereunder, no contractor, subcontractor, nor any person acting on behalf of such contractor or sub-contractor shall by reason of sex, race, creed, color, disability, or national origin discriminate against any citizen of the State of New York who is qualified and available to perform the work to which the employment relates.

2. No contractor, subcontractor, nor any person on his behalf shall, in any manner, discriminate against or intimidate any employee hired for the performance of work under this contract on account of race, color, creed, sex, disability, or national origin.

3. There may be deducted from the amount payable to the Contractor a penalty of fifty dollars for each person for each calendar day during which such person was discriminated against or intimidated in violation of the provisions of the Contract.

4. This Contract may be canceled or terminated by the Owner and all monies due or to become due hereunder may be forfeited for a second or any subsequent violation of the terms or conditions of this section of the Contract.

F. The Contractor shall comply with all of the provisions of the Immigration Reform and Control Act of 1986 and regulations promulgated pursuant thereto and shall require its SubContractors to comply with same. In addition to the other indemnification obligations set forth herein, the Contractor shall and does hereby agree to defend, indemnify, and hold harmless the Owner, the Owner's agents, officers, members of the Board, and its employees from and against any penalties, fees, costs, liabilities, suits, claims, or expenses of any kind or nature, including reasonable attorney's fees, arising out of or resulting from any violation or alleged violation of the provisions of said laws in connection with the work performed hereunder.

G. This Contract shall be void if the Contractor fails to install, maintain, and effectively operate appliances and methods for the elimination of harmful dust when a harmful dust shall have been identified in accordance with Section 222-a of the Labor Law of the State of New York.

H. The Contractor shall ensure that absolutely no asbestos containing material is used in conjunction with the performance of its work. The Contractor bears the sole responsibility to provide assurances that no asbestos containing material is built into the construction, or that any equipment used in the construction contains any asbestos containing material. If asbestos containing material is found, at any time during or after the construction is completed, it shall be the responsibility of the Contractor who installed said material to remove it and replace it with new non-asbestos containing material, as per federal, state, and local laws, ordinances, regulations, rules, codes, orders, and policies.

I. Large and small asbestos abatement projects as defined by 12 N.Y.C.R.R. 56 shall not be performed while the building is occupied. As referenced in this section, the term "building" shall mean a wing or major section of a building that can be completely isolated from the rest of the building with sealed non-combustible construction. The isolated portion of the building must contain exits that do not pass through the occupied portion, and ventilation systems must be physically separated and sealed at the isolation barrier. Exterior work such as roofing, flashing, siding, or soffit work may be performed on occupied buildings provided proper variances are in place as required, and complete isolation of ventilation systems and windows is provided. Work must be scheduled so that classes are not disrupted by noise or visual distraction.

J. Surfaces that will be disturbed by reconstruction must have a determination made as to the presence of lead. Projects which disturb surfaces that contain lead shall have in the Specifications a plan prepared by a certified Lead Risk Assessor or Supervisor which details provisions for occupant protection, worksite preparation, work methods, cleaning, and clearance testing which are in general accordance with the HUD Guidelines.

K. As set forth in Article 4(M), no smoking is allowed anywhere on school property per New York State and County law. Violators are subject to a $1,000.00 fine and/or banishment from the property.

L. Applicable codes and standards for material furnished and work installed shall include all federal, state, and local laws, ordinances, regulations, rules, codes, orders, and policies of public authorities or governmental agencies having jurisdiction, and applicable requirements of following codes and standards, including but not limited to:

1. New York State Uniform Fire Prevention and Building Code, and amendments thereto.

2. New York State Energy Conservation Construction Code.

3. State Education Department Manual of Planning Standards.

4. New York State Department of Transportation, Office of Engineering, Standard Specification, Construction and Materials, latest edition.

5. Life Safety Code - NFPA.

M. Wherever in the Specifications reference is made to ANSI or ASTM Standards, Federal Specifications, Consumer Product Standards, or similar recognized standards, the latest edition of the respective publishing agency in effect at the date of "Bid Issuance" shall be accepted as establishing the technical requirements for which compliance is required.

N. The Owner shall be entitled to request that the Contractor or its successor in interest adequate assurance of future performance in accordance with the terms and conditions of its Agreement in the event: (1) an order for relief is entered on behalf of the Contractor pursuant to Title 11 of the United States Code; (2) any other similar order is entered under any other debtor relief laws; (3) the Contractor makes a general assignment for the benefit of its creditors; (4) a receiver is appointed for the benefit of its creditors; or (5) a receiver is appointed on account of its insolvency. Failure to comply with such request within ten (10) days of delivery of the request shall entitle the Owner to terminate the Contract in accordance with Article 17 hereof. In all events, pending receipt of adequate assurance of performance and actual performance in accordance therewith, the Owner shall be entitled to proceed with the Contractor's work with its own forces or with other contractors on a time and material or other appropriate basis, the cost of which will be back charged against the Contractor.

O. The Contractor shall maintain policies of employment as follows:

1. The Contractor and the Contractor's SubContractor shall not discriminate against any employee or applicant for employment because of race, creed, color, disability, sex, or national origin. The Contractor shall take affirmative action to ensure that applicants are employed, and that employees are treated during employment without regard to their age, race,

creed, color, national origin, citizenship or immigration status, sexual orientation, gender identity or expression, military status, sex, disability, predisposing genetic characteristics, marital status, familial status, status as a victim of domestic violence, pregnancy-related condition, prior arrest or conviction record, or political opinion or affiliation. Such action shall include, but not be limited to, the following: employment, upgrading, demotion, or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. The Contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices setting forth the policies of non-discrimination.

2. The Contractor and the Contractor's SubContractors shall, in all solicitations or advertisements for employees placed by them or on their behalf, state that all qualified applicants will receive consideration for employment without regard to age, race, creed, color, national origin, citizenship or immigration status, sexual orientation, gender identity or expression, military status, sex, disability, predisposing genetic characteristics, marital status, familial status, status as a victim of domestic violence, pregnancy-related condition, prior arrest or conviction record, or political opinion or affiliation.

3. The Contractor and the Contractor's SubContractors shall certify under penalty of perjury, that:

a. it is registered with the New York State Department of Labor pursuant to Section 220-i of the New York Labor Law; and

b. each of the subcontractors engaged by the Contractor for this Project are also registered.

c. The Contractor shall include with its certification, a copy of the Certificate(s) of Registration issued by the Commissioner of the Department of Labor for the Bidder and each of its subcontractor(s).

ARTICLE 17
TERMINATION OR SUSPENSION

A.

1. The Owner may terminate the Contractor's Agreement in the event the Contractor:

a. refuses or fails to supply sufficient skilled workers or suitable materials or equipment to complete the Work in a diligent, efficient, timely, workmanlike, skillful, and careful manner;

b. refuses or fails to correct deficient work performed by it;

c. fails to make prompt payments to SubContractors for labor, materials, and/or equipment in accordance with the respective agreements between the Contractor and the SubContractors;

d. disregards all federal, state, and local laws, ordinances, regulations, rules, codes, orders, and policies of public authorities or governmental agencies having jurisdiction;

e. disregards the instructions of the Architect, the Construction Manager or the Owner (when such instructions are based on the requirements of the Contract Documents);

f. is adjudged a bankrupt or insolvent, or makes a general assignment for the benefit of the Contractor's creditors, or a trustee or receiver is appointed for the Contractor or for any of its property, or files a petition to take advantage of any debtor's act or to reorganize under bankruptcy or similar laws; or

g. breaches any warranty made by the Contractor under or pursuant to the Contract Documents.

h. fails to furnish the Owner with assurances satisfactory to the Owner evidencing the Contractor's ability to complete the Work in compliance with all the requirements of the Contract Documents; or

i. fails after commencement of the Work to proceed continuously with the construction and completion of the Work for more than ten (10) days, except as permitted under the Contract Documents.

j. fails to keep the Project free from strikes, work stoppages, slowdowns, lockouts, or other disruptive activity;

k. or otherwise does not fully comply with the Contract Documents.

2. When any of the above reasons exists, the Owner may, without prejudice to any other rights or remedies, terminate employment of the Contractor upon three (3) days' written notice and may, subject to any prior rights of the surety:

a. take possession of the site and of all materials, equipment, tools, and construction equipment and machinery thereon owned by the Contractor;

b. take possession of materials stored off site by the Contractor;

c. take assignments of the Contractor's SubContractors in accordance with these General Conditions;

d. finish the Work by whatever reasonable method the Owner may deem expedient.

3. When the Owner terminates the Contract for one of the reasons stated in Article 17(A)(1), the Contractor shall not be entitled to receive further payment until the completion of the Contractor's work. If the Owner's costs to complete the Contractor's work, including the expenses incurred by the Owner in connection with the services of the Architect, the Construction Manager and/or other consultants, exceed the contract balance remaining on the Contractor's contract, the Contractor shall be liable to the Owner for such excess costs. This provision shall survive termination of the Contractor's Agreement with the Owner.

B.

1. In addition to the Owner's right to carry out the work of the Contractor pursuant to the Agreement with the Contractor, the Owner may at any time, at will and without cause, terminate any part of the Contractor's work or all of the Contractor's remaining work for any reason whatsoever by giving three (3) days' written notice to the Contractor, specifying the portion of the Contractor's work to be terminated and the effective date of termination.

2. Upon receipt of a notice of termination for convenience, the Contractor shall immediately, in accordance with instructions from the Owner, proceed with performance of the following duties regardless of delay in determining or adjusting amounts due it:

a. Cease operation as specified in the notice.

b. Place no further orders and enter into no further subcontracts for materials, labor, services, or facilities except as necessary to complete continued portions of the Contract.

c. Terminate all subcontracts and orders to the extent they relate to the Work terminated.

d. Proceed to complete the performance of the remaining work on its contract which has not been so terminated.

e. Take actions that may be necessary, or that the Owner may direct, for the protection and preservation of the terminated Work.

3. The Contractor shall continue to prosecute that portion of its work which has not been terminated by the Owner pursuant to this paragraph. If the Contractor's work is terminated, the Owner shall not be liable to the Contractor by reason of such termination, except that the Contractor shall be entitled to payment for the work it has properly executed in accordance with the Agreement and prior to the effective date of termination (the basis for such payment shall be as provided in the Contract) and for costs directly related to work thereafter performed by the Contractor in terminating such Work, provided such work is authorized in advance by the Architect and the Owner in writing. No payment shall be made by the Owner, however, to the

extent that such work is, was, or could have been terminated under the Contractor's Agreement with the Owner.

4. In case of a termination pursuant to this paragraph B, the Owner will issue a Construction Change Directive or authorize a Change Order, making any required adjustment to the Date of Substantial Completion and/or the sum of contract monies remaining to be paid to the Contractor. The Owner shall be credited for: (1) payments previously made to the Contractor for the terminated portion of the Work; (2) claims which the Owner has against the Contractor under the Contract; and (3) the value of the materials, supplies, equipment or other items that are to be disposed of by the Contractor that are part of the Contract Sum; multiplied by fifteen percent (15%) representing the Contractor's overhead and profit.

5. For the remaining portions of the Contractor's work which have not been terminated pursuant to this paragraph B, the terms and conditions of the Contractor's Agreement with the Owner shall remain in full force and effect.

6. Upon termination of the Contractor's work or a portion of the Contractor's work pursuant to this paragraph B, the Contractor shall recover as its sole remedy, payment for work which it has properly performed in connection with the terminated portion of the Work prior to the effective date of termination and for items properly and timely fabricated off the Project site, delivered and stored in accordance with the Owner's instructions. The Contractor hereby waives and forfeits all other claims for payment and damages, including, without limitation, overhead and profit related to work terminated by the Owner pursuant to this paragraph B.

C.

1. In addition to the Owner's right to suspend, delay, or interrupt the Contractor from proceeding with any portion of its work pursuant to the terms and conditions of its Agreement with the Owner, the Owner may at any time, at will and without cause suspend, delay, or interrupt any part of the Contractor's work or all work for any reason whatsoever for such period of time as the Owner may determine by giving three (3) days' prior written notice to the Contractor, specifying that portion of the Contractor's work which is to be suspended, delayed, or interrupted, and the effective date of such suspension, delay, or interruption, as the case may be.

2. The Contractor shall continue to prosecute that portion of its work which has not been suspended, delayed, or interrupted, and shall properly protect and secure the portion of its work so suspended, delayed, or interrupted.

3. The Owner shall incur no liability to the Contractor by reason of such suspension, delay, or interruption except that the Contractor may request an extension of its time to complete its work in accordance with Article 13 hereof.

D. The Contractor agrees and acknowledges that payments for the work have been obtained through obligations or bonds which have been sold after public referendum. In the event the work is suspended or canceled as a result of the order of any court, agency, department entity, or

individual having jurisdiction, or in the event the work is suspended or canceled due to the fact that a court, agency, department, entity, or individual having jurisdiction has issued an order, the result of which is that the aforesaid obligations or bonds are no longer available for payment for the work, the Contractor expressly agrees that it shall be solely entitled to payment for work accomplished until a notice of suspension or cancellation is served upon it. The Contractor expressly waives any and all rights to institute an action, claim, cause of action or similar for any damages it may suffer as a result of the suspension or cancellation of the Work and/or its contract pursuant to this section.

ARTICLE 18
CLAIMS AND DISPUTES

A. Definition. A "Claim" is a demand or assertion by one of the parties seeking, as a matter of right, adjustment or interpretation of Contract terms, payment of money, extension of time or other relief with respect to the terms of the Contract. The term "Claim" also includes other

disputes and matters in question between the Owner and the Contractor arising out of or relating to the Contract.

B. Time Limits on Claims. Claims by the Contractor must be made within thirty (30) days after occurrence of the event giving rise to such Claim, or within thirty (30) days after the claimant first recognizes the condition giving rise to the Claim, whichever is earlier. An additional Claim made after the initial Claim has been decided by the Owner will not be considered unless submitted in a timely manner. Failure of the Contractor to give timely notice of claim shall constitute waiver of the claim. Claims must be made by written notice to the Construction Manager, the Architect, and the Owner. The responsibility to substantiate Claims shall rest with the Contractor.

C. Pending final resolution of a Claim, unless otherwise agreed in writing, the Contractor shall proceed diligently with performance of the Contract and the Owner shall continue to make payments in accordance with the Contract Documents.

D. Claims for Concealed or Unknown Conditions. If conditions are encountered at the site which are: (1) subsurface or otherwise concealed physical conditions which differ materially from those indicated in the Contract Documents; or (2) unknown physical conditions of an unusual nature, which differ materially from those ordinarily found to exist and generally recognized as inherent in construction activities of the character provided for in the Contract Documents, then written notice by the Contractor shall be given to the Owner and the Architect promptly before conditions are disturbed and in no event later than five (5) days after first observance of the conditions; and (3) in the case of a condition at the site which involves a hazardous or toxic substance, as those terms are defined by OSHA or AHERA, written notice to the Owner, the Construction Manager and the Architect shall be given immediately upon discovery of such hazardous or toxic substance. The Architect and/or the Construction Manager will promptly investigate such conditions and, if they differ materially and cause an increase or decrease in the Contractor's cost of, or time required for, performance of any part of the Work, will recommend

an equitable adjustment in the Contract Sum or Contract Time, or both. If the Architect determines that the conditions at the site are not materially different from those indicated in the Contract Documents and that no change in the terms of the Contract is justified, the Architect shall so notify the Contractor in writing, stating the reasons.

E. Claims for Additional Cost. If the Contractor wishes to make a Claim for an increase in the Contract Sum as a result of a Change in the Work pursuant to Article 8 of these General Conditions, written notice as provided in this Article 18 shall be given before proceeding to execute the Work.

F. Claims for Additional Time. If the Contractor wishes to make Claim for an increase in the Contract Time, the Contractor shall comply with the requirements set forth in Article 13(H).

G. Nothing contained in the Contract Documents shall relieve the Contractor from compliance with any statutory requirement, including, but not limited to those contained in Education Law Section 3813.

ARTICLE 19
MISCELLANEOUS PROVISIONS

A. The Agreement between the Owner and the Contractor shall be governed by the law of the place where the Project is located; venue to be in the County in which the Project is located.

B. Historical lack of enforcement of any federal, state, and local laws, ordinances, regulations, rules, codes, orders, and policies shall not constitute a waiver of Contractor's responsibility for compliance with such law in a manner consistent with its Agreement with the Owner unless and until the Contractor has received prior written consent for the waiver of such compliance from the Owner and the Agency responsible for the enforcement of such law.

C. All notices to be given hereunder shall be in writing and may be given, served, or made: (1) by depositing the same for first class mail delivery in the United Stated mail addressed to the authorized representative of the party to be notified; (2) by depositing the same in the United Stated mail addressed to the authorized representative of the party to be notified, postpaid and registered or certified with return receipt requested; (3) by depositing the same for overnight delivery (prepaid by or billed to the party giving notice) with the United States Postal Service or other nationally recognized overnight delivery service addressed to the authorized representative of the party to be notified; or (4) by delivering the same in person to the said authorized representative of such party. Notice deposited in the mail by certified mail or overnight delivery in accordance with the provisions hereof shall be effective from and after the fourth (4th) day next following the date postmarked on the envelope containing such notice, or when actually received, whichever is earlier. All notices to be given to the parties hereto shall be sent to or made at the addresses set forth hereinbelow. By giving the other parties at least seven (7) days' written notice thereof, the parties hereto shall have the right to change their respective addresses and specify as their respective addresses for the purposes hereof any other address in the United States of America.

D. Except as expressly provided in the Agreement between the Owner and the Contractor, duties and obligations imposed by such Agreement and rights and remedies available thereunder shall be in addition to and not a limitation of duties, obligations, rights and remedies otherwise imposed or available by law, or in equity or by other Agreement, and such rights and remedies shall survive acceptance of the Contractor's work and/or any other termination of the Contractor's Agreement with the Owner.

E. No action or failure to act by the Owner, Architect, or Contractor shall constitute a waiver of a right or duty afforded them under the Contract, nor shall such action or failure to act constitute approval of or acquiescence in a breach thereunder, except as may be specifically agreed in writing.

F. The headings denoting the separately numbered Articles of these General Conditions are specifically set forth for reference purposes only and are not in any way to be deemed explanatory of or limiting of the contents of any paragraph or subparagraph. Furthermore, said headings are not to be deemed part of this Agreement for purposes of interpretation, litigation or as defining or limiting the rights or obligations of the parties.

G. In case any provision of this Agreement should be held to be contrary to, or invalid, under the law of any country, state or other jurisdiction, such illegality or invalidity, shall not affect in any way, any other provisions hereof, all of which shall continue, nevertheless, in full force and effect in any country, state, or jurisdiction in which such provision is legal and valid.

H. The rights stated in these General Conditions and the documents which form the Agreement between the Owner and the Contractor are cumulative and not in limitation of any rights of the Owner at law or in equity.

I. The Owner shall not be responsible for damages or for loss of anticipated profits on work not performed on account of any termination of the Contractor by the Owner or by virtue of the Owner's exercise of its right to take over the Contractor's work pursuant to its Agreement with the Contractor.

J. The Owner shall not be liable to the Contractor for punitive damages on account of its termination of the Contractor or any other alleged breach of the Agreement between it and the Contractor and the Contractor hereby expressly waives its right to claim such damages against the Owner.

K. The Contractor hereby expressly waives any rights it may have in law or in equity to lost bonding capacity as a result of any of the actions of the Owner, the Architect, or the Construction Manager taken in connection with the Contractor's work on the Project.

L. Upon determination by legal means (*e.g.*, court action, etc.) that termination of Contractor pursuant to Article 17.A.1 was wrongful, such termination will be deemed converted to a termination for convenience pursuant to Article 17.B.1 and Contractor's remedy for such

termination shall be limited to the recovery of the payments permitted for termination for convenience as set forth in Article 17.B.1.

M. As between the Owner and the Contractor:

1. Before Substantial Completion. As to acts or failures to act occurring prior to the relevant date of Substantial Completion, any applicable statute of limitations shall commence to run and any alleged cause of action shall be deemed to have accrued in any and all events not later than such date of Substantial Completion;

2. Between Substantial Completion and Final Certificate for Payment. As to acts or failures to act occurring subsequent to the relevant date of Substantial Completion and prior to issuance of the final Certificate for Payment, any applicable statute of limitations shall commence to run and any alleged cause of action shall be deemed to have accrued in any and all events not later than the date of issuance of the final Certificate for Payment; and

3. After Final Certificate for Payment. As to acts or failures to act occurring after the relevant date of issuance of the final Certificate for Payment, any applicable statute of limitations shall commence to run and any alleged cause of action shall be deemed to have accrued in any and all events not later than the date of any act or failure to act by the Contractor pursuant to warranties provided in accordance with its Agreement with the Owner, the date of any correction of work performed by the Contractor or failure to correct its work, or the date of actual commission of any other act or failure to perform any duty or obligation by the Contractor or the Owner, whichever occurs last.

N.

1. The Owner may occupy or use any completed or partially completed portion of the Contractor's work at any stage when such occupancy is authorized by public authorities having jurisdiction over the Project.

2. Partial occupancy or use of a portion or portions of the Work shall not constitute acceptance of the Contractor's work, nor does it waive the Owner's right to liquidated damages. Further such occupancy alone shall not determine when Substantial Completion and performance has been reached.

3. Immediately prior to such partial occupancy or use, the Owner, the Contractor, and the Architect shall jointly inspect the area to be occupied or portion of the Work to be used in order to determine and record the condition of the Contractor's work, and in order to prepare a complete punch list of omissions of materials, faulty workmanship, or any items to be repaired, torn out or replaced.

O. The Contractor agrees not to assign, transfer, convey, or sublet or otherwise dispose of this Contract or his right, title, and interest therein or his power to execute such Contract, to any other person, firm, or corporation without the previous consent in writing of the Owner.

P. The Owner is a tax exempt organization and will take title to materials used in the Project in order to permit tax exemption.

Q. The Owner will furnish a certificate with the Owner's Tax Exemption Number to the Contractor for use in purchasing tangible personal property required for the Project.

R. This exemption shall not apply to machinery, equipment, tools, and other items purchased, leased, rented, or otherwise acquired for the Contractor's use even though the machinery, equipment, tools, or other items are used either in part or entirely on the Work. This exemption shall apply only to materials fully incorporated into the Work of the Contract as accepted and approved by the Architect.

S. The Contractor shall, upon request by the Owner, furnish a bill of sale or other instrument indicating the quantities and types of materials purchased directly by the Contractor or SubContractor for incorporation into the Work. Upon delivery of the materials to the site, the Contractor shall mark or otherwise identify the materials to be incorporated into the Work. This exemption shall apply only to materials so identified and accepted.

END OF GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION

SECTION 01 1000
SUMMARY OF CONTRACTS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and other Division 1 Specification Sections, apply to all Sections of the specifications.

1.2 PROJECT

A. Project Name: High School Building "A" Interior Renovations.

B. Project Address: 300 White Oak Lane, Scarsdale, NY

C. Owner's Name: Edgemont Union Free School District.

D. Architect's Name: Fuller and D'Angelo, P.C.

1.3 DEFINITIONS

A. Refer to Article 1, General Conditions.

1.4 CONTRACT DESCRIPTION

A. Contract Type: Multiple prime contracts each based on a Stipulated Lump Sum Price as described in Form of Agreement.

B. Contract Type: Multiple contracts are separate contracts, representing significant construction activities, between Owner and separate contractors. Each contract is performed concurrently and coordinated closely with construction activities performed on Project under other contracts. Contracts for this Project include the following

1. Contract #1 General Construction (including asbestos abatement)
2. Contract #2 Plumbing
3. Contract #3 Mechanical
4. Contract #4 Electrical , (including Site Work)

C. The work of each Contractor is identified in this Project Manual and on the Drawings.

D. Local custom and trade-union jurisdictional settlements do not control the scope of Work included in each prime contract. The Contractor shall only employ labor on the project or in connection with its work capable of working harmoniously with all trades, crafts and any other individuals associated with the capital improvement work to be performed. When a potential jurisdictional dispute or similar interruption of work is first identified or threatened, the affected prime contractor shall ensure that its work continues uninterrupted during the pendency of such dispute. When a potential jurisdictional dispute or similar interruption of work is first identified or threatened, the affected prime contractor shall promptly negotiate a reasonable settlement to avoid or minimize the pending interruption and delays.

E. If it becomes necessary to refer to the contract documents to determine which prime Contract includes a specific element of required work, begin by referring to the prime Contracts, themselves; then, if a determination cannot be made from the prime Contracts, refer, in the following order, to the General Conditions, if any, this section of the Specifications, followed by the other Division-l sections and finally with the Drawings and other Sections of the Specifications.

F. If, after referring to the contract documents, it cannot be clearly determined which prime Contractor will perform a specific item of required work, then, that item of work will be brought to the Construction Manager's attention in writing for determination.

G. Summary by References: Work of the contract can be summarized by reference to the Contract, General Conditions, Instructions to Bidders , Specification Sections, Drawings, or Addenda issued subsequent to the initial printing of this Project Manual, and including but not necessarily limited to printed material referenced by any of these. It is recognized that the work of the Contract is unavoidably affected or influenced by governing regulations, natural phenomenon, including weather conditions, and other forces outside the contract documents.

1.5 RELATED REQUIREMENTS

A. Agreement Form: Contract Sum, retainages.

B. General Conditions : Additional requirements for progress payments and Changes in the Work.

C. Section 01 1000 - Summary of Contracts for Sequence of Work.

D. Section 01 2000 - Price and Payment Procedures.

E. Section 01 2100 - Allowances.

F. Section 01 3553 - Site Safety and Security Procedures.

G. Section 01 5000 - Temporary Facilities and Controls.

H. Section 01 5500 - Vehicular Access and Parking.

I. Section 01 5713 - Temporary Erosion and Sediment Control

J. Section 01 7000 - Execution.

K. Section 01 7900 - Demonstration and Training

L. Section 01 9113 - General Commissioning Requirements

1.6 JURISDICTIONAL DISPUTES

A. To the extent that there is an appearance of an issue of work being performed by the wrong trade, the issue should be raised during the bidding process in writing as a request for clarification for the Architect and Construction Manager to respond to in writing, in the form of an addendum.

B. Each Contractor shall only employ labor on the project or in connection with its work capable of working harmoniously will all trades, crafts and any other individuals associated with the capital improvement work to be performed. There shall be no strikes, picketing, work stoppages, slowdowns or other disruptive activity at the project for any reason by anyone employed or engaged by the Contractor to perform its portion of the work. There shall be no lockout at the project by the Contractor. The Contractor shall be responsible for providing the manpower required to proceed with the work under any circumstance. Should it become necessary to create a separate entrance for a contractor involved in a labor dispute, all costs associated with creating that entrance shall be borne by the contractor involved in the dispute. Such costs shall include, but not be limited to, signage, fencing, temporary roads and security personnel as deemed necessary by the Owner for the safety of the occupants of the site.

C. If the Contractor has engaged the services of workers and/or subcontractor who are members of trade unions, the Contractor shall make all necessary arrangements to reconcile, without delay, damage or cost to the Owner and without recourse to the Owner, Architect, and Construction Manager, any conflict between its agreement with the Owner and any agreements or regulations of any kind at any time in force among members or councils which regulate or distinguish what activities shall not be included in the work of any particular trade.

D. The Contractor shall ensure that its work continues uninterrupted during the labor dispute and will be liable to the Owner for all damages suffered by the Owner occurring as a result of work stoppages, slowdowns, disputes or strikes.

E. Refer to Article 5 of the General Conditions concerning the Contractor's Procedures.

1.7 SUBCONTRACTORS/SUPPLIERS

A. Submittal of Primary Sub Contractors and Suppliers include but not limited to the following:

1. Construction Contractor:
    a. Asbestos Abatement
    b. Removals
    c. Concrete.
    d. Concrete Supplier
    e. Masonry.
    f. Roofing.

g. Steel Doors and Frames.
h. Hardware Supplier and Installer.
i. Gypsum Wallboard Assemblies
j. Acoustical Tile.
k. Resilient Flooring
l. Ceramic Tile.
m. Painting
n. Plastic Laminate Casework

B. Plumbing Contractor:
1. Plumbing Fixture Supplier.
2. Plumbing equipment/Suppliers.
3. Piping.
4. Insulation

C. Mechanical Contractor:
1. Mechanical Equipment/Suppliers.
2. Ductwork.
3. Piping.
4. Insulation
5. ATC.

D. Electrical Contractor:
1. Excavator
2. Conduit and devices.
3. Fire Alarm Sub Contractor
4. Switchboard/Panelboards.
5. Lighting Fixture Supplier.

1.8 DESCRIPTION OF ALTERATIONS WORK

A. Scope of removal work is shown on drawings.

B. Scope of alterations work is indicated on drawings.

C. Plumbing: Alter existing system and add new construction, keeping existing in operation.

D. Mechanical: Alter existing system and add new construction, keeping existing in operation.

E. Electrical Power and Lighting: Alter existing system and add new construction, keeping existing in operation.

F. Fire Alarm: Alter existing system and add new construction, keeping existing in operation.

G. Security System: Alter existing system and add new construction, keeping existing in operation.

1.9 Edgemont Union Free School District will remove and re-install the following items before start of work:

A. Loose furniture, computers, loose books etc.

1.10 OWNER OCCUPANCY

A. Edgemont Union Free School District intends to continue to occupy adjacent portions of the existing building during the entire construction period.

B. Edgemont Union Free School District intends to occupy the Project upon Substantial Completion.

C. Edgemont Union Free School District intends to occupy a certain portion of the Project prior to the completion date for the conduct of normal operations.

D. Contractors shall not stop work during the Owner's occupancy unless so directed by the Construction Manager or Architect.

E. The Contractor shall perform its work and conduct its operations so as not to disturb or interfere with the Owner's occupancy or its normal operations.

F. Refer to Article 4 of the General Conditions concerning Contractor's Use of the Site.

1.11 CONTRACTOR USE OF SITE AND PREMISES

A. Construction Operations: Limited to areas noted on Drawings. Refer to Article 4 of the General Conditions for requirements concerning Contractors use of the site.

B. Arrange use of site and premises to allow:
   1. Edgemont Union Free School District occupancy.
   2. Work by Others.
   3. Work by Edgemont Union Free School District.
   4. Use of site and premises by the public.

C. Provide access to and from site as required by law and by Edgemont Union Free School District:
   1. Emergency Building Exits During Construction: Keep all exits required by code open during construction period; provide temporary exit signs if exit routes are temporarily altered.
   2. Do not obstruct roadways, sidewalks, or other public ways without approval by the Construction Manager's.

D. Existing building spaces may not be used for storage unless approved by the Construction Manager's.

E. Time Restrictions.

F. Contractors shall comply with Local Noise Ordinance. Work disrupting the community must be performed with the following hours:
   1. Monday thru Friday: 8 AM to 8 PM.
   2. Weekends/ Holidays: 9 AM to 6 PM.

G. Construction deliveries shall not occur during the hours of 7:30 AM and 9:00 AM and 2:00 PM and 3:00 PM, when school buses are arriving or leaving the school grounds.

H. During the entire construction period the Prime Contractors shall have the use of the premises for construction operations, including use of the site as indicated in Sequencce of Work and work time included in this section.
   1. General: Limitations on site usage as well as specific requirements that impact utilization are indicated on the drawings and/or by other contract documents. In addition to these limitations and requirements, the Prime Contractors shall administer allocation of available space equitably among the separate prime or sub and other entities needing access and space, so as to produce the best overall efficiency in performance of the total work of the project. Each Prime Contractor shall schedule deliveries so as to minimize space and time requirements for storage of materials and equipment on site.
   2. Prime Contractors shall limit their use of the premises to the work indicated, so as to allow for Owner occupancy and use by the public during the period when the Owner occupies the building.
   3. Prime Contractors shall maintain clear and unobstructed paths of exit discharge from all existing exits.
   4. Driveways and Entrances: Keep driveways and entrances serving the premises clear and available to the Owner's Representative, Owner's employees, emergency vehicles, and public at all time. Do not use these areas for parking or storage of materials.
   5. Lock automotive type vehicles such as passenger cars and trucks and other types of mechanized and motorized construction equipment, when parked and unattended, to prevent unauthorized use. Do not leave such vehicles or equipment unattended with the motor running or the ignition key in place.

I. Only materials and equipment, which are to be used directly in the work, shall be brought to and stored on the project site by the Contractor. After equipment is no longer required for the work, it shall be promptly

removed from the project site. Protection of construction materials and equipment stored at the project site from weather, theft, damage and all other adversity is solely the responsibility of the Contractors.

J. Site work shall be scheduled and coordinated with Construction Manager . The Owner decisions shall be final and binding on all contractors.
   1. Confine operations at the site to the areas permitted under the Contract. Portions of the site beyond areas on which work is indicated are not to be disturbed. Conform to site rules and regulations affecting the work while engaged in project construction

K. The Contractor(s) and any entity for which the Contractor(s) is responsible, shall not erect any sign on the Project site without the prior written consent of the Construction Manager which may be withheld in the sole discretion of the Owner.

L. Contractor shall ensure that the work, at all times, is performed in a manner that affords reasonable access, both vehicular and pedestrian, to the site of the work and all adjacent areas. The work shall be performed, to the fullest extent reasonably possible, in such a manner that public areas adjacent to the site of the work shall be free from all debris, building materials and equipment likely to cause hazardous conditions. Without limitation of any other provision of the Contract Documents, each contractor shall use its best efforts to minimize any interference with the occupancy or beneficial use of:
   1. Any areas and buildings adjacent to the site of the work or;
   2. The Building in the event of partial occupancy as more..

M. Without prior approval of the Construction Manager, each Contractor shall not permit any workers to use any existing facilities at the Project site, including, without limitations, lavatories, toilets, entrances and parking areas other than those designated by the Construction Manager. Without limitation of any other provision of the Contract Documents, the Contractor shall use its best efforts to comply with the rules and regulations promulgated by the Construction Manager in connection with the use and occupancy of the Project Site, and the Building, as amended from time to time. The Contractor shall immediately notify the Construction Manager in writing if during the performance of the Work, the Contractor finds compliance with any portion of such rules and regulations to be impracticable, setting forth the problems of such compliance and suggesting alternatives through which the same results intended by such portions of the rules and regulations can be achieved. The Construction Manager may, in the Construction Manager's sole discretion, adopt such suggestions, develop new alternatives or require compliance with the existing requirements of the rules and regulations. The Contractor shall also comply with all insurance requirements, applicable to use, and occupancy of the Project Site and the Building.

N. Maintain the existing building in a safe and weathertight condition throughout the construction period. Repair damage caused by construction operations. Take all precautions necessary to protect the building and its occupants during the construction period. When work is scheduled after hours clean and remove all temporary barriers and protection so that the building can be occupied the following day when normal building occupancy will occur.

O. Keep public areas such as hallways, stairs, elevator lobbies, and toilet rooms free from accumulation of waste material, rubbish or construction debris.

P. Smoking, drinking of alcoholic beverages or open fires will not be permitted on the project site.

Q. Utility Outages and Shutdown:
   1. Limit disruptions, shut downs, switch overs, etc. of utility services to hours the building is unoccupied, Saturdays, Sunday and/or holidays.
   2. Do not disrupt or shut down life safety systems, including but not limited to fire sprinklers, fire alarm system, electrical, data, and heating system, without 7 days notice to Construction Manager and authorities having jurisdiction.
   3. Prevent accidental disruption of utility services to other facilities.

1.12 AVAILABILITY OF EXISTING BUILDING

A. The existing building work areas will be available to the Contractor(s) as follows:
   1. Phase 1: Pre-Construction.

a. Start Date: Letter of Award
b. Tasks: Schedule of Values, Progress Schedule, Contracts, Bonds and Insurance, Field verification of existing conditions, and Submittals
c. November 10, 2026 thru June 26, 2026
a) 3:30 PM thru 10:30 PM Monday thru Friday if access into the facility is required.

2. Phase 2: Start Construction June 29, 2026 thru August 23, 2026:
a. 7:00 AM thru 3:30 PM Monday thru Friday (if later hours are needed, the contractor can request authorization from the Owner through the CM).
3. Phase 3: September 1, 2026 thru June 25, 2027
a. [3:30 PM] thru [10:30 PM] Monday thru Friday if access into the facility is required.
4. Phase 4: June 28, 2027 thru August 22, 2027
7:00 AM thru 3:30 PM Monday thru Friday (if later hours are needed, the contractor can request authorization from the Owner through the CM).
5. Punch List: August 27, 2027 September 15, 2027
a. 3:30pm - 10:30 pm
6. Closeout: September 16 thru October 1, 2027
a. 3:30 - 10:30 pm
7. Construction operations which create dust, noise or fumes, particularly welding operations shall be schedule after school hours, when approved by the Owner's Representative.
8. Any work that occurs past the punch list phase, due to long-lead times must be done between the hours of 3:30 PM thru 10:30 PM

B. Upon request by the Contractor, the building may be made available, at the discretion of the Construction Manager and at the sole cost of the Contractor, during such times as are allowed by local noise ordnance, in addition to the above listed hours. A written request for use during these off-regular hours must be made at least two (2) days before the use. Such off-hours may include Saturdays, and Holidays.
1. If the Contractor requests the use of the facility for off-hours to maintain the scheduled completion date, the Contractor shall pay all additional costs in connection with opening, providing security and project management expenses incurred. The Owner, Architect, and Construction Manager shall not be responsible for any such additional expenses. Any and all costs and expenses associated with the off-hours use shall be deducted from the Contractors contract price. Comply with other portions of this Section.
2. If the Owner makes special arrangements to open a building at the request of a Contractor and the Contractor does not show, the Prime Contractor shall pay the Owner all costs incurred. All parties agree that any action taken to enforce this requirement shall not be construed by any Prime Contractor or its subcontractors/suppliers, as a reason for a claim (for either time or money) for delay to the Work or to the Prime Contractor, its subcontractors, or suppliers.
3. Weekend, Holiday and Night Work:
a. The contractor shall have no claim for damages arising from the Owner's inability to make the site available for off-hours work. In any event, should the Owner make the site available during these hours at the contractor's request, the contractor shall solely bear the cost and expense associated with such access and work operations including the cost of custodial security and project management fees.

C. ALL CONTRACTORS SHALL BE REQUIRED TO PERFORM SCHEDULED WORK WITHIN THE EXISTING BUILDING ONLY DURING THE TIME PERIODS INDICATED AND SHALL INCLUDE IN THE BID ALL COSTS FOR LABOR, MATERIAL, ETC. INCLUDING PREMIUM TIME TO PERFORM THE WORK, PER PHASE PER TIME PERIOD.

1.13 COMPLETION OF WORK AFTER SCHEDULED COMPLETION DATE

A. Contractor(s) shall perform work only within these limitations and all manpower, equipment, etc., shall be provided as required to complete the work as per schedule. Contractor's failure to complete work in accordance with the scheduled milestone date for completion is subject to assessment of liquidated

damages as set forth in the General Conditions. Any work completed after the scheduled time for completion of the work shall be performed after 4:30 PM when the building is unoccupied and approved by the Construction Manager. All costs shall be borne by the Contractor. Refer to Article 13 of the General Conditions concerning Time for Completion of Work.

B. The Contractor shall prepare a progress schedule in detail listing items of work, sections of building and the time required for each.

C. The Contractor shall provide necessary manpower, equipment, etc., as required to maintain schedule developed within the time limitations as described above.

D. School Calendar is available on the Owner's web site. Calendar is subject to modifications for civil service holidays, changes in education programs, snow days, etc.

1.14 SEQUENCE OF WORK (Construct Work in phases during the construction period)

A. Refer to Section 01 1010 - Milestone Schedule.

1.15 SPECIFICATION SECTIONS APPLICABLE TO ALL CONTRACTS

A. Unless otherwise noted, **ALL Provisions of Division 00 and 01 listed below apply to all contracts.** Specific items of work listed under individual contract descriptions constitute exceptions.

DIVISION 00 - PROCUREMENT AND CONTRACTING REQUIREMENT

00 0115 LIST OF DRAWING SHEETS

00 1113 INVITATION TO BID

00 2113 INSTRUCTIONS TO BIDDERS

00 2115 RFI FORM

00 4100 BID FORM - CONTRACT #1 GENERAL CONSTRUCTION CONTRACTOR

00 4110 BID FORM – CONTRACT #2 PLUMBING CONTRACTOR

00 4120 BID FORM – CONTRACT #3 MECHANICAL CONTRACTOR

00 4130 BID FORM – CONTRACT #4 ELECTRICAL CONTRACTOR

00 4301 BID FORM SUPPLEMENTS COVER SHEET: (Includes attachments as follows :)

1. Combined Insurance Coverage Certification
2. Form of Disclosure
3. Hold Harmless Agreement
4. Certification of Compliance with Iran Divestment Act
5. Declaration of Bidders Inability to Provide Certification of Compliance with Iran Divestment Act
6. Labor Law 220-I Certification Form
7. Non-Collusive Form
8. Owner – Contractor Agreement
9. Qualifications of Bidders
10. Sexual Harassment Prevention Certificate

00 5200 FORM OF AGREEMENT

00 6000 BONDS AND CERTIFICATES

00 7200 GENERAL CONDITIONS

B. **DIVISION 01 - GENERAL REQUIREMENTS**

01 1000 SUMMARY OF CONTRACT

01 1010 MILESTONE SCHEDULE

01 2000 PRICE AND PAYMENT PROCEDURES

01 2005 PARTIAL RELEASE OF LIEN

01 2100 ALLOWANCES
01 2500 SUBSTITUTION PROCEDURES
01 3000 ADMINISTRATIVE REQUIREMENTS
01 3216 CONSTRUCTION PROGRESS SCHEDULE
01 3306 NON DISCRIMINATION CLAUSES
01 3307 SED SPECIAL REQUIREMENTS
01 3553 SITE SAFETY AND SECURITY PROCEDURES
01 3554 PREVAILING WAGE RATES
01 4000 QUALITY REQUIREMENTS
01 4100 REGULATORY REQUIREMENTS
01 4219 REFERENCE STANDARDS
01 5000 TEMPORARY FACILITIES AND CONTROLS
01 5213 FIELD OFFICE AND SHEDS
01 5500 VEHICULAR ACCESS AND PARKING
01 5713 TEMPORARY EROSION AND SEDIMENT CONTROL
01 6000 PRODUCT REQUIREMENTS
01 6100 COMMON PRODUCT REQUIREMENTS
01 6116 VOLATILE ORGANIC COMPOUND (VOC) CONTENT RESTRICTIONS
01 7000 EXECUTION
01 7310 CUTTING AND PATCHING
01 7600 PROCEDURES AND SPECIAL CONDITIONS FOR SEPARATE PRIME CONTRACTS
01 7419 CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL
01 7420 SITE WASTE HANDLING AND DISPOSAL
01 7800 CLOSEOUT SUBMITTALS
01 7900 DEMONSTRATION AND TRAINING
01 9113 GENERAL COMMISSIONING REQUIREMENTS

C. **APPENDIX**
1. GEOTECHNICAL REPORT
2. LIMITED ASBESTOS SURVEY

1.16 CONTRACT #1 - GENERAL CONSTRUCTION

A. The work of the General Construction Contract #1 includes but not limited to the following:
1. DIVISION 02 - EXISTING CONDITIONS

a.		CERTIFICATIONS PAGE
b.	02 8070	ASBESTOS ABATEMENT SUMMARY OF WORK
c.	02 8071	ASBESTOS ABATEMENT REGULATORY REQUIREMENTS
d.	02 8073	ASBESTOS ABATEMENT SUBMITTALS
e.	02 8073.01	ASBESTOS ABATEMENT SUBMITTAL COVER SHEET
f.	02 8074	ASBESTOS ABATEMENT TESTING LABORATORY SERVICES QUALITY CONTROL
g.	02 8075 -	ASBESTOS ABATEMENT TEMPORARY FACILITIES
h.	02 8078 -	ASBESTOS ABATEMENT SITE SECURITY
i.	02 8079 -	ASBESTOS ABATEMENT EMERGENCY PLANNING
j.	02 8080 -	ASBESTOS ABATEMENT PERSONNEL PROTECTION
k.	02 8084 -	ASBESTOS ABATEMENT MAINTENANCE OF RECORDS
l.	02 8086 -	ASBESTOS ABATEMENT WASTE DISPOSAL PROCEDURES

m. 02 8087 - ASBESTOS ABATEMENT RESTORING THE WORK AREA AND SYSTEMS
n. 02 8090 - ASBESTOS ABATEMENT CLEANING UP

2. DIVISION 03 CONCRETE
   a. 03 3000 CAST IN P LACE CONCRETE
   b. 03 5400 CAST UNDERLAYMENT
3. DIVISION 04 MASONRY
   a. 04 2000 UNIT MASONRY
4. DIVISION 05 - METALS
   a. 05 5000 METAL FABRICATIONS
5. DIVISION 06 – WOOD, PLASTIC AND COMPOSITES
   a. 06 1000 ROUGH CARPENTRY
   b. 06 1010 ROOF RELATED ROUGH CARPENTRY
6. DIVISION 07 - THERMAL AND MOISTURE PROTECTION
   a. 07 5010 MODIFICATIONS TO EXISTING ROOFING
   b. 07 6200 SHEET METAL FLASHINGS & TRIM
   c. 07 7200 ROOF ACCESSORIES
   d. 07 8400 FIRESTOPPING
   e. 07 9200 JOINT SEALANTS
7. DIVISION 08 - OPENINGS
   a. 08 1113 HOLLOW METAL DOORS AND FRAMES
   b. 08 1116 ALUMINUM DOORS AND ALUMINUM FRAMES
   c. 08 3100 ACCESS DOORS AND PANELS
   d. 08 7100 DOOR HARDWARE
   e. 08 8000 GLAZING
8. DIVISION 09 - FINISHES
   a. 09 2116 GYPSUM BOARD ASSEMBLIES
   b. 09 3000 TILING
   c. 09 5100 ACOUSTICAL CEILINGS
   d. 09 6500 RESILIENT FLOORING
   e. 09 7700 PLASTIC LAMINATE WALL SURFACES
   f. 09 9113 EXTERIOR PAINTING
   g. 09 9123 INTERIOR PAINTING
9. DIVISION 10 - SPECIALTIES
   a. 10 1100 VISUAL DISPLAY BOARDS
   b. 10 1400 SIGNAGE
   c. 10 2113 PLASTIC TOILET COMPARTMENTS
   d. 10 2800 TOILET AND BATH ACCESSORIES
   e. 10 4400 FIRE PROTECTION SPECIALTIES
   f. 10 5113 METAL LOCKERS
10. DIVISION 12 - FURNISHINGS
   a. 12 2940 ROLLER SHADES
   b. 12 3200 PLASTIC LAMINATED CASEWORK
   c. 12 3600 SOLID SURFACING WINDOW SILLS
   d. 12 4813 ENTRANCE FLOOR MATS AND FRAMES
11. DIVISION 31 - EARTHWORK

B. **Special Notes: CONTRACT - #1 - GENERAL CONSTRUCTION**

1. Access doors furnished by trade requiring access; installation by General Contractor in new walls, floor, ceiling, etc., Access door required in existing walls, floors, ceilings, etc., shall be furnished and installed by the contractor requiring access.
2. All existing ceiling removal /replacements necessary to install General Contractor work will be by General Contractor including temporary support for all lighting fixtures, smoke detectors, etc.
3. General Contractor and subcontractors will not be allowed to use existing or new plumbing fixtures to wash out mortar pans, grout, adhesives, etc.
4. All new roof curbs are supplied by Mechanical Contractor and installed by General Contractor. Cutting penetrations, steel support, and temporary weather protection by General Contractor. Curbs will be flashed / watertight in accordance with roofing section. Hole patching (structural, EPDM, etc.) for roof areas which result from Mechanical demolition of existing rooftop units will be by Contract for General Contractor.
5. General Contractor will restore / patch any finishes damaged by their abatement subcontractor's protections, tape, etc.
6. General Contractor is responsible to provide negative air machines to ventilate all work areas during tasks involving odors, dust, fumes (epoxy floor, painting, etc.)
7. Exterior wall louvers for mechanical items shall be furnished and installed by General Contractor.
8. Within the existing building all cutting and removals of all interior slabs and excavation/ trenching shall be by the General Contractor. Utility trenching, bedding, warning tape and backfill to level indicated on drawings, shall be performed by the each trade Contractor. General Contractor shall provide final gravel base and concrete slab and finish as indicated on the drawings.
9. After removals of rooftop equipment General Contractor shall make existing roof watertight. Coordinate with all trades.
10. General Contractor is responsible for cutting, slotting and patching and finishing existing masonry walls for the Electrical Contractor.

1.17 CONTRACT #2 - PLUMBING

A. **Work in the Plumbing Contractor Contract #2 includes, but is not limited to, the following:**

1. DIVISION 03 - CONCRETE
   - 03 3000 CAST-IN-PLACE CONCRETE
2. DIVISION 06 - WOOD, PLASTICS, AND COMPOSITES
3. DIVISION 07 - THERMAL AND MOISTURE PROTECTION
   - 07 8400 FIRESTOPPING
   - 07 9200 JOINT SEALANTS
4. DIVISION 08 - OPENINGS
   - 08 3100 ACCESS DOORS AND PANELS
5. DIVISION 09 - FINISHES
   - 09 5100 ACOUSTICAL CEILINGS
6. DIVISION 22 - PLUMBING

22 1116 DOMESTIC WATER PIPING
- 22 1316 SANITARY WASTE AND VENT PIPING
- 22 1319 SANITARY WASTE PIPING SPECIALTIES
- 23 1123 FACILITY NATURAL GAS PIPING

DIVISION 31 - EARTHWORK
- 31 2316 EXCAVATION

B. **Special Notes: CONTRACT - #2 for - PLUMBING CONTRACTOR**

1. Any wood blocking for Plumbing Contract, by Plumbing Contractor.
2. All existing ceiling removal / replacements necessary to install new Plumbing Contractor work will be by Plumbing Contractor unless otherwise noted.

3. Access doors furnished by trade requiring access; installation by General Contractor. in new walls, floor, ceiling, etc., Access door required in existing walls, floors, ceilings, etc., shall be furnished and installed by the Contractor requiring access.
4. Within the existing building all cutting and removals of all interior slabs and excavation/ trenching shall be by the General Contractor. Utility bedding, warning tape and backfill to level indicated on drawings, shall be performed by the trade Contractor. General Contractor shall provide final gravel base and concrete slab and finish as indicated on the drawings.
5. Plumbing Contractor shall install an inflatable ball in all new plumbing fixtures to prevent construction debris or grout from entering sub-slab piping. Ball will be deflated / removed at the conclusion of the project as directed by the CM.
6. Plumbing Contractor will install sealant around perimeter of all toilet / plumbing fixtures.
7. Coordinate roof top removals with the General Contractor to maintain the building watertight.
8. Interior housekeeping pads for Plumbing Equipment shall be by the Plumbing Contractor.

1.18 CONTRACT #3 - MECHANICAL

A. **Work in the Mechanical Contract #3 includes, but is not limited to, the following:**

1. DIVISION 03 - CONCRETE
   a. 03 3000 CAST-IN-PLACE CONCRETE
2. DIVISION 06 - WOOD, PLASTICS, AND COMPOSITES
   a. 06 1010 ROOF RELATED ROUGH CARPENTRY
3. DIVISION 07 - THERMAL AND MOISTURE PROTECTION
   a. 07 8400 FIRESTOPPING
   b. 07 9200 JOINT SEALANTS
4. DIVISION 08 - OPENINGS
   a. 08 3100 ACCESS DOORS AND PANELS
5. DIVISION 09 - FINISHES
   a. 09 5100 ACOUSTICAL CEILINGS

DIVISION 23 - MECHANICAL

23 0500 BASIC MECHANICAL MATERIALS AND METHOD
23 0519 METERS AND GAUGES FOR HVAC PIPING
23 0523 GENERAL DUTY VALVES FOR HVAC PIPING
23 0529 HANGERS AND SUPPORTS FOR HVAC PIPING
23 0548 VIBRATION CONTROLS FOR HVAC PIPING
23 0553 IDENTIFICATION FOR HVAC PIPING
23 0593 TESTING, ADJUSTING AND BALANCING FOR HVAC
23 0715 HVAC DUCT INSULATION
23 0719 HVAC PIPING INSULATION
23 0900 HVAC INSTRUMENTATION & CONTROLS
23 0993 SEQUENCE OF OPERATIONS FOR HVAC EQUIPMENT
23 2213 STEAM AND CONDENSATE HEATING PIPING
23 2216 STEAM AND CONDENSATE HEATING PIPING SPECIALTIES
23 3113 METAL DUCTS
23 3300 DUCT ACCESSORIES
23 3423 HVAC POWER VENTILATORS
23 3713 DIFFUSERS, REGISTERS AND GRILLES
23 7200 AIR TO AIR ENERGY RECOVERY EQUIPMENT
23 7417 PACKAGED ROOFTOP AIR CONDITIONING UNITS

B. **Special Notes: CONTRACT #3 - MECHANICAL CONTRACTOR**

1. Any wood blocking for Mechanical Contract items by Mechanical Contractor.
2. All existing ceiling removal / replacements necessary to install new Mechanical Contract work will be by the Mechanical Contractor unless otherwise noted. Temporary supports for items to remain shall be by the Mechanical Contractor.
3. Interior housekeeping pads for Mechanical equipment by Mechanical Contractor.
4. Access doors furnished by trade requiring access; installation by General Contractor in new walls, floor, ceiling, etc., Access door required in existing walls, floors, ceilings, etc., shall be furnished and installed by the contractor requiring access.
5. Disconnects, Motor starters, etc. supplied by Mechanical Contractor shall be installed by Electrical Contractor, unless noted otherwise.
6. If new mechanical units are too large to fit through existing doorways the mechanical contractor will either disassemble equipment into sections, or remove masonry to enlarge opening and reconstruct to match (at no additional costs to Owner). Mechanical Contractor shall notify Owner's representative of proposed removals prior to removal. Owner's representative and Architect shall review for structural and other concerns. Removals shall not proceed without Owner's representative and Architect prior review and written approval. Mechanical Contractor shall be responsible for all additional costs incurred by the Architect review including structural analysis.
7. All new roof curbs and portals to be supplied by Mechanical Contractor (installed by General Construction Contractor).
8. Any interior exhaust grilles or wall louvers for mechanical items are by Mechanical Contractor including opening, lintels, caulking, etc.
9. Within the existing building all cutting and removals of all interior slabs and excavation/ trenching shall be by the General Contractor. Utility bedding, warning tape and backfill to level indicated on drawings, shall be performed by the trade Contractor. General Contractor shall provide final gravel base and concrete slab and finish as indicated on the drawings.
10. The Mechanical Contractor is responsible for cleaning/flushing/purging, capping of piping etc. for abandoned utility(s).
11. Coordinate roof top removals with the General Contractor to maintain the building watertight.

1.19 CONTRACT #4 - ELECTRICAL CONTRACTOR

A. **Work in the Electrical Contract #4 includes, but is not limited to, the following:**

1. DIVISION 03 - CONCRETE
   a. 03 3000 CAST-IN-PLACE CONCRETE
2. DIVISION 06 - WOOD, PLASTICS, AND COMPOSITES
   a. 06 1000 ROUGH CARPENTRY
3. DIVISION 07 - THERMAL AND MOISTURE PROTECTION
   a. 07 8400 FIRESTOPPING
   b. 07 9200 JOINT SEALANTS
4. DIVISION 08 - OPENINGS
   a. 08 3100 ACCESS DOORS AND PANELS
5. DIVISION 09 - FINISHES
   a. 09 5100 ACOUSTICAL CEILINGS
6. DIVISION 26 - ELECTRICAL
   a. 26 0519 LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES
   b. 26 0526 GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS
   c. 26 0529 HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS
   d. 26 0533 RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS

e. 26 0544 SLEEVES AND SLEEVE SEALS FOR ELECTRICAL RACEWAYS AND CABLING
f. 26 0553 IDENTIFICATION FOR ELECTRICAL SYSTEMS
g. 26 2416 PANELBOARDS
h. 26 2726 WIRING DEVICES
i. 26 2816 ENCLOSED SWITCHES AND CIRCUIT BREAKERS

DIVISION 28 – ELECTRONIC SAFETY and SECURITY

a. 28 4621 ADDRESSABLE FIRE-ALARM SYSTEMS

DIVISION 31 - EARTHWORK

a. 31 2316 EXCAVATION
b. 31 2316.26 ROCK REMOVAL
c. 31 2319 DEWATERING
d. 31 2323 FILL

7. DIVISION 32 - EXTERIOR IMPROVEMENTS
   a. 32 9220 RESTORATION OF TURF AREAS

B. **Special notes: - CONTRACT #4 ELECTRICAL**

1. VFD's, disconnects, motor starters which are supplied by Mechanical Contractor will be installed by Electrical Contractor unless noted otherwise.
2. All existing ceiling removal / replacement necessary to install new electrical work to be by the Electrical Contractor unless otherwise noted. Temporary supports for light fixtures, smoke detectors, etc. to remain shall be by the Electrical Contractor.
3. Access doors furnished by trade requiring access; installation by for General Contractor. in new walls, floor, ceiling, etc., Access door required in existing walls, floors, ceilings, etc., shall be furnished and installed by the Contractor requiring access.
4. Interior housekeeping pads for electrical equipment by Electrical Contractor.
5. Coordinate rooftop removals with General Contractor to maintain building watertight.
6. Within the existing building all cutting and removals of all interior slabs and excavation/ trenching shall be by the General Contractor. Utility bedding, warning tape and backfill to level indicated on drawings, shall be performed by the trade Contractor. General Contractor shall provide final gravel base and concrete slab and finish as indicated on the drawings. The Electrical Contractor is responsible for cleaning, flushing, purging, capping of piping etc. for abandoned utility(s).
7. If the electrical switchgear, panels are too large to fit through existing openings, Electrical Contractor will remove masonry to enlarge the opening and reconstruction to match (at no additional cost to Owner). Electrical Contractor shall notify Owner’s Representative of proposed removals prior to removal. Owner’s Representative and Architect shall review for structural and other concerns. Removals shall not proceed without Owner’s Representative and Architect prior review and written approval. Electrical Contractor shall be responsible for all additional costs incurred by the Owner’s Representative and Architect review including structural analysis.
8. Any wood blocking or panel backboards for electrical items by Electrical Contractor.
9. Electric Contractor will tie up and secure with zip ties or J hooks, 5' oc, any existing cabling or wiring which sags below ceiling after any ceiling removals.
10. Temporary power as indicated on drawings or required. Refer to Section 01 5000 - Temporary Facilities and Controls
11. Any solenoid valves will be supplied and installed by Plumbing Contractor. Electrical power wiring supply and install by Electrical Contractor.
12. Electrical Contractor shall firestop electrical back boxes, where required, in fire rate partitions as per detail.
13. Coordinate roof top removals with the General Contractor to maintain the building watertight.
14. All Site Work shall be performed by the Electrical Contractor.

END OF SECTION

SECTION 01 1010
MILESTONE SCHEDULE

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:
   1. Milestone Construction schedule for project durations and phases, for contract(s).

B. Related Sections include the following:
   1. Section 01 1000 - Summary of Contracts for work related to each Prime Contract.
   2. Section 01 3000 - Administrative Requirements for administrative requirements governing preparation and submittal of each Contractors' Construction Schedule.
   3. Section 01 3216 - Construction Progress Schedule governing preparation of Prime Contractors' Construction Schedule.
   4. Section 01 7800 - Closeout Submittals.

1.3 DEFINITIONS

A. Activity: A discrete part of a project that can be identified for planning, scheduling, monitoring, and controlling the construction project. Activities included in a construction schedule consume time and resources.

B. Critical activities are activities on the critical path. They must start and finish on the planned early start and finish times.

C. Predecessor activity is an activity that must be completed before a given activity can be started.

D. Critical Path: The longest continuous chain of activities through the network schedule that establishes the minimum overall Project duration.

E. Event: The starting or ending point of an activity.

F. Major Area: A story of construction, a separate building, or a similar significant construction element.

G. Milestone: A key or critical point in time for reference or measurement.

1.4 REGULATORY REQUIREMENTS

A. Comply with Section 01 3553 - Site Safety and Security Procedures including ID badge, safety vest, hard hat, etc. and all other required personal protective equipment as required by OSHA.
   1. Failure to abide by the aforementioned rules in paragraph (B) not limited to the Owner's requirements, and OSHA' safety rules and regulations, and without prior notice shall result in the removal of said individual from the site

1.5 MILESTONE SCHEDULE PREPARATION

A. A Master Schedule will be developed at a general meeting of all successful prime contractors within 10 days of Letter of Intent or Award of the Contracts. Each prime contractor will coordinate activities, forward submittals, deliver materials and provide necessary manpower to meet the milestones listed below.

1.6 REQUIREMENTS

A. By submitting his/her bid the contractor acknowledges and certify that the project will be completed by the Substantial Completion date and that his/her total base bid has been submitted in accordance with the specifications.

B. Each prime contractor or The Contractor and their subcontractor's project superintendent, employees, directly or indirectly employed by the contractor to work on the project must at all times, whenever on the

school property, wear an ID badge, safety vest, hard hat, etc. and all other required personal protective equipment as required by OSHA.

PART 2 PRODUCTS

2.1 MILESTONE SCHEDULE

A. Building Hours: Refer to Section 01 1000 - Summary of Contracts.

B. The contractor shall have no claim for damages arising from the Owner's inability to make the site available for off-hours work.

C. Administrative Schedule

1.	Drawings out to Bid	Date 10/7/25
2.	Pre-Bid Meeting	Date 10/21/25
3.	Contractor’s RFI's Due	Date 10/27/25
4.	Bids Received	Date 11/4/25
5.	Bidders Qualification Meetings	Date 11/6/25
6.	Tentative Bid Award	Date 11/10/25
7.	Construction Schedule - General Construction	7 days after Contract Award/Letter of Intent
8.	Master Construction Schedule Final	21 days after Contract Award /Letter of Intent

2.2 MILESTONE SCHEDULE

A. The existing building work areas will be available to the Contractor(s) as follows:

1. Phase 1: Pre-Construction/Administrative.
   a. Start Date: Letter of Award
   b. Tasks: Schedule of Values, Progress Schedule, Contracts, Bonds and Insurance, Field verification of existing conditions, and Submittals
   c. November 10, 2026 thru June 26, 2026
      a) 3:30 PM thru 10:30 PM Monday thru Friday if access into the facility is required.
2. Phase 2: Start Construction June 29, 2026 thru August 23, 2026:
   a. 7:00 AM thru 3:30 PM Monday thru Friday (if later hours are needed, the contractor can request authorization from the Owner through the CM).
3. Phase 3: September 1, 2026 thru June 25, 2027
   a. [3:30 PM] thru [10:30 PM] Monday thru Friday if access into the facility is required.
4. Phase 4: June 28, 2027 thru August 22, 2027
   7:00 AM thru 3:30 PM Monday thru Friday (if later hours are needed, the contractor can request authorization from the Owner through the CM).
5. Punch List: August 27, 2027 September 15, 2027
   a. 3:30pm - 10:30 pm
6. Closeout: September 16 thru October 1, 2027
   a. 3:30 - 10:30 pm

B. All work required by the Fuller and D'Angelo, P.C., Construction Manager, Consultant, and Attorneys etc, to execute final close-out of the contract after 30 days beyond Milestone dates, if determined to be caused by Contractor, shall result in additional payment(s) to the Fuller and D'Angelo, P.C., Construction Manager, Consultant, and Attorneys etc. in the form of a change order deduct to the base contract.

PART 3 EXECUTION (NOT APPLICABLE)

END OF SECTION

SECTION 01 2000
PRICE AND PAYMENT PROCEDURES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SECTION INCLUDES

A. Procedures for preparation and submittal of applications for progress payments.

B. Procedures for changes in the work.

C. Procedures for preparation and submittal of application for payments.

1.3 RELATED REQUIREMENTS

A. Section 00 5200 - Form of Agreement: Contract Sum, retainages, payment period.

B. Section 00 6000 - Bonds and Certificates.

C. Section 00 7200 - General Conditions00 7200 - General Conditions: Requirements for the construction including but not limited to progress payments, final payment, and changes in the Work.

D. Section 01 7800 - Closeout Submittals for additional requirements for Final Payment.

E. Section 01 2100 - Allowances: Payment procedures relating to allowances.

F. Section 01 7800 - Closeout Submittals: Closeout requirements, final payment and project record documents.

1.4 SCHEDULE OF VALUES

A. Form to be used: G732/G702CMA Form.

B. Electronic media printout including equivalent information will be considered in lieu of standard form specified; submit draft to Fuller and D'Angelo, P.C. for approval.

C. Forms filled out by hand will not be accepted.

D. Submit Schedule of Values in PDF Format within 5 work days after date Letter of Award.

E. Format: Utilize the Table of Contents of the Project Manual. Identify each line item with number and title of the specification Section. Identify bonds and sub-contractors.

F. Revise schedule to list approved Change Orders, with each Application For Payment.

G. Provide a separate line item for the following: (where applicable): See Article 8 of the General Conditions for additional breakdowns and monetary percentages.

1. Bonds. (Bond premium may be paid when invoice of premium is provided).
2. OCP . (Policy premium may be paid when invoice of premium is provided).
3. Labor and materials, when payment is anticipated for material not installed.
4. Submittals: (1%). Minimum of contract amount.)
5. Each allowance.
6. Each alternate, if any.
7. Meeting attendance. (0.25% Minimum of contract amount.)
8. As-built Drawings : ((0.5%) Minimum of contract amount)
9. Testing, HVAC balancing reports. (0.5% Minimum of contract amount.)
10. Punch List (0.5% Minimum of contract amount)
11. Final Cleaning
12. Closeout Documents (3% Minimum of contract amount).
13. Authorized change orders.

H. Sub-schedules: Where the Work is separated into existing buildings provide separate payment applications, or provide sub-schedules showing values correlated with each existing building.

I. For public school projects identify each application with the SED Project number and Fuller and D'Angelo's project number for each building.

1.5 APPLICATIONS FOR PROGRESS PAYMENTS

A. Payment Period: Submit at intervals stipulated in the Agreement or General Conditions. Please refer to Article 9 of the General Conditions for requirements concerning payment.

B. Use approved Schedule of Values.

C. Execute certification by signature of authorized officer.

D. Use data from approved Schedule of Values. Provide dollar value in each column for each line item for portion of work performed and for stored products.

E. List each authorized Change Order as a separate line item, listing Change Order number and dollar amount as for an original item of work.

F. Submit one (1) electronic "pencil copy", in PDF format, of each Application for Payment to Fuller and D'Angelo, P.C. and Construction Manager for approval.

G. After Architect's approval of the "pencil copy" submit three hard copies of approved Application for Payment to Fuller and D'Angelo, P.C.

H. Include the following with each application:
   1. Transmittal letter as specified for submittals in Section 01 3000.
   2. Construction progress schedule, revised and current as specified in Section 01 3216.
   3. Partial Waivers of Mechanic's Lien: With each Application for Payment, submit partial waivers of mechanic's liens from Contractor, subcontractors, sub-subcontractors, and suppliers for construction period covered by the previous application.
      a. Waiver Forms: Submit waivers of lien on forms, provided by the Architect in Section 01 2005.
   4. When an application shows completion of an item, submit final or full waivers.
   5. Submit Final Application for Payment with or preceded by final waivers from every entity involved with performance of the Work covered by the application who is lawfully entitled to a lien.
   6. Certified Payrolls: All Applications for Payment must be accompanied with certified payrolls for all Contract Work performed. **Each contractor and sub-contractor shall submit to the Owner within thirty days after issuance of its first payroll, and every thirty days thereafter**, a transcript of the original payroll record subscribed and affirmed as true under penalties of perjury. The Owner shall be required to receive and maintain such payroll records. The original payrolls or transcripts shall be preserved for three years from the completion of the work on the awarded project.
      a. Submit certification that all personnel listed on certified payrolls have successfully completed an OSHA construction safety and health course of at least 10 hours prior to performing any work on the project. Certification shall be within the last five (5) years.

I. Liens: Payment may be withheld when a lien is filed against the Owner by a subcontractor or supplier until such lien is removed, bonded or similar action in accordance with the General Conditions.

J. Project record documents as specified in Section 01 7800 - Closeout Submittals, shall be available for review by Owner's Representative as a prerequisite for approval of payments.

K. Payment for stored materials (whether on-site but not installed, or stored in secured warehouse) will require a bill of lading showing the exact value. In no case will more than 90% be approved if the item is not installed. Insurance certificates will be provided specific to materials stored (for on-site or offsite items).

L. When Owner's Representative and Fuller and D'Angelo, P.C. requires substantiating information, submit data justifying dollar amounts in question. Provide one copy of data with cover letter for each copy of submittal. Show application number and date, and line item by number and description.

M. The Owner shall retain Five (5) percent of the amount of each payment.

1.6 INITIAL APPLICATION FOR PAYMENT:

A. Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following: (See Article 8 of the General Conditions for additional time deadlines for submittals)

1. Executed contract.
2. Approved bonds.
3. Approved insurance certificates.
4. Approved Schedule of Values.
5. Names of full time project manager, on site superintendent, and foreman.
   a. Include telephone and e-mail address.
6. Information to be furnished by the contractors for each subcontractor/materialmen; name, trade, subcontract amount, installing subcontractor, if any, for fabricators, and copies of all written and fully executed subcontracts: .
7. List of subcontractors including Certificates of Registration per Labor Law 220-i. Registration Website: https://dol.ny.gov/contractor-and-subcontractor-registry-landing
8. Contractor's Construction Schedule (preliminary if not final).
9. Contractor's Submittal Schedule.

1.7 APPLICATION FOR PAYMENT AT SUBSTANTIAL COMPLETION

A. Comply with Requirements of Section 01 7800 - Closeout Submittals.

1.8 MODIFICATION PROCEDURES

A. Refer to Article 8 of the General Conditions for requirements concerning changes in the work.

B. Submit name of the individual authorized to receive change documents and who will be responsible for informing others in Contractor's employ, subcontractors and other Prime Contractors whose work is affected by any modifications or changes to the Contract Documents

C. For minor changes not involving an adjustment to the Contract Sum or Contract Time, Architect will issue instructions in writing in the form of a field order directly to the contractor.

D. Owner's Representative and Architect may issue a document which includes a detailed description of a proposed change with supplementary or revised Drawings and specifications, a change in Contract Time for executing the change . The Contractor shall prepare and submit a fixed price quotation within five (5) days.

E. Contractor may propose a change by submitting a request for change to Fuller and D'Angelo and Construction Manager, describing the proposed change and its full effect on the Work, with a statement describing the reason for the change, and the effect on the Contract Sum and Contract Time with full documentation and a statement describing the effect on Work by separate or other contractors.

F. Computation of Change in Contract Amount: As specified in the Agreement and Conditions of the Contract.

1. Refer to Article 8 of the General Conditions .
2. For change requested by Architect and Construction Manager for work falling under a fixed price contract, the amount will be based on Contractors 's price quotation.
3. For change requested by the Contractor, the amount will be based on the Contractor 's request for a Change Order as approved by Architect and Construction Manager.
4. For pre-determined unit prices, unit costs, allowance and quantities, the amount will based on the fixed unit costs or allowance.

G. Substantiation of Costs: Provide all information necessary for evaluation and as required by the Contract Documents..
   1. On request, provide the following data:
      a. Quantities of products, labor, and equipment.
      b. Insurance and bonds.
      c. Overhead and profit.
      d. Justification for any change in Contract Time.
      e. Credit for deletions from Contract, similarly documented.
   2. Support each claim for additional costs with additional information:
      a. Origin and date of claim.
      b. Dates and times work was performed, and by whom.
      c. Time records and wage rates paid.
      d. Invoices and receipts for products, equipment, and subcontracts, similarly documented.
   3. For Time and Material work, submit itemized account and supporting data after completion of change, within time limits indicated in the Conditions of the Contract.
      a. If the contractor is directed to perform work on a “Time and Material” basis he will notify the Construction Manager prior to starting and will present an itemized T&M sheet daily for Construction Manager signature at the end of the shift. No payments will be made for any T&M work without daily signed worksheets.

H. Execution of Change Orders: Architect will issue Change Orders for signatures of parties as provided the Contract.

I. After execution of Change Order, promptly revise Schedule of Values and Application for Payment forms to record each authorized Change Order as a separate line item and adjust the Contract Sum.

J. Promptly revise progress schedules to reflect any change in Contract Time, revise sub-schedules to adjust times for other items of work affected by the change, and resubmit.

K. Promptly enter changes in Project Record Documents.

1.9 APPLICATIONS FOR PAYMENT WHEN BEHIND SCHEDULE

A. When the project falls behind schedule the Contractor shall demonstrate the actions to be taken to put the project back on schedule.
   1. Payments will not be approved until satisfactory evidence is presented that the project is back on schedule.

1.10 APPLICATION FOR PAYMENT AFTER SCHEDULED COMPLETION DATE

A. In the event the work is not completed by the schedule date, listed in Section 01 1000 Summary of Contracts, and in addition to the other remedies described, the Architect will not review progress payment requisitions submitted after the construction completion date, and the District will not issue any progress payments after that date, until all work is completed.
   1. Only one requisition for work performed, after the construction completion date, may be submitted, and it may be submitted only when all work is complete and a Punch List inspection is conducted; said requisition may be submitted when the work at 100% complete, less retainage.

1.11 APPLICATION FOR FINAL PAYMENT

A. Comply with Section 01 7800 - Closeout Submittals.

B. Prepare Application for Final Payment as specified for progress payments, identifying total adjusted Contract Sum, previous payments, and sum remaining due.

C. Application for Final Payment will not be considered until the following have been accomplished:
   1. All closeout procedures specified in Section 01 7800 - Closeout Submittals are submitted and approved.
   2. All "punch list" items have been completed.

3. All Releases of Liens.

D. It is understood by the Contractor that the maximum payment due the contractor prior to final payment shall be Ninety (95%) of the Contract amount and the final Five (5%) will be due only after the above is satisfied.

END OF SECTION

SECTION 01 2005
PARTIAL RELEASE OF LIEN

CONTRACTOR/SUBCONTRACTOR/VENDOR'S LETTERHEAD

Name of Facility: Edgemont High School

Address: 300 White Oak Lane

Name of Owner: Edgemont Union Free School District

Project: High School Building "A" Interior Renovations

Name of the Contractor/Subcontractor/Vendor: _____

Address: _____

Trade/Vendor:_____

Application # _____ Dated _____.

We certify that we have completed _____% of our Contract.

Prior to this requisition we have received payment equal to _____ % of of our contract amount.

The undersigned, upon receipt of the above requisition payment hereby releases and discharges the Owner of and from any liability or obligation in any way related to or arising out of this project up to and including the date of this document.

The undersigned further covenants and agrees that it shall not in any way claim or file a mechanic's or other lien against the premises of the above designated project, or any part thereof, or against any fund applicable thereto for any of the work, labor, materials heretofore furnished by it in connection with the improvement of said premises.

The undersigned further warrants that, in order to induce the Owner to release this partial payment, they have paid all claims for labor, material, .insurance, taxes, equipment, etc., employed in the prosecution of the work above, to date of this requisition.

The undersigned hereby releases and agrees to hold the Owner harmless from any and all claims in connection with the furnishing of such labor and materials, etc., for the construction of the aforementioned project.

The undersigned further guarantees that all portions of the work furnished .and/or provided by them are in accordance with the contract and that the terms of the contract with respect to these guarantees will hold for the period specified in said contract.

IN WITNESS WHEREOF, we have executed under seal this release on the above date and to be legally bound hereby:

WITNESS: _____FIRM: _____

BY: _____

_____

State of New York, County of _____ subscribed and sworn to before me this _____ day of _____ 202____

Notary public

My commission expires _____

END OF SECTION

SECTION 01 2100
ALLOWANCES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SECTION INCLUDES

A. This Section includes administrative and procedural requirements governing allowances.

B. Selected materials and equipment are specified in the Contract Documents by allowances. The allowances may include removals and/or installation.

C. Total allowances shall be included in the base bid proposal. The final contract sum will be adjusted by Change Order. The following allowances include:
   1. Unit Cost Allowance.
   2. Commissioning Allowance
   3. Payment and modification procedures relating to allowances.

1.3 RELATED REQUIREMENTS

A. Section 01 2000 - Price and Payment Procedures: Additional payment and modification procedures.

1.4 PAYMENTS FOR ALLOWANCES

A. Allowances shall cover the cost to the Contractor of materials and equipment delivered at the site and all required taxes, less applicable trade discounts.
   1. **Bond, Overhead and Profit will be included in Base Bid for all Allowances**.

B. Unit Cost Allowance: The Total amount for each unit cost allowance listed in this Section 01 2100 is to be included in the Bid Proposal and the allowance tabulation sheet in this section shall be submitted with the bid proposal.
   1. Unit Cost Allowance: Includes Contractor's costs for measurement for materials and services, material, unloading, handling, installation, and other expenses contemplated for the stated unit cost allowance, shall be included in each Unit Cost Allowance.
      a. Quantities indicated are for bidding and contract purposes only. Quantities and measurements of actual Work will determine the payment amount and adjusted by appropriate Change Order.
      b. Measurement methods delineated in the individual specification sections complement the criteria of this section. In the event of conflict, the requirements of the individual specification section govern.
         a) Contractor shall assist by providing necessary equipment, workers, and survey personnel as required.
      c. Payment for Work governed by Unit Cost Allowances will be made on the basis of the actual measurements and quantities of Work which is incorporated in or made necessary by the Work and accepted by the Owner's Representative multiplied by the unit sum/price.
      d. The Unit Cost Allowance shall be applicable to quantities not to exceed twenty (20%) percent of the quantities listed. Quantities above those listed shall be determined in accordance with Article 8 of the General Conditions.
      e. Payment will not be made for any of the following:
         a) Work performed prior to measurement and establishing quantities approved by Owner or Architect.
         b) Products wasted or disposed of in a manner that is not acceptable.
         c) Products determined as unacceptable before or after placement.
         d) Products placed beyond the lines and levels of the required Work.

e) Products remaining on hand after completion of the Work.
f) Loading, hauling, and disposing of rejected products.

f. At closeout of Contract, funds remaining in Unit Cost Allowance will be credited to Owner by Change Order.

C. Commissioning Allowances: Contractor's costs for their work described in Section 01 9113 General Commissioning Requirements and Section 01 1400 Quality Requirements. **Bonds, overhead and profit shall be included in the Contract Sum but not in this allowances.**

D. The Contract Sum for all allowances shall be adjusted accordingly by Change Order.

E. Payment will not be made for any of the following: (If applicable)
1. **Work performed prior to measurement and establishing quantities.**
2. Products waste not used or disposed of off site.
3. Products determined as unacceptable before or after placement.
4. Products not completely unloaded from the transporting vehicle.
5. Products performed or placed beyond the lines and levels of the required Work.
6. Products remaining on hand after completion of the Work.
7. Loading, hauling, and disposing of rejected Products.

F. At closeout of Contract, funds remaining in Allowances will be credited to Owner by Change Order.

1.5 ALLOWANCE RESPONSIBILITY

A. Unit Cost Allowance
1. Refer to paragraph 1.4 above.

1.6 COMMISSIONING ALLOWANCE

A. Costs Included in the Commissioning Allowances: Cost of an Commissioning Agent selected by the Owner to perform commissioning of the HVAC system as directed by the Owner.
1. TOTAL COMMISSIONING ALLOWANCE .
a. Refer to spec 01 2100 and to Bid Form.

1.7 ALLOWANCES SCHEDULE

A. **CONTRACT #1 - GENERAL CONSTRUCTION CONTRACTOR**
1. Unit Cost Allowance GC-1
a. Description: Removal of additional asbestos containing pipe insulation fittings and installation of new insulation fittings in areas already under containment and not specifically indicated with bid documents.
Unit of Measurement: Each
Quantity: Twenty: (20) fittings .
Twenty: (20) fittings @_____ per fittings
_____ ($_____) DOLLARS
2. Unit Cost Allowance GC--2
a. Description: Removal of additional asbestos containing pipe insulation fittings and installation of new insulation fittings in areas already under containment and not specifically indicated with bid documents.
Unit of Measurement: Each
Quantity: Twenty: (20) fittings .
Twenty: (20) fittings @_____ per fittings
_____ ($_____) DOLLARS
3. Unit Cost Allowance GC-3 Asbestos Pipe Fitting Abatement:
a. Description: Removal of additional asbestos containing pipe insulation fittings and installation of new insulation fittings in areas already under containment and not specifically indicated with bid documents.

Unit of Measurement: Each
Quantity: Twenty: (20) fittings .
Twenty: (20) fittings @_____ per fittings
_____ ($_____) DOLLARS

4. Unit Cost Allowance GC-4 Asbestos Pipe Insulation Abatement:
   a. Description: Removal of additional asbestos contain pipe insulation and installation of new insulation in areas already under containment and not specifically indicated in bid documents.
   Unit of Measurement: Linear Feet
   Quantity: Twenty: (20) linear feet .
   Twenty: (20) linear feet @_____ per linear feet
   _____ ($_____) DOLLARS
5. Unit Cost Allowance GC-5 Small Containment Area:
   a. Description: Construct and remove, at completion of work, a small containment area in accordance with Asbestos Abatement Removal specifications at areas not specifically identified in bid documents and removal and reinsulation of five (5) fittings and ten (10) lineal feet of asbestos containing piping insulation.
   Unit of Measurement: Each
   Quantity: Two (2).
   Two Containment areas @_____ per each:
   _____ ($_____) DOLLARS

6. Unit Cost Allowance GC-6 Firestopping:
   a. Description: Provide 1 hr. firestopping at existing masonry corridor wall penetrations.
   Unit of Measurement: Each penetration
   Quantity: One hundred conduit penetrations at 1.5" diameter each..
   Firestop one hundred 1.5" dia. penetrations @_____ each:
   _____ ($_____) DOLLARS

TOTAL UNIT COST ALLOWANCES CONTRACT #1 GENERAL CONSTRUCTION
_____ DOLLARS

Sum of all GC allowances above. Insert sum on Bid Form

B. **CONTRACT #3 - MECHANICAL CONTRACTOR**

1. Commissioning Allowance M-1:
   Twenty Thousand ($20,000.00) DOLLARS

TOTAL ALLOWANCES CONTRACT #3 MECHANICAL **CONTRACTOR**
Twenty Thousand $20,000.00 DOLLARS

Sum of all MC allowances above. Insert sum on Bid Form

C. **CONTRACT #4 - ELECTRICAL CONTRACTOR**

1. Matrix Allowance
   a. Contingency Allowance E-1 Include an allowance for the costs associated with the Fire Alarm Programming. Refer to Section 01 6190 - Matrix of Building System Responsibility for requirements and quantities.
      Seventy Five Hundred $7,500.00 DOLLARS
   b. Contingency Allowance E-2 Include an allowance for the costs associated with the Door Access: 01 6190 - Matrix of Building System Responsibility for requirements and quantities.
      Twelve Thousand FIve Hundred $12,500.00 DOLLARS
   c. Contingency Allowance E-3: Include an allowance for the costs associated with the Security Camera System. Refer to 01 6190 - Matrix of Building System Responsibility
      Twenty Two Thousand Five Hundred $22,500.00 DOLLARS
   d. Contingency Allowance E-4: Include an allowance for the costs associated with the Public Address System Refer to 01 6190 - Matrix of Building System Responsibility
      Ten Thousand $10,000.00 DOLLARS

   e. TOTAL CONTINGENCY (MATRIX) ALLOWANCE:
      Fifty four thousand five hundred_____($54,500.00)

2. Unit Cost Allowance E-5
   a. Description: Removal and disposal of trench rock. Include fill for resultant void.
      Unit of Measurement: Cubic Yard
      Quantity: 200 Cubic yards .
      200 cubic yards @_____ per cubic yard
      _____ ($_____) DOLLARS

3.

TOTAL ALLOWANCES CONTRACT #4 ELECTRICAL
_____-_____ ($_____) DOLLARS

Sum of all EC Contingency and Unit Cost allowances above. Insert sum on Bid Form

END OF SECTION

SECTION 01 2500
SUBSTITUTION PROCEDURES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SECTION INCLUDES

A. Procedural requirements for proposed substitutions. Please refer to Article 6(X) for additional requirements concerning substitutions.

1.3 RELATED REQUIREMENTS

A. Section 00 2113 - Instructions to Bidders: Restrictions on timing of substitution requests.

B. Section 00 7200 - General Conditions; Requirements for the construction including but not limited to application for payment, and changes in the Work.

C. Section 01 2100 - Allowances, for cash allowances affecting this section.

D. Section 01 3000 - Administrative Requirements: Submittal procedures, coordination.

E. Section 01 6000 - Product Requirements: Fundamental product requirements, product options, delivery, storage, and handling and restrictions on timing of substitution requests.

F. Section 01 6116 - Volatile Organic Compound (VOC) Content Restrictions: Restrictions on emissions of indoor substitute products.

1.4 DEFINITIONS

A. Substitutions: Changes from Contract Documents requirements proposed by Contractor to materials, products, assemblies, and equipment.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.1 GENERAL REQUIREMENTS

A. A Substitution Request for products, assemblies, materials, and equipment constitutes a representation that the submitter:

1. Has investigated proposed product and determined that it meets or exceeds the quality level of the specified product, equipment, assembly, or system.
2. Agrees to provide the same warranty for the substitution as for the specified product.
3. Agrees to provide same or equivalent maintenance service and source of replacement parts, as applicable.
4. Agrees to coordinate installation and make changes to other work that may be required for the work to be complete, with no additional cost to Edgemont Union Free School District.
5. Waives claims for additional costs or time extension that may subsequently become apparent.
6. Agrees to reimburse Architect for review or redesign services associated with re-approval by authorities.
7. Statement indicating why specified material or product cannot be provided.
8. Detailed comparison of significant qualities of proposed substitution with those of the Work specified. Significant qualities may include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
9. Samples, where applicable or requested.
10. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners.
11. Material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.

12. Research/evaluation reports evidencing compliance with building code in effect for Project, from a model code organization acceptable to authorities having jurisdiction.
13. Detailed comparison of Contractor's Construction Schedule using proposed substitution with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating lack of availability or delays in delivery.
14. Cost information, including a proposal of change, if any, in the Contract Sum.
15. Contractor's certification that proposed substitution complies with requirements in the Contract Documents and is appropriate for applications indicated.
16. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.

B. Document each request with complete data substantiating compliance of proposed substitution with Contract Documents. Burden of proof is on proposer.
   1. Note explicitly any non-compliant characteristics.

C. Content: Include information necessary for tracking the status of each Substitution Request, and information necessary to provide an actionable response.
   1. Contractor's Substitution Request documentation must include the following:
      a. Project Information:
         a) Official project name and number, and any additional required identifiers established in Contract Documents.
      b. Substitution Request Information:
         a) Discrete and consecutive Substitution Request number, and descriptive subject/title.
         b) Indication of whether the substitution is for cause or convenience.
         c) Issue date.
         d) Reference to particular Contract Document(s) specification section number, title, and article/paragraph(s).
         e) Description of Substitution.
         f) Reason why the specified item cannot be provided.
         g) Differences between proposed substitution and specified item.
         h) Description of how proposed substitution affects other parts of work.
      c. Attached Comparative Data: Provide point-by-point, side-by-side comparison addressing essential attributes specified, as appropriate and relevant for the item:
         a) Physical characteristics.
         b) In-service performance.
         c) Expected durability.
         d) Visual effect.
         e) Sustainable design features.
         f) Warranties.
         g) Other salient features and requirements.
         h) Include, as appropriate or requested, the following types of documentation:
            (a) Product Data:
            (b) Samples: Provide full size actual sample of item proposed for substitution. Sample shall be provided, without exception, even if the originally specified item did not require a sample.
            (c) Certificates, test, reports or similar qualification data.
            (d) Drawings, when required to show impact on adjacent construction elements.
      d. Impact of Substitution:
         a) Savings to Edgemont Union Free School District for accepting substitution.
         b) Change to Contract Time due to accepting substitution.

c) Changes to other aspects of the Work.

e. See Section 00 4301 - General Conditions, Article 6.X, for additional substitution requirements.

D. Limit each request to a single proposed substitution item.

1. Submit an electronic document, combining the request form with supporting data into single document.
2. Deliver sample to Architect.

3.2 SUBSTITUTION PROCEDURES DURING PROCUREMENT

A. Refer to Section 00 4301 - General Conditions, Article 6X.

3.3 SUBSTITUTION PROCEDURES AFTER AWARD OF CONTRACT

A. Submittal Form:

1. Submit substitution requests by completing the form attached to this section. See this section for additional information and instructions. Use only this form; other forms of submission are unacceptable.
2. Submit substitution proposals with the bid package.

B. Substitutions will not be considered under one or more of the following circumstances:

1. When they are indicated or implied on shop drawing or product data submittals, without having received prior approval.
2. Without a separate written request.
3. When acceptance will require revisions to Contract Documents.

3.4 RESOLUTION

A. Architect may request additional information and documentation prior to rendering a decision. Provide this data in an expeditious manner.

B. Architect will notify Contractor in writing of decision to accept or reject request.

3.5 ACCEPTANCE

A. Accepted substitutions change the work of the Project. They will be documented and incorporated into work of the project by Change Order, Construction Change Directive, Architectural Supplementary Instructions, or similar instruments provided for in the Conditions of the Contract.

3.6 CLOSEOUT ACTIVITIES

A. See Section 01 7800 - Closeout Submittals, for closeout submittals.

B. Include completed Substitution Request Forms as part of the Project record. Include both approved and rejected Requests.

3.7 ATTACHMENTS

A. A facsimile of the Substitution Request Form (During Construction) required to be used on the Project is included after this section.

SUBSTITUTION REQUEST FORM

Provide form typewritten Hand written forms will not be accepted.

SUBSTITUTION REQUEST No. _____

(After the Bidding Phase)

Project: High School Building "A" Interior Renovations

Substitution Request Number: _____

From: _____

Date: _____

A/E Project Number: 24529.04

Contract For: _____

Specification Title: _____Description: _____

Section:_____ Page:_____ Article/Paragraph: _____

Proposed Substitution:

Manufacturer: _____ Address: _____ Phone:_____

_____model no.: _____

Installer:_____ Address: _____ Phone: _____

History: _____New product _____2-5 years old _____ 5-10 yrs old _____ More than 10 years old

Differences between proposed substitution and specified product:

_____

Point-by-point comparative data attached - REQUIRED

Reason for not providing specified item: _____

Similar Installation:

Project: _____ Architect: _____

Address:_____ Owner: _____

Date Installed: _____

Proposed substitution affects other parts of Work: ____ No ____Yes; explain

_____

Savings to Owner for accepting substitution: _____ ($)

Proposed substitution changes Contract Time: ____ No ____ Yes Add _____Deduct _____days.

Supporting Data Attached: ____ Drawings ____ Product Data ____ Samples _____ Tests Reports

The Undersigned certifies:

Proposed substitution has been fully investigated and determined to be equal or superior in all respects to specified product.

Same warranty will be furnished for proposed substitution as for specified product.

Same maintenance service and source of replacement parts, as applicable, is available.

Proposed substitution will have no adverse effect on other trades and will not affect or delay progress schedule.

Cost data as stated above is complete. Claims for additional costs related to accepted substitution which may subsequently become apparent are to be waived.

Proposed substitution does not affect dimensions and functional clearances.

Payment will be made for changes to building design, including A/E design, detailing, and construction costs caused by the substitution.

Coordination, installation, and changes in the Work as necessary for accepted substitution will be complete in all respects.

Submitted by: _____

Signed by: _____

Firm: _____

Address: _____

Telephone: _____

Attachments:

A/E's REVIEW AND ACTION

Refer to Specification Section 01 3000 - Administrative Requirements.

:_____Date:_____

Additional Comments: __ Contractor __ Subcontractor __ Supplier __ Manufacturer __ A/E

_____

_____

_____

_____

_____

END OF SECTION

SECTION 01 3000
ADMINISTRATIVE REQUIREMENTS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SECTION INCLUDES

A. General administrative requirements.

B. Preconstruction meeting.

C. Progress meetings.

D. Contractor's daily reports.

E. Proof of Orders & Delivery Dates.

F. Coordination and coordination drawings.

G. Submittals for review and information.

H. Number of copies of submittals.

I. Requests for Interpretation (RFI) procedures.

J. Submittal procedures.

K. Submittal Cover Sheet.

1.3 RELATED REQUIREMENTS

A. Section 00 7200 - General Conditions: Requirements for the construction including but not limited to application for payment, and changes in the work.

B. Section 01 1000 - Summary of Contracts: , Work covered by each contract, occupancy .

C. Section 01 1010 - Milestone Schedule.

D. Section 01 2000 - Price and Payment Procedures

E. Section 00 2115 - RFI Form.

F. Section 01 2500 - Substitution Procedures.

G. Section 01 3216 - Construction Progress Schedule: Form, content, and administration of schedules.

H. Section 01 3553 - Site Safety and Security Procedures.

I. Section 01 5000 - Temporary Facilities and Controls.

J. Section 01 7000 - Execution.

K. Section 01 7800 - Closeout Submittals.

L. Section 01 9113 - General Commissioning Requirements: Additional procedures for submittals relating to commissioning.

1. Where submittals are indicated for review by Architect, Consultant, and Commissioning Authority submit one extra and route to Construction Manager first, before forwarding to the Construction Manager and Commissioning Authority.

1.4 REFERENCE STANDARDS

A. See Section 01 4219 - Reference Standards.

1.5 GENERAL ADMINISTRATIVE REQUIREMENTS

A. Comply with requirements of Section 01 7000 - Execution for coordination of execution of administrative tasks with timing of construction activities.

B. Make the following types of submittals to Construction Manager:

1. Requests for Interpretation (RFI).
2. Requests for substitution.
3. Shop drawings, product data, and samples.
4. Test and inspection reports.
5. Design data.
6. Manufacturer's instructions and field reports.
7. Applications for payment and change order requests.
8. Progress schedules.
9. Coordination drawings.
10. Correction Punch List and Final Correction Punch List for Substantial Completion.
11. Closeout Submittals.

1.6 PROJECT COORDINATION

A. Construction Manager
   1. The District will not be furnishing construction coordination services through its own staff and has engaged a construction manager to provide all construction management/administration services.
   2. Where necessary, prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and attendance at meetings. Prepare similar memoranda for the Architect and Construction Manager and separate Contractors where coordination of their work is required.
   3. The construction manager will hold mandatory weekly project meetings.

B. Each Contractor shall comply with the following:
   1. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities to avoid conflicts and assure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:
      a. Preparation of schedules and 2 week look ahead.
      b. Installation and removal of temporary facilities.
      c. Processing of submittals and photocopying/delivery to affected contractors.
      d. Progress/Coordination meetings.
      e. Project closeout activities.
   2. Inspection of Conditions: Require the Installer of each major component to inspect both the substrate and conditions under which Work is to be performed. Do not proceed until unsatisfactory conditions have been corrected in an acceptable manner. Coordinate temporary enclosures with required inspections and tests to minimize the necessity of uncovering completed construction for that purpose.
   3. Coordination: Each Contractor shall coordinate its construction operations with those of other Prime Contractors and subcontractors and entities to ensure efficient and orderly installation of each part of the Work. Each Contractor shall coordinate its operations with operations included in different Sections that depend on each other for proper installation, connection, and operation.
      a. Coordinate installation of different components with other Prime Contractors and/or subcontractors to ensure maximum accessibility for required maintenance, service, and repair
   4. Meetings: Each Prime Contractor shall have responsible representation at the MANDATORY weekly job meetings held at the Construction Manager's job office from notice to proceed through close out. These meetings will be held to arrange for satisfactory coordination of all building trades so as not to impede job progress. Prime Contractors or subcontractors who fail to attend the meetings will be charged $500.00 per each occurrence.

C. Each shall cooperate with the Construction Manager in allocation of mobilization areas of site, access, traffic, parking facilities, field offices, and sheds.
   1. During construction, coordinate use of site and facilities through the Construction Manager.

D. Comply with Architect's and Construction Manager's procedures for intra-project communications; submittals, reports and records, schedules, coordination drawings, and recommendations; and resolution of ambiguities and conflicts.

E. Comply with instructions of the Construction Manager for use of temporary utilities and construction facilities. Responsibility for providing temporary utilities and construction facilities is identified in Section 01 5000 - Temporary Facilities and Controls.

F. Coordinate field engineering and layout work under instructions of the Construction Manager.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.1 PRECONSTRUCTION MEETING

A. Construction Manager will schedule a meeting after Notice of Award.

B. Attendance Required:
1. Edgemont Union Free School District.
2. Fuller and D'Angelo, P.C.
3. Consultants.
4. Construction Manager
5. All contractors.
6. Contractor's Field Superintendent.

C. Agenda:
1. Execution of Edgemont Union Free School District-Contractor Agreement.
2. Submission of executed Bonds and Insurance certificates.
3. Distribution of Contract Documents.
4. Submission of schedule of values, progress schedule, list of products,, and list of subcontractors/suppliers.
5. Submission of initial Submittal schedule.
6. Submission of DOL Award of Contract form (PW-39).
7. Designation of personnel representing the parties to Contract.
8. Procedures and processing of field decisions, submittals, substitutions, applications for payments, change orders, and contract closeout procedures.
9. Review construction scheduling.
10. Use of premises by Owner and Prime Contractors.
11. Edgemont Union Free School District's requirements and occupancy prior to completion.
12. Temporary utilities provided by Edgemont Union Free School District.
13. Survey existing facilities prior to starting construction.
14. Survey and site layout.
15. Security and housekeeping procedures.
16. Procedures for testing.
17. Procedures for maintaining record documents.
18. Requirements for start-up of equipment.

D. Construction Manager will record minutes and distribute copies within five days after meeting to participants, with copies to all participants, and those affected by decisions made.

3.2 PROGRESS MEETINGS

A. Schedule and administer meetings throughout progress of the work at minimum of two week intervals.

B. Construction Manager will make arrangements for meetings, prepare agenda with copies for participants, preside at meetings.

C. Attendance Required:

1. Edgemont Union Free School District.
2. Fuller and D'Angelo, P.C.
3. Construction Manager
4. Consultants.
5. All Contractors.
6. Contractor's Field Superintendent.
7. Major Subcontractors.
8. Suppliers as appropriate to agenda topics for each meeting.
9. Attendance is mandatory at each meeting and a penalty sum of $500.00 will be assessed to each Prime Contractor not attending without prior written authorization from the Construction Manager. Subcontractors, suppliers, or other entities will be invited at the discretion of the Construction Manager. All participants at the conference shall be familiar with the Project and authorized to conclude matters relating to the work

D. Agenda:
1. Review minutes of previous meetings.
2. Review of work progress.
3. Field observations, problems, and decisions.
4. Identification of problems that impede, or will impede, planned progress.
5. Review of submittals schedule and status of submittals.
6. Review of RFIs log and status of responses.
7. Review of delivery schedules.
8. Review of off-site fabrication and delivery schedules.
9. Review construction safety programs.
10. Review exiting and separation of construction
11. Maintenance of progress schedule.
12. Corrective measures to regain projected schedules.
13. Planned progress during succeeding work period.
14. Coordination of projected progress.
15. Maintenance of quality and work standards.
16. Effect of proposed changes on progress schedule and coordination.
17. Other business relating to work.

E. Construction Manager will record minutes and distribute copies within 5 days after meeting to participants, with copies to all participants, and those affected by decisions made.

3.3 WEEKLY COORDINATION MEETINGS

A. The Construction Manager shall schedule and hold weekly general project coordination meetings at regularly scheduled times that are convenient for the attendance of all prime contractors and other parties involved. These meetings are in addition to specific meetings held for other purposes, such as regular project meetings and special pre-installation meetings. Required attendance includes all Prime Contractors and every other entity identified by any Prime Contractor as being currently involved the coordination or planning for the work of the entire project. Conduct meetings in a manner that resolve coordination problems. Contract #1 General Construction Contractor shall preside at each meeting, and shall record meeting results. Contract #1 General Construction Contractor shall distribute copies of the meeting result to everyone in attendance, the Architect and Construction Manager and to others affected by the decisions and actions resulting from each meeting.
1. Prime Contractors shall review with the Construction Manager the work schedule for the week in order to insure the planned work does not conflict with facility operations.

3.4 CONSTRUCTION PROGRESS SCHEDULE - See Section 01 3216

3.5 DAILY CONSTRUCTION REPORTS

A. Include only factual information. Do not include personal remarks or opinions regarding operations and/or personnel.

B. Transmit reports electronically to Construction Manager at weekly intervals.

C. Each Prime Contractor shall prepare a daily construction report recording the following information concerning events at Project site and project progress:

1. Date.
2. High and low temperatures, and general weather conditions.
3. List of subcontractors at Project site.
4. Major equipment at Project site.
5. Material deliveries.
6. Safety, environmental, or industrial relations incidents.
7. Meetings and significant decisions.
8. Stoppages, delays, shortages, and losses. Include comparison between scheduled work activities (in Contractor's most recently updated and published schedule) and actual activities. Explain differences, if any. Note days or periods when no work was in progress and explain the reasons why.
9. Testing and/or inspections performed.
10. List of verbal instruction given by Construction Manager.
11. Signature of Contractor's authorized representative.
12. Contractor's total manpower and work classification and construction activities to the list of items to be included in the daily construction reports.

3.6 PROOF OF ORDERS AND DELIVERY DATES

A. Within two (2) weeks after the approval of shop drawings, samples, product data and the like, the Contractor(s) shall provide copies of purchase orders for all equipment and materials which are not readily available in local stock or requested by Construction Manager. The Contractor(s) shall submit written statements from suppliers confirming the orders and stating promised delivery dates. Dates shall be indicated and coordinated with the Construction Schedule.

3.7 COORDINATION DRAWINGS

A. General Coordination

1. Coordinate scheduling, submittals, and work of the various sections of the Project Manual to ensure efficient and orderly sequence of installation of interdependent construction elements.
2. Notify affected utility companies and comply with their requirements.
3. Verify that utility requirements and characteristics of new operating equipment are compatible with building utilities. Coordinate work of various sections having interdependent responsibilities for installing, connecting to, and placing in service, such equipment.
4. Coordinate space requirements, supports, and installation of mechanical and electrical work that are indicated diagrammatically on drawings. Follow routing indicated for pipes, ducts, and conduit, as closely as practicable; place runs parallel with lines of building. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance, and for repairs.
5. In finished areas except as otherwise indicated, conceal pipes, ducts, and wiring within the construction. Coordinate locations of fixtures and outlets with finish elements.
6. After Edgemont Union Free School District occupancy of premises, coordinate access to site for correction of defective work and work not in accordance with Contract Documents, to minimize disruption of Edgemont Union Free School District's activities.
7. General: General Construction Contractor includes general coordination of the entire work of the project, including preparation of general coordination drawings, diagrams and schedules and

control of site utilization from the beginning of construction activity through project closeout and warranty periods .

8. Coordination: Each Prime Contractor shall coordinate its construction operations with those of other contractors and entities to ensure efficient and orderly installation of each part of the Work. Each Prime Contractor shall coordinate its operations with operations, included in different Sections that depend on each other for proper installation, connection, and operation.
9. Each Prime Contractor shall provide information required by other Prime Contractor for preparation of coordination drawings required by a Prime Contractor.
10. All roofing work must be performed by roofing sub-contractors approved by the roofing manufacturer and insure roofing warranty is maintained.
11. Review drawings prior to submission to Architect and Construction Manager .
    a. Indicate all mechanical equipment, ductwork, and major piping, including elevations and dimensions to all fixed building elements, such as beams; columns; slabs; ceilings, including ceiling suspension; framing; floors; walls; doors, including door swings; and windows affected by the equipment, ductwork, and piping.
    b. Indicate all existing and proposed lighting fixtures and smoke detectors.
    c. Show location of all valves, dampers (fire, smoke, volume, and automatic), coils, humidifiers, smoke detectors, etc. requiring access for service and maintenance.
    d. Show all registers, grilles, diffusers, radiators and convectors, and other terminal elements.
    e. Locate all access doors.
    f. Include large-scale details and sections as required to fully delineate the conditions in congested areas, leaving space for the work of the other trades.
    g. Show plan layout of all equipment and anchoage and fasteners

B. Special Coordination and Sleeve Drawings:
1. Procedures for special coordination drawings shall be in accordance with paragraphs below:
    a. Methods:
        a) All Contractors shall furnish sufficient experienced drafting and engineering personnel to prepare coordination drawings in the approved format,
        b) Drawing Format: Shall be in AutoCad or other electronic format agreed to by all Contractors.
        c) Drawing Transfer: Shall be on CD or other electronic format agreed to by all Contractors.
    b. Contract #1 General Construction shall and participate in coordination meetings scheduled and directed by the Construction Manager. The Contract #1 General Construction shall submit the coordination drawings of their trades within 20 days from the date of the Letter of Award. Each of the other Prime Contractors shall prepare their coordination drawings within ten days of receiving the coordination drawing "Set" from the previous contractor.
    c. Coordination drawings shall be completed and submitted for distribution in time so as not to delay the construction. The coordination drawings may lack complete data in certain instances pending receipt of shop drawings, but sufficient space shall be allotted for the items affected.
    d. Contract #1 General Construction shall initiate coordinating the installations for all other Prime Contractors by means of coordination and sleeve drawings, as specified herein.
        a) The Construction Contractor shall prepare electronic drawings indicating their equipment and appurtenances for each floor and phase, at not less than 3/8" scale. The drawings shall show beams, columns, ceiling grid and heights, walls/partitions, casework, floor to floor dimensions, floors, windows, door swings etc. that relates to the construction.
        b) The Contract #1 General Construction shall transfer the electronic drawings to Contract #3 Mechcanical Contractor, with copy to Construction Manager.

e. The Contract #3 Mechcanical Contractor shall overlay electronic drawings, at a scale of 3/8" = 1'-0" showing all mechcanical equipment, ductwork, and major piping, including elevations and dimensions to all fixed building elements, such as beams; columns; slabs; ceilings, including ceiling suspension; framing; floors; walls; doors, including door swings; and windows affected by the equipment, ductwork, and piping. Show all registers, grilles, diffusers, radiators and convectors, and other terminal elements Show location of all valves, dampers (fire, smoke, volume, and automatic), coils, humidifiers, smoke detectors, etc. requiring access for service and maintenance. Locate all access doors. Include large-scale details and sections as required to fully delineate the conditions in congested areas, leaving space for the work of the other contractors. Show plan layout of all equipment bases, pads, and inertia blocks. Clearly label all work by Mechcanical Contractor.

   a) Contract #3 Mechcanical Contractor shall deliver electronic drawings to Contract #2 Plumbing Contractor, with copy to Construction Manager.

f. The Contract #2 Plumbing Contractor shall overlay on the electronic drawings drawings prepared by the Mechcanical Contractor and show all water supply, drain, waste, vent, sprinkler main and branch piping, risers and sprinkler heads and other major lines. Indicate piping elevations and locations of fire hose cabinets, drinking fountains, etc. which encroach on duct shafts. Locate valves and other items requiring access for service and maintenance. Locate all access doors. Avoid interference with Mechcanical work and with building construction. Use same scale as drawing being overlaid. Clearly label all work by Plumbing Contractor.

   a) Contract #2 Plumbing Contractor shall deliver electronic drawings to Contract #4 Electrical Contractor with copy of transmittal to Construction Manager.

g. The Contract #4 Electrical Contractor shall overlay the electronic drawings, prepared by General Construction, Plumbing, and Mechcanical Contractors, all main conduit and bus runs, cable trays, light fixtures, major equipment, and switch gear and panel boards. Show elevations and clearances. Show all items requiring access for service and maintenance. Locate all access doors. Avoid interference with work and with building construction. Use same scale as drawings being overlaid. Clearly label all work by Electrical Contractor.

   a) Electrical Contractor shall transfer electronic drawings to Contract #1 Construction Contractor with copy of transmittal to Construction Manager.

h. The Construction Contractor shall review and verify all beams, columns, ceiling grid and heights, walls/partitions, casework, floor to floor dimensions, floors, windows, door swings etc. that relates to the construction.

i. Each Contractor shall attend coordination meetings and participate as directed by Construction Manager to resolve interference and conflicts. All such coordination work is included in the contract responsibility of each involved contractor. When mutually agreed, make minor changes in ductwork, piping, or conduit routing or equipment location required to avoid space conflicts, but do not resize items or relocate exposed items without the Architect's approval. Do not make changes in wall or chase locations, ceiling heights, door swings or locations, window or other openings, or other items affecting the function or aesthetic effect of the building. If conflicts or interference cannot be satisfactorily resolved with such minor changes, notify the Construction Manager who shall obtain a decision from the Architect.

j. Each Contractor shall prepare coordination drawings without awaiting final product approval of terminal devices, outlets, fixtures, etc. Provide sufficient space for such items and re-coordinate as required when final product approval is obtained.

k. No preference or advantage shall be given to any contractor in considering solution of conflicts, or grant priority to any one contractor in the allocation of space. If the contractors are unable to reach an agreement on a matter on a matter of interference the matter shall be submitted to the Architect for his binding decision. Should any problems of coordination

require architectural or structural changes of design, this change shall be submitted to the Architect for approval.

l. After the electronic drawings have been coordinated and all necessary changes have been made, these drawings shall then by signed off by each of the Contractors, indicating their awareness of and agreement with the indicated routings and layouts and their inter-relationship with the adjoining or contiguous work of all contracts Thereafter, no unauthorized deviations will be permitted and if made without the knowledge or agreement of the Construction Manager or other affected contractors, will be subject to removal and correction at no additional cost to the Owner.

m. After final coordination and sleeve drawings have been agreed upon each Contractor shall sign the final coordination drawings. The Construction Contractor shall provide and distribute electronic drawings to each of the Prime Contractors, the Architect and Construction Manager for reference and record purposes. Contractors desiring additional copies of such drawings, beyond the basic distribution indicated above shall arrange and pay for cost of same.

2. Each Contractor as a working reference shall retain the record copies of final coordination drawings. All shop drawings, prior to their submittal to the Architect shall be compared with the coordination drawings and developed accordingly by the contractor responsible. Any revisions to the coordination drawings, which may become necessary during the progress of the work shall be noted by each Contractors and shall be neatly and accurately recorded on the record copies. Each Contractor shall be responsible for the up-to-date maintenance of their own record copies of the coordination drawings and keep one copy available at the site. Each Prime Contractor and sub contractors in the development of their “as-built” drawings thereto, shall utilize the coordination drawings and any subsequent changes. The Mechanical Contractor may not use coordination drawings for the submittal of ductwork.

3. NO EXTRA COMPENSATION will be paid to any Contractor for relocating any duct, pipe, conduit, or other material installed without coordination among trades involved or among other affected contractors. Each Contractor who causes any additional work to other contractors by improperly coordinated work or work not installed in accordance with the signed coordination drawings shall reimburse the affected other contractors for the cost of the additional work.

4. All changes in the work on any contract, whether a change in price is given or not, shall be shown on the coordination drawings.

5. Coordination drawings shall not be used for “shop drawings” or "as-built" drawings except where approved by the Owner's Representative.

6. Upon completion of the project, the Construction Contractor shall turn over the original electronic drawings to the Construction Manager.

3.8 REQUESTS FOR INTERPRETATION (RFI)

A. Use RFI Section 00 2115 - RFI Form.

B. Definition: A request seeking one of the following:

1. An interpretation, amplification, or clarification of some requirement of Contract Documents arising from inability to determine from them the exact material, process, or system to be installed; or when the elements of construction are required to occupy the same space (interference); or when an item of work is described differently at more than one place in Contract Documents.

2. A resolution to an issue which has arisen due to field conditions and affects design intent.

C. Whenever possible, request clarifications at the next appropriate project progress meeting, with response entered into meeting minutes, rendering unnecessary the issuance of a formal RFI.

D. Preparation: Prepare an RFI immediately upon discovery of a need for interpretation of Contract Documents. Failure to submit a RFI in a timely manner is not a legitimate cause for claiming additional costs or delays in execution of the work.

1. Prepare a separate RFI for each specific item.

a. Review, coordinate, and comment on requests originating with subcontractors and/or materials suppliers.
b. Do not forward requests which solely require internal coordination between subcontractors.

2. Combine RFI and its attachments into a single electronic file. PDF format is preferred.

E. Reason for the RFI: Prior to initiation of an RFI, carefully study all Contract Documents to confirm that information sufficient for their interpretation is definitely not included.
1. Include in each request Contractor's signature attesting to good faith effort to determine from Contract Documents information requiring interpretation.
2. Unacceptable Uses for RFIs: Do not use RFIs to request the following::
a. Approval of submittals (use procedures specified elsewhere in this section).
b. Approval of substitutions (see Section - 01 6000 - Product Requirements)
c. Changes that entail change in Contract Time and Contract Sum (comply with provisions of the General Conditions of the Contract).
d. Different methods of performing work than those indicated in the Contract Drawings and Specifications (comply with provisions of the Conditions of the Contract).
3. Improper RFIs: Requests not prepared in compliance with requirements of this section, and/or missing key information required to render an actionable response. They will be returned without a response, with an explanatory notation.
4. Frivolous RFIs: Requests regarding information that is clearly indicated on, or reasonably inferable from, Contract Documents, with no additional input required to clarify the question. They will be returned without a response.
a. The Edgemont Union Free School District reserves the right to assess the Contractor for the costs (on time-and-materials basis) incurred by Owner and Architectt, and Construction Manager and any of its consultants, due to processing of such RFIs.

F. Content: Include identifiers necessary for tracking the status of each RFI, and information necessary to provide an actionable response.
1. Official Project name and number, and any additional required identifiers established in Contract Documents.
2. Discrete and consecutive RFI number, and descriptive subject/title.
3. Issue date, and requested reply date.
4. Reference to particular Contract Document(s) requiring additional information/interpretation. Identify pertinent drawing and detail number and/or specification section number, title, and paragraph(s).
5. Annotations: Field dimensions and/or description of conditions which have engendered the request.
6. Contractor's suggested resolution: A written and/or a graphic solution, to scale, is required in cases where clarification of coordination issues is involved, for example; routing, clearances, and/or specific locations of work shown diagrammatically in Contract Documents. If applicable, state the likely impact of the suggested resolution on Contract Time or the Contract Sum.

G. Attachments: Include sketches, coordination drawings, descriptions, photos, submittals, and other information necessary to substantiate the reason for the request.

H. RFI Log: Prepare and maintain a tabular log of RFIs for the duration of the project.
1. Indicate current status of every RFI. Update log promptly and on a regular basis.
2. Note dates of when each request is made, and when a response is received.
3. Highlight items requiring priority or expedited response.
4. Remove improper or frivolous RFIs.

I. Review Time: Owner, Architect, and Construction Manager will respond and return RFIs to Contractor within seven calendar days of receipt. For the purpose of establishing the start of the mandated response

period, RFIs received after 12:00 noon will be considered as having been received on the following regular working day.

J. Responses: Content of answered RFIs will not constitute in any manner a directive or authorization to perform extra work or delay the project. If in Contractor's belief it is likely to lead to a change to Contract Sum or Contract Time, promptly issue a notice to this effect, and follow up with an appropriate Change Order request to Edgemont Union Free School District.
   1. Response may include a request for additional information, in which case the original RFI will be deemed as having been answered, and an amended one is to be issued forthwith. Identify the amended RFI with an R suffix to the original number.
   2. Do not extend applicability of a response to specific item to encompass other similar conditions, unless specifically so noted in the response.
   3. Upon receipt of a response, promptly review and distribute it to all affected parties, and update the RFI Log.
   4. Notify Fuller and D'Angelo, P.C. within seven calendar days if an additional or corrected response is required by submitting an amended version of the original RFI, identified as specified above.

3.9 SUBMITTAL SCHEDULE

A. Each Contractor shall submit to Construction Manager for review in tabular format the following:
   1. Shop Drawing and Submittal Log no later than ten (10) days after Letter of Award.
   2. Submit at the same time as the preliminary schedule.
   3. Format schedule to allow tracking of status of submittals throughout duration of construction.
   4. Arrange information to include scheduled date for initial submittal, specification number and title, submittal category (for review or for information), description of item of work covered, and role and name of subcontractor.
      a. Identify long lead and critical items critical to maintain the construction schedule.
   5. Account for time required for preparation, review, manufacturing, fabrication and delivery when establishing submittal delivery and review deadline dates.
      a. For assemblies, equipment, systems comprised of multiple components and/or requiring detailed coordination with other work, allow for additional time to make corrections or revisions to initial submittals, and time for their review.
   6. No payments will be processed when a submittal is not submitted as scheduled or the project fall behind schedule until the Contractor submits a revised schedule approved by the Construction Manager.

3.10 SUBMITTALS FOR REVIEW

A. Submittal Cover Sheet: Attached at the end of this section.

B. All submittals are the product and the property of the Contractor. The Owner, Architect, Consultants, or Construction Manager shall not be responsible for the Contractor's construction means, methods or techniques: safety precautions or programs; Acts or omission or failure to carry out the work in accordance with the contract documents.

C. Coordinate transmittal of related items so processing will not be delayed due to requirement of coordination.
   1. Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.
   2. Unauthorized submittals will be considered non-responsive and returned or discarded by the Architect without action.

D. Submittal Cover Sheet and Stamp Sheet, attached to this section, shall be used for **each** submittal.

E. All critical and long lead shop drawing submittals shall be submitted no later than ten (10) days after Letter of Award of Contract. No further payments will be made to the contractor after ten (10) days until all critical and long lead are submitted.

1. If the submittal is rejected for being incomplete, the time period for review does not start until the complete submittal is turned in to the Owner or Construction Manager.

F. When the following are specified in individual sections, including but not limited to the following, submit them for review:
   1. Product data.
   2. Shop drawings.
   3. Samples for selection.
   4. Templates.
   5. Contractor's engineering calculations.
   6. Design mix formulas.
   7. Coordination drawings for use on-site).
   8. Standard wiring diagrams.
   9. Warranties.
   10. Additional items identified in individual sections.
   11. Proof of Orders.

G. Submit to Construction Manager for review for the limited purpose of checking for conformance with information given and the design concept expressed in the reviewing documents.
   1. Submittals for Mechanical, Plumbing, Electrical, Structural, or others requiring consultant review submit directly to consultant with copy to Architect.

H. Samples will be reviewed only for aesthetics, color, or finish selection and for record documents purposes described in Section 01 7800 - Closeout Submittals.

I. After review, provide copies and distribute in accordance with Submittal Procedures article below .

J. The Architect, Consultant, and Construction Manager shall review and approve or take other appropriate action on the Contractor submittals, such as shop drawings, product data, samples and other data, which the Contractor is required to submit, but **only for the limited purpose of reviewing for conformance with the design concept and the information given in the Construction Documents**. This review shall not include review of the accuracy or completeness of details, such as quantities, dimensions, weights or gauges, fabrication processes, construction means or methods, coordination of the work with other trades or construction safety precautions, all of which are the sole responsibility of the Contractor. The Architect, Consultant, and Construction Manager's review shall be conducted with reasonable promptness while allowing sufficient time in the Architect's judgment to permit adequate review. Review of a specific item shall not indicate that the Architect, Consultant, and Construction Manager has reviewed the entire assembly of which the item is a component. **The Architect, Consultant, and Construction Manager shall not be responsible for any deviations from the Construction Documents not brought to the attention of the Architect, Consultant, and Construction Manager, in writing, by the Contractor.** The Architect and Consultant shall not be required to review partial submissions or those for which submissions of correlated items have not been received by Architect and Consultant.

K. Markings or comments on the shop drawing shall not be construed as relieving the Contractor from compliance with the contract project plans and specifications nor departure therefrom. The Contractor remains responsible for details of accuracy for conforming and correlating all quantities, verifying all dimensions for selecting fabrication processes, for techniques of assembly and for performing his work satisfactorily and in a safe manner.

L. **Architect, Consultant, and Construction Manager will review the original submittal and one (1) re submittal. Additional reviews due to the Contractor's failure to meet contract requirements will be additional services provided to the Owner and charged accordingly. All additional costs incurred by the Owner will back charge to the Contractor accordingly.**

M. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing and acquisition of materials to meet approved construction schedule.

N. Deviations: Highlight, encircle, or otherwise identify all deviations from the Contract Documents on submittals.

3.11 SUBMITTALS FOR INFORMATION

A. When the following are specified in individual sections, submit them for information purposes only. The Construction Manager shall not review nor be responsible for the verification or any information contained herein.
   1. Certificates.
   2. Test reports.
   3. Inspection reports.
   4. Manufacturer's instructions.
   5. Manufacturer's field reports.

B. Submit for Architect and Construction Manager's knowledge as contract administrator. No action will be taken.

3.12 SUBMITTALS FOR PROJECT CLOSEOUT

A. Refer to Section 01 7800 - Closeout Submittals..

3.13 NUMBER OF COPIES OF SUBMITTALS AND FORMAT

A. Documents: Submit one electronic copy in PDF format; an electronically-marked up document will be returned. Create PDFs at native size and right-side up; illegible document will be rejected. Submittals shall conform to the following:
   1. Each item shall be in a separate PDF format.
   2. Each document name shall start with the specification section number and contain an abbreviated explanation of what it contains; for example:
      a. 08 5113 Aluminum Window Shop Drawings; 08 8000 Glazing.
   3. Add Revision number (Rev2 Rev3, etc) to the file name when resubmitting items, for example:
      a. 07 5323 EPDM Revl.pdf Bond AdhRevl.pdf
   4. Make all technical submittals at one time per trade- refer to the specification for additional submittal requirements for example:
      a. Concrete; Masonry; Miscellaneous Fabrications; Roofing; etc.
   5. Do not send MSDS with the technical submittals; collate all of the MSDS needed for the entire project in three ring binders, organized by specification section, and submit the binders to the Construction Manager, with copy of Transmittal to the Architect, and maintain one copy at the project site.

B. Samples: Submit the number specified in individual specification sections; one of which will be retained by Construction Manager.
   1. **Submit with each sample, in electronic PDF format, data, cuts, photos, color, charts, etc**.
   2. Approved sample will be retained at the project site.
   3. Retained samples will not be returned to Contractor unless specifically so stated.

3.14 SUBMITTAL PROCEDURES

A. General Requirements:
   1. Submit separate packages of submittals for review and submittals for information, when included in the same specification section.
   2. **Transmit using Submittal Coversheet attached to this section.**
   3. Sequentially identify each item. For revised submittals use original number and a sequential numerical suffix.
   4. Identify: Project; Contractor; subcontractor or supplier; pertinent drawing and detail number; and specification section number and article/paragraph, as appropriate on each copy.

5. Apply Contractor's stamp on the attached form, certifying that review, approval, verification of products required, field dimensions, adjacent construction work, and coordination of information is in accordance with the requirements of the work and Contract Documents.
    a. Submittals from sources other than the Contractor, or without Contractor's stamp will not be acknowledged, reviewed, or returned.
    b. **All submitted shop drawings shall be stamped and signed by the Contractor with the following note:**
        a) **We the undersigned certify that we have reviewed and coordinated this shop drawings with job conditions and Contract requirements and they are in conformance to the plans, specifications and other provisions of the Contract Documents.**
6. Deliver each submittal on date noted in submittal schedule, unless an earlier date has been agreed to by all affected parties, and is of the benefit to the project.
    a. Send submittals in electronic format via email to Construction Manager.
7. Schedule submittals to expedite the Project, and coordinate submission of related items.
    a. For each submittal for review, allow 10 working days excluding delivery time to and from the Contractor.
    b. For sequential reviews involving Architect and Consultant or another affected party, allow an additional 7 working days.
8. Identify variations from Contract Documents and product or system limitations that may be detrimental to successful performance of the completed work.
9. When revised for resubmission, identify all changes made since previous submission.
10. Distribute reviewed submittals. Instruct parties to promptly report inability to comply with requirements.
11. Incomplete submittals will not be reviewed, unless they are partial submittals for distinct portion(s) of the work, and have received prior approval for their use.
12. **Submittals** not requested will be recognized and will be returned "Not Reviewed".

B. Product Data Procedures:
1. Submit only information required by individual specification sections.
2. Collect required information into a single submittal.
3. Do not submit (Material) Safety Data Sheets for materials or products.

C. Shop Drawing Procedures:
1. Prepare accurate, drawn-to-scale, original shop drawing documentation by interpreting Contract Documents and coordinating related work.
2. Do not reproduce Contract Documents to create shop drawings.
3. Generic, non-project-specific information submitted as shop drawings do not meet the requirements for shop drawings.

D. Samples Procedures:
1. Transmit related items together as single package.
2. Identify each item to allow review for applicability in relation to shop drawings showing installation locations.

3.15 SUBMITTAL REVIEW

A. Submittals for Review: Architect, Consultant, and Construction Manager will review each submittal, and approve, or take other appropriate action.

B. Submittals for Information: Construction Manager will acknowledge receipt and review. See below for actions to be taken.

C. Contractor's Delegated Design:

1. Architect's review and approval of delegated design submittals is limited to performance and design criteria and review of general design concepts in accordance with the General Conditions and Specifications.

D. Substitution:
   1. The Contractor shall carry out the Work in accordance with the Contract Plans and Specifications without change in Contract Sum or Contract Time.
      a. Proceeding with the Work, the Contractor acknowledges that they are responsible for:
         a) coordinating this substitution with subcontractor(s) or other Prime Contractor(s)
         b) The Contractor is responsible for any additional costs from subcontractors or other Prime Contractor(s) resulting from this substitution.

E. Architect, Consultant, and Construction Manager's actions will be reflected by marking each returned submittal using virtual stamp on electronic submittals.
   1. Architect and Construction Manager's and their consultants' actions on items submitted for review:
      a. **Authorizing purchasing, fabrication, delivery, and installation:**
         a) "No Exceptions Taken", or language with same legal meaning.
         b) "Make Corrections Noted", or language with same legal meaning.
      b. **Sample:**
         a) Samples will be reviewed only for aesthetic, color, or finish.
      c. **Not Authorizing fabrication, delivery, and installation:**
         a) "Revise and Resubmit"
            (a) Resubmit revised item, with review notations acknowledged and incorporated.
         b) "Rejected".
            (a) Submit item complying with requirements of Contract Documents.
      d. Architect and Construction Manager**'s and their Consultants' actions on items submitted for information:**
         a) Items for which no action was taken:
            (a) "Received" - to notify the Contractor that the submittal has been received for record only.
         b) Items for which action was taken:
            (a) "Examined and Reviewed" - no further action is required from Contractor.

SUBMITTAL COVERSHEET

Edgemont Union Free School District
High School Building "A" Interior Renovations
Edgemont High School

ARCHITECT:	**OWNER:**
Fuller and D'Angelo, P.C.	**Edgemont Union Free School District**
45 Knollwood Rd.	**300 White Oak Lane.**
Elmsford, NY10523	**Scarsdale, NY 10583**

CONTRACTOR: _____ CONTRACT: _____
ADDRESS: _____
DATE _____TELEPHONE: _____EMAIL: _____
Facility Name: Edgemont High School
Type of Submittal: Re-submittal: [ ] No [ ] Yes [ ] Certificate [ ] Warranty [ ] Color Sample
[ ] Shop Drawings [ ] Product Data [ ] Schedule [ ] Sample [ ] Test Report [ ] Certificate
SUBMITTAL DESCRIPTION: _____
PRODUCT NAME: _____
MANUFACTURER: _____
SUBCONTRACTOR/_____
SUPPLIER: _____
SPEC.#_____ DWG. #s _____ PAR.#: _____ RM. OR DETAIL #s: _____

STAMP SHEET

Contractor's Remarks And Stamp:

We the undersigned certify that we have reviewed and coordinated this shop drawings with job conditions and Contract requirements and they are in conformance to the plans, specifications and other provisions of the Contract Documents.

_____
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Construction Manager's Comments and Stamp:

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A. **Architect's Comments and Stamp**

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B. **Consultant's Comments and Stamp**

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_____

NAME: _____ DATE: _____

END OF SECTION

SECTION 01 3216
CONSTRUCTION PROGRESS SCHEDULE

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SECTION INCLUDES

A. Preliminary schedule.

B. Construction progress schedule, bar chart type.

C. Master Schedule.

1.3 RELATED SECTIONS

A. Section 01 1000 - Summary of Contracts: Work sequence and occupancy.

B. Section 01 3000 - Administrative Requirements.

1.4 REFERENCE STANDARDS

A. AGC (CPSM) - Construction Planning and Scheduling Manual; 2004.

1.5 RESPONSIBILITY

A. Each Contractor shall complete the detailed schedule within 10days after Letter of Award.

B. Each Contractor shall develop a full schedule, in sufficient detail and clarity of form and technique so that the General Construction Contractor can plan and control his work properly and the Construction Manager can readily monitor and follow the progress for all portions of the work.

C. Contract #1 General Construction Contractor shall prepare a draft master schedule within 5 days after receiving schedules from each prime contractor and distribute to all prime contactors, Architect and Construction Manager.

1. Within 5 days after receiving draft master schedule all prime contractors shall meet to revise, (if required) and sign off on the master schedule.
    a. In the event of conflicts the Construction Manager shall resolve and provide direction which is in the best interest on the District.
2. Contract #1 General Construction Contractor shall be responsible for incorporating all final revision, schedules, of all prime contractors, and prepare a **full final master schedule,** and updates, as required or directed by the Construction Manager.
3. Identify all long lead items and dates required on site.
4. In the event of conflict Construction Manager shall resolve and provide direction which is in the best interest on the District.
5. Each Contractor shall coordinate their work with work of all prime contractors.

D. Contract #1General Construction Contractor shall coordinate their work with work of all prime contracts.

E. The activities identified in the schedule shall be analyzed in detail to determine activity time durations in units of whole working days. All duration's shall be the result of definitive manpower and resource planning by each Contractor.

F. The activity data shall include activity codes to facilitate selection, sorting and preparation of summary reports and graphics. Activity codes shall be developed for:

1. Area: Subdivision of the building(s) and/or site(s) into logical modules or blocks and levels. Pods A, B, C and D, etc.
2. Contractor or subcontractor responsible for the work.
3. Specifications as listed in the Project Manual.
4. System: Division of the work into building systems for summary purposes.
5. Milestone: Work associated with completion of interim completion dates or milestones

G. All Prime Contractors shall review the completed "Final" detailed construction schedule and acknowledge their acceptance of this schedule by signing a copy to be kept on record by the Construction Manager. This agreed upon schedule must incorporate all milestone dates and shall be established within five (5) weeks of Notice to Proceed.

H. Prime Contractors shall be responsible for coordinating and expediting their fabrication and delivery schedules and keeping the Construction Manager informed as to their progress and their anticipated ability to stay on schedule. Should it become necessary (in the opinion of the Construction Manager) to supplement the Prime Contractor's expediting efforts to maintain job progress, the Construction Manager may elect to charge all costs incurred to said Prime Contractor.

I. Each Prime Contractor is to submit a schedule of projected fabrication on long lead items (items requiring four weeks and over to fabricate) three weeks after Notice to Proceed. Progress/Status reports on fabrication to be submitted to the Construction Manager every two weeks. "Rate of Change" chart and marked up shop drawings to be included in these reports.

1.6 SUBMITTALS

A. Submit updated master schedule with each Application for Payment.

B. Submit in PDF format.

C. When requested by the Construction Manager submit revised schedule when project fall behind schedule illustrating requirements to return the project on schedule.

D. Submit the number of opaque reproductions each prime contractor requires, plus two copies which will be retained by Architect and Construction Manager.

E. Submit under transmittal letter form specified in Section 01 3000 - Administrative Requirements.

F. All Contractors are hereby notified that payment requisitions will not be processed by the Architect and Construction Manager, nor paid by the Owner, until all schedules are reviewed, updated and approved by Owner's Representative and Master Schedule revised.

1.7 QUALITY ASSURANCE

A. Scheduler: Contractor 's personnel or specialist Consultant specializing in construction scheduling with three (3) years minimum experience in scheduling construction work of a complexity comparable to this Project, and having use of computer facilities capable of delivering a detailed graphic printout within 48 hours of request.

1.8 SCHEDULE FORMAT

A. Listings: In chronological order according to the start date for each building and each activity. Identify each activity with the applicable specification section number.

B. Submit schedule in electronic PDF format.

C. At the direction of the Construction Manager, the Prime Contractor shall provide copies of either document and/or data files for any requested document of the following programs. Microsoft Word, Microsoft Excel, or Microsoft Project.

D. Scale and Spacing: To allow for notations and revisions.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.1 PRELIMINARY SCHEDULE

A. Prepare preliminary schedule in the form of a horizontal bar chart.

B. Based on the preliminary development of the progress schedule and on feedback from Architect, Construction Manager, and other prime contractors or whatever updating may have occurred during the project start-up, Contract #1 General Construction Contractor shall, for the entire work of all the prime contracts, , prepare the (Master Schedule), secure critical time commitments for performing major elements of all the work.

3.2 GENERAL CONTENT.

A. Milestones: Include milestones in schedule, including, but not limited to, Notice of Award, Submittals, Verification of existing conditions, Asbestos/Lead Abatement, Removals, Delivery of Major Equiment, such as mechcanical Units, Fans, Motors, Installation, Substantial Completion, Completion of Punch List, Final Completion, and Closeout

B. Show complete sequence of construction by phase, activity, by room with dates for beginning and completion of each element of construction.

C. Identify each item by specification section number.

D. Identify work of Addition and other logically grouped activities.

E. Provide sub-schedules for each stage of Work identified in Section 01 1000 - Summary of Contracts.

F. Include conferences and meetings in schedule.

G. Show accumulated percentage of completion of each item, and total percentage of Work completed, as of the first day of each month.

H. Provide separate schedule of submittal dates for shop drawings, product data, and samples, and dates reviewed submittals will be required from Architect and Construction Manager. Indicate decision dates for selection of finishes.

I. Provide legend for symbols and abbreviations used.

3.3 BAR CHARTS

A. Include a separate bar schedule for Master Schedule each major portion of Work or operation.

B. Identify the first work day of each week.

3.4 REVIEW AND EVALUATION OF SCHEDULE

A. Participate in joint review and evaluation of schedule with Construction Manager at each submittal.

B. Evaluate project status to determine work behind schedule and work ahead of schedule.

C. After review, revise as necessary as result of review, the Master Schedule and resubmit within 5 days.
   1. When project work is behind schedule indicate revisions required to put the project on schedule.
   2. Payments will not be approved until satisfactory evidence is presented, by the Contractor(s) behind schedule, to put the project on schedule.

3.5 UPDATING SCHEDULE

A. Maintain schedules to record actual start and finish dates of completed activities.

B. Indicate progress of each activity to date of revision, with projected completion date of each activity.

C. Update diagrams to graphically depict current status of Work.

D. Identify activities modified since previous submittal, major changes in Work, and other identifiable changes.

E. Indicate changes required to maintain Date of Substantial Completion.

F. Submit reports required to support recommended changes.

3.6 DISTRIBUTION OF SCHEDULE

A. Distribute copies of updated schedules to Architect, Construction Manager, other Prime Contractors, subcontractors, and major suppliers and other concerned parties.

B. Instruct recipients to promptly report, in writing, problems anticipated by projections indicated in schedules.

3.7 CHANGES, DELAYS AND EXTENSIONS OF TIME

A. When changes or delays are experienced, each Contractor shall submit to the Construction Manager a Time Impact Analysis illustrating the influence of each change or delay on the current Contract scheduled

completion date. Each time analysis shall include a Fragment (network analysis) demonstrating how the Contractor proposed to incorporate the change or delay into the Detailed Schedule. Please refer to Article 13 of the General Conditions regarding time for completion of the work.

1. Each time analysis shall include a Fragment (network analysis) demonstrating how the Contractor proposed to incorporate the change or delay into the Detailed Schedule.
2. The analysis shall demonstrate the time impact based on the date the change was given to the Contractor, the status of construction at that point in time, and the activity duration of all effected activities.
3. The activity duration used in this analysis shall be those included in the latest update of the Detailed Schedule, closest to the time of delay or as adjusted by mutual agreement.

B. Each Time Impact Analysis shall be submitted within five (5) calendar days after a delay occurs or a notice of change order is given to the Contractor. In cases where the Contractor does not submit a Time Impact Analysis for a specific change or delay with a specified period of time, it shall be mutually agreed that no time extension is required. Final evaluation of each Time Impact Analysis by the Construction Manager shall be made within five calendar days after receipt unless subsequent meetings and negotiations are necessary. Adjustments in the Contract time for performance shall be made only by written change order approved by the Construction Manager. Upon approval of the Owner and Construction Manager, fragments illustrating the influence of changes and delays shall be incorporated into the Detailed Master Schedule by the Contract #1 General Construction during the first update after agreement is reached.

END OF SECTION

SECTION 01 3306
NON-DISCRIMINATION CLAUSES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 1 Specification Sections, apply to this Section.

1.2 REQUIREMENTS

A. During the performance of this contract, the Contractor agrees as follows:

1. The Contractor will not discriminate against any employee or applicant for employment because of race, creed, color or national origin, and will take affirmative action to insure that they are afforded equal employment opportunities without discrimination because of race, creed, color or national origin. Such action shall be taken with reference, but not be limited, to: recruitment, employment, job assignment, promotion, upgrading, demotion, transfer, layoff or termination, rates of pay or other forms of compensation, and selection for training or retraining, including apprenticeship and on-the job training.
2. The Contractor will send to each labor union or representative of workers with which he has or is bound by a collective bargaining or other agreement or understanding, a notice, to be provided by the State Commission for Human Rights, advising such labor union or representative of the Contractor's agreement under these clauses hereinafter called "non-discrimination clauses" and requesting such labor union or representative to agree in writing, standing or otherwise, that such labor union or representative will not discriminate against any member or applicant for membership because of race, creed, color or natural origin. Such action shall be taken with reference, but not limited, to: recruitment, employment job assignment, promotion, upgrading, demotion, transfer, layoff, or termination, rates of pay or other forms of compensation, and selection for training or retraining, including apprenticeship and on-the-job training. Such notice shall be given by the Contractor, and such written agreement shall be made by such labor union or representative, prior to the commencement of performance of this contract. If such labor union or representative fails or refuses so to agree in writing the Contractor shall promptly notify the State Commission of Human Rights of such failure or refusal.
3. The Contractor will post and keep posted in conspicuous places, available to employees and applicants for employment, notices to be provided by the State Commission for Human Rights setting forth the substance of the provisions of clauses and such provisions of the State's laws against discrimination as the State Commission for Human Rights shall determine.
4. The Contractor will state, in all solicitation or advertisements for employees placed by or on behalf of the Contractor, that all qualified applicants will be afforded equal employment opportunities without discrimination because of race, creed, color or national origin.
5. The Contractor will comply with the provisions of Section 291-299 of the Executive Law and the Civil Rights Law, will furnish all information and reports deemed necessary by the State Commission for Human Rights under these non-discrimination clauses and such sections of the Executive Law, and will permit access to his books, records and accounts by the State Commission for Human Rights, the Attorney General and the Industrial Commissioner for purposes of investigation to ascertain compliance with these non-discrimination clauses and such sections of the Executive Law and Civil Rights Law.
6. This contract may be forthwith canceled, terminated or suspended, in whole or in part by the Owner upon the basis of a finding made by the State Commission for Human Rights that the Contractor has not complied with these nondiscrimination clauses, and the Contractor may be declared ineligible for future contracts made by or on behalf of the Owner or agency of the Owner, until he or it satisfies the State Commission for Human Rights that he or it has established and is carrying out a program in conformity with the provisions of these non-discrimination clauses. Such findings shall be made by the State Commission for Human Rights after conciliation efforts by the Commission have failed to achieve compliance with these nondiscrimination clauses and after a

verified complaint has been filed with the Commission, notice thereof has been given to the Contractor and an opportunity has been afforded him to be heard publicly before three members of the Commission. Such sanctions may be imposed and remedies invoked independently of or in addition to sanctions or remedies otherwise provided by law.

7. If this Contract is canceled or terminated under the above clause, in addition to other rights of the Owner, provided in this contract upon its breach by the Contractor, the Contractor will hold the Owner harmless against any additional expenses or costs incurred by the Owner in completing the work or in purchasing the services, materials, equipment or supplies contemplated by this contract, and the Owner may withhold payments from the Contractors in an amount sufficient for this purpose and recourse may be had against the surety on the performance bond if necessary.
8. The Contractor will include the provisions of these clauses in every sub-contract or purchase order in such a manner that such provisions will be binding upon each sub-contractor or vendor as to operations to be performed within the State of New York. The Contractor will take such action in enforcing such provisions of such Sub-Contract or purchase order as the contracting agency may direct, including sanctions or remedies for non-compliance. If the Contractor becomes involved in or is threatened with litigation with a subcontractor or vendor as a result of such direction by the contracting agency, the Contractor shall promptly so notify the Attorney General, requesting him to intervene and protect the interests of the Owner.

END OF SECTION

SECTION 01 3307
SED SPECIAL REQUIREMENTS`

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section specifies special requirements of State Education Department, including Commissioner's Regulation Part 155.5, 155.7
   1. Copies of Commissioner's Regulation Part 155.5, 155.7 are available on the State Education Department's web site.www.p12nysed.gov.
   2. Copy of Commissioner's Regulation Part 155.5 is included as Appendix to the specifications.
   3. Please refer to Article 4 of the General Conditions concerning Contractor's Use of the Site.

1.3 CERTIFICATE OF OCCUPANCY

A. The occupied portion of any school building shall always comply with the minimum requirements necessary to maintain a Certificate of Occupancy.

1.4 GENERAL SAFETY AND SECURITY DURING CONSTRUCTION

A. All construction materials shall be stored in a safe and secure manner.
   1. Fences around construction supplies or debris shall be maintained.
   2. Gates shall always be locked unless a worker is in attendance, to prevent unauthorized entry.
   3. During exterior renovation work, overhead protection shall be provided for any sidewalks or areas immediately beneath the work site or such areas shall be fenced off and provided with warning signs to prevent entry.
   4. Workers shall be required to wear photo-identification badges at all times for identification and security purposes while working at occupied sites. At a minimum Badges must include Employee Full Name and Company.
   5. No drinking of alcoholic beverages, smoking, or use of cannabis, cannabinoid hemp, personal vaporizing devices, or controlled substances is permitted in the buildings or on the grounds.

1.5 SEPARATION OF CONSTRUCTION

A. Separation of construction areas from occupied spaces. Construction areas that are under the control of a contractor and therefore not occupied by district staff or students shall be separated from occupied areas. Provisions shall be made to prevent the passage of dust and contaminants into occupied parts of the building. Periodic inspection and repairs of the containment barriers must be made to prevent exposure to dust or contaminants. Metal stud and gypsum board (Type X) must be used in exit ways or other areas that require fire rated separation. Heavy duty plastic sheeting may be used only for a vapor, fine dust or air infiltration barrier, and shall not be used to separate occupied spaces from construction areas.
   1. A specific stairwell and/or elevator may be assigned for construction worker use during work hours, when approved by the Construction Manager. Workers may not use corridors, stairs or elevators designated for students or school staff.
      a. Large amounts of debris must be removed by using enclosed chutes or a similar sealed system. There shall be no movement of debris through halls of occupied spaces of the building. No material shall be dropped or thrown outside the walls of the building.
      b. All occupied parts of the building affected by renovation activity shall be cleaned at the close of each work day. School buildings occupied during a construction project shall maintain required health, safety and educational capabilities at all times that classes are in session.

1.6 FIRE PREVENTION

A. There is no smoking on school property for fire prevention and New York State Law.

B. Any holes in floors or walls shall be sealed with a fire resistant material.

C. The Owner shall maintain existing fire extinguishers.

D. Fire alarm and smoke detection systems shall remain in operation at all times.

1.7 CONSTRUCTION DIRECTIVES

A. Construction Noise. Construction and maintenance operations shall not produce noise in excess of 60 dba in occupied spaces or shall be scheduled for times when the building or affected building spaces are not occupied or acoustical abatement measures shall be taken.

1. Construction Fume Control: Each Contractor shall be responsible for the control of chemical fumes, gases, and other contaminates produced by welding, gasoline or diesel engines, roofing, paving, painting, etc. to ensure they do not enter occupied portions of the building or air intakes.
2. Off-Gassing Control. Each Contractor shall be responsible to ensure that activities and materials which result in "off-gassing" of volatile organic compounds such as glues, paints, furniture, carpeting, wall covering, drapery, etc., are scheduled, cured or ventilated in accordance with manufacturer's recommendations before a space can be occupied.

1.8 ASBESTOS

A. Asbestos/Lead Test Asbestos Letter. Indication that all school areas to be disturbed during renovation or demolition have been or will be tested for lead and asbestos.

B. Asbestos Code Rule 56. Large and small asbestos abatement projects as defined by 8 NYCRR 155.5(k) shall not be performed while the building is occupied. Note: It is SED's interpretation that the term "building" as referenced in this section, means a wing or major section of a building that can be completely isolated from the rest of the building with sealed non combustible construction. The isolated portions (the occupied portion and the portion under construction) of the building must contain separate code compliant exits. The ventilation systems must be physically separated and sealed at the isolation barrier(s).

1. Asbestos TEM. The asbestos abatement area shall be completely sealed off from the rest of the building and completely cleaned and tested by TEM prior to re-entry by the public.
2. Lead Abatement Projects. A project that contains materials identified to be disturbed which tests positive for lead shall include that information in the Construction Documents. The Construction Documents must address the availability of lead testing data for the building and include a statement that the OSHA regulations be followed and that cleanup and testing be done by HUD protocol.

1.9 VENTILATION

A. The work, as scheduled in the existing building, is to be performed when the facility is unoccupied. In the event that work is required to be performed during times when the building is occupied, all existing ventilation system between areas of work and areas of occupancy shall be disconnected, separated and code complying ventilation requirements be provided the occupied area. Prior to such work commencing each Contractor shall submit a plan, for review indicating procedure to be taken. Also see paragraph 1.5 above for additional requirements."

1.10 ELECTRICAL CERTIFICATION:

A. The Electrical Contractor shall obtain UL Certification or Inspection from a Certified Electrical Organization for electrical installation.

1.11 EXITING

A. Exiting: Work will be performed when school is not in session or after school hours. All exits will be clear and usable at all times.

B. All modifications or changes to the exiting plan shall be approved by the Construction Manager.

1.12 CONSTRUCTION WORKERS IN OCCUPIED AREAS

A. No worker shall be permitted in areas occupied by students. If access is required by the contractor's personnel they will be supervised by District personnel. Contractor shall provide 24 hour notice to the Owner when such access will be required.

B. The contractor, its employees, subcontractor's employees, or others engaged by the contractor for the performance of the work of the contract shall not communicate with students or staff.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 01 3553
SITE SAFETY AND SECURITY PROCEDURES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and other Division 1 Specification Sections, apply to this Section.

B. Please refer to Article 7 of the General Conditions.

1.2 SECTION INCLUDES

A. Refer to Section 01 4100 - Regulatory Requirements for additional requirements.

B. The safety requirements, which must be followed by each Contractor during the execution of this contract.

C. Security measures including entry control, personnel identification, and miscellaneous restrictions.

1.3 REFERENCES:

A. Code of Federal Regulations OSHA Safety and Health.

B. Education Department Regulations of the Commissioner Section 155.5 Uniform Safety Standards for School Construction and Maintenance Projects. (See Appendix).

1.4 RELATED REQUIREMENTS

A. Section 01 1000 - Summary of Contracts: Use of premises and occupancy.

B. Section 01 3307 - SED Spectial Requirements.

C. Section 01 5000 - Temporary Facilities and Controls: Temporary lighting, site fence, and barriers and enclosures.

D. Section 01 5500 - Vehicular Access and Parking.

1.5 DEFINITIONS

A. Public shall mean anyone not involved with or employed by each Contractor to perform the duties of this contract.

B. Site shall mean the limits of the work area.

C. Contractor shall mean the Contractor, his/her subcontractors and any other person related to the contract execution.

1.6 SECURITY PROGRAM

A. Security and Protection Facilities and Services shall be the responsibility of each Contractor and all costs shall be included in their bid.

B. Initiate program in coordination with Edgemont Union Free School District's existing security system at project mobilization.

C. Maintain program throughout construction period until directed by Construction Manager .

1.7 ENTRY CONTROL

A. The existing building contains a security alarm system maintained and operated by the Owner. Access into the existing building shall not be permitted unless the Construction Manager is notified and arrangements made to deactivate the system

B. Each Contractor shall restrict entrance of persons and vehicles into Project site and existing facilities.

C. Allow entrance only to authorized persons with proper identification.

D. Maintain log of workers and visitors, make available to Edgemont Union Free School District on request.

E. Edgemont Union Free School District will control entrance of persons and vehicles related to Edgemont Union Free School District's operations.

F. Coordinate access of Edgemont Union Free School District's personnel to site in coordination with Construction Manager and Edgemont School District's security forces.

G. Traffic Control
   1. Each Contractor shall maintain access for emergency vehicles, fireman and pedestrians and protect from damage all persons and property within the limits of and for the duration of the contract; all in accordance with the plans and specifications.
   2. Conduct construction operations so that the traveling public and pedestrian safety is subjected to a minimum of hazard and delay.
   3. Each Contractor shall perform the following minimum requirements as directed by Construction Manager.
      a. Keep the surface of the traveled way free from mounds, depressions, and obstructions of any type which could present hazards or annoyance to traffic.
      b. Keep the surface of all pavements used by the public free and clean of all dirt and debris or other obstructions to provide safe traveled ways.
      c. Control dust and keep the traveled way free from materials spilled from hauling and construction equipment.
      d. Provide all cones, barricades, signs and warning devices as may be required and/or as ordered by Construction Manager to safely carry out the foregoing. All such signs and devices shall be fabricated and placed in accordance with the latest “Federal Manual on Uniform Control Devices”. Use of Open Flares Is Prohibited.
   4. Ingress and Egress
      a. Each Contractor shall provide and maintain at all times safe and adequate ingress and egress to and from site at existing or at new access points consistent with work, unless otherwise authorized by the Construction Manager
   5. All traffic control costs shall include, in the base bid, the furnishing all labor, material and equipment including the cost of any and all incidental required by job conditions as ordered by Construction Manager.

1.8 FIRE PREVENTION AND CONTROL

A. Each Contractor shall provide Fire Extinguishers as follows: Provide type "A" fire extinguishers for temporary offices and similar spaces where there is minimal danger of electrical fires or grease-oil-flammable liquid fires. In other locations provide either type "ABC" dry chemical extinguishers, or a combination of several extinguishers of NFPA recommended types for the exposures in each case.
   1. All required exits, fire alarm, security, automatic temperature control, PA, sprinkler and similar systems shall be maintained and operable throughout the entire construction contract.
      a. Contractor(s) will be back-charged for all fines imposed for false alarms or service calls.

B. Free access to fire hydrants and standpipe connections shall be maintained at all times during construction operations. Portable fire extinguishers shall be provided by the Construction Contractor and made conveniently available throughout the construction site. Contractor(s) shall notify their employees of the location of the nearest fire alarm box at all locations where work is in progress.

C. Each Contractor shall take all possible precautions for the prevention of fires. Where flame cutting torches, blow torches, or welding tools are required to be used within the building, their use shall be as approved by the Construction Manager at the site. When welding tools or torches of any type are in use, have available in the immediate vicinity of the work a fire extinguisher of the dry chemical 20 lbs. Type. The fire extinguisher(s) shall be provided and maintained by the Contractor doing such work.

D. Fuel for cutting and heating torches shall be gas only and shall be contained in Underwriters laboratory approved containers.

E. Storage of gas shall be in locations as approved by the Construction Manager and subject to Fire Department regulations and requirements.

F. No volatile liquids shall be used for cleaning agents or as fuels for motorized equipment or tools within a building except with the express approval of the Construction Manager and in accordance with local codes. On-site bulk storage of volatile liquids shall be outside the buildings at locations directed by the Construction Manager, who shall determine the extent of volatile liquid allowed within the building at any given time.

G. Each Contractor shall comply with the following requirements relating to compressed gas:
   1. Where compressed gas of any type is used for any purpose at the site, it shall be contained in cylinders complying with ICC regulations. Gases of different types shall not be stored together except when in use and when such proximity is required.
   2. All gas cylinders shall be stored in sheds constructed of noncombustible materials. Sheds shall be well ventilated and without electric lights or fixtures and shall be located as far from other buildings as is practicable. All gas cylinders not in actual use, or in proposed immediate use, shall be removed from the building under construction or reconstruction. Empty gas cylinders shall be removed prior to bringing in a replacement cylinder. Cylinders shall at all times be supported and braced in an upright position. When not in use, the protective cap shall be screwed over the valve.
   3. All persons required to handle gas cylinders or to act as temporary firemen (Fire Watchers) shall be able to read, write and understand the English language; they shall also be required by the Contractor to read Part 3 of Pamphlet P-1 “Safe Handling of Compressed Gases” published by the Compressed Gas Association, 500 Fifth Avenue, New York, NY 10036.
   4. Where local ordinances are in effect regarding gas cylinders, (their use, appurtenances and handling), such ordinances shall supplement the requirements of this paragraph. All personnel engaged in fire watch shall be certified by the Local Fire Department having jurisdiction.
   5. LP-Gas Heating will not be permitted in enclosed areas below grade.
   6. Any cylinder not having the proper ICC markings or reinspection marking, or any cylinder with a leak shall be isolated immediately away from any building and the supplier shall be immediately notified; such other precautions as may be required to prevent damage or injury shall also be taken by the Contractor.

1.9 PERSONNEL IDENTIFICATION

A. Provide identification badge or other approved identification to each Contractor's, project superintendent, employees, subcontractor’s directly or indirectly employed by the Contractor or persons authorized to enter premises.

B. Maintain a list of accredited persons, submit copy to Construction Manager on request.

C. Fingerprinting: The Contractor acknowledges and agrees that he/she or its employees may be subject to fingerprinting and a criminal history record check as may be required by the Educational Law of the State of State of New York. In such an event, Contractor agrees to cooperate with Construction Manager and to complete any and all forms or procedures, all at no cost or expense to the Edgemont Union Free School District.

1.10 RESTRICTIONS

A. Refer to Section 01 1000 - Summary of Contracts

B. Do not allow cameras on site or photographs taken except by written approval of Construction Manager.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.1 GENERAL

A. In the performance of its contract, each Contractor shall exercise every precaution to prevent injury to workers and the public or damage to property.
   1. Each Contractor shall be responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the work to be done under this contract. Each

Contractor shall take all necessary precautions for the safety of, and shall provide the necessary protection to prevent damage, injury or loss including but not limited to:

a. All employees working in connection with this contract, and other persons who may be affected thereby.

b. All the work materials and equipment to be incorporated therein whether in storage on or off site; and including trees, shrubs, lawns, walks, pavements, facilities not designated for removal, relocation or replacement in the course of construction.

B. Each Contractor's duties and responsibilities for the safety and protection of the work: shall continue until such time as all the work is completed and contractor has removed all workers, material and equipment from the site, or the issuance of the certificate of final completion, whichever shall occur last.

C. Each Contractor shall use only machinery and equipment adapted to operate with the least possible noise, and shall so conduct his operations that annoyance to occupants of the site and nearby homes and facilities shall be reduced to a minimum

D. It shall be the responsibility of each Contractor to insure that all employees of the Contractor and all subcontractors, and any other persons associated with the performance of their contract shall comply with the provisions of this specification.

E. Each Contractor shall follow all rules and regulations put forth in the Code of Federal Regulations (OSHA Safety and Health Standards).

F. Two weeks after the receipt of the Notice to Proceed, each Prime Contractor shall provide a Site Safety/Logistics Plan to the Construction Manager as it relates to their work. The site logistics plan should minimally include locations of the eight-foot-high temporary fence, traffic plans for deliveries and removals, refuse container locations, crane locations, pick locations, boom radius, and lift locations. This plan shall also show the location of all staging and storage areas, non-rated and fire-rated partitions used to separate construction and school areas, made with plywood and/or gypsum wallboard, etc. The logistical information represented by the construction documents shall serve as a minimal guide.

G. Each Prime Contractor is to submit their corporate safety policy (2) weeks after notice to proceed. Plan to minimally meet OSHA standards. Each Prime Contractor shall make the participation of their subcontractors in this program mandatory. These Safety Programs should be a detailed Company Policy defining the specifics as to how a safe work environment shall be maintained.

H. Each Prime Contractor and Subcontractors shall schedule weekly safety meetings (Job Site Safety Talks) and submit meeting minutes indicating attendees and topics to the Construction Manager.

I. Each Prime Contractor is to identify in writing to the Construction Manager their “OSHA Competent Person Regarding Safety” Definition. "Competent person" means one who is capable of identifying existing and predictable hazards in the surroundings or working conditions which are unsanitary, hazardous, or dangerous to employees, and who has authorization to take prompt corrective measures to eliminate them.

J. All delivery vehicles/trucks/machinery/etc. permitted on site must be equipped with back-up alarms and enter through the designated access points. Failure to demonstrate this ability will result in cancellation of delivery or stoppage of work. On the rear access road behind the High School/Middle School building, a dedicated flagman will be required for all deliveries during work hours. The flagman will be required to escort the vehicle from the town road, to the staging area. This flagman will be supplied by the Prime Contractor receiving the delivery. All delays associated with this cancellation will be the responsibility of the Prime Contractor responsible for the Work involved.

K. All temporary construction site fences installed by any Contractor shall be installed with a tightly woven, blind screen mesh. This mesh is to be installed on the “construction” side of the fence. The General Construction Contractor will maintain all fencing daily and lock gates at the end of the day.

L. All crane picks, material delivery, etc. must be coordinated so as not to lift over any occupied area of the building. If necessary, this work shall be done on off hours to ensure the safety of the building occupants. Crane location must be carefully chosen to ensure the safety of building occupants. Crane picks cannot be conducted during academic hours within 20’ of an occupied building.

M. The Owner or Construction Manager reserves the right to have all hoisting equipment periodically inspected by an independent inspector whose findings will be binding. The Prime Contractor at its own expense must make corrections before continuing work. The Owner or Construction Manager will not assume any responsibility for the safe operation of any hoisting equipment by exercising this right. Each Prime Contractor or Sub-Contractor shall cooperate with the inspector by allowing time for the inspection. The Prime Contractor shall be notified 24 hours prior to the time of the inspection. These inspections do not release the Prime Contractor of their responsibility to provide all engineering, permits, and inspections as required by OSHA or the SED prior to use of any hoisting equipment.

N. All vehicular traffic (personal vehicles, trucks, equipment, deliveries, etc.) are to use the designated entrances as outlined on the Logistics Drawings. Access by other routes shall be reviewed and approved by the owner and Construction Manager.

O. Each Prime Contractor is to submit their corporate safety policy (2) weeks after notice to proceed. Plan to minimally meet OSHA standards. Each Prime Contractor shall make the participation of their subcontractors in this program mandatory. These Safety Programs should be a detailed Company Policy defining the specifics as to how a safe work environment shall be maintained.

END OF SECTION

SECTION 01 3554
PREVAILING WAGE RATES

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General , Supplementary, and Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 PROVISIONS OF LAW DEEMED INSERTED

A. Each and every provision of law and clauses required by law to be inserted in the Contract shall be deemed to be inserted herein and the contract shall be read and enforced as though it were included herein, and if through mistake or otherwise any such provision is not inserted, or is not correctly inserted, then upon the application of either party the Contract shall forthwith be physically amended to make such insertion.

B. The Contractor and subcontractors shall comply with applicable provisions of the Labor Law and all other state laws and Federal and Local statues ordinances, codes, rules and regulations and orders which are applicable to the performance of this contract. The Contractor shall likewise require all sub-contractors to comply therewith. The attention of the Contractor is particularly, but not exclusively, directed to Sections 220 through 223 of the New York State Labor Law and Sections 109 of the New York State Municipal Corporations Law and the following:

1. The Contractor shall post the prevailing wages in a conspicuous place on the job site.
2. Posters shall list the Department of Labor’s Public work field offices with telephone numbers.

C. All contractors and subcontractors shall furnish each of its workers with written notification of the applicable prevailing wage rates and supplements at the commencement of and at periodic intervals during the performance of the Work as required by the New York Labor Law

D. The Contractor shall provide and keep certified payroll records at the job site.

E. Prevailing Wages Schedule for this project can be obtained by the bidders on the DOL web site as follows:

1. http://www.labor.ny.gov/workerprotection/publicwork/PWContents.shtm.
2. Click on: "Request for Wage and Supplement Information" (PW39).
3. View "Previously Requested Prevailing Wage Schedule" using PRC# 2025006128

F. NOTE THESE WAGE RATES ARE EFFECTIVE UNTIL JUNE 30, of each year. Updated schedules will be available on the Department of Labor web site: www.labor.state.ny.us

END OF SECTION

SECTION 01 4000
QUALITY REQUIREMENTS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SECTION INCLUDES

A. Quality assurance.

B. Testing and inspection agencies and services.

C. Control of installation.

D. Mock-ups.

E. Tolerances.

F. Manufacturers' field services.

G. Defect Assessment.

1.3 RELATED REQUIREMENTS

A. Section 01 2100 - Allowances: Allowance for payment of testing services.

B. Section 01 3000 - Administrative Requirements: Submittal procedures.

C. Section 01 4219 - Reference Standards.

D. Section 01 6000 - Product Requirements.

1.4 REFERENCE STANDARDS

A. ASTM C1077 - Standard Practice for Agencies Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Testing Agency Evaluation; 2017.

B. ASTM C1093 - Standard Practice for Accreditation of Testing Agencies for Masonry; 2015a, with Editorial Revision (2016).

C. ASTM D3740 - Standard Practice for Minimum Requirements for Agencies Engaged in the Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction; 2012a.

D. ASTM E329 - Standard Specification for Agencies Engaged in Construction Inspection, Testing, or Special Inspection; 2018.

E. ASTM E543 - Standard Specification for Agencies Performing Nondestructive Testing; 2015.

F. IAS AC89 - Accreditation Criteria for Testing Laboratories; 2017.

1.5 CONTRACTOR'S CONSTRUCTION-RELATED PROFESSIONAL DESIGN SERVICES

A. Coordination: Contractor's professional design services are subject to requirements of project's General Conditions for Construction Contract.

B. Provide such engineering design services as may be necessary to plan and safely conduct certain construction operations, pertaining to, but not limited to the following:

1. Temporary sheeting, shoring, or supports.
2. Temporary scaffolding.
3. Temporary bracing.
4. Temporary foundation underpinning.
5. Temporary stairs or steps required for construction access only.
6. Temporary hoist(s) and rigging.
7. Investigation of soil conditions to support construction equipment or structure.

1.6 CONTRACTOR'S DESIGN-RELATED PROFESSIONAL DESIGN SERVICES

A. Coordination: Contractor's professional design services are subject to requirements of project's Conditions for Construction Contract.

B. Base design on performance and/or design criteria indicated in individual specification sections.
   1. Submit a Request for Interpretation to Fuller and D'Angelo, P.C. if the criteria indicated are not sufficient to perform required design services.

C. Scope of Contractor's Professional Design Services: Provide for the following items of work:
   1. Structural Design of Reinforcement Splices: As described in Division 3.
   2. Structural Design of Formwork.
   3. Structural Design of Steel Connections: As described in Section 05 1200 - Structural Steel.
   4. Structural Design of Steel Connections: As described in Section 05 2100 - Steel Joist Framing.
   5. Structural Design of Steel Decking: As described in Section 05 3100 - Steel Decking.
   6. Structural Design of Metal Framing: As described in Section 05 4000 - Cold-Formed Metal Framing.
   7. Structural Design of Metal Fabrications: As described in Section 05 5000 - Metal Fabrications.
   8. Structural Design: Include calculations for resisting wind loads, anchor locations, loads at points of attachment to building structure, physical characteristics, resulting dimensional limitations as described in Section 08 4413 - Glazed Aluminum Curtain Walls.

1.7 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements.

B. Designer's Qualification Statement: Submit for Construction Manager knowledge as contract administrator, or for Edgemont Union Free School District's information.
   1. Include information for each individual professional responsible for producing, or supervising production of, design-related professional services by Contractor.
      a. Full name.
      b. Professional licensure information.
      c. Statement addressing extent and depth of experience specifically relevant to design of items assigned to Contractor.

C. Testing Agency Qualifications:
   1. Prior to start of Work, submit agency name, address, and telephone number, and names of full time registered Engineer and responsible officer.

D. Design Data: Submit for Construction Manager's knowledge as contract administrator for the limited purpose of assessing conformance with information given and the design concept expressed in the contract documents.
   1. Include signature and seal of design professional responsible for allocated design services on calculations and drawings.

E. Test Reports: After each test/inspection, promptly submit one (1) copy of report to Architect and Construction Manager.
   1. Include:
      a. Date issued.
      b. Project title and number.
      c. Name of inspector.
      d. Date and time of sampling or inspection.
      e. Identification of product and specifications section.
      f. Location in the Project.
      g. Type of test/inspection.
      h. Date of test/inspection.

i. Results of test/inspection.
j. Compliance with Contract Documents.
k. When requested by Architect and Construction Manager, provide interpretation of results.

2. Test report submittals are for Architect and Construction Manager's knowledge as contract administrator for the limited purpose of assessing conformance with information given and the design concept expressed in the contract documents.

F. Certificates: When specified in individual specification sections, submit certification by the manufacturer and Contractor to Construction Manager, in quantities specified for Product Data.
1. Indicate material or product complies with or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.
2. Certificates may be recent or previous test results on material or product, but must be acceptable to Construction Manager.

G. Manufacturer's Instructions: When specified in individual specification sections, submit printed instructions for delivery, storage, assembly, installation, adjusting, and finishing, for the Owner's Representative's information. Indicate special procedures, perimeter conditions requiring special attention, and special environmental criteria required for application or installation.

H. Manufacturer's Field Reports: Submit reports for Architect and Construction Manager's benefit as contract administrator.
1. Submit report in PDF format within 30 days of observation to Architect, Construction Manager, and Contractor for information.
2. Submit for information for the limited purpose of assessing compliance with information given and the design concept expressed in the Contract Documents.

1.8 QUALITY ASSURANCE

A. Testing Agency Qualifications:
1. Prior to start of work, submit agency name, address, and telephone number, and names of full time registered Engineer and responsible officer.
2. Qualification Statement: Provide documentation showing testing laboratory is accredited under IAS AC89.

B. Designer Qualifications: Where professional engineering design services and design data submittals are specifically required of Contractor by Contract Documents, provide services of a Professional Engineer experienced in design of this type of work and licensed in New York.

1.9 REFERENCES AND STANDARDS - See Section 01 4219

1.10 TESTING AND INSPECTION AGENCIES AND SERVICES

A. Edgemont Union Free School District will employ and pay for services of an independent testing agency to perform specified testing which is the responsibility of the Owner.

B. As indicated in individual specification sections, Contractor shall employ and pay for services of an independent testing agency to perform specified testing which is the responsibility of the Contractor.

C. Employment of agency in no way relieves Contractor of obligation to perform Work in accordance with requirements of Contract Documents.

D. D. If the Architect or Owner determines that any work requires special inspection, testing or approval the Owner’s Representative will instruct the Prime Contractor of such special inspection, or testing. If such special inspection or testing reveals a failure of the work to comply with the requirements of the Contract Documents, the Prime Contractor shall bear all costs thereof, including compensation for the Architect's, Owner’s Representative's, and Testing Lab costs.

E. Contractor shall furnish incidental labor to:
1. Provide access to the work to be tested, sampled, and inspected.
2. Obtain and handle samples at the project site or at the source of the product to be tested.

3. Facilitate inspections, sampling, and tests.
4. Coordinate with the Owners Rep and testing lab and submit schedule of required tests one week in advance.
5. Coordinate inspections

F. F. As they relate to the timely completion of the work, all Prime Contractors shall coordinate independent testing and inspections. If any Prime fails to coordinate such inspections and additional costs are incurred to the Owner, the Prime Contractor will be responsible for that inspection cost.

G. The following is a list of intended inspections by third-party hired by the owner, including but not limited to:
1. Soil bearing, sub-grade inspection and/or compaction
2. Soil compaction, density and sieve analysis testing, soil bearing
3. Concrete field and plant testing & rebar placement
4. Masonry or stone field inspection, mortar sampling, reinforcement placement inspection
5. Structural steel field welding, bolting, connections, and metal deck (referring to structural specifications and drawings for additional special inspections not listed herein).
6. Asphalt and sub-base inspection
7. Under slab plumbing work – Witnessed, testing performed by contractor.
8. Firestopping
9. Fireproofing
10. Asbestos air and visual monitoring

H. Architect and Owner’s Representative shall be notified forty-eight (48) hours prior to the need of testing, in the event the Contractor does not give proper notification, and the work is done with no test, that Contractor will bear all costs for such tests.

I. All special testing costs will be paid for by the Owner except as noted in the project contract documents.

J. As part of the two-week look ahead, the Prime Contractor shall provide the Construction Manager with a schedule of all anticipated on-site Owner supplied inspections (if any are required). The Prime Contractor shall submit all requests for Owner-supplied inspection for all items of controlled inspection by 1:30 p.m. of the day previous.

K. ContractorEmployed Agency:
1. Inspection agency: Comply with requirements of ASTM D3740 and ASTM E329.
2. Laboratory: Authorized to operate in New York.
3. Laboratory Staff: Maintain a full time registered Engineer on staff to review services.
4. Testing Equipment: Calibrated at reasonable intervals either by NIST or using an NIST established Measurement Assurance Program, under a laboratory measurement quality assurance program.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.1 CONTROL OF INSTALLATION

A. Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce work of specified quality.

B. Comply with manufacturers' instructions, including each step in sequence.

C. Should manufacturers' instructions conflict with Contract Documents, request clarification from Architect before proceeding.

D. Comply with specified standards as minimum quality for the work except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.

E. Have work performed by persons qualified to produce required and specified quality.

3.2 MOCK-UPS

A. Before installing portions of the Work where mock-ups are required, for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work. The purpose of mock-up is to demonstrate the proposed range of aesthetic effects and workmanship.

B. Accepted mock-ups establish the standard of quality for Architect and Construction Manager will use to judge the Work.

C. Notify Architect and Construction Manager five (5) working days in advance of dates and times when mock-ups will be constructed.

D. Provide supervisory personnel who will oversee mock-up construction. Provide workers that will be employed during the construction at Project.

E. Tests shall be performed under provisions identified in this section and identified in the respective product specification sections.

F. Obtain Architect and Construction Manager's approval of mock-ups before starting work, fabrication, or construction.

1. Make corrections as necessary until Architect and Construction Manager's approval is issued.

G. Owner's Representative and Architect will use accepted mock-ups as a comparison standard for the remaining Work.

3.3 TOLERANCES

A. Monitor fabrication and installation tolerance control of products to produce acceptable Work. Do not permit tolerances to accumulate.

B. Comply with manufacturers' tolerances. Should manufacturers' tolerances conflict with Contract Documents, request clarification from Architect and Construction Manager before proceeding.

C. Adjust products to appropriate dimensions; position before securing products in place.

3.4 TESTING AND INSPECTION

A. See individual specification sections for testing and inspection required.

B. Limits on Testing/Inspection Agency Authority:

1. Agency may not release, revoke, alter, or enlarge on requirements of Contract Documents.
2. Agency may not approve or accept any portion of the Work.
3. Agency may not assume any duties of the Contractor.
4. Agency has no authority to stop the Work.

C. Contractor Responsibilities:

1. Deliver to agency at designated location, adequate samples of materials proposed to be used that require testing, along with proposed mix designs.
2. Cooperate with laboratory personnel, and provide access to the Work.
3. Provide incidental labor and facilities:
    a. To provide access to Work to be tested/inspected.
    b. To obtain and handle samples at the site or at source of Products to be tested/inspected.
    c. To facilitate tests/inspections.
    d. To provide storage and curing of test samples.
4. Notify Architect and Construction Manager and laboratory 24 hours prior to expected time for operations requiring testing/inspection services.
5. Employ services of an independent qualified testing laboratory and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.
6. Arrange with Edgemont Union Free School District's agency and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.

D. Re-testing required because of non-conformance to specified requirements shall be shall be performed by the same agency on instructions by Construction Manager paid for by Contractor.

3.5 OWNER'S TESTING AND INSPECTIONS

A. Coordinate with Construction Manager.

B. Owner will engage a qualified testing agency or special inspector to conduct tests and inspections are the responsibility of Owner and paid for by Owner as follows:

1. Asbestos inspection and air monitoring
2. Soil bearing capacity and bottom of footings.
3. Compaction and backfilling.
4. Compaction of structural fill.
5. Wall footings and pier footing reinforcing, size and placement.
6. Foundation wall reinforcing and placement.
7. Slab on grade thickness and reinforcing placement.
8. Concrete samples and compression tests.
9. Placement of joint reinforcement.
10. Placement of anchors.
11. Placement of concealed flashing.
12. Cast stone anchors.
13. Placement of cavity insulation.
14. Placement of cavity drainage material.
15. Placement of weep holes.
16. Structural steel column, beam and miscellaneous framing members..
17. Field bolts & welded connections.
18. Shop fabrication and welding.
19. Welder's certificates.
20. Steel studs.
21. Placement and type of metal deck.
22. Attachment of deck to steel.
23. Pour stops and framed openings.
24. Testing of shear studs.
25. Size, placement and fasteners of light gauge metal framing.
26. Exterior wall system including metal framing fasteners, gypsum sheathing, vapor barrier, masonry, insulation
27. Curtain wall connections and fasteners.
28. Aluminum windows connections and fasteners.
29. Firestopping.
30. Commissioning. (See Section 01 2100 - Allowances)

C. Contractor shall perform the work in an efficient manner consistent with industry standards. Excessive testing resulting from the contractor's inability to perform efficiently will result in back charges to the contractor.

D. All re-inspections required for work not properly installed shall be paid for by the contractor.

E. The Owner will not be liable for any costs or delay claims due to the testing agency or special inspector failure to provide inspection without proper and sufficient notification.

F. All requests by the contractor for inspection that are cancelled and result in charges to the Owner will be back charged to the contractor.

3.6 CONTRACTOR'S TESTING AND INSPECTION

A. Testing and Inspections shall be conducted by a qualified testing agency or special inspector, approved by the Construction Manager as required by authorities having jurisdiction and as indicated in individual Specification Sections as the contractor's responsibility including but not limited to:

1. Verifying that manufacturer maintains detailed fabrication and quality-control procedures and reviewing the completeness and adequacy of those procedures to perform the Work.
2. Notifying Construction Manager promptly of irregularities and deficiencies observed in the work during performance of its services.
3. Submitting a certified written report of each test, inspection, and similar quality-control service to Construction Manager with copy to Contractor and to authorities having jurisdiction.
4. Submitting a final report of special tests and inspections at Substantial Completion, which includes a list of unresolved deficiencies.
5. Interpreting tests and inspections and stating in each report whether tested and inspected work complies with or deviates from the Contract Documents.
6. All design mixes.
7. Testing and balancing of all mechanical and electrical.
8. Testing Fire Alarm
9. Testing technology data and communications systems.
10. Testing fire protection system.
11. Testing public address system.
12. Electrical systems.
13. Electrical Certification: The Electrical Contractor shall obtain UL Certification or Inspection from a Certified Electrical Organization for electrical installation.
14. Testing as required by individual specification sections.

3.7 MANUFACTURERS' FIELD SERVICES

A. When specified in individual specification sections, require material or product suppliers or manufacturers to provide qualified staff personnel to observe site conditions, conditions of surfaces and installation, quality of workmanship, adjusting as applicable, and to initiate instructions when necessary.

B. Report observations and site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturers' written instructions in writing to Architect and Construction Manager.

3.8 DEFECT ASSESSMENT

A. Replace Work or portions of the Work not complying with specified requirements.

B. If, in the opinion of Construction Manager, it is not practical to remove and replace the Work, Construction Manager will direct an appropriate remedy or adjust payment.

END OF SECTION

SECTION 01 4100
REGULATORY REQUIREMENTS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 1 Specification Sections, apply to this Section.

1.2 GENERAL

A. Electrical Certification: The Electrical Contractor shall obtain UL Certification or Inspection from a Certified Electrical Organization for certification of electrical installations.

B. The Owner shall file and obtain the Building Permit.

C. The Contractor shall furnish and pay for all other permits, fees and other installation costs required for the various installations by governing authorities and utility companies; prepare and file drawings and diagrams required; arrange for inspections of any and all parts of the work required by the authorities and furnish all certificates necessary to the Owner's Representative and Architect as evidence that the work installed under this Section of the Specifications conforms with all applicable requirements of the State Codes, National Board of Fire Underwriters, and National Electric Code.

D. Any items of work specified herein and shown on the drawings which conflict with aforementioned rules, regulations and requirements, shall be referred to the Architect for decision, which decision shall be final and binding.

E. The work shall not be deemed to have reached a Substantial Completion until the certificates have been delivered.

1.3 SUMMARY OF REFERENCE STANDARDS

A. Regulatory requirements applicable to this project are the following:
   1. 36 CFR 1191 - Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines; current edition.
   2. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design; 2010.
   3. 29 CFR 1910 - Occupational Safety and Health Standards; current edition.
   4. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2017.
   5. NFPA 1 - Fire Code; 2018.
   6. NFPA 101 - Life Safety Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
   7. New York State Uniform Fire and Building Codes known as the “Building Codes of the State of New York” and consist of the following:
      a. State Education Department Planning Standards, including Commissioner's Regulation Part 155.5, 155.7
      b. Energy Conservation Construction Code of New York State
      c. Fire Code of New York State
      d. Fuel Gas Code of New York State
      e. Mechanical Code of New York State
      f. Plumbing Code of New York State
      g. Utility Company Regulations and Requirements.
      h. Classification of Construction: Type IIB.
      i. Occupancy Classification:Education E
      j. State Education Department: Planning Standards is applicable to the work. Any conflicts between the Building Codes of New York and the State Education Department Planning Standards, the most restrictive shall apply. Copies of the Planning standards are available at the SED web site. http://www.p12.nysed.gov/facplan/
   8. EPA - Environmental Protection Agency

9. IEEE - Institute of Electrical And Electronic Engineers
10. NEMA - National Electrical Manufacturers Association
11. UL - Underwriters Laboratories
12. OSHA Part 1926 Safety and Health Regulations for Construction.
13. Federal Regulation for Asbestos Abatement
    a. Title 30 CFR Part 61, Subpart G; The Transport and Disposal of Asbestos Waste
    b. The Transport and Disposal of Asbestos Waste]
    c. Title 40 CFR, Part 763 Asbestos Containing Materials in Schools; Final Rule and Notice
    d. Title 49 CFR Parts 106, 107, and 171-179.The Transportation Safety Act of 1974 and the Hazardous Material Transportation Act..
    e. Public Law 101-637 ASHARA
14. New York State Official Compilation of Codes, Rules and Regulations
    a. Title 12 Part 56
    b. Title 10 Part 73
    c. Title 6 Parts 360-364
    d. Labor Law - Article 30 and Sections 900-912
    e. All applicable Additions, Addenda, Variances and Regulatory Interpretation Memoranda

1.4 MANDATORY OSHA CONSTRUCTION SAFETY AND HEALTH TRAINING

A. All contractors and their subcontractor's project superintendent, employees, directly or indirectly employed by the contractor to work on the project must at all times, whenever on the Owner's property, wear an ID badge, safety vest, hard hat, etc. and all other required personal protective equipment as required by OSHA

1.5 RELATED REQUIREMENTS

A. Section 01 4000 - Quality Requirements.

B. Section 01 4219 - Reference Standards

C. Section 02 2080 - Asbestos Abatement.

D. Division 31 - Earthwork.

E. Division 32 - Exterior Improvements

F. Division 22 - Plumbing.

G. Division 23 - Heating, Ventilation and Air Conditioning.

H. Division 26 - Electrical.

I. Division 27 - Communications.

1.6 QUALITY ASSURANCE

A. Regulations: Each Contractor shall comply with industry standards and with applicable laws and regulations of authorities having jurisdiction including, but not limited to, the following:
    1. Building code requirements.
    2. Health and safety regulations.
    3. Police, fire department and rescue squad rules.
    4. Environmental protection regulations

B. Standards: Each Contractor shall comply with NFPA 241 "Standard for Safeguarding Construction, Alterations, and Demolition Operations," ANSI-A10 Series standards for "Safety Requirements for Construction and Demolition," and NECA Electrical Design Library "Temporary Electrical Facilities."

C. Designer Qualifications: Where delegated engineering design is to be performed under the construction contract provide the direct supervision of a Professional Engineer experienced in design of this type of work and licensed in NY .

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 4219
REFERENCE STANDARDS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SECTION INCLUDES

A. Requirements relating to referenced standards.

1.3 RELATED REQUIREMENTS

A. Document 00 7200 - General Conditions: Reference standards.

1.4 QUALITY ASSURANCE

A. For products or workmanship specified by reference to a document or documents not included in the Project Manual, also referred to as reference standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.

B. Comply with the reference standard of date of issue specified in this section, except where a specific date is established by applicable code.

C. Obtain copies of standards when required by Contract Documents.

D. Maintain copy at project site during submittals, planning, and progress of the specific work, until Date of Substantial Completion.

E. Should specified reference standards conflict with Contract Documents, request clarification from the Fuller and D'Angelo, P.C. before proceeding.

F. Neither the contractual relationships, duties, or responsibilities of the parties in Contract nor those of the Fuller and D'Angelo, P.C. shall be altered by Contract Documents by mention or inference otherwise in any reference document.

1.5 DEFINITIONS

A. General: Basic Contract definitions are included in the Conditions of the Contract and Section 01422 Definitions

1.6 INDUSTRY STANDARDS

A. Applicability of Standards: Unless the Contract Documents, including reference standards in codes having jurisdiction, include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.

B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of the requirements. Refer uncertainties to Architect for a decision before proceeding.

C. Copies of Standards: Each entity engaged in construction on Project must be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Contract Documents.

D. Where copies of standards are needed to perform a required construction activity, obtain copies directly from the publication source and make them available on request.

PART 2 CONSTRUCTION INDUSTRY ORGANIZATION DOCUMENTS

2.1 Abbreviations and Names:

A. Abbreviations and acronyms are frequently used in the Specifications and other Contract Documents to represent the name of a trade association, standards-developing organization, authorities having jurisdiction, or other entity in the context of referencing a standard or publication. Where abbreviations and acronyms are used in the Specifications or other Contract Documents, they mean the recognized name of these entities. Refer to Gale Research's "Encyclopedia of Associations" or Columbia Books' "National Trade & Professional Associations of the U.S.," which are available in most libraries or the internet.

LIST OF REFERENCES

3.1 AAMA -- AMERICAN ARCHITECTURAL MANUFACTURERS ASSOCIATION

A. AAMA 1304 - Voluntary Specification for Forced Entry Resistance of Side-Hinged Door Systems; 2018.

B. AAMA SFM-1 - Aluminum Storefront and Entrance Manual; 2014.

3.2 AASHTO -- AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS

A. AASHTO M 147 - Standard Specification for Materials for Aggregate and Soil-Aggregate Subbase, Base and Surface Courses; 2017.

3.3 AATCC -- AMERICAN ASSOCIATION OF TEXTILE CHEMISTS & COLORISTS

3.4 ACI -- AMERICAN CONCRETE INSTITUTE INTERNATIONAL

A. ACI 117 - Specifications for Tolerances for Concrete Construction and Materials; 2010 (Reapproved 2015).

B. ACI 211.1 - Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete; 1991 (Reapproved 2009).

C. ACI 301 - Specifications for Structural Concrete; 2016.

D. ACI 302.1R - Guide to Concrete Floor and Slab Construction; 2015.

E. ACI 303R - Guide to Cast-in-Place Architectural Concrete Practice; 2012.

F. ACI 304R - Guide for Measuring, Mixing, Transporting, and Placing Concrete; 2000 (Reapproved 2009).

G. ACI 305R - Guide to Hot Weather Concreting; 2010.

H. ACI 306R - Guide to Cold Weather Concreting; 2016.

I. ACI 308R - Guide to External Curing of Concrete; 2016.

J. ACI 440.1R - Guide for the Design and Construction of Structural Concrete Reinforced with Fiber-Reinforced Polymer (FRP) Bars; 2015.

K. TMS 402/602 - Building Code Requirements and Specification for Masonry Structures; 2016.

L. ACI MNL-66 - ACI Detailing Manual; 2020.

M. ACI PRC-211.1 - Selecting Proportions for Normal-Density and High Density-Concrete - Guide; 2022.

3.5 AFPA -- AMERICAN FOREST AND PAPER ASSOCIATION

3.6 AI -- THE ASPHALT INSTITUTE

A. AI SS-2 - Specifications for Paving and Industrial Asphalts; 1995.

3.7 AISC -- AMERICAN INSTITUTE OF STEEL CONSTRUCTION, INC.

A. AISC (MAN) - Steel Construction Manual; 2017.

B. AISC S303 - Code of Standard Practice for Steel Buildings and Bridges; 2016.

3.8 ANSI -- AMERICAN NATIONAL STANDARDS INSTITUTE

A. ANSI/AWI 0641 - Architectural Wood Casework; 2019.

B. ANSI A108.10 - American National Standard Specifications for Installation of Grout in Tilework; 1999 (Reaffirmed 2010).

C. ANSI A118.1 - American National Standard Specifications for Dry-Set Cement Mortar; 2012 (Revised).

D. ANSI A136.1 - American National Standard for Organic Adhesives for Installation of Ceramic Tile; 2008 (Reaffirmed 2013).

E. ANSI A137.1 - American National Standard Specifications for Ceramic Tile; 2012.

F. ANSI/BHMA A156.29 - Standard for Exit Locks, Exit Alarms, Alarms for Exit Devices; 2017.

G. ANSI A208.1 - American National Standard for Particleboard; 2009.

H. ANSI A208.2 - American National Standard for Medium Density Fiberboard for Interior Use; 2009.

I. ANSI A224.1 - American National Standard Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames; 1990.

J. ANSI A250.8 - SDI-100 Recommended Specifications for Standard Steel Doors and Frames; 2003.

K. ANSI/SDI A250.4 - Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames and Frame Anchors; 2011.

L. ANSI/SDI A250.6 - Recommended Practice for Hardware Reinforcing on Standard Steel Doors and Frames; 2003 (R2009).

M. ANSI/SDI A250.8 - Specifications for Standard Steel Doors and Frames (SDI-100); 2017.

N. ANSI/SDI A250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames; 2011.

O. ANSI A300 Part 1 - American National Standard for Tree Care Operations -- Tree, Shrub and Other Woody Plant Maintenance -- Standard Practices; 2017.

P. ANSI A300 Part 5 - American National Standard for Tree Care Operations – Tree, Shrub and Other Woody Plant Maintenance – Standard Practices. (Management Of Trees And Shrubs During Site Planning, Site Development, And Construction Operations); 2012.

Q. ANSI/SPRI/FM 4435/ES-1 - Test Standard for Edge Systems Used with Low Slope Roofing Systems; 2017.

R. ANSI/AHIA Z60.1 - American National Standard for Nursery Stock; 2014.

S. ANSI Z97.1 - American National Standard for Safety Glazing Materials Used in Buildings - Safety Performance Specifications and Methods of Test; 2015.

3.9 ASHRAE -- AMERICAN SOCIETY OF HEATING, REFRIGERATING AND AIR-CONDITIONING ENGINEERS, INC.

A. ASHRAE (FUND)-2017 - ASHRAE Handbook - Fundamentals; 2017.

B. ASHRAE (HVACA) - ASHRAE Handbook - HVAC Applications; Most Recent Edition Cited by Referring Code or Reference Standard.

C. ASHRAE Std 52.2 - Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size; 2017.

D. ASHRAE Std 62.1-2019 - Ventilation for Acceptable Indoor Air Quality; 2019, with Errata and Amendments (2021).

E. ASHRAE Std 129 - Measuring Air-Change Effectiveness; 1997 (Reaffirmed 2002).

3.10 ASME -- THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS

A. ASME A17.1 - Safety Code for Elevators and Escalators; 2016.

3.11 ASTM A Series -- ASTM INTERNATIONAL

A. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.

B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2016a.

C. ASTM A240/A240M - Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications; 2018.

D. ASTM A269/A269M - Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service; 2015a.

E. ASTM A283/A283M - Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates; 2013.

F. ASTM A325 - Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength; 2014.

G. ASTM A392 - Standard Specification for Zinc-Coated Steel Chain-Link Fence Fabric; 2011a (Reapproved 2017).

H. ASTM A424/A424M - Standard Specification for Steel, Sheet, for Porcelain Enameling; 2018.

I. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes; 2013.

J. ASTM A526/A526M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process, Commercial Quality; 1990.

K. ASTM A580/A580M - Standard Specification for Stainless Steel Wire; 2016.

L. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement; 2018, with Editorial Revision (2018).

M. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2018.

N. ASTM A704/A704M - Standard Specification for Welded Steel Plain Bar or Rod Mats for Concrete Reinforcement; 2018.

O. ASTM A767/A767M - Standard Specification for Zinc-Coated (Galvanized) Steel Bars for Concrete Reinforcement; 2016.

P. ASTM A775/A775M - Standard Specification for Epoxy-Coated Steel Reinforcing Bars; 2017.

Q. ASTM A792/A792M - Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process; 2010 (Reapproved 2015).

R. ASTM A879/A879M - Standard Specification for Steel Sheet, Zinc Coated by the Electrolytic Process for Applications Requiring Designation of the Coating Mass on Each Surface; 2012 (Reapproved 2017).

S. ASTM A884/A884M - Standard Specification for Epoxy-Coated Steel Wire and Welded Wire Reinforcement; 2014.

T. ASTM A951/A951M - Standard Specification for Steel Wire for Masonry Joint Reinforcement; 2016.

U. ASTM A1003/A1003M - Standard Specification for Steel Sheet, Carbon, Metallic- and Nonmetallic-Coated for Cold-Formed Framing Members; 2015.

V. ASTM A1064/A1064M - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete; 2018a.

3.12 ASTM F Series -- ASTM INTERNATIONAL

A. ASTM F150 - Standard Test Method for Electrical Resistance of Conductive and Static Dissipative Resilient Flooring; 2006 (Reapproved 2018).

B. ASTM F567 - Standard Practice for Installation of Chain-Link Fence; 2014a.

C. ASTM F588 - Standard Test Methods for Measuring the Forced Entry Resistance of Window Assemblies, Excluding Glazing Impact; 2017.

D. ASTM F668 - Standard Specification for Polyvinyl Chloride (PVC) and Other Organic Polymer-Coated Steel Chain-Link Fence Fabric; 2017.

E. ASTM F710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring; 2017.

F. ASTM F793/F793M - Standard Classification of Wall Coverings by Use Characteristics; 2015.

G. ASTM F970 - Standard Test Method for Measuring Recovery Properties of Floor Coverings after Static Loading; 2017.

H. ASTM F1066 - Standard Specification for Vinyl Composition Floor Tile; 2004 (Reapproved 2018).

I. ASTM F1083 - Standard Specification for Pipe, Steel, Hot-Dipped Zinc-Coated (Galvanized) Welded, for Fence Structures; 2016.

J. ASTM F1861 - Standard Specification for Resilient Wall Base; 2016.

K. ASTM F2170 - Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes; 2017.

L. ASTM F2408 - Standard Specification for Ornamental Fences Employing Galvanized Steel Tubular Pickets; 2016.

3.13 ASTM G Series -- ASTM INTERNATIONAL

3.14 AWI -- ARCHITECTURAL WOODWORK INSTITUTE

A. AWI/AWMAC (QSI) - Architectural Woodwork Quality Standards Illustrated; Architectural Woodwork Institute and Architectural Woodwork Manufacturers Association of Canada; 2005, 8th Ed., Version 2.0.

B. AWI P-201 - Architectural Casework; 1989.

C. AWI P-206 - Guide to Wood Species; 1977.

D. AWI (QCP) - Quality Certification Program; current edition at www.awiqcp.org.

3.15 AWI/AWMAC/WI -- JOINT PUBLICATION OF ARCHITECTURAL WOODWORK INSTITUTE/ARCHITECTURAL WOODWORK MANUFACTURERS ASSOCIATION OF CANADA/WOODWORK INSTITUTE

A. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards; 2014, with Errata (2016).

3.16 AWPA -- AMERICAN WOOD-PRESERVERS' ASSOCIATION

A. AWPA U1 - Use Category System: User Specification for Treated Wood; 2017.

3.17 AWS -- AMERICAN WELDING SOCIETY

A. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination; 2012.

B. AWS B2.1/B2.1M - Specification for Welding Procedure and Performance Qualification; 2014 (Amended 2015).

C. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2015, with Errata (2016).

D. AWS D1.2/D1.2M - Structural Welding Code - Aluminum; 2014, with Errata.

3.18 BIA -- BRICK INDUSTRY ASSOCIATION

A. BIA Technical Notes No. 7 - Water Penetration Resistance – Design and Detailing; 2017.

3.19 BICSI -- BUILDING INDUSTRY CONSULTING SERVICE INTERNATIONAL

A. BICSI N1 - Installation Practices for Telecommunications and ICT Cabling and Related Cabling Infrastructure, 1st Edition; 2019.

3.20 CAL -- STATE OF CALIFORNIA

3.21 CARB -- CALIFORNIA AIR RESOURCES BOARD

3.22 CHPS -- COLLABORATIVE FOR HIGH PERFORMANCE SCHOOLS

3.23 CLFMI -- CHAIN LINK FENCE MANUFACTURERS INSTITUTE

3.24 EIA -- ELECTRONIC INDUSTRIES ALLIANCE

A. EIA/ECA-310 - Cabinets, Racks, Panels, and Associated Equipment; Revision E, 2005.

3.25 GA -- GYPSUM ASSOCIATION

A. GA-216 - Application and Finishing of Gypsum Panel Products; 2016.

3.26 GREENSEAL -- GREENSEAL, INC.

A. GreenSeal GS-36 - Adhesives for Commercial Use; 2013.

3.27 IAAF -- INTERNATIONAL AMATEUR ATHLETIC FEDERATION

3.28 IAS -- INTERNATIONAL ACCREDITATION SERVICE

A. IAS AC89 - Accreditation Criteria for Testing Laboratories; 2017.

3.29 ICEA -- INSULATED CABLE ENGINEERS ASSOCIATION

3.30 IEEE -- INSTITUTE OF ELECTRICAL AND ELECTRONIC ENGINEERS

A. IEEE 802.3 - IEEE Standard for Ethernet; 2018.

3.31 NAAMM -- THE NATIONAL ASSOCIATION OF ARCHITECTURAL METAL MANUFACTURERS

A. NAAMM FP 1001 - Guide Specifications for Design Loads of Metal Flagpoles; 2007.

B. NAAMM HMMA 830 - Hardware Selection for Hollow Metal Doors and Frames; 2002.

C. NAAMM HMMA 831 - Hardware Locations for Hollow Metal Doors and Frames; 2011.

D. NAAMM HMMA 840 - Guide Specifications for Installation and Storage of Hollow Metal Doors and Frames; 2007.

E. NAAMM HMMA 861 - Guide Specifications for Commercial Hollow Metal Doors and Frames; 2014.

3.32 NECA -- NATIONAL ELECTRICAL CONTRACTORS ASSOCIATION

A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

B. NECA 303 - Standard for Installing Closed-Circuit Television (CCTV) Systems; 2005.

3.33 NFPA -- NATIONAL FIRE PROTECTION ASSOCIATION

A. NFPA 1 - Fire Code; 2018.

B. NFPA 10 - Standard for Portable Fire Extinguishers; 2017.

C. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

D. NFPA 101 - Life Safety Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

E. NFPA 241 - Standard for Safeguarding Construction, Alteration, and Demolition Operations; 2013.

F. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies; 2017.

G. NFPA 253 - Standard Method of Test for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source; 2015.

H. NFPA 286 - Standard Methods of Fire Tests for Evaluating Contribution of Wall and Ceiling Interior Finish to Room Fire Growth; 2015.

I. NFPA 495 - Explosive Materials Code; 2018.

3.34 NRCA -- NATIONAL ROOFING CONTRACTORS ASSOCIATION

A. NRCA ML104 - The NRCA Roofing and Waterproofing Manual; Fifth Edition, with interim updates.

3.35 PCI -- PRECAST/PRESTRESSED CONCRETE INSTITUTE

A. PCI MNL-123 - Design and Typical Details of Connections for Precast and Prestressed Concrete; 1988.

3.36 PECI - PORTLAND ENERGY CONSERVATION, INC.

A. PECI (Samples) - Sample Forms for Prefunctional Checklists and Functional Performance Tests; Current Edition.

3.37 SDI -- STEEL DECK INSTITUTE

3.38 SDI -- STEEL DOOR INSTITUTE

A. SDI 117 - Manufacturing Tolerances for Standard Steel Doors and Frames; 2013.

3.39 SMACNA -- SHEET METAL AND AIR CONDITIONING CONTRACTORS' NATIONAL ASSOCIATION, INC.

A. SMACNA (ASMM) - Architectural Sheet Metal Manual; 2012.

3.40 TCNA -- TILE COUNCIL OF NORTH AMERICA, INC.

3.41 TIA -- TELECOMMUNICATIONS INDUSTRY ASSOCIATION

A. TIA-568 (SET) - Commercial Building Telecommunications Cabling Standard Set; 2018.

B. TIA-568.2 - Balanced Twisted-Pair Telecommunications Cabling and Components Standards; 2009c, with Addendum (2016).

C. TIA-569 - Telecommunications Pathways and Spaces; 2015d, with Addendum (2016).

D. TIA-606 - Administration Standard for Telecommunications Infrastructure; 2017c.

E. TIA-607 - Generic Telecommunications Bonding and Grounding (Earthing) for Customer Premises; 2015c, with Addendum (2017).

3.42 TMS -- THE MASONRY SOCIETY

A. TMS 402/602 - Building Code Requirements and Specification for Masonry Structures; 2016.

3.43 UL -- UNDERWRITERS LABORATORIES INC.

A. UL (FRD) - Fire Resistance Directory; Current Edition.

B. UL 9 - Standard for Fire Tests of Window Assemblies; Current Edition, Including All Revisions.

C. UL 10B - Standard for Fire Tests of Door Assemblies; Current Edition, Including All Revisions.

D. UL 10C - Standard for Positive Pressure Fire Tests of Door Assemblies; Current Edition, Including All Revisions.

E. UL 444 - Communications Cables; Current Edition, Including All Revisions.

F. UL 752 - Standard for Bullet-Resisting Equipment; Current Edition, Including All Revisions.

G. UL 1784 - Standard for Air Leakage Tests of Door Assemblies; Current Edition, Including All Revisions.

H. UL 2079 - Standard for Tests for Fire Resistance of Building Joint Systems; Current Edition, Including All Revisions.

3.44 WCLIB -- WEST COAST LUMBER INSPECTION BUREAU

A. WCLIB (GR) - Standard Grading Rules for West Coast Lumber No. 17; 2015.

3.45 WWPA -- WESTERN WOOD PRODUCTS ASSOCIATION

A. WWPA G-5 - Western Lumber Grading Rules; 2017.

END OF SECTION

SECTION 01 5000
TEMPORARY FACILITIES AND CONTROLS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SECTION INCLUDES

A. Dewatering facilities and drains.

B. Temporary utilities.

C. Water service and distribution.

D. Temporary water.

E. Temporary electric power.

F. Temporary heat.

G. Ventilation.

H. Temporary sanitary facilities.

I. Temporary Controls: Barriers, enclosures, and fencing.

J. Enclosure fence for the construction site.

K. Dust control.

L. Vehicular access and parking.

M. Hoists and temporary elevator use

N. Waste removal facilities and services.

O. Construction aids and miscellaneous services and facilities.

P. Environmental protection.

1.3 RELATED REQUIREMENTS

A. Section 01 3000 - Administrative Requirements for submittals.

B. Section 01 3553 - Site Safety and Security Procedures

C. Section 01 5050 - Pipe Scaffolding And Sidewalk Bridges.

D. Section 01 5213 - Field Offices and Sheds.

E. Section 01 5500 - Vehicular Access and Parking.

F. Section 01 5510 - Traffic and Pedestrian Access & Control

G. Section 01 7419 - Construction Waste Management and Disposal

H. Section 01 7419 - Construction Waste Management and Disposal.

I. Section 01 5813 - Temporary Project Signage.

J. Section 01 7000 - Execution progress cleaning and construction layout.

K. Division 32 Earthwork for disposal of ground water at Project site.

L. Division 32 Asphalt Unit Paving" for construction and maintenance of asphalt paving for temporary roads and paved areas.

1.4 REFERENCE STANDARDS

A. Refer to Section 01 4219 - Reference Standards.

B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2018b.

1.5 DEWATERING

A. Provide temporary means and methods for dewatering all temporary facilities and controls.

B. Maintain temporary facilities in operable condition.

1.6 SITE PLAN:

A. Show exiting fencing, temporary facilities, utility hookups, staging areas, and parking areas for construction personnel.

1.7 REPORTS AND PERMITS:

A. Refer to 01 3000 - Administrative Requirements and 01 4100 - Regulatory Requirements.

1.8 QUALITY ASSURANCE

A. Refer to Section 01 4000 Quality Requirements.

B. Regulations: Refer to 01 4100 Regulatory Requirements.

C. Standards: Refer to 01 4219 Reference Standards.

1.9 PROJECT CONDITIONS

A. General: Each Contractor shall provide each temporary service and facility ready for use at each location, when first needed to avoid delays in performance of work. Maintain, expand as required, and modify as needed throughout the progress of the work. Do not remove until services or facilities are no longer needed, or are replaced by the authorized use of completed permanent facilities.

B. Conditions of Use: Operate temporary services and facilities in a safe and efficient manner. Do not overload, and do not permit temporary services and facilities to interfere with the progress of work, or occupancy of existing facility. Do not allow unsanitary conditions, public nuisances or hazardous conditions to develop or persist on the site.

C. Temporary Utilities: Do not permit freezing of pipes, flooding or the contamination of water sources.

D. Temporary Construction and Support Facilities: Maintain temporary facilities in a manner to prevent discomfort to users. Take necessary fire prevention measures. Maintain temporary facilities in a sanitary manner so as to avoid health problems.

E. Security and Protection: Maintain site security and protection facilities in a safe, lawful, publicly acceptable manner. Take measures necessary to prevent site erosion.

1.10 TEMPORARY UTILITIES

A. Edgemont Union Free School District will provide the following:
   1. Electrical power consisting of connections to existing facilities.
   2. Water supply, consisting of connections to existing facilities.

B. Provide for all electrical power, lighting, and water required for construction purposes.

C. Existing facilities may be used.

D. New permanent facilities may be used if approved by the Construction Manager.

E. Use trigger-operated nozzles, with back flow devices, for water hoses, to avoid waste of water.

F. Engage the appropriate local utility company to install temporary service or connect to existing service. Where the company provides only part of the service, provide the remainder with matching, compatible materials and equipment. Comply with company recommendations.
   1. Comply with utility company recommendations. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation and similar facilities on a 24 hour day basis where required to achieve indicated results in the work and avoid the possibility of damage to work or the temporary facilities at no additional cost to the Owner.
   2. Arrange with the company and existing users for a time when service can be interrupted, if necessary, to make connections for temporary services.

3. Provide adequate capacity at each stage of construction. Prior to temporary utility availability, provide trucked-in services.
    a. Obtain easements to bring temporary utilities to the site where the Owner's easements cannot be used for that purpose

1.11 DIVISION OF RESPONSIBILITIES

A. Each Contractor is responsible for the following:
1. Installation, operation, maintenance, and removal of each temporary facility usually considered as its own normal construction activity, as well as the costs and use charges associated with each facility.
2. Plug-in electric power cords and extension cords.
3. Supplementary plug-in task lighting, and special lighting necessary exclusively for its own activities.
4. Special power requirements for installation of its own work such as welding.
5. Its own field office complete with necessary furniture, utilities, and telephone service.
6. Its own storage and fabrication sheds.
7. Temporary telephone service.
8. Temporary heat, ventilation, humidity control, and enclosure of the building where these facilities are necessary for its construction activity but have not yet been installed by the responsible Prime Contractor.
9. All hoisting and fencing for its own work.
10. Collection and disposal, off site, of its own hazardous, dangerous, unsanitary, or other harmful waste material.
11. **Collection and disposal of major equipment removed such as unit ventilators, heaters, fans, toilet fixtures, light fixtures, and other major equipment.**
12. Collection and disposal of major equipment removed such as unit ventilators, heaters , fans, toilet fixtures , light fixtures, and HV equipment.
13. Collection of general waste and debris and disposing into containers provided by the Contract #1 General Construction.
14. Secure lockup of its own tools, materials and equipment.
15. Construction aids and miscellaneous services and facilities necessary exclusively for its own construction activities.

B. The Contract #1 General Construction is responsible and pays all costs for the following:
1. Temporary roads and paving.
2. Temporary toilets, including disposable supplies.
3. Temporary heat.
4. First Aid Station and Supplies.
5. Containers for non-hazardous waste and debris.
6. Temporary enclosure of the building.
7. Project temporary project signs.
8. Disposal of wastes containers.
9. Rodent and pest control.
10. Barricades, warning signs, and lights.
11. Site/construction enclosure fence.
12. Sidewalk bridge and fence.
13. Security enclosure and lockup.
14. Temporary Protection for existing flooring, within and from altered areas to exits.
15. Construction aids and miscellaneous services and facilities.
16. Temporary dustproof partitions.

17. Temporary dust control.

C. Water Service: The Contract #2 Plumbing shall provide and pay all costs to install distribution piping of sizes and pressures adequate for construction .
   1. As soon as construction operations at each floor level require water, extend service, the full height of the building to form a temporary water and fire water standpipe. Provide distribution piping for temporary water to each location of use. Provide one outlet for each level of construction spaced so that water can be reached with a 100 foot length of hose. Provide one 3/4" flexible rubber hose 100 feet long with an adjustable nozzle, at each outlet where work requiring water is in progress.
   2. Provide backflow devices to prevent water from re-entering the potable system.
   3. Maintain hose connections and outlet valves in leak-proof condition. Where finish work below an outlet might be damaged by spillage or leakage, provide a drip pan of suitable size to minimize the possibility of water damage. Drain water promptly from drip pans as it accumulates.
   4. Pumping: Where temporary water pressure is inadequate to provide at least 20 psig pressure at the highest point of use, provide temporary water pumps as necessary to supply the required flow of water and to provide a minimum of 30 psig static pressure at the highest point of use. Equip pumps with adequate surge and storage tanks and automatic controls to supply water uniformly, at reasonable pressures.
      a. Sterilization: Except piping of non-potable water, sterilize temporary water piping prior to use. Refer to Division 22 sections for procedures.
   5. Maintaining existing domestic hot and cold water systems, sanitary and storm systems, fire protection systems within the existing building operational at all times for Owner's occupancy and during construction.
   6. Applicability: This section applies to all renovation and new construction work areas for this Project.

D. The Contract #3 Mechanical Contractor is responsible and pays all costs for the following:
   1. Maintaining existing heating system in service during the period between September 15 and June 15. Contractor shall provide all piping, valves, controls, etc., and labor and materials required to maintain operation of existing heating system where affected by the work.

E. Temporary Electric Power Service: Contract #4 Electrical Contractor shall provide and pay all costs to provide a weatherproof, grounded electric power service and distribution system of sufficient size, capacity, and power characteristics to accommodate performance of work during the construction period .
   1. Applicability: This section applies to all renovation and new construction work areas for this Project.
   2. Connect temporary service to Owner's existing main in the manner directed by Construction Manager.
   3. The Contractor shall maintain all parts of the electrical system temporary and permanent active and in-service at all times throughout the contract duration. All temporary lighting and power to be controlled by standard switches per code (outside of power panels) at no additional charge.
   4. Temporary Service: Install service and grounding in compliance with the National Electric Code (NFPA 70). Include necessary meters, transformers, overload protected disconnect and main distribution switch gear. Comply with all NECA, NEMA and UL Standards.
   5. Provide temporary service with an automatic ground-fault interrupter feature, activated from the circuits of the system.
   6. Power Distribution System: Provide circuits of adequate size and proper characteristics for each use. In general run wiring overhead. Rise vertically where wiring will be least exposed to damage from construction operations.
   7. Contract #4 Electrical Contractor shall provide temporary generator power where Owner's electricity in not available. Contractor shall include required fuel for operation.
   8. Provide metal conduit, tubing or armored cable for protection of temporary power wiring where exposed to possible damage during construction operations. where permitted by code, wiring of

circuits not exceeding 110-120 Volt 20 Amp rating and wiring of lighting circuits may be non-metallic sheathed cable in areas where located overhead and exposed. Do not wire temporary lighting with plain, exposed (insulated) electrical conductors. Provide metal enclosures or boxes for wiring devices.

9. Provide overload-protected disconnect switch as required by code.
10. Temporary power for new corridors, stairways and other exit ways

F. Temporary Lighting: Contract #4 Electrical Contractor shall provide and pay all costs to provide local switching of temporary lighting, spaced to allow lighting to be turned off in patterns to conserve energy, retain light suitable for work-in-progress, access traffic, security check and project lock-up .

1. Provide not less than on 200-watt lamp per 400 sq. ft. of floor area, uniformly distributed, for general construction lighting, or illumination of a similar nature.
   a. In corridors and similar traffic areas provide one 100-watt incandescent lamp every 50 feet.
   b. In stairways and at ladder runs, provide one lamp per story, located to illuminate each landing and flight.
   c. Provide separate circuitry for corridors, stairways and other travel exits.
2. Operate corridors, stairways and other travel exits 24 hours per day 7 days per week on each level.
   a. Install and operate temporary lighting to fulfill security and protection requirements, without the necessity of operating the entire system

G. Whenever an overhead floor or roof deck has been installed, install temporary lighting adequate to provide sufficient illumination for safe work and traffic conditions in every work area

H. Temporary light and power shall be provided 15 minutes before the normal scheduled daily start of any trade and 15 minutes after the normal schedule daily completion of the last trade.

I. The Electrical Contractor shall maintain power and lighting during the normal work week during the hours established by Construction Manager whether or not they fall within established working hours.

1.12 MAXIMUM LOADS

A. General: Lighting and power loads connected to the temporary power distribution system shall be limited to the following maximum individual loads:

	Load	Type	Maximum Size
1.	120 volt	1-phase	1.5 KVA
2.	208 volt	1-phase	2.5 KVA
3.	208 volt	3-phase	5.0 KVA

B. General: The temporary power distribution system shall be sufficiently sized to provide temporary power as required within this section. Meter and Meter connections to be part of electrical contractor.

1.13 ELECTRIC WELDERS

A. Separate Power Sources Required: Power for electric welders and for other loads larger than the maximum allowable sizes shall be taken from portable power sources provided, paid for and operated by the Contractor or Sub-Contractor requiring the use of such equipment. Remove such power sources when no longer needed.

1.14 USE CHARGES

A. General: Cost for temporary facilities are not chargeable to the Owner, Architect, and Construction Manager. The Owner, Architect, and Construction Manager will not accept a contractor's cost or use charges for temporary services or facilities as a basis of claim for an adjustment in the Contract Sum or the Contract Time.

1. Water Service Use Charges: Water from the Owner’s existing water system may be used without metering, and without payment for use charges.
2. Electric Power and Lighting Service Use Charges: Electric power from the Owner's existing system may be used without payment of use charges. Contractor and Sub-Contractors shall exercise measures to conserve energy usage.

a. Use of owner electric for items not specific to project (e.g. heating construction shanties, etc.) will not be permitted.

3. All temporary lighting and power to be controlled by standard switches per code (outside of power panels) at no additional charge.
4. Temporary Utility Services: Where Owner's existing services is inadequate or would disrupt owners use of the existing facility, Contract #4 Electrical Contractor shall provide utility services for the temporary use at the project site from the utility company, and pay all costs, including use charges.
5. Each Contractor is responsible for providing adequate utility capacity at each stage of construction for temporary services required under its contract. Prior to availability of temporary utility services at the site, provide trucked-in services for start up of construction operations.
6. Contractor may elect to use alternative temporary services and facilities equivalent to those specified, subject to acceptance by the Architect.

1.15 TELECOMMUNICATIONS SERVICES

A. Each Contractor shall provide and pay for its own telephone service consisting of mobile phone service for all field superintendents and foreman.

B. Temporary Telephones: Contract #1 General Construction shall arrange and pay all costs including usage costs for the local telephone company to install temporary service to the project. Provide service of the type and capacity as follows:
1. Install three separate lines, one for facsimile machine and two for voice, for General Construction temporary field office, two telephone instruments. (One instrument shall be portable.)
2. Install a pay-telephone station at grade level, for the convenience of personnel at the site.

C. At Contractor's Field Office location post a list of important telephone numbers, including the following:
1. Local police and fire department.
2. Doctor.
3. Ambulance service.
4. Each Contractor's temporary and home office.
5. Construction Manager temporary and home office
6. Architect's home office.
7. Owner's home office.
8. Principal subcontractors temporary and home office

1.16 TEMPORARY SANITARY FACILITIES

A. Responsibilities: The Contract #1 General Construction is responsible for temporary sanitary facilities and their maintenance, including supplies .

B. Provide and maintain required facilities and enclosures. Provide at time of project mobilization.

C. Use of existing facilities is not permitted.

D. Maintain daily in clean and sanitary condition.

E. Sanitary Facilities: Sanitary facilities include temporary toilets. Comply with governing regulations including safety and health codes for the type, number, location, operation and maintenance of fixtures and facilities; provide not less than specified requirements. Install in locations which will best serve the project's needs.
1. Locate toilets and drinking water fixtures so that no one within the construction area will need to walk more than 2 stories vertically or 200 feet horizontally to reach these facilities.
2. Install self-contained toilets to the extent permitted by governing regulations.
3. Supply and maintain toilet tissue, paper towels, paper cups and other disposable materials as appropriate for each facility for full contract duration. Provide covered waste containers for used material.

1.17 BARRIERS

A. Responsibility: Contract #1 General Construction Contractor shall be responsible for construction barriers required for the project.

B. Barricades, Warning Signs and Lights: Comply with recognized standards and code requirements for erection of substantial, structurally adequate barricades where needed to prevent accidents and losses. Paint with appropriate colors, graphics and warning signs to inform personnel at the site and the public, of the hazard being protected against. Provide lighting where appropriate and needed for recognition of the facility, including flashing red lights where appropriate

1. Sign Materials: For signs and directory boards, provide exterior type, Grade B-B High Density Concrete Form Overlay Plywood conforming to PS-1, of sizes and thickness indicated. Provide exterior grade acrylic-latex-base enamel for painting sign panels and applying graphics.

C. Provide barriers to prevent unauthorized entry to construction areas, to prevent access to areas that could be hazardous to workers or the public, to allow for owner's use of site and to protect existing facilities and adjacent properties from damage from construction operations and removals .

1.18 SIDEWALK BRIDGES

A. Sidewalk Bridge: General: Erect a substantial structurally adequate protective bridge for passage of persons along exits from existing building when overhead work is being performed. Coordinate with project entrance gates and other facilities and obstructions. Comply with governing regulations and requests of governing authorities.

1. Responsibility: Sidewalk bridge required for the project shall be the responsibility of Contract #1 the General Construction Contractor
2. Shop drawings for safety fence and sidewalk bridges showing the locations, dimensions, and details for all components and assemblies of the safety fence and sidewalk bridges.
    a. Sidewalk Bridges shop drawings shall be signed, sealed and stamped by a professional engineer licensed in New York State.
3. Shall be designed for live load of 100 lbs/sf. and meet the following minimum requirements:
4. Prior to overhead construction at exit ways construct sidewalk bridges as follows:
    a. Tubular metal sections, or other non-combustible material, to meet at a minimum the NYS Building Code, and OSHA requirements.
        a) Lumber used in the erection of the scaffold or sidewalk bridges shall be at least equal in strength and quality to construction grade Douglas fir, and treated with a recognized fire retardant.
        b) Fasteners to secure lumber and timber shall be galvanized nails or bolts of a suitable size to produce a secure joint capable of withstanding the design load.
        c) Mud sills shall be 2 X 10 inch wood planks.
    b. Brace and securely attach all components.
    c. Fence - ¼" plywood.
        a) The bridge shall be braced longitudinally and horizontally with X-bracing every fifth bay and each end bay. Transverse bracing is provided 8' o.c. at post beam junctions

1.19 FENCING

A. Enclosure Fence: General: Prior to start of excavation or other substantial elements of work begin, install a general enclosure fence with suitable lockable entrance gates. Locate where indicated, or if not indicated, enclose the entire site or the portion of the site determined to be sufficient to accommodate construction operations. Install in a manner that will prevent people, dogs and other animals from easily entering the site, except through entrance gates.

1. The Contract #1 General Construction shall provide, maintain and pay all costs for temporary fencing until directed to remove fence from the site

B. Construction: Commercial grade chain link fence.

C. Provide 6 foot high fence around construction site; equip with vehicular and pedestrian gates with locks.

D. Locate where indicated, or if not indicated, enclosed portions of the site determined to be sufficient to accommodate construction operations. Install in a manner that will prevent people, dogs and other animals from easily entering the site, except through entrance gates.

1. Material:
   a. Steel fencing: Galvanized Chain Link and galvanized gates (non-climbable size).
   b. Fabric: No. 9 GA galvanized, steel wire mesh, furnish one-piece fabric widths for fencing up to 12' in height indicated in the Contract Documents.
   c. Framing and Accessories: End, Corner and Pull posts: 2.375" OD steel pipe.
   d. Line Posts: Space 10'-0" O.C. maximum. 1.90" steel pipe or 1.875" x 1.625 C-sections.
   e. Fence Rails: Locate at top and bottom of fabric. Post brace assembly - manufacturer's standard.
   f. Wire ties: For tying fabric to line posts use wire ties spaced 12" O.C.
   g. Height: 6'
2. Excavate hole depths approximately 3" lower than post bottom; with bottom of posts set not less than 36" below finish grade surface. The line post holes will be 16" in diameter and 3'-9" in depth filled with set in a compacted mixture of gravel and earth.
   a. Self-supporting fence with movable bases may be used when approved by the Owner's Representative.

1.20 EXTERIOR ENCLOSURES

A. Responsibilities: Contract #1 General Construction is responsible for temporary enclosure.

B. Provide temporary insulated weather tight closure of exterior openings to accommodate acceptable working conditions and protection for Products, to allow for temporary heating and maintenance of required ambient temperatures identified in individual specification sections, and to prevent entry of unauthorized persons. Provide access doors with self-closing hardware and locks.

C. Provide temporary enclosures where temporary heat is needed and permanent building enclosure is not yet completed, and there is no other provision for containment of temporary heat. Coordinate enclosures with ventilating and material drying or curing requirements to avoid dangerous conditions and adverse effects.

D. Enclosure: Install tarpaulins or equivalent materials securely, using a minimum of metal framing, 4" - 20 ga. metal framing 16” o.c., and ½” plywood plus 6 mil poly for secure and weather tight protection of the school. Individual openings of 16-sq. ft. or less may be closed with plywood or similar materials.

1. Tarpaulins: Provide waterproof, fire-resistant, UL labeled tarpaulins with flame-spread rating of 15 or less. For temporary enclosures where work is being or will be performed, provide translucent tarpaulins made of nylon reinforced laminated polyethylene to admit the maximum amount of daylight and reduce the need for temporary lighting

E. Close openings through floor and roof deck and other horizontal surfaces with substantial load-bearing metal framing or similar construction

1.21 INTERIOR ENCLOSURES

A. Refer to Section 02 2080 Asbestos Abatement for additional requirements.

B. Temporary Dustproof Partitions: Contract #1 General Construction Contractor shall provide dustproof partitions to separate work area from occupied sections of building. Partitions shall be full height metal stud surfaced with minimum 1/2" Type X gypsum board with 2 layers of poly sheeting, overlapped and edges caulked.

1. Where isolated work is being performed by a Prime Contractor(s) the contractor performing the work shall be responsible for protecting the occupied areas from the work areas as directed by the Construction Manager, including providing dust protection.
2. Horizontal Openings: Close openings in floor or roof decks and horizontal surfaces with load-bearing, wood-framed construction.

3. Install tarpaulins securely using fire-retardant-treated wood framing and other materials.
4. Where temporary wood or plywood enclosure exceeds 100sq. Ft. (9.2 sq. m) in area, use fire-retardant-treated material for framing and main sheathing.

C. Contract #1 General Construction Contractor will install these 9'x12' fire rated temporary partitions at the corridor connection points in the existing building as indicated on drawings. Each location will be equipped with a 3' x 7' hollow metal door and frame with a lockable panic device and door closer.

D. Contractor shall remove and reinstall any devices impacted by temporary partition installation. At conclusion of project the Contractor will again remove and reinstall these devices onto the permanent locations

E. Refer to Section 01 7330 - Selective Removals for additional requirements.

1.22 SITE SAFETY AND SECURITY PROCEDURES

A. See Section 01 3553 See Section 01 3553

1.23 VEHICULAR ACCESS AND PARKING

A. See Section 01 5500.

1.24 WASTE REMOVAL

A. See Section 01 7419 - Construction Waste Management and Disposal, for additional requirements.

B. Contract #1 General Construction Contractor shall provide containers, at grade, sufficient for the depositing of non- hazardous/non-toxic waste materials, and shall remove such waste materials from project site as required or directed by the Construction Manager.
1. Provide specific containers for separation and storage of materials for recycling, salvage, reuse, return, and trash disposal, for use by all contractors and installers.
2. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
3. Contractors shall not utilize the Owner's bins or dumpsters.

C. Provide waste removal facilities and services as required to maintain the site in clean and orderly condition.

D. Open free-fall chutes are not permitted. Terminate closed chutes into appropriate containers with lids.

E. Contract #1 General Construction Contractor shall be responsible for daily cleaning up of spillage and debris resulting from its operations and from those of its subcontractors; and shall be responsible for complete removal and disposition of hazardous and toxic waste materials:
1. Broom clean the work area at the end of each work day.
2. Remove liquid spills promptly.
3. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.

F. Burying or burning of waste materials on the site will not be permitted. Washing waste materials down sewers or into waterways will not be permitted.

G. Site: The General Construction Contractor shall maintain Project site free of waste materials and debris.

H. Installed Work: Keep installed work clean. Each Contractor shall clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.

I. Concealed Spaces: Each contractor shall remove debris from concealed spaces before enclosing the space.

J. Exposed Surfaces: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.

1.25 PROJECT SIGNS - See Section 01 5813

1.26 FIELD OFFICES

A. See Section 01 5213.

1.27 TEMPORARY HEAT

A. Temporary Heat: General: Provide temporary heat as required for proper performance of the Work, curing or drying of recently installed work or protection of work in place from adverse effects of low temperatures or high humidity. Select facilities known to be safe and without deleterious effect upon work in place or being installed. Coordinate with ventilation requirements to produce indicated ambient condition required and to minimize consumption of fuel or energy.
   1. All temporary heat required within the perimeter of the building being erected, or within the completed or uncompleted walls of the building being erected, shall be the responsibility of the Contract #1 General Construction Contractor and complete costs therefore shall be borne by them and included in the amount quoted in his proposal for all temporary heating described in this section.
   2. Contract #1 General Construction Contractor shall enclosed the area within the perimeter of the building, or the required portion of that area, with temporary, legal and fire-resistant construction which will retain temporary heat within that area, if the exterior walls are not erected. He shall do so when directed by the Owner's Representative, Architect, or Construction Manager in order to comply with the progress schedule, and to protect work or materials previously placed, being placed, or about to be placed from damage that could result from cold weather.
   3. All other contractors shall be responsible for temporary heat required to comply with the progress schedule and protect their work and materials on the site, but beyond the perimeter or beyond the completed or uncompleted walls of the building or buildings in this project.
   4. When the building or a section thereof is enclosed, or when temporary heating is required for the proper progress or protection of the work as determined by the Construction Manager the General Construction Contractor shall provide temporary heating.
   5. Maintain a minimum temperature of 55 degF in permanently enclosed portions of the building and areas where finished work has been installed. Refer to individual sections for more stringent requirements.
   6. Heating Facilities: Except where conditions make it necessary to use another system, provide properly vented self-contained LP gas heaters with individual space thermostatic control for temporary heat.
      a. Gasoline burning space heaters will not be permitted.
      b. Electric space heaters will not be permitted.
      c. Do not use open burning, electric or salamander type temporary heating units

1.28 HOISTS AND TEMPORARY ELEVATOR USE

A. Each Contractor shall provide facilities for hoisting materials and employees. Do not permit employees to ride hoists which comply only with requirements for hoisting materials. Selection of type, size and number of facilities is the Contractor's option. Truck cranes and similar devices used for hoisting are considered tools and equipment and not temporary facilities.

B. Elevator Use: Owner's existing elevator may not be used by the Contractor.

1.29 MISCELLANEOUS PROVISIONS

A. Temporary Floor Protection: Contract #1 General Construction shall provide protective floor covering from and within construction work areas to all floors leading to outside the construction area thru all finish area used by the or each Contractor(s).
   1. Heavy-duty, temporary floor protection "Ram Board" reusable and recyclable.
   2. Handling and storage in accordance with manufacturer's recommendations.
   3. Tape all joints

4. All corridors from renovated areas to exitways, used by Contractors, shall be mopped and left clean daily by the Contract #1 General Construction Contractor

B. Temporary Roof Drainage: Contract #1 General Construction Contractor shall provide temporary drainage until roof drain replacements are completed or similar waterproof deck construction is completed and prior to connection and operation of permanent drainage piping system

1. Dispose of rainwater in a lawful manner, which will not result in flooding of the project site or adjoining property, or endanger either permanent work or temporary facilities

1.30 REMOVAL OF UTILITIES, FACILITIES, AND CONTROLS

A. Clean and repair damage caused by installation or use of temporary work.

B. Restore existing facilities used during construction to original condition.

C. Restore new permanent facilities used during construction to specified condition.

D. Unless the Construction Manager requests that it be maintained for a longer period of time, remove each temporary service and facility promptly when the need for it has ended, or when it has been replaced by authorized use of a permanent facility, or no later than the Date of Substantial Completion. If necessary, restore permanent work which may have been delayed because of interference with the temporary service or facility. Repair damaged work, clean exposed surfaces and replace work which cannot be satisfactorily repaired

E. Remove temporary roads and paving materials not intended for or acceptable for integration into permanent paving. Where the area shown is intended for landscape development, remove soil and aggregate fill that does not comply with requirements for fill or subsoil in the landscape area. Remove materials contaminated with road oil, asphalt and other petrochemical compounds, and other substances which might impair plant materials or lawns. Repair or replace street paving, curbs and sidewalks at temporary entrances, as required by the governing authority, and/or restore to original condition

PART 2 PRODUCTS - NOT USED

2.1 DE - WATERING FACILITIES AND DRAINS

A. Contract #1 General Construction Contractor is directly responsible for de-watering their excavations. The responsibility of de-watering of the site as to facilitate the work will be the responsibility of the General Construction Contractor coordinate with Construction Manager.

1. Dispose of rainwater in a lawful manner that will not result in flooding project or adjoining property nor endanger permanent drainage piping system, provide temporary drainage where roofing or similar waterproof deck construction is completed.
2. Remove snow and ice as required to minimize accumulations.

PART 3 EXECUTION -

3.1 TEMPORARY INSTALLATION

A. Use qualified personnel for installation of temporary facilities. Locate facilities where they will serve Project adequately and result in minimum interference with performance of the work. Relocate and modify facilities as required.

B. Each Contractor shall provide each facility ready for use when needed to avoid delay. Maintain and modify as required. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

C. Arrange with utility company, Owner, and existing users for time when service can be interrupted, if necessary, to make connections for temporary services.

3.2 STAGING

A. All staging thereto shall comply in total to the requirements of Safety and Health Regulations for Construction Chapter XVII of OSHA, Part 1926 and all related amendments.

B. Install and maintain staging and appurtenances where roofing and window replacement work is specified until all work and punch list work is complete and approved by the Construction Manager.

3.3 ROOF PROTECTION

A. Each Contractors shall provide temporary protection on any newly installed and existing roof surface when it is necessary for work to take place on completed sections.

3.4 FIRE PREVENTION AND CONTROL

A. Refer to Section 01 3553 - Site Safety and Security Procedures.

3.5 DISCONTINUE, CHANGES AND REMOVAL

A. Each Contractor shall:
   1. Discontinue all temporary services required by the Contract when so directed by the Construction Manager.
   2. The discontinuance of any such temporary service prior to the completion of the work shall not render the Owner liable for any additional cost entailed thereby and each Contractor shall thereafter furnish, at no additional cost to the Owner, any and all temporary service required by such Contractor(s) work.
   3. Remove and relocate such temporary facilities as directed by the Construction Manager without additional cost to the Owner, and shall restore the site and the work to a condition satisfactory to the Owner.

3.6 VENTILATION AND HUMIDITY CONTROL FOR CONSTRUCTION

A. Refer to Section 01 5719 - Temporary Environmental Controls.

B. Provide temporary ventilation required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of high humidity. Select equipment from that specified that will not have a harmful effect on completed installations or elements being installed. Coordinate ventilation requirements to produce ambient condition required and minimize energy consumption.

C. Contract #1 General Construction Contractor shall be responsible for own temporary ventilation required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of high humidity.

D. Ventilate enclosed area to dissipate humidity, and to prevent accumulation of dust, fumes, vapors or gases.

E. Provide equipment as necessary for air and fresh exchange for the work area per OSHA standards.

F. Remove temporary ventilation equipment prior to the completion of construction.

G. Contract #1 General Construction Contractor will provide negative air machines of sufficient size / qty for square footage of work areas to exhaust any dust / fumes through flexible duct hose to exterior to eliminate any odors/smoke etc. During second shift work, there can be no odors in school the following day.

3.7 ROADS AND PAVED AREAS:

A. Contract #1 General Construction Contractor shall construct and maintain temporary areas adequate to support loads and to withstand exposure to traffic during construction period.
   1. Includes access for delivery through staging area to building work areas, and to equipment and storage areas and sheds. Maintenance of existing staging area to prevent / repair any ruts by grading with heavy equipment and placement of import ¾" stone for smooth, stable surface.
   2. Provide dust-control treatment that is nonpolluting and non-tracking. Reapply treatment as required to minimize dust.
   3. Temporary areas are installed and/or maintained by for access to all required areas of the sites.
   4. Contractors will be permitted to utilize existing campus roads, as designated (as segregated by the Owner - if required).
   5. Road Cleaning: Maintain roads and walkways in an acceptably clean condition. This includes the removal of debris daily, if required, and/or a minimum of once a week due to all project traffic.

Road cleaning equipment to be wet/vacuum type. General Construction Contractor will clean roads for debris from building-related activities.

6. Snow Plowing: The General Construction Contractor shall provide snow plowing of temporary road, parking areas, access route, and a 5' walkway to General Construction office trailer.
   a. The school district will provide snow plowing of established routes.
7. Staging Areas:
   a. Temporary parking by construction personnel shall be allowed only in areas so designated.
   b. Owner does not have space for construction parking in existing parking lots or roadways and will subsequently have vehicles in violation of parking prohibitions towed from site and back-charged with all fees to the contractor.
   c. Traffic Regulations:
      a) Access through Owner's entrances shall be limited
      b) Utilize only entrances/temporary roads as designated
      c) Maintain all District traffic regulations
      d) Employee parking to be located as directed by the Construction Manager.

3.8 TRAFFIC CONTROLS

A. Refer to Section 01 5510 - Traffic and Pedestrian Access & Control.

3.9 TEMPORARY SITE SAFETY AND DIRECTIONAL SIGNS:

A. Refer to Section 01 5813 - Temporary Project Signage.

3.10 ENVIRONMENTAL PROTECTION:

A. General Construction Contractor shall provide protection, operate temporary facilities, and conduct construction in ways and by methods that comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects. Avoid using tools and equipment that produce harmful noise. Restrict use of noise making tools and equipment to hours that will minimize complaints from persons or firms near Project site.

3.11 OPERATION, TERMINATION, AND REMOVAL

A. Supervision: Enforce strict discipline in use of temporary facilities. Limit availability of temporary facilities to essential and intended uses to minimize waste and abuse.

B. Maintenance: Maintain facilities in good operating condition until removal. Protect from damage by freezing temperatures and similar elements.
   1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.
   2. Protection: Prevent water-filled piping from freezing. Maintain markers for underground lines. Protect from damage during excavation operations.

C. At the completion of the project, including all punch list item and prior to Substantial Completion, remove all temporary facilities with the approval of the Construction Manager

END OF SECTION

SECTION 01 5213
FIELD OFFICES AND SHEDS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SECTION INCLUDES

A. Temporary field office shall be provided by Contract #1 General Construction.

B. Temporary field offices for use by other Prime Contractors shall be at their option.

C. Maintenance and removal.

1.3 RELATED REQUIREMENTS

A. Section 01 1000 - Summary of Contracts: Use of premises.

B. Section 01 5000 - Temporary Facilities and Controls:

1. Temporary telecommunications services for administrative purposes.
2. Temporary sanitary facilities required by law.

C. Section 01 5500: Parking and access to field office(s).

1.4 USE OF EXISTING FACILITIES

A. Existing facilities shall not be used for field offices.

1.5 USE OF PERMANENT FACILITIES

A. Permanent facilities shall not be used for field offices.

PART 2 PRODUCTS

2.1 MATERIALS, EQUIPMENT, FURNISHINGS

A. Materials, Equipment, Furnishings: Serviceable, new or used, adequate for required purpose.

2.2 CONSTRUCTION

A. Portable or mobile buildings, or buildings constructed with floors raised above ground, securely fixed to foundations, with steps and landings at entrance doors.

B. Construction: Structurally sound, secure, weather tight enclosures for office. Maintain during progress of Work; remove at completion of Work or when directed by the Construction Manager.

C. Exterior Materials: Weather resistant, finished in one color.

D. Interior Materials in Offices: Sheet type materials for walls and ceilings, prefinished or painted; resilient floors and bases.

E. Lighting for Offices: 50 fc at desk top height, exterior lighting at entrance doors.

F. Fire Extinguishers: Appropriate type fire extinguisher at each office.

G. Locate field offices, storage and fabrication sheds and other facilities for easy access to the work and as approved by the Construction Manager. Position offices so that window gives the best possible view of construction activities.

H. Offices, storage and fabrication sheds and other facilities constructed of combustible material shall not be located closer than a minimum distance of 15 feet from existing and new structures.

I. Storage and Fabrication Sheds: Install Storage and Fabrication Sheds: sheds, properly sized, furnished and equipped, as required to accommodate work. Comply with applicable provisions specified elsewhere for distribution and use of temporary utilities. Sheds may be open shelters or fully enclosed spaces, within the building construction area or elsewhere on the project site as approved by the Construction Manager.

2.3 ENVIRONMENTAL CONTROL

A. Heating, Cooling, and Ventilating: Automatic equipment to maintain comfort conditions.

2.4 CONTRACTOR(S) OFFICE AND FACILITIES

A. Each Contractor is responsible for all cost for their field offices.

B. Size: For each Contractor's needs and to provide space for project meetings.

C. Telephone: As specified in Section 01 5000.

D. Furnishings in Meeting Area: Contract #1 General Construction shall provide in their trailer an office for the Construction Manager, conference table and chairs to seat at least eight persons; racks and files for Contract Documents, submittals, and project record documents.

E. Trailer Manufacture:

1. Cassone Inc, Ronkonkama, NY. Model "Mobile Unit 10' x 50'.
    a. Refer to Section 01 2500 - Substitution Procedures.

PART 3 EXECUTION

3.1 PREPARATION

A. Fill and grade sites for temporary structures to provide drainage away from buildings.

3.2 INSTALLATION

A. Install Contractor's office spaces ready for occupancy 15 days after date fixed in Notice of Award.

B. Parking: Two hard surfaced parking spaces for use by Construction Manager connected to office by hard surfaced walk.

3.3 MAINTENANCE AND CLEANING

A. Weekly janitorial services, including supplies for Contractor's offices; periodic cleaning and maintenance for offices.

B. Maintain approach walks free of mud, water, and snow.

3.4 REMOVAL

A. At completion of Work remove buildings, foundations, utility services, and debris. Restore areas.

END OF SECTION

SECTION 01 5500
VEHICULAR ACCESS AND PARKING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SECTION INCLUDES

A. Access roads.

B. Temporary roads and/or paving.

C. Parking.

D. Existing pavements and parking areas.

E. Permanent pavements and parking facilities.

F. Construction parking controls.

G. Maintenance.

H. Removal, repair.

I. Mud from site vehicles.

1.3 RELATED REQUIREMENTS

A. Section 01 1000 - Summary of Contracts: For access to site and occupancy.

B. Section 01 5000 - Temporary Facilities and Controls.

C. Section 01 5813 - Temporary Project Signage: Post Mounted and/or Wall Mounted Traffic Control and Informational Signs.

D. Section 01 7000 - Execution.

E. Divisions 31, 32 and 33.

1.4 INGRESS AND EGRESS

A. Each Contractor shall provide and maintain at all times safe and adequate ingress and egress to and from site at existing or at new access points consistent with work, unless otherwise authorized by the Construction Manager.

B. However, where major non-conformance with the requirements of this specification is noted by the Construction Manager and prompt contractor compliance is deemed not to be obtainable, all contract work may be stopped by direct order of the Construction Manager regardless of whether corrections are made by the Construction Manager as stated in the paragraph above.

PART 2 PRODUCTS

2.1 RESPONSIBILITY

A. It is specifically noted that if school is in session, there are children playing at recess, walking to outdoor gym classes, etc. Contractor’s trucks must be walked from the project site to the main traffic loop and vice versa, with a separate monitoring individual to insure children’s safety. See Section 01 1000 - Summary of Contracts for delivery black out times.

B. Contract #1 General Construction is responsibility for the requirements of this section for all Contracts**.**

2.2 MATERIALS

A. Temporary Construction: Refer to Section 01 5000 - Temporary Facilities and Controls.

B. Materials for Permanent Construction: As specified in product specification sections, including earthwork, paving base, and topping.

2.3 SIGNS, SIGNALS, AND DEVICES

A. Traffic Cones and Drums, Flares and/or Lights: As approved by Construction Manager.

B. Flag Person Equipment: As required by Construction Manager.

PART 3 EXECUTION

3.1 ACCESS ROADS

A. Use of existing on-site streets and driveways for construction traffic is permitted as approved Construction Manager.

B. Tracked vehicles not allowed on paved areas.

C. Contract #1 General Construction shall construct and maintain temporary areas adequate to support loads and to withstand exposure to traffic during construction period.

1. Includes access for delivery through staging area to building work areas, and to equipment and storage areas and sheds. Maintenance of staging area to prevent / repair any ruts by grading with heavy equipment and placement of import ¾" stone for smooth, stable surface.
2. Provide dust-control treatment that is nonpolluting and contracting. Reapply treatment as required to minimize dust.
3. Temporary areas are installed and/or maintained for access to all required areas of the sites.
4. Road Cleaning: Maintain roads and walkways in an acceptably clean condition. This includes the removal of debris daily, if required, and/or a minimum of once a week due to all project traffic. Road cleaning equipment to be wet/vacuum type. The General Work Contractor (Contract #1) will clean roads for debris from building-related activities.
5. Snow Plowing: The Contract #1 General Construction shall provide snow plowing of temporary road, parking areas, access route, and a 5' walkway to office trailer. Provide snow removal and salting of walkways to office trailer(s). The school district will provide snow plowing of established routes.

D. Construct new temporary all-weather access roads from public thoroughfares to serve construction area, of a width and load bearing capacity to provide unimpeded traffic for construction purposes.

E. Staging Areas:

1. Refer to Section 01 5000 - Temporary Facilities and Controls for additional requirements.
2. Staging areas where indicated on drawings will be provided by Contract #1 General Construction and shall consist of the following:
   a. Typed 4 Crushed stone base and conform to the requirements of Section 304 of NYS DOT Specifications. No recycled material of any kind is allowed on the project.
   b. Gradation shall conform to the following:

Sieve Size	Percent Passing by Weight
3 inch:	100
2 inch:	90-100
1/4 inch	30-65
No. 40	5-40
No. 200	0-10

F. Extend and relocate as work progress requires, provide detours as necessary for unimpeded traffic flow.

G. Provide unimpeded access for emergency vehicles. Maintain 20 foot width driveways with turning space between and around combustible materials.

H. Provide and maintain access to fire hydrants and emergency vehicles free of obstructions.

3.2 PARKING

A. Use of designated areas of existing parking facilities by construction personnel is permitted if approved by the Construction Manager.

3.3 PERMANENT PAVEMENTS AND PARKING FACILITIES

A. Prior to Substantial Completion the base for permanent roads and parking areas may be used for construction traffic.

B. Avoid traffic loading beyond paving design capacity. Tracked vehicles not allowed.

3.4 CONSTRUCTION PARKING CONTROL

A. Control vehicular parking to prevent interference with public traffic and parking, access by emergency vehicles, and Edgemont Union Free School District's operations.

B. Each Contractor shall monitor parking of their personnel's vehicles . Maintain vehicular access to and through thru roads and parking areas as designated and approved by the Construction Manager.

C. Traffic Regulations:
   1. Utilize only entrances/temporary roads as designated.
   2. Maintain all District traffic regulations.
   3. Construction Employee parking to be located as where directed by the Construction Manager.

3.5 FLAG PERSONS

A. Provide trained and equipped flag persons to regulate traffic when construction operations or traffic encroach on public traffic lanes when directed by the Construction Manager.

3.6 HAUL ROUTES

A. Confine construction traffic to designated haul routes as directed by the Construction Manager.

B. Provide traffic control at critical areas of haul routes to regulate traffic, to minimize interference with public traffic.

3.7 TRAFFIC SIGNS AND SIGNALS

A. At approaches to site and on site, install at crossroads, detours, parking areas, and elsewhere as needed to direct construction and affected public traffic.

3.8 MAINTENANCE

A. General Construction Contractor shall maintain traffic for the duration of the contract and protect the traveling public and pedestrians from all damage to persons and property within the limits of and for the duration of the contract; all in accordance with the plans and specifications.

B. General Construction Contractor shall maintain and protect traffic by so conducting his construction operations that the traveling public and pedestrian safety is subjected to a minimum of hazard and delay. In order to adequately maintain and protect traffic, contractor shall perform the following additional minimum requirements as directed by Construction Manager:
   1. Keep the surface of the traveled way free from mounds, depressions, and dirt, debris, stone, obstructions of any type which could present hazards or annoyance to traffic.
   2. Keep the surface of all pavements used by the public free and clean of all dirt, debris, stone, timber or other obstructions to provide safe traveled ways.
   3. Control dust and keep the traveled way free from materials spilled from hauling and construction equipment.
   4. Provide all cones, barricades, signs and warning devices as may be required and/or as ordered by the Construction Manager to safely carry out the foregoing. All such signs and devices shall be fabricated and placed in accordance with the latest “Federal Manual on Uniform Control Devices”. Use of Open Flares Is Prohibited.
   5. Prepare and submit for approval sketch/drawing showing proposed location and type of signs, barricades and devices as required in above.
   6. General Construction Contractor shall cover with steel plates all open trenches at the close of each work day. Such plates to abut each other and be wedged at each end of trench to prevent plates from sliding open.

7. General Construction Contractor to post temporary construction signs, including construction traffic signs, safety signs, security signs, and no trespassing signs as required.

C. Maintain existing paved areas used for construction; promptly repair breaks, potholes, low areas, standing water, and other deficiencies, to maintain paving and drainage in original, or specified, condition.

3.9 REMOVAL, REPAIRINGRESS AND EGRESS

A. Remove temporary roads when permanent paving is usable and approved by Construction Manager

B. Remove underground work and compacted materials to a depth of 2 feet; fill and grade site as specified.

C. Repair existing facilities damaged by use, to original condition.

D. Remove equipment and devices when no longer required.

E. Remove post settings to a depth of 2 feet.

3.10 MUD FROM SITE VEHICLES

A. Provide means of removing mud from vehicle wheels before entering streets. .

END OF SECTION

SECTION 01 5813
TEMPORARY PROJECT SIGNAGE

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SECTION INCLUDES

A. Project identification sign.

B. Project informational signs.

C. All Contractors, Subcontractors, Sub-subcontractors, Vendors and the like shall be required to familiarize themselves with said provisions.

1.3 RELATED REQUIREMENTS

A. Section 01 1000 - Summary of Contracts.

B. Section 01 5000 - Temporary Facilities and Controls.

C. Section 10 1400 - Signage for permanent signs.

1.4 REFERENCE STANDARDS

A. New York State Department of Transportation.

1.5 QUALITY ASSURANCE

A. Design sign and structure to withstand 50 miles/hr wind velocity.

B. Sign Painter: Experienced as a professional sign painter for minimum three years.

C. Finishes, Painting: Adequate to withstand weathering, fading, and chipping for duration of construction.

1.6 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Shop Drawing: Show content, layout, lettering, color, structure, sizes.

PART 2 PRODUCTS

2.1 RESPONSIBILITY

A. Contract #1 General Construction Contractor is responsible for the requirements of this section for all contracts.

2.2 TRAFFIC SIGN MATERIALS

A. Structure and Framing: New or Used metal or wood, structurally adequate.

B. Metal Signs shall be minimum 16 gauge steel.

C. Size shall be appropriate to message and in conformance to State of NY DOT.

D. Rough Hardware: Galvanized or aluminum.

E. Paint and Primers: Exterior quality, two coats; sign background of color as selected.

F. Lettering: Exterior quality paint, white.

2.3 PROJECT INFORMATIONAL SIGNS

A. Painted informational signs of same colors and lettering as Project Identification sign, or color as selected of standard products; size lettering to provide legibility at 100 foot distance.

B. Each Contractor shall provide identification signage at field office and storage trailers with contractor's name and telephone number.

C. Contract #1 General Construction Contractor shall provide directional signs to direct traffic into and within site. Relocate as Work progress requires.

2.4 TEMPORARY SITE SAFETY AND DIRECTIONAL SIGNS:

A. Prepare temporary signs to provide directional information to construction personnel and visitors.

B. Construct signs of exterior type Grade AC plywood ½" thick. Support on posts or framing of preservative-treated wood or steel, or attach to fencing; do not attach signs to buildings or permanent construction.

C. Paint sign panel and applied graphics with exterior grade alkyd gloss enamel over exterior primer. Engage an experienced sign painter or fabricator to apply graphics.

D. Include relocating temporary site safety and directional signs as many times as required or directed.

E. Metal DOT / MUTCO compliant signage is acceptable where applicable.

F. Contract #1 General Construction Contractor shall furnish and install construction signage as required at each project site.

1. For construction traffic control/flow at entrances/exits, as designated by the Construction Manager (8 required).
2. To direct visitors (4 required)
3. For construction parking (4 required)
4. To direct deliveries (4 required)
5. Emergency egress only - Construction area (8 required)
6. Per OSHA standards as necessary.
7. For "No Smoking" safe work site at multiple locations (6 required).

2.5 SIGNS, SIGNALS, AND DEVICES (Contractor's Option)

A. Stock Post Mounted and Wall Mounted Traffic Control and Informational Signs:

1. Products:
   a. Brimar Industries, Inc.: www.safetysign.com/#sle.
   b. Substitutions: Section 01 2500 Substitution Procedures.

PART 3 EXECUTION

3.1 INSTALLATION

A. Erect at location of high public visibility adjacent to main entrance to site and as directed by Construction Manager.

B. Erect supports and framing on secure foundation, rigidly braced and framed to resist wind loadings.

C. Install sign surface plumb and level, with butt joints. Anchor securely.

D. Paint exposed surfaces of sign, supports, and framing.

3.2 MAINTENANCE

A. Maintain signs and supports clean, repair deterioration and damage.

3.3 REMOVAL

A. Remove signs, framing, supports, and foundations at completion of the project and restore the area.

END OF SECTION

SECTION 01 6000
PRODUCT REQUIREMENTS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SECTION INCLUDES

A. General product requirements.

B. Transportation, handling, storage and protection.

C. Product option requirements.

D. Substitution limitations.

E. Maintenance materials, extra materials.

1.3 RELATED REQUIREMENTS

A. Section 01 2500 - Substitution Procedures:

B. Section 01 4000 - Quality Requirements: Product quality monitoring.

C. Section 01 6116 - Volatile Organic Compound (VOC) Content Restrictions: Requirements for VOC-restricted product categories.

D. Section 01 7419 - Construction Waste Management and Disposal: Waste disposal requirements potentially affecting product selection, packaging and substitutions.

1.4 REFERENCE STANDARDS

A. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.5 DEFINITIONS

A. Refer to General Conditions and Section 01 4216 - Definitions for additional definitions.

B. Products: Items purchased for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.

C. Named Products: Items identified by manufacturer's product name, including make or model number or other designation, shown or listed in manufacturer's published product literature, that is current as of date of the Contract Documents.

D. New Products: Items that have not previously been incorporated into another project or facility, except that products consisting of recycled-content materials are allowed, unless explicitly stated otherwise. Products salvaged or recycled from other projects are not considered new products.

E. Comparable Product: Product that is demonstrated and approved through submittal process, or where indicated as a product substitution, to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.

F. Substitutions: Changes in products, materials, equipment, and methods of construction from those required or specified by the Contract Documents and proposed by Contractor.

G. Basis-of-Design Or Equal Product Specification: Where a specific manufacturer's product is named and accompanied by the words "basis of design," or "or substitutions", including make or model number or other designation, to establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products of other named manufacturers **shall be submitted as substitutions**.

1. Refer to Section 01 2500 - Substitution Procedures.

H. Manufacturer's Warranty: Preprinted written warranty published by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.

1.6 SUBMITTALS

A. Refer to Section 01 3000 - Administrative Requirements for additional requirements

B. Proposed Products List: Submit list of major products proposed for use, with name of manufacturer, trade name, and model number of each product.
   1. Submit within 30 days after date of Notice of Award.
   2. For products specified only by reference standards, list applicable reference standards.

C. Product Data Submittals: Submit manufacturer's standard published data. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information specific to this Project.

D. Shop Drawing Submittals: Prepared specifically for this Project; indicate utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.

E. Sample Submittals: Illustrate functional and aesthetic characteristics of the product, with integral parts and attachment devices. Coordinate sample submittals for interfacing work.
   1. For selection from standard finishes, submit samples of the full range of the manufacturer's standard colors, textures, and patterns.

1.7 QUALITY ASSURANCE

A. Health Product Declarations (HPD): Complete, published declaration with full disclosure of known hazards, prepared using one of the HPDC (HPD-OLT) online tools.

1.8 ASBESTOS

A. Asbestos: All products, materials, etc., used in conjunction with this Project shall be Asbestos-Free.
   1. Each Contractor shall provide a certified letter to the Construction Manager stating that no asbestos containing material has been used in this project. Refer to Section 01 7800 - Closeout Submittals.

B. Each, Contractor, and sub contractors must provide test results upon completion from a New York State accredited testing lab certifying that all material including joint and pipe insulation on this project is non-asbestos.
   1. This certification shall be based on a sampling of 10% of all linear feet of pipe insulation, (unless manufacturer's certificate is submitted).

PART 2 PRODUCTS

2.1 EXISTING PRODUCTS

A. Do not use materials and equipment removed from existing premises unless specifically required or permitted by Contract Documents.

B. Existing materials and equipment indicated to be removed, but not to be re-used, relocated, reinstalled, delivered to the Edgemont Union Free School District, or otherwise indicated as to remain the property of the Edgemont Union Free School District, become the property of the Contractor(s); remove from site.

2.2 NEW PRODUCTS

A. Provide new products for all unless otherwise specifically required or permitted by the Contract Documents.

B. See Section 01 4000 - Quality Requirements, for additional source quality control requirements.

C. Use of products having any of the following characteristics is not permitted:
   1. Made outside the United States, its territories, Canada, or Mexico.
   2. Made using or containing CFC's or HCFC's.
   3. Made of wood from newly cut old growth timber.

4. Containing lead, cadmium, or asbestos.

D. Where other criteria are met, each Contractor shall give preference to products that:
1. If used on interior, have lower emissions, as defined in Section 01 6116.
2. If wet-applied, have lower VOC content, as defined in Section 01 6116.
3. Are extracted, harvested, and/or manufactured closer to the location of the project.
4. Have longer documented life span under normal use.
5. Result in less construction waste. See Section 01 7419
6. Are made of vegetable materials that are rapidly renewable.
7. Are made of recycled materials.
8. Are Cradle-to-Cradle Certified.
9. Have a published Environmental Product Declaration (EPD).
10. Have a published Health Product Declaration (HPD).

2.3 PRODUCT OPTIONS

A. Refer to Section 00 2113 - Instructions to Bidders for Product/Assembly/System Substitutions.

B. Refer to Section 01 2500 - Substitution Procedures.

2.4 MAINTENANCE MATERIALS

A. Furnish extra materials, spare parts, tools, and software of types and in quantities specified in individual specification sections.
1. Deliver to Construction Manager; obtain receipt prior to final payment.

PART 3 EXECUTION

3.1 SUBSTITUTION SUBMITTAL PROCEDURE AFTER BIDDING PHASE

A. Refer to Section 01 2500 - Substitution Procedures.

3.2 TRANSPORTATION AND HANDLING

A. Package products for shipment in manner to prevent damage; for equipment, package to avoid loss of factory calibration.

B. If special precautions are required, attach instructions prominently and legibly on outside of packaging.

C. Coordinate schedule of product delivery to designated prepared areas in order to minimize site storage time and potential damage to stored materials.

D. Transport and handle products in accordance with manufacturer's instructions.

E. Transport materials in covered trucks to prevent contamination of product and littering of surrounding areas.

F. Promptly inspect shipments to ensure that products comply with requirements, quantities are correct, and products are undamaged.

G. Provide equipment and personnel to handle products by methods to prevent soiling, disfigurement, or damage, and to minimize handling.

H. Arrange for the return of packing materials, such as wood pallets, where economically feasible.

3.3 STORAGE AND PROTECTION

A. Designate receiving/storage areas for incoming products so that they are delivered according to installation schedule and placed convenient to work area in order to minimize waste due to excessive materials handling and misapplication. See Section 01 7419.
1. Structural Loading Limitations: Handle and store products and materials so as not to exceed static and dynamic load-bearing capacities of project floor and roof areas.

B. Store and protect products in accordance with manufacturers' instructions.

C. Store with seals and labels intact and legible.

D. Store sensitive products in weathertight, climate-controlled enclosures in an environment favorable to product.

E. For exterior storage of fabricated products, place on sloped supports above ground.

F. Provide off-site storage and protection when site does not permit on-site storage or protection.
   1. Execute a formal supplemental agreement between Edgemont Union Free School District and Contractor allowing off-site storage, for each occurrence.

G. Protect products from damage or deterioration due to construction operations, weather, precipitation, humidity, temperature, sunlight and ultraviolet light, dirt, dust, and other contaminants.

H. Comply with manufacturer's warranty conditions.

I. Do not store products directly on the ground.

J. Store loose granular materials on solid flat surfaces in a well-drained area. Prevent mixing with foreign matter.

K. Prevent contact with material that may cause corrosion, discoloration, or staining.

L. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.

M. Arrange storage of products to permit access for inspection. Periodically inspect to verify products are undamaged and are maintained in acceptable condition.

END OF SECTION

SECTION 01 6116
VOLATILE ORGANIC COMPOUND (VOC) CONTENT RESTRICTIONS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SECTION INCLUDES

A. Requirements for Indoor-Emissions-Restricted products.

B. Requirements for VOC-Content-Restricted products.

C. Requirement for installer certification that they did not use any non-compliant products.

1.3 RELATED REQUIREMENTS

A. Section 01 3000 - Administrative Requirements: Submittal procedures.

B. Section 01 4000 - Quality Requirements: Procedures for testing and certifications.

C. Section 01 6000 - Product Requirements: Fundamental product requirements, delivery, storage, and handling.

D. Section 07 9200 - Joint Sealants: Emissions-compliant sealants.

E. Section 09 5100 - Acoustical Ceilings.

F. Section 09 9123 - Interior Painting.

G. Section 09 6500 - Resilient Flooring.

1.4 DEFINITIONS

A. Indoor-Emissions-Restricted Products: All products in the following product categories, whether specified or not:

1. Interior paints and coatings applied on site.
2. Interior adhesives and sealants applied on site, including flooring adhesives.
3. Flooring.
4. Products making up wall and ceiling assemblies.
5. Thermal and acoustical insulation.
6. Free-standing furniture.
7. Other products when specifically stated in the specifications.

B. VOC-Content-Restricted Products: All products in the following product categories, whether specified or not:

1. Exterior and interior paints and coatings applied on site.
2. Exterior and interior adhesives and sealants applied on site, including flooring adhesives.
3. Wet-applied roofing and waterproofing.
4. Other products when specifically stated in the specifications.

C. VOC-Restricted Products: All products of each of the following categories when installed or applied on-site in the building interior:

1. Interior of Building: Anywhere inside the exterior weather barrier.
2. Adhesives: All gunnable, trowelable, liquid-applied, and aerosol adhesives, whether specified or not; including flooring adhesives, resilient base adhesives, and pipe jointing adhesives.
3. Sealants: All gunnable, trowelable, and liquid-applied joint sealants and sealant primers, whether specified or not; including firestopping sealants and duct joint sealers.

D. Inherently Non-Emitting Materials: Products composed wholly of minerals or metals, unless they include organic-based surface coatings, binders, or sealants; and specifically the following:

1. Concrete.

2. Clay brick.
3. Metals that are plated, anodized, or powder-coated.
4. Glass.
5. Ceramics.
6. Solid wood flooring that is unfinished and untreated.

1.5 REFERENCE STANDARDS

A. 40 CFR 59, Subpart D - National Volatile Organic Compound Emission Standards for Architectural Coatings; U.S. Environmental Protection Agency; current edition.

B. ASTM D3960 - Standard Practice for Determining Volatile Organic Compound (VOC) Content of Paints and Related Coatings; 2005 (Reapproved 2013).

C. CAL (CDPH SM) - Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions From Indoor Sources Using Environmental Chambers; 2017, v1.2.

D. CARB (SCM) - Suggested Control Measure for Architectural Coatings; California Air Resources Board; 2007.

E. CHPS (HPPD) - High Performance Products Database; Current Edition at www.chps.net/.

F. GreenSeal GS-36 - Adhesives for Commercial Use; 2013.

G. SCAQMD 1113 - Architectural Coatings; 1977 (Amended 2016).

H. SCAQMD 1168 - Adhesive and Sealant Applications; 1989 (Amended 2017).

1.6 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Evidence of Compliance: Submit for each different product in each applicable category.

C. Product Data: For each VOC-restricted product used in the project, submit evidence of compliance.

D. Installer Certifications Regarding Prohibited Content: Require each installer of any type of product (not just the products for which VOC restrictions are specified) to certify that either 1) no adhesives, joint sealants, paints, coatings, or composite wood or agrifiber products have been used in the installation of installer's products, or 2) that such products used comply with these requirements.

1.7 QUALITY ASSURANCE

A. Indoor Emissions Standard and Test Method: CAL (CDPH SM), using Standard Private Office exposure scenario and the allowable concentrations specified in the method, and range of total VOC's after 14 days.
   1. Wet-Applied Products: State amount applied in mass per surface area.
   2. Paints and Coatings: Test tinted products, not just tinting bases.
   3. Evidence of Compliance: Acceptable types of evidence are the following;
      a. Current UL (GGG) certification.
      b. Current SCS (CPD) Floorscore certification.
      c. Current SCS (CPD) Indoor Advantage Gold certification.
      d. Current listing in CHPS (HPPD) as a low-emitting product.
      e. Current CRI (GLP) certification.
      f. Test report showing compliance and stating exposure scenario used.
   4. Product data submittal showing VOC content is NOT acceptable evidence.
   5. Manufacturer's certification without test report by independent agency is NOT acceptable evidence.

B. VOC Content Test Method: 40 CFR 59, Subpart D (EPA Method 24), or ASTM D3960, unless otherwise indicated.
   1. Evidence of Compliance: Acceptable types of evidence are:
      a. Report of laboratory testing performed in accordance with requirements.

C. Testing Agency Qualifications: Independent firm specializing in performing testing and inspections of the type specified in this section.

PART 2 PRODUCTS

2.1 MATERIALS

A. All Products: Comply with the most stringent of federal, State, and local requirements, or these specifications.

B. VOC-Content-Restricted Products: VOC content not greater than required by the following:
   1. Adhesives, Including Flooring Adhesives: SCAQMD 1168 Rule.
   2. Aerosol Adhesives: GreenSeal GS-36.
   3. Joint Sealants: SCAQMD 1168 Rule.
   4. Paints and Coatings: Each color; most stringent of the following:
      a. 40 CFR 59, Subpart D.
      b. SCAQMD 1113 Rule.
      c. CARB (SCM).
   5. Wet-Applied Roofing and Waterproofing: Comply with requirements for paints and coatings.

PART 3 EXECUTION

3.1 FIELD QUALITY CONTROL

A. Edgemont Union Free School District reserves the right to reject non-compliant products, whether installed or not, and require their removal and replacement with compliant products at no extra cost to Edgemont Union Free School District.

B. Additional costs to restore indoor air quality due to installation of non-compliant products will be borne by the Contractor.

END OF SECTION

SECTION 01 6190
MATRIX OF BUILDING SYSTEM RESPONSIBILITY

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SECTION INCLUDES

A. This section describes the relationship and responsibilities of the Prime Contractors, suppliers, vendors,, subcontractors and Owner.

1.3 RELATED REQUIREMENTS

A. Section 01 1000 - Summary of Contracts: Contract descriptions, description of alterations work, work by others, future work, occupancy conditions, use of site and premises, work sequence.

B. Section 01 2000 - Price and Payment Procedures: Applications for payment, Schedule of Values, modifications procedures, closeout procedures.

C. Section 01 2100 - Allowances: Cash and contingency allowances.

D. Section 01 3000 - Administrative Requirements: Submittal procedures, project meetings, progress schedules and documentation, reports, coordination.

E. Section 01 7419 - Construction Waste Management and Disposal.

F. Section 01 7800 - Closeout Submittals: Project record documents, operation and maintenance (O&M) data, warranties and bonds.

G. Section 01 7900 - Demonstration and Training: Detailed requirements.

H. Section 01 9113 - General Commissioning Requirements.

1.4 PRICE AND PAYMENT PROCEDURES

A. Allowances: See Section 01 2100 - Allowances, for cash allowances affecting this section.

1.5 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

PART 2 PRODUCTS NOT USED

PART 3 EXECUTION

3.1 MATRIX

A. See attached.

3.2 CLEANING

A. See Section 01 7419 - Construction Waste Management and Disposal, for additional requirements.

3.3 COMMISSIONING

A. See Section 01 9113 - General Commissioning Requirements, for commissioning requirements.

B. Perform the following Functional Tests:

3.4 CLOSEOUT ACTIVITIES

A. See Section 01 7800 - Closeout Submittals, for closeout submittals.

B. See Section 01 7900 - Demonstration and Training, for additional requirements.

3.5 RESPONSIBILITY

A. It is the Contactors responsibility to coordinate and obtain from the Owner all information neccessary to complete the work.

3.6 ATTACHMENTS

A. Matrix is attached to this section.

END OF SECTION

Edgemont BLDG. A: Matrix of Building System Responsibility

Work Description	Furnished By	Installed By	Comments/Response
DATA			
Rough-in: Conduit drops in walls, wired to outlet, conduit (unfinished area), conduit sleeve, junction box (wall and/or ceiling type), outlet box, floor box, poke-thru, cover plate with female bulk head, supports.	EC	EC	
In wall combo boxes, cover plate, bulkheads (Jacks) for Data/Tele	EC	EC	
Data Cat 6 Cable Support - J-Hooks, fire rated zip ties and ladders in data closet.	EC	EC	
Data Cat 6 Cable - From Data Outlet & WAP to Patch Panel. Tag both ends of cable, type written address nomenclature at outlet and patch panel, Test cable as per Spec.	EC	EC	All Addresses will be furnished by ESD
Data cable color selection.	N/A	N/A	BLUE Data Cables
New Data rack/closets: new racks, ladders, patch panels and all patch cords. See specs for quantity and color.	EC	EC	Separate patch panel for each wire category
Fiber Cable - From IDF to MDF, including connectors, connection (termination), labelling and testing , OM3 (12 Strand 10 Gigabyte) 50um Fiber Cable - Specific cable type description shall be provided by ESD)	ESD	ESD	
Device Address to be furnished by ESD to Electrical Contractor - EC to provide labels	ESD	EC	
Wireless Access Point Device (WAP) and configuration.	ESD	ESD	YELLOW Data Cables
Switches, servers, Relays UPS onto racks including installing patch cords from patch panel to switches. Patch Cords furnished by EC as indicated above.	ESD	ESD	
Provide PC's, Lap Tops, I-Pads, Chrome Carts	ESD	ESD	
Interface with District Network including and not limited to Programming, Integration, Commissioning of Hardware and Software. Include all licenses.	ESD	EDS	
Patch and Paint disturbed areas in Existing Building	EC	EC	

Edgemont BLDG. A: Matrix of Building System Responsibility

Work Description	Furnished By	Installed By	Comments/Response
Patch and Paint at newly constructed areas	GC	GC	
Plywood mounting boards for equipment panels, etc..	EC	EC	
Telephone			
Rough-in: Conduit drops in walls, wiremold, conduit, conduit sleeve, junction box, outlet box, floor box, poke-thru, cover plate with female bulk head, mini PBX, supports.	EC	EC	
Telephone Cat 6 Cable Support - J-Hooks, fire rated zip ties.	EC	EC	
Telephone Cat 6 Cable - From Telephone Outlet to Patch Panel. Tag both ends of cable, type written address nomenclature at outlet and patch panel, include patch panels, patch cords (Patch cord quantity listed under Data Section). Test cable as per Spec.	EC	EC	
Telephone cable color selection.	ESD	N/A	WHITE Cable Color
Telephone Head-end equipment.	ESD	ESD	
Telephone Hand Set.	ESD	ESD	
Telephone Switches, servers, Relays UPS onto racks including jumper cable from patch panel to switches. Patch Cords furnished by EC as indicated in Data Section above.	ESD	ESD	
Switches or relays to interface with School Copper wire phone system.	ESD	ESD	
Integration and programming of phones.	Current District Vendor	N/A	
Security Cameras			
Rough-in: Conduit drops in new walls, wired to outlet, conduit sleeve, junction box (durable wall and/or ceiling type to support camera), supports.	EC	EC	
Camera Cat 6 Cable, Supports - J-Hooks, fire rated zip ties.	EC	EC	

Edgemont BLDG. A: Matrix of Building System Responsibility

Work Description	Furnished By	Installed By	Comments/Response
Camera Cat 6 Cable - From Camera J-Box to Patch Panel. Provide 5'-0" pig tail @ each J- Box. Tag both ends of cable. Include patch panel and patch cords. Test cable as per Spec	EC	EC	
Type written address specialty nomenclature at each Camera and patch panel.	EC	EC	
Camera mounting brackets.	EC	EC	
Camera and other mounting accessories.	Owner Assigned Security Vendor	EC	
Camera Lens Adjustment, Camera Adjustment, sequencing, commissioning, etc.	Owner Assigned Security Vendor	Owner Assigned Security Vendor	
Camera Switch, DVR, Server, Programming, integration, Licenses.	Owner Assigned Security Vendor	Owner Assigned Security Vendor	
Interface and provide conductivity for Cameras to data system.	Owner Assigned Security Vendor	Owner Assigned Security Vendor	
Setup the Cameras to be viewed on Monitors.	Owner Assigned Security Vendor	Owner Assigned Security Vendor	
Door Access (Interior Doors)			
Electronic Door Locksets (including batteries)	GC	GC	
Panel Interface Modules (PIMs)	GC	EC	
Cat 6 Cable from PIMs to patch panel on data rack.	EC	EC	
Programming, Smarts & Parts	Owner Assigned Security Vendor	Owner Assigned Security Vendor	

Edgemont BLDG. A: Matrix of Building System Responsibility

Work Description	Furnished By	Installed By	Comments/Response
CAT 6 cable from existing exterior door electric strikes to new I.T. Closet	EC	EC	
Switches, relays, etc.	Owner Assigned Security Vendor	Owner Assigned Security Vendor	
Integration into existing access control head-end controller and data base.	Owner Assigned Security Vendor	Owner Assigned Security Vendor	
Fire Alarm System			
Rough-in: Conduit drops in walls, MC Cable, wiring, wiremold, conduit, conduit sleeve; J-box (wall and/or ceiling type), cover plate, supports.	EC	EC	
Fire Alarm Devices - Horn/Strobe, Speaker/Strobes, Strobes, Manual Pull station, smoke/heat detectors, duct detector, DGP, F.A.C.P. Expansion cards, relays, Annunciator, Carbon detectors, Gas Detectors, etc.	EC	EC	
Magnetic Door Holders.	EC	EC	
The F.A. wiring for Magnetic Door Holders (MH). Include line voltage. Provide high power addressable control relays to interface with MH.	EC	EC	
F.A. Devices address labelling at each device.	EC	EC	
Fire Alarm Floor Layout Plaque.	EC	EC	

Edgemont BLDG. A: Matrix of Building System Responsibility

Work Description	Furnished By	Installed By	Comments/Response
Fire Alarm Programming & Start-up	EC	EC	EC to coordinate with owner all room numbers/designation before the start of programming.
P.A. System and Clock			
Rough-in: Wiremold, conduit, conduit sleeve; J-box, outlet box, supports.	EC	EC	
P.A. System Cable Support - J-Hooks, fire rated zip ties.	EC	EC	
New P.A. System Cable - From indicated rooms to IT Closets. Tag both ends of cable, Test cable as per Spec and provide report.	EC	EC	
P.A. System Speaker, Integrated Message/Clock Panel, Call-In Button.	EC	EC	
P.A. System Programming and integration with existing system.	District Assigned Vendor	District Assigned Vendor	
Interface zone modules, switches, relays, etc. for connection to current system.	District Assigned Vendor	District Assigned Vendor	
Integrated Speaker/Clock	EC	EC	
PA Tie-In to incident Command Panel	ESD	ESD	
LIGHTING CONTROLS			
Lighting controls (Complete Installation included and not limited to wiring, conduit, supports, Programming, etc.)	EC	EC	

Edgemont BLDG. A: Matrix of Building System Responsibility

Work Description	Furnished By	Installed By	Comments/Response
Commissioning (Third Party)	Owner Third Party Commissioning Agent	Owner Third Party Commissioning Agent	Electrical Contractor shall assist Third Party Commissioning Agent.
Mechanical Equipment Controls			
All low voltage wiring and conduit in unfinished areas, line voltage circuit for mechanical equipment, installation, tie-ins, update programming for heating and Cooling to BMS system.	HVAC Sub Controller Contractor	HVAC Sub Controller Contractor	Refer to Specification Section 23 0000 for additional information.
Commissioning (Third Party)	Owner Third Party Commissioning Agent	Owner Third Party Commissioning Agent	HVAC Sub Controller Contract and HVAC Contractor shall assist Third Party Commissioning Agent.
ESD interfaces with District Network IP Address	HVAC Sub	HVAC Sub	
Network Drops to equipment's	HVAC Sub	HVAC Sub	
Line Voltage Electric power to BMS control panels	HVAC Contr.	HVAC Contr.	

SECTION 01 7000
EXECUTION

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SECTION INCLUDES

A. Inspections prior to start of work.

B. Examination, preparation, and general installation procedures.

C. Requirements for alterations work, including selective removals and asbestos/lead abatement.

D. General installation of products.

E. Protection of installed construction.

F. Correction of the Work.

G. Pre-installation meetings.

H. Dust control

I. Cutting and patching.

J. Progress and Final cleaning.

K. Protection of installed construction.

L. Starting of systems and equipment.

M. Demonstration and instruction of Edgemont Union Free School District personnel.

N. Closeout procedures, including Contractor's Correction Punch List.

1.3 RELATED REQUIREMENTS

A. Section 01 1000 - Summary of Contracts: Limitations on working in existing building; continued occupancy; work sequence; identification of salvaged and relocated materials.

B. Section 01 3000 - Administrative Requirements: Submittals procedures.

C. Section 01 4000 - Quality Requirements: Testing and inspection procedures.

D. Section 01 5000 - Temporary Facilities and Controls.

E. Section 01 3553 - Site Safety and Security Procedures

F. Section 01 7800 - Closeout Submittals: Project record documents, operation and maintenance data, warranties.

G. Section 01 7900 - Demonstration and Training: Demonstration of products and systems to be commissioned and where indicated in specific specification sections

H. Section 01 9113 - General Commissioning Requirements: Contractor's responsibilities in regard to commissioning.

I. Section 01 2100 - Allowances.

J. Section 07 8400 - Firestopping.

K. Section 31 2316 - Excavation.

L. Individual Specification Sections:

1.4 REFERENCE STANDARDS

A. NFPA 241 - Standard for Safeguarding Construction, Alteration, and Demolition Operations; 2013.

1.5 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Conduct a preinstallation meeting one week prior to the start of the work of this section; require attendance by all affected installers and Architect and Construction Manager.

1.6 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Landfill Receipts: Submit copy of receipts issued by a landfill facility, licensed to accept hazardous and non-hazardous materials and hazardous waste disposal.

C. Cutting and Patching:

D. Cutting and Patching: Submit written request in advance of cutting or alteration that affects:
   1. Structural integrity of any element of Project.
   2. Integrity of weather exposed or moisture resistant element.
   3. Efficiency, maintenance, or safety of any operational element.
   4. Visual qualities of sight exposed elements.
   5. Include in request:
      a. Identification of Project.
      b. Location and description of affected work.
      c. Necessity for cutting or alteration.
      d. Effect on work of Edgemont Union Free School District or separate Contractor.
      e. Written permission of affected separate Contractor.
      f. Date and time work will be executed.

E. Project Record Documents: Accurately record actual locations of capped and active utilities.

1.7 QUALIFICATIONS

1.8 PROJECT CONDITIONS

A. Use of explosives is not permitted.

B. Grade site to drain. Maintain excavations free of water. Provide, operate, and maintain pumping equipment.

C. Protect site from puddling or running water. Provide water barriers as required to protect site from soil erosion.

D. Perform dewatering activities, as required, for the duration of the project.

E. Ventilate enclosed areas to assist cure of materials, to dissipate humidity, and to prevent accumulation of dust, fumes, vapors, or gases. Refer to Section 01 5000 - Temporary Facilities and Controls.

F. Dust Control: Each Contractor shall execute work by methods to minimize raising dust from construction operations. Provide positive means to prevent air-borne dust from dispersing into atmosphere and over adjacent property.
   1. Provide dust-proof enclosures to prevent entry of dust generated outdoors.

G. Contract #1 General Construction Contractor shall provide dust-proof barriers between construction areas, non construction areas and occupied areas.
   1. Refer to Section 01 5000 - Temporary Facilities and Controls.

H. Erosion and Sediment Control: Plan and execute work by methods to control surface drainage from cuts and fills, from borrow and waste disposal areas. Prevent erosion and sedimentation.
   1. Minimize amount of bare soil exposed at one time.
   2. Provide temporary measures such as berms, dikes, and drains, to prevent water flow.
   3. Periodically inspect earthwork to detect evidence of erosion and sedimentation; promptly apply corrective measures.

I. Noise Control: Provide methods, means, and facilities to minimize noise produced by construction operations.
   1. Outdoors: Limit conduct of especially noisy exterior work to hours within the local Noise ordinances.

J. Pest and Rodent Control: Provide methods, means, and facilities to prevent pests and insects from damaging the work.

1.9 COORDINATION

A. Refer to Section 01 3000 - Administrative Requirements.

1.10 CODES, PERMITS, FEES, ETC.

A. Refer to Section 01 4100 Regulatory Requirements.

PART 2 PRODUCTS

2.1 MATERIALS

A. New Materials: As specified in product sections; match existing products and work for patching and extending work.

B. Product Substitution: For any proposed change in materials, submit request for substitution described in Section 01 2500 - Substitution Procedures.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify layout information shown on Drawings, in relation to the property survey and existing benchmarks. Notify Construction Manager of any discrepancies immediately in writing before proceeding to lay out the work. Locate and protect existing benchmarks and base line. Preserve permanent reference points during construction.

B. Prior to start of construction take photographs, video's or similar documentation as evidence of existing project conditions as follows:
   1. Interior views: Each room and areas of outside or within the work area which could be construded as caused by the contractor.
   2. Exterior views: Each area of work outside and adjacent to the work area which could be construded as caused by the contractor.

C. Verify that existing site conditions and substrate surfaces are acceptable for subsequent work. Start of work means acceptance of existing conditions.

D. Verify that existing substrate is capable of structural support or attachment of new work being applied or attached.

E. Examine and verify specific conditions described in individual specification sections.

F. Take field measurements before confirming product orders or beginning fabrication, to minimize waste due to over-ordering or misfabrication.

G. Verify that utility services are available, of the correct characteristics, and in the correct locations.

H. Prior to Cutting: Examine existing conditions prior to commencing work, including elements subject to damage or movement during cutting and patching. After uncovering existing work, assess conditions affecting performance of work. Beginning of cutting or patching means acceptance of existing conditions.

3.2 PREPARATION

A. Clean substrate surfaces prior to applying next material or substance.

B. Seal cracks or openings of substrate prior to applying next material or substance.

C. Apply manufacturer required or recommended substrate primer, sealer, or conditioner prior to applying any new material or substance in contact or bond.

3.3 PREINSTALLATION MEETINGS

A. When required in individual specification sections, convene a preinstallation meeting at the site prior to commencing work of the section.

B. Require attendance of parties directly affecting, or affected by, work of the specific section.

C. Notify Construction Manager five (5) working days in advance of meeting date.

D. Prepare agenda and preside at meeting:
   1. Review conditions of examination, preparation and installation procedures.
   2. Review coordination with related work.

E. Record minutes and distribute copies within two days after meeting to participants, with one copies to Architect and Construction Manager, participants and those affected by decisions made.

3.4 REMOVAL AND DUST CONTROL

A. The following procedures shall be followed when removals are performed:
   1. Asbestos and lead containing material shall be removed as per asbestos and lead abatement sections of the specifications.
      a. Refer to Section 02 2080 Asbestos Removal and Disposal.
   2. Exterior
      a. Work must be in compliance with OSHA Construction Standard (29 CFR 1926.62).
      b. Provide tarps on the outside of the building to catch all dust, debris and paint chips when items are being removed and installed.
   3. Interior:
      a. Floor surfaces protection as specified in Section 01 5000 - Temporary Facilities and Controls.
      b. All air vents in the room shall be closed, shut off and sealed.
      c. Access to all rooms undergoing removals shall be restricted to prevent unauthorized entry.
      d. All TV’s, smart boards, furniture, books and clocks, moveable objects will be removed as indicated in Section 01 1000 Summary of Work. Items to remain, including fixed furniture, etc. shall be cover with a six mil plastic by the Contract #1 General Construction. Contractor.
   4. Contract #1 General Construction Contractor shall provide labor for daily cleanup on the interior of the building as required or directed by the Construction Manager. Any visible debris shall be removed prior to occupancy the following day.
   5. All debris shall be disposed of properly in accordance with Federal, State and Local Regulations. Refer to Section 01 5000 - Temporary Facilities and Controls and asbestos and lead abatement sections for containers required.
   6. Do not leave any openings unprotected at end of work day or during periods of excessive cold weather or precipitation.

3.5 GENERAL INSTALLATION REQUIREMENTS

A. In addition to compliance with regulatory requirements, conduct construction operations in compliance with NFPA 241, including applicable recommendations in Appendix A.

B. Install products as specified in individual sections, in accordance with manufacturer's instructions and recommendations, and so as to avoid waste due to necessity for replacement.

C. Make vertical elements plumb and horizontal elements level, unless otherwise indicated.

D. Saw cut all concrete slabs and asphalt paving.

E. Install equipment and fittings plumb and level, neatly aligned with adjacent vertical and horizontal lines, unless otherwise indicated.

F. Make consistent texture on surfaces, with seamless transitions, unless otherwise indicated.

G. Make neat transitions between different surfaces, maintaining texture and appearance.

3.6 ALTERATIONS

A. Drawings showing existing construction and utilities are based on casual field observation and existing record documents only.
   1. Verify that construction and utility arrangements are as indicated.
   2. Report discrepancies to Construction Manager before disturbing existing installation.
   3. Beginning of alterations work constitutes acceptance of existing conditions.

B. Keep areas in which alterations are being conducted separated from other areas that are still occupied.
   1. Provide, erect, and maintain temporary dustproof partitions of construction specified in Section 01 5000 .

C. Maintain weatherproof exterior building enclosure except for interruptions required for replacement or modifications; take care to prevent water and humidity damage.
   1. Where openings in exterior enclosure exist, provide construction to make exterior enclosure weatherproof.
   2. Insulate existing ducts or pipes that are exposed to outdoor ambient temperatures by alterations work.

D. Remove existing work as indicated and as required to accomplish new work.
   1. Remove items indicated on drawings.
   2. Relocate items indicated on drawings.
   3. Where new surface finishes are to be applied to existing work, perform removals, patch, and prepare existing surfaces as required to receive new finish; remove existing finish if necessary for successful application of new finish.
   4. Where new surface finishes are not specified or indicated, patch holes and damaged surfaces to match adjacent finished surfaces as closely as possible.

E. Services (Including but not limited to Mechanical , plumbing and electrical contracts.): Remove, relocate, and extend existing systems to accommodate new construction.
   1. Where existing systems or equipment are not active and Contract Documents require reactivation, put back into operational condition; repair supply, distribution, and equipment as required.
   2. Where existing active systems serve occupied facilities, but are to be replaced with new units, systems and services, replacement shall not occur until new units are on site**.**
      a. Identify new equipment installed, but not in service, with appropriate signage or other forms of identification. indicating "Not in Service"**.**
      b. Disable existing systems only to make switchovers and connections; minimize duration of outages.
      c. Remove existing systems and install new only after scheduling with the Construction Manager in order to minimize duration of outages to units serving occupied areas.
      d. See Section 01 1000 - Summary of Contracts for other limitations on outages and required notifications.
      e. Provide temporary connections as required to maintain existing systems in service.
      f. Perform all switchovers, shutdowns, etc after hours, weekends, holidays or times when the building is not occupied. All switchover scheduling shall be approved by the Construction Manager.
   3. Verify that abandoned services serve only abandoned facilities.
   4. Remove conduits, including those above accessible ceilings; remove back to source of supply where possible, otherwise cap stub and tag with identification; patch holes left by removal using materials specified for new construction.

F. Protect existing work to remain.
   1. Prevent movement of structure; provide shoring and bracing if necessary.

2. Perform cutting to accomplish removals neatly and as specified for cutting new work.
3. Repair adjacent construction and finishes damaged during removal work.
4. Patch as specified for patching new work.

G. Adapt existing work to fit new work: Make as neat and smooth transition as possible.
1. Where removal of partitions or walls results in adjacent spaces becoming one, rework floors, walls, and ceilings to a smooth plane without breaks, steps, or bulkheads.
2. Where a change of plane of 1/4 inch or more occurs in existing work, submit recommendation for providing a smooth transition for Architect review and request instructions.

H. Patching: Where the existing surface is not indicated to be refinished, patch to match the surface finish that existed prior to cutting. Where the surface is indicated to be refinished, patch so that the substrate is ready for the new finish.

I. Refinish existing surfaces as indicated:
1. Where rooms or spaces are indicated to be refinished, refinish all visible existing surfaces to remain to the specified condition for each material, with a neat transition to adjacent finishes.
2. If mechanical or electrical work is exposed accidentally during the work, re-cover and refinish to match.

J. Clean existing systems and equipment.

K. Remove demolition debris and abandoned items from alterations areas and dispose of off-site; do not burn or bury.

L. Do not begin new construction in alterations areas before removals is complete.

M. Comply with all other applicable requirements of this section.

3.7 CUTTING AND PATCHING

A. This Section includes procedural requirements for cutting and patching.

B. Contractor acknowledges that the work involves renovation and alteration of existing improvements and, therefore, cutting and patching of the work is essential for the Project to be successfully completed. Contractor shall perform any cutting, altering, patching and fitting of the work necessary for the work and the existing improvements to be fully integrated and to present the visual appearance of an entire, completed, and unified project. In performing any work which requires cutting, fixing, or patching, Contractor shall use its best efforts to protect and preserve the visual appearance and aesthetics of the project to the reasonable satisfaction of both the Architect and Construction Manager.

C. Each Contractor shall do all cutting, patching, repairing as necessary for their work. In all cases, the cutting, patching, repairing and finishing shall be performed mechanics skilled in the particular trade required at no additional cost to the Owner.

D. Whenever possible, execute the work by methods that avoid cutting or patching.

E. See Alterations article above for additional requirements.

F. Refer to other Sections for specific requirements and limitations applicable to cutting and patching.

G. Refer to various sections and divisions for other requirements and limitations applicable to cutting and patching.

H. Perform whatever cutting and patching is necessary to:
1. Complete the work.
2. Fit products together to integrate with other work.
3. Provide openings for penetration of mechanical, electrical, and other services.
4. Match work that has been cut to adjacent work.
5. Repair areas adjacent to cuts to required condition.
6. Repair new work damaged by subsequent work.
7. Remove samples of installed work for testing when requested.

8. Remove and replace defective and non-complying work.

I. Execute work by methods that avoid damage to other work and that will provide appropriate surfaces to receive patching and finishing. In existing work, minimize damage and restore to original condition.

J. Employ skilled and experienced installer to perform cutting for weather exposed and moisture resistant elements, and sight exposed surfaces.

K. Cut rigid materials using masonry saw or core drill. Pneumatic tools not allowed without prior approval.

L. Cut existing construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition. A sufficient time in advance of the construction of new walls, floors, or pavement etc. Each Contractor shall be responsible for properly locating and providing in place all sleeves, inserts and forms required for work.

M. Cutting: All cutting of holes in existing existing construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. .

1. Whenever possible, execute the work In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots as small as possible, neatly to size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
2. Existing Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
3. Concrete/Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
4. Excavating and Backfilling: Comply with requirements in applicable Section 31 2316 - Excavation where required by cutting and patching operations.
5. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.
6. All cutting of holes in existing walls, existing floors, existing roofs, and existing ceilings, etc. for the removal of any existing work (including, but not limited to ducts, fans, fixtures, motors, equipment, drains, wiring, conduit, etc.) or for the installation of any new work shall be done in a neat manner by the Contractor. Debris caused by such cutting or removals will be removed by each Contractor unless noted otherwise.
7. Where sleeves, inserts or openings are required in existing walls, floors, and roofs of existing buildings or structures, all necessary cutting, furnishing and installing of sleeves, inserts, lintels, etc., shall be done by each Contractor unless noted otherwise.

N. All surfaces where existing items are removed from existing walls, floors, roofs, and pavements, etc. shall be patched to match existing surfaces by each Contractor.

1. Proceed with patching after construction operations requiring cutting are complete.

O. Fit work tight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.

P. At penetrations of fire rated walls, partitions, ceiling, or floor construction, completely seal voids with fire rated material in accordance with Section 07 8400, to full thickness of the penetrated element.

1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate integrity of installation.
2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing.
3. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove existing floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.

a. Where patching occurs in a painted surface, apply primer and intermediate paint coats over the patch and apply final paint coat over entire unbroken surface containing the patch. Provide additional coats until patch blends with adjacent surfaces.

4. Ceilings: Patch, repair, or rehang existing ceilings as necessary to provide an even-plane surface of uniform appearance.
5. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition.

Q. Patching:
1. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other Work. Patch with durable seams that are as invisible as possible. Provide materials and comply with installation requirements specified in other Sections of these Specifications.
2. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate integrity of installation.
3. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing.
4. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove existing floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.
   a. Where patching occurs in a painted surface, apply primer and intermediate paint coats over the patch and apply final paint coat over entire unbroken surface containing the patch. Provide additional coats until patch blends with adjacent surfaces.
5. Ceilings: Patch, repair, or rehang existing ceilings as necessary to provide an even-plane surface of uniform appearance.
6. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition.

R. Finish patched surfaces to match finish that existed prior to patching. On continuous surfaces, refinish to nearest intersection or natural break. For an assembly, refinish entire unit.
1. Match color, texture, and appearance.
2. Repair patched surfaces that are damaged, lifted, discolored, or showing other imperfections due to patching work. If defects are due to condition of substrate, repair substrate prior to repairing finish.

3.8 SPECIAL REQUIREMENTS

A. Notwithstanding anything contained in the Contract Documents to the contrary, the Contractor(s) shall not be permitted to disrupt operation of any building system or any of the services without Construction Manager's prior written consent, which shall not be unreasonably withheld. Any request to perform such work shall be in writing, received by Construction Manager no less than five (5) working days prior to the commencement of the request for disruption, and shall detail:
1. The exact nature and duration of such interruption;
2. The area of the Building affected, and;
3. Any impact upon the Construction Schedule caused by such proposed temporary disruption. All Work shall be performed during the hours and on the days set forth in the Specifications.

3.9 FIRE PREVENTION AND CONTROL

A. Refer to Section 01 3553.

3.10 UNDERGROUND UTILITIES

A. Broken utilities from work are the responsibility of the Contractor performing the work. Use extreme caution when uncovering utilities. If a utility is broken while uncovering because the utility was not in the exact location identified, the cost of repair is the responsibility of the Contractor.

3.11 WATCHMAN

A. The Owner will not provide watchman. Each Contractor will be held responsible for loss or injury to persons or property or work where his work is involved and shall provide such watchman and take such precautionary measures as he may deem necessary to protect his own interests.

3.12 SECURITY SYSTEM

A. Refer to 01 3553 - Security Procedures

3.13 VERIFICATION OF CONDITIONS

A. All openings, measurements, door frames, existing conditions and other similar items or conditions shall be field measured prior to submission of any shop drawings or manufacturers literature for approval.
   1. Each Contractor shall investigate each space into and through which equipment must be moved. Equipment shall be shipped from manufacturer in sections, of size suitable for moving through restricted spaces. Where sectional fabrication and or delivery cannot be achieved, openings, enlargements etc shall be provided by Each contractor whose equipment requires access, at no additional cost to the Owner.

3.14 PROGRESS CLEANING

A. Maintain areas free of waste materials, debris, and rubbish. Maintain site in a clean and orderly condition.

B. Remove debris and rubbish from pipe chases, plenums, attics, crawl spaces, and other closed or remote spaces, prior to enclosing the space.

C. Broom and vacuum clean interior areas prior to start of surface finishing, and continue cleaning to eliminate dust.

D. Collect and remove waste materials, debris, and trash/rubbish from site periodically and dispose off-site; do not burn or bury.

E. Each Contractor is responsible for own daily debris removal into containers provided by the Contract #1 General Construction Contractor. Interior work areas are to be broom swept on a daily basis by the Contract #1 General Construction Contractor.

F. If daily cleaning and dust protection is not provided the Contractor will be back charged for cleanup performed by employees of the Construction Manager or a separate contractor retained by the Owner's Representative.

3.15 PROTECTION OF INSTALLED WORK

A. Each Contractor is responsible to provide protection for their work.

B. Protect installed work from damage by construction operations.

C. Provide special protection where specified in individual specification sections.

D. Provide temporary and removable protection for installed products. Control activity in immediate work area to prevent damage.

E. Provide protective coverings at walls, projections, jambs, sills, and soffits of openings.

F. Protect finished floors, stairs, and other surfaces from traffic, dirt, wear, damage, or movement of heavy objects, by protecting with durable sheet materials.

G. Protect work from spilled liquids. If work is exposed to spilled liquids, immediately remove protective coverings, dry out work, and replace protective coverings.
   1. Prohibit traffic or storage upon waterproofed or roofed surfaces. If traffic or activity is necessary, obtain recommendations for protection from waterproofing or roofing material manufacturer.

H. Prohibit traffic from landscaped areas.

I. Remove protective coverings when no longer needed; reuse or recycle coverings if possible.

3.16 SYSTEM STARTUP

A. Coordinate with requirements of Section 01 9113 - General Commissioning Requirements.

B. Coordinate schedule for start-up of various equipment and systems.

C. Notify Construction Manager 5 days prior to start-up of each item.

D. Verify that each piece of equipment or system has been checked for proper lubrication, drive rotation, belt tension, control sequence, and for conditions that may cause damage.

E. Verify tests, meter readings, and specified electrical characteristics agree with those required by the equipment or system manufacturer.

F. Verify that wiring and support components for equipment are complete and tested.

G. Execute start-up under supervision of applicable Contractor personnel and manufacturer's representative in accordance with manufacturers' instructions.

H. When specified in individual specification Sections, require manufacturer to provide authorized representative to be present at site to inspect, check, and approve equipment or system installation prior to start-up, and to supervise placing equipment or system in operation.

I. Submit a written report that equipment or system has been properly installed and is functioning correctly.

3.17 DEMONSTRATION AND INSTRUCTION

A. See Section 01 7900 - Demonstration and Training.

3.18 ADJUSTING

A. Adjust operating products and equipment to ensure smooth and unhindered operation.

B. Testing, balancing and Adjusting HVAC. Refer to Division 23.

3.19 FINAL CLEANING

A. Final cleaning shall be the responsibility of the Contract #1 General Construction Contractor for all interior cleaning and all costs for final cleaning shall be included in the Base Bid. Final cleaning responsibility shall be limited to al lnew additions and areas where renovations occur.

B. Execute final cleaning prior to Substantial Completion.

C. Use cleaning materials that are nonhazardous.

D. Clean interior and exterior glass, surfaces exposed to view; remove temporary labels, stains and foreign substances, polish transparent and glossy surfaces

E. Remove all labels that are not permanent. Do not paint or otherwise cover fire test labels or nameplates on mechanical and electrical equipment.

F. Clean equipment and fixtures to a sanitary condition with cleaning materials appropriate to the surface and material being cleaned.

G. Replace filters of operating equipment.

H. Clean site; sweep paved areas, rake clean landscaped surfaces.

I. Remove waste, surplus materials, trash/rubbish, and construction facilities from the site; dispose of in legal manner; do not burn or bury.

J. General: Provide final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.

K. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.

L. Cleaning Agents: Use cleaning materials and agents recommended by the manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

M. Remove tools, construction equipment, machinery, and surplus material from Project site.

N. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.

O. Sweep concrete floors broom clean in unoccupied spaces.

P. Remove labels that are not permanent.

Q. Touch up and otherwise repair and restore marred, exposed finishes and surfaces evidence of repair or restoration. Replace finishes and surfaces that cannot be satisfactorily repaired or restored or that already show

R. Do not paint over "UL" and similar labels, including mechanical and electrical nameplates.

S. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency. Replace burned-out bulbs, and those noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.

T. Leave Project clean and ready for occupancy.

U. Comply with safety standards for cleaning. Do not burn waste materials. Do not bury debris or excess materials on Owner's property. Do not discharge volatile, harmful, or dangerous materials into drainage systems. Remove waste materials from Project site and dispose of lawfully.

3.20 CLOSEOUT PROCEDURES

A. Refer to Section 01 7800

END OF SECTION

SECTION 01 7310
CUTTING AND PATCHING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Whenever possible, execute the work by methods that avoid cutting or patching.

B. This Section includes procedural requirements for cutting and patching.

1. Refer to other Sections for specific requirements and limitations applicable to cutting and patching.
2. Requirements of this Section apply to all contracts. Refer to various sections and divisions of these specifications for other requirements and limitations applicable to cutting and patching.
3. Contractor acknowledges that the work involves renovation and alteration of existing improvements and, therefore, cutting and patching of the work is essential for the Project to be successfully completed. Each Contractor shall perform any cutting, altering, patching and fitting of the work necessary for the work and the existing improvements to be fully integrated and to present the visual appearance of an entire, completed, and unified project. In performing any work which requires cutting, fixing, or patching, Contractor shall use its best efforts to protect and preserve the visual appearance and aesthetics of the project to the reasonable satisfaction of both the Owner and the Architect.
4. Each Contractor shall do all cutting, patching, repairing as necessary for their work In all cases, the cutting, patching, repairing and finishing shall be performed by mechanics skilled in the particular trade required at no additional cost to the Owner.

1.3 RELATED SECTIONS

A. Division 1 Section "Selective Removals" for removals of selected portions of the building for alterations.

B. Division 7 Section "Through-Penetration Firestop Systems" for patching fire-rated construction.

C. Divisions 2 through 14 Sections for additional requirements and limitations applicable to cutting and patching individual parts of the Work.

D. Requirements in this Section apply to each contractor and installations. Refer to all Division Sections for other requirements and limitations applicable to cutting and patching mechanical and electrical installations.

1.4 DEFINITIONS

A. Cutting: Removal of existing construction necessary to permit installation or performance of other Work.

B. Patching: Fitting and repair work required to restore surfaces to original conditions after installation of other Work.

1.5 SUBMITTALS

A. Cutting and Patching Proposal: Submit a proposal describing procedures at least 10 days before the time cutting and patching will be performed, requesting approval to proceed. Include the following information:

1. Extent: Describe cutting and patching; show how they will be performed, and indicate why they cannot be avoided.
2. Changes to Existing Construction: Describe anticipated results. Include changes to structural elements and operating components as well as changes in building's appearance and other significant visual elements.
3. Products: List products to be used and firms or entities that will perform the Work.
4. Dates: Indicate when cutting and patching will be performed.

5. Utilities: List utilities that cutting and patching procedures will disturb or affect. List utilities that will be relocated and those that will be temporarily out of service. Indicate how long service will be disrupted.
6. Structural Elements: Where cutting and patching involve adding reinforcement to structural elements, submit details and engineering calculations showing integration of reinforcement with original structure.
7. Architect's Approval: Obtain approval of cutting and patching proposal before cutting and patching. Approval does not waive right to later require removal and replacement of unsatisfactory work.

1.6 QUALITY ASSURANCE

A. Structural Elements: Do not cut and patch structural elements in a manner that could change their load-carrying capacity or load-deflection ratio.

B. Operational Elements: Do not cut and patch the following operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety.
1. Primary operational systems and equipment.
a. Air or smoke barriers.
b. Fire-protection systems.
c. Control systems.
d. Communication systems.
e. Conveying systems.
f. Electrical wiring systems.
g. Operating systems of special construction in Division 13 Sections.

C. Miscellaneous Elements: Do not cut and patch the following elements or related components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety.
1. Water, moisture, or vapor barriers.
a. Membranes and flashings.
b. Exterior curtain-wall construction.
c. Equipment supports.
d. Piping, ductwork, vessels, and equipment.
e. Noise- and vibration-control elements and systems.

D. Visual Requirements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch construction exposed on the exterior or in occupied spaces in a manner that would, in Architect's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.

E. Cutting and Patching Conference: Before proceeding, meet at Project site with parties involved in cutting and patching, including mechanical and electrical trades. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.

1.7 WARRANTY

A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during cutting and patching operations, by methods and with materials so as not to void existing warranties.

B. Prior to cutting and patching verify with Construction Manager all existing warranties in effect.
1. Portions of the exist roofs are under warranty. Work must be reviewed and approved by the manufacturer of the warranty.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: Comply with requirements specified in other Sections of these Specifications.

B. Existing Materials: Use materials identical to existing materials. For exposed surfaces, use materials that visually match existing adjacent surfaces to the fullest extent possible.

1. If identical materials are unavailable or cannot be used, use materials that, when installed, will match the visual and functional performance of existing materials.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine surfaces to be cut and patched and conditions under which cutting and patching are to be performed.

B. Compatibility: Before patching, verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.

C. Proceed with installation only after unsafe or unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Temporary Support: Provide temporary support of Work to be cut.

B. Protection: Protect existing construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.

C. Adjoining Areas: Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.

D. Existing Services: Where existing services are required to be removed, relocated, or abandoned, bypass such services before cutting to avoid interruption of services to occupied areas.

3.3 PERFORMANCE

A. General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.

B. Cut existing construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition. A sufficient time in advance of the construction of new walls, floors, pavement, or roofing etc. Each Contractor shall be responsible for properly locating and providing in place all sleeves, inserts and forms required for work.

C. Cutting: Cut existing construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.

1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots as small as possible, neatly to size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
2. Existing Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
3. Concrete/Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
4. Excavating and Backfilling: Comply with requirements in applicable Division 2 Sections where required by cutting and patching operations.
5. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.

D. All cutting of holes in existing walls, existing floors, existing roofs, existing ceilings, etc. for the removal of any existing work (including, but not limited to ducts, fans, fixtures, motors, equipment, drains, wiring, conduit, etc.) or for the installation of any new work shall be done in a neat manner by each Contractor. Debris caused by such cutting or removals will be removed by each Contractor.

E. Where sleeves, inserts or openings are required in existing walls, floors, roofs, vaults and pavements of existing buildings or structures, all necessary cutting, furnishing and installing of sleeves, inserts, lintels, etc., shall be done by each Contractor.

F. Contractor(s) are hereby notified that the existing walls in the existing building are concrete mansory unit. All openings in existing walls shall be provided with steel lintels, minimum 4" bearing each side and 8" wide x wall thickness concrete masonry units filled solid on each side of the opening for proper support.

G. Adequate blocking, fastening, etc., required to support equipment, casework, etc., from existing terra cotta walls shall be included as required to complete work.

H. All surfaces where existing items are removed from existing walls, floors, ceilings, roofs, vaults, etc. shall be patched to match existing surfaces.

1. All patching shall be provided with prime and finish paint or other material to match existing. In areas indicated to be completely painted/finished by the Contractor for Construction , other prime contractors shall be required only to patch existing surfaces to match as required to accept new finishes.
2. Proceed with patching after construction operations requiring cutting are complete.

I. Removals of selected portions of the building for alterations is included in Section "Selective Removals".

J. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other Work. Patch with durable seams that are as invisible as possible. Provide materials and comply with installation requirements specified in other Sections of these Specifications.

1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate integrity of installation.
2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing.
3. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove existing floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.
    a. Where patching occurs in a painted surface, apply primer and intermediate paint coats over the patch and apply final paint coat over entire unbroken surface containing the patch. Provide additional coats until patch blends with adjacent surfaces.
4. Ceilings: Patch, repair, or rehang existing ceilings as necessary to provide an even-plane surface of uniform appearance.
5. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition.

3.4 CLEANING

A. Clean areas and spaces where cutting and patching are performed. Completely remove paint, mortar, oils, putty, and similar items. Thoroughly clean piping, conduit, and similar features before applying paint or other finishing materials. Restore damaged pipe covering to its original condition.

END OF SECTION

SECTION 01 7419
CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 1 Specification Sections, apply to this Section.

1.2 WASTE MANAGEMENT REQUIREMENTS

A. Edgemont Union Free School District requires that this project generate the least amount of trash and waste possible.

B. Contract #1 General Construction Contractor shall be responsible for Construction Waste Management

C. Each Contractor shall collect and dispose of waste material into containers provided by Contract #1 General Construction Contractor . Refer to Section 01 5000 - Temporary Facilities and Controls for disposal by each Contractor for unit ventilators, heaters, fans, toilet fixtures, light fixtures, and etc.

D. Employ processes that ensure the generation of as little waste as possible due to error, poor planning, breakage, mishandling, contamination, or other factors.

E. Minimize trash/waste disposal in landfills; reuse, salvage, or recycle as much waste as economically feasible.

F. Required Recycling, Salvage, and Reuse: The following may not be disposed of in landfills or by incineration:

1. Aluminum and plastic beverage containers.
2. Corrugated cardboard.
3. Wood pallets.
4. Clean dimensional wood.
5. Land clearing debris, including brush, branches, logs, and stumps; see Section 31 1000 - Site Clearing.
6. Metals, including packaging banding, metal studs, sheet metal, structural steel, piping, reinforcing bars, door frames, and other items made of steel, iron, galvanized steel, stainless steel, aluminum, copper, zinc, lead, brass, and bronze.
7. Glass.
8. Gypsum drywall and plaster.
9. Plastic buckets.
10. Carpet, carpet cushion, carpet tile, and carpet remnants, both new and removed: DuPont (http://flooring.dupont.com) and Interface (www.interfaceinc.com) conduct reclamation programs.
11. Paint.
12. Windows, doors, and door hardware.
13. Mechanical and electrical equipment.
14. Fluorescent lamps (light bulbs).
15. Acoustical ceiling tile and panels.

G. General Construction Contractor shall submit periodic Waste Disposal Reports to Construction Manager; all landfill disposal, recycling, salvage, and reuse must be reported regardless of to whom the cost or savings accrues; use the same units of measure on all reports.

H. General Construction Contractor shall develop and follow a Waste Management Plan designed to implement these requirements.

I. The following sources may be useful in developing the Waste Management Plan:

J. Methods of trash/waste disposal that are not acceptable are:

1. Burning on the project site.
2. Burying on the project site.

3. Dumping or burying on other property, public or private.
4. Other illegal dumping or burying.
5. Incineration, either on- or off-site.

K. Regulatory Requirements: Each Contractor is responsible for knowing and complying with regulatory requirements, including but not limited to Federal, state and local requirements, pertaining to legal disposal of all construction and demolition waste materials.

1.3 RELATED REQUIREMENTS

A. Section 01 3000 - Administrative Requirements: Additional requirements for project meetings, reports, submittal procedures, and project documentation.

B. Section 01 5000 - Temporary Facilities and Controls: Additional requirements related to trash/waste collection and removal facilities and services.

C. Section 01 6000 - Product Requirements: Waste prevention requirements related to delivery, storage, and handling.

D. Section 01 7000 - Execution: Trash/waste prevention procedures related to cutting and patching, installation, protection, and cleaning.

E. Section 31 1000 - Site Clearing: Handling and disposal of land clearing debris.

1.4 DEFINITIONS

A. Clean: Untreated and unpainted; not contaminated with oils, solvents, caulk, or the like.

B. Construction and Demolition Waste: Solid wastes typically including building materials, packaging, trash, debris, and rubble resulting from construction, remodeling, repair and demolition operations.

C. Hazardous: Exhibiting the characteristics of hazardous substances, i.e., ignitibility, corrosivity, toxicity or reactivity.

D. Nonhazardous: Exhibiting none of the characteristics of hazardous substances, i.e., ignitibility, corrosivity, toxicity, or reactivity.

E. Nontoxic: Neither immediately poisonous to humans nor poisonous after a long period of exposure.

F. Recyclable: The ability of a product or material to be recovered at the end of its life cycle and remanufactured into a new product for reuse by others.

G. Recycle: To remove a waste material from the project site to another site for remanufacture into a new product for reuse by others.

H. Recycling: The process of sorting, cleansing, treating and reconstituting solid waste and other discarded materials for the purpose of using the altered form. Recycling does not include burning, incinerating, or thermally destroying waste.

I. Return: To give back reusable items or unused products to vendors for credit.

J. Reuse: To reuse a construction waste material in some manner on the project site.

K. Salvage: To remove a waste material from the project site to another site for resale or reuse by others.

L. Sediment: Soil and other debris that has been eroded and transported by storm or well production run-off water.

M. Source Separation: The act of keeping different types of waste materials separate beginning from the first time they become waste.

N. Toxic: Poisonous to humans either immediately or after a long period of exposure.

O. Trash: Any product or material unable to be reused, returned, recycled, or salvaged.

P. Waste: Extra material or material that has reached the end of its useful life in its intended use. Waste includes salvageable, returnable, recyclable, and reusable material.

1.5 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Waste Management Plan: Include the following information:

1. Analysis of the trash and waste projected to be generated during the entire project construction cycle, including types and quantities.
2. Landfill Options: The name, address, and telephone number of the landfill(s) where trash/waste will be disposed of, the applicable landfill tipping fee(s), and the projected cost of disposing of all project trash/waste in the landfill(s).
3. Landfill Alternatives: List all waste materials that will be diverted from landfills by reuse, salvage, or recycling.
4. Meetings: Describe regular meetings to be held to address waste prevention, reduction, recycling, salvage, reuse, and disposal.
5. Materials Handling Procedures: Describe the means by which materials to be diverted from landfills will be protected from contamination and prepared for acceptance by designated facilities; include separation procedures for recyclables, storage, and packaging.
6. Transportation: Identify the destination and means of transportation of materials to be recycled; i.e. whether materials will be site-separated and self-hauled to designated centers, or whether mixed materials will be collected by a waste hauler.

C. Waste Disposal Reports: Submit at specified intervals, with details of quantities of trash and waste, means of disposal or reuse, and costs; show both totals to date and since last report.

1. Submit updated Report with each Application for Progress Payment; failure to submit Report will delay payment.
2. Submit Report on a form acceptable to Construction Manager.
3. Landfill Disposal: Include the following information:
    a. Identification of material.
    b. Amount, in tons or cubic yards, of trash/waste material from the project disposed of in landfills.
    c. State the identity of landfills, total amount of tipping fees paid to landfill, and total disposal cost.
    d. Include manifests, weight tickets, receipts, and invoices as evidence of quantity and cost.
4. Recycled and Salvaged Materials: Include the following information for each:
    a. Identification of material, including those retrieved by installer for use on other projects.
    b. Amount, in tons or cubic yards, date removed from the project site, and receiving party.
    c. Transportation cost, amount paid or received for the material, and the net total cost or savings of salvage or recycling each material.
    d. Include manifests, weight tickets, receipts, and invoices as evidence of quantity and cost.
    e. Certification by receiving party that materials will not be disposed of in landfills or by incineration.
5. Material Reused on Project: Include the following information for each:
    a. Identification of material and how it was used in the project.
    b. Amount, in tons or cubic yards.
    c. Include weight tickets as evidence of quantity.
6. Other Disposal Methods: Include information similar to that described above, as appropriate to disposal method.

PART 2 PRODUCTS NOT USED

PART 3 EXECUTION

3.1 WASTE MANAGEMENT PLAN IMPLEMENTATION

A. Manager: Designate an on-site person or persons responsible for instructing workers and overseeing and documenting results of the Waste Management Plan.

B. Communication: Distribute copies of the Waste Management Plan to job site foreman, each subcontractor and Construction Manager.

C. Instruction: Provide on-site instruction of appropriate separation, handling, and recycling, salvage, reuse, and return methods to be used by all parties at the appropriate stages of the project.

D. Meetings: Discuss trash/waste management goals and issues at project meetings.
   1. Prebid meeting.
   2. Preconstruction meeting.
   3. Regular job-site meetings.

E. Facilities: Provide specific facilities for separation and storage of materials for recycling, salvage, reuse, return, and trash disposal, for use by all contractors and installers.
   1. Provide containers as required.
   2. Provide adequate space for pick-up and delivery and convenience to subcontractors.
   3. Keep recycling and trash/waste bin areas neat and clean and clearly marked in order to avoid contamination of materials.

F. Hazardous Wastes: Separate, store, and dispose of hazardous wastes according to applicable regulations.

G. Recycling: Separate, store, protect, and handle at the site identified recyclable waste products in order to prevent contamination of materials and to maximize recyclability of identified materials. Arrange for timely pickups from the site or deliveries to recycling facility in order to prevent contamination of recyclable materials.

H. Reuse of Materials On-Site: Set aside, sort, and protect separated products in preparation for reuse.

I. Salvage: Set aside, sort, and protect products to be salvaged for reuse off-site.

END OF SECTION

SECTION 01 7600
PROCEDURES AND SPECIAL CONDITIONS FOR SEPARATE PRIME CONTRACTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 1 Specification Sections, apply to this Section.

1.2 DESCRIPTION OF WORK

A. The types of minimum requirements for procedures and performance or control work of a general nature, to be fulfilled collectively by Prime Contractors, and must be participated in by each Prime Contractors (where applicable) even though certain lets of work may be assigned to a specific Prime Contractors.

1.3 USE OF PREMISES

A. Refer to Section 01 1000 Summary of Contract(s).

1.4 MISCELLANEOUS PROVISIONS:

A. Except as otherwise indicated comply with applicable requirements of Division-22, 23, and 26 sections for mechanical provisions within units of general (Divisions 2-14) work. Except as otherwise indicated, comply with applicable requirements of Division-26 section for electrical provisions within units of general (Divisions 2-14) work.

B. Service Connections: Refer to Division-22, Division-23 and Division-26 sections for the characteristics of the mechanical and electrical services to be connected to units of general work. Provide units manufactured or fabricated for proper connection to and utilization of available services, as indicated. Except as otherwise indicated, final connection of mechanical services to general work is defined as being mechanical work, and final connection of electrical services to general work is defined as electrical work.

1.5 DISSIMILAR METAL

A. Wherever dissimilar metals would otherwise come in contact with each other, they must be isolated by use of an approved, permanent non-staining material. Where one of the metals is aluminum, a coat of zinc-chromate primer followed by a coat of alkali-resistant bituminous paint shall be applied.

1.6 MODIFICATION OF WORK

A. Where necessary, because of job or space conditions, the Contractor shall modify his work to suit these conditions, within accepted standards and limitations. No allowance will be made for this modification. .

1. If work is executed without regard for other trades as cited above, the Architect may direct its removal and modification. No allowance will be made for this work.

1.7 ACCESSIBILITY, SIZE AND LOCATION OF EQUIPMENT AND WORK

A. Each Contractor shall investigate each space into and through which equipment must be moved. Equipment shall be shipped from manufacturer in sections, of size(s) suitable for moving through restricted spaces.

B. Each Contractor shall be responsible for the sufficiency of the size of shafts and chases, the adequate thickness of partitions, and sizes of duct enclosures, for the proper installation of his work. They shall cooperate with the all other contractors whose work is in the same spaces and shall advise the Construction Contractor of their requirements. Such spaces and clearances shall, however, be kept to the minimum size required.

C. Each Contractor shall locate all equipment, which must be serviced, operated or maintained in fully accessible positions. Equipment shall include, but not be limited to: valves, traps, cleanouts, motors, controllers, switch-gear, and drain point etc. Minor deviations from drawings may be made to allow for better accessibility, but changes of magnitude or which involves extra cost shall not be made without approval.

1.8 ACCESS DOORS

A. Provide all access doors for all dampers, valves, cleanest, junction boxes, pull boxes or similar items located above finished ceilings or ceiling breaks or extensions, behind finished walls or below finished floors. The access doors shall be stainless steel or steel, hinged types as required for type of construction.steel, hinged types as required for type of construction.

1. Where feasible locate all dampers, valves, cleanest, junction boxes, pull boxes or similar items above acoustical tile ceiling.
2. Provide where required:
   a. Wall and ceiling access door and frame units.
   b. Floor access door and frame units, interior.
   c. Access door and frame units, fire-rated and non-fire-rated, in wall, ceiling, and floor locations.
3. Group together concealed boxes, control valves, dampers and other mechanical and electrical equipment requiring access for operation, maintenance and repair, to reduce number of access doors required.
4. Group together concealed boxes, control valves, dampers and other mechanical and electrical equipment requiring access for operation, maintenance and repair, to reduce number of access doors required.
5. Where electric motors or heaters are installed above hung ceilings, provide disconnect switch in hung ceilings within reach from access doors, unless switch is located on wall immediately below.
   a. Disconnect switch shall be provided by the Contractor furnishing the equipment unless shown otherwise.
6. All access doors in Toilets, Janitor Closets, and Kitchen and Food Related Areas and similar spaces shall be watertight and constructed completely of stainless steel type 302.
7. In new construction each contractor shall furnish the access dorr(s) to the General Construction Contractor for installation. In existing construction each Prime Contractor shall furnish and install.

1.9 MACHINERY GUARDS

A. Moving parts of machinery exposed to contact by personnel shall be guarded by a barrier of a type a approved by the Architect.

1. Exposed moving parts such as belts and couplings shall have 3/4" No 16 gauge galvanized expanded metal mesh guards, with all edges rounded. Guards shall be 1-1/2" x 1-1/2" x 1/8" angle iron framed properly supported.
2. All machinery guards covering the ends of motor or equipment shafts shall have openings for the insertion of a tachometer.

1.10 DRIP PANS

A. The respective mechanical contractor shall provide 20 oz. copper all soldered reinforced pans with 2" high lips under all heating, domestic water piping, soil and waste piping which runs over electric switchboards, mounting boards, motors or electric motor starters. Each drip pan shall have a copper drain piped to discharge where shown on the drawings, of if not shown, to discharge to the nearest available open drain or floor where directed by the Owner's Representative. All piping shall be copper 1-1/2" minimum in diameter.

1.11 CONCEALMENT OF UNSIGHTLY INSTALLATIONS

A. Piping and conduit work is to be run concealed in all occupied areas, in partitions, construction and pipe spaces. Obtain exact dimensions locations of partitions, use special care to see that no joints, fittings, piping or conduit will be exposed except as shown or specified. In the event of any unsightly exposed piping or conduit work or unsightly partitions resulting, the Contractor shall rebuild, and re-run lines at his own expense. When approved by the Owner's Representative all exposed conduit shall be installed in wiremold.

1.12 SUPPORTS FROM OVERHEAD CONSTRUCTION

A. Where overhead equipment does not permit fastening of supports for equipment, furnish at no additional cost to the Owner, additional framing, supplementary steel, etc., as required, subject to approval by the Owner's Representative. Specific types of hangers and supports which are required in certain areas are to be installed as indicated on the drawings.

1.13 ESCUTCHEONS

A. Where exposed un-insulated mechanical piping or conduits pass through floors, ceilings or walls of finished rooms, apply, approved hinged escutcheon of sufficient outside diameter to cover the pipe sleeve.
   1. Where exposed insulated pipes pass through walls, floors, or ceilings of finished rooms, provide escutcheons fastened to the sleeves.
   2. Finish shall be stainless steel in toilets, janitor’s closet and similar “wet areas”. Submit samples.

1.14 FLASHINGS

A. Cap Flashing:
   1. Unless noted otherwise on drawings all cap flashings for HVAC, Plumbing and Electrical work shall be provided by the respective HVAC, Plumbing and Electrical Contractor, except where specifically indicated or specified to be provided by the General Construction Contractor.
      a. Unless noted othewise on drawings cap flashings for all contracts shall conform to Section 07600 Flashing and Sheetmetal and shall be a minimum 16 oz.. lead coated copper. Provide a minimum 4" lap extending over the base flashing.

B. Base Flashing:
   1. All base flashings and pitch pockets for all contracts to be installed in new roofing system shall be provided by the Construction Contractor.
      a. All base flashing and pitch pockets for equipment installed on existing roof systems shall be furnished and installed by the Construction Contractor. Work shall be compatible to existing roofing system and performed by installers acceptable to the roofing manufacturer so as not to void any existing roofing warranties. Prior to starting work on existing roof systems notify Owner's Representative and roofing manufacturer.
      b. Unless noted othewise on drawings all base flashing shall be a minimum 12" above roof membrane.

1.15 WATERPROOFING

A. Where any work pierced waterproofing, including waterproof concrete, the method of installation shall be approved by Owner's Representative before work is done. Each Contractor shall furnish all necessary sleeves, caulking and flashing required making openings absolutely watertight. (See Cutting and Patching Section 01700)

1.16 SALVAGEABLE MATERIALS:

A. The Owner will prepare a list of salvageable items it wishes to retain. All salvageable items shall be delivered by the Contractor to a storage area designated by the Owner on site. All demolished equipment etc., except those items specifically requested by the Owner shall become the Contractor's property and shall be removed from the premises.

1.17 CONSERVATION:

A. General: It is a requirement for each Prime Contractor's supervision and administration of the work, that construction operations be carried out with the maximum possible consideration given to conservation of energy, water and materials.

1.18 MATERIALS AND WORKMANSHIP

A. All material, apparatus and accessories shall be new and of the best quality of their respective kind.

1. Work and materials shall conform to the latest applicable requirements of the New York State Building Code including Reference Standards or National Board of Fire Underwriters and Local Municipal codes, where applicable.
2. All labor shall be performed in a first-class workmanlike manner, and adequate supervision must be provided to insure against neglect or faulty installations of any part of the systems during the progress of the work.
3. Any inferior material and/or workmanship shall be removed at once, when directed by the Owner's Representative and replaced with material and workmanship in accordance with the true intent and meaning of the drawings and specifications, at no additional cost to the Owner.
4. If material or equipment is installed before it is approved, as to manufacture and shop drawings, the Contractor shall be liable for the removal and replacement at no extra charge, if in the opinion of the Owner's Representative the material or equipment does not meet the intent of the drawings and specifications.
5. If after installation (with or without prior approval) operation of any equipment proves to be unsatisfactory by reasons of defects, workmanship, error or omissions, the Owner's Representative reserves the right to operate equipment until it can be removed from service for correction or replacement by the Contractor. The Contractor shall pay for the repair of all damage to work of other Prime Contractor's caused by this defective equipment and its correction or replacement.
6. No advertising matter exclusive of nameplates containing required data shall appear on any equipment without the written consent of the Owner's Representative. The equipment furnished under this specification shall be essentially the standard product of a manufacturer regularly engaged in the manufacture of such equipment. Where two or more units of the same class of equipment are required, the units shall be products of a single manufacturer; however, the component parts of the equipment need not be products of the same manufacturer.

1.19 SELECTIVE REMOVAL OF EXISTING PLUMBING, HEATING, ELECTRICAL AND RELATED WORK

A. All selective removal work shall be in accordance with the time schedule as specified herein.
   1. All plumbing, mechanical and electrical removals shall be performed as required to complete the work as intended.
   2. Remove all plumbing, heating and electrical apparatus, equipment, specialties, drains, controls, hangers, bases supports, piping, pneumatic tubing, conduit, panels, switches, wiring, plumbing accessories and electrical fixtures, etc., that are not incorporated in the new layout or required.
   3. Where removal is indicated, or implied, or not incorporated in the new layout, the item itself is to be removed completely together with all connecting conduits, specialties, supports, controls, etc. Connecting conduits are to be removed back to the mains and panels where they are to be capped or disconnected. All abandoned open ends shall be sealed and capped or disconnected. This includes all heating, electric, water, gas, etc. Patching and finishing of all surfaces to match existing shall be performed by the Contractor doing the removal. (See Cutting and Patching Section 01700)
   4. Where existing conduit, etc., enter inaccessible trenches, tunnels, shafts, walls, and ceilings, inside of the existing building, they shall be cut back at least 2" into such inaccessible spaces and shall be suitably capped and sealed by the Contractor.
   5. Each Contractor shall exercise all normal caution to prevent unnecessary cutting and damage to the existing building. Any excessive damage, as determined by the Owner's Representative shall be repaired and paid for by the Contractor causing the damage.

1.20 ELIMINATION OF NOISE AND VIBRATION

A. All equipment and accessories shall operate without objectionable noise or vibration.
   1. Should operation of any one or more of the systems produce noise or vibration which is, in the opinion of the Owner's Representative, objectionable, the Contractor shall, at his own expense, make changes in equipment and do all work necessary to eliminate the objectionable noise or vibration.

2. All work shall operate under all conditions of load without any sound or vibration which, in the opinion of the Owner's Representative, is objectionable. In the case of moving machinery, sound or vibration noticeable outside the room in which it is installed, or annoyingly noticeable inside its own room, will be considered objectionable. Sound or vibration conditions considered objectionable by the Owner's Representative shall be corrected in an approved manner by the Contractor at his expense.
    a. Provide vibration isolators on all moving machinery.

1.21 GENERAL LABELING

A. All mechanical and electrical equipment such as unit ventilators, heating and ventilating units, exhaust fans, etc., shall have appropriate descriptive labels, identification tags and nameplates, furnished and installed under the respective control under which the corresponding item is provided, and shall be properly placed and permanently secured to (or adjacent to) the item being installed.
    1. Submit complete schedules, listings, and descriptive data, together with samples for checking and approval before purchasing.
    2. Refer to respective M/E specifications for additional requirements.

1.22 IDENTIFICATION OF PIPING

A. Each Contractor shall provide on all new exposed, insulated and uninsulated piping, semi-rigid, wrap-around plastic identification markers.
    1. Each marker background is to be appropriately color-coded with a clearly printed legend to identify the contents of the pipe conformance with the Scheme for the Identification of Piping Systems (ASA A13.1-1956). Direction of flow arrows is to be included on each marker.
    2. Exposed locations for the pipe markers to be as follows:
        a. Adjacent to each valve.
            a) At each branch and riser take-off.
            b) At each pipe passage through wall, floor and ceiling construction.
            c) On all horizontal pipe runs - marked every 15 feet.
            d) At each inlet and outlet of coils, pumps, etc.
    3. Refer to respective M/E specifications for additional requirements.

1.23 PAINTING

A. All apparatus, cabinets, etc., furnished under the Mechanical and Electrical Sections of the specifications, shall be provided with a priming coat, and enamel finish. All patched surfaces and surfaces where removals have occurred (by each Contractor) shall receive a prime coat and a finish coat to match adjacent surfaces acceptable to the Owner's Representative unless noted otherwise.
    1. All finish painting of new insulated and uninsulated piping, new duct work, apparatus, and appurtenances, will be performed by each contractor, unless noted otherwise.
    2. All concealed supports and ironwork not otherwise protected against corrosion shall be given two (2) coats of bituminous base paint.

1.24 TEMPLATES:

A. Each contractor shall prepare templates showing all dimensions and shall furnish all anchor bolts and sleeves required for all equipment,, boilers, and transformers, etc., and submit to Contractor who requires this information.

1.25 EQUIPMENT BASES

A. Each contractor shall submit for approval of the Fuller and D'Angelo, P.C., detail drawings of all equipment foundations and shall furnish all templates for his foundation.
    1. Unless otherwise indicated Construction Contractor will furnish and install their equipment bases. It is the responsibility of each Contractor to place any templates and anchor bolts and to supervise the construction of the equipment bases regardless of who installs the bases.

a. Concrete equipment bases for shall be minimum 3,000 psi test strength at 28 days . Provide minimum 6/6 x 10/10 welded wire mesh.

1.26 MOTORS

A. Each Contractor shall furnish and install the electric motors required for the motor-driven equipment supplied under his contract. The motors shall be of sufficient size for the duty to be performed, and shall not exceed their full rated load when the driven equipment is operating at required capacity under the most severe conditions likely to be encountered. The speed and horsepower for each motor are given in the schedule on the drawings, or are specified.

1. All motors shall be suitable for operating on alternating current, sixty (60) cycle frequency. Motors 1/2 horsepower and smaller shall be wound for single-phase, 60 cycle, 120 volt current. Motors exceeding 1/2 horsepower shall be designed for operation on three phase, 60 cycle, voltage indicated on the Electrical drawings or specifications current.
   a. Fractional horsepower motors shall be of the sealed prelubricated ball bearing type.
      a) All motors shall be approved by the Underwriters Laboratories, Inc., for the service and location intended.
      b) All motors shall be equipped with ball bearings unless specified otherwise in other sections of these specifications.
      c) Motors for single-phase operation shall be of the capacitor type.

1.27 WIRING

A. The wiring of prewired equipment or apparatus is specified under the corresponding sections of the Specifications. The Electrical volt systems design as indicated on the Electrical Drawings and Specifications.

B. The Electrical Contractor will perform all Power wiring; however, each Contractor shall furnish all magnetic starters and automatic controls, suitable for the equipment furnished by the Contractor. Motor starters shall be installed by the Electrical Contractor.

C. Each Contractor shall prepare wiring diagrams and submit same for approval Submit in electronic PDF format.Approved copies with any additional instructions are to be given to the Electrical Contractor.

1. All prewired and job wired control panels for motors shall be provided with approved high interrupting capacity circuit breakers.
2. All electrical wiring for equipment where exposed to the weather (factory or field installed) shall be installed in weathertight conduits and shall be U.L. approved.

1.28 CONTROL WIRING

A. Control wiring is required wiring, conduit, relays, contractors, electro-mechanical, hydraulic activators and solid state regulating devices either low or line voltage, to the controlled device that is regulated by the controller and necessary for the operation, controlling, sequencing etc. of the equipment or system. Control wiring shall be furnished and installed by each contractor furnishing and installing such equipment or systems.

1. Power wiring to equipment, including wiring and installation of magnetic starters and disconnect switches, where required, shall be the responsibility of the Electrical Contractor. The Electrical Contractor shall furnish and install all disconnect switches, where required, and install all magnetic starters. All magnetic starters shall be furnished by each contractor furnishing the equipment or systems.
2. EachContractor shall supervise the wiring of all equipment included under his Contract.

1.29 MOTOR STARTERS

A. Except where specified to be motor or pedestal mounted as part of a prewired control panel furnished with the equipment they serve, all magnetic starters shall be provided by each Contractor. Magnetic starters, with thermal and under voltage protection, suitable for the voltages indicated, shall have a heater in each phase and reset button on the cover.

1. Motors 1/2 HP and larger shall have Allen Bradley, Emerson Phase Guard or approved substitute phase failure relays suitable for the voltages indicated, included in the starter enclosure. Refer to specific section of specifications for special starters.

B. Motors over 1 HP shall be provided with variable frequency drive. (VFD), unless shown otherwise

C. Where the installation of phase failure non-reversing relays are required, these shall, wherever possible, be wired and installed at the equipment manufacturer's factory panel mounted equipment in connection with refrigeration equipment and temperature controls. Starters shall be Allen Bradley, Square D or approved equal.

1.30 UNDERWRITERS' LABORATORIES CERTIFICATION

A. All mechanical and electrical equipment shall bear the UL label of approval where such inspection service is furnished for the particular type of equipment.

1.31 LOCATIONS AND MEASUREMENTS

A. The locations of fixtures, appliances, conduits, etc., are specified and shown on the plans as accurately as possible, but in all cases, they are to be adjusted to the surrounding conditions. Contractor must take all measurements at the building, and should the space allotted for any appliance be inadequate, it shall be the Contractor's responsibility to immediately notify in writing, and shall he fail to do so, he must bear the expense necessary to correct the conditions. All work shall be coordinated with the work of other trades.

1.32 GROUNDING

A. Standards set forth by the latest edition of the National Electric Code, relative to the grounding of system and equipment, shall be followed together with the rules and regulations of the Utility Company. All non-current carrying metal parts shall be solidly grounded. All motor frames that are not clamped to supply conduits shall be grounded by suitable wire and ground clamp.

1. The identified neutral wire or white wire of the interior wiring system shall be permanently grounded to the water services. The grounded wire shall be connected to the supply side of the main service switch and mechanically connected to an approved ground clamp and securely bonded to the water service at the point of entry. The ground connection shall be made on the supply side of the first main control valve. The conductors shall be protected from mechanical injury by rigid steel conduit to which the conductors shall be securely bonded in each length of connection. Conduit system shall be securely grounded to the above described ground of wiring system.
2. Ground connections to water mains shall be made to non-current carrying metal parts of distribution panels, instrument cases, and instrument transformer cases.

1.33 FIRESTOPPING:

A. All openings thru walls, floors, shafts, etc. shall be fire stopped with approved material to maintain rating. See Section 07 8400 - Firestopping.

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION (NOT APPLICABLE)

END OF SECTION

SECTION 01 7800
CLOSEOUT SUBMITTALS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SECTION INCLUDES

A. Substantial Completion.

B. Final Completion.

C. Project record documents.

D. Operation and maintenance data.

E. Warranties

1.3 RELATED REQUIREMENTS

A. Article 15 of the General Conditions: Warranty and Correction of work.

B. Section 01 3000 - Administrative Requirements: Submittals procedures.

C. Section 01 7000 - Execution: Progress and Final cleaning.

D. Section 01 7900 - Demonstration and Training.

E. Section 01 9113 - General Commissioning Requirements.

F. Individual Product Sections: Specific requirements for operation and maintenance data.

G. Individual Product Sections: Warranties required for specific products or Work.

1.4 SUBSTANTIAL COMPLETION

A. Preliminary Procedures: Before requesting inspection for determining date of Substantial Completion:

1. Prepare a list of items to be completed and corrected, the value of items on the list, and reasons why the Work is not complete.
2. Advise Architect and Construction Manager of pending insurance changeover requirements.
3. Obtain and submit releases permitting Architect and Construction Manager unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.

B. Prior to issuance of the Certificate of Substantial Completion, submit, in writing, a request to the Architect and Construction Manager to perform site inspection for the purpose of preparing a "punch list".

C. On receipt of request the Architect and Construction Manager will schedule and prepare a punch list.

D. Certificate of Substantial Completion will be issued **only after completion of all punch list items, including photos of corrected items,** or Construction Manager will notify the each Prime Contractor of items, either punch list or additional items identified by Architect, **that must be completed or corrected before a certificate will be issued.** After completion of **all punch list items** submit the following:

1. Application for Payment showing 100 percent completion for portion of the Work claimed as substantially completed.
2. Manufacturer's Warranties/guarantees.
3. Contractor's Warranty - Three years minimum except where longer periods are prescribed or there is an extended warranty.
4. Maintenance agreements, if any.
5. Manifest for disposal of Hazardous Material.
6. Manifest for disposal of material.
7. Test/adjust/balance reports and records.
8. Maintenance Manuals and Instructions Manuals

9. Signed Receipt by Construction Manager of spare parts and attic stock, if any.
10. Start-up performance reports.
11. Changeover information related to Owner's occupancy, use, and maintenance.
12. Video Training Sessions.
13. Advice on shifting insurance coverage.
14. All third party inspections including concrete, steel, rebar, manufactures field inspection, etc.
15. List of incomplete Work, recognized as exceptions to Architect's and Construction Manager's "punch list".
16. Removal of temporary facilities and services.
17. Removal of surplus materials, rubbish and similar elements.
18. As Built Drawings.
19. Project Record Documents.
20. Fully executed Certificate of Substantial Completion. (AIA G704 by Architect).
21. Asbestos manifest, if any.
22. Underwriters Certificate or authorized third party Certificate.
23. This application shall reflect Certificates of Partial Substantial Completion issued previously for Owner occupancy of designated portions of the Work.

E. Request re-inspection when the Work identified in previous inspections as incomplete is completed or corrected.
   1. If necessary re-inspection will be repeated and the contractor shall pay for all additional inspections as per amount stated in the General Conditions..
   2. Results of completed inspection will form the basis of requirements for Final Completion.
   3. The maximum payment for Substantial Completion shall 100% of contract amount, **less 5% retainange.** The retainage will be paid when all Final Completion items are submitted and approved.

1.5 FINAL COMPLETION AND PAYMENT

A. Preliminary Procedures: Before requesting final inspection for determining date of Final Completion, complete the following:
   1. Inspection: Submit a written request for final inspection for acceptance. On receipt of request, Architect and Construction Manager will either proceed with inspection or notify each Prime Contractor of unfulfilled requirements. Architect and Construction Manager will not process a final Certificate for Payment until after the inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.
      a. Re-inspection: Request re-inspection when the Work identified in previous inspections as incomplete is completed or corrected.
      b. At the completion of each “punch list” item the each Prime Contractor shall photograph each item and submit them to Construction Manager.

B. Following Final Inspection and acceptance of work submit the following: (As applicable to each Prime Contractor)
   1. Submit a final Application for Payment according to Division 1 Section 01 2000 - Price and Payment Procedures.
   2. Architect's punch list certifying all punch list items have been completed, with photograph of each item, signed off by the Construction Manager and each Prime Contractor**.**
   3. Update final statement, accounting for final changes to the Contract Sum.
   4. Consent of Surety to Final Payment, AIA Document G707
   5. Final Liquidated Damages settlement statement.
   6. Contractor's Affidavit of Release of Liens (AIA G706A).
   7. Contractors Affidavit of Payment of Debts and Claims (AIA G706)
   8. Contractor's Certification of Payment of Prevailing Wage Rates.

9. Contractor's Certification of Compliance that products comply with VOC requirements stated in Section 01 6116 - Volatile Organic Compound (VOC) Content Restrictions.
10. Contractor's Certified Statement certifying that no asbestos containing material was incorporated into the project.
11. DOL Final Completion Form. (PW 200).
12. Asbestos Manifest
13. Underwriters Certificate or equivalent.

1.6 SUBMITTALS

A. Each Contractor shall submit all documentation identified in this section within ninety (90) working days from the time the Contractor submits the list of items to be corrected, in addition to other rights of the Owner set forth elsewhere in the Contract Documents, to include but not limited to withholding of final payment. If the documentation has not been submitted within [ninety (90)] day period, the Construction Manager will obtain such through whatever means necessary. The Contractor shall solely be responsible for all expenses incurred by the Owner, provided the Owner has advised the Contractor of this action [seven (7)] days prior to the culmination date by written notice.

B. Project Record Documents: Submit documents to Architect with claim for final Application for Payment. Refer to Section 01 1000 Summary of Work for addition information.

C. Operation and Maintenance Data:
1. Refer to individual sections for additional requirements.
2. Submit two copies of preliminary draft or proposed formats and outlines of contents before start of Work. Construction Manager and Architect will review draft and return one copy with comments.
3. For equipment, or component parts of equipment put into service during construction and operated by Edgemont Union Free School District, submit completed documents within ten days after acceptance.
4. Submit one copy of completed documents 10 days prior to final inspection. This copy will be reviewed and returned after final inspection with Construction Manager and Architect comments. Revise content of all document sets as required prior to final submission.
5. Submit two sets of revised final documents in final form within 10 days after final inspection.

D. Warranties.
1. Make other submittals within 10 days after Date of Substantial Completion, prior to final Application for Payment.
2. For items of Work for which acceptance is delayed beyond Date of Substantial Completion, submit within 10 days after acceptance, listing the date of acceptance as the beginning of the warranty period.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.1 PROJECT RECORD DOCUMENTS

A. Maintain on site one set of the following record documents; record actual revisions to the Work:
1. Drawings.
2. Specifications.
3. Addenda.
4. Change Orders and other modifications to the Contract.
5. Reviewed shop drawings, product data, and samples.
6. Manufacturer's instruction for assembly, installation, and adjusting.
7. O&M Manuals.

B. Ensure entries are complete and accurate, enabling future reference by Construction Manager.

C. Store record documents separate from documents used for construction.

D. Record information concurrent with construction progress.
   1. Review with Construction Manager with each application for payment.
   2. Construction Manager shall verify record mark-up are up to date.
   3. Failure to maintain mark up will be cause for rejecting the application.

E. Specifications: Legibly mark and record at each product section description of actual products installed, including the following:
   1. Manufacturer's name and product model and number.
   2. Product substitutions or alternates utilized.
   3. Changes made by Addenda and modifications.

F. Record Drawings and Shop Drawings: Legibly mark each item to record actual construction including:
   1. Measured depths of foundations in relation to finish first floor datum.
   2. Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
   3. Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of the Work.
   4. Field changes of dimension and detail.
   5. Details not on original Contract drawings.

G. Record Prints: Maintain one set of blue- or black-line white prints of the Contract Drawings and approved Shop Drawings at the project site.

H. Each Contractor is responsible for marking up Sections that contain its own Work and for submitting the complete set of record Specifications as specified.

I. Preparation: Mark Record Prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to prepare the marked-up Record Prints.
   1. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
   2. Accurately record information in an understandable drawing technique.
   3. Record data as soon as possible after obtaining it. Record and check the markup before enclosing concealed installations.

J. Content: Types of items requiring marking include, but are not limited to, the following:
   1. Dimensional changes to Drawings.
   2. Revisions to details shown on Drawings.
   3. Locations and depths of underground utilities.
   4. Revisions to routing of piping and conduits.
   5. Revisions to electrical circuitry.
   6. Actual equipment locations.
   7. Duct size and routing.
   8. Locations of concealed internal utilities.
   9. Changes made by Change Order or Construction Change Directive.
   10. Changes made following Architect and Construction Manager's written orders.
   11. Details not on the original Contract Drawings.
   12. Field records for variable and concealed conditions.
   13. Record information on the Work that is shown only schematically.

K. Mark the Contract Drawings or Shop Drawings, whichever is most capable of showing actual physical conditions, completely and accurately. If Shop Drawings are marked, show cross-reference on the Contract Drawings.

L. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at the same location.

M. Mark important additional information that was either shown schematically or omitted from original Drawings.

N. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.

O. **Provide ALL final record documents on flash drive in PDF-A Format.**

3.2 FORMAT

A. Identify and date each Record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location. Contractor shall certify and sign.

B. Record Prints: Organize Record Prints and newly prepared Record Drawings into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets.

C. Record PDF Drawings: Organize PDF information into separate electronic files that correspond to each sheet of the Contract Drawings. Name each file with the sheet identification. Include identification in each PDF file.

D. Identify Record Drawing as follows:

1. Project name.
    a. Date.
    b. Designation "PROJECT RECORD DRAWINGS."
    c. Name of Owner, Architect , Consultants, and Construction Manager.
    d. Name of Contractor.
    e. Contractor shall certify and sign each drawings or attached TOC as follows:
        a) "We the undersigned certify that we have reviewed and coordinated the As-Built Drawings and they are in conformance to the plans, specifications, applicable codes and provisions of the Contract Documents. To the best of our knowledge all items reflected on the As-Built Drawings are a true representation of the site and building conditions".

3.3 OPERATION AND MAINTENANCE DATA

A. Source Data: For each product or system, list names, addresses and telephone numbers of Subcontractors and suppliers, including local source of supplies and replacement parts.

B. Product Data: Mark each sheet to clearly identify specific products and component parts, and data applicable to installation. Delete inapplicable information.

C. Drawings: Supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams. Do not use Project Record Documents as maintenance drawings.

D. Typed Text: As required to supplement product data. Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions.

3.4 OPERATION AND MAINTENANCE DATA FOR MATERIALS AND FINISHES

A. For Each Product, Applied Material, and Finish:

B. Instructions for Care and Maintenance: Manufacturer's recommendations for cleaning agents and methods, precautions against detrimental cleaning agents and methods, and recommended schedule for cleaning and maintenance.

C. Where additional instructions are required, beyond the manufacturer's standard printed instructions, have instructions prepared by personnel experienced in the operation and maintenance of the specific products.

3.5 OPERATION AND MAINTENANCE DATA FOR EQUIPMENT AND SYSTEMS

A. For Each Item of Equipment and Each System:

1. Description of unit or system, and component parts.

2. Identify function, normal operating characteristics, and limiting conditions.
3. Include performance curves, with engineering data and tests.
4. Complete nomenclature and model number of replaceable parts.

B. Where additional instructions are required, beyond the manufacturer's standard printed instructions, have instructions prepared by personnel experienced in the operation and maintenance of the specific products.

C. Panelboard Circuit Directories: Provide electrical service characteristics, controls, and communications; typed.

D. Include color coded wiring diagrams as installed.

E. Operating Procedures: Include start-up, break-in, and routine normal operating instructions and sequences. Include regulation, control, stopping, shut-down, and emergency instructions. Include summer, winter, and any special operating instructions.

F. Maintenance Requirements: Include routine procedures and guide for preventative maintenance and trouble shooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.
1. Include HVAC outdoor and exhaust air damper calibration strategy.
   a. Include provisions which ensure that full closure of dampers can be achieved.
2. Include Carbon Dioxide Monitoring Protocol.
3. Include Carbon Monoxide Monitoring Protocol.

G. Provide servicing and lubrication schedule, and list of lubricants required.

H. Include manufacturer's printed operation and maintenance instructions.

I. Include sequence of operation by controls manufacturer.

J. Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.

K. Provide control diagrams by controls manufacturer as installed.

L. Provide contractors's coordination drawings, with color coded piping diagrams as installed.

M. Provide charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.

N. Provide list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.

O. Include test and balancing reports.

P. Additional Requirements: As specified in individual product specification sections.

3.6 ASSEMBLY OF OPERATION AND MAINTENANCE MANUALS

A. Assemble operation and maintenance data into durable manuals for Edgemont Union Free School District's personnel use, with data arranged in the same sequence as, and identified by, the specification sections.

B. Where systems involve more than one specification section, provide separate tabbed divider for each system.

C. Binders: Commercial quality, 8-1/2 by 11 inch three D side ring binders with durable plastic covers; 2 inch maximum ring size. When multiple binders are used, correlate data into related consistent groupings.

D. Cover: Identify each binder with typed or printed title OPERATION AND MAINTENANCE INSTRUCTIONS; identify title of Project; identify subject matter of contents.

E. Project Directory: Title and address of Project; names, addresses, and telephone numbers of Fuller and D'Angelo, P.C., Consultants, Construction Manager, Contractor, and Subcontractors with names of responsible parties.

F. Tables of Contents: List every item separated by a divider, using the same identification as on the divider tab; where multiple volumes are required, include all volumes Tables of Contents in each volume, with the current volume clearly identified.

G. Dividers: Provide tabbed dividers for each separate product and system; identify the contents on the divider tab; immediately following the divider tab include a description of product and major component parts of equipment.

H. Text: Manufacturer's printed data, or typewritten data on 24 pound paper.

I. Drawings: Provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.

J. Arrangement of Contents: Organize each volume in parts as follows:
   1. Project Directory.
   2. Table of Contents, of all volumes, and of this volume.
   3. Operation and Maintenance Data: Arranged by system, then by product category.
      a. Source data.
      b. Operation and maintenance data.
      c. Field quality control data.
      d. Photocopies of warranties and bonds.

K. Arrange content by systems under section numbers and sequence of Table of Contents of this Project Manual.
   1. Maintenance instructions for special finishes, including recommended cleaning methods and materials, and special precautions identifying detrimental agents.

3.7 WARRANTIES

A. Obtain warranties and bonds, executed in duplicate by responsible Subcontractors, suppliers, and manufacturers, within 10 days after completion of the applicable item of work. Except for items put into use with Edgemont Union Free School District's permission, leave date of beginning of time of warranty until Date of Substantial completion is determined.

B. Verify that documents are in proper form, contain full information, and are notarized.

C. Co-execute submittals when required.

D. Retain warranties until time specified for submittal.

E. Manual: Bind in commercial quality 8-1/2 by 11 inch three D side ring binders with durable plastic covers.

F. Cover: Identify each binder with typed or printed title WARRANTIES, with title of Project; name, address and telephone number of Contractor and equipment supplier; and name of responsible company principal.

G. Table of Contents: Neatly typed, in the sequence of the Table of Contents of the Project Manual, with each item identified with the number and title of the specification section in which specified, and the name of product or work item.

H. Separate each warranty or bond with index tab sheets keyed to the Table of Contents listing. Provide full information, using separate typed sheets as necessary. List Subcontractor, supplier, and manufacturer, with name, address, and telephone number of responsible principal.

CHECKLIST FOR PROJECT CLOSEOUT AND PROCESSING OF FINAL PAYMENT

SUBMIT CHECKLIST WITH CLOSEOUT DOCUMENTS

Project: High School Building "A" Interior Renovations

Owner: Edgemont School District

Architect Project #: 24529.04

CLOSE-OUT SUBMITTALS: (As Applicable. Include this checklist with submittal)

SUBSTANTIAL COMPLETION

[ ] UL Certification or equivalent.

[ ] Three (3) Ring Binder Brochures of Operation And Maintenance Manuals For All Equipment Installed on The Project including the following:

- [ ] Typed or Printed Instructions Covering The Care And Operations of Equipment And Systems Furnished And Installed.
- [ ] Start-up Performance Reports
- [ ] Test/Balancing Reports.
- [ ] Final Survey
- [ ] Manufacturers Instruction Books, Diagrams, Spare Parts Lists Covering All Equipment.
- [ ] Instruction of Owner's Representative In Care And Maintenance of New Equipment.
- [ ] All Approved Shop Drawings and Submittals.
- [ ] Third Party Inspections Reports.
- [ ] Field Reports Executed by each Prime Contractor.
- [ ] Video Training Sessions.
- [ ] Surveys and survey logs.
- [ ] Certificates of Compliance And Inspection. (Where Applicable Electric, Elevator, Etc.)

[ ] Spare Parts, O&M and Maintenance Materials. (Receipt Signed By Field Superintendent)

[ ] Evidence of Compliance With Requirements Of Governing Authorities (Certificates Of Inspection Electrical).

- [ ] Certificates of Insurance For Products And Completed Operations. .
- [ ] Fully Executed Certificate of Substantial Completion: AIA G704 (Issued by Architect).
- [ ] Construction Manager's Written Two-Year Warranty And Extended Warranties (If Any Required).
- [ ] Manufacturer’s Warranty/Guaranties
- [ ] Manifest for Disposal of Hazardous Material.
- [ ] Manifest for Disposal of Material.
- [ ] Architect's Punch List Items, **including photographs,** certifying all Punch List have been completed with sign-off by Construction Manager and Contractor.
- [ ] Project Record Documents.
- [ ] Approved As-Built Drawings. (Printed Copy and PDF Format with corrections if any)

[ ] **All files listed above shall be submitted on USB flash drive**

_____ Date _____

(Authorized signing officer, Title)

FINAL COMPLETION

[ ] Affidavit of Payment of Debts And Claims: AIA G706.

[ ] Affidavit of Final Release of Liens - AIA G706a for all with Lien Right Against The Owner's Property.

[ ] Notarized Statement That Only Non-Asbestos Materials Were Installed On This Project.

[ ] Consent Of Surety To Final Payment AIA G707.

[ ] Certification of Payment of Prevailing Wage Rates.

[ ] Contractor's Certification of Compliance that products comply with VOC requirements stated in Section 01 6116.

[ ] DOL PW 200 Form.

_____ Date _____

(Authorized signing officer, Title)

Final payment will not be processed until all items indicated are received and approved in accordance with Section 01 7800 - Closeout Submittals by the Construction Manager .

END OF SECTION

SECTION 01 7900
DEMONSTRATION AND TRAINING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Demonstration of products and systems to be commissioned where indicated in specific specification sections.

B. Training of Edgemont Union Free School District personnel in operation and maintenance is required for:
   1. All software-operated systems.
   2. Mechanical systems and equipment.
   3. Plumbing equipment.
   4. Electrical systems and equipment.
   5. Items specified in individual product Sections.

C. Training of Edgemont Union Free School District personnel in care, cleaning, maintenance, and repair is required for:
   1. Items specified in individual product Sections.

1.3 RELATED REQUIREMENTS

A. Section 01 7800 - Closeout Submittals: Operation and maintenance manuals.

B. Section 01 9113 - General Commissioning Requirements: Additional requirements applicable to demonstration and training.

1.4 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures; except:
   1. Make all submittals specified in this section, and elsewhere where indicated for commissioning purposes, directly to the Commissioning Authority.
   2. Make commissioning submittals on time schedule specified by Commissioning Authority.
   3. Submittals indicated as "Draft" are intended for the use of the Commissioning Authority in preparation of overall Training Plan; submit in editable electronic format, Microsoft Word 2003 preferred.

B. Draft Training Plans: Edgemont Union Free School District will designate personnel to be trained; tailor training to needs and skill-level of attendees.
   1. Submit to Consruction Manager for transmittal to .
   2. Submit to Commissioning Authority for review and inclusion in overall training plan.
   3. Submit not less than four weeks prior to start of training.
   4. Revise and resubmit until acceptable.
   5. Provide an overall schedule showing all training sessions.
   6. Include at least the following for each training session:
      a. Identification, date, time, and duration.
      b. Description of products and/or systems to be covered.
      c. Name of firm and person conducting training; include qualifications.
      d. Intended audience, such as job description.
      e. Objectives of training and suggested methods of ensuring adequate training.
      f. Methods to be used, such as classroom lecture, live demonstrations, hands-on, etc.
      g. Media to be used, such a slides, hand-outs, etc.

h. Training equipment required, such as projector, projection screen, etc., to be provided by Contractor.

C. Training Manuals: Provide training manual for each attendee; allow for minimum of four attendees per training session.
1. Include applicable portion of O&M manuals.
2. Include copies of all hand-outs, slides, overheads, video presentations, etc., that are not included in O&M manuals.
3. Provide one extra copy of each training manual to be included with operation and maintenance data.

D. Video Recordings: Submit digital video recording of each demonstration and training session for Edgemont Union Free School District's subsequent use.
1. Format: DVD Disc.
2. Label each disc and container with session identification and date.

1.5 QUALITY ASSURANCE

A. Instructor Qualifications: Familiar with design, operation, maintenance and troubleshooting of the relevant products and systems.
1. Provide as instructors the most qualified trainer of those contractors and/or installers who actually supplied and installed the systems and equipment.
2. Where a single person is not familiar with all aspects, provide specialists with necessary qualifications.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.1 DEMONSTRATION - GENERAL

A. Demonstrations conducted during system start-up do not qualify as demonstrations for the purposes of this section, unless approved in advance by Consruction Manager.

B. Demonstrations conducted during Functional Testing need not be repeated unless Edgemont Union Free School District personnel training is specified.

C. Demonstration may be combined with Edgemont Union Free School District personnel training if applicable.

D. Operating Equipment and Systems: Demonstrate operation in all modes, including start-up, shut-down, seasonal changeover, emergency conditions, and troubleshooting, and maintenance procedures, including scheduled and preventive maintenance.
1. Perform demonstrations not less than two weeks prior to Substantial Completion.
2. For equipment or systems requiring seasonal operation, perform demonstration for other season within six months.

E. Non-Operating Products: Demonstrate cleaning, scheduled and preventive maintenance, and repair procedures.
1. Perform demonstrations not less than two weeks prior to Substantial Completion.

3.2 TRAINING - GENERAL

A. Commissioning Authority will prepare the Training Plan based on draft plans submitted.

B. Conduct training on-site unless otherwise indicated.

C. Construction Manager will provide classroom and seating at no cost to the Contractor.

D. Do not start training until Functional Testing is complete, unless otherwise specified or approved by the Commissioning Authority.

E. Provide training in minimum of two (2) - two hour segments.

F. The Commissioning Authority is responsible for determining that the training was satisfactorily completed and will provide approval forms.

G. Training schedule will be subject to availability of Edgemont Union Free School District's personnel to be trained; re-schedule training sessions as required by Edgemont Union Free School District; once schedule has been approved by Edgemont Union Free School District failure to conduct sessions according to schedule will be cause for Edgemont Union Free School District to charge the Contractor for personnel "show-up" time.

H. Review of Facility Policy on Operation and Maintenance Data: During training discuss:
   1. The location of the O&M manuals and procedures for use and preservation; backup copies.
   2. Typical contents and organization of all manuals, including explanatory information, system narratives, and product specific information.
   3. Typical uses of the O&M manuals.

I. Product- and System-Specific Training:
   1. Review the applicable O&M manuals.
   2. For systems, provide an overview of system operation, design parameters and constraints, and operational strategies.
   3. Review instructions for proper operation in all modes, including start-up, shut-down, seasonal changeover and emergency procedures, and for maintenance, including preventative maintenance.
   4. Provide hands-on training on all operational modes possible and preventive maintenance.
   5. Emphasize safe and proper operating requirements; discuss relevant health and safety issues and emergency procedures.
   6. Discuss common troubleshooting problems and solutions.
   7. Discuss any peculiarities of equipment installation or operation.
   8. Discuss warranties and guarantees, including procedures necessary to avoid voiding coverage.
   9. Review recommended tools and spare parts inventory suggestions of manufacturers.
   10. Review spare parts and tools required to be furnished by the Contractor
   11. Review spare parts suppliers and sources and procurement procedures.

J. Be prepared to answer questions raised by training attendees; if unable to answer during training session, provide written response within five days.

END OF SECTION

SECTION 01 9113
GENERAL COMMISSIONING REQUIREMENTS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Commissioning is intended to achieve the following specific objectives; this section specifies the Contractor's responsibilities for commissioning:
   1. Verify that the work is installed in accordance with Contract Documents and the manufacturer's recommendations and instructions, and that it receives adequate operational checkout prior to startup: Startup reports and Prefunctional Checklists executed by Contractor are utilized to achieve this.
   2. Verify and document that functional performance is in accordance with Contract Documents: Functional Tests executed by Contractor and witnessed by the Commissioning Authority are utilized to achieve this.
   3. Verify that operation and maintenance manuals submitted to Edgemont Union Free School District are complete: Detailed operation and maintenance (O&M) data submittals by Contractor are utilized to achieve this.
   4. Verify that the Edgemont Union Free School District's operating personnel are adequately trained: Formal training conducted by Contractor is utilized to achieve this.

B. Commissioning, including Functional Tests, O&M documentation review, and training, is to occur after startup and initial checkout and be completed before Substantial Completion.

C. The Commissioning Authority directs and coordinates all commissioning activities; this section describes some but not all of the Commissioning Authority's responsibilities.

D. The Commissioning Authority is employed by Edgemont Union Free School District.

1.3 SCOPE OF COMMISSIONING

A. The following are to be commissioned:

B. HVAC System, including:
   1. Major and minor equipment items.
   2. Piping systems and equipment.
   3. Terminal units.
   4. Control system.

C. Electronic Safety and Security:
   1. Fire and smoke alarms.

D. Other equipment and systems explicitly identified elsewhere in Contract Documents as requiring commissioning.

1.4 RELATED REQUIREMENTS

A. Refer to Section 01 2100 - Allowances for commissioning allowance.

B. Section 01 7800 - Closeout Submittals: Scope and procedures for operation and maintenance manuals and project record documents.

1.5 REFERENCE STANDARDS

A. PECI (Samples) - Sample Forms for Prefunctional Checklists and Functional Performance Tests; Current Edition.

1.6 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures; except:

1. Submit one copy to the Commissioning Authority, not to be returned.
2. Make commissioning submittals on time schedule specified by Commissioning Authority.
3. Submittals indicated as "Draft" are intended for the use of the Commissioning Authority in preparation of Prefunctional Checklists or Functional Test requirements; submit in editable electronic format, Microsoft Word 2010 preferred.

B. Product Data: If submittals to Fuller and D'Angelo, P.C. do not include the following, submit copies as soon as possible:
1. Manufacturer's product data, cut sheets, and shop drawings.
2. Manufacturer's installation instructions.
3. Startup, operating, and troubleshooting procedures.
4. Fan and pump curves.
5. Factory test reports.
6. Warranty information, including details of Edgemont Union Free School District's responsibilities in regard to keeping warranties in force.

C. Manufacturers' Instructions: Submit copies of all manufacturer-provided instructions that are shipped with the equipment as soon as the equipment is delivered.

D. Startup Plans and Reports.

E. Completed Prefunctional Checklists.

F. HERS Rating Report: Include the following mandatory completed reports for ENERGY STAR Certified Homes:

PART 2 PRODUCTS

2.1 TEST EQUIPMENT

A. Provide all standard testing equipment required to perform startup and initial checkout and required Functional Testing; unless otherwise noted such testing equipment will NOT become the property of Edgemont Union Free School District.

B. Calibration Tolerances: Provide testing equipment of sufficient quality and accuracy to test and/or measure system performance with the tolerances specified. If not otherwise noted, the following minimum requirements apply:
1. Temperature Sensors and Digital Thermometers: Certified calibration within past year to accuracy of 0.5 degree F and resolution of plus/minus 0.1 degree F.
2. Pressure Sensors: Accuracy of plus/minus 2.0 percent of the value range being measured (not full range of meter), calibrated within the last year.
3. Calibration: According to the manufacturer’s recommended intervals and when dropped or damaged; affix calibration tags or keep certificates readily available for inspection.

C. Equipment-Specific Tools: Where special testing equipment, tools and instruments are specific to a piece of equipment, are only available from the vendor, and are required in order to accomplish startup or Functional Testing, provide such equipment, tools, and instruments as part of the work at no extra cost to Edgemont Union Free School District; such equipment, tools, and instruments are to become the property of Edgemont Union Free School District.

D. Dataloggers: Independent equipment and software for monitoring flows, currents, status, pressures, etc. of equipment.
1. Dataloggers required to for Functional Tests will be provided by the Commissioning Authority and will not become the property of Edgemont Union Free School District.

PART 3 EXECUTION

3.1 COMMISSIONING PLAN

A. Commissioning Authority will prepare the Commissioning Plan.

1. Attend meetings called by the Commissioning Authority for purposes of completing the commissioning plan.
2. Require attendance and participation of relevant subcontractors, installers, suppliers, and manufacturer representatives.

B. Contractor is responsible for compliance with the Commissioning Plan.

C. Commissioning Plan: The commissioning schedule, procedures, and coordination requirements for all parties in the commissioning process.

D. Commissioning Schedule:
1. Submit anticipated dates of startup of each item of equipment and system to Commissioning Authority within 60 days after award of Contract.
2. Re-submit anticipated startup dates monthly, but not less than 4 weeks prior to startup.
3. Prefunctional Checklists and Functional Tests are to be performed in sequence from components, to subsystems, to systems.
4. Provide sufficient notice to Commissioning Authority for delivery of relevant Checklists and Functional Test procedures, to avoid delay.

3.2 STARTUP PLANS AND REPORTS

A. Startup Plans: For each item of equipment and system for which the manufacturer provides a startup plan, submit the plan not less than 8 weeks prior to startup.

B. Startup Reports: For each item of equipment and system for which the manufacturer provides a startup checklist (or startup plan or field checkout sheet), document compliance by submitting the completed startup checklist prior to startup, signed and dated by responsible entity.

C. Submit directly to the Commissioning Authority.

3.3 PREFUNCTIONAL CHECKLISTS

A. A Prefunctional Checklist is required to be filled out for each item of equipment or other assembly specified to be commissioned.
1. No sampling of identical or near-identical items is allowed.
2. These checklists do not replace manufacturers' recommended startup checklists, regardless of apparent redundancy.
3. Prefunctional Checklist forms will not be complete until after award of the contract; the following types of information will be gathered via the completed Checklist forms:
   a. Certification by installing contractor that the unit is properly installed, started up, and operating and ready for Functional Testing.
   b. Confirmation of receipt of each shop drawing and commissioning submittal specified, itemized by unit.
   c. Manufacturer, model number, and relevant capacity information; list information "as specified," "as submitted," and "as installed."
   d. Serial number of installed unit.
   e. List of inspections to be conducted to document proper installation prior to startup and Functional Testing; these will be primarily static inspections and procedures; for equipment and systems may include normal manufacturer’s start-up checklist items and minor testing.
   f. Sensor and actuator calibration information.
4. PECI (Samples) found at http://www.peci.org/library/mcpgs.htm indicate anticipated level of detail for Prefunctional Checklists.

B. Contractor is responsible for filling out Prefunctional Checklists, after completion of installation and before startup; witnessing by the Commissioning Authority is not required unless otherwise specified.
1. Each line item without deficiency is to be witnessed, initialed, and dated by the actual witness; checklists are not complete until all line items are initialed and dated complete without deficiencies.

2. Checklists with incomplete items may be submitted for approval provided the Contractor attests that incomplete items do not preclude the performance of safe and reliable Functional Testing; re-submission of the Checklist is required upon completion of remaining items.
3. Individual Checklists may contain line items that are the responsibility of more than one installer; Contractor shall assign responsibility to appropriate installers or subcontractors, with identification recorded on the form.
4. If any Checklist line item is not relevant, record reasons on the form.
5. Contractor may independently perform startup inspections and/or tests, at Contractor's option.
6. Regardless of these reporting requirements, Contractor is responsible for correct startup and operation.
7. Submit completed Checklists to Commissioning Authority within two days of completion.

C. Commissioning Authority is responsible for furnishing the Prefunctional Checklists to Contractor.
1. Initial Drafts: Contractor is responsible for initial draft of Prefunctional Checklist where so indicated in Contract Documents.
2. Provide all additional information requested by Commissioning Authority to aid in preparation of checklists, such as shop drawing submittals, manufacturers' startup checklists, and O&M data.
3. Commissioning Authority may add any relevant items deemed necessary regardless of whether they are explicitly mentioned in Contract Documents or not.
4. When asked to review the proposed Checklists, do so in a timely manner.

D. Commissioning Authority Witnessing: Required for:
1. Each piece of primary equipment, unless sampling of multiple similar units is allowed by the commissioning plan.
2. A sampling of non-primary equipment, as allowed by the commissioning plan.

E. Deficiencies: Correct deficiencies and re-inspect or re-test, as applicable, at no extra cost to Edgemont Union Free School District.
1. If difficulty in correction would delay progress, report deficiency to the Commissioning Authority immediately.

3.4 FUNCTIONAL TESTS

A. A Functional Test is required for each item of equipment, system, or other assembly specified to be commissioned, unless sampling of multiple identical or near-identical units is allowed by the final test procedures.

B. Contractor is responsible for execution of required Functional Tests, after completion of Prefunctional Checklist and before closeout.

C. Commissioning Authority is responsible for witnessing and reporting results of Functional Tests, including preparation and completion of forms for that purpose.

D. Contractor is responsible for correction of deficiencies and re-testing at no extra cost to Edgemont Union Free School District; if a deficiency is not corrected and re-tested immediately, the Commissioning Authority will document the deficiency and the Contractor's stated intentions regarding correction.
1. Deficiencies are any condition in the installation or function of a component, piece of equipment or system that is not in compliance with Contract Documents or does not perform properly.
2. When the deficiency has been corrected, the Contractor completes the form certifying that the item is ready to be re-tested and returns the form to the Commissioning Authority; the Commissioning Authority will reschedule the test and the Contractor shall re-test.
3. Identical or Near-Identical Items: If 10 percent, or three, whichever is greater, of identical or near-identical items fail to perform due to material or manufacturing defect, all items will be considered defective; provide a proposal for correction within 2 weeks after notification of defect, including provision for testing sample installations prior to replacement of all items.
4. Contractor shall bear the cost of Edgemont Union Free School District and Commissioning Authority personnel time witnessing re-testing.

5. Contractor shall bear the cost of Edgemont Union Free School District and Commissioning Authority personnel time witnessing re-testing if the test failed due to failure to execute the relevant Prefunctional Checklist correctly; if the test failed for reasons that would not have been identified in the Prefunctional Checklist process, Contractor shall bear the cost of the second and subsequent re-tests.

E. Functional Test Procedures:
1. Some test procedures are included in Contract Documents; where Functional Test procedures are not included in Contract Documents, test procedures will be determined by the Commissioning Authority with input by and coordination with Contractor.
2. Examples of Functional Testing:
a. Test the dynamic function and operation of equipment and systems (rather than just components) using manual (direct observation) or monitoring methods under full operation (e.g., the chiller pump is tested interactively with the chiller functions to see if the pump ramps up and down to maintain the differential pressure setpoint).
b. Systems are tested under various modes, such as during low cooling or heating loads, high loads, component failures, unoccupied, varying outside air temperatures, fire alarm, power failure, etc.
c. Systems are run through all the HVAC control system’s sequences of operation and components are verified to be responding as the sequence's state.
d. Traditional air or water test and balancing (TAB) is not Functional Testing; spot checking of TAB by demonstration to the Commissioning Authority is Functional Testing.
3. PECI (Samples) found at http://www.peci.org/library/mcpgs.htm indicated anticipated level of detail for Functional Tests.

F. Deferred Functional Tests: Some tests may need to be performed later, after substantial completion, due to partial occupancy, equipment, seasonal requirements, design or other site conditions; performance of these tests remains the Contractor's responsibility regardless of timing.

3.5 SENSOR AND ACTUATOR CALIBRATION

A. Calibrate all field-installed temperature, relative humidity, carbon monoxide, carbon dioxide, and pressure sensors and gauges, and all actuators (dampers and valves) on this piece of equipment shall be calibrated. Sensors installed in the unit at the factory with calibration certification provided need not be field calibrated.

B. Calibrate using the methods described below; alternate methods may be used, if approved by Commissioning Authority beforehand. See PART 2 for test instrument requirements. Record methods used on the relevant Prefunctional Checklist or other suitable forms, documenting initial, intermediate and final results.

C. All Sensors:
1. Verify that sensor location is appropriate and away from potential causes of erratic operation.
2. Verify that sensors with shielded cable are grounded only at one end.
3. For sensor pairs that are used to determine a temperature or pressure difference, for temperature make sure they are reading within 0.2 degree F of each other, and for pressure, within tolerance equal to 2 percent of the reading, of each other.
4. Tolerances for critical applications may be tighter.

D. Sensors Without Transmitters - Standard Application:
1. Make a reading with a calibrated test instrument within 6 inches of the site sensor.
2. Verify that the sensor reading, via the permanent thermostat, gauge or building automation system, is within the tolerances in the table below of the instrument-measured value.
3. If not, install offset, calibrate or replace sensor.

E. Sensors With Transmitters - Standard Application.
1. Disconnect sensor.

2. Connect a signal generator in place of sensor.
3. Connect ammeter in series between transmitter and building automation system control panel.
4. Using manufacturer's resistance-temperature data, simulate minimum desired temperature.
5. Adjust transmitter potentiometer zero until 4 mA is read by the ammeter.
6. Repeat for the maximum temperature matching 20 mA to the potentiometer span or maximum and verify at the building automation system.
7. Record all values and recalibrate controller as necessary to comply with specified control ramps, reset schedules, proportional relationship, reset relationship and P/I reaction.
8. Reconnect sensor.
9. Make a reading with a calibrated test instrument within 6 inches of the site sensor.
10. Verify that the sensor reading, via the permanent thermostat, gauge or building automation system, is within the tolerances in the table below of the instrument-measured value.
11. If not, replace sensor and repeat.
12. For pressure sensors, perform a similar process with a suitable signal generator.

F. Sensor Tolerances for Standard Applications: Plus/minus the following maximums:
1. Watthour, Voltage, Amperage: 1 percent of design.
2. Pressure, Air, Water, Gas: 3 percent of design.
3. Air Temperatures (Outside Air, Space Air, Duct Air): 0.4 degrees F.
4. Relative Humidity: 4 percent of design.
5. Barometric Pressure: 0.1 inch of Hg.
6. Flow Rate, Air: 10 percent of design.
7. Flow Rate, Water: 4 percent of design.
8. AHU Wet Bulb and Dew Point: 2.0 degrees F.

G. Critical Applications: For some applications more rigorous calibration techniques may be required for selected sensors. Describe any such methods used on an attached sheet.

H. Valve/Damper Stroke Setup and Check:
1. For all valve/damper actuator positions checked, verify the actual position against the control system readout.
2. Set pump/fan to normal operating mode.
3. Command valve/damper closed; visually verify that valve/damper is closed and adjust output zero signal as required.
4. Command valve/damper to open; verify position is full open and adjust output signal as required.
5. Command valve/damper to a few intermediate positions.
6. If actual valve/damper position does not reasonably correspond, replace actuator or add pilot positioner (for pneumatics).

I. Isolation Valve or System Valve Leak Check: For valves not associated with coils.
1. With full pressure in the system, command valve closed.
2. Use an ultra-sonic flow meter to detect flow or leakage.

3.6 TEST PROCEDURES - GENERAL

A. Provide skilled technicians to execute starting of equipment and to execute the Functional Tests. Ensure that they are available and present during the agreed upon schedules and for sufficient duration to complete the necessary tests, adjustments and problem-solving.

B. Provide all necessary materials and system modifications required to produce the flows, pressures, temperatures, and conditions necessary to execute the test according to the specified conditions. At completion of the test, return all affected equipment and systems to their pre-test condition.

C. Sampling: Where Functional Testing of fewer than the total number of multiple identical or near-identical items is explicitly permitted, perform sampling as follows:

1. Identical Units: Defined as units with same application and sequence of operation; only minor size or capacity difference.
2. Sampling is not allowed for:
   a. Major equipment.
   b. Life-safety-critical equipment.
   c. Prefunctional Checklist execution.
3. XX = the percent of the group of identical equipment to be included in each sample; defined for specific type of equipment.
4. YY = the percent of the sample that if failed will require another sample to be tested; defined for specific type of equipment.
5. Randomly test at least XX percent of each group of identical equipment, but not less than three units. This constitutes the "first sample."
6. If YY percent of the units in the first sample fail, test another XX percent of the remaining identical units.
7. If YY percent of the units in the second sample fail, test all remaining identical units.
8. If frequent failures occur, resulting in more troubleshooting than testing, the Commissioning Authority may stop the testing and require Contractor to perform and document a checkout of the remaining units prior to continuing testing.

D. Manual Testing: Use hand-held instruments, immediate control system readouts, or direct observation to verify performance (contrasted to analyzing monitored data taken over time to make the “observation”).

E. Simulating Conditions: Artificially create the necessary condition for the purpose of testing the response of a system; for example apply hot air to a space sensor using a hair dryer to see the response in a VAV box.

F. Simulating Signals: Disconnect the sensor and use a signal generator to send an amperage, resistance or pressure to the transducer and control system to simulate the sensor value.

G. Over-Writing Values: Change the sensor value known to the control system in the control system to see the response of the system; for example, change the outside air temperature value from 50 degrees F to 75 degrees F to verify economizer operation.

H. Indirect Indicators: Remote indicators of a response or condition, such as a reading from a control system screen reporting a damper to be 100 percent closed, are considered indirect indicators.

I. Monitoring: Record parameters (flow, current, status, pressure, etc.) of equipment operation using dataloggers or the trending capabilities of the relevant control systems; where monitoring of specific points is called for in Functional Test Procedures:
   1. All points that are monitored by the relevant control system shall be trended by Contractor; at the Commissioning Authority’s request, Contractor shall trend up to 20 percent more points than specified at no extra charge.
   2. Other points will be monitored by the Commissioning Authority using dataloggers.
   3. At the option of the Commissioning Authority, some control system monitoring may be replaced with datalogger monitoring.
   4. Provide hard copies of monitored data in columnar format with time down left column and at least 5 columns of point values on same page.
   5. Graphical output is desirable and is required for all output if the system can produce it.
   6. Monitoring may be used to augment manual testing.

3.7 OPERATION AND MAINTENANCE MANUALS

A. See Section 01 7800 - Closeout Submittals for additional requirements.

B. Add design intent documentation furnished by Fuller and D'Angelo, P.C. to manuals prior to submission to Edgemont Union Free School District.

C. Submit manuals related to items that were commissioned to Commissioning Authority for review; make changes recommended by Commissioning Authority.

D. Commissioning Authority will add commissioning records to manuals after submission to Edgemont Union Free School District.

END OF SECTION

SECTION 02 8070

ASBESTOS ABATEMENT SUMMARY OF WORK

PART 1 - GENERAL

1.01 WORK COVERED BY CONTRACT DOCUMENTS

A. The Work of this Contract comprises of asbestos abatement located at the Edgemont School District.

B. The work includes the removal and disposal of the following asbestos containing materials:
   1. High School Building A
      a. Countertops
      b. Vibration Cloth
      c. Thermal Insulation
      d. Wall Tile and Mastic
      e. Floor Tile and Mastic
      f. Chalkboard/Tackboard Mastic
   2. Includes Demolition of Chases/Ceilings as necessary to access the Asbestos Containing Materials.
   3. In addition to the asbestos containing materials, there is PCB containing Window Caulk. Refer to Section 02 8401 for PCB remediation.

1.02 CONTRACTS

A. Division of Work
   1. Asbestos Abatement Contractor under General Contractor
      a. Perform the Work required and as specified in the following specification sections and divisions: Divisions 00 through 02.
      b. Perform Work required and indicated on the HM Series drawings.
   2. The above listing of drawings and specifications is intended as a guide and does not relieve the Contractors of the responsibility of reviewing all drawings and specifications for bidding and coordinating with others during the construction period. Review Contract Documents before submitting proposals.

1.03 WORK BY OTHERS

A. Work on the project site which will be executed prior to the start of the Work of this Contract, and which is excluded from this Contract, is as follows:
   1. None

B. Work on the project site which will be executed after completion of the Work of this Contract, and which is excluded from this Contract, is as follows:
   1. Renovations

1.04 DESCRIPTION OF WORK

A. The Work specified herein shall be the removal of asbestos containing materials by competent persons trained, knowledgeable, and qualified in the techniques of abatement, handling, and disposal of asbestos containing and asbestos contaminated materials and the subsequent cleaning of contaminated areas, who comply with all applicable federal, state, and local regulations and are capable of and willing to perform the Work of this Contract.

B. The Contractor shall supply labor, materials, services, insurance, permits, and equipment necessary to carry out the Work in accordance with all applicable federal, state, and local regulations and these specifications.

C. The Contractor is responsible for restoring the Work area and auxiliary areas utilized during the abatement to conditions equal to or better than original. Damage caused during the performance of abatement activities shall be repaired by the Contractor (e.g., paint peeled off by barrier tape, nail holes, water damage, broken glass) at no additional expense to the Owner.

1.05 WORK SEQUENCE

A. Construct Work in stages to accommodate the Owner's use of the premises during the construction period. Coordinate construction schedule with the Engineer.

B. Construct Work in stages to provide for public convenience.

1.06 PARTIAL OWNER OCCUPANCY

A. The Owner will occupy the existing building during the construction period and will maintain normal operations. The Owner will cooperate with the Contractor to facilitate the continuity and the progress of the Work. Cooperate with the Owner by minimizing the disturbance of the Owner's activities in spaces adjacent to the construction Work.

B. Protect the occupants against hazards of the asbestos abatement and other construction operations and provide access to Owner-occupied spaces. If elimination of access to any occupied space becomes necessary, it shall occur only after advance notice and special arrangements with the Owner.

C. Provide necessary barricades, temporary partitions, other separations, and closures to protect the occupants of the building from harm or injury due to the construction operations, to restrict occupancy of construction areas to construction workers, and to prevent dust and debris caused by construction activities from entering Owner-occupied spaces.

1.07 COORDINATION

A. The Contractor shall work with the others at the job site to maintain continuity of Work in accordance with the project schedule. The Contractor must cooperate to the maximum extent with the other Contractors to facilitate the execution of their Work. Timely notice of change in the Contractor's schedule shall be given to the others and to the Engineer so that all operations may be rescheduled or modified as required.

B. In case of conflicts occurring because of failure to abide by the requirements of the above paragraph, the Engineer's decision will be final, and no extra compensation will be awarded for extra work caused by failure to follow the above requirements.

C. The Owner or his representative shall have the right to stop the work immediately if the Contractor does not adhere to the specifications contained herein. Such notice can be verbal or in writing. If a verbal order is given, a written order must follow.

1.08 INTERPRETATION OF DRAWINGS AND SPECIFICATIONS

A. The lists of equipment, tabulations of data measurements, and schedules appearing in the specifications or drawings are included only for the assistance and guidance of the Contractor in arriving at a more complete understanding of the intended installation. They are not intended, or to be construed, as relieving the responsibility of the Contractor in making his own takeoff.

1.09 ABBREVIATIONS AND SYMBOLS

A. Contractor is expected to be familiar with the standard abbreviation symbols used in the Contract Documents. Inform the Engineer, in writing, of any unclear or unknown abbreviation or symbol prior to the Bid Date. Unless notified, the Engineer will assume that the Contractor is fully familiar with all such items and can execute his Work accordingly.

1.10 PROTECTION OF EXISTING BUILDING AND GROUNDS

A. Provide protection to prevent damage to building, both interior and exterior, during construction operations.

B. Repair damage to building and grounds to satisfaction of the Owner.

1.11 PROTECTION OF EQUIPMENT AND MATERIALS

A. Assume full and complete responsibility for protection and safe-keeping of his products and equipment stored at project location.

1.12 PROTECTION OF UTILITIES

A. Provide and maintain adequate protection for existing utilities. Repair such Work damaged during construction to the satisfaction of the Engineer.

1.13 ASBESTOS PROJECT MONITOR

A. Perform work only when the Asbestos Project Monitor is on site unless otherwise instructed in writing by the Engineer.

B. Perform work only during the hours of work established at the Pre-Construction Meeting or as approved in writing by the Engineer at least 24 hours in advance of the change. This will allow the Asbestos Project Monitor to monitor the Work in progress.

NOTE: THE CONTRACTORS ARE HEREBY NOTIFIED THAT IN THE EVENT THE CONTRACTORS, THEIR EMPLOYEES OR SUBCONTRACTORS ENCOUNTER A MATERIAL OR CONDITION WHICH IS UNKNOWN OR WHICH MAY BE SUSPECTED TO CONTAIN ASBESTOS OR OTHER HAZARDOUS MATERIAL, THE CONTRACTOR WILL NOT DISTURB THE MATERIAL, BUT SHALL STOP WORK IN THAT AREA AND NOTIFY THE OWNER IN WRITING IMMEDIATELY OF THE CONDITION OR MATERIAL.

END OF SECTION

SECTION 02 8071

ASBESTOS ABATEMENT REGULATORY REQUIREMENTS

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

A. All Work under this Contract shall be done in strict accordance with all applicable federal, state, and local regulations, standards, and codes governing asbestos abatement and any other trade work done in conjunction with the abatement.

B. The most recent edition of any relevant regulation, standard, document, or code shall be applicable to the Work. Where conflict among the requirements or with these specifications exists, the most stringent requirements are applicable.

C. Copies of all standards, regulations, codes, and other applicable documents and subsequent amendments thereto, listed in this section and including this specification, shall be available at the work site in the clean change area of the worker decontamination system.

PART 2 - SPECIFIC REQUIREMENTS

2.01 OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION (OSHA)

A. OSHA regulations governing asbestos abatement include, but are not limited to:
1. Title 29 CFR 1926.1101, Occupational Exposure to Asbestos Construction Standard.
2. Title 29 CFR 1910.1001, General Industry Standard for Asbestos.
3. Title 29 CFR Section 1910.134, General Industry Standard for Respiratory Protection.
4. Title 29 CFR Section 1910.20, Access to Employee Exposure and Medical Records.
5. Title 29 CFR Section 1910.1200, Hazard Communication.
6. Title 29 CFR Section 1910.145, Specifications for Accident Prevention Signs and Tags.
7. Title 29 CFR Section 1910.95, Noise Regulation.

2.02 ENVIRONMENTAL PROTECTION AGENCY (EPA)

A. EPA regulations governing asbestos abatement include, but are not limited to:
1. Title 40 CFR Part 61, Subparts A and M, National Emission Standard for Asbestos.
2. Title 40 CFR Part 763, Subpart G, Asbestos Abatement Project.
3. Title 40 CFR Part 763, Asbestos Containing Materials in Schools, Final Rule and Notice.

2.03 AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

A. ANSI standards governing asbestos abatement include, but are not limited to:
1. Fundamentals Governing the Design and Operation of Local Exhaust Systems, Publication 29.2-79.
2. Practices for Respiratory Protection, Publication Z88.2-80.

2.04 COMPRESSED GAS ASSOCIATION (CGA)

A. Pamphlet G-7, "Compressed Air for Human Respiration" and Specification G-7.1, "Commodity Specification for Air."

2.05 MINE SAFETY AND HEALTH ADMINISTRATION (MSHA)

A. Certification of respirators as per 30 CFR Part 11.

2.06 NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH (NIOSH)

A. NIOSH regulations governing asbestos abatement include, but are not limited to:
1. A guide to respiratory protection for the asbestos abatement industry.
2. Approval of respirators as per 30 CFR Part 11.
3. Standards for analysis of air samples.

2.07 CANADIAN STANDARD ASSOCIATION

A. Standard Z180.1-1978, "Compressed Breathing Air."

2.08 AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

A. Standard Guide for Visual Inspection of Asbestos Abatement Projects.

2.09 NEW YORK STATE REQUIREMENTS

A. State regulations governing asbestos abatement include, but are not limited to:
   1. New York State Department of Environmental Conservation (NYSDEC), Title 6 NYCRR, Part 360 and 364, The New York State Hazardous Waste Management Regulations.

B. Part 56 of Title 12 of the Official Compilation of Codes, Rules and Regulations.

C. Chapter II: Title 10, Part 73 of the New York Code of Rules and Regulations: Asbestos Safety Program Requirements.

D. New York State Education Department regulations.

2.10 LICENSES

A. Maintain current licenses as required by applicable state or local jurisdictions for the removal, transportation, disposal, or other regulated activity related to the Work of this Contract.

2.11 NEW AND AMENDED REGULATIONS

A. Any and all new or amended federal, state, or local regulations becoming effective during this project and not listed are to be considered as part of this specification.

2.12 NOTICES

A. USEPA: Send written notification in accordance with 40 CFR Part 61.146 to the Regional Asbestos Contact responsible for the enforcement of the National Emission Standard for Asbestos at least ten (10) days prior to the commencement of any on-site project activity. Send notification to the following address:

Region 2

Asbestos NESHAPS Contact

Air and Waste Management Division

USEPA

26 Federal Plaza

New York, New York 10007

B. NYS Department of Labor: Send written notification in accordance with Part 56 of Title 12 to the Asbestos Control Bureau of the NYS Department of Labor's Division of Safety and Health. Use forms provided by the Department of Labor.

END OF SECTION

SECTION 02 8073

ASBESTOS ABATEMENT SUBMITTALS

PART 1 - GENERAL

1.01 DESCRIPTION

A. Related Requirements Specified Elsewhere
   1. Testing Laboratory Services: Section 02 8074

B. Schedule submittals to be presented at the pre-construction meeting. Indicate items where additional time is needed and on what dates they will be submitted. The dates indicated for each submittal shall consider the lead time required for ordering and fabricating the various items.

1.02 SUBMISSION REQUIREMENTS

A. Pre-contract Submittals. Within three days after the bids are opened, the three apparent low bidders shall be required to submit the following documentation:
   1. Resume: Shall include the following:
      a. Contractor license issued by New York State Department of Labor.
      b. The number of years engaged in asbestos removal.
      c. An outline of the worker training course and medical surveillance program conducted by the contractor.
      d. A standard operating procedures manual describing work practices and procedures, equipment, type of decontamination facilities, respirator program, special removal techniques, etc.
   2. Citations/Violations/Legal Proceedings
      a. Submit a notarized statement describing any citations, violations, criminal charges, or legal proceedings undertaken or issued by any law enforcement, regulatory agency, or consultant concerning performance on previous abatement contracts. Briefly describe the circumstances citing the project and involved persons and agencies as well as the outcome of any actions.
      b. Answer the question: "Has your firm or its agents been issued a Stop Work Order on any project within the last two years?" If "Yes", provide details as discussed above.
      c. Answer the question: "Are you now, or have you been in the past, a party to any litigation or arbitration arising out of your performance on asbestos abatement contracts?" If "Yes", provide details as discussed above.
      d. Describe any liquidated damages assessed within the last two years.
   3. Preliminary Schedule
      a. Provide an estimate of manpower to be utilized, and the time required for completion of each major work area. Include the size and number of crews and work shifts.

B. Prior to Commencement of Work, Owner will:
   1. Submit to the Contractor results of pre-abatement air sampling (if conducted) including location of samples, names of the Air Sampling Professional, equipment utilized, and method of analysis.
   2. Document that Owner's employees who will be required to enter the work area during abatement have received training equal to that detailed in Section 02 8080.

C. Prior to Commencement of Work, Contractor shall:
   1. NYS Department of Labor: Provide Owner with a copy of the notice to the Asbestos Control Program of the NYS Labor Department's Division of Safety and Health as per Part 56 of Title 12.
   2. NYSDEC: Submit to the Owner a copy of the annual "Industrial Waste Hauler Permit" specifically for asbestos-containing materials required pursuant to 6 NYCRR364. Submit certification that the proposed waste disposal site meets the requirements of 40 CFR 61.156 and any pertinent local and state regulations. Provide Owner with a copy of the notice to the Asbestos Enforcement Division of the NYSDEC.

3. Submit documentation satisfactory to the Owner that the Contractor's employees, including Superintendent, Foremen, Supervisors, and other company personnel or agents, who may be exposed to airborne asbestos fibers or who may be responsible for any aspects of abatement activities, have received adequate training. A copy of their Asbestos Handling Certificates will be provided. Foremen and Supervisors shall, at a minimum, meet the training requirements of a competent person as defined in 29 CFR 1926.1101.
4. Submit to the Owner shop drawings for layout and construction of decontamination enclosure systems and barriers for isolation of the work area as detailed in Section 028081 of this specification and required by applicable regulations.
5. With the Owner, inspect the premises wherein all abatement and abatement related activities will occur and prepare a statement signed by both agreeing on building and fixture conditions prior to the commencement of work.
6. Submit manufacturer's certification that HEPA vacuums, negative pressure ventilation units, and other local exhaust ventilation equipment conform to ANSI Z9.2-79.
7. When rental equipment is to be used in abatement areas or to transport asbestos-contaminated waste, a written notification concerning intended use of the rental equipment must be provided to the rental agency with a copy submitted to the Owner.
8. Provide a copy of the respiratory program required in 29 CFR 1910.134 (b), (d), (e), and (f). Include manufacturer certification of HEPA filtration capabilities for all cartridges and filters.
9. Submit a copy of the firm's asbestos handling license.
10. Submit the name, address, contact person and the ELAP approval number for the laboratory utilized for the analysis of the Contractor's OSHA monitoring.
11. Progress Schedule:
    a. Show the complete sequence of construction by activity and the sequencing of work within each building or section of the work.
    b. Show the dates for the beginning and completion of each major element of work including substantial completion dates for each work area, building, or phase.
    c. Show projected percentage of completion for each item, as of the first day of each month.
    d. Show final inspection dates.
12. Abatement Work Plan: Provide plans which clearly indicate all work areas (numbered sequentially) including the locations and types of all decontamination chambers, entrances and exits to the work area, type of abatement activity/technique, number and location of negative air units and exhaust including calculations, and the proposed location and construction of storage facilities and field office.
13. Worker Training and Medical Surveillance: The Contractor shall submit a list of the persons who will be employed by him and his subcontractors in the removal work. Present evidence that workers have received proper training required by the regulations and the medical examinations required by OSHA 29 CFR 1926.1101.
14. Logs: Specimen copies of daily progress log, visitor's log, and disposal log.
15. Material List: A complete materials list of all items proposed to be furnished and used under this contract.
16. Subcontractors List: The prime contractor shall submit a list of all subcontractors to be used on the project.
17. Material Safety Data Sheets (MSDS): Submit copies of MSDS for each chemical or material used for the project (encapsulant, surfactant, mastic remover, etc.)
18. Project Supervisor: Submit the resume of the proposed Project Supervisor.
19. Worker's Acknowledgments: Submit statements signed by each employee that the employee has received training in the proper handling of asbestos containing materials; understands the health implications and risks involved; and understands the use and limitations of the respiratory equipment to be used.

D. During abatement activities, Contractor shall:

1. Submit copies of all transport manifests, trip tickets, and disposal receipts for all asbestos waste materials removed from the work area during the abatement process. The documentation must show the entire chain of custody from the time the asbestos is removed.
2. The Contractor will maintain worksite entry logbooks with information on worker and visitor access. The Asbestos Handling Certificates for all workers will be kept at the entrance to the work site or the certificates will be checked upon each entry by the Contractor. Copies will be provided to the Owner, Engineer, and Contractor.
3. Submit logs documenting filter changes on respirators, HEPA vacuums, negative pressure ventilation units, and other engineering controls.
4. Submit results of bulk material analysis and air sampling data collected during the abatement including OSHA compliance air monitoring results.
5. Submit results of materials testing conducted during the abatement for purposes of utilization during abatement activities (e.g., testing of encapsulant for depth of penetration and testing of substitute materials for adherence to encapsulated surfaces).
6. Post in the clean room area of the worker decontamination enclosure a list containing the names, addresses, and telephone numbers of the Contractor, the Owner, the Engineer, the Asbestos Project Monitor, the General Superintendent, the Air Sampling Professional, the testing laboratory, the police department, the fire department, and any other personnel who may be required to assist during abatement activities (e.g., Safety Officer, Building Maintenance Supervisor, and Energy Conservation Officer).

E. Project Closeout Submissions:
1. Submit copies of all waste disposal manifests, seals, and disposal logs.
2. Submit OSHA compliance air monitoring records conducted during the work.
3. Submit copies of the daily progress log.
4. Submit copies of the Visitor's log.
5. Submit Certificate of Visual Inspection.
6. Submit copies of any required Employee Statements such as Medical Examination Statement, Certificate of Worker's Release, or Employee Training Statement.

END OF SECTION

SECTION 02 8073.01
SUBMITTAL COVER SHEET

1.01 EISENBACH & RUHNKE ENGINEERING, P.C.
FOUR OXFORD CROSSING, SUITE 104, NEW HARTFORD, NY 13413 PHONE: 315-735-1916
EMAIL: LKINNE@ERENGPC.COM and ACORRELL@ERENGPC.COM

1.02 NAME OF PROJECT: EDGEMONT SCHOOL DISTRICT
E&R PROJECT NUMBER: 14-22-01 CLIENT'S PROJECT NUMBER: _____

1.03 CONTRACTOR/SUBCONTRACTOR:_____

DATE OF SUBMITTAL:_____

SUBMITTAL TITLE: _____

SHOP DRAWING TITLE:_____

SUBMITTAL NUMBER: _____ REVISION NUMBER: _____ DATE:_____

PRODUCT DATA, TESTS, SCHEDULES: _____

SAMPLES: _____

MANUFACTURER: _____

SPECIFICATION SECTION(S):_____

CONTRACT DRAWING(S):_____

ENGINEER'S STAMP:	**COMMENTS:**
____NO EXCEPTION TAKEN ____REJECTED **____MAKE CORRECTIONS NOTED ____REVISE AND RESUBMIT** **____SUBMIT SPECIFIED ITEM** **CHECKING IS ONLY FOR GENERAL CONFORMANCE WITH THE DESIGN CONCEPT OF THE PROJECT AND GENERAL COMPLIANCE WITH THE INFORMATION GIVEN IN THE CONTRACT DOCUMENTS. NOTATIONS ARE SUBJECT TO THE REQUIREMENTS OF THE PLANS AND SPECIFICATIONS. THE CONTRACTOR IS RESPONSIBLE FOR DIMENSIONS WHICH SHALL BE CONFIRMED AND CORRELATED AT THE JOB SITE: FABRICATION PROCESSES AND TECHNIQUES OF CONSTRUCTION, COORDINATION OF THE WORK WITH THAT OF ALL OTHER TRADES AND THE SATISFACTORY PERFORMANCE OF THE WORK.** **EISENBACH & RUHNKE ENGINEERING, PC** **DATE:_____ BY: _____**	

END OF SECTION

SECTION 02 8074

ASBESTOS ABATEMENT TESTING LABORATORY SERVICES QUALITY CONTROL

PART 1 - GENERAL

1.01 DESCRIPTION

A. Related Requirements Specified Elsewhere
   1. Asbestos Abatement Submittals: Section 02 8073
   2. Personnel Protection: Section 02 8080
   3. The Owner will obtain the services of a Project Monitor and analysis laboratory to constantly monitor airborne concentrations of asbestos throughout the course of the abatement project.
   4. Laboratory services, obtained by the Owner for bulk sampling, area air sampling, and clearance sampling, are to ensure that Contract provisions are met.
      a. Results of Owner-procured tests will be made available to the Contractor. This act shall not be construed as relieving the Contractor of his obligations to provide materials and workmanship in accordance with pertinent regulations.
   5. Laboratory services obtained by the Contractor for personnel sampling shall comply with all pertinent regulations.
      a. Forward copies of test results to the Owner as indicated in Section 02 8073.
   6. The air sampling to be done will be in accordance with an air sampling plan to be prepared by the Project Monitor and this specification. The plan will be approved by the Owner.

1.02 QUALITY ASSURANCE

A. Pre-Work Airborne Fiber Counts
   1. The Owner will monitor the baseline fiber counts or those prevalent in the area before work begins using the NIOSH 7400 analytical procedure.

B. Work Area Airborne Fiber Counts
   1. The Owner will monitor airborne fiber counts in the work area during the progress of the work through reviewing the personnel monitoring done by the contractor. The purpose of this air sampling will be to detect airborne fiber counts which may significantly challenge the ability of the work area isolation procedures to protect the balance of the building or outside of the building from contamination by airborne fibers.

C. Work Area Clearance
   1. To determine if the elevated airborne fiber counts encountered during abatement operations have been reduced to an acceptable level, the Owner will sample and analyze air as per this Section using either Phase Contrast Microscopy (PCM) and/or Transmission Electron Microscopy (TEM).

D. The Owner will be conducting air sampling throughout the course of the project.

E. Fibers Counted
   1. PCM: "Airborne Fibers" referred to above include all fibers regardless of composition as counted in the NIOSH 7400 procedure.
   2. TEM: "Airborne Fibers" referred to above and to be analyzed using the method defined in 40 CFR Part 763.

F. The laboratory utilized for analyzing air samples shall be satisfactory participants in the AIHA Proficiency Analytical Testing (PAT) program for asbestos analysis and shall be NYSDOH (New York State Department of Health) ELAP accredited.

G. Laboratories used for bulk material identification shall be satisfactory participants in the EPA quality assurance program for bulk asbestos analysis and shall be NYSDOH ELAP accredited.

H. The Project Monitor shall have a current Project Monitor certificate.

PART 2 - PRODUCTS - NOT APPLICABLE

PART 3 - EXECUTION

3.01 TESTING LABORATORY SERVICES

A. The Owner will obtain air and bulk sampling laboratory services by separate Contract. The laboratory will be independent of the abatement contractor.

B. Personal Air Monitoring
   1. In addition to the requirements of OSHA 1926.1101, the contractor shall be required to perform personal air monitoring every work shift, in each work area, during which abatement activities occur, in order to determine that appropriate respiratory protection is being utilized.
   2. Results of the air monitoring shall be returned to the site, at least verbally, and posted no later than 24 hours following the time the sample was collected. Written results shall be returned to the site and posted no more than five days after the monitoring was performed.
   3. Personal air samples shall be analyzed by a laboratory which holds certification by the New York State Department of Health's Environmental Laboratory Approval Program. The asbestos consultant must approve the laboratory the contractor intends to use.

3.02 RESPONSIBILITIES AND DUTIES OF CONTRACTOR

A. To facilitate testing services, the Contractor shall:
   1. Furnish to the laboratory such samples of materials as may be necessary for testing purposes.
   2. Advise the testing agency sufficiently in advance of operations to allow for completion of tests and for the assignment of personnel.
   3. Ensure the cooperation of the employees and superintendent with the Project Monitor.

3.03 ANALYTICAL METHODS

A. The following methods may be used by the testing laboratory in analyzing filters used to collect air samples:
   1. Cellulose ester filters will be analyzed using the NIOSH 7400 Method accounting rules.

3.04 SAMPLE VOLUMES

A. General: The number and volume of air samples taken by the Owner will be in accordance with the following schedule. Sample volumes given may vary depending upon the analytical method used.

B. Before the Start of Work
   1. The Owner will secure the following air samples to establish a base line before the start of work.

LOCATION SAMPLED	MINIMUM NUMBER OF SAMPLES	FILTER MEDIA	DETECTION LIMIT (FIBERS/C.C.)	MINIMUM VOLUME (LITERS)	RATE LPM
EACH WORK AREA	5	CELLULOSE ESTER	0.01	1500	2-10
OUTSIDE EACH WORK AREA	5	CELLULOSE ESTER	0.01	1500	2-10
OUTSIDE BUILDING	2	CELLULOSE ESTER	0.01	1500	2-10
AT JOB SITE	2	CELLULOSE ESTER	0.01	0	0

A. Base line is an action level by sample location and expressed in fibers per cubic centimeter which is the largest of the following:

1. Actual fiber concentration of the samples collected on cellulose ester filters for each work area.
2. 0.01 fibers per cubic centimeter.

B. Daily During Preparation

LOCATION SAMPLED	MINIMUM NUMBER OF SAMPLES	FILTER MEDIA	DETECTION LIMIT (FIBERS/C.C.)	MINIMUM VOLUME (LITERS)	RATE LPM
EACH WORK AREA	5	CELLULOSE ESTER	0.01	1500	2-10
OUTSIDE EACH WORK AREA	5	CELLULOSE ESTER	0.01	1500	2-10
OUTSIDE BUILDING	2	CELLULOSE ESTER	0.01	1500	2-10
AT JOB SITE	2	CELLULOSE ESTER	0.01	0	0

A. Daily During Abatement
1. From the start of work building temporary enclosures until ready for clearance air monitoring, the laboratory will take the following samples on a daily basis.

LOCATION SAMPLED	MINIMUM NUMBER OF SAMPLES	FILTER MEDIA	DETECTION LIMIT (FIBERS/C.C.)	MINIMUM VOLUME (LITERS)	RATE LPM
OUTSIDE EACH WORK AREA *	4	CELLULOSE ESTER	0.01	1500	2-10
OUTSIDE BUILDING	1	CELLULOSE ESTER	0.01	1500	2-10
OUTPUT NEGATIVE PRESSURE SYSTEM		CELLULOSE ESTER	0.01	1500	2-10
AT JOB SITE		CELLULOSE ESTER	0.01	0	0

*** TWO (2) SAMPLES OUTSIDE THE WORK AREA BUT WITHIN TEN (10) FEET OF ISOLATION BARRIERS. TWO (2) SAMPLES AT LOCATION WITHIN TEN (10) FEET OF AND WITHIN THE ACTUAL ENVIRONMENT OF THE ENTRANCE EXIT OF THE PERSONNEL AND WASTE DECONTAMINATION ENCLOSURES.**

A. If airborne fiber counts exceed allowed limits additional samples will be taken as necessary to monitor fiber levels.

B. Clearance Air Monitoring
1. Air sample locations shall be the same as the locations of the samples collected before the start of work.
2. All air samples will be taken using aggressive sampling techniques as follows:

a. There are no standards available for flow rate of leaf blowers or large fans. However, this information is not critical to the success of the procedure.
b. Before sampling pumps are started, the exhaust from forced air equipment (leaf blower with at least 1 horsepower electric motor) will be swept against all walls, ceilings, floors, ledges and other surfaces in the room. This procedure will be continued for five minutes per 1,000 cubic feet of floor.
c. One 20 inch diameter fan per 10,000 cubic feet of room volume will be mounted in a central location at approximately 2 meters above floor, directed toward ceiling, and operated at low speed for the entire period of sample collection.
d. Air samples will be collected in areas subject to normal air circulation away from room corners, obstructed locations, and sites near windows, door, or vents.
e. After air sampling pumps have been shut off, fans will be shut off.

3. Schedule of Air Samples
   a. General: The number and volume of air samples taken and analytical methods used by the Owner will be in accordance with the following schedule. Sample volumes given may vary depending upon the analytical instruments used.
4. Phase/Contrast Microscopy
   a. In each homogeneous work area after completion of all cleaning work, a minimum of 13 samples will be taken and analyzed as follows:

LOCATION SAMPLED	MINIMUM NUMBER OF SAMPLES	FILTER MEDIA	DETECTION LIMIT (FIBERS/C.C.)	MINIMUM VOLUME (LITERS)	RATE LPM
Each Work Area	5	CELLULOSE ESTER	0.01	1500	2-10
Outside Work Area	5	CELLULOSE ESTER	0.01	1500	2-10
At Job Site	2	CELLULOSE ESTER	0.01	0	0
At Laboratory	1	CELLULOSE ESTER	0.01	0	0

a. Analysis: Fibers on each filter will be measured using the NIOSH 7400 procedure accounting rules.
b. Split Sample: One work area sample will be split and both halves analyzed separately for duplicate analysis.
c. Satisfactory Clearance Air Monitoring Results: PCM clearance air monitoring is considered to be satisfactory only when every sample is <.01 f/cc unless otherwise directed by the Engineer.

3.05 LABORATORY TESTING

A. Phase Contrast Microscopy
   1. The services of a testing laboratory will be employed by the Owner to perform laboratory analysis of the air samples. Samples will be sent daily by overnight mail so that verbal reports on air samples can be obtained within 24 hours. A complete record, certified by the testing laboratory, of all air monitoring tests and results, will be furnished to the Owner's Representative, the Owner, and the Contractor.
      a. Written reports of all monitoring tests will be posted at the job site on a daily basis.

2. The personnel monitoring done by the Contractor will be conducted in accordance with the standards outline in sub-paragraph 1 above.

3.06 ADDITIONAL TESTING

A. The Contractor may conduct his own air monitoring and laboratory testing. If he elects to do this, the cost shall be included in the Contract sum.

B. If it is necessary to resample work areas for clearance testing because the area does not meet the release criteria, the Abatement Contractor will bear all costs for this additional sampling.

C. If the Contractor does not adhere to the schedule and the Owner incurs additional air monitoring costs as a result, the additional costs will be paid by the Contractor. This will not apply if the project is delayed because of an Owner caused delay.

3.07 DATA SUBMITTAL

A. The Project Monitor will submit all clearance air monitoring data to the NYSDOL in accordance with Industrial Code Rule 56.

END OF SECTION

SECTION 02 8075

ASBESTOS ABATEMENT TEMPORARY FACILITIES

PART 1 - GENERAL

1.01 DESCRIPTION

A. The Contractor shall:
   1. Provide temporary facilities throughout the construction period, unless otherwise indicated.

PART 2 - FACILITIES

2.01 TEMPORARY SANITARY FACILITIES

A. Provide and maintain sanitary facilities for all personnel on the project.
   1. The number of sanitary facilities required shall be based on the total number of workmen employed on the project and shall be in accordance with the provisions of the applicable codes.

B. Maintain in a sanitary and clean condition at all times.

2.02 TEMPORARY WATER

A. The Owner will provide water.
   1. Contractor is to provide and maintain temporary connections to the designated outlet for construction water. Provide and maintain hoses, piping, and valves as required for obtaining construction water.
   2. Provide and maintain temporary connections to the designated outlet for cold shower water in the decontamination unit. Provide and maintain a hot water heater of sufficient capacity to provide hot water for showers for all workers.
   3. Provide anti-siphon prevention valves on each connection to Owner's outlet.

B. All care must be exercised in the use of water furnished by the Owner.

2.03 FIRE PROTECTION

A. Provide and maintain portable fire extinguishers on each floor level and building area. Number to conform to applicable codes.

B. Fire Extinguishers: Multipurpose (ABC) dry chemicals both inside and outside the work area.

C. UL labeled.

2.04 STORAGE

A. Storage space is limited and will be permitted in areas designated by the Engineer.

2.05 TEMPORARY POWER

A. Electrical service will be provided by the Owner at no cost.

B. Contractor shall be responsible for extending the service to provide lighting and power required to complete the Work of this Contract.

C. Comply with the National Electrical Code, OSHA requirements, and applicable local codes and utility regulations.

D. Maintain continuous service and provide safe working conditions.

E. Do not overload circuits. Verify capacity of circuit prior to use.

F. Provide ground fault protection for all temporary power sources.

G. Temporary power and lighting cords will be elevated to keep them away from water on the floor and damage from foot traffic and scaffolds.

2.06 PHONE

A. Supervisor must have a cellular phone at the job site.

PART 3 - EXECUTION

3.01 GENERAL

A. Install temporary facilities in accordance with applicable codes.

B. Maintain temporary facilities throughout the construction period.

C. Remove temporary facilities when they are no longer required or when directed by the Engineer.

D. Repair damage to the project site caused by the installation of temporary facilities.

END OF SECTION

SECTION 02 8078

ASBESTOS ABATEMENT SITE SECURITY

PART 1 - GENERAL

1.01 DESCRIPTION

A. Related Requirements Specified Elsewhere
   1. Submittals: Section 02 8073

B. The Contractor shall provide all controls required to comply with all pertinent regulations and the Contract Documents including, but not limited to, those described in this section.

PART 2 - CONTROLS

2.01 SITE SECURITY

A. The Work area is to be restricted to authorized, trained, and protected personnel. These may include the Contractor's employees, employees of subcontractors, Owner employees and representatives, state and local inspectors, and any other designated individuals. A list of authorized personnel shall be established prior to job start and posted in the clean room of the worker decontamination facility.

B. Entry into the Work area by unauthorized individuals shall be reported immediately to the Owner by the Contractor.

C. A logbook shall be maintained by the Contractor in the clean room area of the worker decontamination system. Anyone who enters the Work area must record name, affiliation, time in, and time out for each entry. The asbestos handlers shall show their certification card or have a copy on file at the entrance upon their first entry of the day.

D. Access to the Work area shall be through a single worker decontamination system. All other means of access (doors, windows, hallways, etc.) shall be blocked or locked so as to prevent entry to or exit from the Work area. The only exceptions for this rule are the waste pass-out air-lock which shall be sealed except during the removal of containerized asbestos waste from the Work area, and emergency exits in case of fire or accident. Emergency exits shall not be locked from the inside; however, they shall be sealed with polyethylene sheeting and tape until needed.

E. The Project Monitor should have control of site security during abatement operations whenever possible, in order to protect Work efforts and equipment.

F. Contractor will have Owner's assistance in notifying building occupants of impending activity and enforcement of restricted access by Owner's employees.

G. If the decontamination chamber or the waste pass-out chamber is located outside the building, provide a security guard 24 hours a day and a fence around the site.

END OF SECTION

SECTION 02 8079

ASBESTOS ABATEMENT EMERGENCY PLANNING

PART 1 - GENERAL

1.01 DESCRIPTION

A. Related Requirements Specified Elsewhere
   1. Submittals: Section 02 8073

B. The Contractor shall prepare an emergency preparedness plan detailing at least the information required in this section and in any pertinent federal, state, or local regulations.

PART 2 - DETAILS OF PLAN

2.01 EMERGENCY PLANNING

A. Emergency planning shall be developed prior to abatement initiation and agreed to by Contractor and Owner.

B. Emergency procedures shall be in written form and prominently posted in the clean change area and equipment room of the worker decontamination area. Everyone, prior to entering the work area, must read and sign these procedures to acknowledge receipt and understanding of work site layout, location of emergency exits, and emergency procedures.

C. Emergency planning shall include written notification of police, fire and emergency medical personnel of planned abatement activities, work schedule and layout of work area, particularly barriers that may affect response capabilities.

D. Emergency planning shall include considerations of fire, power failure, explosion, toxic atmospheres, electrical hazards, slips, trips and falls, confined spaces, and heat related injury. Written procedures shall be developed and employee training in procedures shall be provided.

E. Employees shall be trained in evacuation procedures in the event of workplace emergencies.
   1. For Non-Life-Threatening Situations: Employees injured or otherwise incapacitated shall decontaminate following normal procedures with assistance from fellow workers, if necessary, before exiting the workplace to obtain proper medical treatment.
   2. For Life-Threatening Injury or Illness: Worker decontamination shall take least priority. After measures to stabilize the injured worker, remove him from the workplace and secure proper medical treatment.

F. Telephone numbers of all emergency response personnel shall be prominently posted in the clean change area and equipment room, along with the location of the nearest telephone.

END OF SECTION

SECTION 02 8080

ASBESTOS ABATEMENT PERSONNEL PROTECTION

PART 1 - GENERAL

1.01 DESCRIPTION

A. Related Requirements Specified Elsewhere
   1. Regulatory Requirements: Section 02 8071
   2. Testing Laboratory Services: Section 02 8074

B. Description of Work
   1. This section describes the equipment and procedures required for workers and authorized visitor protection against asbestos contamination and other hazards.

1.02 SUBMITTALS

A. Asbestos Handling Certificate
   1. Each worker will have a current asbestos handling certificate issued by the NYS Department of Labor. Copies will be submitted to the Engineer.

B. Product Data
   1. Submit manufacturer's product data for all components of respiratory systems proposed to be utilized.

C. Operations and Maintenance (O&M)
   1. Submit O&M manuals for respiratory systems.
   2. Submit the name and qualifications of the individual assigned to monitor the supply air respiratory system.

D. Respiratory Protection Program
   1. Provide the respiratory protection program detailed herein.

PART 2 - EQUIPMENT

2.01 RESPIRATORY PROTECTION EQUIPMENT

A. Respirators shall be provided that have been tested and approved by NIOSH MSHA under 30 CFR Part 11 for use in asbestos-contaminated atmospheres and bear the approval labels and TC numbers. The respirator chosen by the Contractor must ensure that the workers are not exposed to asbestos concentrations above the PEL, 0.1 f/cc, 8-hour TWA. The rules in 29 CFR 1926.1101 (h) shall govern the respirator selection.

B. Spectacle kits and eyeglasses must be provided for employees who wear glasses and who must wear full-faced respirators.

C. The nature of the encapsulant may affect the requirements for respiratory protection. Vapors that may be given off during encapsulant application must be taken into account when selecting respirators, if types other than air supplied are used.

D. The minimum level of respiratory protection allowable for all plaster and fireproofing work areas during gross removal will be PAPRs.

2.02 PROTECTIVE CLOTHING

A. Full body disposable protective clothing, including head, body, and foot coverings (unless using footwear as described below) consisting of material impenetrable by asbestos fibers (TyvekR or equivalent) shall be provided to all workers and authorized visitors in sizes adequate to accommodate movement without tearing. Provide a sufficient number for all required changes, for all workers in the work area.

B. Additional safety equipment (e.g., hard hats meeting the requirements of ANSI Standard Z89.1-1981, eye protection meeting the requirements of ANSI Standard Z87.1-1979, safety shoes meeting the requirements of ANSI Standard Z41.1-1967, disposable PVC gloves or other work gloves), as necessary, shall be provided to all workers and authorized visitors.

C. Nonskid footwear shall be provided to all abatement workers. Disposable clothing shall be adequately sealed to the footwear to prevent body contamination.

PART 3 - EXECUTION

3.01 TRAINING

A. All workers will have current Asbestos Handling Certificates issued by the New York State Commissioner of Labor.

B. Supervisory personnel shall be competent people, as defined in 29 CFR 1926.1101 (b), and shall receive training as required in 29 CFR 1926.1101 and have a current Supervisor Certificate issued by the New York State Commissioner of Labor.

3.02 RESPIRATORY PROTECTION

A. All respiratory protection shall be provided to workers in accordance with the submitted written respiratory protection program, which includes all items in OSHA 29 CFR 1910.134 (b), (d), (e), and (f). This program shall be posted in the clean room of the worker decontamination enclosure system.

B. Workers shall be provided with personally issued, individually identified (marked with waterproof designations) respirators.

C. Respirators shall be selected that meet the following level of protection requirements: The workers will not be exposed to in excess of 0.1 f/cc, 8-hour TWA.

D. When air tests show the level of asbestos exceeds 0.1 f/cc, the permissible exposure level, the Contractor will begin respiratory protection and personnel monitoring. At a minimum, half-face air purifying respirators will be worn during all preparation and cleaning operations.

E. During all removal operations, except glovebag removal, the minimum level of protection required is the powered air purifying respirator. During glovebag removal the minimum level of protection required is a half face negative pressure air purifying respirator.

F. Fit Testing
   1. Workers must perform positive and negative air pressure fit tests each time a respirator is put on, whenever the respirator design permits. Powered air-purifying respirators shall be tested for adequate flow as specified by the manufacturer.
   2. Workers shall be given a qualitative fit test in accordance with procedures detailed in the OSHA Regulation (29 CFR 1926.1101, Appendix C, Qualitative and Quantitative Fit Testing Procedures) for all respirators to be used on this abatement project. The irritant fume protocol will be utilized. An appropriately administered quantitative fit test may be substituted for the qualitative fit test.

G. No one wearing a beard or other facial hair shall be permitted to don a respirator and enter the work area.

H. Additional respirators (minimum of two of each type) and training on their donning and use must be available at the work site for authorized visitors who may be required to enter the work area.

3.03 PROTECTIVE CLOTHING

A. Disposable clothing including head, foot, and full body protection shall be provided in sufficient quantities and adequate sizes for all workers and authorized visitors.

B. Hard hats, protective eyewear, gloves, rubber boots, and/or other footwear shall be provided as required for workers and authorized visitors. Safety shoes may be required for some activities.

C. Protective clothing shall not be worn outside the work area in lieu of street clothing.

3.04 MEDICAL SURVEILLANCE

A. Medical surveillance must be provided by the Contractor to any employee or agent that may be exposed to asbestos in excess of background levels during any phase of the abatement project. The surveillance program shall be in accordance with 29 CFR 1926.1101.

B. Employees shall be given an opportunity to be evaluated by a physician to determine their capability to work safely while breathing through the added resistance of a respirator.

C. Copies of the Medical Surveillance Documentation for each employee must be submitted.

END OF SECTION

SECTION 02 8084

ASBESTOS ABATEMENT MAINTENANCE OF RECORDS

PART 1 - GENERAL

1.01 DESCRIPTION

A. The Contractor shall maintain the records required in Title 29 CFR 1926.1101 (n) and Part 56 of Title 12 of the Official Compilation of Codes, Rules and Regulations of the State of New York.

B. The Contractor shall provide the Owner and Engineer with 3 bound hard copies and 1electronic copy of all records.

C. Related Requirements Specified Elsewhere
   1. Submittals: Section 02 8073

END OF SECTION

SECTION 02 8086

ASBESTOS ABATEMENT WASTE DISPOSAL PROCEDURES

PART 1 - GENERAL

1.01 DESCRIPTION

A. As the work progresses, to prevent exceeding available storage capacity on site, sealed and labeled containers of asbestos-containing waste shall be removed and transported to the pre-arranged disposal location.

B. All containers of asbestos-containing waste shall be labeled with the name of the waste generator and the location at which the waste was generated.

C. Disposal of all regulated asbestos-containing material must occur at an authorized site in accordance with regulatory requirements of NESHAP 40 CFR 61.156, NYSDEC 6NYCRR364, and local guidelines and regulations.

D. All dump receipts; trip tickets, transportation manifests, or other documentation of disposal shall be delivered to the Owner for his records.

1. A record keeping format utilizing a chain of custody form which includes the names and addresses of the Generator (Owner), Contractor, pickup site, disposal site, the estimated quantity of the asbestos waste, and the type of containers used.
2. The form should be signed by the Generator, the Contractor, the truck drivers, and the disposal site operator, as the responsibility for the material changes hands.
3. If a separate hauler is employed, his name, address, telephone number, and signature should also appear on the form.

PART 2 - PRODUCTS - NOT APPLICABLE

PART 3 - EXECUTION

3.01 TRANSPORTATION TO THE LANDFILL - (REGULATED ASBESTOS CONTAINING MATERIAL)

A. Once drums, bags, and wrapped components have been removed from the work area, they shall be loaded into an enclosed, hardbody, lockable truck for transportation.

B. When moving containers, utilize hand trucks, carts, and proper lifting techniques to avoid back injuries. Trucks with lift gates are helpful for raising drums during truck loading.

C. The enclosed cargo area of the truck shall be free of debris and lined with 2 layers of 6 mil polyethylene sheeting to prevent contamination from leaking or spilled containers. Floor sheeting shall be installed first and extend up the sidewalls. Ceiling and wall sheeting shall be overlapped and taped into place.

D. Drums shall be placed on level surfaces in the cargo area and packed tightly together to prevent shifting and tipping. Large structural components shall be secured to prevent shifting and have bags placed on top. Do not throw containers into truck cargo area.

E. Personnel loading asbestos-containing waste shall be protected by disposable clothing including head, body, and foot protection, and at a minimum, half-face piece, air-purifying, dual cartridge respirators equipped with high efficiency filters.

F. Any debris or residue observed on containers or surfaces outside of the work area resulting from clean-up or disposal activities shall be immediately cleaned up using HEPA filtered vacuum equipment and/or wet methods as appropriate.

G. Large metal dumpsters are sometimes used for asbestos waste disposal. These should have doors or tops that can be closed and locked to prevent vandalism or other disturbance of the bagged asbestos debris and wind dispersion of asbestos fibers. Unbagged material shall not be placed in these containers, nor shall they be used for non-asbestos waste. Bags shall be placed, not thrown, into these containers to avoid splitting.

H. The waste hauler shall provide a copy of his "Industrial Waste Hauler Permit" specifically for asbestos-containing material required pursuant to NYSDEC regulation 6 NYCRR364.

3.02 DISPOSAL AT THE LANDFILL - (REGULATED ASBESTOS CONTAINING MATERIAL)

A. Upon reaching the landfill, trucks are to approach the dump location as closely as possible for unloading of the asbestos-containing waste.

B. Bags, drums, and components shall be inspected as they are off-loaded at the disposal site. Material in damaged containers shall be repacked in empty drums or bags as necessary. (Local requirements may not allow the disposal of asbestos waste in drums. Check with appropriate agency and institute appropriate alternative procedures.)

C. Waste containers shall be placed on the ground at the disposal site, not pushed or thrown out of trucks (weight of wet material could rupture containers).

D. Personnel off-loading containers at the disposal site shall wear protective equipment consisting of disposable head, body, and foot protection and, at a minimum, half-face piece, air-purifying, dual cartridge respirators equipped with high efficiency filters.

E. Following the removal of all containerized waste, the truck cargo area shall be decontaminated using HEPA vacuums and/or wet methods to meet the no-visible residue criteria. Polyethylene sheeting shall be removed and discarded along with contaminated cleaning materials and protective clothing, in bags or drums at the disposal site.

F. If landfill personnel have not been provided with personal protective equipment for the compaction operation by the land-fill operator, Contractor shall supply protective clothing and respiratory protection for the duration of this operation.

END OF SECTION

SECTION 02 8087

ASBESTOS ABATEMENT RESTORING THE WORK AREA AND SYSTEMS

PART 1 - GENERAL

1.01 DESCRIPTION

A. Related Requirements Specified Elsewhere
   1. Cleaning Up: Section 02 8090

B. Restoring of the work area to pre-abatement condition shall only occur following the completion of clean-up procedures and after clearance air monitoring has been performed and documented to the satisfaction of the Owner.

PART 2 - PRODUCTS - NOT APPLICABLE

PART 3 - EXECUTION

3.01 REESTABLISHMENT PROCEDURES

A. The Contractor and Owner shall visually inspect the work area for any remaining visible residue. Evidence of contamination will necessitate additional cleaning.

B. Additional air monitoring shall be performed if additional clean-up is necessary.

C. Following satisfactory clearance of the work area, remaining polyethylene barriers may be removed and disposed of as asbestos-contaminated waste.

D. At the discretion of the Owner, mandatory requirements for personal protective equipment may be waived following the removal of all barriers.

E. Re-secure mounted objects removed from their former positions during area preparation activities.

F. Relocate objects that were removed to temporary locations back to their original positions.

G. Repair areas of damage that occurred as a result of abatement activities and as indicated.

END OF SECTION

SECTION 02 8090

ASBESTOS ABATEMENT CLEANING UP

PART 1 - GENERAL

1.01 DESCRIPTION

A. Related Requirements Specified Elsewhere
   1. Regulatory Requirements: Section 02 8071
   2. Restoring the Work Area and Systems: Section 02 8087
   3. Cleaning for Specific Products or Work: The respective sections of the specifications.

B. Maintain premises and public properties free from accumulations of waste, debris, and rubbish caused by operations.

C. At completion of Work, remove waste materials, rubbish, tools, equipment, machinery, and surplus materials, and clean all sight-exposed surfaces; leave project clean and ready for occupancy.

1.02 SAFETY REQUIREMENTS

A. Standards: Maintain project in accordance with safety and insurance standards and the specifications contained herein.

B. Hazards Control
   1. Remove asbestos waste from premises daily.
   2. Prevent accumulation of waste which creates hazardous conditions.
   3. Provide adequate ventilation.

C. Conduct cleaning and disposal operations to comply with federal, state, and local ordinances.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Use only cleaning materials recommended by manufacturer of surface to be cleaned.

B. Use cleaning materials only on surfaces recommended by cleaning material manufacturers.

PART 3 - EXECUTION

3.01 DURING CONSTRUCTION

A. Clean the Worker Decontamination Unit at least once each shift.

B. Clean the area near the Waste Decontamination Unit and the Worker Decontamination Unit at least once each shift.

3.02 FINAL CLEANING

A. Employ experienced workmen or professional cleaners for final cleaning.

B. In preparation for substantial completion or occupancy, conduct final inspection of sight-exposed interior and exterior surfaces, and of concealed spaces.

C. Remove grease, dust, dirt, stains, labels, fingerprints, and other foreign materials from sight-exposed interior and exterior finished surfaces; polish surfaces so designated to shine finish.

D. Repair, patch, and touch up marred surfaces to specified finish, to match adjacent surfaces.

E. Broom clean paved surfaces; rake clean other surfaces of grounds.

F. Maintain cleaning until project, or portion thereof, is occupied by Owner.

END OF SECTION

SECTION 02 8401
PCB REMEDIATION - SEALANTS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this section.

1.02 DESCRIPTION

A. This section describes the procedures and requirements to be followed by the Contractor for removal and disposal of building sealants (including caulking and glazings) which contain Polychlorinated Biphenyls (PCB's) classified as PCB Bulk Product Waste, and procedures for PCB decontaminating and encapsulation of building surfaces that were in contact with the sealants at levels of 50ppm or more. PCB containing sealants require special handling during removal to prevent worker and building occupant exposures.

B. The worker training and disposal procedures are determined by the PCB concentration in the sealants. Sealants that contain 50 parts per million (ppm) or more are classified by the USEPA as a PCB Bulk Product Waste, and by NYSDEC as regulated hazardous waste. Handling these materials require worker training, managing and disposal as such (Refer to Part 3.01, B - for details). Sealants that contain levels less than 50 parts per million (ppm) but more than 1 ppm are unregulated by the USEPA and are classified as a non-hazardous, regulated solid waste in New York. These materials and require worker training, managing and disposal as such (see Part 3.01, A for details).

C. A summary report of PCB testing is attached to this Section.

1.03 WORKER TRAINING

A. All persons performing removal or handling of PCB containing materials shall be trained at a minimum on the health hazards of PCBs, symptoms of exposure, medical surveillance, work methods and engineering controls to prevent workplace exposure and release into the environment, use of personal protective equipment, waste handling, disposal requirements, and hazardous communications.

B. All persons performing removal or handling of PCB containing materials with concentrations of 50 parts per million (ppm) or greater shall be performed by persons trained and in accordance with O.S.H.A. Hazardous Waste Operations, as determined by O.S.H.A. 1910.120.

C. All persons performing removal or handling of PCB containing materials with concentrations less than 50 ppm, but more than 1 ppm shall be performed by persons trained and in accordance with O.S.H.A. 8 – hour awareness training including, at a minimum, the topics listed in Section 1.04, A.

1.04 O.S.H.A. EXPOSURE MONITORING

A. During removal or handling of PCB containing materials, worker airborne exposure shall be monitored by the Contractor. This monitoring shall be done in accordance with Occupational Safety and Health Administration personal/occupational exposure monitoring requirements. Results of monitoring shall be submitted to the Engineer.

1.05 PERSONAL PROTECTIVE EQUIPMENT (P.P.E.)

A. During removal or handling of PCB containing materials, and products used in the process, workers shall wear suitable skin, hand, eye and respiratory protection. At a minimum, gloves and skin protection for chemical resistance, and P100 rating half face respiratory protection shall be worn. P.P.E. shall be modified as necessary based on exposure monitoring and hazards present. The specifics of the required P.P.E. shall be defined by the Contractors O.S.H.A. health and safety program. Any P.P.E. proposed that does not meet the minimum requirements specified must be approved in writing by the Engineer.

1.06 REGULATORY REQUIREMENTS

A. In addition to the requirements outlined in this specification, the Contractor shall comply with the U.S. Toxic Substance Control Act (TSCA), U.S. Environmental Protection Agency 40 CFR Part 761, New York State Department of Environmental Conservation 6NYCRR 370 -376, and Federal Occupational Safety and Health Administration (O.S.H.A.) 29CFR 1926 & 1910 and all other relevant federal, state and local regulations.

PART 2 – PRODUCTS

2.01 EQUIPMENT

A. Special Clothing (PPE): Work clothes shall consist of personal protective equipment (PPE) as required by 29CFR1926.28 and Subpart E; 29 CFR 1910.132-138; including, but not limited to, the following:
   1. Disposable coveralls.
   2. Gloves (Disposable rubber gloves may be worn under these).
   3. Disposable foot covers (polyethylene).
   4. Chemical safety goggles.
   5. Half mask cartridge respirator.

B. Special Clothing for Owner's Personnel Required to Enter Control Areas: Provide PPE same as specified for workers.

C. Caution Signs: Comply with 29CFR 1926.200-203 & 29 CFR 1910.145.
   1. Provide signs at approaches to Control Areas.
   2. Locate signs at such a distance that personnel may read the sign and take the necessary precautions before entering the control area.

D. CAPSUR® PCB Extraction System, manufactured by Integrated Chemicals, Inc. (ph. 651-426-3224), or equal.
   1. Model T Jr. Foamer- Decontamination Foam Cleaning System.
   2. Air Compressor 80 PSI @ 8CFM minimum.
   3. Compressed Air Line: Air supply hose with a connection for an industrial 1/4" interchange quick disconnect nipple.
   4. Industrial Wet Vacuum, HEPA exhaust equipped:
      a. > 100 cfm with shielded (spark proof) motor, grounded at plug.
   5. Water Supply:
      a. Used for dilution of product and rinsing between applications.

E. Use scrubbers and absorbent pads that are not dissolved by the solvents or cleaners used, and that do not shred, crumble, or leave visible fragments on the surface.

PART 3 – EXECUTION

3.01 WORK AREA PREPARATION, SEALANT REMOVAL, SURFACE TREATMENT, CLEANUP AND ENCAPSULATION FOR WORK AREAS WHERE PCB SEALANT CONCENTRATIONS ARE GREATER THAN OR EQUAL TO 50 PPM

A. Work Area Preparation- Isolate Controlled Area by physical boundaries to prevent unauthorized entry of personnel (Barrier Tape); do not permit food, drink, or smoking materials in areas where toxic substances are handled or stored. Precautions shall be taken to contain the sealants during removal and prevent the sealant from being released into the environment. A drop cloth shall be placed below the work area and shall extend five feet out from the work area and additional 5 feet in every direction for every story above the 1st floor (20 ft maximum), or as determined necessary. Any caulking/sealant identified in the soil adjacent to the building will be the Contractors responsibility to remove from the soil and dispose of properly. The interior of the windows shall be covered and sealed with one layer of six millimeter, fire-retardant plastic to prevent migration of dust into the building.

B. Sealant Removal - Precautions shall be taken to contain the caulking during removal. The sealant shall be scraped using manual methods. No visible emissions will be allowed. Dust must be kept to a minimum and wetting or misting of the sealants may be required to control dust. No electric grinders or brushes shall be utilized. Any proposed electric equipment to be used in the removal must be approved by the Engineer and at a minimum be equipped with dust shroud, and vacuum containing a HEPA Filter. The Contractor will propose to the Engineer the methods to be used to contain all dust. If methods produce visible dust, then an isolation enclosure ("tent") shall be required. Any contamination resulting from the removal process shall be the contractor's responsibility to remediate the impacted areas to EPA standards for high occupancy use areas. All sealants shall be removed from the building substrate completely and substrate shall be decontaminated per Section 3.01, (C). Building materials removed that contain PCB sealants, or were in direct contact with sealants, shall be disposed of with the PCBs sealants. Any removed building components (i.e., metal, or wood frames and sashes, or other materials), that were in direct contact with the sealants and are to be recycled or reused, must be cleaned free of PCBs sealants

and residuals. Cleaning includes removing any residuals and verifying cleanup as clean per 40CFR 760 if to be recycled. Reuse or recycling requires Owner/Engineer approval. Note: testing of the building surface that shall remain and is to be encapsulated is not required.

C. Building Surface Decontamination – This applies to all areas where PCBs are being removed with concentrations over 50ppm: After removal of all sealants from surfaces are complete, the Contractor shall vacuum all surfaces within five feet of work area using a HEPA vacuum starting from the highest point down, to ground level. The work area where PCB concentrations were over 50ppm must then be treated with CAPSUR® PCB Extraction System, manufactured by Integrated Chemicals, Inc.(ph. 651-426-3224), or equal. The CAPSUR shall be applied to the areas in of the building that are remaining and that were in direct contact with the PCB sealants. The application method shall be per manufacture's recommendations (i.e. applying in liquid form using a chemical sprayer or foam form using foam applicator). After allowable extraction time, the CAPSUR shall then be removed from the surfaces using a wet vacuum that is equipped with a HEPA filtration. The surfaces must then be rinsed with clean water by applying water and removed using wet vacuum that is equipped with a HEPA filtration. The rinse process shall be repeated three times. The Contractor must provide a written procedure for application, removal and rinsing procedures to the Engineer for approval prior to start of work.

1. A surface decontamination and wash procedure test will need to be performed on an area identified by the Engineer to determine impact on surface discoloring. These tests must be done prior to completing work and shall be witnessed by architect and signed off on. If a contractor proceeds to wash/decontaminate without performing the test and receiving the sign off from the Engineer, then the contractor takes the responsibility and costs of any discoloration and repairs that may be needed to correct the problem.

D. Work Area Cleanup – After the PCB surface decontamination is complete in the areas of sealant containing 50 ppm or greater, the plastic on the exterior shall be cleaned free of any residual debris and wiped cleaned prior to removal. Inside the building, the plastic barrier shall be removed and the surfaces within the work area shall be HEPA vacuumed and wiped from highest point down to the ground using disposable wipes (Sentinel 805 Envirowash distributed by SECI 800-543-4592 or equal). Note: the interior plastic may need to be left in place to protect the interior of the building when the new window blocking and/ or receivers are installed, non-asbestos project only. This is to be coordinated with window contractor. All work areas shall be cleared based on a visual inspection by the Contractor and a representative of Owner. Inspection results shall be included in the Contractors daily log. Inspection shall pass when no visible residue of sealant or residual dust is present.

E. Surface Encapsulation - Upon completion of the cleanup procedure and visual inspection, the surfaces that were in direct contact with sealants containing PCBs at levels greater that 50ppm shall be encapsulated by a two layer, two color barrier system or enclosed per Section 3.01,F (note: enclosures locations shall be specified on drawings). If no enclosure is specified than the encapsulation methods shall be used. The encapsulation barrier shall consist of Sikagard 62 ® High-build, protective, solvent-free colored epoxy coating (10-mil thick), or equal. The areas to be encapsulated shall be the areas in direct contact with the sealants and extending out to the edge of the rough openings. The details and extent of application shall be coordinated with the Engineer/Architect. The two-layer coating system is for the purpose to identify wear on the outer layer. The colors of the coating shall be submitted to the Architect for approval prior to application. The product shall be applied in accordance with the manufacture's recommendations and Engineers approval.

F. Asbestos and PCB containing Sealants – Where sealants contain both PCBs and asbestos, follow the asbestos abatement procedures for work area prep, removal and clean up. The Contractor shall also follow Part 3.01, Section A, B, C, D, and E of this specification section.

3.02 WORK AREA PREPARATION, SEALANT REMOVAL AND CLEANUP FOR WORK AREAS WHERE PCB SEALANT CONCENTRATIONS ARE LESS THAN 50 PPM

A. Work Area Preparation- Isolate Control Area by physical boundaries to prevent unauthorized entry of personnel (Barrier Tape); do not permit food, drink, or smoking materials in areas where toxic substances are handled or stored. Precautions shall be taken to contain the sealants during removal and prevent the sealant from being released into the environment. A drop cloth shall be placed below the work area and shall extend five feet out (minimum) from the work area and an additional 5 feet in every direction for every story above the 1st floor, or as determined necessary. Any caulking/sealant identified in the soil adjacent to the building will be the Contractors responsibility to remove from the soil and dispose of

properly. The interior of the windows shall be covered and sealed with one layer of six-millimeter, fire-retardant plastic to prevent migration of dust into the building.

B. Removal - Precautions shall be taken to contain the caulking during removal. The sealant shall be scraped using manual methods. No visible emissions will be allowed. Dust must be kept to a minimum and wetting or misting of the sealants may be required to control dust. No electric grinders or brushes shall be utilized. Any proposed electric equipment to be used in the removal must be approved by the Engineer and at a minimum be equipped with dust shroud, and vacuum containing a HEPA Filter. The Contractor will propose to the Engineer the methods to be used to contain all dust. All sealants shall be removed from the substrate completely. Any metal or other materials that were in direct contact with the sealant must be cleaned free of PCBs sealants and residuals.

C. Work Area Cleanup – After removals are complete, the Contractor shall vacuum all surfaces within five feet of work area using a HEPA vacuum starting from the highest point down, to ground level. The work area must then be wiped from highest point down to the ground using disposable wipes (Sentinel 805 Envirowash distributed by SECI 800-543-4592 or equal). Inside the building, the plastic barrier shall be removed and the surfaces within the work area shall be HEPA vacuumed and wiped from highest point down to floor level. Note: the interior plastic may need to be left in place to protect interior of the building when the new window blocking and/or receivers are installed, non-asbestos project only. This is to be coordinated with window contractor, see Section 3.03). All work areas shall be cleared based on a visual inspection by the Contractor and a representative of Owner. Inspection results shall be included in the Contractors daily log. Inspection shall pass when no visible residue of sealant or residual dust is present.

D. Asbestos and PCB containing Sealants – Where sealants contain both PCBs and asbestos, follow the asbestos abatement procedures for work area prep, removal and clean up. The Contractor will also follow Part 3.02, Sections A, B and C of this specification section.

3.03 HYGIENE FACILITIES

A. The Contractor must provide and ensure that workers use washing facilities.

B. Washing facilities shall be provided for employees. Such facilities shall be in near proximity to the work site and provided with water, soap, and clean towels to enable employees to remove contamination from their skin.

C. Washing facilities must include Change Areas equipped with storage street clothes and separate area with facilities for removal and storage of contaminated protective work clothing and equipment. Change Areas are to be used for taking off street clothes, suiting up in clean working clothes (protective Clothing), donning respirators prior to beginning work, and dressing in street clothes after work. No contaminated items should enter this clean area.

D. Work clothing must not be worn away from the job site. Under no circumstances should contaminated work clothes be laundered at home or taken from the work site, except to be laundered professionally or properly disposed of following applicable regulations.

E. Showers shall be provided when there is potential for extensive contamination of employees' skin, hair and protective clothing. Shower facilities must be provided if feasible so that exposed employees can was lead from their skin and hair prior to leaving the work site. Where showers are provided, employees must change out of their work clothes sand shower before changing into their street clothes and leaving site.

PART 4 – DISPOSAL

4.01 DISPOSAL

A. PCB levels 50 ppm or greater - All PCB containing caulking and sealants shall be removed, containerized and disposed of as a TOSCA "PCB Bulk Product Waste" and in New York as a RCRA Regulated Hazardous, TOXIC-PCB containing waste. All waste shall be placed in Department of Transportation (DOT) approved waste containers and labeled "Hazardous Waste -TOXIC PCB Containing". In addition, the following information shall be placed on the container: Date container was filled; Generator/Owner name and address; DOT Shipping Name (i.e. Hazardous Waste Solid N.O.S."); EPA ID number of generator if applicable, waste code B001, and the manifest number the container is shipped under. Storage of this waste must be in a secured area and labeled "Hazardous Waste Storage"

B. PCBs levels Less than <50 ppm. - All PCB containing caulking and sealants shall be removed, containerized and disposed of as non-hazardous PCB regulated waste. All waste shall be placed in appropriate containers and labeled as "PCB Containing Waste". All waste shall be manifested with a Non-Hazardous, Regulated Waste Manifest and disposed of at a Landfill permitted to accept PCB containing wastes.

C. PCB and Asbestos Containing: When the sealants are PCB and asbestos containing, the waste must be managed for both waste streams, including labeling, manifesting, transportation and disposal.

D. Building Debris with PCB sealants removed: Building materials removed that contain PCB sealants, or were in direct contact with sealants, shall be disposed of with the PCBs sealants. Any removed building components (i.e., metal, or wood frames and sashes, or other materials), that were in direct contact with the sealants and are to be recycled or reused, must be cleaned free of PCBs sealants and residuals. Cleaning includes removing any residuals and verifying cleanup as clean per 40CFR 760 if to be recycled. Reuse or recycling requires Owner/Engineer approval. Note: testing of the building surface that shall remain and is to be encapsulated is not required.

4.02 PART 5 – SUBMITTALS

4.03 SUBMITTALS

A. Prior to Commencement of Work:
1. The Contractor shall submit a list of the persons who will be employed by him and his subcontractors in the removal work. Present evidence that workers have received proper training required by the regulations and the medical examinations required by OSHA 29 CFR 1910.134.
2. Project Supervisor: Submit the resume of the proposed Project Supervisor.
3. Submit copy of Health and Safety program.
4. Submit Material Safety Data Sheets (MSDS) for all chemical and products to be used.
5. Submit copies of waste hauler and disposal facility permits.
6. Submit copy of Non-hazardous Regulated Waste Manifest and Regulated Hazardous Waste Manifests to be used.
7. Submit information on waste containers to be used for Hazardous and non-hazardous wastes.
8. Submit copies of labels to be used on both non-hazardous and hazardous waste containers.
9. Submit written plan for application, removal and cleanup procedures for CAPSUR PCB Decontamination process.
10. Submit color choices and application procedures for Sikagard 62 ® High-build, protective, solvent-free colored epoxy coating (10-mils thick) encapsulant.

B. During abatement activities, Contractor shall:
1. Submit copies of all waste manifests for all waste materials removed from the site.
2. The Contractor will maintain worksite logbooks with information on the work being completed, number of workers, dates, amounts, quantities, sub-contractors, inspections results and waste shipments.
3. Submit results of bulk material analysis, waste sample classification and OSHA compliance air monitoring results.
4. Submit Landfill letter of authorization accepting waste.

C. Project Closeout Submissions:
1. Submit copies of all waste disposal manifests and a copy certificate of disposal for each hazardous waste container.
2. Submit OSHA compliance air monitoring records conducted during the work.
3. Submit copies of waste classification testing.
4. Submit copies of contactors daily logs.

END OF SECTION

SECTION 03 3000
CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SECTION INCLUDES

A. Concrete formwork.

B. Floors and slabs on grade.

C. Concrete foundation walls and footings.

D. Concrete reinforcement.

E. Joint devices associated with concrete work.

F. Miscellaneous concrete elements, including equipment pads.

G. Concrete curing.

H. Ramps.

I. Finishes.

J. Mix design.

K. Vapor Retarder.

L. Concrete materials.

M. Placement procedure.

N. Field Quality Control.

1.3 RELATED REQUIREMENTS

A. Section 01 4533 - Code-Required Special Inspections and Procedures.

B. Section 05 5213 - Pipe and Tube Railings.

C. Section 31 2316 - Excavation for drainage fill under slab-on grade, stairs, and ramps.

D. Section 32 1313 - Concrete Paving and Curbs.

1.4 Reference Standards

A. ACI 211.1 - Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete; 1991 (Reapproved 2009).

B. ACI PRC-211.1 - Selecting Proportions for Normal-Density and High Density-Concrete - Guide; 2022.

C. ACI 301 - Specifications for Structural Concrete; 2016.

D. ACI 302.1R - Guide to Concrete Floor and Slab Construction; 2015.

E. ACI 303 "Guide to Cast-in-Place Architectural Concrete Practice."

F. ACI 304R - Guide for Measuring, Mixing, Transporting, and Placing Concrete; 2000 (Reapproved 2009).

G. ACI 305R - Guide to Hot Weather Concreting; 2010.

H. ACI 306R - Guide to Cold Weather Concreting; 2016.

I. ACI 308R - Guide to External Curing of Concrete; 2016.

J. ACI 318 - Building Code Requirements for Structural Concrete and Commentary; 2014 (Errata 2018).

K. ASTM A185/A185M - Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete; 2007.

L. ASTM A775/A775M - Standard Specification for Epoxy-Coated Steel Reinforcing Bars; 2017.

M. ASTM A884/A884M - Standard Specification for Epoxy-Coated Steel Wire and Welded Wire Reinforcement; 2014.

N. ASTM C33/C33M - Standard Specification for Concrete Aggregates; 2016, with Editorial Revision (2016).

O. ASTM C39/C39M - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens; 2018.

P. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete; 2018.

Q. ASTM C150/C150M - Standard Specification for Portland Cement; 2018.

R. ASTM C171 - Standard Specification for Sheet Materials for Curing Concrete; 2016.

S. ASTM C173/C173M - Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method; 2016.

T. ASTM C260/C260M - Standard Specification for Air-Entraining Admixtures for Concrete; 2010a (Reapproved 2016).

U. ASTM C494/C494M - Standard Specification for Chemical Admixtures for Concrete; 2017.

V. ASTM C618 - Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete; 2015.

W. ASTM C881/C881M - Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete; 2015.

X. ASTM C1240 - Standard Specification for Silica Fume Used in Cementitious Mixtures; 2015.

Y. ASTM D1751 - Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types); 2018.

Z. ASTM D3963/D3963M - Standard Specification for Fabrication and Jobsite Handling of Epoxy-Coated Steel Reinforcing Bars; 2015.

AA. CRSI Manual of Standard Practice.

1.5 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Submit manufacturers' data on manufactured products showing compliance with specified requirements and installation instructions for each product indicated.

C. Steel Reinforcement Shop Drawings: Placing drawings that detail fabrication, bending, and placement. Include bar sizes, lengths, material, grade, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, splices and laps, mechanical connections, tie spacing, hoop spacing, and supports for concrete reinforcement.
   1. Include foundation plans and elevations.
   2. Indicate all penetrations and sleeve location and reinforcing.
   3. Identify areas of exposed surfaces and finish.

D. Mix Design: Submit proposed concrete mix design with NY State PE seal and signature.
   1. Indicate proposed mix design complies with requirements of ACI 301, Section 4 - Concrete Mixtures.
   2. Indicate proposed mix design complies with requirements of ACI 318, Chapter 5 - Concrete Quality, Mixing and Placing.
   3. Indicate amounts of mixing water to be withheld for later addition at Project site.

E. Samples: Submit samples of underslab vapor retarder to be used.

F. Test Reports: Submit report for each test or series of tests specified.

G. Manufacturer's Installation Instructions: For concrete accessories, indicate installation procedures and interface required with adjacent construction.

H. Qualification Data: For installer and concrete supplier.

I. Material Test Reports: For the following, from a qualified testing agency, indicating compliance with requirements:
   1. Material Certificates: For each of the following, signed by manufacturers:
      a. Cementitious materials.
      b. Admixtures.
      c. Form materials and form-release agents.
      d. Steel reinforcement and accessories.
      e. Curing compounds.
      f. Bonding agents.
      g. Joint-filler strips.

J. Project Record Documents: Accurately record actual locations of embedded utilities and components that will be concealed from view upon completion of concrete work.

1.6 QUALITY ASSURANCE

A. Perform work of this section in accordance with ACI 301 and ACI 318.

B. Follow recommendations of ACI 305R when concreting during hot weather.

C. Follow recommendations of ACI 306R when concreting during cold weather.

D. Manufacturer/Supplier Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.

E. Installer Qualifications: The work of this section shall be performed by a qualified installer, with a minimum of five (5) years experience, approved by the Owner's Representative. The term “installer” used herein, shall mean a firm of established reputation which is regularly engaged in and which maintains a regular force of workmen skilled in the installation of the type of work specified in this section.

F. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from one source, and obtain admixtures through one source from a single manufacturer.

G. Concrete Testing Service: Refer to Section 01 4000 - Quality Requirements.

H. Preinstallation Conference: Conduct conference at Project site to comply with requirements.-
   1. Require representatives of each entity directly concerned with cast-in-place concrete to attend, including the following:
      a. Contractor's superintendent.
      b. Independent testing agency responsible for concrete design mixtures.
      c. Concrete subcontractor.

I. Delivery Records: Each delivery to the site of concrete shall be accompanied by weigh master's certification. Retain all copies for inspection by the Testing Agency.
   1. Indicate water added to mix a job site on each delivery ticket. Show quantity of water added. Site water tempered mixes exceeding specified slump range will be rejected as not complying with specification requirements

1.7 WARRANTY

A. See Section 01 7800 - Closeout Submittals..

1.8 DELIVERY, STORAGE, AND HANDLING

A. Store materials so as to preserve their quality and fitness for work.

B. Store reinforcement and formwork in manner to prevent bending, damage (including damage to coatings), and accumulation of dirt.

C. All packed materials shall be delivered to the site in original unopened containers, clearly indicating manufacturer's name, brand name, and other identifying information.

1.9 PROJECT CONDITIONS

A. Coordinate with the work of all other sections and/or separate contracts.

PART 2 PRODUCTS

2.1 FORM WORK

A. Form Materials: Contractor's choice of standard products with sufficient strength to withstand hydrostatic head without distortion in excess of permitted tolerances.
   1. Form Facing for Exposed Finish Concrete: Plywood, metal, metal-framed/plywood faced, or other acceptable panel-type materials, to provide continuous, straight, smooth, exposed surfaces. Furnish in largest practicable sizes to minimize number of joints and to conform to joint system shown in drawings. .
      a. Material:
         a) Plywood materials shall be one of the following:
            (a) Overlaid plywood complying with U.S. Product Standards PS 1 "A-C or B-B High Density Overlaid (HDO) Concrete Form," Class 1, exterior grade or better.
            (b) Plywood complying with U.S. Product Standard PS 1 "B-B (Concrete Form) Plywood," Class 1, exterior grade or better, mill-oiled and edge-sealed, with each piece bearing legible inspection trademark.
   2. Forms for Unexposed Finish Concrete: Plywood, lumber, metal, or other acceptable material. Provide lumber dressed on at least two edges and one side for tight fit.
   3. Form Coating: Release agent that will not adversely affect concrete or interfere with application of coatings, maximum VOC of 450 g/l that will not bond with, stain, or adversely affect concrete surfaces or impair subsequent treatments of concrete surfaces requiring bond or adhesion or impede wetting of surfaces to be cured with water or curing compound.
      a. Formulate form release agent with rust inhibiter for steel form-facing materials
   4. Form Ties: Factory-fabricated, adjustable-length, removable or snap-off, metal form ties, designed to prevent form deflection and spalling concrete upon removal. Provide units that will leave no metal closer than 1 inch to exposed surface.
      a. Provide ties that will leave holes no larger than 1-inch diameter in concrete surface when removed.
      b. Provide galvanized or stainless-steel ties for concrete elements that are reinforced with epoxy-coated or galvanized reinforcing.
      c. Internal wood spreaders are prohibited

B. Chamfer Strips: Wood, metal, PVC, or rubber strips, 3/4 by 3/4 inch, minimum.

2.2 REINFORCEMENT MATERIALS

A. Reinforcing Steel: ASTM A615/A615M, Grade 60 (60,000 psi).
   1. Finish: Epoxy coated in accordance with ASTM A775/A775M, unless otherwise indicated.

B. Steel Welded Wire Reinforcement (WWR): Class A epoxy coated, deformed type, ASTM A884/A884M.
   1. Form: Flat Sheets.
   2. Mesh Size: 4x4.
   3. Wire Gage: W 4 x W 4.

C. Reinforcement Accessories:
   1. Tie Wire: Annealed, minimum 16 gauge, 0.0508 inch.
   2. Chairs, Bolsters, Bar Supports, Spacers: Sized and shaped for adequate support of reinforcement during concrete placement.

a. Supports for epoxy-coated reinforcing shall be either wire bar-type coated with epoxy, plastic, or vinyl compatible with concrete for a minimum distance of 2 inches from the point of contact with reinforcing or all plastic-type.

3. Finish (epoxy-coated or galvanized) for supports formed from reinforcing bars shall match the finish of the supported reinforcing.
4. Provide stainless steel or plastic coated steel components for placement within 1-1/2 inches of weathering surfaces.
5. Epoxy Repair Coating: Liquid, two-part, epoxy repair coating; compatible with epoxy coating on reinforcement and complying with ASTM A 775.

2.3 CONCRETE MATERIALS

A. Cement: ASTM C150/C150M, Type I - Normal Portland type.
1. Acquire cement for entire project from same source.

B. Fine and Coarse Aggregates: ASTM C33/C33M.
1. Acquire aggregates for entire project from same source.
2. Fine Aggregate: Clean, sharp, natural sand free from loam, clay, lumps, or other deleterious substances.
3. Coarse Aggregate: Clean, uncoated, processed aggregate free from clay, mud, loam, or foreign matter.
4. Gradations:
a. For footings, foundation walls, piers, grade beams, basement walls, retaining walls, and interior walls:

Sieve Size	Percent Passing
2 inch	100
1-1/2 inch	95 to 100
3/4 inch	35 to 70
3/8 inch	10 to 30
No. 4	0 to 5

b. For Slabs on Grade:

Sieve Size	Percent Passing
1 inch	95 to 98.5
3/4 inch	75 to 94
1/2 inch	25 to 50
3/8 inch	10 to 25
No.4	0 to 10

C. Lightweight Aggregate: ASTM C330/C330M.
1. Size 3/4-inch to No. 4. Dry unit weight of concrete shall be a maximum 120 pcf from a batch weight of 120 to 124 pcf, presoaked to achieve a damp condition according to ACI 211.2; limit shrinkage to 0.03 percent at 28 days.

D. Fly Ash: ASTM C618, Class C or F.

E. Calcined Pozzolan: ASTM C618, Class N.

F. Silica Fume: ASTM C1240, proportioned in accordance with ACI PRC-211.1.

G. Water: ASTM C1602/C1602M; clean, potable, and not detrimental to concrete.

2.4 ADMIXTURES

A. Do not use chemicals that will result in soluble chloride ions in excess of 0.1 percent by weight of cement.

B. Air Entrainment Admixture: ASTM C260/C260M.

C. Water Reducing Admixture: ASTM C494/C494M **Type A**.

2.5 ACCESSORY MATERIALS

A. Underslab Vapor Retarder:
   1. Accessory Products: Vapor retarder manufacturer's recommended tape, adhesive, mastic, prefabricated boots, etc., for sealing seams and penetrations.
   2. Manufacturers:
      a. Basis of Design: Stego Wrap Vapor Barrier (15-mil) by Stego Industries LLC., (877) 464-7834 www.stegoindustries.com
      b. Substitutions: See Section 01 2500 Substitution Procedures.

B. Non-Shrink Epoxy Grout: Moisture-insensitive, two-part; consisting of epoxy resin, non-metallic aggregate, and activator.
   1. Composition: High solids content material exhibiting positive expansion when tested in accordance with ASTM C827/C827M.
      a. Maximum Height Change: Plus 4 percent.
      b. Minimum Height Change: Plus 1 percent.

C. Concrete Crack Filler: Two part low viscosity rigid polyurethane crack and joint repair. See drawing for quantity to be included in Base Bid.
   1. ARDEX Ardifix

2.6 BONDING AND JOINTING PRODUCTS

A. Epoxy Bonding System:
   1. Complying with ASTM C881/C881M and of Type required for specific application.
   2. Manufacturers:
      a. Euclid Chemical Company: www.euclidchemical.com.
      b. Dayton Superior Corporation: www.daytonsuperior.com.
      c. Types I and II, non-load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.
      d. Types IV and V, load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.
      e. Substitutions: See Section 01 2500 Substitution Procedures..

B. Slab Isolation Joint Filler: 1/4 inch thick, height equal to slab thickness, with removable top section that will form 1/2 inch deep sealant pocket after removal.
   1. Material: ASTM D1751, cellulose fiber.
   2. Manufacturers:
      a. W. R. Meadows, Inc; Fiber Expansion Joint Filler with Snap-Cap: www.wrmeadows.com.
      b. Substitutions: See Section 01 2500 Substitution Procedures.

C. Slab Construction Joint Devices: Combination keyed joint form and screed, galvanized steel, with rectangular or round knockout holes for conduit or rebar to pass through joint form at 6 inches on center; ribbed steel stakes for setting.
   1. Provide removable plastic cap strip that forms wedge-shaped joint for sealant installation.
   2. Height: To suit slab thickness.
   3. Manufacturers:
      a. Vinylex, Knoxville, TN 37921 (615) 690-2211.
      b. Substitutions: See Section 01 2500 Substitution Procedures..

2.7 CURING MATERIALS

A. Moisture-Retaining Sheet: ASTM C171.
   1. Polyethylene film, clear, minimum nominal thickness of 4 mil, 0.004 inch.

B. Water: Potable, not detrimental to concrete.

2.8 REPAIR MATERIALS

A. Repair Underlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch (3.2 mm) and that can be feathered at edges to match adjacent floor elevations.
   1. Cement Binder: ASTM C 150, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
   2. Primer: Product of underlayment manufacturer recommended for substrate, conditions, and application.
   3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch (3 to 6 mm) or coarse sand as recommended by underlayment manufacturer.
   4. Compressive Strength: Not less than 4100 psi (29 MPa) at 28 days when tested according to ASTM C 109/C 109M.

B. Concrete Patching and Repair: One-component, early strength gaining, cementitious, patching material.
   1. Flexural Strength (ASTM C-293): 28 days 850 psi.
   2. Splitting Tensile Strength (ASTM C-496): 28 days 550 psi.
   3. Bond Strength (ASTM C-882 modified): 28 days 1,800 psi.
   4. Compressive Strength (ASTM C-109): 28 days 7,000 psi.
   5. Color Concrete gray
   6. Manufacturers:
      a. Acceptable Products: SilkaRepair 223
      b. Substitutions: See Section 01 2500 Substitution Procedures..

2.9 CONCRETE MIX DESIGN

A. Proportioning Normal and Structural Lightweight Concrete: Comply with ACI 211.2 recommendations.

B. Identify sources of all products used in design mixes.

C. Admixtures: Add acceptable admixtures as recommended in ACI 211.1 and at rates recommended or required by manufacturer.

D. Normal Weight Concrete:
   1. Compressive Strength, when tested in accordance with ASTM C39/C39M at 28 days: 4,000 pounds per square inch.
   2. Water-Cement Ratio: Maximum 0.45.
   3. Total Air Content: 6 percent, determined in accordance with ASTM C173/C173M.
   4. Maximum Slump: 4 inches.
   5. Provide batch ticket for each batch discharged and used in work indicating project identification name and number, date, mix type, mix time, quantity, and amount of water introduced.

2.10 MIXING

A. Transit Mixers: Comply with ASTM C94/C94M.

2.11 REINFORCING FABRICATION

A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice." Fabricate bars to required lengths, shapes, and bends. Do not rebend or straighten reinforcement in manner that could weaken material.

2.12 FINISHES

A. "Rapid Set WunderFixx" as manufactured by CTS Cement Manufacturing Corporation, www.ctscement.com <http://www.ctscement.com> or approved equal.
   1. Use for finishing all exposed concrete vertical surfaces.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify lines, levels, and dimensions before proceeding with work of this section.

B. Do not proceed with work until unsatisfactory conditions are corrected.

3.2 PREPARATION

A. Formwork: Comply with requirements of ACI 301. Design and fabricate forms to support all applied loads until concrete is cured, and for easy removal without damage to concrete.

B. Construct formwork so concrete members and structures are of correct size, shape, alignment, elevation, and position. Maintain formwork construction tolerances complying with ACI 347 and ACI 117.

C. Verify that forms are clean and free of rust before applying release agent.

D. Clean and coat forms before erection. Do not coat forms in place.

E. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush plates or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces where slope is too steep to place concrete with bottom forms only. Kerf wood inserts for forming keyways, reglets, recesses, etc., for easy removal.

F. Coordinate placement of embedded items with erection of concrete formwork and placement of form accessories.

G. Chamfer exposed corners and edges as indicated using wood, metal, PVC, or rubber chamfer strips fabricated to produce uniform smooth lines and tight edge joints.

H. Fit corners and joints with gaskets or tape to prevent leakage.

I. Provisions for Other Trades: Provide openings in concrete formwork to accommodate work of other trades. Determine size and location of openings, recesses, and chases from trades providing such items. Accurately place and securely support items built into forms.

J. Sleeves: Provide sleeves in concrete formwork for plumbing, electrical, and mechanical penetrations. Coordinate size and location of sleeves with Contractors and mechanical, electrical, and plumbing drawings.

1. Accurately place and secure in forms.
2. Coordinate sleeve locations with reinforcing bars.

K. Penetrations shall not occur through footings, piers, columns, beams, joists, grade beams, or supported slabs unless shown in structural drawings

L. Where new concrete is to be bonded to previously placed concrete, prepare existing surface by cleaning and applying bonding agent in according to bonding agent manufacturer's instructions.

1. Use epoxy bonding system for bonding to damp surfaces, for structural load-bearing applications, and where curing under humid conditions is required.

M. In locations where new concrete is doweled to existing work, drill holes in existing concrete, insert steel dowels and pack solid with non-shrink grout.

N. Interior Slabs on Grade: Install vapor retarder under interior slabs on grade. Comply with ASTM E1643. Lap joints minimum 6 inches. Seal joints, seams and penetrations watertight with manufacturer's recommended products and follow manufacturer's written instructions. Repair damaged vapor retarder before covering.

3.3 INSTALLING REINFORCEMENT AND OTHER EMBEDDED ITEMS

A. General: Comply with CRSI's "Manual of Standard Practice" for placing reinforcement

B. Fabricate and handle epoxy-coated reinforcing in accordance with ASTM D3963/D3963M.

C. Comply with requirements of ACI 301. Clean reinforcement of loose rust and mill scale, and accurately position, support, and secure in place to achieve not less than minimum concrete coverage required for protection.

D. Place slab reinforcing one-third of slab thickness below top surface of slab. Support reinforcement by metal chairs, runners, bolsters, or concrete brick as required.
   1. Dedicate workers to placement of reinforcement to continuously monitor and adjust reinforcement location during concrete placement.

E. Install welded wire reinforcement in maximum possible lengths, and offset end laps in both directions. Splice laps with tie wire.

F. Verify that anchors, seats, plates, reinforcement and other items to be cast into concrete are accurately placed, positioned securely, and will not interfere with concrete placement.

G. Epoxy-Coated Reinforcement: Repair cut and damaged epoxy coatings with epoxy repair coating according to ASTM D 3963. Use epoxy-coated steel wire ties to fasten epoxy-coated steel reinforcement.

H. Comply with manufacturer-recommended procedures for installing and anchoring of doweled reinforcement using chemical adhesives, including drilling and cleaning of holes and mixing and applying of adhesives.

I. Coordinate placement of reinforcement with openings, including sleeves and other embedded items. Where one or more bars are interrupted, provide additional reinforcement at openings. Additional reinforcement is noted in drawings.

J. Use of nails in forms and use of clay brick to support reinforcement is prohibited.

3.4 WATERPROOF MORTAR

A. Install as per manufacturer's instructions.
   1. Apply at all junctions of slab on grade and vertical foundation walls.

3.5 PLACING CONCRETE

A. Place concrete in accordance with ACI 304R.

B. Notify Owner's Representative not less than 24 hours prior to commencement of placement operations.

C. Maintain records of concrete placement. Record date, location, quantity, air temperature, and test samples taken.

D. Ensure reinforcement and formed construction joint devices will not be disturbed during concrete placement.

E. Place concrete continuously without construction (cold) joints wherever possible; where construction joints are necessary, before next placement prepare joint surface by removing laitance and exposing the sand and sound surface mortar, by sandblasting or high-pressure water jetting.
   1. Slabs on Grade: Use strip pour methods and mechanical vibratory screed whenever possible.
   2. Deposit and consolidate concrete in continuous operation within limits of construction joints until placing of panel or section is complete.
   3. Consolidate concrete during placing operations so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
   4. Bring slab surfaces to correct level with a straightedge and strike off. Uniformly slope to drains. Use darbies to smooth surface, leaving it free of humps or hollows. Do not sprinkle water or portland cement on plastic surface. Do not disturb slab surfaces before beginning finishing operations.
   5. For floor areas with drains, Contractor shall be responsible for finishing concrete slabs to proper elevations to ensure surface moisture will drain freely to floor drains and no puddle areas exist. Reference elevations shown in drawings.

F. Consolidate placed concrete by mechanical vibrating equipment supplemented by hand spading, rodding, or tamping. Use equipment and procedures for consolidation of concrete in accordance with ACI 309.

G. Do not use vibrators to transport concrete inside formwork.

H. Insert and withdraw vibrators vertically at uniformly spaced locations not farther than visible effectiveness of machine. Vibrators shall penetrate placed layer of concrete at least 6 inches into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to set.

I. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing segregation of mix.

J. Do not allow vibrator to come in contact with form.

3.6 SLAB JOINTING

A. Locate joints as indicated on drawings or as recommended by ACI 302.

B. For placement of slabs that will be subsequently concealed with an architectural finish material place slabs with few construction joints or as recommended by ACI 302.

C. Anchor joint fillers and devices to prevent movement during concrete placement .

D. Isolation Joints: Use preformed joint filler with removable top section for joint sealant, total height equal to thickness of slab, set flush with top of slab.

1. Install wherever necessary to separate slab from other building members, including columns, walls, equipment foundations, footings, stairs, manholes, sumps, and drains.
2. Place joint filler in floor slab pattern placement sequence. Set top to required elevations.
3. Install joint devices in accordance with manufacturer's instructions.
4. Apply sealants in joint devices in accordance with Section 07 9200 - Joint Sealants.

E. Load Transfer Construction and Contraction Joints: Install load transfer devices as indicated; saw cut joint at surface as indicated for contraction joints.

F. Hand tooled or Saw Cut Contraction Joints: Saw cut joints before concrete begins to cool, within 4 to 12 hours after placing; use 3/16 inch thick blade and cut at least 1 inch deep but not less than one quarter (1/4) the depth of the slab.

3.7 SEPARATE FLOOR TOPPINGS

A. Prior to placing floor topping, roughen substrate concrete surface and remove deleterious material. Broom and vacuum clean.

3.8 MISCELLANEOUS CONCRETE ITEMS

A. Filling In: Fill in holes and openings left in concrete structures, unless otherwise indicated, after work of other trades is in place. Mix, place, and cure concrete, as specified, to blend with in-place construction. Provide other miscellaneous concrete filling indicated or required to complete Work.

B. Equipment Bases and Foundations: Provide machine, locker and equipment bases and foundations as shown on Drawings. Set anchor bolts for machines and equipment at correct elevations, complying with diagrams or templates of manufacturer furnishing machines and equipment.

3.9 CONCRETE FINISHING

A. Repair surface defects, including tie holes, immediately after removing formwork.

B. Unexposed Form Finish: Rub down or chip off fins or other raised areas 1/4 inch or more in height.

C. Exposed Form Finish: Rub down or chip off and smooth fins or other raised areas 1/4 inch or more in height. Provide finish as follows:

1. Preparation:
   a. Mechanically remove loose, unsound, contaminated concrete.
   b. Concrete must be free of materials such as paint, oil, curing compound, bond breaker, etc. that will inhibit bonding.
   c. Thoroughly clean extraneous material such as dirt, loose chips, and dust from concrete surface. If compressed air is used, it shall be free of oil.
   d. Concrete surface shall be dry

2. Mixing:
   a. Use 1 part water to 2 parts of material.
   b. Mixed material should have a temperature of about 70°F. Warmer material will set faster than expected and cooler material will have slower strength gain. Control the mixed temperature by protecting the bags of repair material from temperature extremes and adjust the mixed temperature by using hot or cold water.
   c. Add potable water first then add material while mixing mechanically with a drill and mixing paddle.
   d. Do NOT add any other admixtures. Do NOT add sand, aggregate, or cement.
   e. Mix until smooth, uniform, and lump-free (usually 3 to 5 minutes).
   f. Do NOT re-temper.
   g. Clean mixing bucket and tools between batches.
3. Placement:
   a. Place material onto the dry substrate.
   b. Maintain surface and ambient temperature between 45°F and 100°F during and for 4 hours after placement.
   c. Protect adjacent surfaces with drop cloths, waterproof paper, or other means to maintain them free of material splashes, water, and debris.
   d. Place material immediately after mixing.
   e. Apply material in one pass and avoid re-troweling.
   f. As the material becomes stiff (usually 10 to 20 minutes) use a trowel to shave or cut the material to the desired shape.
   g. Sanding may be begun as soon as material has dried and must be completed within 24 hours.
4. Smooth Rubbed Finish: Wet concrete and rub with carborundum brick or other abrasive, not more than 24 hours after form removal.

D. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces, unless otherwise indicated.

E. Concrete Slabs: Finish to requirements of ACI 302.1R, and as follows:
1. Surfaces to Receive Thick Floor Coverings: "Scratch" as described in ACI 302.1R; thick floor coverings include quarry tile, ceramic tile, and Portland cement terrazzo with full bed setting system.
2. Surfaces to Receive Thin Floor Coverings: "Steel trowel" as described in ACI 302.1R; thin floor coverings include exposed to view, resilient flooring, and thin set ceramic tile.
   a. Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power driven floats. Re-straighten, cut down high spots, and fill low spots. Repeat float passes and re-straightening until surface is left with a uniform, smooth, granular texture.
3. Broom Finish: Apply a broom finish to exterior sidewalks, concrete platforms, steps, and ramps, and elsewhere as indicated.
   a. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route. Coordinate required final finish with Owner's Representative before application.
4. Surfaces to Be Left Exposed: Steel Trowel as described in ACI 302.1R, minimizing burnish marks and other appearance defects.
   a. Chemical Hardener: After slab has cured, apply water-diluted hardener in three coats per manufacturer's instructions, allowing 24 hours between coats.

5. Screed floors level, maintaining the following minimum F(F) Floor Flatness and F(L) Floor Levelness values when measured in accordance with ASTM E 1155/ASTM E 1155M.
   a. F(F): Specified Overall Value (SOV) of 35; Minimum Localized Value (MLV) of 24.

F. In areas with floor drains, maintain floor elevation at walls; pitch surfaces uniformly to drains as indicated on drawings.

3.10 CURING AND PROTECTION

A. Comply with requirements of ACI 308R. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, and mechanical injury.

B. Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete.
   1. Normal concrete: Not less than seven days.

C. Formed Surfaces: Cure by moist curing with forms in place for full curing period.

3.11 FIELD QUALITY CONTROL

A. An independent testing agency will perform field quality control tests, as specified in Section 01 4000 - Quality Requirements.

B. Provide free access to concrete operations at project site and cooperate with appointed firm.

C. Submit proposed mix design to testing firm for review prior to commencement of concrete operations.

D. Compressive Strength Tests: ASTM C39/C39M, for each test, mold and cure three concrete test cylinders. Obtain test samples for every 100 cubic yards or less of each class of concrete placed.

E. Take one additional test cylinder during cold weather concreting, cured on job site under same conditions as concrete it represents.

F. Perform one slump test for each set of test cylinders taken, following procedures of ASTM C143/C143M.

G. Permeability Test: Test concrete with waterproofing admixture according to COE CRD-C 48.

H. Maintain records of concrete placement. Record date, location, quantity, air temperature, and test samples taken.

3.12 DEFECTIVE CONCRETE

A. Test Results: The testing agency shall report test results in writing to Owner's Representative and Contractor within 24 hours of test.

B. Defective Concrete: Concrete not complying with required lines, details, dimensions, tolerances or specified requirements.

C. Repair or replacement of defective concrete will be determined by the Owner's Representative. The cost of additional testing shall be borne by Contractor when defective concrete is identified.

D. Do not patch, fill, touch-up, repair, or replace exposed concrete except upon express direction of Owner's Representative for each individual area.

3.13 PROTECTION

A. Do not permit traffic over unprotected concrete floor surface until fully cured.

END OF SECTION

SECTION 03 5400
CAST UNDERLAYMENT

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SECTION INCLUDES

A. Liquid-applied self-leveling floor underlayment.
   1. Use cementitious type at all locations recieving new floor finishes.

1.3 RELATED REQUIREMENTS

A. Section 01 7000 - Execution: Alteration project procedures; selective removals for remodeling.

B. Section 09 6500 - Resilient Flooring for flashing patching.

C. Section 09 3000 - Tiling.

1.4 REFERENCE STANDARDS

A. ASTM C109/C109M - Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or (50-mm) Cube Specimens); 2016a.

B. ASTM C348 - Standard Test Method for Flexural Strength of Hydraulic-Cement Mortars; 2018.

C. ASTM F-2170 Relative Humidity in Concrete.

D. ASTM F710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring

1.5 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's data sheets documenting physical characteristics and product limitations of underlayment materials. Include information on surface preparation, environmental limitations, and installation instructions.

C. Manufacturer's Instructions.

D. Material Test Reports: From a qualified testing agency indicating and interpreting test results of underlayments for compliance with requirements indicated.

E. Minutes of preinstallation conference.

F. Submit certification, in writing by the finish floor manufacturer that the Cast Underlayment is compatible and acceptable for their product,

1.6 QUALITY ASSURANCE

A. Manufacturer: Provide underlayment manufactured by a firm with a minimum of ten (10) years experience with types equivalent to those specified.
   1. Manufacturer capable of providing technical training and field service representation.

B. Applicator Qualifications: Company specializing in performing the work of this section with minimum five years of experience who has completed work similar in material, design, and extent to that indicated for this Project and approved by the manufacturer.

C. Testing Agency Qualifications: An independent testing agency, acceptable to Owner’s Representative and Architect, qualified according to ASTM C 1077 and ASTM E 329 to conduct the testing indicated, as documented according to ASTM E 548.

D. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section 01 3000 - Administrative Requirements.

E. Product must have a hydraulic cement-based inorganic binder content as the primary binder which includes portland cement per ASTM C150: Standard Specification for Portland Cement and other specialty hydraulic cements. Gypsum-based products are not acceptable.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

B. Store products in a dry area with temperature maintained between 50° and 85°F (10° and 29°C) and protect from direct sunlight

C. Handle products in accordance with manufacturer's printed recommendations

1.8 MOCK-UP

A. Provide a mock-up for evaluation of surface preparation techniques and application workmanship.
   1. Prepare mock-up in location designated by Owner’s Representative.
   2. Area: 6 ft by 6 ft.
   3. Do not proceed with underlayment work until workmanship of mock-up has been approved by Owner’s Representative
   4. If Owner’s Representative determines that mockups do not meet requirements, demolish and remove them from the site and cast others until mockups are approved.
   5. Mock-up may remain as part of the Work.

1.9 FIELD CONDITIONS

A. Comply with manufacturer's written instructions for substrate temperature and moisture content, ambient temperature and humidity, ventilation, and other conditions affecting underlayments performance.

B. During the curing process, ventilate spaces to remove excess moisture.

C. Close areas to traffic during underlayments application and, after application, for time period recommended in writing by manufacturer

1.10 WARRANTY

A. Provide manufacturer's comprehensive ten)10) year warranty.
   1. Verify material is acceptable with adhesives use with finish floor systems.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Cementitious Underlayment: Basis of Design:
   1. ARDEX Engineered Cements; ARDEX K 15 with ARDEX P51 Primer: www.ardexamericas.com.
   2. Substitutions: Section 01 2500 Substitution Procedures.

2.2 MATERIALS

A. Cast Underlayments, General:
   1. Comply with applicable code for combustibility or flame spread requirements.
      a. Refer to Section 01 4100 - Regulatory Requirements.

B. Cementitious Underlayment: Blended cement mix, that when mixed with water in accordance with manufacturer's directions will produce self-leveling underlayment with the following properties:
   1. Compressive Strength: Minimum 5,5000 pounds per square inch after 28 days, tested per ASTM C109/C109M.
   2. Flexural Strength: Minimum 1200 psi after 28 days, tested per ASTM C348.
   3. Shrinkage: 0.025 - 0.045% @ 28 days when tested in conformance with ASTM C 531 (modified).
   4. Ideal Slump range 11.5” - 12.5” (2” diameter pipe, 4” high).
   5. Bond Strength: 350-400 psi when tested in conformance with ASTM D 3931
   6. “0” VOC content
   7. Final Set Time: 2 to 3hour.

8. Thickness: Capable of thicknesses from feather edge to maximum 3-1/2 inch.
9. Surface Burning Characteristics: Flame spread/Smoke developed index of 0/0 in accordance with ASTM E84.

C. Aggregate: Dry, well graded, washed silica aggregate, approximately 1/8 inch in size and acceptable to underlayment manufacturer.

D. Reinforcement: Galvanized metal lath complying with recommendations of underlayment manufacturer for specific project circumstances.

E. Water: ASTM C1602/C1602M; clean, potable, and not detrimental to underlayment mix materials.

F. Primer: Ardex P 51

G. Joint and Crack Filler: Latex based filler, as recommended by manufacturer.

2.3 MIXING

A. Site mix materials in accordance with manufacturer's instructions.

B. Mix using a ½" (12 mm) heavy-duty drill (min. 650 rpm) with an mixing paddle. Do not over water. When mixing sanded materials, follow manufacturer's recommendations, or use a standard "gutter hook" vacuum attachment in combination with a wet/dry (Shop-Vac® style) vacuum and HEPA dust extraction vacuum system. Additionally, each bag should be handled with care and emptied slowly to avoid creating a plume of dust. Contact the manufacturer's Technical Service Department for more details on products and air quality management.

C. Aggregate mix: For areas to be installed over 1 ½" (4 cm) thick, aggregate may be added to reduce ` material costs. Mix Underlayment with water first, then add 1 part aggregate by volume of washed, well-graded 1/8" to 3/8" (3 to 9.5 mm) pea gravel. The aggregate size must not exceed 1/3 the depth of the pour. Do not use sand. Note: The addition of aggregate will diminish the workability of the product and may make it necessary to install a finish coat to obtain a smooth surface. Allow the initial application to dry for 12 to 16 hours, and then prime this layer with primer mixed 1: 1 with water. Allow the primer to dry (min. 30 minutes, max. 24 hours) before installing the neat coat of underlayment

D. For pump installations, underlayment shall be mixed using the Automatic Mixing Pumps. recommended by the manufacturer Contact the manufacturer's Technical Service Department for complete pump operation instructions.

E. Mix to self-leveling consistency without over-watering and in accordance with manufacturer's instructions.

PART 3 EXECUTION

3.1 EXAMINATION

A. Test moisture content of substrates:
1. Per ASTM F2170, do not install if relative humidity is > 95% (15 pounds per 1000 sq. ft. per 24 hours ASTM F1869) up to and including 98% Relative Humidity (20 pounds per 1000 sq. ft. per 24 hours ASTM F 1869) without first applying TEC® The LiquiDAM® moisture mitigation membrane.
   a. Cost of mitigation testing shall be included in the Contractor's proposal.
2. For moisture sensitive floor finishes refer to the finish floor manufacturers specifications for moisture limitations. Remediation of excessive moisture conditions **must be done prior to** installation of Self Leveling Underlayment. To reduce moisture vapor emissions to an acceptable level, use material recommended by the manufacturer.
3. Refer to finish flooring systems for additional requirements.

B. Notify the Owner's Representative and Architect in writing of any unsatisfactory conditions.

C. Verify that substrate surfaces are clean, dry, unfrozen, do not contain petroleum byproducts, or other compounds detrimental to underlayment material bond to substrate.

3.2 PREPARATION

A. Existing Concrete: Remove existing surface treatments and deteriorated and unsound concrete. Mechanically abrade base slabs to produce a heavily scarified surface profile with an amplitude of 1/4 inch
   1. After profiling test substrate by place drop of water, or other means to insure all coatings, sealers etc have been removed. Repeat profiling if necessary.
   2. Prepare and clean existing base slabs according to topping manufacturer's written instructions. Fill voids, cracks, and cavities in base slabs.
   3. Mechanically remove contaminants from existing concrete that might impair bond of topping.
   4. Saw cut existing contraction and construction joints to a depth of 1/2 inch and fill with epoxy joint filler.

B. Install joint-filler strips where topping abuts vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.

C. Remove substrate surface irregularities. Fill voids and deck joints with filler. Finish smooth.

D. Vacuum clean surfaces.

E. Prime substrate in accordance with manufacturer's instructions. Allow to dry.

F. Close former roof and floor openings where items and equipment have been removed and as indicated.

G. Close floor openings.

3.3 APPLICATION OF PRIMER

A. Install products in accordance with manufacturer's instructions.

B. Prime standard subfloors with manufacturer's recommended solvent-free primer.
   1. Mix Primer 1:1 with water and apply evenly with stiff bristled push broom.
   2. Apply an even continuous coat.
   3. Allow to dry to a clear film (typically 30 minutes; maximum 24 hours).
   4. Do not apply underlayment until the primer is dry.
      a. To determine if the primer is dry after a minimum of 30 minutes (max. 24 hours), pour water onto the surface of the primer in several areas and rub it with your finger. If the water remains clear, the primer is dry. If the water turns cloudy or milky, additional drying time is needed.
   5. Primer coverage is approximately 400 to 450 sq. ft. per gallon depending on surface texture.
   6. Prime extremely absorbent subfloors twice.

3.4 APPLICATION OF UNDERLAYMENT

A. Existing Concrete: Apply epoxy-bonding adhesive, mixed according to manufacturer's written instructions, and scrub into dry base slabs to a thickness of 1/16 to 1/8 inch, without puddling. Place topping while adhesive is still tacky

B. Install underlayment in accordance with manufacturer's instructions.

C. Pump or pour material onto substrate. Do not retemper or add water.
   1. Pump, move, and screed while the material is still highly flowable.
   2. Be careful not to create cold joints.
   3. Wear spiked shoes while working in the wet material to avoid leaving marks.

D. Place to required thickness, with top surface level to 1/16 inch in 10 ft.

E. For final thickness over 1-1/2 inches, place underlayment in layers. Allow initial layer to harden to the point where the material has lost its evaporative moisture. Immediately prime and begin application of the subsequent layer within 24 hours.

F. Where additional aggregate has been used in the mix, add a top layer of neat mix (without aggregate), if needed to level and smooth the surface.

G. Construction Joints: Construct joints true to line with faces perpendicular to surface plane of topping, at locations indicated or as approved by Owner's Representative.
   1. Coat face of construction joint with epoxy adhesive at locations where topping is placed against hardened or partially hardened topping.

H. Contraction Joints: Form weakened-plane contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before topping develops random contraction cracks.
   1. Form joints in topping over contraction joints in base slabs, unless otherwise indicated.
   2. Construct contraction joints for a combined depth equal to topping thickness and not less than one-fourth of base-slab thickness.
   3. Construct contraction joints for a depth equal to one-half of topping thickness, but not less than 1/2 inch deep

I. If a fine, feathered edge is desired, steel trowel the edge after initial set, but before it is completely hard.

3.5 CURING

A. Once underlayment starts to set, prohibit foot traffic until final set has been reached.

B. Air cure in accordance with manufacturer's instructions.

Underlayment can be walked on in 2-3 hours. Moisture-insensitive tiles such as ceramic, quarry and porcelain can be installed after 6 hours. All other finish floor coverings can be installed after 16 hours at 70°F (21°C). For resinous systems such as epoxy and polyurethane floors please contact the manufacturer's Technical Services Department.

3.6 JOINT FILLING

A. Prepare and clean contraction joints and install epoxy joint filler, according to manufacturer's written instructions, once topping has fully cured.

B. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joint clean and dry.

C. Install epoxy joint filler full depth of contraction joints. Overfill joint and trim joint filler flush with top of joint after hardening

3.7 FIELD QUALITY CONTROL

A. An independent testing agency will perform field inspection and testing, as specified in Section 01 4000 - Quality Requirements.

3.8 REPAIRS

A. Defective Topping: Repair and patch defective topping areas, including areas that have not bonded to concrete substrate

3.9 PROTECTION

A. Do not permit traffic over unprotected floor underlayment surfaces.

END OF SECTION

SECTION 04 2000
UNIT MASONRY

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SECTION INCLUDES

A. Concrete Masonry Units (CMU).

B. Clay facing brick.

C. Common brick.

D. Reinforcement and anchorage.

E. Flashings.

F. Accessories.

1.3 RELATED REQUIREMENTS

A. Section 04 0100 - Maintenance of Masonry.

B. Section 05 5000 - Metal Fabrications: Loose steel lintels.

C. Section 07 6200 - Sheet Metal Flashing and Trim: Through-wall masonry flashings.

D. Section 07 8400 - Firestopping: Firestopping at penetrations of fire-rated masonry and at top of fire-rated walls.

E. Section 07 9200 - Joint Sealants: Sealing control and expansion joints.

1.4 MATERIAL EVALUATION/QUALITY ASSURANCE

A. Preconstruction Testing: Contractor shall employ and pay qualified independent Testing Agency to perform preconstruction testing indicated and other inspecting and testing services required for source and field quality control.

1. Clay Unit Masonry Tests: For each different clay masonry unit indicated, test units in accordance with ASTM C 67.
2. Concrete Masonry Unit Tests: For each different concrete masonry unit indicated, test units for strength, absorption, and moisture content in accordance with ASTM C 140.
3. Prism Tests: For each type of wall construction indicated, test masonry prisms in accordance with ASTM C 1314.
    a. Contractor shall fabricate prisms under supervision and direction of Testing Agency Representative.
4. Test mortar composition and properties in accordance with ASTM C 270 if Property Specification is used.
5. Evaluate mortar proportions in accordance with ASTM C 270 if Proportion Specification is used.
6. Test mortar properties for approved mix in accordance with ASTM C780 (Compressive Strength Method) to determine a base line for field mortar tests.
7. Test grout compressive strength in accordance with ASTM C 1019 to demonstrate compliance with ASTM C476, Property Specification.
    a. Contractor shall deliver to Testing Agency accepted CMU for fabrication of test samples.

B. Testing Agency Qualifications: Independent Testing Agency shall demonstrate to Owner’s representative ’s satisfaction that it has experience and capability to satisfactorily perform testing indicated without delaying progress of work.

C. Contractor shall employ and pay a licensed Land Surveyor to survey foundations for compliance with dimensional tolerances specified in referenced unit masonry standard.

D. Preinstallation Conference: Perform conference at project site to comply with requirements of Division 1 section "Project Meetings.".

E. The Registered Design Professionals (RDPs) for Structural Engineering and Architecture will visit construction site at appropriate intervals to determine if work is in general conformance with Contract Documents and specifications. Notify RDPs 48 hours before anticipated time of completion for given section of work so they may determine if site observations are required. If site observations are required, do not place grout or continue construction of masonry until RDPs have had opportunity to make observations.

1.5 SPECIAL INSPECTIONS

A. Refer to Specification Section 014533 and Schedule of Special Inspections

1.6 REFERENCE STANDARDS

A. TMS 402/602 - Building Code Requirements and Specification for Masonry Structures; 2018

B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2016a.

C. ASTM A240/A240M - Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications; 2018.

D. ASTM A580/A580M - Standard Specification for Stainless Steel Wire; 2016.

E. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement; 2018, with Editorial Revision (2018).

F. ASTM A951/A951M - Standard Specification for Steel Wire for Masonry Joint Reinforcement; 2016.

G. ASTM A1064/A1064M - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete; 2018a.

H. ASTM B370 - Standard Specification for Copper Sheet and Strip for Building Construction; 2012.

I. ASTM C62 - Standard Specification for Building Brick (Solid Masonry Units Made From Clay or Shale); 2017.

J. ASTM C67/C67M - Standard Test Methods for Sampling and Testing Brick and Structural Clay Tile; 2018.

K. ASTM C90 - Standard Specification for Loadbearing Concrete Masonry Units; 2016a.

L. ASTM C129 - Standard Specification for Nonloadbearing Concrete Masonry Units; 2017.

M. ASTM C140/C140M - Standard Test Methods of Sampling and Testing Concrete Masonry Units and Related Units; 2017a.

N. ASTM C144 - Standard Specification for Aggregate for Masonry Mortar; 2018.

O. ASTM C150/C150M - Standard Specification for Portland Cement; 2018.

P. ASTM C207 - Standard Specification for Hydrated Lime for Masonry Purposes; 2018.

Q. ASTM C270 - Standard Specification for Mortar for Unit Masonry; 2014a.

R. ASTM C404 - Standard Specification for Aggregates for Masonry Grout; 2018.

S. ASTM C744 - Standard Specification for Prefaced Concrete and Calcium Silicate Masonry Units; 2016.

T. BIA Technical Notes No. 7 - Water Penetration Resistance – Design and Detailing; 2017.

1.7 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene a preinstallation meeting two (2) weeks before starting work of this section; require attendance by all relevant installers and Construction Manager.

1.8 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide data for masonry units, fabricated wire reinforcement, mortar, all masonry accessories, and anchors.
   1. Material Data: Submit to Architect and Construction Manager certificates for the following signed by manufacturer and Contractor certifying each material complies with requirements.
      a. Masonry Units.
      b. Each different cement product required for mortar and grout, including name of manufacturer, brand, and type.
      c. Each material and grade indicated for reinforcing bars.
      d. Each type and size of joint reinforcement.
      e. Each type and size of anchors, ties, and metal accessories.

C. Shop Drawings: Indicate pertinent dimensions, materials, anchorage, size and type of fasteners, and accessories for brickwork support system.
   1. Include calculations or selections from the manufacturer's prescriptive design tables that indicate compliance with the applicable building code and project conditions.

D. Samples: Submit four samples of facing brick units to illustrate color, texture, and extremes of color range.

E. Manufacturer's Certificate: Certify that masonry units meet or exceed specified requirements.

F. Test Reports: Concrete masonry manufacturer's test reports for: units with integral water repellent admixture.
   1. Mortar: Property (Proportion) requirements of ASTM C 270.
   2. Grout complying with ASTM C 476. Include description of type and proportions of grout ingredients.
   3. Masonry units: ASTM C67 and ASTM C140.
   4. Field Mortar Base Line Compressive Test: ASTM C780.
   5. Efflorescence tests for Brick: ASTM C67.
   6. Durability tests for surface-coated brick: ASTM C67.

G. Designer's Qualification Statement.

H. Material Data: Submit to Special Inspector and Architect/Engineer certificates for the following signed by manufacturer and Contractor certifying each material complies with requirements.
   1. Masonry Units.
   2. Each different cement product required for mortar and grout, including name of manufacturer, brand, and type.
   3. Integral Water Repellant used in CMU.
   4. Each material and grade indicated for reinforcing bars.
   5. Each type and size of joint reinforcement.
   6. Each type and size of anchors, ties, and metal accessories.

I. Material Test Reports: Submit to Special Inspector and Architect/Engineer reports from qualified independent Testing Agency employed and paid by Contractor indicating and interpreting test results relative to compliance for the following proposed masonry materials with requirements indicated:
   1. Mortar: Property (Proportion) requirements of ASTM C 270.
   2. Grout complying with ASTM C 476. Include description of type and proportions of grout ingredients.
   3. Masonry units: ASTM C67 and ASTM C140.
   4. Field Mortar Base Line Compressive Test: ASTM C780.
   5. Efflorescence tests for Brick: ASTM C67.
   6. Durability tests for surface-coated brick: ASTM C67.

J. Construction Procedures: Submit cold-weather construction and hot-weather construction procedures evidencing compliance with requirements specified in referenced unit masonry standard

K. Grouting Program: Submit proposed grouting program for grouting CMU walls. Grouting shall be in accordance with recommendations of NCMA-TEK 3-2A

1.9 QUALITY ASSURANCE

A. Comply with provisions of TMS 402/602, except where exceeded by requirements of Contract Documents.

B. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section with minimum five years of documented experience.

C. Installer Qualifications: Company specializing in performing work of the type specified and with at least five years of documented experience.
   1. Submit data for firms and persons specified to demonstrate their capabilities and experience. Include list of completed projects with project names, addresses, telephone numbers, names of Architects and Owners, and other information specified.

D. Grouting and Reinforcing: All masonry and grouting and reinforcing work shall be performed by masonry craft-workers who have successfully completed the International Masonry Institute (1-800-IMI-0988) training course for Grouting and Reinforced Masonry Construction, or equal.

E. Fire-Resistance Ratings: Where indicated, provide materials and construction identical to those of assemblies with fire-resistance ratings determined per ASTM E 119 by a testing and inspecting agency, by equivalent concrete masonry thickness, or by another means, as acceptable to authorities having jurisdiction.
   1. Provide manufacturer's certification for fire ratings.
   2. Equivalent thickness as determined by ASTM C 140.
      a. Aggregate: Limestone.
         a) One hour rated:
            (a) 6” CMU: 55% solid.
            (b) 8” CMU: 53% solid.
            (c) 10” CMU: 51.7 solid.
         b) Two hour rated:
            (a) 6” CMU: 75% solid.
            (b) 8” CMU: 53% solid.
            (c) 10” CMU: 51.7% solid
         c) Three hour rated:
            (a) 8” CMU: 75% solid

F. Source Limitations for Masonry Units: Obtain exposed masonry units of a uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, through one source from a single manufacturer for each product required

1.10 MOCK-UPs

A. Locate where directed.

B. Mock-up may not remain as part of work.

C. Build mockup of typical wall area as directed by Construction Manager.

D. Build mockups for the following types of masonry in sizes approximately 8 feet long by 6 feet high by full thickness, including face and backup wythes and accessories. Include a sealant-filled joint at least 16 inches long in each mockup.
   1. Each type of exposed unit masonry construction including pre-cast units.
   2. Include mortar, accessories, structural backup, reinforcement, flashings (with lap joint, corner, and end dam), weather barrier, and wall insulation.

3. Typical exterior wall, including precast units.
4. Typical exterior wall with lower corner of window opening framed with stone trim at upper corner of mockup. Make opening approximately 36 inches wide by 36 inches high. Show jamb construction, special coursing and bands.
5. Typical exterior wall with through-wall flashing installed for a 24-inch length in corner of mockup approximately 16-inches down from top of mockup, with a 12-inch length of flashing left exposed to view (omit masonry above half of flashing).
6. Typical steel stud framing or masonry backup.
7. Show sheathing, cavity insulation, joint reinforcing, drainage board, weather barrier, mortar net and weeps.
8. Typical interior unit masonry wall.

E. Clean exposed faces of mockups with masonry cleaner as indicated.

F. Where masonry is to match existing, erect mockups adjacent and parallel to existing surface.

G. Notify Architect and Construction Manager seven days in advance of dates and times when mockups will be constructed.

H. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.

I. Approval of mockups is for color, texture, and blending of masonry units; relationship of mortar and sealant colors to masonry unit colors; tooling of joints; and aesthetic qualities of workmanship.
1. Approval of mockups is also for other material and construction qualities specifically approved by Architect and Construction Manager in writing.
2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups, unless such deviations are specifically approved by Architect and Construction Manager in writing.
3. **No work shall commence until mock-up is completely approved.**

J. Demolish and remove mockups when directed Construction Manager.

1.11 DELIVERY, STORAGE, AND HANDLING

A. Deliver, handle, and store masonry units by means that will prevent mechanical damage and contamination by other materials.

B. Handle and store pre-faced concrete block units in protective cartons or trays. Do not remove from protective packaging until ready for installation.

C. Store masonry units on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied. If units become wet, do not install until they are dry.
1. Protect concrete masonry units from moisture absorption so that, at the time of installation, the moisture content is not more than the maximum allowed at the time of delivery.

D. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.

E. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.

F. Deliver pre blended, dry mortar mix in moisture-resistant containers designed for lifting and emptying into dispensing silo. Store pre blended, dry mortar mix in delivery containers on elevated platforms, under cover, and in a dry location or in a metal dispensing silo with weatherproof cover.

G. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil

H. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, mortar, and soil that come in contact with such masonry.

1. Protect base of walls from rain-splashed mud and from mortar splatter by coverings spread on ground and over wall surface.
2. Protect sills, ledges, and projections from mortar droppings.
3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.
4. Turn scaffold boards near the wall on edge at the end of each day to prevent rain from splashing mortar and dirt onto completed masonry.

1.12 WORKMANSHIP

A. Contractor shall be responsible for correction of work not conforming to specified requirements. Correct deficient work as directed by Construction Manager.

B. Remove work found to be defective. Replace with new acceptable work.

PART 2 PRODUCTS

2.1 CONCRETE MASONRY UNITS

A. Materials General
1. Unit Masonry Standard: Comply with TMS 402/602/ACI 530.1/ASCE 6 “Specifications for Masonry Structures” except where exceeded by the requirements of the contract documents.
2. Fire Performance Characteristics: Where indicated, provide materials and construction identical to those of assemblies whose fire resistance has been determined in accordance with ASTM E 119 by a testing and inspecting organization, by equivalent concrete masonry thickness, or by another means as acceptable to authorities having jurisdiction.
3. Single-Source Responsibility for Masonry Units: Obtain exposed masonry units of uniform texture and color or uniform blend within ranges accepted for these characteristics from one manufacturer for each different product required for each continuous surface or visually related surfaces.
4. Single-Source Responsibility for Mortar Materials: Obtain mortar ingredients of uniform quality, including color for exposed masonry, from one manufacturer for each cementitious component and from one source and producer for each aggregate.

2.2 CONCRETE MASONRY UNITS

A. Concrete Masonry Units: Comply with referenced standards and as follows:
1. Lightweight block units shall not be used.
2. Size: Standard units with nominal face dimensions of 16 by 8 inches and nominal depths as indicated on drawings for specific locations.
   a. Manufactured to specified dimensions of 3/8 inch less than nominal widths by nominal heights by nominal lengths indicated in drawings. If not shown in drawings, use length to produce coursing with little or no cutting.
3. Special Shapes: Provide nonstandard blocks configured for corners, lintels, and control joint edges.
4. Load-Bearing Units: ASTM C90, normal weight.
   a. Hollow block, as indicated.
   b. Exposed Faces: Special color and texture where indicated.
   c. Strength: Minimum 2,000 psi @ 28 days.
5. Nonloadbearing Units: ASTM C129.
   a. Normal weight.
   b. Strength: Minimum 2,500 @ 28 days.
6. Pre-Faced Trim Units: ASTM C90, hollow block, with smooth resinous facing complying with ASTM C744.
   a. Facing Components: Facing ingredients must be manufacturer's compound made with polymers, supplied by the manufacturer to approved manufacturer's authorized fabricators

and other ingredients as required to meet or exceed manufacture's product standards including ASTM C 744.

b. Exterior use, smooth, satin finish, conforming to the manufacturer's latest published standards and ASTM C 744, ASTM C 67, paragraph 8 (freeze-thaw) and Thermal Shock Test B 100JL, 2 4 P.

c. Sizes: As indicated on drawings.

2.3 CLAY MASONRY UNITS

A. General: Comply with the following requirements applicable to each form of brick required:

1. Provide special molded shapes where indicated and as follows:

a. For applications requiring brick of form, color, texture, and size on exposed surfaces that cannot be produced by sawing standard brick sizes.

b. For applications where stretcher units cannot accommodate special conditions including those at corners, movement joints, bond beams, sashes, and lintels.

B. Provide units without frogs.

C. Provide units without cores where cores would be exposed to view

D. Face Brick: ASTM C216, Type FBS, Grade SW.

1. Color and texture to match match existing building..
2. Nominal size: match existing.
3. Compressive strength: 12,309 psi, average, measured in accordance with ASTM C67.
4. Initial Rate of Absorption: Less than 15.33% when tested per ASTM C 67.
5. Efflorescence: Provide brick that has been tested according to ASTM C 67 and is rated "not effloresce."
6. Surface Coloring: Brick with surface coloring, other than flashed or sand-finished brick, shall withstand 50 cycles of freezing and thawing per ASTM C 67 with no observable difference in the applied finish when viewed from 10 feet

E. Building (Common) Brick: ASTM C62, Grade SW; solid units.

1. Nominal size: 3-5/8" x 2-1/4" x 7-5/8".
2. Compressive strength: 3,000 psi, measured in accordance with ASTM C67/C67M.
3. Application: Use where brick is indicated for concealed locations.

2.4 MORTAR AND GROUT MATERIALS

A. Mortar and Grout: As specified in Section 04 0511.

2.5 REINFORCEMENT AND ANCHORAGE

A. General: Provide reinforcing steel complying with requirements of referenced unit masonry standard and this article.

B. All reinforcement and anchors for masonry, located in exterior walls, shall be hot dipped galvanized steel.

C. All reinforcement and anchors located in interior walls shall be hot dipped galvanized steel.

D. Reinforcing Steel: ASTM A615/A615M, Grade 60 (60,000 psi).

E. Deformed Reinforcing Wire: ASTM A 496.

F. Plain-Welded Wire Fabric: ASTM A 185.

G. Joint Reinforcement: Use ladder type joint reinforcement where vertical reinforcement is involved and truss type elsewhere, unless otherwise indicated.

H. Single Wythe Joint Reinforcement: ASTM A951/A951M.

1. Type: Truss.
2. Material: ASTM A1064/A1064M steel wire, hot dip galvanized after fabrication to ASTM A153/A153M, Class B.

3. Size: 0.1483 inch (9 ga.) side rods with 0.1483 inch (9 ga.) cross rods; width as required to provide not less than 5/8 inch of mortar coverage on each exposure. Flush weld all keys
4. Hohmann & Barnard - #120.

I. Multiple Wythe Joint Reinforcement: ASTM A951/A951M.
1. Type: Truss.
2. Material: ASTM A1064/A1064M steel wire, hot dip galvanized after fabrication to ASTM A153/A153M, Class B.
3. Size: 0.1483 inch (9 ga.) side rods with 0.1483 inch (9 ga.) cross rods; width as required to provide not less than 5/8 inch of mortar coverage on each exposure. Flush weld all keys.
4. Hohmann & Barnard - #130.

J. Masonry Veneer Anchors: 2-piece wall ties: Formed steel wire, 0.1875 inch thick, adjustable, eye and pintle type, hot dip galvanized to ASTM A 153/A 153M, Class B, sized to provide not less than 5/8 inch of mortar coverage from masonry face and to allow vertical adjustment of up to 1-1/4 in.
1. Truss Wire Size: 0.1483 inch (9 ga.) side rods with 0.1483 inch (9 ga.) cross rods; width as required to provide not less than 5/8 inch of mortar coverage on each exposure. Flush weld all keys.
2. Eye Wire: 3/16" dia.
3. Leg Hook: 3/16" dia. wire.

K. Partition Anchors: Partition anchors to provide lateral shear at upper limit of masonry wall with neoprene pad and anchor.
1. Hohmann & Barnard PTA-420 Series

2.6 EMBEDDED FLASHING MATERIALS

A. Sheet Metal Flashings and Trim - Refer to Section 07 6200 - Sheet Metal Flashing and Trim.

B. Combination Asphaltic Flashing Materials - Copper:
1. Copper/Asphalt Flashing: 3 oz/sq ft copper sheet bonded between 2 layers asphalt saturated glass fabric.
2. Width: 24".
3. Drip Plate: Stainless Steel. 3-1/2"Flat or Drip as shown on drawings.
4. Manufacturers:
a. Hohmann & Barnard, Inc; Copper Thru Wall Flashing C-Coat Flashing: www.h-b.com.
b. Substitutions: See Section 01 2500 - Substitution Procedures.
c. Hohmann & Barnard, Inc; Copper-Fabric NA: www.h-b.com/#sle.

C. Termination Bars: Stainless steel; compatible with membrane and adhesives.
1. Manufacturers:
a. Hohmann & Barnard, Inc; T2- FTS: www.h-b.com/#sle.

D. Drip Edge: Stainless steel; angled drip with hemmed edge and flat drip with hemmed edge as shown on drawings and compatible with membrane and adhesives.

E. Size: 3-1/2".
1. Manufacturers:
a. Hohmann & Barnard, Inc; FTSA Drip plate : www.h-b.com/#sle.
b. Substitutions: See Section 01 2500 - Substitution Procedures.

F. Lap Sealants and Tapes: As recommended by flashing manufacturer; compatible with membrane and adhesives.

2.7 ACCESSORIES

A. Joint Filler: Closed cell polyvinyl chloride; oversized 50 percent to joint width; self expanding; in maximum lengths available.
1. Manufacturers:

a. Hohmann & Barnard, Inc; -: www.h-b.com/sle.
b. Substitutions: See Section 01 2500 - Substitution Procedures.

B. Cavity Mortar Control: Semi-rigid high density polyethylene panels, sized to thickness of wall cavity, and designed to prevent mortar droppings from clogging weeps and cavity vents and allow proper cavity drainage.
1. Size: 10" high x 4' x thickness as required.
2. Manufacturers:
a. Hohmann & Barnard, Inc; Mortar Trap.

C. Weeps:
1. Type: Polypropylene.
2. Size: 3/8" thick x 3" wide x 2 ½" tall.
3. Manufacturers:
a. Hohmann & Barnard, Inc; QV - Quadro-Vent: www.h-b.com/sle.
b. Substitutions: See Section 01 2500 - Substitution Procedures.

D. Reinforcing Bar Positioners: Wire units designed to fit into mortar bed joints spanning masonry unit cells with loops for holding reinforcing bars in center of cells. Units are formed from 0.1483-inch steel wire, hot-dip galvanized after fabrication.
1. Provide units with either two loops or four loops as needed for number of bars indicated.
a. Hohmann & Barnard, Inc. #RB Rebar Positioner

2.8 MASONRY CLEANERS

A. Manufacturer's standard-strength cleaner designed for removing mortar/grout stains, efflorescence, and other new construction stains from new masonry without discoloring or damaging masonry surfaces. Use product expressly approved for intended use by cleaner manufacturer and manufacturer of masonry units being cleaned.
1. Products: :
a. Cleaners for Red and light-colored Brick Not Subject to Metallic Staining with Mortar Not Subject to Bleaching:
a) ProSoCo, Inc.Sure Klean No. 600 Detergent
b. Substitutions: See Section 01 2500 - Substitution Procedures

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine conditions with installer on-site for compliance with requirements for installation tolerances and other conditions affecting performance of unit masonry.
1. For record, prepare written report, endorsed by installer, listing conditions detrimental to performance of unit masonry.
2. Verify that foundations are within tolerances specified.
3. Verify that reinforcing dowels are properly placed.
4. Verify that substrates are free of substances that impair mortar bond.
5. Verify that field conditions are acceptable and are ready to receive masonry.
6. Verify that related items provided under other sections are properly sized and located.
7. Verify that built-in items are in proper location, and ready for roughing into masonry work.

B. Examine rough in and built in construction to verify actual locations of piping connections prior to installation.

C. Examine mechanical vibrators to be used for grout consolidation prior to grout delivery to verify vibrators are in proper working order.

D. Notify Construction Manager if construction is not acceptable.

E. Do not proceed with construction until unacceptable conditions have been corrected.

3.2 PREPARATION

A. Provide temporary bracing during installation of masonry work. Maintain in place until building structure provides permanent bracing.

3.3 COLD AND HOT WEATHER REQUIREMENTS

A. Maintain materials and surrounding air temperature to minimum 40 degrees F prior to, during, and 48 hours after completion of masonry work or as required by TMS 402/602.

B. Maintain materials and surrounding air temperature to maximum 90 degrees F prior to, during, and 48 hours after completion of masonry work or as required by TMS 402/602.

1. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions. Comply with cold-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602 IMIAC and the following:
    a. When the ambient temperature is within the limits indicated, use the following procedures:
        a) 40 to 32 deg F (4 to 0 deg C): Heat mixing water or sand to produce mortar temperatures between 40 and 120 deg F (4 and 49 deg C).
        b) 32 to 25 deg F (0 to -4 deg C): Heat mixing water and sand to produce mortar temperatures between 40 and 120 deg F (4 and 49 deg C). Heat grout materials to produce grout temperatures between 40 and 120 deg F (4 and 49 deg C). Maintain mortar and grout above freezing until used in masonry.
        c) 25 to 20 deg F (-4 to -7 deg C): Heat mixing water and sand to produce mortar temperatures between 40 and 120 deg F (4 and 49 deg C). Heat grout materials to produce grout temperatures between 40 and 120 deg F (4 and 49 deg C). Maintain mortar and grout above freezing until used in masonry. Heat masonry units to 40 deg F (4 deg C) if grouting. Use heat on both sides of walls under construction.
        d) 20 deg F (-7 deg C) and Below: Heat mixing water and sand to produce mortar temperatures between 40 and 120 deg F (4 and 49 deg C). Heat grout materials to produce grout temperatures between 40 and 120 deg F (4 and 49 deg C). Maintain mortar and grout above freezing until used in masonry. Heat masonry units to 40 deg F (4 deg C). Provide enclosures and use heat on both sides of walls under construction to maintain temperatures above 32 deg F (0 deg C) within the enclosures.
        e) Cold-Weather Protection: When the mean daily temperature is within the limits indicated, provide the following protection:
            (a) 40 to 25 deg F (4 to -4 deg C): Cover masonry with a weather-resistant membrane for 48 hours after construction.
            (b) 25 to 20 deg F (-4 to -7 deg C): Cover masonry with insulating blankets or provide enclosure and heat for 48 hours after construction to prevent freezing. Install wind breaks when wind velocity exceeds 15 mi./h (25 km/h).
            (c) 20 deg F (-7 deg C) and Below: Provide enclosure and heat to maintain temperatures above 32 deg F (0 deg C) within the enclosure for 48 hours after construction.
        f) Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F and above and will remain so until masonry has dried, but not less than 7 days after completing cleaning.
2. Hot-Weather Requirements: Protect unit masonry work when temperature and humidity conditions produce excessive evaporation of water from mortar and grout. Provide artificial shade and wind breaks and use cooled materials as required.
    a. When ambient temperature exceeds 100 deg F, or 90 deg F with a wind velocity greater than 8 mph, do not spread mortar beds more than 48 inches ahead of masonry. Set masonry units within one minute of spreading mortar.

b. Verify moister content in brick. If dry wet bricks prior to installation.
   a) Comply with the requirements of IMIAC.

3.4 PROJECT CONDITIONS

A. Protection of Masonry: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.
   1. Extend cover a minimum of 24 inches down both sides and hold cover securely in place.
   2. Where one wythe of multi wythe masonry walls is completed in advance of other wythes, secure cover a minimum of 24 inches down face next to un constructed wythe and hold cover in place.
   3. Do not apply uniform floor or roof loads for at least 12 hours and concentrated loads for at least 3 days after building masonry walls or columns.
   4. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, mortar, and soil that come in contact with such masonry.
      a. Protect base of walls from rain-splashed mud and from mortar splatter by coverings spread on ground and over wall surface.
      b. Protect sills, ledges, and projections from mortar droppings.
      c. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.
      d. Turn scaffold boards near the wall on edge at the end of each day to prevent rain from splashing mortar and dirt onto completed masonry.
   5. **Under no circumstances shall masonry installation cease or be delayed due to the weather conditions. Installation shall continue using procedures listed above.**

3.5 LAYING MASONRY WALLS

A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint widths and for accurate locating of openings, movement-type joints, returns, and offsets.

B. Lay up walls to comply with specified construction tolerances, with courses accurately spaced and coordinated with other construction.

C. Bond Pattern for Exposed Masonry: Lay exposed masonry as follows unless indicated otherwise in drawings:
   1. Do not use units with less than nominal 4?inch horizontal face dimensions.
   2. One-half running bond with vertical joint in each course centered on units in courses above and below.
   3. Avoid use of less than half sized units at corners, jambs, and where possible at other locations.
   4. Where indicated in drawings, match coursing, bonding, color, and texture of new masonry with existing masonry.
   5. Toothe in new masonry to existing at all locations.

D. Lay concealed masonry with units in wythe in running bond or bonded by lapping not less than 4 inches. Bond and interlock each course of each wythe at corners. Do not use units with less than nominal 4?inch-horizontal face dimensions at corners or jambs.

E. Stopping and Resuming Work: In each course, rack back one-half unit length for one-half running bond or one-third unit length for one third running bond. Do not tooth. Clean exposed surfaces of set masonry. Wet clay masonry units lightly if required. Remove loose masonry units and mortar prior to laying fresh masonry.

F. Built-In Work: As construction progresses, build-in items specified under this and other sections of specifications. Fill in solidly with masonry around built-in items.
   1. Fill space between hollow-metal frames and masonry solidly with mortar unless otherwise indicated.

a. At exterior frames, insert extruded polystyrene board insulation around perimeter of frame in thickness indicated but not less than 3/4 inch to act as thermal break between frame and masonry.

2. Where built-in items are to be embedded in cores of hollow masonry units, place layer of metal lath in joint below and rod mortar or grout into core.

3. Fill cores in hollow concrete masonry units with grout three courses (24 inches) under bearing plates, beams, lintels, posts, and similar items unless otherwise indicated.

G. Build chases and recesses as shown or required to accommodate items specified in this and other sections of specifications. Provide not less than 8 inches of masonry between chase or recess and jamb of openings and between adjacent chases and recesses.

H. Leave openings for equipment to be installed before completion of masonry. After installation of equipment, complete masonry to match construction immediately adjacent to opening.

I. Nonbearing Interior Partitions: Build full height of story to underside of solid floor or roof structure above and as follows.

1. Install compressible filler in joint between top of partition and underside of structure above. Brace top of wall as shown in drawings.

J. Temporary Formwork and Shores: Construct formwork and shores to support reinforced masonry elements during construction.

1. Construct formwork to conform to shape, line, and dimensions shown. Make sufficiently tight to prevent mortar and grout leakage. Brace, tie, and support forms to maintain position and shape during construction and curing of reinforced masonry.

2. Do not remove forms and shores until reinforced masonry members have hardened sufficiently to carry their own weight and other temporary loads that may be placed on them during construction.

3.6 INSTALLATION OF MASONRY UNITS

A. General: Comply with referenced unit masonry standard and other requirements indicated applicable to each type of installation included in project.

1. Masonry units shall be laid true, level, plumb and in uniform coursing in accordance with drawings. Corners and angles shall be square unless otherwise indicated in drawings.

2. Lay only dry concrete masonry units. Do not wet concrete masonry units unless approved.

3. Adjust masonry units into final position while mortar is soft and plastic. If units are displaced after mortar has stiffened, remove mortar, clean joints and units, and relay units with fresh mortar.

4. Thickness: Build cavity and composite walls and other masonry construction to full thickness shown. Build single-wythe walls to actual thickness of masonry units using units of nominal thickness indicated.

5. Use full-sized units without cutting where possible. Cut masonry units with motor-driven saws to provide clean, sharp, unchipped edges. Cut units as required to provide continuous pattern and to fit adjoining construction.

6. Use concrete brick as miscellaneous infill at pockets and elsewhere as needed.

B. Select and arrange units for exposed unit masonry to produce a uniform blend of colors and textures. Mix units from several pallets or cubes as they are placed.

C. Matching Existing Masonry: Match coursing, bonding, color, and texture of existing masonry.

D. Wetting of Brick: Wet brick before laying if initial rate of absorption exceeds 30 g/30 sq. in. per minute when tested according to ASTM C 67. Allow units to absorb water so they are damp but not wet at time of laying.

3.7 MORTAR BEDDING AND JOINTING

A. Mortar joint at foundation shall not be less than ¼ inch or more than ¾ inch in thickness. Provide full mortar coverage for bed joint at foundation, except do not project mortar into cells to be grouted. Fill

head and bed joints of hollow units with mortar for thickness of face shell. Solid units shall have full head and bed joints.

B. Set stone units in full bed of mortar with vertical joints slushed full. Fill dowel, anchor, and similar holes solid. Wet stone joint surface thoroughly before setting. For stone surfaces that are soiled, clean bedding and exposed surfaces with fiber brush and soap powder and rinse thoroughly with clear water.

C. If it is necessary to remove a unit after it has been set in place, remove unit, clean, and set in fresh mortar.

D. Nominal mortar joint thickness shall be 3/8 + 1/8 inch for precision units and 1/2 + 1/8 inch for slumped units.

E. Mortar joints with wire reinforcement shall be at least twice the wire diameter of the wire.

F. Mortar joints shall be straight, clean, and uniform in thickness.

G. Unless otherwise specified or noted in drawings, tool mortar joints with a concave surface except for the following:
   1. Walls to be plastered shall have flush cut or sacked mortar joints.
   2. Walls to be concealed by other materials shall have flush cut joints.
   3. For joints facing cavities/air spaces, strike joints flush. No voids allowed.

H. Perform tooling when mortar is partially set but still sufficiently plastic to bond. Tooling shall be performed with a tool that compacts mortar.

I. Place and construct control joints as shown in drawings. Keep joints clean from mortar drippings and other debris.

3.8 INSTALLATION OF REINFORCING STEEL

A. Place reinforcement as detailed in drawings. Secure against displacement prior to grouting. Horizontal bars may rest on cross web of hollow units.

B. Tolerances for placement of reinforcing steel in walls and flexural members shall be as follows:
   1. Plus/minus 1/2 inch for d equal to 8 inches or less.
   2. Plus/minus 1 inch for d equal to 24 inches or less but greater than 8 inches.
   3. Plus/minus 1 ½ inches for d equal to 24 inches or less.
   4. Plus/minus 2 inches for longitudinal location of reinforcement.

C. Clearance between reinforcing steel and surface of masonry shall not be less than ¼ inch for fine grout and ½ inch for coarse grout.

D. Lap reinforcing bars as shown in drawings.

E. Positioners: Provide positioners to maintain position of vertical reinforcing bars at each lap splice or at maximum spacing of 10 feet, whichever is less. Where these positioners are within ½ inch of surface of masonry, galvanize according to ASTM Standard A 153.

F. Provide continuous bond beams reinforced with two No. 5 bars at floors, roof, and tops of parapets unless otherwise noted. Provide corner bars same size as continuous reinforcing in wall corners and intersections, lapped 2 feet with continuous reinforcing.

G. Provide minimum vertical reinforcing of one No. 4 bar in window and door jambs, at ends of walls, corners, and each side of vertical control joints. Locate bar maximum 16 inches from end of CMU. If typical vertical wall reinforcing noted is larger than No. 4, use larger size.

3.9 HORIZONTAL JOINT REINFORCEMENT

A. General: Provide continuous horizontal joint reinforcement as indicated. Install longitudinal side rods fully embedded in mortar for their entire length with minimum cover of 5/8 inch on exterior side of walls, 1/2 inch elsewhere. Lap reinforcing minimum 8 inches.
   1. Install single-wythe horizontal joint reinforcing in concrete masonry veneer at 16 inches on center vertically unless noted otherwise.

2. Provide additional joint reinforcement not more than 8 inches above and below wall openings and extending at least 12 inches beyond openings.
3. Cut or interrupt joint reinforcement at control and expansion joints unless otherwise indicated.
4. Provide continuity at corners by use of prefabricated "L" sections. Cut and bend reinforcement units as directed by manufacturer for continuity at returns, offsets, column fireproofing, pipe enclosures, and other special conditions.

B. Intersecting and Abutting Walls: Unless vertical expansion or control joints are shown at juncture, provide continuity with:
1. Horizontal joint reinforcement using prefabricated "T" sections.
a. Rigid metal anchors at 48 inches on-center.

3.10 GROUTING

A. General
1. Use grout to fill masonry. Do not use mortar.
2. Reinforcement must be in place prior to grouting.
3. Install vertical grout dams at maximum horizontal spacing of 30 feet to control horizontal flow of grout. For walls partially grouted, use expanded metal lath mesh or other material that will not interfere with bond to restrict grout into only those cells that are to be grouted.
4. After mortar joints have set, remove protruding mortar fins that excessively constrict grout space.
5. Do not place grout until entire height of masonry to be grouted has attained sufficient strength to resist grout pressure.
6. Grout to 1½ inches below top of masonry units for each lift to form and interlock with subsequent masonry and grouting. Where bond beams occur, stop grout pour minimum 1½ inch below top of masonry. At top of masonry, fill grout space flush with tops of units and consolidate.
7. Solidly grout cells and spaces containing reinforcing steel for partially grouted walls. For solid grouted walls, grout all cells.
8. Consolidate grout using mechanical vibrator and reconsolidate using mechanical vibrator after excess water is absorbed into masonry units.
a. Do not consolidate or reconsolidate self-consolidating grout.

B. Low Pour Grouting:
1. Construct masonry wall up to 5 feet 4 inches pour height (vertically) at a time. Minimum height of grout lift creating a cold joint shall equal splice length of reinforcing indicated in drawings.
2. Install vertical and horizontal reinforcing steel, anchors, and embedded items as masonry work progresses.
3. Grout walls in 5 foot 4 inch maximum lifts, consolidating and reconsolidating each lift. Stop grout 1½ inch below top of top course.
a. Do not consolidate or reconsolidate self-consolidating grout.

C. High Pour Grouting
1. Construct masonry wall up to 24 feet maximum pour height without grouting.
2. Provide cleanout openings at base of wall:
a. At vertical reinforcing bars.
b. At spacing of no more than 32 inches on center for solid grouted walls.
c. At spacing of no more than 48 inches on center for partially grouted walls.
3. Install horizontal reinforcing steel, anchors, and embedded items as masonry work progresses. Vertical reinforcing steel may be placed during or after wall is constructed but must be secured in place prior to grouting.
4. Provide positioners to secure vertical reinforcement in correct location.
5. Remove mortar droppings and other debris through cleanouts at base of wall. After cleanouts have been inspected, seal and brace cleanouts.
6. Grout walls in 5 foot 4 inch maximum lifts, consolidating and reconsolidating each lift.

a. Do not consolidate or reconsolidate self-consolidating grout.
b. Alternate Lift Height: Where the following conditions are met, maximum lift height may be increased to 12 foot 8 inches:
a) Masonry wall must be cured for a minimum of 4 hours.
b) No intermediate horizontal reinforcing steel (bond beam) is present.

7. If grouting is to be stopped for more than one hour during a pour, stop grout 1½ inch below top of uppermost grouted unit (top of pour). Where additional masonry is to be laid above a given pour, stop grout 1½ inch below top of top course.

3.11 BONDING CAVITY WALLS/MULTIWYTHE MASONRY

A. Bond wythes together using the following method:
1. Individual Two-Piece Wire Ties: Use continuous horizontal joint reinforcing with individual ties installed in horizontal joints spaced not to exceed 16 inches on-center horizontally and 16 inches on-center vertically. Stagger ties in alternate courses. Provide additional ties within 12 inches of openings and space not more than 8 inches on-center around perimeter of openings. Provide two-piece adjustable ties where wythes do not align.

3.12 ANCHORED MASONRY VENEER TO LIGHT-GAUGE BACKUP WALLS

A. Anchor single-wythe masonry veneer to metal studs with masonry veneer anchors to comply with the following requirements:
1. Fasten each anchor section through sheathing and insulation to metal studs as indicated.
2. Install Self-Sealing Tape behind anchor sections.
3. Embed tie section in masonry joints. Provide not less than 2?inch air space between back of masonry veneer wythe and face of sheathing or insulation.
4. Locate anchor section relative to course in which tie section is embedded to allow maximum vertical differential movement of tie up and down.
5. Space anchors as indicated but not more than 16 inches on-center vertically and horizontally. Install additional anchors within 1 foot of openings and at intervals around perimeter not exceeding 8 inches.

B. If masonry veneer is concrete-masonry, provide single-wythe joint reinforcing at 16 inches vertically, staggered with ties.

3.13 ANCHORING MASONRY TO STRUCTURAL MEMBERS

A. Anchor masonry to structural members where masonry abuts or faces structural members to comply with the following:
1. Provide open space not less than 1 inch wide between masonry and structural member unless otherwise indicated. Keep open space free of mortar or other rigid materials.
2. Anchor masonry to structural members with adjustable anchors embedded in masonry joints and attached to structure.
3. Space anchors as indicated but not more than 16 inches on center vertically and horizontally.

3.14 MOVEMENT (CONTROL AND EXPANSION) JOINTS

A. General: Install control and expansion joints in unit masonry where indicated. Build in related items as masonry progresses. Do not form continuous span through movement joints unless provisions are made to prevent in-place restraint of wall or partition movement.

B. Form control joints in concrete masonry as follows:
1. Install preformed control joint gaskets designed to fit standard sash block.
2. Fit bond-breaker strips into hollow contour in ends of CMUs on one side of control joint. Fill resultant core with grout and rake out joints in exposed faces for application of sealant.
3. Unless noted otherwise in drawings, continue reinforcing in bond beams through control joints. Rake vertical joint on each side and provide backer rod and sealant in joint.

C. Form expansion joints in brick made from clay or shale as follows:

1. Build flanges of factory-fabricated expansion joint units into masonry.
2. Build in compressible joint fillers where indicated.
3. Form open joint of width indicated but not less than 3/8 inch for installation of sealant and backer rod specified in Division 7. Maintain joint free and clear of mortar.

D. Install nonmetallic expansion joint strips at building expansion joints.

3.15 LINTELS

A. Install steel lintels where indicated.

B. Provide masonry lintels where shown and wherever openings of more than 1 foot for brick-sized units and 2 feet for block-sized units are shown without structural steel or other supporting lintels. Provide precast or formed in-place masonry lintels. Cure precast lintels before handling and installing. Temporarily support formed in-place lintels.

1. For hollow concrete masonry unit walls, use specially formed bond beam units with reinforcement bars filled with coarse grout.

C. Provide minimum bearing of 8 inches at each jamb unless otherwise indicated.

3.16 CAVITIES/AIR SPACES

A. Keep cavities/air spaces clean of mortar droppings and other materials during construction. Strike joints facing cavities/air spaces flush. No voids are allowed.

B. Install cavity drainage material as indicated in Architectural drawings.

C. For rigid insulation, install small pads of adhesive spaced approximately one foot on-center both ways on inside face or attach to inside face with plastic fasteners designed for this purpose. Fit courses of insulation between wall ties and other confining obstructions in cavity, with edges butted tightly both ways. Press units firmly against inside wythe of masonry or other construction as shown.

1. Fill cracks and open gaps in insulation with crack sealer compatible with insulation and masonry.

3.17

3.18 COURSING

A. Establish lines, levels, and coursing indicated. Protect from displacement.

B. Maintain masonry courses to uniform dimension. Form vertical and horizontal joints of uniform thickness.

C. Concrete Masonry Units:

1. Bond: Running match existing and new.
2. Coursing: One unit and one mortar joint to equal 8 inches.
3. Mortar Joints: Concave.

D. Brick Units:

1. Bond: Match existing.
2. Coursing: Three units and three mortar joints to equal 8 inches.
3. Mortar Joints: Concave.

3.19 PLACING AND BONDING

A. General: Comply with referenced unit masonry standard and other requirements indicated applicable to each type of installation included in project.

1. Masonry units shall be laid true, level, plumb and in uniform coursing in accordance with drawings. Corners and angles shall be square unless otherwise indicated in drawings.
2. Lay only dry concrete masonry units. Do not wet concrete masonry units unless approved.
3. Adjust masonry units into final position while mortar is soft and plastic. If units are displaced after mortar has stiffened, remove mortar, clean joints and units, and relay units with fresh mortar.

4. Thickness: Build cavity and composite walls and other masonry construction to full thickness shown. Build single-wythe walls to actual thickness of masonry units using units of nominal thickness indicated.
5. Use full-sized units without cutting where possible. Cut masonry units with motor-driven saws to provide clean, sharp, unchipped edges. Cut units as required to provide continuous pattern and to fit adjoining construction.

B. Wetting of Brick: Wet brick before laying if initial rate of absorption exceeds 30 g/30 sq. in. per minute when tested according to ASTM C 67. Allow units to absorb water so they are damp but not wet at time of laying.

C. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint widths and for accurate locating of openings, movement-type joints, returns, and offsets.

D. Layup walls to comply with specified construction tolerances, with courses accurately spaced and coordinated with other construction.

E. Bond Pattern for Exposed Masonry: Lay exposed masonry as follows unless indicated otherwise in drawings:
1. Match Existing Bond.
2. Do not use units with less than nominal 4-inch horizontal face dimensions.
3. Avoid use of less-than-half-sized units at corners, jambs, and where possible at other locations.
4. Where indicated in drawings, match coursing, bonding, color, and texture of new masonry with existing masonry bond.

F. Lay concealed masonry with units in wythe in running bond or bonded by lapping not less than 4 inches.
1. Bond and interlock each course of each wythe at corners. Do not use units with less than nominal 4-inch- horizontal face dimensions at corners or jambs.

G. Leave openings for equipment to be installed before completion of masonry. After installation of equipment, complete masonry to match construction immediately adjacent to opening.

H. Nonbearing Interior Partitions: Build full height of story to underside of solid floor or roof structure above and as follows.
1. Install compressible filler in joint between top of partition and underside of structure above. Brace top of wall as shown in drawings.

I. Lay solid masonry units in full bed of mortar, with full head joints, uniformly jointed with other work.

J. Lay hollow masonry units with face shell bedding on head and bed joints.

K. Remove excess mortar and mortar smears as work progresses.

L. Do not shift or tap masonry units after mortar has achieved initial set. Where adjustment must be made, remove mortar and replace.

M. Perform job site cutting of masonry units with proper tools to provide straight, clean, unchipped edges. Prevent broken masonry unit corners or edges.

N. Cut mortar joints flush where wall tile is scheduled or resilient base is scheduled.

O. Isolate masonry partitions from vertical structural framing members with a control joint as indicated.

P. Isolate top joint of masonry partitions from horizontal structural framing members and slabs or decks with compressible joint filler.

Q. Stopping and Resuming Work: In each course, rack back one-half unit length for one-half running bond or one-third unit length for one-third running bond. Do not tooth. Clean exposed surfaces of set masonry. Wet clay masonry units lightly if required. Remove loose masonry units and mortar prior to laying fresh masonry.

3.20 WEEPS/CAVITY VENTS

A. Install weeps in veneer walls at 24 inches on center horizontally directly as shown on drawings.

3.21 CAVITY MORTAR CONTROL

A. Do not permit mortar to drop or accumulate into cavity air space or to plug weep/cavity vents.

B. For cavity walls, build inner wythe ahead of outer wythe to accommodate accessories.

C. Install cavity mortar control panels continuously throughout full height of exterior masonry cavities during construction of exterior wythe, complying with manufacturer's installation instructions.

D. Install mortar diverter at every floor level. For wall cavities that exceed 11' in height, place an additional continuous trapezoidal strip on wall reinforcing anchors/ties at every 9' to 11' of wall height.

E. Flashing should extend at least 6" above the top of mortar diverter, as should any other materials used to fill space between mortar diverter and inside cavity surface.

F. No more than 1/4" should be left between mortar diverter and cavity's inside surface (flashing or filler).

G. Installing Cavity-Wall Insulation:

1. For attachment to metal framing backup anchor thru insulation and sheathing into the metal stud using masonry anchors specified. Butt joints tightly both ways. Install tongue and groove panels with tongue in the up position.
    a. Seal all joints between insulation board units in cavity with joint sealing tape, to form a tight seal at all joints, including areas around masonry anchors and other openings. Fill voids in completed installation with adhesive, mastic, or sealant as recommended by insulation manufacturer.
2. For attachment to masonry backup place small dabs of adhesive, spaced approximately 12 inches o.c. both ways, on inside face of insulation boards, or attach with plastic fasteners designed for this purpose. Fit courses of insulation between wall ties and other confining obstructions in cavity, with edges butted tightly both ways. Press units firmly against inside wythe of masonry or other construction as shown.

3.22 MASONRY FLASHINGS

A. Whether or not specifically indicated, install masonry flashing to divert water to exterior at all locations where downward flow of water will be interrupted.

1. Extend flashings full width at such interruptions and at least 6 inches, minimum, into adjacent masonry or turn up flashing ends at least 1 inch, minimum, to form watertight pan at nonmasonry construction.
2. Remove or cover protrusions or sharp edges that could puncture flashings.
3. Seal lapped ends and penetrations of flashing before covering with mortar.

B. Terminate flashing up 8 inches minimum on vertical surface of backing:

C. Lap end joints of flashings at least 4 inches and seal watertight with mastic or elastic sealant.

D. Install flashing a minimum of 6" above cavity mortar drainage system.

3.23 CONTROL AND EXPANSION JOINTS

A. Do not continue horizontal joint reinforcement through control or expansion joints.

B. Size control joint in accordance with Section 07 9200 - Joint Sealants for sealant performance.

C. Form expansion joint as detailed on drawings.

3.24 TOLERANCES

A. Maximum Variation from Alignment of Columns: 1/4 inch.

B. Maximum Variation From Unit to Adjacent Unit: 1/16 inch.

C. Maximum Variation from Plane of Wall: 1/4 inch in 10 ft and 1/2 inch in 20 ft or more.

D. Maximum Variation from Plumb: 1/4 inch per story non-cumulative; 1/2 inch in two stories or more.

E. Maximum Variation from Level Coursing: 1/8 inch in 3 ft and 1/4 inch in 10 ft; 1/2 inch in 30 ft.

F. Maximum Variation from Cross Sectional Thickness of Walls: 1/4 inch.

3.25 CUTTING AND FITTING

A. Cut and fit for pipes and conduit. Coordinate with other sections of work to provide correct size, shape, and location.

B. Obtain approval prior to cutting or fitting masonry work not indicated or where appearance or strength of masonry work may be impaired.

3.26 FIRE RATED WALL MARKING AND IDENTIFICATION

A. For all masonry walls or partitions indicated to be fire rated, or smoke rated, where there is an accessible concealed floor, ceiling or attic space adjacent to said wall. Contractor shall permanently mark with signs or stenciling within he concealed space, in accordance with IBC 703.7 in concealed spaces.
   1. Identifications shall be located within 15 feet of the end of each wall or partition and at intervals not exceeding 30 feet measured horizontally along the wall or partition.
   2. Identifications shall include lettering not less than 3 inches in height with a minimum 3/8 inch stroke width in a contrasting color incorporating the wording " FIRE AND/OR SMOKE BARRIER – PROTECT ALL OPENINGS".

3.27 CLEANING

A. Remove excess mortar and mortar droppings.

B. Replace defective mortar. Match adjacent work.

C. Clean soiled surfaces with cleaning solution.

D. Use non-metallic tools in cleaning operations.

E. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Install new units to match adjoining units; install in fresh mortar, pointed to eliminate evidence of replacement.

F. Pointing: During the tooling of joints, enlarge voids and holes, except weep holes, and completely fill with mortar. Point up joints, including corners, openings, and adjacent construction, to provide a neat, uniform appearance. Prepare joints for sealant application.

G. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.

H. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:
   1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
   2. Test cleaning methods on sample wall panel; leave one-half of panel un cleaned for comparison purposes. Obtain Owner's representative 's approval of sample cleaning before proceeding with cleaning of masonry.
   3. Protect adjacent stone and non masonry surfaces from contact with cleaner by covering them with liquid strippable masking agent, polyethylene film, or waterproof masking tape.
   4. Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing the surfaces thoroughly with clear water.
   5. Clean masonry with a proprietary acidic cleaner applied according to manufacturer's written instructions.

3.28 PROTECTION

A. Without damaging completed work, provide protective boards at exposed external corners that are subject to damage by construction activities.

3.29 MASONRY WASTE DISPOSAL

A. Excess Masonry Waste: Remove excess, clean masonry waste that cannot be used as fill, as described above, and other masonry waste, and legally dispose of off Owner's property

END OF SECTION

SECTION 05 5000
METAL FABRICATIONS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SECTION INCLUDES

A. Shop fabricated steel items.

B. Steel framing for dunnage for mechanical equipment and miscellaneous equipment.

C. Steel framing and supports for applications where framing and supports are not specified in other Sections.

D. Loose lintel where indicated.

E. Roof ladder.

1.3 RELATED REQUIREMENTS

A. Section 01 4000 - Quality Requirements for testing requirements and procedures.

B. Division 7 for roofing and sheet metal flashings for roof penetrations and installations associated with steel support roof framing.

C. Section 09 9113 - Exterior Painting: Paint finish.

D. Section 09 9123 - Interior Painting: Paint finish.

1.4 REFERENCE STANDARDS

A. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2014.

B. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.

C. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2016a.

D. ASTM A283/A283M - Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates; 2013.

E. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes; 2013.

F. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination; 2012.

G. AWS B2.1/B2.1M - Specification for Welding Procedure and Performance Qualification; 2014 (Amended 2015).

H. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2015, with Errata (2016).

I. AWS D1.2/D1.2M - Structural Welding Code - Aluminum; 2014, with Errata.

J. SSPC-SP 2 - Hand Tool Cleaning; 1982, with Editorial Revision (2004).

1.5 PERFORMANCE REQUIREMENTS

A. Structural Performance of Ladders: Provide ladders capable of withstanding the effects of loads and stresses within limits and under conditions specified in ANSI A14.3.

B. Thermal Movements: Provide exterior metal fabrications that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces

1.6 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: For the following:
   1. Miscellaneous framing for mechanical/electrical equipment.
   2. Lintels
   3. Interior roof ladders.
   4. Paint products.
   5. Black Iron

C. Shop Drawings: Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories. Include erection drawings, elevations, and details where applicable.
   1. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.
   2. Design data: Submit drawings and supporting calculations, signed and sealed by a qualified professional structural engineer.
   3. For installed products indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer, licensed in the State of NY responsible for their preparation.

D. Welders' Qualification Statement: Welders' certificates in accordance with AWS B2.1/B2.1M and dated no more than 12 months before start of scheduled welding work.

1.7 QUALITY ASSURANCE

A. Fabricator Qualifications: A qualified steel fabricator that is accredited by IAS AC172.

B. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in the State of NY and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of cold-formed metal framing that are similar to those indicated for this Project in material, design, and extent.

C. Welding: Qualify procedures and personnel according to the following:
   1. AWS D1.1, "Structural Welding Code--Steel."

1.8 PROJECT CONDITIONS

A. Field Measurements: Verify actual locations of walls and other construction contiguous with metal fabrications by field measurements before fabrication and indicate measurements on Shop Drawings.
   1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating metal fabrications without field measurements. Coordinate wall and other contiguous construction to ensure that actual dimensions correspond to established dimensions.
   2. Provide for trimming and fitting at site.

1.9 COORDINATION

A. Coordinate installation of anchorages for metal fabrications. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

B. Coordinate with Plumbing, Mechanical, and Electrical Contractor's equipment prefabricated equipment, curbs, portals, and conduit.

PART 2 PRODUCTS

2.1 MATERIALS - STEEL

A. Steel Sections: ASTM A36/A36M.

B. Steel Tubing: ASTM A501/A501M hot-formed structural tubing.

C. Plates: ASTM A283/A283M.

D. Pipe: ASTM A53/A53M, Grade B Schedule 40, black finish.

E. Bolts, Nuts, and Washers: ASTM A 325 (ASTM A 325M), Type 1, galvanized to ASTM A 153/A 153M where connecting galvanized components.

F. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.

G. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations Section 01 6116 - Volatile Organic Compound (VOC) Content Restrictions.

H. Touch-'Up Primer for Galvanized Surfaces: Refer to Section 09 9113 Exterior Painting.

2.2 FABRICATION

A. Shop Assembly: Preassemble items in the shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.

B. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch, unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.

C. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work

D. Fit and shop assemble items in largest practical sections, for delivery to site.

E. Fabricate items with joints tightly fitted and secured.

F. Weld corners and seams continuously to comply with the following:
   1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
   2. Do not use ferrous material and equipment on stainless steel components.
   3. Obtain fusion without undercut or overlap.
   4. Remove welding flux immediately.
   5. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface

G. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.

H. Furnish components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.

2.3 FASTENERS

A. General: Unless otherwise indicated, provide Type 304 stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B 633, Class Fe/Zn 5, at exterior walls. Provide stainless-steel fasteners for fastening aluminum. Select fasteners for type, grade, and class required.

B. Expansion Anchors: Anchor bolt and sleeve assembly with capability to sustain, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E 488, conducted by a qualified independent testing agency.
   1. Material for Anchors in Exterior Locations: Alloy Group 1 stainless-steel bolts complying with ASTM F 593 and nuts complying with ASTM F 594

2.4 FABRICATED ITEMS

A. Vertical Ladder
   1. Basis of Design: O'Keefe's Inc.Model 501, 100 N Hill Drive, Suite 12, Brisbane, CA 94005. Toll Free Tel: (888) 653-3333.
   2. Materials
      a. Aluminum Sheet: Alloy 5005-H34 to comply with ASTM B209.

b. Aluminum Extrusions: Alloy 6005-T5 to comply with ASTM B221.

B. Lintels: As detailed; Fabricate and prime paint. Refer to Section 09 9123 for finish coat..
1. Fabricate loose steel lintels from steel angles and shapes of size indicated for openings and recesses in masonry walls and partitions at locations indicated. Weld adjoining members together to form a single unit where indicated
2. Size loose lintels to provide bearing length at each side of openings equal to 1/12 of clear span but not less than 8 inches, unless otherwise indicated.
3. Galvanize loose steel lintels located in exterior walls.
4. Refer to Lintel Schedule on drawings.

2.5 MISCELLANEOUS MATERIALS

A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.

2.6 MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Provide steel framing and supports not specified in other Sections as needed to complete the Work.

B. Fabricate units from steel shapes, plates, and bars of welded construction, unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction retained by framing and supports. Cut, drill, and tap units to receive hardware, hangers, and similar items.

2.7 FINISHES - STEEL

A. Refer to Section 09 9123 Interior Painting and Section 09 9113 Exterior Painting.

B. Prime paint steel items.
1. Prime paint all steel items except:
a. Galvanize items to be embedded in concrete and items to be embedded in masonry.
b. Do not prime surfaces in direct contact with concrete, where field welding is required, and items to be covered with sprayed fireproofing.

C. Prepare surfaces to be primed in accordance with SSPC-SP2.

D. Clean surfaces of rust, scale, grease, and foreign matter prior to finishing.

E. Prime Painting: One coat.
1. Interior ferrous metal: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with performance requirements in FS TT-P-664.
2. Refer to Section Section 09 9123 Interior Painting and Section 09 9113 Exterior Painting for preparation, prime coats and finish coats for all exterior exposed ferrous metal.

F. Galvanizing of Structural Steel Members: Galvanize after fabrication to ASTM A123/A123M requirements. Provide minimum 1.7 oz/sq ft galvanized coating.
1. Locations all exterior steel and as shown on drawings.

G. Galvanizing of Non-structural Items: Galvanize after fabrication to ASTM A123/A123M requirements.

2.8 FABRICATION TOLERANCES

A. Squareness: 1/8 inch maximum difference in diagonal measurements.

B. Maximum Offset Between Faces: 1/16 inch.

C. Maximum Misalignment of Adjacent Members: 1/16 inch.

D. Maximum Bow: 1/8 inch in 48 inches.

E. Maximum Deviation From Plane: 1/16 inch in 48 inches.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive work.

3.2 PREPARATION

A. Clean and strip primed steel items to bare metal where site welding is required.

3.3 INSTALLATION

A. Install fabricated items as per manufacturer's instructions

B. Install items plumb and level, accurately fitted, free from distortion or defects.

C. Provide for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.

D. Field weld components as indicated on shop drawings.

E. Perform field welding in accordance with AWS D1.1/D1.1M.

F. Obtain approval prior to site cutting or making adjustments not scheduled.

G. After erection, prime welds, abrasions, and surfaces not shop primed or galvanized, except surfaces to be in contact with concrete.

3.4 TOLERANCES

A. Maximum Variation From Plumb: 1/4 inch per story, non-cumulative.

B. Maximum Offset From True Alignment: 1/4 inch.

C. Maximum Out-of-Position: 1/4 inch.

END OF SECTION

SECTION 06 1000
ROUGH CARPENTRY

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SECTION INCLUDES

A. Fire retardant treated wood materials.

B. Communications and electrical room mounting boards.

C. Concealed wood blocking, nailers, plywood, shims and supports for windows, hardware, and as shown on drawings.

1.3 RELATED REQUIREMENTS

A. Section 08 1113 - Hollow Metal Doors and Frames.

B. Section 08 7100 - Door Hardware

C. Section 09 2116 - Gypsum Board Assemblies.

D. Section 10 2800 - Toilet, Bath, and Laundry Accessories.

E. Section 12 2940 - Roller Shades.

F. Section 12 3600 - Solid Surfacing Window Sills and Countertops.

1.4 REFERENCE STANDARDS

A. ASTM D2898 - Standard Test Methods for Accelerated Weathering of Fire-Retardant-Treated Wood for Fire Testing; 2010 (Reapproved 2017).

B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2018b.

C. AWPA U1 - Use Category System: User Specification for Treated Wood; 2017.

D. ICC (IBC) - International Building Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

E. PS 20 - American Softwood Lumber Standard; 2015.

F. WWPA G-5 - Western Lumber Grading Rules; 2017.

1.5 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide technical data on lumber, plywood, and fasteners.

C. Shop drawings, or 2 foot long on-site samples which show the size, shape, configuration and method of fastening for all wood blocking assemblies, and which show how the blocking assemblies will relate to other adjoining work.

D. Manufacturer's Certificate: Certify that wood products supplied for rough carpentry meet or exceed specified requirements.

E. Material Safety Data Sheets.

1.6 QUALITY ASSURANCE

A. A firm (Installer) with not less than five (5) continuous years experience performing carpentry work comparable to that required for this project, employing personnel skilled in the work specified.

B. The Installer shall directly employ the personnel performing the work of this section.

C. The Installer shall have a full time supervisor/foreman on the roof when work is in progress. The Supervisor shall have a minimum of five (5) years experience in work similar in nature and scope to this project, and speak fluent English.

D. Lumber: Comply with PS 20 and approved grading rules and inspection agencies.

1.7 DELIVERY, STORAGE, AND HANDLING

A. General: Cover wood products to protect against moisture. Support stacked products to prevent deformation and to allow air circulation.

B. Deliver and store materials dry at all times.

C. Fire Retardant Treated Wood: Prevent exposure to precipitation during shipping, storage, and installation.

1.8 WARRANTY

A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.

B. Refer to Section 07 5010 - Modifications to Existing Roofing for Warranty requirements.

1.9 WARRANTY

A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.

PART 2 PRODUCTS

2.1 GENERAL REQUIREMENTS

A. Dimension Lumber: Comply with PS 20 and requirements of specified grading agencies.
   1. Species: Douglas Fir, unless otherwise indicated, construction grade solid lumber free of splits, large knots and other imperfections.
   2. If no species is specified, provide species graded by the agency specified; if no grading agency is specified, provide lumber graded by grading agency meeting the specified requirements.
   3. Grading Agency: Grading agency whose rules are approved by the Board of Review, American Lumber Standard Committee at www.alsc.org, and who provides grading service for the species and grade specified; provide lumber stamped with grade mark unless otherwise indicated.

2.2 DIMENSION LUMBER FOR CONCEALED APPLICATIONS

A. Grading Agency: Western Wood Products Association; WWPA G-5.

B. Sizes: Nominal sizes as indicated on drawings, S4S.

C. Moisture Content: Kiln-dry or MC15.

D. Miscellaneous Framing, Blocking, Nailers, Grounds, and Furring:
   1. Lumber: S4S, No. 2 or Standard Grade.

2.3 CONSTRUCTION PANELS

A. Communications and Electrical Room Mounting Boards: PS 1 A-D plywood, 3/4 inch thick; flame spread index of 25 or less, smoke developed index of 450 or less, when tested in accordance with ASTM E84.

2.4 ACCESSORIES

A. Fasteners and Anchors:
   1. General: Provide fasteners of size and type that comply with requirements specified in this article by the authority having jurisdiction, International Building Code, International Residential Code, Wood Frame Construction manual, and National Design Specification
   2. Metal and Finish: Hot-dipped galvanized steel as per ASTM A153/A153M for exterior, wet areas, wood presevative, and high humidity areas and unfinished steel for other wood locations.
   3. Use screws wherever possible, minimum size diameter #12. If nails are used they shall be annular ring shank type. Do not use dry wall screws to secure wood blocking assemblies.
   4. Anchors: Toggle bolt type for anchorage to hollow masonry.

2.5 FACTORY WOOD TREATMENT

A. Fire Retardant Treatment:
   1. Manufacturers:

a. Arch Wood Protection, Inc: www.wolmanizedwood.com.
b. Koppers, Inc: www.koppers.com.

2. Exterior Type: AWPA U1, Category UCFB, Commodity Specification H, chemically treated and pressure impregnated; capable of providing a maximum flame spread index of 25 when tested in accordance with ASTM E84, with no evidence of significant combustion when test is extended for an additional 20 minutes both before and after accelerated weathering test performed in accordance with ASTM D2898.
   a. Kiln dry wood after treatment to a maximum moisture content of 19 percent for lumber and 15 percent for plywood.
   b. Do not use treated wood in direct contact with the ground.
3. Interior Type A: AWPA U1, Use Category UCFA, Commodity Specification H, low temperature (low hygroscopic) type, chemically treated and pressure impregnated; capable of providing a maximum flame spread index of 25 when tested in accordance with ASTM E84, with no evidence of significant combustion when test is extended for an additional 20 minutes.
   a. Kiln dry wood after treatment to a maximum moisture content of 19 percent for lumber and 15 percent for plywood.
   b. Treat rough carpentry items for all interior concealed blocking.
   c. Do not use treated wood in applications exposed to weather or where the wood may become wet.

PART 3 EXECUTION

3.1 PREPARATION

A. Coordinate installation of rough carpentry members specified in other sections.

3.2 INSTALLATION - GENERAL

A. Select material sizes to minimize waste.

B. Reuse scrap to the greatest extent possible; clearly separate scrap for use on site as accessory components, including: shims, bracing, and blocking.

C. Where treated wood is used on interior, provide temporary ventilation during and immediately after installation sufficient to remove indoor air contaminants.

3.3 BLOCKING, NAILERS, AND SUPPORTS

A. Provide framing and blocking members as indicated or as required to support finishes, fixtures, specialty items, and trim.

B. In walls, provide blocking attached to studs as backing and support for wall-mounted items, unless item can be securely fastened to two or more studs or other method of support is explicitly indicated.

C. Provide the following specific nonstructural framing and blocking:
   1. Grab bars.
   2. Toilet accessories.
   3. Wall-mounted door stops.

3.4 INSTALLATION OF CONSTRUCTION PANELS

A. Communications and Electrical Room Mounting Boards: Secure with screws to studs with edges over firm bearing; space fasteners at maximum 24 inches on center on all edges and into studs in field of board.
   1. At fire-rated walls, install board over wall board indicated as part of the fire-rated assembly.
   2. Where boards are indicated or required as full floor-to-ceiling height, install with long edge of board parallel to studs.
   3. Install adjacent boards without gaps.

3.5 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements for additional requirements.

3.6 CLEANING AND PROTECTION

A. General: Comply with the requirements of Section 01 7419 - Construction Waste Management and Disposal.
   1. Comply with applicable regulations.
   2. Do not burn scrap on project site.
   3. Do not burn scraps that have been pressure treated.
   4. Do not send materials treated with pentachlorophenol, CCA, or ACA to co-generation facilities or “waste-to-energy” facilities.

B. Do not leave wood, shavings, sawdust, etc. on the ground or buried in fill.

C. Prevent sawdust and wood shavings from entering the storm drainage system.

END OF SECTION

SECTION 06 1010
ROOF RELATED ROUGH CARPENTRY

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SECTION INCLUDES

A. All plant, labor, materials, equipment, testing and services necessary to complete the work shown on the schedules, keynotes, drawings, as specified herein, and as may be required by conditions and including, but not limited to, the following:
   1. Related wood nailers, blocking, shims, and plywood.

1.3 RELATED REQUIREMENTS

A. Section 07 2100 - Thermal Insulation

B. Section 07 6200 - Sheet Metal Flashings and Specialties.

C. Section07 7200 - Roof Accessories

D. Section 237416 - Packaged Rooftop Air Conditioning Units.

1.4 REFERENCE STANDARDS

A. APA PRP-108 - Performance Standards and Qualification Policy for Structural-Use Panels (Form E445); 2001.

B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2016a.

C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2018b.

D. AWPA U1 - Use Category System: User Specification for Treated Wood; 2017.

E. ICC (IBC) - International Building Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

F. PS 1 - Structural Plywood; 2009.

G. WCLIB (GR) - Standard Grading Rules for West Coast Lumber No. 17; 2015.

H. WWPA G-5 - Western Lumber Grading Rules; 2017.

1.5 QUALITY ASSURANCE

A. Installer Qualifications:
   1. A firm (Installer) with at least 5 continuous years experience performing carpentry work comparable to that required for this project, employing personnel skilled in the work specified.
   2. The Installer shall directly employ the personnel performing the work of this section.
   3. The Installer shall have a full time supervisor on the roof when work is in progress. The Supervisor shall have a minimum of 5 years experience in work similar in nature and scope to this project, and speak fluent English.

B. Pre-Construction Conference: Attend the pre-construction meeting to discuss how and when carpentry work will be performed and coordinated with other work, and how the building will be kept watertight as work occurs.

1.6 SUBMITTALS

A. Submit the following items far enough in advance to obtain approval prior to performing any work on site:
   1. A pre-work site and building inspection report with photos, to document conditions before work starts.
   2. Mill or Manufacturer data sheets to identify the source for each type of lumber and fastener.

3. Shop drawings or 2 foot long on-site samples which show the size, shape, configuration and method of fastening for all wood blocking assemblies, and which show how the blocking assemblies will relate to other adjoining work.
4. Simultaneously provide all technical data submittals needed for this project, for all technical sections, collated by section. Incomplete submittals will not be reviewed.
   a. Submittals shall be prepared and made by the firm that will perform the actual work.
   b. Provide electronic submittals in pdf format, organized in folders by Section.

B. Safety Data Sheets: Simultaneously provide all Safety Data Sheets needed for this project, for all specification sections - collated by section, in three ring binders. Provide two binders for each building to the Construction Manager.

C. Manufacturer's Certificate: Certify that wood products supplied meet or exceed specified requirements.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store materials dry at all times.
   1. Cover with tarps and protect against exposure to weather and contact with damp or wet surfaces.

B. Support stacked products to prevent deformation and to allow air circulation.

C. Do not overload the structure when storing material on the roof. Material stored on the roof shall be placed on 2 by 10 wooden planks, placed over 1-1/2 inch foam insulation, that is laid on a layer of 6 mil fire retardant polyethylene.

1.8 WARRANTY

A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.

B. Correct defective Work within a two (2) year period after Date of Substantial Completion.

1.9 WARRANTY

A. For roof related installations:
   1. Provide a Contractor's written Guarantee which warrants that all work will remain free of material and workmanship defects and in a watertight condition for a two (2) year period beginning upon Final Completion:
   2. Defective work includes but is not limited to the following types of failure: leakage, delamination, lifting, loosening, splitting, cracking, and undue expansion.
   3. The Contractor's Guarantee shall provide that the Contractor will make the repairs and modifications necessary to enable the work to perform as warranted at his own expense.
   4. The Guarantee shall include the removal and replacement of items or materials installed as part of the original work, if removal is needed to affect guaranteed repairs.
   5. The Contractor's Guarantee shall be issued no more than 30 days before the satisfactory completion of punch list work.

B. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

PART 2 PRODUCTS

2.1 MATERIALS

A. Wood, including shims, nailers, blocking, furring and similar members, in the sizes indicated, worked into the shapes shown, and as follows:
   1. Lumber: Douglas Fir dimension lumber, free of large knots and other imperfections. Kiln Dried.
   2. Plywood: Exterior grade APA rated Type CDX underlayment plywood.
   3. Beveled Siding: Utility grade cedar, redwood, or synthetic siding, 1/2 inch by 6 inches and 3/4 inch by 10 inches wide, tapered to 1/8 inch thick.

B. Lumber: Comply with PS 20 and approved grading rules and inspection agencies.
   1. Material Quality: Obtain each type of material from a single source to ensure consistent quality, color, pattern, and texture.

2. Pre-Work Conference: Attend the pre-roofing meeting to discuss how carpentry work will be performed and coordinated with other work.

C. Lumber fabricated from old growth timber is not permitted.

D. Metal including light gage metal channels and studs shall be factory formed of minimum 20 gauge cold, unless otherwise noted, formed galvanized steel.

E. Preservative Pressure Treatment of Lumber Above Grade: AWPA U1, Use Category UC3B, Commodity Specification A using waterborne preservative.
1. Kiln dry lumber after treatment to maximum moisture content of 19 percent.
2. Treat lumber in contact with roofing, flashing, or masonry.

2.2 FASTENERS

A. Hot dipped galvanized steel, stainless steel, or steel covered with a proprietary rust inhibiting coating.

B. Use screws wherever possible, minimum size diameter #12. If nails are used they shall be annular ring shank type. Do not use dry wall screws to secure wood blocking assemblies.

C. Metal and Finish: Stainless steel for high humidity and preservative-treated wood locations, galvanized elsewhere.
1. Do not use drywall screws to secure wood blocking assemblies. Remove and replace carpentry components installed with drywall screws.

2.3 ACCESSORIES

A. Batt Insulation: un-faced fiberglass insulation, minimum thickness 6 inches, R=30, as needed to fill the metal stud framing.

B. Polyethylene: 6 mil thick fire retardant polyethylene sheeting.

PART 3 EXECUTION

3.1 INSTALLATION - GENERAL

A. Coordinate carpentry work with the installation of the roofing system, insulation, flashings, and other similar items.

B. Shim and set carpentry work plumb and true, except provide slope at the top surfaces of horizontal members as indicated.

C. Stagger joints in built up assemblies at least 2 feet to obtain maximum strength. Provide the appropriate shapes needed and adjust wood members to suit existing conditions for full bearing and secure attachment. Discard defective material, and pieces which are too small, and fabricate the work with a minimum of joints and an optimum joint arrangement.

D. Securely attach carpentry work to resist a pull of 275 pounds per lineal foot in any direction. Countersink all fasteners flush unless otherwise shown.

E. Blocking used for the attachment of roof assembly and flashing shall be dry prior to roof or flashing is installed.

F. Space fasteners to achieve adequate holding power, generally as follows:
1. Anchor bolts embedded in concrete, drilled anchors into concrete or masonry, screws into a steel deck or structural steel member, or screws into wood framing: 12 inches on center.
2. Nails into wood: 8 inches on center.
3. Install two rows of fasteners on blocking wider than 5 inches.

G. Fit carpentry work neatly scribed and cut to fit within 1/8 inch of adjoining materials. Position furring, nailers, blocking, shims and similar supports for the proper attachment of subsequent work.

H. Fasten wood blocking assemblies to metal decks with #12 screws. Pre-drill holes as needed. .

3.2 CLEANING, PROTECTION AND WATERTIGHTNESS

A. Contractor shall inspect the interior and exterior of the building and grounds, and submit a written report with photos to document any leaks or damage, prior to performing any work.

B. The Construction Manager will conduct a similar inspection at the completion of the work, and the Contractor will be charged for all leaks or damage which was not documented in the Contractor's report, or repaired to the Owners satisfaction at the Contractor's expense.

C. Provide any equipment, material and labor necessary to protect the site, the building, its contents and occupants, pedestrians, and surrounding landscaped and paved areas from damage due to the construction work or from inclement weather during construction.

D. Do not perform work during inclement weather. Protect incomplete work and the building from damage by inclement weather which may occur unexpectedly. Make all work areas watertight at the end of each day's work.

E. Frequently clean up all refuse, rubbish, scrap materials and debris so the work site presents a neat, orderly and workmanlike appearance.

F. Carefully clean the roof to remove all residual debris when work is complete. After cleaning the roof, thoroughly clean all drain sumps, drain lines, leader heads and leaders. Do not allow debris to enter the drainage system.

3.3 WASTE DISPOSAL

A. Comply with the requirements of Section 01 7419 - Construction Waste Management and Disposal.

B. Comply with applicable regulations.

C. Do not burn scrap on project site.

D. Do not burn scraps that have been pressure treated.

E. Do not send materials treated with pentachlorophenol, CCA, or ACA to co-generation facilities or "waste-to-energy" facilities.

END OF SECTION

SECTION 07 5010
MODIFICATIONS TO EXISTING ROOFING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SECTION INCLUDES

A. Modification to existing EPDM membrane roofing system.

B. The existing roof is under warranty. Coordinate with Construction Manager for further information.
   1. Contractor must notify and be authorized by the manufacturer to perform all work as per the manufacturer's instruction.
   2. Obtain copy of existing warranty from the owner.

C. Remove all existing membrane, insulation, flashings, curbs, cover boards, vapor barrier, and dunnage as required to provide and install new openings, mechanical equipment, connection to existing roofing, curbs, dunnage, and portals as shown on drawings.

D. Cut new openings and install curbs.

E. Disposal of removal and debris construction waste and dispose in manner complying with all applicable federal, state, and local regulations.

F. Install new isocyanurate insulation, cover board, fully adhered 60 mil thick fire rated EPDM roofing, and flashings as indicated or required.

G. Clean all residual material from substrate surfaces and the flutes of any exposed steel deck - prior to installing new insulation and roofing. Install new insulation, roofing and flashings only on dry smooth surfaces.

H. Abandoned mechanical equipment and support curbs will be removed by the mechanical contractors.

I. Maintain building watertight at all times.

J. Install new support steel and decking; insulation to finish flush with existing the deck substrate, new insulation and roofing to make the building permanently watertight.

K. Comply with the published recommendations and instructions of the roofing membrane manufacturer.

L. Commencement of work shall constitute acknowledgement by Contractor that this specification can be satisfactorily executed, under the project conditions and with all necessary prerequisites for warranty acceptance by roofing membrane manufacturer. No modification of the Contract Sum will be made for failure to adequately examine the Contract Documents or the project conditions.

1.3 RELATED REQUIREMENTS

A. Section 06 1010 - Roof Related Rough Carpentry Wood nailers associated with roofing and roof insulation.

B. Section 07 6200 - Sheet Metal Flashings and Specialties.

C. Section 07 7200 - Roof Accessories

1.4 DEFINITIONS

A. Roofing Terminology: Refer to ASTM D1079 for definition of terms related to roofing work not otherwise defined in the section.

1.5 REFERENCE STANDARDS

A. ANSI/SPRI/FM 4435/ES-1 - Test Standard for Edge Systems Used with Low Slope Roofing Systems; 2017.

B. ASTM C1177/C1177M - Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing; 2013.

C. ASTM C1289 - Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board; 2018a.

D. ASTM D1079 - Standard Terminology Relating to Roofing and Waterproofing; 2016.

E. ASTM D4637/D4637M - Standard Specification for EPDM Sheet Used in Single-Ply Roof Membrane; 2015.

F. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2018b.

G. FM DS 1-29 - Roof Deck Securement and Above-Deck Roof Components; Factory Mutual System; 2016.

1.6 ADMINISTRATIVE REQUIREMENTS

A. Pre-Installation Conference: Before start of roofing work, General Construction Contractor and Installer shall hold a meeting to discuss the proper installation of materials, status of the existing warranty and requirements to maintain the existing warranty.
   1. Notify Owner's Representative well in advance of meeting.
   2. Review all locations required for modifications to existing roofing.

1.7 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data:
   1. Provide manufacturer's printed data sufficient to show that all components of roofing systems, including insulation and fasteners, comply with the specified requirements and with the roofing manufacturer's requirements and recommendations for the system type specified; include at least the following:
      a. Technical data sheet for roof membrane.
      b. Technical data sheets for splice tape and adhesives.
      c. Technical data sheet for each insulation type.
      d. Technical data sheet for each cover board type.
      e. Technical data sheet for pavers.
   2. Written certification from the existing roofing manufacturer which states that the installer is acceptable or licensed to install or modify the existing roofing system, and that the warranty will remina in effect; if not previously provided.

C. Installer Qualifications: Letter from manufacturer attesting that the roofing installer meets the specified qualifications for all systems under warranty.

1.8 CODE APPROVAL REQUIREMENTS

A. Install roofing and insulation system components to meet the following minimum requirements:
   1. New York State Uniform Fire Prevention and Building Code, which includes by reference the New York State Energy Conservation Code.
   2. Underwriters Laboratories Inc. Class A External Fire Rating for roof assemblies tested in accordance with ASTM E 108 or UL 790.
   3. Minimum wind uplift pressure calculated using ASCE 7 and a safety factor of 2:
      a. Field Zone - 90 psf
      b. Perimeter Zones - 135 psf
      c. Corner Zone - 180 psf

B. Provide written certification from the roof material Manufacturer, before beginning work, to confirm the roofing system meets these requirements.

1.9 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum twenty (20) years of documented experience.

B. Installer Qualifications: Roofing installer shall have the following:

1. A firm (Installer) with not less than five (5) continuous years experience performing EPDM roofing work similar to that required for this project, employing personnel skilled in the specified work.
2. The Installer shall directly employ the personnel performing the work of this section.
3. The Installer shall have a full time supervisor/foreman on the roof when roofing work is in progress. The Supervisor shall have a minimum of five (5) years experience in roofing work similar in nature and scope to this project, and speak fluent English.
4. The Installer shall provide a reference list of at least three projects of comparable size and similar design, within a fifty mile radius of this project, which may be observed by representatives of the Owner's Representative.
5. The Installer shall be acceptable to or licensed by the Manufacturer of the primary roofing materials, and provide written certification from the Manufacturer to confirm this prior to award if requested.

C. Material Quality: Obtain each product, including the insulation, cover board, EPDM roofing and flashing, and cements, primers and adhesives produced by a single Manufacturer, which has manufactured the same products in the United States of America for not less than five (5) continuous years.

1.10 JOB CONDITIONS (CAUTIONS & WARNINGS)

A. Do not use oil base or plastic roof cement with EPDM roofing. Do not allow waste products, (petroleum grease or oil, solvents, vegetable or mineral oil, animal fat) or direct steam venting to come in contact with any roofing, insulation or flashing product. Do not expose EPDM roofing and accessories to a temperature in excess of 175 degrees Fahrenheit.

B. Splice cleaner, primer, cements and bonding adhesives are flammable. Do not breathe vapors or use near fire or flame or in a confined or unventilated area. Dispense only from a UL listed or approved safety can.

C. Remove empty adhesive and solvent containers and contaminated rags from the roof and legally dispose of them daily.

D. Do not apply adhesives adjacent to open ventilation system louvers, or windows. Temporarily cover the louvers and windows with 6 mil fire retardant polyethylene and prevent adhesive odors from entering the building. Remove temporary covers at the end of each days work.

1.11 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Deliver material to the site in the Manufacturer's original and unopened packaging, bearing labels which identify the type and names of the products and Manufacturers, with the labels intact and legible.

B. Store all materials in accordance to manufacturer's instructions.

C. Cover all stored materials, except rolls of EPDM and sealed cans of adhesives, with watertight tarpaulins installed immediately upon delivery.

D. Immediately remove any insulation which gets wet from the job site.

E. Do not overload the structure when storing materials on the roof.

F. Store and install all material within the Manufacturer's recommended temperature range.

1.12 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Existing Roof System Under Warranty

1. The existing roofing system is under warranty and the General Construction Contractor or their subcontractor must notify and be authorized by the manufacturer to perform all work as per the manufacturer's instruction.
    a. Manufacture's Warranty: Certification from manufacturer that the existing warranty covering membrane, roof insulation, and other indicated components of the system, shall remain the new and existing terms of the original warranty.

2. Comply with all warranty procedures required by manufacturer, including notifications Manufacture's Warranty: Certification from manufacturer that the existing warranty covering membrane, roof insulation, and other indicated components of the system, shall remain the new and existing terms of the original warranty, scheduling, and inspections:
3. Manufacturer's and Contractor's Guarantees/Warranties shall be issued no more than 30 days before the satisfactory completion of punch list work.

PART 2 PRODUCTS

2.1 GENERAL

A. Acceptable Manufacturer - Roofing System: Match existing manufacturers roofing system.
   1. Roofing systems by other manufacturers are not acceptable if existing roof is under warranty.

B. Substitutions: See Section 01 2500 - Substitution Procedures

2.2 EPDM ROOFING

A. Unreinforced 60 mils thick, fire retardant, EPDM (Ethylene Propylene Diene Monomer) sheet membrane conforming to the following minimum physical properties.

	PROPERTY	TEST METHOD	SPECIFICATION
2.	Color- Gray/Black		
3.	Elongation	ASTM D-412	300% min
4.	Tear Strength	ASTM D-624	150 lb/in min
5.	Ozone Resistance	ASTM D-1149	No cracks, 7 days/100 pphm/100ºF/50% strain
6.	Heat Aging	ASTM D-573	1200 psi min@ 200% elongation/4 wks/240ºF
7.	Brittleness Temperature	ASTM D-746	-49ºF
8.	Water Vapor Permanence	ASTM E-96	2.0 perm max
9.	Thickness	ASTM D-412	60 mils plus/minus 6 mils
10.	Fire Retardant		UL Class A

B. Related Materials:
   1. Cleaners, adhesives, sealants, caulking and fasteners furnished by the EPDM system Manufacturer. Use low VOC adhesives and cleaners to comply with regulations in effect at the time of application.
      a. Stripping: 90 mil thick 5 inch and 9 inch wide self adhering flashing, consisting of 45 mils of semi-cured EPDM factory laminated to 45 mils of cured seaming tape.
      b. Bonding Adhesive: High strength contact adhesive.
      c. Splice Adhesive: High strength synthetic polymer based contact cement formulated specifically to splice EPDM sheets.
      d. Lap Sealant: EPDM rubber based gun grade sealant.
      e. Water Block Seal: One component low viscosity butyl rubber sealant.
      f. Pre-Molded Pipe Flashing: Pressure sensitive prefabricated flashings with pre-applied adhesive.
      g. Pourable Sealer: Two component, solvent free polyurethane based sealant.
      h. Reinforced Perimeter Fastening Strips: .030 inch thick reinforced cured EPDM.
      i. Seam Tape Primer: Synthetic rubber polymer based primer designed to clean and prime seam tape spice areas prior to installing the tape.
      j. Seam Splice Tape: Nominal 30 mil thick cured polymer self adhesive tape with release paper carrier, 6 inches wide.
      k. Plates and Bars: Galvanized and corrosion resistant specialty products.
      l. Fasteners: #14 Fluorocarbon polymer coated heavy duty screws.

C. Gypsum Cover Board: 1/4 inch thick fire resistant gypsum board decking with inorganic glass mat facers and a water resistant core, formulated in 48 x 48 inch square edge boards, UL Class A, meeting ASTM C-1177, manufactured under the trade name Dens-Deck Prime

2.3 INSULATION:

A. Isocyanurate – Tapered rigid cellular polyisocyanurate boards with fibrous felt/fiberglass mat facers, sloping 1/8 inch per foot, (match existing) minimum starting thickness 1-1/2 inches, minimum compressive strength 20 psi, meeting ASTM C1289-01, Type II, Class1, Grade 2.
   1. Crickets sloping 1/4 inch per foot.
   2. At repairs to existing building match thickness of existing insulation.
   3. Product: Firestone “ISO 95+ Isocyanurate Insulation” or approved equal.

2.4 ACCESSORY MATERIALS

A. Roof Deck: Non-composite type, fluted steel sheet:
   1. Galvanized Steel Sheet: ASTM A653/A653M, Structural Steel (SS) Grade 33/230, with G90/Z275 galvanized coating.
   2. Minimum Base Metal Thickness: Match existing.
   3. Nominal Height: Match existing.
   4. Side Joints: Lapped, mechanically fastened.
   5. End Joints: Lapped, mechanically fastened.

B. Rubber Walkway Pads: 30" x 30"x 1/4". Compatible with existing roofing system.

C. Concrete Pavers: Interlocking, with shiplap edges on all sides and integral radiused bearing pads.
   1. Size: Approximately 30 inches by 30 inches by 1-1/2 inches thick.

PART 3 INSTALLATION

3.1 GENERAL

A. Construct the new roofing system in a watertight, workmanlike manner, meeting the guarantee requirements specified herein; in strict accordance with the drawings and in conformance with the Manufacturer's requirements, except as enhanced in this specification.

B. Clean the surface on which roofing system components will be applied, of all laitance, dirt, oil, grease or other foreign matter which would in any way affect the quality of the installation.

C. Install roof system components on dry surfaces only. Do not install any items when weather conditions and outside temperatures are not suitable in accordance with the Manufacturer's recommendations.

D. Complete all work in sequence as quickly as possible so that as small an area as practicable is in the process of construction at any one time. Complete the entire area of work begun each day, the same day, and make all exposed edges watertight at the end of each day's work.

3.2 SUBSTRATE INSPECTION

A. Remove portions of existing roofing, insulation, and flashings, and carefully check the existing deck and new roof substrate. To be an acceptable surface for the new roofing system, the deck and substrate shall be well secured to the underlying structure, dry and not otherwise deteriorated.

B. Immediately notify the Owner's Representative in writing if defects in the substrate are discovered.

C. Maintain the building watertight in the interim, but do not install new insulation or roofing until substrate defects have been corrected.

3.3 NEW TO EXISTING INTERFACE

A. Remove and replace portions of existing roofing at the construction interface between new construction and existing roof areas.
   1. Install new isocyanurate insulation, mechanically fastened, to match existing insulation thickness and to maintain the slope of the existing insulation.

2. Install 60 mil. fully adhered EPDM membrane to lap a minimum of 12 inches onto existing EPDM membrane.

3.4 INSULATION AND COVER BOARD

A. Install tapered insulation and crickets, neatly cut at all miters and transitions.
   1. Do not lace corner boards.
   2. Install the crickets under the new insulation

B. Install insulation with joints offset between rows and layers a minimum of 12 inches. Cut insulation to fit neatly at penetrations and joints. Fill any gap which is greater than 1/4 inch.

C. Fasten new and replacement layers of insulation with screws and discs which penetrate through the deck a minimum of 3/4 inch and a maximum of 1-1/2 inches.
   1. Provide number of fasteners as recommended by the manufacturer or the equivalent of:
      a. Install 16 fasteners per 4 by 8 foot insulation board in the field of the roof.
      b. Install 28 fasteners per 4 by 8 foot insulation board in 12 foot wide perimeter zones.
      c. Install 32 fasteners per 4 by 8 foot insulation board in 12 foot square corner zones.
   2. Carefully choose the length and position of each screw to ensure the screws do not protrude through the underside of the deck where visible inside the school.

D. Install gypsum cover board over the insulation with joints offset between rows and the insulation a minimum of 12 inches. Cut gypsum cover board to fit neatly at penetrations and joints. Fill any gap which is greater than 1/4 inch.

E. Install all layers of insulation on deck areas and the gypsum cover board, in low rise polyurethane foam adhesive applied in accordance with the Manufacturer's recommendations and to achieve the specified minimum uplift resistance.
   1. Install 1/2 inch diameter adhesive beads spaced 12 inches on center in the field of the roof.
   2. Install 1/2 inch diameter adhesive beads spaced 6 inches on center in 12 foot wide perimeter zones.
   3. Install 1/2 inch diameter adhesive beads spaced 4 inches on center in 12 foot square corner zones.

3.5 PREPARATION

A. Remove all of the existing roof system down to the roof deck including all existing composition base flashings. Dispose of all materials properly. Perform asbestos removal in accordance with federal, state and local regulations and dispose of waste in legal manner.
   1. At penetrations, remove all existing flashings, including lead, asphalt, mastic, etc.
   2. At walls, curbs, and other vertical and sloped surfaces, remove loose and unsecured flashings; remove mineral surfaced and coated flashings; remove excessive asphalt to provide a smooth, sound surface for new flashings.

B. Take appropriate measures to ensure that fumes from adhesive solvents are not drawn into the building through air intakes.

C. Prior to proceeding, prepare roof surface so that it is clean, dry, and smooth, and free of sharp edges, fins, roughened surfaces, loose or foreign materials, oil, grease and other materials that may damage the membrane.

D. Fill all surface voids in the immediate substrate that are greater than 1/4 inch wide with fill material acceptable insulation to membrane manufacturer.

E. Seal, grout, or tape deck joints, where needed, to prevent bitumen seepage into building.

3.6 VAPOR RETARDER

A. Before installing insulation install vapor retarder directly over the deck to match existing, if present.

B. Ensure that all penetrations and edge conditions are sealed to prevent moisture and air drive into the roofing system.

3.7 INSULATION AND COVER BOARD INSTALLATION

A. Install insulation in configuration and with attachment method(s) specified in PART 2, under Roofing System.

B. Install insulation in a manner that will not compromise the vapor retarder integrity.

C. Neatly and tightly fit insulation to all penetrations, projections, and nailers, with gaps not greater than 1/4 inch. Fill gaps greater than 1/4 inch with acceptable insulation. Do not leave the roofing membrane unsupported over a space greater than 1/4 inch.

D. Mechanical Fastening: Using specified fasteners and insulation plates engage fasteners through insulation into deck to depth and in pattern required by membrane manufacturer.

3.8 SINGLE-PLY MEMBRANE INSTALLATION

A. Beginning at low point of roof, place membrane without stretching over substrate and allow to relax at least 30 minutes before attachment or splicing; in colder weather allow for longer relax time.

B. Lay out the membrane pieces so that field and flashing splices are installed to shed water.

C. Install membrane without wrinkles and without gaps or fishmouths in seams; bond and test seams and laps in accordance with membrane manufacturer's instructions and details.

D. Install membrane adhered to the substrate, with edge securement as specified.

E. Fully adhere EPDM to the substrate with bonding adhesive, .

1. Allow contact bonding adhesive to dry to the touch EPDM before joining the EPDM to the substrate. Roll the EPDM onto the bonding adhesive and immediately rub it vigorously with a soft bristle broom to ensure complete adhesion.
2. Do not punch holes in cans of adhesive and use them in a “Better Spreader” without first opening the cans to mix them.
3. Replace used roller covers each day; discard covers after each days use.
4. Allow bonding adhesive to dry to the touch before joining the PVC to the substrate.
5. Allow bonding adhesive to dry to the touch before joining the EPDM to the substrate.

F. Roofing installed over improperly applied adhesive or with adhesive that wasn't stirred, and roofing installed with blisters, ridges, mole runs and similar deficiencies shall be removed and replaced at the Contractor’s expense

G. Adhered Membrane: Bond membrane sheet to substrate using membrane manufacturer's recommended bonding material, application rate, and procedures.

H. Edge Securement: Secure membrane at all locations where membrane terminates or goes through an angle change greater than 2 in 12 inches using mechanically fastened reinforced perimeter fastening strips, plates, or metal edging as indicated or as recommended by roofing manufacturer.

3.9 FLASHING AND ACCESSORIES INSTALLATION

A. Install flashings, including laps, splices, joints, bonding, adhesion, and attachment, as required by membrane manufacturer's recommendations and details.

B. Flashing at Walls, Curbs, and Other Vertical and Sloped Surfaces: Install weathertight flashing at all walls and curbs and other vertical and sloped surfaces that the roofing membrane abuts to; extend flashing high above membrane surface or as shown on drawings.

1. Use the longest practical flashing pieces.
2. Evaluate the substrate and overlay and adjust installation procedure in accordance with membrane manufacturer's recommendations.
3. Complete the splice between flashing and the main roof sheet with specified splice adhesive before adhering flashing to the vertical surface.
4. Provide termination directly to the vertical substrate as shown on roof drawings.

C. Flashing at Penetrations: Flash all penetrations passing through the membrane; make flashing seals directly to the penetration.
   1. Pipes, Round Supports, and Similar Items: Flash with specified pre-molded pipe flashings wherever practical; otherwise use specified self-curing elastomeric flashing.
   2. Structural Steel Tubing: If corner radii are greater than 1/4 inch and longest side of tube does not exceed 12 inches, flash as for pipes; otherwise, provide a standard curb with flashing.

3.10 FINISHING AND WALKWAY INSTALLATION

A. Install walkways at access points to the roof, around rooftop equipment that may require maintenance, and where indicated on the drawings.

B. Walkway Pads: Adhere to the roofing membrane, with five full strips of adhesive tape, spacing each pad at minimum of 1.0 inch and maximum of 3.0 inches from each other to allow for drainage.
   1. If installation of walkway pads over field fabricated splices or within 6 inches of a splice edge cannot be avoided, adhere another layer of flashing over the splice and extending beyond the walkway pad a minimum of 6 inches on either side.
   2. Prime the membrane, remove the release paper on the pad, press in place, and walk on pad to ensure proper adhesion.

3.11 FIELD QUALITY CONTROL

A. Inspection by Manufacturer: Provide final inspection of the roofing system by a Technical Representative employed by roofing system manufacturer specifically to inspect installation for warranty purposes (i.e. not a sales person).

B. Perform all corrections necessary for issuance of warranty.

3.12 CLEANING

A. Clean all contaminants generated by roofing work from building and surrounding areas, including bitumen, adhesives, sealants, and coatings.

B. Repair or replace building components and finished surfaces damaged or defaced due to the work of this section; comply with recommendations of manufacturers of components and surfaces.

C. Remove leftover materials, trash, debris, equipment from project site and surrounding areas.

3.13 PROTECTION

A. Where construction traffic must continue over finished roof membrane, provide durable protection and replace or repair damaged roofing to original condition.

END OF SECTION

SECTION 07 6200
SHEET METAL FLASHING AND TRIM

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SECTION INCLUDES

A. Sealants for joints within sheet metal fabrications.

B. Through wall flashings.

1.3 RELATED REQUIREMENTS

A. Section 04 2000 - Unit Masonry: Metal flashings embedded in masonry.

B. Section 06 1010 - Roof Related Rough Carpentry.

C. Section 07 5010 - Modifications to Existing Roofing.

D. Section 07 9200 - Joint Sealants: Sealing non-lap joints between sheet metal fabrications and adjacent construction.

1.4 REFERENCE STANDARDS

A. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum; 2014 (2015 Errata).

B. AAMA 2603 - Voluntary Specification, Performance Requirements and Test Procedures for Pigmented Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2017a.

C. AAMA 2604 - Voluntary Specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2017a.

D. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2018.

E. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2015.

F. ASTM B32 - Standard Specification for Solder Metal; 2008 (Reapproved 2014).

G. ASTM B209/B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2021.

H. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2018.

I. ASTM D4586/D4586M - Standard Specification for Asphalt Roof Cement, Asbestos-Free; 2007, with Editorial Revision (2012).

J. SMACNA (ASMM) - Architectural Sheet Metal Manual; 2012.

1.5 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene one week before starting work of this section.

B. Review methods and procedures related to sheet metal work, including but not limited to the following:

1. How the application of sheet metal items will be coordinated with the installation of wood blocking, roofing & flashing materials, ice and water shield, underlayment, and other similar items to provide a watertight installation.
2. Commercial practice and the Manufacturer's instructions for handling and installing his materials.
3. The condition of sheet metal substrates, curbs, penetrations and other preparatory work, needed and/or performed by other trades.
4. The schedule for mock-up construction and approval.
5. The construction schedule: availability of sheet metal materials, personnel, equipment and facilities needed to make progress and avoid delays.

6. Weather and forecaster weather conditions, and procedures for coping with unfavorable weather conditions.

1.6 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Technical literature for each type of sheet metal, sealant and fastener.

C. Manufacturer's technical literature and shop drawings for preformed sheet metal items, which show how to install the items, form and seal joints

D. Shop Drawings: Indicate material profile, jointing pattern, jointing details, fastening methods, flashings, terminations, and installation details.

E. Samples: Submit four samples, 6 x 6 inch in size illustrating material, finish, and fabrication details of each typical shape.

F. Samples of each type of fastener.

G. Material Safety Data Sheets

1.7 QUALITY ASSURANCE

A. Perform work in accordance with SMACNA (ASMM) and CDA A4050 requirements and standard details, except as otherwise indicated.

B. Fabricator and Installer Qualifications: Company specializing in sheet metal work with five (5) years of documented experience.

1. The Installer shall provide a list of at least five completed projects of comparable size and similar design, within a fifty mile radius of this project, which may be observed by representatives of the Owner.
2. The Installer shall directly employ the personnel performing the work of this section.
3. Installer's Field Supervision: Maintain a full time supervisor-foreman on the roof, who has a minimum of five (5) years experience in roof related sheet metal work, and who speaks fluent English, when sheet metal work is in progress.
4. Attend the Pre-roofing conference and review methods and procedures related to sheet metal work, including but not limited to the following:
   a. How the application of sheet metal items will be coordinated with the installation of masonry, wood blocking, roofing & flashing materials, insulation, and other similar items to provide a watertight installation.
   b. Commercial practice and the Manufacturer's instructions for handling and installing his materials.
   c. The condition of sheet metal substrates, curbs, penetrations and other preparatory work, needed and/or performed by other trades.
   d. The schedule for mock-up construction and approval.
   e. The construction schedule, and the availability of sheet metal materials, personnel, equipment and facilities needed to make progress and avoid delays.
   f. Weather and forecast weather conditions, and procedures for coping with unfavorable weather conditions.

1.8 JOB MOCK UPS

A. After the submittals are approved, prepare in actual job locations, mock-ups of cap flashings, hook strips, drip edges, fascia, copings, and all other items of sheet metal and related work, for the inspection and approval of the Architect.

B. Construct each mock-up of two full lengths of metal, fastened, connected and stripped-in to the related roofing system, to show the following:

1. Type, gauge, color, cross-sectional dimensions and shape, and joint and mitering techniques.

2. Related masonry work, wood blocking, and the attachment techniques and fasteners for all wood and metal components.
3. Other sheet metal related materials and their installation techniques to fully define the detailing of each mock-up

C. The purpose of each mock-up is to establish the minimum standard of materials and workmanship, and to assure that completed work based on the mock-ups will be fully functional and will serve the purpose for it has been designed.

D. Approved mock-ups may be left in place and incorporated into the permanent installation. Rejected mock-ups shall be removed and replaced until approved.

E. Do not purchase or fabricate sheet metal items until mock-up erection, inspection and approval is completed and approval is documented in writing

1.9 DELIVERY, STORAGE, AND HANDLING

A. See Section 01 7419 - Construction Waste Management and Disposal for packaging waste requirements.

B. Stack material to prevent twisting, bending, and abrasion, and to provide ventilation. Slope metal sheets to ensure drainage.

C. Prevent contact with materials that could cause discoloration or staining.

1.10 GUARANTEE

A. Provide a Contractor's written Guarantee which warrants that all work will remain free of material and workmanship defects and in a watertight condition for a five year period beginning upon Final Completion.
1. Defective work includes but is not limited to the following types of failure: leakage, delamination, lifting, loosening, splitting, cracking, and undue expansion.

B. The Guarantee shall include the removal and replacement of items or materials installed with sheet metal flashings and accessories as part of the original work, if removal is needed to effect guaranteed repairs

PART 2 PRODUCTS

2.1 SHEET MATERIALS

A. Zinc-Tin coated copper: copper sheet, coated on both sides, with a smooth uniform coating of zinc and tin, nominal weight 16 ounces per square foot, cold rolled temper, available as FreedomGray Copper by Revere.

B. Anodized Aluminum: ASTM B209/B209M, 3005 alloy, H12 or H14 temper; 20 gauge, 0.032 inch thick; clear anodized finish.

C. Pre-Finished Aluminum:
1. Superior-Performance Organic Finish: AA-C12C40R1x (Chemical Finish: cleaned with inhibited chemicals; Chemical Finish: acid-chromate-fluoride-phosphate conversion coating; Organic Coating: as specified below). Prepare, pretreat, and apply coating to exposed metal surfaces to comply with AAMA 2605 and with coating and resin manufacturer's written instructions.
a. Fluoropolymer Two-Coat System: Manufacturer's standard two-coat thermocured system consisting of specially formulated inhibitive primer fluoropolymer color coat, and clear fluoropolymer top coat, with both color coat and clear topcoat containing not less than 70 percent polyvinylidene fluoride resin by weight; complying with AAMA 2605.
b. Color: As selected by Owner's Representative from manufacturer's standard colors.
c. Product: "AnchorGard SP" Firestone Building Products Company

2.2 FABRICATION

A. Form sections true to shape, accurate in size, square, and free from distortion or defects.
1. Accurately reproduce the details and design shown, and form the profiles, bends and intersections, sharp, true and even. Fabricate sheet metal in the shop whenever possible, and form joints, laps, splices and connections to shed water and condensation in the direction of flow.

2. Provide any miscellaneous flashing and sheet metal work not shown on the drawings but otherwise needed to leave the project complete and entirely watertight, neatly and carefully executed in a thorough and workmanlike manner

B. Fabricate and install copper work in accordance with the current edition of "Copper and Common Sense" published by the Revere Copper and Brass Company, unless otherwise indicated

C. Fabricate cleats of same material as sheet, minimum 3 inches wide, interlocking with sheet.

D. Form pieces in longest possible lengths.

E. Hem exposed edges on underside 1/2 inch; miter and seam corners.

F. Form material with flat lock seams, except where otherwise indicated; at moving joints, use sealed lapped, bayonet-type or interlocking hooked seams.

G. Tin edges of copper sheet to be soldered; solder shop formed metal joints, and after soldering, remove flux, wipe and wash solder joints clean; provide weathertight joints.

H. Fabricate corners from one piece with minimum 18-inch long legs; seam for rigidity, seal with sealant.

I. Fabricate vertical faces with bottom edge formed outward 1/4 inch and hemmed to form drip.

J. Through Wall Flashing: Fabricate new through wall flashings to extend the entire width of the masonry wall, turn down 3/4 inch on the exterior and 4 inches with a 1/2 inch hem on the interior.
   1. Set through wall flashings on a skim coat of mortar used to level the wall.
   2. Form all seams, except sealant filled expansion seams, in the through wall flashing to overlap 2 inches. Secure the seams with rivets spaced 1 inch apart and sweat solder the joint.
   3. Form 2 inch wide flat locked sealant filled expansion seams 32 feet on center.
   4. Install stainless steel dowels through the new through wall flashings, positioned so that each piece of coping will be secured with a minimum of two dowels.
   5. Pre-tin the dowels, and solder the dowels to the through wall flashing to form a watertight seal, before the copings are re-installed

2.3 ACCESSORIES

A. Fasteners: Stainless steel, with soft neoprene washers.

B. Primer: Zinc chromate type.

C. Protective Backing Paint: Zinc molybdate alkyd.

D. Concealed Sealants: Non-curing butyl sealant.

E. Exposed Sealants: ASTM C920; elastomeric sealant, with minimum movement capability as recommended by manufacturer for substrates to be sealed; color to match adjacent material.

F. Asphalt Roof Cement: ASTM D4586/D4586M, Type I, asbestos-free.

G. Solder:
   1. Lead free / or pure tin solder for zinc-tin coated copper, Number 497 by Johnson Manufacturing.

H. Flux:
   1. Tin-bearing flux such as “Flux-N-Solder E127 with pure tin” by Johnson Manufacturing

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine surfaces to receive work of this section and report to the Owner's Representative any defects affecting installation. Commencement of work will be construed as complete acceptance of surfaces.

B. Verify roof openings, curbs, pipes, sleeves, ducts, and vents through roof are solidly set, reglets in place, and nailing strips located.

C. Verify roofing termination and base flashings are in place, sealed, and secure.

3.2 PREPARATION

A. Install starter and edge strips, and cleats before starting installation.

B. Back paint concealed metal surfaces with protective backing paint to a minimum dry film thickness of 15 mil, 0.015 inch.

3.3 INSTALLATION

A. Fabricate and install copper work in accordance with "Copper and Common Sense" as published by the Revere Copper and Brass Company, unless otherwise indicated.

B. Secure flashings in place using concealed fasteners, and use exposed fasteners only where permitted..

C. Form all joints, except loose locked sealant filled expansion joints, 3/4 inch wide flat locked and soldered, or, overlapped 2 inches riveted 1 inch on-center and soldered. Use solder only to fill and seal the joint, not for mechanical strength. Form soldered joints continuous, strong and free from defects, with well heated soldering irons. Do not use open flame torches for soldering.

1. Clean soldered joints daily, immediately upon the completion of soldering, by washing with soap and water applied with a soft bristle brush, then rinsing with clear water.

D. Form all seams double locked, to finish 1 inch high. Install cleats in all seams 12 inches on center.

E. Securely fasten and anchor all work, and make provisions for thermal expansion. Submit details of expansion joints for approval. Install fasteners through one edge of metal only.

F. Use stainless steel pin Zamac type nail-in fasteners where fasteners will be exposed

G. Fit flashings tight in place; make corners square, surfaces true and straight in planes, and lines accurate to profiles.

3.4 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements for field inspection requirements.

B. Inspection will involve surveillance of work during installation to ascertain compliance with specified requirements.

3.5 CLEANING

A. Clean all metal of any stains or blemishes; touch up and clean prefinished material after roofing is complete. Leave all surfaces clean and satisfactory to the Owner.

3.6 PROTECTION AND WATERTIGHTNESS

A. Provide the equipment, materials and labor necessary to adequately protect the contract area, the building and its contents and occupants, and surrounding landscaped and paved areas from damage due to the construction work or from inclement weather during construction.

B. Do not perform work during inclement weather. Provide temporary covers, and make work areas and the building watertight at the end of each day's work.

C. Clean up frequently all refuse, rubbish, scrap materials and debris so that at all times the work site shall present a neat, orderly and workmanlike appearance

END OF SECTION

SECTION 07 7200
ROOF ACCESSORIES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and other Division 1 Specification Sections, apply to this Section.

1.2 SECTION INCLUDES

A. Roof hatches.

B. Pipe portals.

1.3 RELATED REQUIREMENTS

A. Section 05 5000 - Metal Fabrications for roof equipment supports.

B. Section 06 1010 - Roof Related Rough Carpentry

C. Section 07 5010 - Modifications to Existing Roofing

D. Section 07 6200 - Sheet Metal Flashings and Specialties.

E. Mechanical Division 23 for equipment.

F. Electrical Divisions 26 for associated Electrical work.

1.4 CODE REQUIREMENTS

A. Refer to 01 4100 - Regulatory Requirements.

1.5 REFERENCE STANDARDS

A. 29 CFR 1910.23 - Ladders; current edition.

B. 29 CFR 1910.29 - Fall Protection Systems and Falling Object Protection - Criteria and Practices; Current Edition.

C. ASTM A792/A792M - Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process; 2010 (Reapproved 2015).

D. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2014.

1.6 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Submit the following items in advance to obtain approval prior to performing any work.

C. Product Data: Manufacturer's on each product to be used all technical data sheets required for this project .Incomplete submittals will not be reviewed.

1. Preparation instructions and recommendations.
2. Storage and handling requirements and recommendations.
3. Installation methods.
4. Maintenance requirements.

D. Shop Drawings: Submit detailed layout developed for this project and provide dimensioned location and number for each type of roof accessory.

1. Coordinate with other prime contractor (s) for roof accessories provided by them and installed by the General Contractor.

E. Samples: Submit samples when requested.

F. Samples of the Contractor’s and Manufacturer’s guarantee/warranty forms.

G. Warranty Documentation:

1. Submit documentation that roof accessories are acceptable to roofing manufacturer, and do not limit the roofing warranty.
2. Submit certification from roofing manufacture that existing warranty remains in effect,

1.7 QUALITY ASSURANCE

A. Standards: Comply with SMACNA "Architectural Sheet Metal Manual" fabrication details and "NRCA Roofing and Waterproofing Manual" installation details unless otherwise indicated.

B. Manufacturer Qualifications: Provide each primary product, produced by a single Manufacturer, which has produced that type product successfully for not less than five (5) years which has manufactured the same product in the United States of America for not less than 5 continuous years.

C. Installer Qualifications: A firm with not less than five (5) years of successful experience installing specialties similar to those required for this project employing personnel skilled in the work specified.
1. The Installer shall provide a reference list of at least three completed projects of comparable size and similar design, within a fifty mile radius of this project.
2. Provide name address, telephone number of Owner, Architect, and Construction Manager

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver material to the site in the Manufacturer's original and unopened packaging, with intact and legible labels which identify the products and Manufacturers

B. Store products in manufacturer's unopened packaging until ready for installation.

C. Store products under cover and elevated above grade.

D. Do not overload the structure when storing materials on the roof.

1.9 WARRANTY

A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.

B. Provide five year Contractor's warranty for that all work will remain free of material and workmanship defects and in a watertight condition for a five year period beginning upon Substaintial Completion..
1. Defective work includes but is not limited to the following types of failure: leakage, delamination, lifting, loosening, splitting, cracking, undue expansion, peeling paint.
2. Guarantee coverage shall have no dollar limit.
3. Contractor’s Guarantee covers “all work performed” when a single contractor/installer is awarded work specified in multiple Sections.

C. The Contractor’s Surety Company may add a rider to the Performance Bond which clarifies that Performance Bond Coverage expires two years after Final Completion; i.e., Performance Bond Coverage does not run for the entire five year term of the Contractor’s Guarantee

D. The Guarantee shall be issued no more than 30 days after approval of the punch list work.

E. The Guarantee shall include the removal and replacement of items or materials installed with the roof specialties as part of the original work, if removal is needed to effect guaranteed repairs.

PART 2 PRODUCTS

2.1 ROOF CURBS

A. Provided by HVAC Contractor and installed by General Contractor. Refer to HVAC drawings.

2.2 ROOF HATCHES AND VENTS

A. Roof Hatch Manufacturers:
1. Bilco Company; S-50TB: www.bilco.com.
2. Substitutions: See Section 01 2500 Substitution Procedures.

B. Roof Hatches : Factory-assembled aluminum frame and cover, complete with operating and release hardware.
1. Style: Provide flat metal covers unless otherwise indicated.

2. Mounting: Provide frames and curbs suitable for mounting conditions as indicated on drawings.
3. Thermally Broken Hatches: Provide insulation within frame and cover.
4. For Ladder Access: Single leaf; 30 by 36 inches.

C. Frames and Curbs: One-piece curb and frame with integral cap flashing to receive roof flashings; extended bottom flange to suit mounting.
1. Material: Mill finished aluminum, 11 gauge, 0.0907 inch thick.
2. Insulation: Manufacturer's standard; 3 inch rigid glass fiber, located on inside hollow curb.
3. Curb Height: 12 inches from finished surface of roof, minimum.

D. Metal Covers: Flush, insulated, hollow metal construction.
1. Capable of supporting 40 psf live load.
2. Material: Mill finished aluminum; outer cover 11 gauge, 0.0907 inch thick, liner 0.04 inch thick.
3. Insulation: Manufacturer's standard 3 inch rigid polyisocyanurate.
4. Gasket: EPDM, continuous around cover perimeter.

E. Safety Railing System: Roof hatch safety rail system mounted directly to curb without penetration of roofing system.
1. Railing Size: As indicated on drawings.
2. Railing: Comply with 29 CFR 1910.23 for ladder safety, with a safety factor of two.
3. Self-Closing Gate: Comply with 29 CFR 1910.29 for safe egress and fall protection through hatch opening.
4. Posts and Rails: Aluminum tubing.
5. Gate: Same material as railing; automatic closing with latch.
6. Finish: Manufacturer's standard, factory applied finish.
7. Fasteners: Stainless steel, Type 316.
8. Products:
a. BILCO Company; Bil-Guard 2.0: www.bilco.com.

F. Hardware: Type 316 stainless steel, unless otherwise indicated or required by manufacturer.
1. Lifting Mechanisms: Compression or torsion spring operator with shock absorbers that automatically opens upon release of latch; capable of lifting covers despite 10 psf load.
2. Hinges: Heavy duty pintle type.
3. Hold open arm with vinyl-coated handle for manual release.
4. Latch: Upon closing, engage latch automatically and reset manual release.
5. Manual Release: Pull handle on interior and exterior.
6. Locking: Padlock hasp on interior.

2.3 ROOFTOP SUPPORTS / ASSEMBLIES

A. Non-Penetrating Rooftop Support/Assemblies: Manufacturer-engineered and factory-fabricated, with pedestal bases that rest on top of roofing membrane, and not requiring any attachment to roof structure and not penetrating roofing assembly. Provided and installed by HVAC contractor. General Construction Contractor shall provide roof pads.

2.4 FACTORY FABRICATED PIPE CURB PORTALS

A. Pipe Portals: Provided byHVAC Contractor and installed by General COntractor. Refer to Mechanical drawings.
1. Provide number of pipes indicate on drawings.
2. Manufacturer: ALTA Products.
a. Model AL-1610 with ALTC-18 curb.
b. .080 aluminum curb, body and lid
c. Thermal- break body and curb
d. Sigrist exit seals, ABS, Schedule 80

e. Housing shall be UV protected powder coated
f. Stainless steel fasteners

3. Attachment and installation of the pipe portal shall be done in accordance with manufacturer's instructions and the roofing membrane manufacturer's recommendations.

2.5 ROOF WALKWAY PADS

A. 30 inches by 30 inches hard rubber walkway pads, color; black, as manufactured by Firestone or equal.
1. Provide under all pedestal supports and concrete pads and where shown on drawings.
2.

PART 3 EXECUTION

3.1 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. If substrate preparation is the responsibility of another installer, notify Fuller and D'Angelo, P.C. of unsatisfactory preparation before proceeding.

3.2 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using methods recommended by manufacturer for achieving acceptable results for applicable substrate under project conditions.

3.3 INSTALLATION

A. Install in accordance with manufacturer's instructions, in manner that maintains roofing system weather-tight integrity.

B. Coordinate all work interfacing with mechanical and electrical contracts with respective contractors.

C. Roof Hatches and Safety Railings:
1. Install in accordance with manufactures recommendations and as follows:
a. Coordinate blocking and insulation thickness to maintain top of curb 12" above finished surface of roof.
b. Coordinate hatch opening orientation with ladder below.
c. Install safety railing system to curb without penetrating flashings in accordance with manufacturer's requirements.

D. Roof Walkway Pads
1. Install hard rubber walkway pad for walkways to provide a path 2-1/2 feet wide, where shown on the Drawings, adhered to the membrane surface with **5 strips of peel and stick SeamTape**, and at all roof access points, i.e., doors, ladders and hatches, and under all concrete pavers used for conduit supports. **Manufacturers 3 strip tape shall not be installed.**

3.4 MISCELLANEOUS

A. Provide and install any sealants needed, where shown or required.

B. Provide new material, couplings, transition pieces, blocking, fasteners and the similar accessories needed to complete the work.

C. Adjust safety railing gate to provide positive closure and latching in conformance to OSHA and CPSC requirements.

3.5 CLEANING

A. Do not perform work during inclement weather. Protect incomplete work and the building from damage by inclement weather - which may occur unexpectedly. Make all work areas watertight at the end of each day's work

B. Clean installed work to like-new condition.

3.6 PROTECTION

A. Protect existing and new roof surfaces where material and equipment is placed on them, and where construction traffic occurs, with 6 mil fire retardant polyethylene, covered with 1-1/2 inch thick foam insulation, overlaid with 2 by 10 wooden planks.

B. Protect installed products until completion of project.

C. Touch-up, repair or replace damaged products before Date of Substantial Completion.

END OF SECTION

SECTION 07 8400
FIRESTOPPING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SECTION INCLUDES

A. Firestopping of joints and penetrations in fire-resistance-rated and smoke-resistant assemblies, whether indicated on drawings or not.

B. Speed strips & plugs.

C. Flexible sealant.

D. Joint spray.

1.3 RELATED REQUIREMENTS

A. Section 01 6116 - Volatile Organic Compound (VOC) Content Restrictions.

1.4 REFERENCE STANDARDS

A. ASTM C1241 - Average volume shrinkage: 51.1%

B. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials; 2018c.

C. ASTM E814 - Standard Test Method for Fire Tests of Penetration Firestop Systems; 2013a (Reapproved 2017).

D. ASTM E 90-99 - Sound Transmission Classification; 59 per tested construction.

E. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

F. ASTM E1966 - Standard Test Method for Fire-Resistive Joint Systems; 2015.

G. FM 4991 - Approval Standard for Firestop Contractors; 2013.

H. FM (AG) - FM Approval Guide; current edition.

I. SCAQMD 1168 - Adhesive and Sealant Applications; 1989 (Amended 2017).

J. UL 2079 - Standard for Tests for Fire Resistance of Building Joint Systems; Current Edition, Including All Revisions.

K. UL (FRD) - Fire Resistance Directory; Current Edition.

1.5 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Schedule of Firestopping: List each type of penetration, fire rating of the penetrated assembly, and firestopping test or design number.

C. Product Data: Provide data on product characteristics, performance ratings, and limitations.

D. Sustainable Design Submittal: Submit VOC content documentation for nonpreformed materials.

E. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

F. Manufacturer's qualification statement.

G. Installer's qualification statement.

1.6 QUALITY ASSURANCE

A. Fire Testing: Provide firestopping assemblies of designs that provide the scheduled fire ratings when tested in accordance with methods indicated.

1. Listing in UL (FRD) or FM (AG) will be considered as constituting an acceptable test report.

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

C. Installer Qualifications: Company specializing in performing the work of this section and:

1.7 MOCK-UPS

A. See Section 01 4000 - Quality Requirements for additional requirements.

B. Install one firestopping assembly representative of each fire rating design required on project.
   1. Where one design may be used for different penetrating items or in different wall constructions, install one assembly for each different combination.

C. If accepted, mock-up will represent minimum standard for this work.

D. If accepted, mock-up may remain as part of this work. Remove and replace mock-ups not accepted.

1.8 FIELD CONDITIONS

A. Comply with firestopping manufacturer's recommendations for temperature and conditions during and after installation; maintain minimum temperature before, during, and for three days after installation of materials.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Firestopping Manufacturers:
   1. Hilti Firestop Systems Hilti, Inc. (U.S.) 1-800-879-8000 www.us.hilti.com • en español 1-800-879-5000 • P.O. Box 21148, Tulsa.

2.2 MATERIALS

A. Firestopping Materials: Any materials meeting requirements.

B. Volatile Organic Compound (VOC) Content: Provide products having VOC content lower than that required by SCAQMD 1168.

C. Primers, Sleeves, Forms, Insulation, Packing, Stuffing, and Accessories: Provide type of materials as required for tested firestopping assembly.

2.3 SYSTEMS

A. Concrete and Concrete Masonry Walls and Floors:

B. Gypsum Board Walls:
   1. Wall-to-Wall Joints That Have Movement Capabilities (Dynamic-D):
      a. 1 Hour Construction: UL System WW-D-0067; **Hilti CP 606** Flexible Firestop Sealant.
   2. Head-of-Wall Joints at Concrete Over Metal Deck, Wall Parallel to Ribs:
      a. 1 Hour Construction: UL System HW-D-0049; Hilti **CFS-SP WB** Firestop Joint Spray and CP 672.
   3. Head-of-Wall Joints at Concrete Over Metal Deck, Wall Perpendicular to Ribs, Cut to Fit Ribs:
      a. 1 Hour Construction: UL System HW-D-0045; Hilti **CP 606** Flexible Firestop Sealant.
   4. Head-of-Wall Joints at Concrete Over Metal Deck, Wall Perpendicular to Ribs, Not Cut to Fit:
      a. 1 Hour Construction: UL System HW-D-0042; Hilti **CFS-SP WB** Firestop Joint Spray and CP 672.

2.4 FIRESTOPPING PENETRATIONS THROUGH CONCRETE AND CONCRETE MASONRY CONSTRUCTION

A. Penetrations Through Floors or Walls By:
   1. Multiple Penetrations in Large Openings:
      a. 1 & 2 Hour Construction: UL System C-AJ-8143; Hilti FS-ONE MAX Intumescent Firestop Sealant.
   2. Uninsulated Metallic Pipe, Conduit, and Tubing:

a. 1 & 2 Hour Construction: UL System C-AJ-1226; Hilti FS-ONE MAX Intumescent Firestop Sealant.

3. Electrical Cables Not In Conduit:
   a. 1 & 2 Hour Construction: UL System W-J-3199; Hilti CFS-SL SK Firestop Sleeve Kit.
4. Insulated Pipes:
   a. 1 & 2 Hour Construction: UL System C-AJ-5091; Hilti FS-ONE IMAX intumescent Firestop Sealant.
5. HVAC Ducts, Uninsulated:
   a. 1 & 2 Hour Construction: UL System C-AJ-7111; Hilti FS-ONE MAX Intumescent Firestop Sealant.

B. Penetrations Through Floors By:
1. Multiple Penetrations in Large Openings:
   a. 1 & 2 Hour Construction: UL System F-A-8012; Hilti CFS-S SIL GG Firestop Silicone Sealant Gun-Grade or CFS-S SIL SL Firestop Silicone Sealant Self-Leveling.
2. Uninsulated Metallic Pipe, Conduit, and Tubing:
   a. 1 & 2 Hour Construction: UL System F-A-1016; Hilti CP 680-P/M Cast-In Device.
3. Insulated Pipes:
   a. 2 Hour Construction: UL System F-A-5015; Hilti CP 680-P/M Cast-In Device.

C. Penetrations Through Walls By:
1. Uninsulated Metallic Pipe, Conduit, and Tubing:
   a. 2 Hour Construction: UL System W-J-1067; Hilti FS-ONE MAX Intumescent Firestop Sealant.
   b. 1 Hour Construction: UL System W-J-1067; Hilti FS-ONE MAX Intumescent Firestop Sealant.
2. Electrical Cables Not In Conduit:
   a. 2 Hour Construction: UL System C-AJ-3095; Hilti FS-ONE MAX Intumescent Firestop Sealant.
3. Insulated Pipes:
   a. 2 Hour Construction: UL System C-AJ-5091; Hilti FS-ONE MAX Intumescent Firestop Sealant.
   b. 1 Hour Construction: UL System C-AJ-5091; Hilti FS-ONE MAX Intumescent Firestop Sealant.
4. HVAC Ducts, Uninsulated:
   a. 1 & 2 Hour Construction: UL System W-J-7109; Hilti FS-ONE MAX Intumescent Firestop Sealant or CP 606 Flexible Firestop Sealant.
5. HVAC Ducts, Insulated:
   a. 1 & 2 Hour Construction: UL System W-J-7112; Hilti FS-ONE MAX Intumescent Firestop Sealant.

2.5 FIRESTOPPING PENETRATIONS THROUGH GYPSUM BOARD WALLS

A. Penetrations By:
1. Multiple Penetrations in Large Openings:
   a. 1 Hour Construction: UL System W-L-1408; Hilti FS-ONE MAX Intumescent Firestop Sealant.
2. Uninsulated Metallic Pipe, Conduit, and Tubing:
   a. 1 Hour Construction: UL System W-L-1164; Hilti FS-ONE MAX Intumescent Firestop Sealant.
3. Electrical Cables Not In Conduit:

a. 1 Hour Construction: UL System W-L-3393; Hilti CFS-SL RK Retrofit Sleeve Kit for Existing Cables.

4. Insulated Pipes:
   a. 1 Hour Construction: UL System W-L-5028; Hilti FS-ONE MAX Intumescent Firestop Sealant.
5. HVAC Ducts, Insulated:
   a. 1 Hour Construction: UL System W-L-7156; Hilti FS-ONE MAX Intumescent Firestop Sealant.

2.6 MATERIALS

A. Firestopping Sealants: Provide only products having lower volatile organic compound (VOC) content than required by South Coast Air Quality Management District Rule No.1168.

B. Elastomeric Silicone Firestopping: Single component silicone elastomeric compound and compatible silicone sealant; conforming to the following:
   1. Manufacturers:
      a. 3M Fire Protection Products; Product CP-25WB: www.3m.com/firestop.
      b. Substitutions: See Section 01 2500 Substitution Procedures.

C. Fiber Firestopping: Mineral fiber insulation used in conjunction with elastomeric surface sealer forming airtight bond to opening; conforming to the following:
   1. Density: 4 lb/cu ft.
   2. Manufacturers:
      a. Thermafiber, Inc: www.thermafiber.com.
   3. Substitutions: See Section 01 2500 Substitution Procedures.

D. Primers, Sleeves, Forms, Insulation, Packing, Stuffing, and Accessories: Type required for tested assembly design.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify openings are ready to receive the work of this section.

3.2 PREPARATION

A. Clean substrate surfaces of dirt, dust, grease, oil, loose material, or other materials that could adversely affect bond of firestopping material.

B. Remove incompatible materials that could adversely affect bond.

C. Install backing materials to prevent liquid material from leakage.

3.3 INSTALLATION

A. Install materials in manner described in fire test report and in accordance with manufacturer's instructions, completely closing openings.

B. Do not cover installed firestopping until inspected by authorities having jurisdiction.

C. Install labeling required by code.

3.4 PROTECTION

A. Protect adjacent surfaces from damage by material installation.

END OF SECTION

SECTION 07 9200
JOINT SEALANTS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SECTION INCLUDES

A. Nonsag gunnable joint sealants.

B. Acoustical sealant.

C. Joint backings and accessories.

1.3 RELATED REQUIREMENTS

A. Section 01 6116 - Volatile Organic Compound (VOC) Content Restrictions: Additional requirements for sealants and primers.

B. Section 07 8400 - Firestopping: Firestopping sealants.

C. Section 07 9513 - Expansion Joint Cover Assemblies: Sealants forming part of expansion joint cover assemblies.

D. Section 08 7100 - Door Hardware: Setting exterior door thresholds in sealant.

E. Section 08 8000 - Glazing: Glazing sealants and accessories.

F. Section 09 2116 - Gypsum Board Assemblies: Sealing acoustical and sound-rated walls and ceilings.

G. Section 09 3000 - Tiling: Sealant between tile and plumbing fixtures and at junctions with other materials and changes in plane.

1.4 REFERENCE STANDARDS

A. ASTM C661 - Standard Test Method for Indentation Hardness of Elastomeric-Type Sealants by Means of a Durometer; 2015.

B. ASTM C919 - Standard Practice for Use of Sealants in Acoustical Applications; 2012 (Reapproved 2017).

C. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2018.

D. ASTM C1193 - Standard Guide for Use of Joint Sealants; 2016.

E. ASTM C1521 - Standard Practice for Evaluating Adhesion of Installed Weatherproofing Sealant Joints; 2013.

1.5 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data for Sealants: Submit manufacturer's technical data sheets for each product to be used, that includes the following.

1. Physical characteristics, including movement capability, VOC content, hardness, cure time, and color availability.
2. List of backing materials approved for use with the specific product.
3. Substrates that product is known to satisfactorily adhere to and with which it is compatible.
4. Substrates the product should not be used on.
5. Substrates for which use of primer is required.
6. Sample product warranty.
7. Certification by manufacturer indicating that product complies with specification requirements.

C. Product Data for Accessory Products: Submit manufacturer's technical data sheet for each product to be used, including physical characteristics, installation instructions, and recommended tools.

D. Color Cards for Selection: Where sealant color is not specified, submit manufacturer's color cards showing standard colors available for selection.

E. Preinstallation Field Adhesion Test Plan: Submit at least two weeks prior to start of installation.

F. Field Quality Control Plan: Submit at least two weeks prior to start of installation.

G. Field Quality Control Log: Submit filled out log for each length or instance of sealant installed, within 10 days after completion of inspections/tests; include bagged test samples and photographic records, if any.

H. Executed warranty.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

B. Installer Qualifications: Company specializing in performing the work of this section and with at least three years of documented experience.

C. Testing Agency Qualifications: Independent firm specializing in performing testing and inspections of the type specified in this section.

D. Preinstallation Field Adhesion Test Plan: Include destructive field adhesion testing of one sample of each combination of sealant type and substrate, except interior acrylic latex sealants, and include the following for each tested sample.
   1. Identification of testing agency.
   2. Preinstallation Field Adhesion Test Log Form: Include the following data fields, with known information filled out.
      a. Test date.
      b. Copy of test method documents.
      c. Age of sealant upon date of testing.
      d. Test results, modeled after the sample form in the test method document.
      e. Indicate use of photographic record of test.

E. Field Quality Control Plan:
   1. Visual inspection of entire length of sealant joints.

F. Field Adhesion Test Procedures:
   1. Allow sealants to fully cure as recommended by manufacturer before testing.
   2. Have a copy of the test method document available during tests.
   3. Record the type of failure that occurred, other information required by test method, and the information required on the Field Quality Control Log.
   4. When performing destructive tests, also inspect the opened joint for proper installation characteristics recommended by manufacturer, and report any deficiencies.
   5. Deliver the samples removed during destructive tests in separate sealed plastic bags, identified with project, location, test date, and test results, to Edgemont Union Free School District.
   6. If any combination of sealant type and substrate does not show evidence of minimum adhesion or shows cohesion failure before minimum adhesion, report results to Fuller and D'Angelo, P.C. .

G. Destructive Field Adhesion Test: Test for adhesion in accordance with ASTM C1521, using Destructive Tail Procedure.
   1. Sample: At least 18 inches long.
   2. Minimum Elongation Without Adhesive Failure: Consider the tail at rest, not under any elongation stress; multiply the stated movement capability of the sealant in percent by two; then multiply 1 inch by that percentage; if adhesion failure occurs before the "1 inch mark" is that distance from the substrate, the test has failed.
   3. If either adhesive or cohesive failure occurs prior to minimum elongation, take necessary measures to correct conditions and re-test; record each modification to products or installation procedures.

1.7 WARRANTY

A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.

B. Manufacturer Warranty: Provide 2-year manufacturer warranty for installed sealants and accessories that fail to achieve a watertight seal, exhibit loss of adhesion or cohesion, or do not cure. Complete forms in Edgemont Union Free School District's name and register with manufacturer.

1.8 MOCK-UP

A. Mockups: Before installing joint sealants, apply elastomeric sealants as follows to verify selections made under sample submittals and to demonstrate aesthetic effects and qualities of materials and execution:
   1. Joints in mockups of assemblies specified in other Sections that are indicated to receive elastomeric joint sealants, which are specified by reference to this Section.

B. Construct mock-up with specified sealant types and with other components noted.

C. Locate where directed.

D. Mock-up may remain as part of the Work.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Non-Sag Sealants: Permits application in joints on vertical surfaces without sagging or slumping.
   1. Sika Corporation: www.usa-sika.com.
   2. Bostik Inc: www.bostik-us.com.
   3. Dow Corning Corporation: www.dowcorning.com/construction.
   4. Pecora Corporation: www.pecora.com.
   5. W.R. Meadows, Inc: www.wrmeadows.com/sle.

B. Acoustic Sealants
   1. Pecora

2.2 JOINT SEALANT APPLICATIONS

A. Scope:
   1. Exterior Joints: Seal open joints, whether or not the joint is indicated on drawings, unless specifically indicated not to be sealed. Exterior joints to be sealed include, but are not limited to:
      a. Wall expansion and control joints.
      b. Joints between door, window, and other frames and adjacent construction.
      c. Joints between different exposed materials.
      d. Openings below ledge angles in masonry.
      e. Other joints indicated below.
   2. Interior Joints: Do not seal interior joints unless specifically indicated to be sealed. Interior joints to be sealed include, but are not limited to, the following items.
      a. Joints between door, window, and other frames and adjacent construction.

B. Exterior Joints: Use non-sag non-staining silicone sealant, unless otherwise indicated.

C. Interior Vertical Joints: Use non-sag polyurethane sealant, unless otherwise indicated.

D. Interior Wet Areas: Bathrooms, restrooms, kitchens, and food service areas; fixtures in wet areas include plumbing fixtures, food service equipment, countertops, cabinets, and other similar items.

2.3 JOINT SEALANTS - GENERAL

A. Sealants and Primers: Provide products with acceptable levels of volatile organic compound (VOC) content; see Section 01 6116.

2.4 NONSAG JOINT SEALANTS

A. Non-Staining Silicone Sealant: ASTM C920, Grade NS, Uses M and A; not expected to withstand continuous water immersion or traffic.
   1. Movement Capability: [], minimum.
   2. Nonstaining to Porous Stone: Nonstaining to light-colored natural stone when tested in accordance with ASTM C1248.
   3. Dirt Pick-Up: Reduced dirt pick-up compared to other silicone sealants.
   4. Hardness Range: 15 to 35, Shore A, when tested in accordance with ASTM C661.
   5. Color: To be selected by Fuller and D'Angelo, P.C. from manufacturer's standard and premium range.
   6. Cure Type: Single-component, neutral moisture curing.
   7. Service Temperature Range: Minus 20 to 180 degrees F.
   8. Manufacturers:
      a. Pecora Corporation; Pecora 864 NST (Non-Staining Technology): www.pecora.com.
      b. Sika Corporation; Sikasil WS-295: www.usa-sika.com.

B. Mildew-Resistant Silicone Sealant: ASTM C920, Grade NS, Uses M and A; single component, mildew resistant; not expected to withstand continuous water immersion or traffic.
   1. Color: White.
   2. Applications: Use for:
      a. All perimeter joints of toilet fixtures, cabinets, casework, countertops and similar locations.
   3. Manufacturers:
      a. Sika Corporation; Sikasil GP: www.usa-sika.com.
      b. 786 Mildew Resistant; Dow Corning.
      c. Pecora Corporation; Pecora 898 NST (Non-Staining Technology):: www.pecora.com.
      d. Sanitary 1700; GE Silicones..

C. Polyurethane Sealant: ASTM C920, Grade NS, Uses M and A; single component; not expected to withstand continuous water immersion or traffic.
   1. Movement Capability: Plus and minus 25 percent, minimum.
   2. Color: To be selected by Fuller and D'Angelo, P.C. from manufacturer's standard range.
   3. Service Temperature Range: Minus 40 to 180 degrees F.
   4. Manufacturers:
      a. Sika Corporation; Sikasil GP: www.usa-sika.com.
      b. Pecora Corporation; Dynatrol II;: www.pecora.com.
   5. Applications: Use for:
      a. All exterior and interior vertical joints.
   6. Substitutions: 01 2500 - Substitution Procedures.

D. Type Acoustical Sealant: - Acrylic Emulsion Latex: Water-based; ASTM C834, single component, non-staining, non-bleeding, non-hardening, non-sagging; not intended for exterior use.
   1. Color: To be selected by Fuller and D'Angelo, P.C. from manufacturer's standard range.
   2. Grade: ASTM C834; Grade 0 Degrees F (Minus 18 Degrees C).
   3. Manufacturers:
      a. Pecora Corporation; AC-20 FTR Acoustical and Insulation Sealant: www.pecora.com.
   4. Applications: Use for:
      a. Use for all interior joints of where acoustical sealant indicated.
   5. Substitutions: 01 2500 - Substitution Procedures

2.5 ACCESSORIES

A. Backer Rod: Cylindrical cellular foam rod with surface that sealant will not adhere to, compatible with specific sealant used, and recommended by backing and sealant manufacturers for specific application.
   1. Type for Joints Not Subject to Pedestrian or Vehicular Traffic: ASTM C1330; Type O - Open Cell Polyurethane.
   2. Type for Joints Subject to Pedestrian or Vehicular Traffic: ASTM C1330; Type C - Closed Cell Polyethylene.
   3. Open Cell: 40 to 50 percent larger in diameter than joint width. (Not to be used in flat or horizontal joints)
   4. Closed Cell and Bi-Cellular: 25 to 33 percent larger in diameter than joint width. (Use for flat and horizontal joints)

B. Backing Tape: Self-adhesive polyethylene tape with surface that sealant will not adhere to and recommended by tape and sealant manufacturers for specific application.

C. Masking Tape: Self-adhesive, nonabsorbent, non-staining, removable without adhesive residue, and compatible with surfaces adjacent to joints and sealants.

D. Primers: Type recommended by sealant manufacturer to suit application; non-staining.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that joints are ready to receive work.

B. Verify that backing materials are compatible with sealants.

C. Verify that backer rods are of the correct size.

D. Preinstallation Adhesion Testing: Install a sample for each test location indicated in the test plan.
   1. Test each sample as specified in PART 1 under QUALITY ASSURANCE article.
   2. Notify Fuller and D'Angelo, P.C. of date and time that tests will be performed, at least seven days in advance.
   3. Record each test on Preinstallation Adhesion Test Log as indicated.
   4. If any sample fails, review products and installation procedures, consult manufacturer, or take whatever other measures are necessary to ensure adhesion; re-test in a different location; if unable to obtain satisfactory adhesion, report to Fuller and D'Angelo, P.C. .
   5. After completion of tests, remove remaining sample material and prepare joint for new sealant installation.

3.2 PREPARATION

A. Remove loose materials and foreign matter that could impair adhesion of sealant.

B. Clean joints, and prime as necessary, in accordance with manufacturer's instructions.

C. Perform preparation in accordance with manufacturer's instructions and ASTM C1193.

D. Mask elements and surfaces adjacent to joints from damage and disfigurement due to sealant work; be aware that sealant drips and smears may not be completely removable.

3.3 INSTALLATION

A. Perform work in accordance with sealant manufacturer's requirements for preparation of surfaces and material installation instructions.

B. Perform installation in accordance with ASTM C1193.

C. Measure joint dimensions and size joint backers to achieve width-to-depth ratio, neck dimension, and surface bond area as recommended by manufacturer, except where specific dimensions are indicated.

D. Install bond breaker backing tape where backer rod cannot be used.

E. Install sealant free of air pockets, foreign embedded matter, ridges, and sags, and without getting sealant on adjacent surfaces.

F. Do not install sealant when ambient temperature is outside manufacturer's recommended temperature range, or will be outside that range during the entire curing period, unless manufacturer's approval is obtained and instructions are followed.

G. Nonsag Sealants: Tool surface concave, unless otherwise indicated; remove masking tape immediately after tooling sealant surface.

H. Self-leveling joints: Recess joint depth as recommended by the sealant manufacturer.

3.4 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements for additional requirements.

B. Perform field quality control inspection/testing as specified in PART 1 under QUALITY ASSURANCE article.

C. Remove and replace failed portions of sealants using same materials and procedures as indicated for original installation.

END OF SECTION

SECTION 08 1113
HOLLOW METAL DOORS AND FRAMES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SECTION INCLUDES

A. Non-fire-rated hollow metal doors and frames.

B. Fire-rated hollow metal doors and frames.

C. Patching existing metal frames.

D. Verification of existing rated doors and or frames.

E. Foam door seal.

1.3 RELATED REQUIREMENTS

A. Section 04 2000 - Unit Masonry.

B. Section 08 7100 - Door Hardware.

C. Section 08 8000 - Glazing

D. Section 09 2116 - Gypsum Board Assemblies.

E. Section 09 9123 - Interior Painting: Field painting.

1.4 ABBREVIATIONS AND ACRONYMS

A. ANSI: American National Standards Institute.

B. HMMA: Hollow Metal Manufacturers Association.

C. NFPA: National Fire Protection Association.

D. SDI: Steel Door Institute.

E. UL: Underwriters Laboratories.

1.5 REFERENCE STANDARDS

A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design; 2010.

B. ANSI/ICC A117.1 - American National Standard for Accessible and Usable Buildings and Facilities; International Code Council; 2009.

C. ANSI/SDI A250.6 - Recommended Practice for Hardware Reinforcing on Standard Steel Doors and Frames; 2003 (R2009).

D. ANSI/SDI A250.8 - Specifications for Standard Steel Doors and Frames (SDI-100); 2017.

E. ANSI/SDI A250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames; 2011.

F. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2018.

G. ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength; 2018a.

H. ASTM C476 - Standard Specification for Grout for Masonry; 2018.

I. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements; 2009 (Reapproved 2016).

J. ASTM E330/E330M - Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference; 2014.

K. BHMA A156.115 - American National Standard for Hardware Preparation in Steel Doors and Steel Frames; 2016.

L. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2017.

M. NAAMM HMMA 830 - Hardware Selection for Hollow Metal Doors and Frames; 2002.

N. NAAMM HMMA 831 - Hardware Locations for Hollow Metal Doors and Frames; 2011.

O. NAAMM HMMA 840 - Guide Specifications for Installation and Storage of Hollow Metal Doors and Frames; 2007.

P. NAAMM HMMA 861 - Guide Specifications for Commercial Hollow Metal Doors and Frames; 2014.

Q. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies; 2017.

R. SDI 117 - Manufacturing Tolerances for Standard Steel Doors and Frames; 2013.

S. UL (BMD) - Building Materials Directory; current edition.

T. UL 1784 - Standard for Air Leakage Tests of Door Assemblies; Current Edition, Including All Revisions.

1.6 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Materials and details of design and construction, hardware locations, reinforcement type and locations, anchorage and fastening methods, and finishes.

C. Shop Drawings: Details of each opening, showing elevations and frame profiles

D. Samples: Submit two samples of metal, 2 by 2 inches in size, showing factory finishes, colors, and surface texture.

E. Installation Instructions: Manufacturer's published instructions, including any special installation instructions relating to this project.

F. Manufacturer's Certificate: Certification that products meet or exceed specified requirements.

1.7 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than ten (10) years experience.

B. Installer Qualifications: Company specializing in performing work of the type specified and with at least five (5) years of documented experience.

C. Maintain at project site copies of reference standards relating to installation of products specified.

D. Installed Fire Rated Door Assembly: Conform to NFPA 80 for fire rated class as scheduled.

E. **Existing Frames: All existing frames in rated openings, which will receive fired doors and without UL labels, shall be certified as conforming to rating indicated on drawings**.

1. Testing Agency: provided by Inchcape Testing Services, Warnok Hersey 716-875-9775.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Comply with NAAMM HMMA 840 or ANSI/SDI A250.8 (SDI-100) in accordance with specified requirements.

B. Protect with resilient packaging; avoid humidity build-up under coverings; prevent corrosion and adverse effects on factory applied painted finish.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Hollow Metal Doors and Frames:

1. Steelcraft, an Allegion brand 1819 N. Pennsylvania St. Carmel, IN 46032; Toll Free Tel: 877-578-1247; Product GRAINTECH Series: Full flush design door: www.allegion.com/us.
2. Substitutions: See Section 01 2500 Substitution Procedures.

2.2 PERFORMANCE REQUIREMENTS

A. Requirements for Hollow Metal Doors and Frames:
   1. Steel Sheet: Comply with one or more of the following requirements; galvannealed steel complying with ASTM A653/A653M, cold-rolled steel complying with ASTM A1008/A1008M, or hot-rolled pickled and oiled (HRPO) steel complying with ASTM A1011/A1011M, commercial steel (CS) Type B, for each.
   2. Accessibility: Comply with ICC A117.1 and ADA Standards.
   3. Door Top Closures: Flush end closure channel, with top and door faces aligned.
   4. Door Edge Profile: Beveled.
   5. Typical Door Face Sheets: Flush with wood grain. Refer to Door Schedule for additional information.
   6. Hardware Preparations, Selections and Locations: Comply with NAAMM HMMA 830 and NAAMM HMMA 831 or BHMA A156.115 and ANSI/SDI A250.8 (SDI-100) in accordance with specified requirements.
      a. Provide 14 gauge channel reinforcing for all door closers.
   7. Galvanizing including all doors and frames: All components hot-dipped zinc-iron alloy-coated (galvannealed), manufacturer's standard coating thickness.

2.3 EMBOSSED WOOD GRAIN FINISH DOORS

A. Full Flush Doors:

B. Acceptable Product: Steelcraft GrainTech Series.
   1. Performance:
      a. Physical performance: 5 million cycles per ANSI A250.4.
      b. Sound attenuation (gasketed):
         a) Honeycomb core, 35 STC.
      c. Thermal performance (gasketed), ASTM C1363.
         a) Polystyrene core, 0.48 U-factor.
      d. Thermal performance (gasketed), ASTM C236.
         a) Honeycomb core, 0.363 U-factor.

C. Door Thickness: 1-3/4 inches.

D. Gauge: 16 Gauge.

E. Door faces reinforced and sound deadened as follows:
   1. Honeycomb Core:
      a. Sanded for maximum adhesion.
      b. Impregnated with phenolic resin.
      c. Laminated to both faces sheets with contact adhesive.

F. Vertical edge seams: Provide doors with continuous vertical mechanical inter-locking joints at lock and hinge edges. Finish edges as follows:
   1. Full Height, Epoxy Filled Mechanical Interlock Edges provide structural support and stability the full height of the door edges.
      a. Filled Edge Seam: Seam filled with structural adhesive and dressed smooth. Includes tack welds above and below edge cutouts as required for doors over 7'-2" rated over 20 minutes.

G. Bevel hinge and lock door edges 1/8 inch (3 mm) in 2 inches (50 mm). Square edges on hinge and/or lock stiles are not acceptable.

H. Reinforce top and bottom of doors with galvannealed 14 gage (1.7 mm), welded to both panels.

I. Glazing Bead: Formed steel sheet or snap-in Designer trim.

J. Fire Rating: Supply door units bearing Labels for fire ratings indicated in Door Schedule for the locations indicated.

K. In addition to the requirements listed the following apply where wood grain finished are indicated:
   1. Fabricated from steel that has an embossed wood grain pattern extending the full height and width of the door. Provide a wood grain embodiment minimum .005" deep. Applied grain pattern or material is not acceptable.

L. Anchors: Manufacturer's standard framing anchors, specified in manufacturer's printed installation instructions for project conditions.

M. Astragals for pairs of doors: Manufacturer's standard for labeled and non-labeled openings.

N. Door Bottom:
   1. Acceptable Product: Steelcraft Fas-Seal Door Bottom.
   2. Characteristics: Electrometric, continuous strip, screw-attached to recessed bottom door channel for concealed installation; double-sealing; acceptable for fire-rated doors up to 3 hour rating.

O. Plaster Guards: Same material as door frame, minimum 24 gage (0.5 mm) minimum; provide for all strike boxes.

P. Silencers: Resilient rubber, Inserted type, three per strike jamb for single openings and two per head for paired openings. Stick-on silencers shall not be permitted except on hollow metal framing systems.
   1. Provide silencers on all existing frames.

Q. Finish: Complete factory finish.
   1. Color: Oak

2.4 HOLLOW METAL FRAMES

A. Comply with standards and/or custom guidelines as indicated for corresponding door in accordance with applicable door frame requirements.

B. Frame Finish: Factory primed and field finished.

C. Repair Frames as indicated on drawings or required, cut and reweld new frame material and finish to match existing surfaces. Prime and paint frames.

D. Interior Door Frames: Full profile/continuously welded type..
   1. Fire Rating: Same as door, labeled.
   2. Frame Metal Thickness: 14 gage, 0.067 inch, minimum.
   3. Frame Finish: Factory primed and field finished.

2.5 FINISHES

A. Refer to Section 09 91 23 Interior Painting.

B. Primer: Rust-inhibiting, complying with ANSI/SDI A250.10, door manufacturer's standard.

C. Factory Finish: Complying with ANSI/SDI A250.3, manufacturer's standard coating.
   1. Color: Maple.

2.6 ACCESSORIES

A. Glazing Trim: As per manufacturer's standard for doors and glass thickness.

B. Glazing: As specified in Section 08 8000, factory installed.

C. Removable Stops: Formed sheet steel, shape as indicated on drawings, mitered or butted corners; prepared for countersink style tamper proof screws.

D. Astragals and Edges for Double Doors: Pairs of door astragals, and door edge sealing and protection devices.
   1. UL listed products in compliance with requirements of authorities having jurisdiction.
   2. Provide surface mounted astragal to cover or fill space for full door height between pair of doors or door and adjacent jamb.

E. Grout for Frames: Mortar grout complying with ASTM C476 with maximum slump of 4 inches as measured in accordance with ASTM C143/C143M for hand troweling in place; plaster grout and thinner pumpable grout are prohibited.

F. Silencers: Resilient rubber, fitted into drilled hole; provide three on strike side of single door, three on center mullion of pairs, and two on head of pairs without center mullions.

G. Temporary Frame Spreaders: Provide for factory- or shop-assembled frames.

H. Frame Anchors: Minimum of six wall anchors and two base anchors.
1. T anchors for masonry.
2. Clips angles for metal framing.

I. Frame Repairs:
1. Repair dents, patch rust holes, fill in chips etc.
2. Body Filler With Hardener.
3. Color: Light Gray.
4. Manufacturer: 3M Product "Bondo Body Filler 265".

J. Foam window and door seal.
1. Fill all exterior joint between windows and doors solid in accordance with manufacture's instructions.
2. Cut back to permit application of joint sealant.
3. Insulating-Foam Sealant: Dow "Great Stuff Window & Door.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that opening sizes and tolerances are acceptable.

C. Verify that finished walls are in plane to ensure proper door alignment.

3.2 PREPARATION

A. Coat inside of frames to be installed in masonry or to be grouted, with bituminous coating, prior to installation.

B. Patch existing frames as required to remove rust, dents, chips and fill holes.
1. Appy body filler i accordance to manufacturer's instruction.
2. Sand surfaces smooth.

3.3 INSTALLATION

A. Install doors and frames in accordance with manufacturer's instructions and related requirements of specified door and frame standards or custom guidelines indicated and NAAMM HMMA 840.

B. Coordinate frame anchor placement with wall construction.

C. Grout frames in masonry construction, using hand trowel methods; brace frames so that pressure of grout before setting will not deform frames.

D. Install door hardware as specified in Section 08 7100.
1. Comply with recommended practice for hardware placement of doors and frames in accordance with ANSI/SDI A250.6 or NAAMM HMMA 861.

E. Comply with glazing installation requirements of Section 08 8000.

F. Coordinate installation of electrical connections to electrical hardware items.

G. Install perimeter foam seal in accordance with requirements specified in Section 07 9005.
1. Fill all exterior spaces and joint between windows and doors solid with foam in accordance with manufacture's instructions.

2. Cut back to permit application of joint sealant.

H. Touch up damaged factory finishes.

3.4 TOLERANCES

A. Clearances Between Door and Frame: Comply with related requirements of specified frame standards or custom guidelines indicated in accordance with SDI 117 or NAAMM HMMA 861.

B. Maximum Diagonal Distortion: 1/16 inch measured with straight edge, corner to corner.

3.5 ADJUSTING

A. Adjust for smooth and balanced door movement.

3.6 SCHEDULE

A. Refer to Door and Frame Schedule on the drawings.

END OF SECTION

SECTION 08 1116
ALUMINUM DOORS AND ALUMINUM FRAMES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SECTION INCLUDES

A. Aluminum Frames for Aluminum doors.

B. Monumental Aluminum Stile and Rail Doors.

C. Factory installed Finish Hardware

D. Foam door seal.

1.3 REFERENCE STANDARDS

A. AAMA 1503 - Voluntary Test Method for Thermal Transmittance and Condensation Resistance of Windows, Doors and Glazed Wall Sections; 2009.

B. ASTM D 638 - Tensile Properties of Plastics

C. ASTM D256 - Standard Test Methods for Determining the Izod Pendulum Impact Resistance of Plastics; 2010 (Reapproved 2018).

D. ASTM D2583 - Standard Test Method for Indentation Hardness of Rigid Plastics by Means of Barcol Impressor; 2013a.

E. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2018b.

F. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements; 2009 (Reapproved 2016).

G. ASTM E283 - Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen; 2004 (Reapproved 2012).

H. ASTM E330/E330M - Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference; 2014.

I. ASTM E1886 - Impact Test.

J. ASTM F1642 - Blast Test.

K. NFRC: Door and Thermally Broken Aluminum Frame Assembly.

1.4 PERFORMANCE

A. Door Panel.
   1. Thermal Transmittance, AAMA 1503-98: U-Factor = 0.82 Btu/hr ft² °F, CRFp = 23.
   2. Indoor Air Quality, ASTM-D5116, ASTM-D6607: GreenGuard, GreenGuard Gold.

B. Door and Thermally Broken Aluminum Frame Assembly.
   1. Thermal Transmittance, NFRC 100.
      a. Commercially Glazed Swinging Entrance Door (> than 50% glass)
         a) U-Factor = 0.62 Btu/hr ft² °F.
   2. Air Leakage, NFRC 400, ASTM-E283.
      a. Commercially Glazed Swinging Entrance Door (> than 50% glass)
         a) 0.39 cfm/sqft @ 1.57 psf.
         b) 0.78 cfm/sqft @ 6.24 psf.
   3. Sound Transmission, ASTM-E90: STC = 30, OITC = 28.

1.5 SYSTEM PERFORMANCE:

A. Provide Door assemblies that have been designed and fabricated to comply with requirements for system performance characteristics listed below, as demonstrated by testing manufacturer's corresponding stock systems according to test methods designated.

B. Thermal Transmission (Exterior Doors): U-value of not more than 0.09 (BTU/Hr. x sf x degrees F.) per AAMA 1503.1.

1.6 ADMINISTRATIVE REQUIREMENTS

A. Coordination: Obtain hardware templates from hardware manufacturer prior to starting fabrication.

1.7 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's standard details, installation instructions, hardware and anchor recommendations.

C. Shop Drawings: Indicate layout and profiles; include assembly methods.

1. Indicate product components, including hardware reinforcement locations and preparations, accessories, finish colors, patterns, and textures.
2. Indicate wall conditions, door and frame elevations, at 1/2" scale, half-sized detail sections, materials, gages, finishes, location of door hardware by dimension, and details of openings; use same reference numbers indicated on Drawings to identify details and openings. expansion provisions, and other components not included in the manufacturer's standard data. Include glazing details

D. Selection Samples: Submit two complete sets of color chips, illustrating manufacturer's available finishes, colors, and textures.

1. Where normal color and texture variations are expected, include two or more units in each sample to show the range of such variations.

E. Architect reserves the right to require samples of typical fabricated section, showing joints, exposed fastenings (if any), quality of workmanship, hardware and accessory items, before fabrication of the work proceeds.

F. Test Reports: Submit certified test reports from qualified independent testing agency indicating doors comply with specified performance requirements.

G. Manufacturer's Qualification Statement.

H. Maintenance Data: Include instructions for repair of minor scratches and damage.

I. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Edgemont Union Free School District's name and registered with manufacturer; include detailed terms of warranty.

1.8 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products of the type specified in this section, with not less than twenty (20) years of documented experience.

1. Door and frame components from same manufacturer.
2. Evidence of a compliant documented quality management system.

B. Standards: Comply with the requirements and recommendations in applicable specifications and standards by NAAMM, AAMA, and AA, including the terminology definitions, and specifically including the "Entrance Manual" by NAAMM, except to the extent more stringent requirements are indicated.

C. All materials, equipment and operation supplied shall conform to all Code requirements including Accessibility for the Handicapped.

D. Installer Qualifications: Company specializing in installing products of the type specified in this section with not less than five (5) years of documented experience, **and approved by the manufacturer.**

E. The manufacturer shall provide a factory trained technician to visit this project and instruct the installers in the proper installation of the door and frame assemblies and submit written report.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact. Materials shall be inspected for damage, and the manufacturer shall be advised immediately of any discrepancies. Unsatisfactory materials are not to be used

B. Store materials in original corrugated packaging, under cover, protected from exposure to harmful weather conditions and from direct contact with water.
   1. Store in position recommended by manufacturer, elevated minimum 4 inch above grade, with minimum 1/4 inch space between doors.

1.10 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Provide a written warranty signed by Manufacturer, Installer and Contractor, agreeing to replace, at no cost to the Owner, any doors or frames that fail in materials or workmanship, within the time period of acceptance, as indicated below. Failure of materials or workmanship includes excessive deflection, faulty operation of entrances, deterioration of finish, or construction, in excess of normal weathering, and defects in hardware, weather stripping, and other components of the work. In addition the manufacturer further certifies that they have factory installed all hardware and such hardware is also guaranteed not to come loose during the guarantee period.

C. Warranty Time Period: Ten Years from substantial completion.

D. Finish:
   1. Anodized, aluminum:10 years.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Manufacturer: Subject to compliance with requirements, provide products of one of the following:
   1. Aluminum Wide Stile Doors and frames
      a. Special-Lite, Inc. PO Box 6, Decatur, Michigan 49045.
         a) Toll Free (800) 821-6531, Phone (269) 423-7068, Fax (800) 423-7610.

2.2 DESCRIPTION

A. Model.
   1. SL-15 Wide Stile Monumental Door:

B. Door Opening Size:
   1. Refer to Door Schedule:

C. Construction.
   1. Door Thickness:
      a. 1-3/4".
   2. Stiles:
      a. 4-3/4" wide with integral glass stop on exterior side, no snap or applied stops allowed.
      b. Aluminum extrusions made from 6063 aluminum alloys with a minimum temper of T5.
      c. Screw or snap in place applied caps are not acceptable.
      d. Meeting stiles to include integral pocket to accept pile brush weather seal.
   3. Rails.
      a. Top Rail Height: 6-1/2"
      b. Bottom Rail Height: 10-1/2"
      c. Integral panel stops on exterior side, no snap or applied stops allowed.
      d. Aluminum Extrusions: 6063 aluminum alloys, temper of T5.

e. Screw or snap in place applied caps are not acceptable.

4. Corners:
   a. True mortise and tenon joints.
   b. Secured with 3/8” diameter full-width steel tie rod.
   c. Weld, glue, or other methods of corner joinery are not acceptable.
5. Mid Panel.
   a. Model SL-484.
   b. 12” high.
   c. Core.
      a) Poured-in-place polyurethane foam.
      b) Laid in foam cores are not acceptable.
      c) Foam Plastic Insulated Doors: IBC 2603.4.
         (a) Foam plastic shall be separated from the interior of a building by an approved thermal barrier.
         (b) IBC 2603.4.1.7 foam plastic insulation, having a flame spread index less than 75 and a smoke developed index of not more than 450 shall be permitted as a door core when the face is metal minimum 0.032” aluminum or 0.016” steel.
      d) Frame.
         (a) Aluminum extrusions with extruded spline and interlocking edges to secure face sheet.
      e) Secured to stiles with mortise & tenon joints and two 3/8” steel tie rods with locking hex nuts.
   d. Face Sheet:
      a) Exterior.
         (a) Aluminum
            (1) 0.125” thick smooth aluminum sheet.
      b) Interior.
         (a) Aluminum
         (b) 0.125” thick smooth aluminum sheet.
6. Hardware.
   a. Refer to Section 08 7100 - Door Hardware.
   b. Pre-machine doors in accordance with templates from specified hardware manufacturers.
   c. Surface mounted closures will be reinforced for but not prepped or installed at factory.
   d. Factory install door hardware.
   e. Refer to Section 08 7100 - Door Hardware.
7. Reinforcements.
   a. Aluminum extrusions made from 6061 or 6063 aluminum alloys.
   b. Sheet and plate to conform to ASTM-B209.
   c. Alloy and temper to be selected by manufacturer for strength, corrosion resistance, and application of required finish, and control of color.
   d. Bars and tubes to meet ASTM-B221.

2.3 FRAMING

A. Thermally Broken Aluminum Framing.
   1. Model: SL600TB 2" x 6"
      a. Choose an item.
   2. Materials.
      a. See 2.05.A.
   3. Perimeter Frame Members.

a. Storefront frame with thermally broken pocket filler.
b. Factory fabricated.
c. Open-back framing is not acceptable.

4. Applied Door Stops.
   a. 5/8" x 1-1/4" or 5/8" x 1-3/4", 0.125" wall thickness, with screws and weather-stripping.
   b. Provide solid ½" aluminum bar behind door stop for closer shoe attachment.
   c. Pressure gasketing for weathering seal.
   d. Counterpunch fastener holes in door stop to preserve full-metal thickness under fastener head.
   e. Minimum ½" aluminum bar reinforcement under doorstop for required hardware attachments, aluminum to meet ASTM-B221.
5. Caulking.
   a. Caulk joints before assembling frame members.
6. Frame Member to Member Connections.
   a. Secure joints with fasteners.
   b. Provide hairline butt joint appearance.
   c. Shear block construction only, no screw spline allowed.
7. Hardware
   a. Pre-machine and reinforce frame members for hardware in accordance with manufacturer's standards and door hardware schedule.
   b. Surface mounted closures will be reinforced for but not prepped or installed at factory.
   c. Factory install door hardware.
8. Anchors:
   a. Anchors appropriate for wall conditions to anchor framing to wall materials.
   b. Door Jamb and Header Mounting Holes: Maximum of 24-inch centers.
   c. Secure head and sill members of transom, side lites, and similar conditions.

2.4 PERFORMANCE

A. Door Panel.
   1. Thermal Transmittance, AAMA 1503-98: U-Factor = 0.82 Btu/hr ft² °F, CRFp = 23.

B. Door and Thermally Broken Aluminum Frame Assembly.
   1. Thermal Transmittance, NFRC 100.
      a. Commercially Glazed Swinging Entrance Door (> than 50% glass)
         a) U-Factor = 0.62 Btu/hr ft² °F.
   2. Air Leakage, NFRC 400, ASTM-E283.
      a. Commercially Glazed Swinging Entrance Door (> than 50% glass)
         a) 0.39 cfm/sqft @ 1.57 psf.
         b) 0.78 cfm/sqft @ 6.24 psf.
   3. Sound Transmission, ASTM-E90: STC = 30, OITC = 28

2.5 MATERIALS

A. Aluminum Members.
   1. Aluminum extrusions made 6061 or 6063 aluminum alloys.
   2. Sheet and plate to conform to ASTM-B209.
   3. Alloy and temper to be selected by manufacturer for strength, corrosion resistance, and application of required finish, and control of color.

B. Fasteners.
   1. 410 stainless steel or other non-corrosive metal.

2.6 FINISH HARDWARE:

A. Provide and factory install finish hardware for each door leaf as specified in Section 08 8711 - Finish Hardware.
   1. Premachine doors in accordance with templates from specified hardware manufacturers and hardware schedule.

B. Pull
   1. Special-Lite SL-82 Clear Anodized Class I Aluminum Recessed Pull Handles.

C. Special-Lite SL-301 Concealed adjustable brush. Install door manufacturer’s multi-directional adjustable bottom with double nylon brush weatherstripping. Door bottom must be concealed and adjust to accommodate irregular tapered floor conditions.

D. Receive Hardware supplied in accordance with this Section, and coordinate with the Hardware requirements of this section. Report discrepancies (in writing) to the Architect immediately.

E. Reinforce, cut, drill and tap doors and frames as required to receive Hardware, except do not drill and tap for surface mounted closers and holders, which will be applied at the jobsite. Comply with Hardware manufacturer's instructions and template requirements. Use concealed fasteners wherever possible.

F. Install all Hardware, except surface mounted closers, holders, gaskets and seals at the fabrication plant. Remove only Hardware as required for final finishing or delivery to jobsite. Package and identify such Hardware and ship with doors and frames for installation at the project site.

G. Painting: All existing surfaces to remain exposed, and all disturbed areas shall be painted to match existing surfaces.

2.7 FABRICATION:

A. Sizes and Profiles: The required sizes for door and frame units, and profiles requirements are shown on the drawings.

B. The details shown are based upon standard details by one or more manufacturers. It is intended that similar details by other manufacturers will be accepted, provided they comply with size requirements, and with minimum/maximum profile requirements as shown.

C. Co-ordination of Fabrication: Check the actual frame or door openings in the construction work by accurate field measurements before fabrication, and show recorded measurements on final shop drawings. Coordinate fabrication schedule with construction progress, as directed by Contractor, and avoid delays of the work.

D. Assembly
   1. Complete the cutting, fitting, forming, drilling and grinding of all metal work prior to the cleaning, finishing, treatment and application for coatings.
   2. Remove burrs from cut edges, and ease edges and corners to a radius of approximately 1/64"

E. No Welding of joints will be accepted.

F. Conceal fasteners, wherever possible, except as otherwise noted.

G. Maintain continuity of line and accurate relation of planes and angles. Provide secure attachments and support at mechanical joints, with hairline fit at contacting members.

H. Reinforce the work as necessary for performance requirements, and for support to the structure. Separate dissimilar metals with bituminous paint or preformed separators which will prevent corrosion. Separate metal surfaces at moving joints with non-metallic separators to prevent "freeze-up" of joints.

2.8 ACCESSORIES

A. Foam window and door seal.
   1. Fill all exterior joint between windows and doors solid in accordance with manufacture's instructions.
   2. Cut back to permit application of joint sealant.

3. Insulating-Foam Sealant: Dow Great Stuff Window & Door.

B. Hardware: As specified in Section 08 7100.

2.9 FINISHES

A. High-Performance Organic Finish: AA-C12C42R1x (Chemical Finish: cleaned with inhibited chemicals; Chemical Finish: acid-chromate-fluoride-phosphate conversion coating; Organic Coating: as specified below). Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturer's written instructions

1. Fluoropolymer Two-Coat System: Manufacturer's standard two-coat thermocured system consisting of specially formulated inhibitive primer and fluoropolymer color topcoat containing not less than 50% polyvinylcloride resin by weight; complying with AAMA 2604.
2. Color: As selected by Architect from manufacturer's standard and premium colors including metallics. (Note: Exterior color may be different from interior color.)

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify actual dimensions of openings by field measurements before door fabrication; show recorded measurements on shop drawings.

B. Do not begin installation until substrates have been properly prepared.

3.2 PREPARATION

A. Remove existing doors and frames, and dispose of all removed materials in accordance with local authorities having jurisdiction.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

C. Ensure openings to receive frames are plumb, level, square, and in tolerance.

D. Clean and prepare substrate in accordance with manufacturer's directions.

E. Protect adjacent work and finish surfaces from damage during installation.

3.3 INSTALLATION

A. Install in accordance with manufacturer's instructions; do not penetrate frames with anchors.

B. Install gaskets and seals to doors in accordance with manufacturer's instructions.

C. Set units plumb, level, and true-to-line, without warping or racking doors, and with specified clearances; anchor in place.

D. Follow Curvature of the Arched Brick openings, for top Aluminum Frames. See drawings.

E. Set units plumb, level and true to line, without warp or rack of doors or frames. Anchor securely in place. Separate Aluminum, and other corrodible metal surfaces, from sources of corrosion or electrolytic action at points of contact with other materials, with bituminous coatings, or other means as approved by Architect.

F. In masonry walls, install frames prior to laying masonry; anchor frames into masonry mortar joints; fill jambs with grout as walls are laid up.

G. In stud walls, install frames prior to building walls; anchor frames to studs using concealed anchors.

H. Set saddles in a bed of compound.

I. Separate aluminum and other metal surfaces from sources of corrosion of electrolytic action at points of contact with other materials.

J. Install perimeter foam seal in accordance with requirements specified in Section 07 9005.

1. Fill all exterior spaces and joint between windows and doors solid with foam in accordance with manufacture's instructions.
2. Cut back to permit application of joint sealant.

K. Repair or replace damaged installed products.

L. Remove and replace damaged components that cannot be successfully repaired as determined by Architect.

3.4 ADJUSTING

A. Lubricate, test, and adjust doors to operate easily, free from warp, twist or distortion, and to fit watertight for entire perimeter.

B. Adjust hardware for smooth and quiet operation.

C. Adjust doors to fit snugly and close without sticking or binding.

3.5 CLEANING

A. Clean installed products in accordance with manufacturer's instructions prior to owner's acceptance.

B. Do not use harsh cleaning materials or methods that would damage finish.

3.6 PROTECTION

A. Protect installed products from damage until Date of Substantial Completion.

B. Protect installed doors to ensure that, except for normal weathering, doors will be without damage or deterioration at time of substantial completion.

C. Provide protective treatment and other precautions required through the remainder of the construction period, to ensure that the doors and frames will be without damage or deterioration (other than normal weathering) at the time of acceptance.

END OF SECTION

SECTION 08 3100
ACCESS DOORS AND PANELS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SECTION INCLUDES

A. Wall- and ceiling-mounted access units.

1.3 RESPONIBILITY AND REQUIREMENTS

A. Each Contractor shall provided access doors for all dampers, valves, cleanest, junction boxes, pull boxes or similar items located above finished ceilings or ceiling breaks or extensions, behind finished walls or below finished floors. The access doors shall be steel, unless noted otherwise, hinged types as required for type of construction.
   1. Where feasible locate all dampers, valves, cleanest, junction boxes, pull boxes or similar items above acoustical panel tile ceilings.

B. In new walls, floor, ceiling, etc., access doors are to be installed by the General Construction Contractor and furnished by each Contractor whose work requires access.

C. Access door required in existing walls, floors, ceilings, etc., shall be furnished and installed by the contractor requiring access.

1.4 RELATED REQUIREMENTS

A. Section 04 2000 - Unit Masonry: Access doors in masonry.

B. Section 09 2116 - Gypsum Board Assemblies: Access doors in gypsum walls.

C. Section 09 9123 - Interior Painting: Field paint finish.

1.5 REFERENCE STANDARDS

A. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2014.

B. ASTM A276/A276M - Standard Specification for Stainless Steel Bars and Shapes; 2017.

C. ITS (DIR) - Directory of Listed Products; current edition.

D. UL (FRD) - Fire Resistance Directory; Current Edition.

1.6 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide sizes, types, finishes, hardware, scheduled locations, and details of adjoining work.

C. Shop Drawings: Indicate exact position of each access door and/or panel unit.

D. Manufacturer's Installation Instructions: Indicate installation requirements.

E. Project Record Documents: Record actual locations of each access unit.

1.7 QUALITY ASSURANCE

PART 2 PRODUCTS

2.1 GENERAL:

A. All Units: Factory fabricated, fully assembled units with corner joints welded, filled, and ground flush; square and without rack or warp; coordinate requirements with assemblies units are to be installed in.

B. Sizes shall be 12 X 12 inch at easily accessible valves and cleanouts; 18 X 18 inch where partial body access is required; 24 X 24 inch where entree body access is necessary.

C. Group together concealed boxes, control valves, dampers and other mechanical and electrical equipment requiring access for operation, maintenance and repair, to reduce number of access doors required.

D. Where electric motors or heaters are installed above hung ceilings, provide disconnect switch in hung ceilings within reach from access doors, unless switch is located on wall immediately below.
   1. Disconnect switch shall be provided and installed by the Contractor furnishing the equipment unless shown otherwise.

E. Door/Panel: Hinged, standard duty, with tool-operated spring or cam lock and no handle.

F. All access doors shall have integral casing bead, white enamel prime coat, reinforced panel, flush type tamper proof lock unless noted otherwise.

G. All access doors in Toilets, Janitor Closets, Science and Prep Rooms, Storage Rooms, and Kitchen and Food Related Areas and similar spaces shall be watertight and constructed completely of stainless steel type 304.

2.2 ACCESS DOORS AND PANELS ASSEMBLIES

A. Wall-Mounted Units:
   1. Location: As required.
   2. Panel Material: Steel. Painted
   3. Door/Panel: Hinged, standard duty, with tool-operated spring or cam lock and no handle.
   4. Gypsum Board Mounting Criteria: Provide drywall bead frame with door surface flush with wall surface.
   5. Masonry Mounting Criteria: Provide surface-mounted frame with door surface flush with frame surface.

B. Wall-Mounted Units in Wet Areas:
   1. Location: As required.
   2. Material: Stainless steel, Type 304.
   3. Door/Panel: Hinged, standard duty, with tool-operated spring or cam lock and no handle.
   4. Gypsum Board Mounting Criteria: Provide drywall bead frame with door surface flush with wall surface.
   5. Masonry Mounting Criteria: Provide surface-mounted frame with door surface flush with frame surface.

C. Fire-Rated Wall-Mounted Units:
   1. Wall Fire-Rating: Fire rating equivalent to the fire rated assembly in which they are to be installed..
      a. Provide products listed and labeled by UL or ITS (Warnock Hersey) as suitable for the purpose specified and indicated.
   2. Panel Material: Steel. Painted
   3. Door/Panel: Insulated double-surface panel, with tool-operated spring or cam lock and no handle.

D. Ceiling-Mounted Units:
   1. Location: As required.
   2. Material: Steel, hot-dipped zinc, or zinc-aluminum-alloy coated.
   3. Size - Lay-In Grid Ceilings: To match module of ceiling grid.
   4. Size: As required
   5. Door/Panel: Hinged, standard duty, with tool-operated spring or cam lock and no handle.

E. Manufacturers:
   1. Milcor, Inc: www.milcorinc.com/#sle.
   2. Substitutions: Section 01 2500 Substitution Procedures

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that rough openings are correctly sized and located.

B. Begin installation only after substrates have been properly prepared, and if the responsibility of another installer, notify Construction Manager of unsatisfactory preparation before proceeding.

3.2 PREPARATION

A. Clean surfaces thoroughly prior to proceeding with this work.

B. Prepare surfaces using methods recommended by manufacturer for applicable substrates in accordance with project conditions.

3.3 INSTALLATION

A. Install units in accordance with manufacturer's instructions.

B. Install frames plumb and level in openings, and secure units rigidly in place.

C. Position units to provide convenient access to concealed equipment when necessary.

END OF SECTION

SECTION 08 7100
DOOR HARDWARE

GENERAL

1.1 SUMMARY

A. Section includes:
   1. Mechanical and electrified door hardware
      a. Electronic access control system components
      b. Field verification, preparation and modification of existing doors and frames to receive new door hardware.
   2. Section excludes:
      a. Windows
      b. Cabinets (casework), including locks in cabinets
      c. Signage
      d. Toilet accessories
      e. Overhead doors
   3. Related Sections:
      a. Division 01 "General Requirements" sections for Allowances, Alternates, Owner Furnished Contractor Installed, Project Management and Coordination.
      b. Division 06 Section "Rough Carpentry"
      c. Division 06 Section "Finish Carpentry"
      d. Division 07 Section "Joint Sealants" for sealant requirements applicable to threshold installation specified in this section.
      e. Division 08 Sections:
         a) "Metal Doors and Frames"
         b) "Interior Aluminum Doors and Frames"
      f. Division 09 sections for touchup, finishing or refinishing of existing openings modified by this section.
      g. Division 26 "Electrical" sections for connections to electrical power system and for low-voltage wiring.
      h. Division 28 "Electronic Safety and Security" sections for coordination with other components of electronic access control system and fire alarm system.

B. REFERENCES
   1. UL LLC
      a. UL 10B - Fire Test of Door Assemblies
      b. UL 10C - Positive Pressure Test of Fire Door Assemblies
      c. UL 1784 - Air Leakage Tests of Door Assemblies
      d. UL 305 - Panic Hardware
   2. DHI - Door and Hardware Institute
      a. Sequence and Format for the Hardware Schedule
      b. Recommended Locations for Builders Hardware
      c. Keying Systems and Nomenclature
      d. Installation Guide for Doors and Hardware
   3. NFPA – National Fire Protection Association
      a. NFPA 70 – National Electric Code
      b. NFPA 80 – 2016 Edition – Standard for Fire Doors and Other Opening Protectives
      c. NFPA 101 – Life Safety Code
      d. NFPA 105 – Smoke and Draft Control Door Assemblies
      e. NFPA 252 – Fire Tests of Door Assemblies

4. ANSI - American National Standards Institute
   a. ANSI A117.1 – 2017 Edition – Accessible and Usable Buildings and Facilities
   b. ANSI/BHMA A156.1 - A156.29, and ANSI/BHMA A156.31 - Standards for Hardware and Specialties
   c. ANSI/BHMA A156.28 - Recommended Practices for Keying Systems
   d. ANSI/WDMA I.S. 1A - Interior Architectural Wood Flush Doors
   e. ANSI/SDI A250.8 - Standard Steel Doors and Frames

C. SUBMITTALS
1. General:
   a. Submit in accordance with Conditions of Contract and Division 01 Submittal Procedures.
   b. Prior to forwarding submittal:
      a) Comply with procedures for verifying existing door and frame compatibility for new hardware, as specified in PART 3, "EXAMINATION" article, herein.
      b) Review drawings and Sections from related trades to verify compatibility with specified hardware.
      c) Highlight, encircle, or otherwise specifically identify on submittals: deviations from Contract Documents, issues of incompatibility or other issues which may detrimentally affect the Work.
2. Action Submittals:
   a. Product Data: Submit technical product data for each item of door hardware, installation instructions, maintenance of operating parts and finish, and other information necessary to show compliance with requirements.
   b. Riser and Wiring Diagrams: After final approval of hardware schedule, submit details of electrified door hardware, indicating:
      a) Wiring Diagrams: For power, signal, and control wiring and including:
         (a) Details of interface of electrified door hardware and building safety and security systems.
         (b) Schematic diagram of systems that interface with electrified door hardware.
         (c) Point-to-point wiring.
         (d) Risers.
   c. Samples for Verification: If requested by Architect, submit production sample of requested door hardware unit in finish indicated and tagged with full description for coordination with schedule.
      a) Samples will be returned to supplier. Units that are acceptable to Architect may, after final check of operations, be incorporated into Work, within limitations of key coordination requirements.
   d. Door Hardware Schedule:
      a) Submit concurrent with submissions of Product Data, Samples, and Shop Drawings. Coordinate submission of door hardware schedule with scheduling requirements of other work to facilitate fabrication of other work critical in Project construction schedule.
      b) Submit under direct supervision of a Door Hardware Institute (DHI) certified Architectural Hardware Consultant (AHC) or Door Hardware Consultant (DHC) with hardware sets in vertical format as illustrated by Sequence of Format for the Hardware Schedule published by DHI.
      c) Indicate complete designations of each item required for each opening, include:
         (a) Door Index: door number, heading number, and Architect's hardware set number.
         (b) Quantity, type, style, function, size, and finish of each hardware item.
         (c) Name and manufacturer of each item.

(d) Fastenings and other pertinent information.
(e) Location of each hardware set cross-referenced to indications on Drawings.
(f) Explanation of all abbreviations, symbols, and codes contained in schedule.
(g) Mounting locations for hardware.
(h) Door and frame sizes and materials.
(i) Degree of door swing and handing.
(j) Operational Description of openings with electrified hardware covering egress, ingress (access), and fire/smoke alarm connections.

e. Key Schedule:
a) After Keying Conference, provide keying schedule that includes levels of keying, explanations of key system's function, key symbols used, and door numbers controlled.
b) Use ANSI/BHMA A156.28 "Recommended Practices for Keying Systems" as guideline for nomenclature, definitions, and approach for selecting optimal keying system.
c) Provide 3 copies of keying schedule for review prepared and detailed in accordance with referenced DHI publication. Include schematic keying diagram and index each key to unique door designations.
d) Index keying schedule by door number, keyset, hardware heading number, cross keying instructions, and special key stamping instructions.
e) Provide one complete bitting list of key cuts and one key system schematic illustrating system usage and expansion. Forward bitting list, key cuts and key system schematic directly to Owner, by means as directed by Owner.
f) Prepare key schedule by or under supervision of supplier, detailing Owner's final keying instructions for locks.

3. Informational Submittals:
a. Provide Qualification Data for Supplier, Installer and Architectural Hardware Consultant.
b. Provide Product Data:
a) Certify that door hardware approved for use on types and sizes of labeled fire-rated doors complies with listed fire-rated door assemblies.
b) Include warranties for specified door hardware.

4. Closeout Submittals:
a. Operations and Maintenance Data: Provide in accordance with Division 01 and include:
a) Complete information on care, maintenance, and adjustment; data on repair and replacement parts, and information on preservation of finishes.
b) Catalog pages for each product.
c) Final approved hardware schedule edited to reflect conditions as installed.
d) Final keying schedule
e) Copy of warranties including appropriate reference numbers for manufacturers to identify project.
f) As-installed wiring diagrams for each opening connected to power, both low voltage and 110 volts.

5. Inspection and Testing:
a. Submit written reports to the Owner and Authority Having Jurisdiction (AHJ) of the results of functional testing and inspection for:
a) Fire door assemblies, in compliance with NFPA 80.
b) Required egress door assemblies, in compliance with NFPA 101.

D. QUALITY ASSURANCE
1. Qualifications and Responsibilities:

a. Supplier: Recognized architectural hardware supplier with a minimum of 5 years documented experience supplying both mechanical and electromechanical door hardware similar in quantity, type, and quality to that indicated for this Project. Supplier to be recognized as a factory direct distributor by the manufacturer of the primary materials with a warehousing facility in the Project's vicinity. Supplier to have on staff, a certified Architectural Hardware Consultant (AHC) or Door Hardware Consultant (DHC) available to Owner, Architect, and Contractor, at reasonable times during the Work for consultation.

b. Installer: Qualified tradesperson skilled in the application of commercial grade hardware with experience installing door hardware similar in quantity, type, and quality as indicated for this Project.

c. Architectural Hardware Consultant: Person who is experienced in providing consulting services for door hardware installations that are comparable in material, design, and extent to that indicated for this Project and meets these requirements:

a) For door hardware: DHI certified AHC or DHC.

b) Can provide installation and technical data to Architect and other related subcontractors.

c) Can inspect and verify components are in working order upon completion of installation.

d) Capable of producing wiring diagram and coordinating installation of electrified hardware with Architect and electrical engineers.

d. Single Source Responsibility: Obtain each type of door hardware from single manufacturer.

2. Certifications:

a. Fire-Rated Door Openings:

a) Provide door hardware for fire-rated openings that complies with NFPA 80 and requirements of authorities having jurisdiction.

b) Provide only items of door hardware that are listed products tested by UL LLC, Intertek Testing Services, or other testing and inspecting organizations acceptable to authorities having jurisdiction for use on types and sizes of doors indicated, based on testing at positive pressure and according to NFPA 252 or UL 10C and in compliance with requirements of fire-rated door and door frame labels.

b. Smoke and Draft Control Door Assemblies:

a) Provide door hardware that meets requirements of assemblies tested according to UL 1784 and installed in compliance with NFPA 105

b) Comply with the maximum air leakage of 0.3 cfm/sq. ft. (3 cu. m per minute/sq. m) at tested pressure differential of 0.3-inch wg (75 Pa) of water.

c. Electrified Door Hardware

a) Listed and labeled as defined in NFPA 70, Article 100, by testing agency acceptable to authorities having jurisdiction.

d. Accessibility Requirements:

a) Comply with governing accessibility regulations cited in "REFERENCES" article 087100, 1.02.D3 herein for door hardware on doors in an accessible route. This project must comply with all Federal Americans with Disability Act regulations and all Local Accessibility Regulations.

3. Pre-Installation Meetings

a. Keying Conference

a) Incorporate keying conference decisions into final keying schedule after reviewing door hardware keying system including:

(a) Function of building, flow of traffic, purpose of each area, degree of security required, and plans for future expansion.

(b) Preliminary key system schematic diagram.

(c) Requirements for key control system.
(d) Requirements for access control.
(e) Address for delivery of keys.

b. Pre-installation Conference
a) Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
b) Inspect and discuss preparatory work performed by other trades.
c) Inspect and discuss electrical roughing-in for electrified door hardware.
d) Review sequence of operation for each type of electrified door hardware.
e) Review required testing, inspecting, and certifying procedures.
f) Review questions or concerns related to proper installation and adjustment of door hardware.

c. Electrified Hardware Coordination Conference:
a) Prior to ordering electrified hardware, schedule and hold meeting to coordinate door hardware with security, electrical, doors and frames, and other related suppliers.

E. DELIVERY, STORAGE, AND HANDLING

1. Inventory door hardware on receipt and provide secure lock-up for hardware delivered to Project site. Promptly replace products damaged during shipping.
2. Tag each item or package separately with identification coordinated with final door hardware schedule, and include installation instructions, templates, and necessary fasteners with each item or package. Deliver each article of hardware in manufacturer's original packaging.
3. Maintain manufacturer-recommended environmental conditions throughout storage and installation periods.
4. Provide secure lock-up for door hardware delivered to Project. Control handling and installation of hardware items so that completion of Work will not be delayed by hardware losses both before and after installation.
5. Handle hardware in manner to avoid damage, marring, or scratching. Correct, replace or repair products damaged during Work. Protect products against malfunction due to paint, solvent, cleanser, or any chemical agent.
6. Deliver keys to manufacturer of key control system for subsequent delivery to Owner.

F. COORDINATION

1. Coordinate layout and installation of floor-recessed door hardware with floor construction. Cast anchoring inserts into concrete.
2. Installation Templates: Distribute for doors, frames, and other work specified to be factory or shop prepared. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.
3. Security: Coordinate installation of door hardware, keying, and access control with Owner's security consultant.
4. Electrical System Roughing-In: Coordinate layout and installation of electrified door hardware with connections to power supplies and building safety and security systems.
5. Existing Openings: Where existing doors, frames and/or hardware are to remain, field verify existing functions, conditions and preparations and coordinate to suit opening conditions and to provide proper door operation.

G. WARRANTY

1. Manufacturer's standard form in which manufacturer agrees to repair or replace components of door hardware that fail in materials or workmanship within published warranty period.
a. Warranty does not cover damage or faulty operation due to improper installation, improper use or abuse.

b. Warranty Period: Beginning from date of Substantial Completion, for durations indicated in manufacturer's published listings.
   a) Mechanical Warranty
      (a) Locks
         (1) Schlage ND Series: 10 years
      (b) Exit Devices
         (1) Von Duprin: 10 years
      (c) Closers
         (1) LCN 4050 Series: 25 years

H. MAINTENANCE
1. Furnish complete set of special tools required for maintenance and adjustment of hardware, including changing of cylinders.
2. Turn over unused materials to Owner for maintenance purposes.

1.2 PRODUCTS

A. MANUFACTURERS
1. Approval of alternate manufacturers and/or products other than those listed as "Scheduled Manufacturer" or "Acceptable Manufacturers" in the individual article for the product category are only to be considered by official substitution request in accordance with section 01 25 00.
2. Approval of products from manufacturers indicated in "Acceptable Manufacturers" is contingent upon those products providing all functions and features and meeting all requirements of scheduled manufacturer's product.
3. Where specified hardware is not adaptable to finished shape or size of members requiring hardware, furnish suitable types having same operation and quality as type specified, subject to Architect's approval.

B. MATERIALS
1. Fabrication
   a. Provide door hardware manufactured to comply with published templates generally prepared for machine, wood, and sheet metal screws. provide screws according to manufacturer’s recognized installation standards for application intended.
   b. Finish exposed screws to match hardware finish, or, if exposed in surfaces of other work, to match finish of this other work including prepared for paint surfaces to receive painted finish.
   c. Provide concealed fasteners wherever possible for hardware units exposed when door is closed. Coordinate with “Metal Doors and Frames”, “Flush Wood Doors”, “Stile and Rail Wood Doors” to ensure proper reinforcements. Advise the Architect where visible fasteners, such as thru bolts, are required.
2. Modification and Preparation of Existing Doors: Where existing door hardware is indicated to be removed and reinstalled.
   a. Provide necessary fillers, Dutchmen, reinforcements, and fasteners, compatible with existing materials, as required for mounting new opening hardware and to cover existing door and frame preparations.
   b. Use materials which match materials of adjacent modified areas.
   c. When modifying existing fire-rated openings, provide materials permitted by NFPA 80 as required to maintain fire-rating.
3. Provide screws, bolts, expansion shields, drop plates and other devices necessary for hardware installation.
   a. Where fasteners are exposed to view: Finish to match adjacent door hardware material.
4. Cable and Connectors:

a. Where scheduled in the hardware sets, provide each item of electrified hardware and wire harnesses with number and gage of wires enough to accommodate electric function of specified hardware.
b. Provide Molex connectors that plug directly into connectors from harnesses, electric locking and power transfer devices.
c. Provide through-door wire harness for each electrified locking device installed in a door and wire harness for each electrified hinge, electrified continuous hinge, electrified pivot, and electric power transfer for connection to power supplies.

C. CONTINUOUS HINGES
1. Manufacturers:
a. Scheduled Manufacturer:
a) Ives
b. Acceptable Manufacturers:
a) Select
b) Roton
2. Requirements:
a. Provide aluminum geared continuous hinges conforming to ANSI/BHMA A156.26, Grade 1.
b. Provide aluminum geared continuous hinges, where specified in the hardware sets, fabricated from 6063-T6 aluminum.
c. Provide split nylon bearings at each hinge knuckle for quiet, smooth, self-lubricating operation.
d. Provide hinges capable of supporting door weights up to 450 pounds, and successfully tested for 1,500,000 cycles.
e. On fire-rated doors, provide aluminum geared continuous hinges classified for use on rated doors by testing agency acceptable to authority having jurisdiction.
f. Provide aluminum geared continuous hinges with electrified option scheduled in the hardware sets. Provide with number and gage of wires enough to accommodate electric function of specified hardware.
g. Provide hinges 1 inch (25 mm) shorter in length than nominal height of door, unless otherwise noted or door details require shorter length and with symmetrical hole pattern.

D. CYLINDRICAL LOCKS – GRADE 1
1. Manufacturers and Products:
a. Scheduled Manufacturer and Product:
a) Schlage ND series
b. Acceptable Manufacturers and Products:
a) Sargent 11-Line
b) Best 9K series
2. Requirements:
a. Provide cylindrical locks conforming to ANSI/BHMA A156.2 Series 4000, Grade 1, and UL Listed for 3-hour fire doors.
b. Indicators: Where specified, provide escutcheon with lock status indicator window on top of lockset rose:
a) Escutcheon height (including rose) 6.05 inches high by 3.68 inches wide.
b) Indicator window measuring a minimum 3.52-inch by .60 inch with 1.92 square-inches of front facing viewing area and 180-degree visibility with a total of .236 square-inches of total viewable area.
c) Provide snap-in serviceable window to prevent tampering. Lock must function if indicator is compromised.

d) Provide messages color-coded with full text and symbol, as scheduled, for easy visibility.
e) Unlocked and Unoccupied message will display on white background, and Locked and Occupied message will display on red background.

c. Cylinders: Refer to "KEYING" article, herein.
d. Provide locks with standard 2-3/4 inches (70 mm) backset, unless noted otherwise, with 1/2-inch latch throw. Provide proper latch throw for UL listing at pairs.
e. Provide locksets with separate anti-rotation thru-bolts, and no exposed screws.
f. Provide independently operating levers with two external return spring cassettes mounted under roses to prevent lever sag.
g. Provide standard ASA strikes unless extended lip strikes are necessary to protect trim.
h. Provide electrified options as scheduled in the hardware sets.
i. Lever Trim: Solid cast levers without plastic inserts and wrought roses on both sides.
a) Lever Design: RHO

E. EXIT DEVICES
1. Manufacturers and Products:
a. Scheduled Manufacturer and Product:
a) Von Duprin 98/35A series
b. Acceptable Manufacturers and Products:
a) Sargent 19-43-GL-80 series
b) Falcon 24/25 series
2. Requirements:
a. Provide exit devices tested to ANSI/BHMA A156.3 Grade 1 and UL listed for Panic Exit or Fire Exit Hardware.
b. Cylinders: Refer to "KEYING" article, herein.
c. Provide smooth touchpad type exit devices, fabricated of brass, bronze, stainless steel, or aluminum, plated to standard architectural finishes to match balance of door hardware.
d. Touchpad must extend a minimum of one half of door width. No plastic inserts are allowed in touchpads.
e. Provide exit devices with deadlatching feature for security and for future addition of alarm kits and/or other electrified requirements.
f. Provide exit devices with weather resistant components that can withstand harsh conditions of various climates and corrosive cleaners used in outdoor pool environments.
g. Provide flush end caps for exit devices.
h. Provide exit devices with manufacturer's approved strikes.
i. Provide exit devices cut to door width and height. Install exit devices at height recommended by exit device manufacturer, allowable by governing building codes, and approved by Architect.
j. Mount mechanism case flush on face of doors or provide spacers to fill gaps behind devices. Where glass trim or molding projects off face of door, provide glass bead kits.
k. Provide cylinder or hex-key dogging as specified at non fire-rated openings.
l. Removable Mullions: 2 inches (51 mm) x 3 inches (76 mm) steel tube. Where scheduled as keyed removable mullion, provide type that can be removed by use of a keyed cylinder, which is self-locking when re-installed.
m. Provide factory drilled weep holes for exit devices used in full exterior application, highly corrosive areas, and where noted in hardware sets.
n. Provide electrified options as scheduled.
o. Top latch mounting: double- or single-tab mount for steel doors, face mount for aluminum doors eliminating requirement of tabs, and double tab mount for wood doors.

p. Provide exit devices with optional trim designs to match other lever and pull designs used on the project.

F. ELECTRONIC ACCESS CONTROL LOCKSETS AND EXIT DEVICE TRIM

1. Manufacturers:
   a. Scheduled Manufacturer and Product:
      a) Schlage AD Series to be provided by a certified I-Pro dealer.
2. Requirements:
   a. Provide adaptable electronic access control products that comply with the following requirements:
      a) Listed, UL 294 - The Standard of Safety for Access Control System Units.
      b) Compliant with ANSI/BHMA A156.25 Grade 1 Operation and Security.
      c) Certified to UL10C, FCC Part15, Florida Building Code Standards TAS 201 large missile impact, TAS 202 and TAS 203.
      d) Compliant with ASTM E330 for door assemblies.
      e) Compliant with ICC / ANSI A117.1, NFPA 101, NFPA 80, and Industry Canada IC.
   b. Functions: Provide functions as scheduled that are field configurable without taking the adaptable electronic product off the door.
   c. Emergency Override: Provide mechanical key override; cylinders: Refer to "KEYING" article, herein.
   d. Levers:
      a) Vandal Resistance: Exterior (secure side) lever rotates freely while door remains locked, preventing damage to internal lock components from vandalism by excessive force.
      b) Provide non-handed lever trim that operates independently of non-locking levers.
      c) Style: RHO
      d) Tactile Warning (Knurling): Where required by authority having jurisdiction. Provide on levers on exterior (secure side) of doors serving rooms considered to be hazardous.
   e. Features:
      a) Audible feedback that can be enabled or disabled.
      b) Tamper-Resistant Screws: Tamper torx screws on inside escutcheon for increased security.
      c) Visual tri-colored LED indicators that indicate activation, additional PIN code credential required, operational systems status, system error conditions and low power conditions.
      d) Door Position Switch
      e) Interior Cover Tamper Guard
      f) Mechanical Key Override
      g) Request to Exit
      h) Request to Enter
      i) Lock/Unlock Status
   f. Credential Reader
      a) Credential Reader Configuration: Provide credential reader modules in the following configurations as indicated in door hardware sets.
      b) Credential Reader Capabilities: Provide credential readers capable of operating with the following integrated software partners.
         (a) 13.56 MHz Smart card credentials:

(1) Secure section (Multi-Technology and Smartcard): Schlage MIFARE Classic, Schlage MIFARE DESFire EV1/EV3, PIV and PIV-I Compatible
(2) 13.56 MHz Serial number only (Multi-Technology and Smartcard): MIFARE, DESFire, HID iClass, MIFARE DESFire EV1/EV3
(3) 125 kHz Proximity card credentials: Schlage, XceedID, HID, GE/CASI ProxLite and AWID.

(b) Multi-Technology readers that read both 13.56 MHz Smart Cards and 125 kHz Prox cards.
(c) Dual credential reading capabilities credential card or fob and PIN.
(d) 12 button keypad with backlit buttons.

g. Operation:
a) Networked – wireless
(a) Adaptable electronic access control product system interface:
(b) Adaptable electronic access control products to have real-time bidirectional communication between access control system and lock.
(c) Remote Commanding By I-PRO Access Control Network Software: Battery-powered lockset shall have "Wake on Radio" feature causing activation of remote, wireless access control devices, enabling activated devices to be configured, locked or unlocked from a centralized location within 10 seconds or less without user interface at the device.
(d) Local Commanding: Provide adaptable electronic access control product with the ability to be configured, locked or unlocked locally by handheld programming device, in real-time.
(e) When Utilized with Access Control Network Software with Remote Commanding Capability: Provide adaptable electronic access control product with the ability to be remotely locked down or unlocked within 10 seconds or less while battery powered without user interface at the device.
(f) Real-time response of battery powered device capable of being configured at door by handheld programming device and remotely by Partner integrated software.
(g) Upon Loss of Power to Device: Provide adaptable electronic access control product with the ability to manage access control offline in one of three methods below that can be configured in the field at device by handheld programming device and remotely by Partner integrated software:
(1) Fail locked (secured)
(2) Fail unlocked (unsecured)
(3) Fail As-Is
(h) Upon Loss of Communication Between Device and Network: Provide adaptable electronic access control product with the ability to manage access control offline in one of four methods below that can be configured in the field at lockset by handheld programming device and remotely by Partner integrated software:
(1) Fail locked (secured)
(2) Fail unlocked (unsecured)
(3) Fail As-Is
(4) Fail to Degraded/cache mode utilizing cache memory with following selectable options:
(5) Grant access up to the last 1,000 unique previously accepted User IDs.

(6) Grant access up to the last 1,000 unique previously accepted facility/site codes
(7) Remove from cache previously stored User IDs or facility/site codes that have not been presented to lock within the last 5 days.

(i) Provide adaptable electronic access control product with the ability to be configured at door by handheld programming device and remotely by Partner integrated software the length of time device is unlocked upon access grant.
(j) Provide adaptable electronic access control product with the ability to communicate identifying information such as firmware versions, hardware versions, serial numbers, and manufacturing dates by handheld programming device and remotely by Partner integrated software.
(k) Wireless Transmission:
(1) Modulation: 900 MHz spread spectrum, direct sequence, 10 channels.
(2) Encryption: AES-128-bit Key minimum.

h. Provide Panel Interface for adaptable electronic access control products.
a) Product: Schlage PIM400-1501 Panel Interface Module.

G. CYLINDERS
1. Manufacturers and Products:
a. Scheduled Manufacturer and Product:
a) Schlage Everest 29 R
b. Acceptable Manufacturers and Products:
a) Best Preferred Patented
b) Sargent XC
2. Requirements:
a. Provide cylinders/cores compliant with ANSI/BHMA A156.5; latest revision; cylinder face finished to match lockset; manufacturer's series as indicated. Refer to "KEYING" article, herein.
b. Provide cylinders in the below-listed configuration(s), distributed throughout the Project as indicated.
a) Patented Restricted Small Format: cylinder with small format interchangeable cores (SFIC) with restricted, patented keyway.
c. Patent Protection: Cylinders/cores requiring use of restricted, patented keys, patent protected.
d. Nickel silver bottom pins.

H. KEYING
1. Scheduled System:
a. New factory registered system:
a) Provide a factory registered keying system, complying with guidelines in ANSI/BHMA A156.28, incorporating decisions made at keying conference.
2. Requirements:
a. Construction Keying:
a) Replaceable Construction Cores.
(a) Provide temporary construction cores replaceable by permanent cores, furnished in accordance with the following requirements.
(1) 3 construction control keys
(2) 12 construction change (day) keys.
(b) Owner or Owner's Representative will replace temporary construction cores with permanent cores.
b. Permanent Keying:

a) Provide permanent cylinders/cores keyed by the manufacturer according to the following key system.
   (a) Master Keying system as directed by the Owner.
b) Forward bitting list and keys separately from cylinders, by means as directed by Owner. Failure to comply with forwarding requirements will be cause for replacement of cylinders/cores involved at no additional cost to Owner.
c) Provide keys with the following features:
   (a) Material: Nickel silver; minimum thickness of .107-inch (2.3mm)
   (b) Patent Protection: Keys and blanks protected by one or more utility patent(s).
d) Identification:
   (a) Mark permanent cylinders/cores and keys with applicable blind code for identification. Do not provide blind code marks with actual key cuts.
   (b) Identification stamping provisions must be approved by the Architect and Owner.
   (c) Stamp cylinders/cores and keys with Owner's unique key system facility code as established by the manufacturer; key symbol and embossed or stamped with "DO NOT DUPLICATE" along with the "PATENTED" or patent number to enforce the patent protection.
   (d) Failure to comply with stamping requirements will be cause for replacement of keys involved at no additional cost to Owner.
   (e) Forward permanent cylinders/cores to Owner, separately from keys, by means as directed by Owner.
e) Quantity: Furnish in the following quantities.
   (a) Permanent Control Keys: 3.
   (b) Master Keys: 6.
   (c) Change (Day) Keys: 3 per cylinder/core that is keyed differently
   (d) Key Blanks: Quantity as determined in the keying meeting.

I. DOOR CLOSERS
1. Manufacturers and Products:
   a. Scheduled Manufacturer and Product:
      a) LCN 4050A series
   b. Acceptable Manufacturers and Products:
      a) Falcon SC70A series
      b) Norton 7500 series
2. Requirements:
   a. Provide door closers conforming to ANSI/BHMA A156.4 Grade 1 requirements by BHMA certified independent testing laboratory. ISO 9000 certify closers. Stamp units with date of manufacture code.
   b. Provide door closers with fully hydraulic, full rack and pinion action with cast aluminum cylinder.
   c. Closer Body: 1-1/2-inch (38 mm) diameter with 11/16-inch (17 mm) diameter heat-treated pinion journal and full complement bearings.
   d. Hydraulic Fluid: Fireproof, passing requirements of UL10C, and all weather requiring no seasonal closer adjustment for temperatures ranging from 120 degrees F to -30 degrees F.
   e. Spring Power: Continuously adjustable over full range of closer sizes, and providing reduced opening force as required by accessibility codes and standards.
   f. Hydraulic Regulation: By tamper-proof, non-critical valves, with separate adjustment for latch speed, general speed, and back check.
   g. Pressure Relief Valve (PRV) Technology: Not permitted.

h. Provide stick on templates, special templates, drop plates, mounting brackets, or adapters for arms as required for details, overhead stops, and other door hardware items interfering with closer mounting.

J. DOOR TRIM
1. Manufacturers:
a. Scheduled Manufacturer:
a) Ives
b. Acceptable Manufacturers:
a) Burns
b) Trimco
2. Requirements:
a. Provide push plates, push bars, pull plates, pulls, and hands-free reversible door pulls with diameter and length as scheduled.

K. PROTECTION PLATES
1. Manufacturers:
a. Scheduled Manufacturer:
a) Ives
b. Acceptable Manufacturers:
a) Burns
b) Trimco
2. Requirements:
a. Provide protection plates with a minimum of 0.050 inch (1 mm) thick, beveled four edges as scheduled. Furnish with sheet metal or wood screws, finished to match plates.
b. Sizes plates 2 inches (51 mm) less width of door on single doors, pairs of doors with a mullion, and doors with edge guards. Size plates 1 inch (25 mm) less width of door on pairs without a mullion or edge guards.
c. At fire rated doors, provide protection plates over 16 inches high with UL label.

L. OVERHEAD STOPS AND OVERHEAD STOP/HOLDERS
1. Manufacturers:
a. Scheduled Manufacturers:
a) Glynn-Johnson
b. Acceptable Manufacturers:
a) Sargent
b) ABH
2. Requirements:
a. Provide overhead stop at any door where conditions do not allow for a wall stop or floor stop presents tripping hazard.

M. DOOR STOPS AND HOLDERS
1. Manufacturers:
a. Scheduled Manufacturer:
a) Ives
b. Acceptable Manufacturers:
a) Burns
b) Trimco
c) Rockwood
2. Provide door stops at each door leaf:
a. Provide wall stops wherever possible. Provide concave type where lockset has a push button of thumbturn.

b. Where a wall stop cannot be used, provide universal floor stops.
c. Where wall or floor stop cannot be used, provide overhead stop.
d. Provide roller bumper where doors open into each other and overhead stop cannot be used.

N. THRESHOLDS, SEALS, DOOR SWEEPS, AUTOMATIC DOOR BOTTOMS, AND GASKETING
1. Manufacturers:
a. Scheduled Manufacturer:
a) Zero International
b. Acceptable Manufacturers:
a) National Guard
b) Reese
2. Requirements:
a. Provide thresholds, weather-stripping, and gasketing systems as specified and per architectural details. Match finish of other items.
b. Smoke- and Draft-Control Door Assemblies: Where smoke- and draft-control door assemblies are required, provide door hardware that meets requirements of assemblies tested according to UL 1784 and installed in compliance with NFPA 105.
c. Provide door sweeps, seals, astragals, and auto door bottoms only of type where resilient or flexible seal strip is easily replaceable and readily available.
d. Size thresholds 1/2 inch (13 mm) high by 5 inches (127 mm) wide by door width unless otherwise specified in the hardware sets or detailed in the drawings.

O. SILENCERS
1. Manufacturers:
a. Scheduled Manufacturer:
a) Ives
b. Acceptable Manufacturers:
a) Burns
b) Rockwood
c) Trimco
2. Requirements:
a. Provide "push-in" type silencers for hollow metal or wood frames.
b. Provide one silencer per 30 inches (762 mm) of height on each single frame, and two for each pair frame.
c. Omit where gasketing is specified.

P. FINISHES
1. FINISH: BHMA 626/652 (US26D); EXCEPT:
a. Hinges at Exterior Doors: BHMA 630 (US32D)
b. Aluminum Geared Continuous Hinges: BHMA 628 (US28)
c. Push Plates, Pulls, and Push Bars: BHMA 630 (US32D)
d. Protection Plates: BHMA 630 (US32D)
e. Overhead Stops and Holders: BHMA 630 (US32D)
f. Door Closers: Powder Coat to Match
g. Wall Stops: BHMA 630 (US32D)
h. Latch Protectors: BHMA 630 (US32D)
i. Weatherstripping: Clear Anodized Aluminum
j. Thresholds: Mill Finish Aluminum

1.3 EXECUTION

A. EXAMINATION

1. Prior to installation of hardware, examine doors and frames, with Installer present, for compliance with requirements for installation tolerances, labeled fire-rated door assembly construction, wall and floor construction, and other conditions affecting performance. Verify doors, frames, and walls have been properly reinforced for hardware installation.
2. Field verify existing doors and frames receiving new hardware and existing conditions receiving new openings. Verify that new hardware is compatible with existing door and frame preparation and existing conditions.
3. Examine roughing-in for electrical power systems to verify actual locations of wiring connections before electrified door hardware installation.
4. Submit a list of deficiencies in writing and proceed with installation only after unsatisfactory conditions have been corrected.

B. PREPARATION
1. Where on-site modification of doors and frames is required:
   a. Carefully remove existing door hardware and components being reused. Clean, protect, tag, and store in accordance with storage and handling requirements specified herein.
   b. Field modify and prepare existing doors and frames for new hardware being installed.
   c. When modifications are exposed to view, use concealed fasteners, when possible.
   d. Prepare hardware locations and reinstall in accordance with installation requirements for new door hardware and with:
      a) Steel Doors and Frames: For surface applied door hardware, drill and tap doors and frames according to ANSI/SDI A250.6.
      b) Wood Doors: DHI WDHS.5 "Recommended Hardware Reinforcement Locations for Mineral Core Wood Flush Doors."
      c) Doors in rated assemblies: NFPA 80 for restrictions on on-site door hardware preparation.

C. INSTALLATION
1. Mount door hardware units at heights to comply with the following, unless otherwise indicated or required to comply with governing regulations.
   a. Standard Steel Doors and Frames: ANSI/SDI A250.8.
   b. Custom Steel Doors and Frames: HMMA 831.
   c. Interior Architectural Wood Flush Doors: ANSI/WDMA I.S. 1A
   d. Installation Guide for Doors and Hardware: DHI TDH-007-20
2. Install door hardware in accordance with NFPA 80, NFPA 101 and provide post-install inspection, testing as specified in section 1.03.E unless otherwise required to comply with governing regulations.
3. Install each hardware item in compliance with manufacturer's instructions and recommendations, using only fasteners provided by manufacturer.
4. Do not install surface mounted items until finishes have been completed on substrate. Protect all installed hardware during painting.
5. Set units level, plumb and true to line and location. Adjust and reinforce attachment substrate as necessary for proper installation and operation.
6. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.
7. Install operating parts so they move freely and smoothly without binding, sticking, or excessive clearance.
8. Hinges: Install types and in quantities indicated in door hardware schedule but not fewer than quantity recommended by manufacturer for application indicated.
9. Lock Cylinders:
   a. Install construction cores to secure building and areas during construction period.

b. Replace construction cores with permanent cores as indicated in keying section.
c. Furnish permanent cores to Owner for installation.

10. Continuous Hinges: Re-locate the door and frame fire rating labels where they will remain visible so that the hinge does not cover the label once installed.
11. Door Closers & Auto Operators: Mount closers/operators on room side of corridor doors, inside of exterior doors, and stair side of stairway doors from corridors. Mount closers/operators so they are not visible in corridors, lobbies and other public spaces unless approved by Architect.
12. Overhead Stops/Holders: Mount overhead stops/holders on room side of corridor doors, inside of exterior doors, and stair side of stairway doors.
13. Thresholds: Set thresholds in full bed of sealant complying with requirements specified in Division 07 Section "Joint Sealants."
14. Stops: Provide floor stops for doors unless wall or other type stops are indicated in door hardware schedule. Do not mount floor stops where they may impede traffic or present tripping hazard.
15. Perimeter Gasketing: Apply to head and jamb, forming seal between door and frame.
16. Meeting Stile Gasketing: Fasten to meeting stiles, forming seal when doors are closed.
17. Door Bottoms and Sweeps: Apply to bottom of door, forming seal with threshold when door is closed.

D. ADJUSTING

1. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.
   a. Spring Hinges: Adjust to achieve positive latching when door can close freely from an open position of 30 degrees.
   b. Electric Strikes: Adjust horizontal and vertical alignment of keeper to properly engage lock bolt.
   c. Door Closers: Adjust sweep period to comply with accessibility requirements and requirements of authorities having jurisdiction.
2. Occupancy Adjustment: Approximately three to six months after date of Substantial Completion, examine and readjust each item of door hardware, including adjusting operating forces, as necessary to ensure function of doors and door hardware.

E. CLEANING AND PROTECTION

1. Clean adjacent surfaces soiled by door hardware installation.
2. Clean operating items per manufacturer's instructions to restore proper function and finish.
3. Provide final protection and maintain conditions that ensure door hardware is without damage or deterioration at time of Substantial Completion.

F. DOOR HARDWARE SCHEDULE

1. The intent of the hardware specification is to specify the hardware for interior and exterior doors, and to establish a type, continuity, and standard of quality. However, it is the door hardware supplier's responsibility to thoroughly review existing conditions, schedules, specifications, drawings, and other Contract Documents to verify the suitability of the hardware specified.
2. Discrepancies, conflicting hardware, and missing items are to be brought to the attention of the architect with corrections made prior to the bidding process. Omitted items not included in a hardware set should be scheduled with the appropriate additional hardware required for proper application.
3. Hardware items are referenced in the following hardware schedule. Refer to the above specifications for special features, options, cylinders/keying, and other requirements.
4. Hardware Sets:

Abbreviation	Name

ACC	**Accurate Lock & Hardware Co**
DON	**Don-Jo Manufacturing, Inc.**
GLY	**Glynn-Johnson Corp**
IVE	**H.B. Ives**
LCN	**LCN Commercial Division**
MIS	**Misc - Out-Sourced Items**
PEM	**Pemko Mfg Co**
SCE	**Schlage Electronic Security**
SCH	**Schlage Lock Company**
VON	**Von Duprin**
ZER	**Zero International Inc**

Hardware Group No. 01

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
1	EA	CONT. HINGE	112XY		628	IVE
3	EA	HINGE FILLER PLATE	FF SERIES MATCH EXISTING FRAME PREP AS REQUIRED		600	DON
1	EA	ELEC OFFICE LOCK	AD-400-CY-50-MT-RHO-B 4AA BATTERY PROVIDED BY SECURITY INTEGRATOR	~	626	SCE
1	EA	SFIC EVEREST CORE	80-037 CKC EV29 R		626	SCH
1	EA	CUSTOM STRIKE	SIZE AS REQUIRED FOR EXISTING FRAME		626	ACC
1	EA	OH STOP	90S		630	GLY
1	EA	SURFACE CLOSER	4050A REG OR PA AS REQ		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
1	EA	GASKETING	488S/488FS		BK	ZER

OPERATIONAL DESCRIPTION:

1. DOOR NORMALLY CLOSED AND LOCKED.

2. ENTRY BY VALID CREDENTIAL AT CARD READER ON DOOR WHICH SIGNALS ELECTRIC TRIM OF LOCK TO OPEN AND ALLOW ENTRY.

3. FREE EGRESS AT ALL TIMES VIA THE INSIDE LEVER HANDLE.

4. INSIDE LEVER HANDLE HAS RX SWITCH WHICH WILL SIGNAL ACCESS CONTROL SYSTEM OF A VALID RELEASE.

5. LOCK IS FAIL-SECURE UPON LOSS OF POWER DOOR WILL REMAIN LOCKED.

Hardware Group No. 02

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	CONT. HINGE	112XY	628	IVE
1	EA	CLASSROOM LOCK	ND70HD RHO	626	SCH

1	**EA**	**SFIC EVEREST CORE**	**80-037 CKC EV29 R**		**626**	**SCH**
1	**EA**	**SURFACE CLOSER**	**4050A REG OR PA AS REQ**		**689**	**LCN**
1	**EA**	**MOP PLATE**	**8400 10" X 1" LDW B-CS**		**630**	**IVE**
1	**EA**	**KICK PLATE**	**8400 10" X 2" LDW B-CS**		**630**	**IVE**
1	**EA**	**WALL STOP**	**WS406/407CCV**		**630**	**IVE**
1	**EA**	**GASKETING**	**488S/488FS**		**BK**	**ZER**

Hardware Group No. 03

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
1	**EA**	**CONT. HINGE**	**112XY**		**628**	**IVE**
3	**EA**	**HINGE FILLER PLATE**	**FF SERIES MATCH EXISTING FRAME PREP AS REQUIRED**		**600**	**DON**
1	**EA**	**ENTRANCE/OFFICE LOCK**	**ND50HD RHO**		**626**	**SCH**
1	**EA**	**SFIC EVEREST CORE**	**80-037 CKC EV29 R**		**626**	**SCH**
1	**EA**	**CUSTOM STRIKE**	**SIZE AS REQUIRED FOR EXISTING FRAME**		**626**	**ACC**
1	**EA**	**OH STOP**	**90S**		**630**	**GLY**
1	**EA**	**KICK PLATE**	**8400 10" X 2" LDW B-CS**		**630**	**IVE**
3	**EA**	**SILENCER**	**SR64**		**GRY**	**IVE**

Hardware Group No. 04

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
1	**EA**	**CONT. HINGE**	**112XY**		**628**	**IVE**
1	**EA**	**ELEC PRIVACY LOCK**	**AD-400-CY-40-MT-RHO-B 4AA BATTERY PROVIDED BY SECURITY INTEGRATOR**	**~**	**626**	**SCE**
1	**EA**	**SFIC EVEREST CORE**	**80-037 CKC EV29 R**		**626**	**SCH**
1	**EA**	**SURFACE CLOSER**	**4050A REG OR PA AS REQ**		**689**	**LCN**
1	**EA**	**MOP PLATE**	**8400 10" X 1" LDW B-CS**		**630**	**IVE**
1	**EA**	**KICK PLATE**	**8400 10" X 2" LDW B-CS**		**630**	**IVE**
1	**EA**	**WALL STOP**	**WS406/407CCV**		**630**	**IVE**
1	**EA**	**GASKETING**	**488S/488FS**		**BK**	**ZER**

OPERATIONAL DESCRIPTION:

1. DOOR NORMALLY CLOSED AND LOCKED.

2. ENTRY BY VALID CREDENTIAL AT CARD READER ON DOOR WHICH SIGNALS ELECTRIC TRIM OF LOCK TO OPEN AND ALLOW ENTRY.

3. FREE EGRESS AT ALL TIMES VIA THE INSIDE LEVER HANDLE.

4. INSIDE LEVER HANDLE HAS RX SWITCH WHICH WILL SIGNAL ACCESS CONTROL SYSTEM OF A VALID RELEASE.

5. LOCK IS FAIL-SECURE UPON LOSS OF POWER DOOR WILL REMAIN LOCKED.

Hardware Group No. 05

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
1	EA	CONT. HINGE	112XY		628	IVE
1	EA	ELEC CLASSROOM LOCK	AD-400-CY-70-MT-RHO-B 4AA BATTERY PROVIDED BY SECURITY INTEGRATOR	~	626	SCE
1	EA	SFIC EVEREST CORE	80-037 CKC EV29 R		626	SCH
1	EA	SURFACE CLOSER	4050A REG OR PA AS REQ		689	LCN
1	EA	MOP PLATE	8400 10" X 1" LDW B-CS		630	IVE
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
1	EA	WALL STOP	WS406/407CCV		630	IVE
1	EA	GASKETING	488S/488FS		BK	ZER

OPERATIONAL DESCRIPTION:

1. DOOR NORMALLY CLOSED AND LOCKED.

2. ENTRY BY VALID CREDENTIAL AT CARD READER ON DOOR WHICH SIGNALS ELECTRIC TRIM OF LOCK TO OPEN AND ALLOW ENTRY.

3. FREE EGRESS AT ALL TIMES VIA THE INSIDE LEVER HANDLE.

4. INSIDE LEVER HANDLE HAS RX SWITCH WHICH WILL SIGNAL ACCESS CONTROL SYSTEM OF A VALID RELEASE.

5. LOCK IS FAIL-SECURE UPON LOSS OF POWER DOOR WILL REMAIN LOCKED.

Hardware Group No. 06

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
1	EA	CONT. HINGE	112XY		628	IVE
3	EA	HINGE FILLER PLATE	FF SERIES MATCH EXISTING FRAME PREP AS REQUIRED		600	DON
1	EA	ELEC CLASSROOM LOCK	AD-400-CY-70-MT-RHO-B 4AA BATTERY PROVIDED BY SECURITY INTEGRATOR	~	626	SCE

1	EA	SFIC EVEREST CORE	80-037 CKC EV29 R	626	SCH
1	EA	CUSTOM STRIKE	SIZE AS REQUIRED FOR EXISTING FRAME	626	ACC
1	EA	OH STOP	90S	630	GLY
1	EA	SURFACE CLOSER	4050A REG OR PA AS REQ	689	LCN
1	EA	MOP PLATE	8400 10" X 1" LDW B-CS	630	IVE
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	GASKETING	488S/488FS	BK	ZER

OPERATIONAL DESCRIPTION:

1. DOOR NORMALLY CLOSED AND LOCKED.

2. ENTRY BY VALID CREDENTIAL AT CARD READER ON DOOR WHICH SIGNALS ELECTRIC TRIM OF LOCK TO OPEN AND ALLOW ENTRY.

3. FREE EGRESS AT ALL TIMES VIA THE INSIDE LEVER HANDLE.

4. INSIDE LEVER HANDLE HAS RX SWITCH WHICH WILL SIGNAL ACCESS CONTROL SYSTEM OF A VALID RELEASE.

5. LOCK IS FAIL-SECURE UPON LOSS OF POWER DOOR WILL REMAIN LOCKED.

Hardware Group No. 07

Provide each PR door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
2	EA	CONT. HINGE	112XY	628	IVE
2	EA	FIRE EXIT HARDWARE	9827-L-BE-F-LBRAFL-06-499F	626	VON
2	EA	SURFACE CLOSER	4050A DEL EDA	689	LCN
2	EA	WALL STOP	WS406/407CCV	630	IVE
1	EA	GASKETING	488S/488FS	BK	ZER
1	EA	ASTRAGAL	S771	BLK	PEM

Hardware Group No. 08

Provide each PR door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
2	EA	CONT. HINGE	112XY	628	IVE
2	EA	DUMMY PUSH BAR	350	626	VON
2	EA	90 DEG OFFSET PULL	8190EZHD 12" O	630-316	IVE
2	EA	SURFACE CLOSER	4050A DEL SCUSH	689	LCN
1	EA	THRESHOLD	655A-223	A	ZER
1	SET	WEATHERSTRIPPING	BY ALUM FRAME MANUFACTURER		MIS

DR#	HW SET #
100	01
101	01
102	01
103	01
104	02
105	01
105A	03
106	04
107	04
108	05
109	02
110	05
111	05
112	01
113	06
114	01
115	01
116	01
117	01
118	01
119	07
120	09
121	01
122	01
123	01
124	01
125	01
126	01
127	08
128	08

END OF SECTION

SECTION 08 8000
GLAZING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SECTION INCLUDES

A. Insulating glass

B. Fire rated safety glass.

C. Glazing compounds and accessories

1.3 RELATED REQUIREMENTS

A. Section 07 9200 - Joint Sealants: Sealants for other than glazing purposes.

B. Section 08 1113 - Hollow Metal Doors and Frames: Glazed lites installed in doors and borrowed lites.

1.4 DEFINITIONS

A. Manufacturer: A firm that produces primary glass or fabricated glass as defined in referenced glazing publications.

B. Glass Thicknesses: Indicated by thickness designations in millimeters according to ASTM C 1036.

1.5 REFERENCE STANDARDS

A. 16 CFR 1201 - Safety Standard for Architectural Glazing Materials; current edition.

B. ANSI Z97.1 - American National Standard for Safety Glazing Materials Used in Buildings - Safety Performance Specifications and Methods of Test; 2015.

C. ASTM C864 - Standard Specification for Dense Elastomeric Compression Seal Gaskets, Setting Blocks, and Spacers; 2005 (Reapproved 2015).

D. ASTM C1036 - Standard Specification for Flat Glass; 2016.

E. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass; 2018.

F. ASTM C1172 - Standard Specification for Laminated Architectural Flat Glass; 2014.

G. ASTM C1376 - Standard Specification for Pyrolytic and Vacuum Deposition Coatings on Flat Glass; 2015.

H. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials; 2018c.

I. ASTM E1300 - Standard Practice for Determining Load Resistance of Glass in Buildings; 2016.

J. ASTM E1996 - Standard Specification for Performance of Exterior Windows, Curtain Walls, Doors, and Impact Protective Systems Impacted by Windborne Debris in Hurricanes; 2017.

K. ASTM E 2188 – Standard Test Method for Insulating Glass Unit Performance and Evaluation.

L. ASTM E2190 - Standard Specification for Insulating Glass Unit Performance and Evaluation; 2010.

M. CPSC 16 CFR 1201: Safety Standard for Architectural Glazing Materials.

N. GANA (SM) - GANA Sealant Manual; 2008.

O. GANA (LGRM) - Laminated Glazing Reference Manual; 2009.

P. ICC (IBC) - International Building Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

Q. UL 9 - Standard for Fire Tests of Window Assemblies; Current Edition, Including All Revisions.

R. UL 10B - Standard for Fire Tests of Door Assemblies; Current Edition, Including All Revisions.

S. UL 752 - Standard for Bullet-Resisting Equipment; Current Edition, Including All Revisions.

T. New York State Section 2406 Safety Glazing.

1.6 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data for each glass product and glazing material indicated. Provide structural, physical and environmental characteristics, size limitations, special handling and installation requirements.

C. Product Data on Glazing Compounds and Accessories: Provide chemical, functional, and environmental characteristics, limitations, special application requirements, and identify available colors.

D. Samples: Submit two samples 12 by 12 inch in size of glass units.

E. Samples: Submit 6 inch long bead of glazing sealant, color as selected.

F. Glazing Schedule: Use same designations indicated on Drawings for glazed openings in preparing a schedule listing glass types and thicknesses for each size opening and location.

G. Certificate: Certify in writing and signed by manufacturers that products of this section meet or exceed specified requirements.

H. Qualification Data: For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

I. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Edgemont Union Free School District's name and registered with manufacturer.

1.7 QUALITY ASSURANCE

A. Sustainable Design Certification: Glass shall be Cradle to Cradle Certified™, minimum Silver Level, Cradle to Cradle Innovation Institute.

B. Perform Work in accordance with GANA (SM), GANA (LGRM), and IGMA TM-3000 for glazing installation methods.

C. Insulating-Glass Certification Program: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of the following testing and inspecting agency:
   1. Insulating Glass Manufacturers Alliance

D. Safety Glazing Products: Comply with testing requirements in 16 CFR 1201 and, Insulating Glass Manufacturers Alliance ANSI Z97.1.
   1. Subject to compliance with requirements, obtain safety glazing products permanently marked with certification label of the Safety Glazing Certification Council or another certification agency acceptable to authorities having jurisdiction.
   2. Lites more than 9 square feet (sf) (0.84 sq. m) in area are required to be Category II materials

E. Where glazing units, including Kind FT glass, are specified in Part 2 articles for glazing lites more than 9 sf in area, provide glazing products that comply with Category II materials, and for lites 9 sf or less in area, provide glazing products that comply with Category I or II materials.

F. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum Ten (10) years of documented experience and meet ANSI / ASQC Q9002 1994.

G. Fabricator Qualifications: Manufactured Certified as acceptable to the manufacturer

H. Installer Qualifications: Company specializing in performing work of the type specified and with at least five (5) years documented experience and approved by manufacturer.
   1. Manufacture shall provide field inspection of the installation.
   2. An experienced installer who has completed glazing similar in material, design, and extent to that indicated for this Project; whose work has resulted in glass installations with a record of successful in-service performance; and who employs glass installers for this Project who are certified under the National Glass Association Glazier Certification Program as Level 2 (Senior Glaziers) or Level 3 (Master Glaziers).

I. Source Limitations for Glass: Obtain the following through one source from a single manufacturer for each glass type:
   1. Insulating glass.

J. Source Limitations for Laminated Glass: Obtain laminated-glass units from one manufacturer using the same type of glass lites and interlayers for each type of unit indicated.

K. Source Limitations for Insulating Glass: Obtain insulating-glass units from one manufacturer using the same type of glass and other components for each type of unit indicated.
   1. Insulating Glass products are to by permanently marked either on spacers or at least one component lite of units with appropriate certification label of inspecting and testing agency indicated below:
      a. Insulating Glass Certification Council (IGCC).
      b. Single Source fabrication responsibility: All fabrication processes, including Low E and reflective coatings, insulating, laminating, silkscreen, and tempering, shall be fabricated by a single Fabricator.

L. Insulating Glass products are to by permanently marked either on spacers or at least one component lite of units with appropriate certification label of inspecting and testing agency indicated below:
   1. Insulating Glass Certification Council (IGCC).
   2. Single Source fabrication responsibility: All fabrication processes, including Low E and reflective coatings, insulating, laminating, silkscreen, and tempering, shall be fabricated by a single Fabricator.

M. Testing Agency Qualifications: Independent firm specializing in performing testing and inspections of the type specified in this section.

1.8 MOCK-UPS

A. See Section 01 4000 - Quality Requirements and individual sections for additional mock-up requirements.

B. Provide on-site glazing mock-up with the specified glazing components.

C. Locate where directed.

D. Mock-ups may remain as part of the Work.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Protect glazing materials according to manufacturer’s written instructions and as needed to prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.

B. For insulating glass units that will be exposed to substantial altitude changes, comply with insulating glass manufacturer’s written recommendations for venting and sealing to avoid hermetic seal ruptures.

1.10 WARRANTY

A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.

B. Insulating Glass Units: Provide a five (5) year manufacturer warranty to include coverage for seal failure, interpane dusting or misting, including providing products to replace failed units.

C. Laminated Glass: Provide a five (5) year manufacturer warranty to include coverage for delamination, including replacement of failed units.

D. Fire rated glazing: 5 year manufacturers standard coverage warranty.

E. Coated-Glass Products: Manufacturer’s standard form, made out to the glass fabricator, in which the coated glass manufacturer agrees to replace coated glass units that deteriorate during normal use within the specified warranty period. Deterioration of the coated glass is defined as peeling and/or cracking, or discoloration that is not attributed to glass breakage, seal failure, improper installation or cleaning and maintenance that is contrary to the manufacturer’s written instructions.
   1. Warranty Period:five (5) from date of Substantial Completion

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Fire Rated Safety Glass conforming to Underwriters Laboratories, Inc. Fire Tests of Door Assemblies and the following:
   1. Firelite Plus, clear ceramic laminated with 2 pieces of Premium Lite and a proprietary interlayer specialty high impact fire rated glazing material.
      a. Thickness: 5/16”
      b. Provide Safety film as specified in Section 08 9717.
      c. U Value: 0.40
      d. Weight: 3.8-lbs/sq. ft.
      e. Sound Transmission Rating: 38 STC
      f. Glazing materials shall be optically clear, colorless and free from usual distortion.
      g. Each piece of fire-rated glazing material shall be labeled with a permanent logo including name of product, manufacturer, testing laboratory fire rating period and safety glazing standards.
      h. Glazing material installed shall be certified and permanently labeled as meeting applicable requirements referenced in NFPA 80 and:
      i. ANSI Z97.1
      j. CPSC 16 CFR 1201, Category II 400 ft.lbs.
      k. Glazing shall be installed in a rated framing system meeting ASTM E2010-01, NFPA 257, UL 9, UBC 7-4 or CAN4-S106 and ASTM E2074-00, NFPA 252, UL 10b, UBC 7-2 or CAN4-S104
   2. Use for all interior vision panels in fire rated doors, transoms in fire rated door assemblies, and glass within 18" above the floor.

B. Insulated Glass:
   1. Basis of Design - Vitro Architectural Glass (formerly PPG Glass); Solarban 60: www.vitroglazings.com/#sle.

C. Space between lites filled with manufacturer's standard.

D. Total Thickness: 1 inch.

E. Spacer Color: Black.

F. Edge Seal:

G. Color: Black.

2.2 GLASS MATERIALS

A. Float Glass: Provide float glass based glazing unless otherwise indicated.
   1. Annealed Type: ASTM C1036, Type I - Transparent Flat, Class 1 - Clear, Quality - Q3.
   2. Kind HS - Heat-Strengthened Type: Complies with ASTM C1048.
      a. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed, unless otherwise indicated.
      b. For uncoated glass, comply with requirements for Condition A.
      c. For coated vision glass, comply with requirements for Condition C (other uncoated glass).
   3. Fully Tempered Safety Glass: Complies with ANSI Z97.1 or 16 CFR 1201 criteria for safety glazing used in hazardous locations.

B. Fire-Resistance-Rated Glass Manufacturers: Provide products as required to achieve indicated fire-rating period.
   1. SAFTIFIRST, a division of O'Keeffe's Inc; SuperLite II-XL: www.safti.com/#sle.
   2. Substitutions: Refer to Section 01 2500 - Substitution Procedures..

C. Laminated Glass Manufacturers: Float glass laminated in accordance with ASTM C1172.
   1. Laminated Safety Glass: Complies with ANSI Z97.1 - Class B or 16 CFR 1201 - Category I impact test requirements.

2.3 GLASS TYPES

A. **Monolithic Interior Non-Rated Vision Glazing:**
   1. Applications: As scheduled.
   2. Glass Type: Laminated float glass.
   3. Tint: Clear.
   4. Thickness: 1/4 inch, nominal. (For all Doors not within Aluminum Framing.)
   5. Thickness: 3/8 inch nominal. (For all Doors and sidelights within Aluminum Framing.)
   6. Interlayer: Polyvinyl butural (PVB) Thickness as required to meet performance requirements.
   7. Use for all non-rated interior door sidelights and all interior glass within 18" above the finished floor.
   8. Refer to Section 01 2500 - Substitution Procedures

B. **Fire Rated Safety Interior Vision Glazing**
   1. Conform to Underwriters Laboratories, Inc. Fire Tests of Door Assemblies and the following:
   2. Firelite Plus, clear ceramic laminated with 2 pieces of PREMIUM FireLite and a proprietary interlayer specialty high impact fire rated glazing material.
      a. Thickness: 5/16”
      b. U Value: 0.40
      c. Weight: 3.8-lbs/sq. ft.
      d. Sound Transmission Rating: 38 STC
      e. Glazing materials shall be optically clear, colorless and free from usual distortion.
      f. Each piece of fire-rated glazing material shall be labeled with a permanent logo including name of product, manufacturer, testing laboratory fire rating period and safety glazing standards.
      g. Glazing material installed shall be certified and permanently labeled as meeting applicable requirements referenced in NFPA 80 and:
      h. ANSI Z97.1
      i. CPSC 16 CFR 1201, Category II 400 ft.lbs.
      j. Glazing shall be installed in a rated framing system meeting ASTM E2010-01, NFPA 257, UL 9, UBC 7-4 or CAN4-S106 and ASTM E2074-00, NFPA 252, UL 10b, UBC 7-2 or CAN4-S104
   3. Use for all interior vision panels in fire rated doors, sidelites adjacent to fire rate doors, glass within 18" above the floor., and glass in fire rated partitions and corridor doors.
   4. Refer to Section 01 2500 - Substitution Procedures

2.4 GLAZING COMPOUNDS

A. As reccommended by the manufacturer.

2.5 ACCESSORIES

A. Setting Blocks: Silicone, with 80 to 90 Shore A durometer hardness; ASTM C864 Option II. Length of 0.1 inch for each square foot of glazing or minimum 4 inch by width of glazing rabbet space minus 1/16 inch by height to suit glazing method and pane weight and area.

B. Spacer Shims: Neoprene, 50 to 60 Shore A durometer hardness; ASTM C864 Option II. Continuous by one half the height of the glazing stop by thickness to suit application, self adhesive on one face.

C. Glazing Tape, Back Bedding Mastic Type: Preformed, butyl-based, 100 percent solids compound with integral resilient spacer rod applicable to application indicated; 5 to 30 cured Shore A durometer hardness; coiled on release paper; black color.

1. Width: As required for application.

2.6 FABRICATION OF GLAZING UNITS

A. Fabricate glazing units in sizes required to glaze openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing publications, to comply with system performance requirements

2.7 SOURCE QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements and individual sections requirements.

PART 3 EXECUTION

3.1 VERIFICATION OF CONDITIONS

A. Verify that openings for glazing are correctly sized and within tolerances, including those for size, squareness, and offsets at corners.

B. Verify that the minimum required face and edge clearances are being provided.

C. Verify that surfaces of glazing channels or recesses are clean, free of obstructions that may impede moisture movement, weeps are clear, and support framing is ready to receive glazing system.

3.2 PREPARATION

A. Clean contact surfaces with appropriate solvent and wipe dry within maximum of 24 hours before glazing. Remove coatings that are not tightly bonded to substrates.

B. Seal porous glazing channels or recesses with substrate compatible primer or sealer.

C. Prime surfaces scheduled to receive sealant where required for proper sealant adhesion.

3.3 INSTALLATION, GENERAL

A. Install glazing in compliance with written instructions of glass, gaskets, and other glazing material manufacturers, unless more stringent requirements are indicated, including those in glazing referenced standards.

B. Install glazing sealants in accordance with ASTM C1193, GANA (SM), and manufacturer's instructions.

C. Do not exceed edge pressures around perimeter of glass lites as stipulated by glass manufacturer.

D. Set glass lites of system with uniform pattern, draw, bow, and similar characteristics.

E. Set glass lites in proper orientation so that coatings face exterior or interior as indicated.

F. Prevent glass from contact with any contaminating substances that may be the result of construction operations such as, and not limited to the following; weld splatter, fire-safing, plastering, mortar droppings, etc.

3.4 GLAZING SYSTEM:

A. Manufacturer's standard factory-glazing system that produces weather tight seal.

3.5 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements for additional requirements.

B. Glass and Glazing product manufacturers to provide field surveillance of the installation of their products.

C. Monitor and report installation procedures and unacceptable conditions.

3.6 CLEANING

A. See Section 01 7419 - Construction Waste Management and Disposal, for additional requirements.

B. Remove excess glazing materials from finish surfaces immediately after application using solvents or cleaners recommended by manufacturers.

C. Remove nonpermanent labels immediately after glazing installation is complete.

D. Clean glass and adjacent surfaces after sealants are fully cured.

E. Clean glass on both exposed surfaces not more than 4 days prior to Date of Substantial Completion in accordance with glass manufacturer's written recommendations.

3.7 PROTECTION

A. After installation, mark pane with an 'X' by using removable plastic tape or paste; do not mark heat absorbing or reflective glass units.

B. Remove and replace glass that is damaged during construction period prior to Date of Substantial Completion.

3.8 SCHEDULE

A. Refer to drawings schedule and drawings for location and/or requirements.

END OF SECTION

SECTION 09 2116
GYPSUM BOARD ASSEMBLIES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SECTION INCLUDES

A. Performance criteria for gypsum board assemblies.

B. Metal stud wall framing.

C. Metal channel soffit/ceiling framing.

D. Gypsum wallboard.

E. Joint treatment and accessories.

1.3 RELATED REQUIREMENTS

A. Section 01 6116 - Volatile Organic Compound (VOC) Content Restrictions.

B. Section 04 2000 - Unit Masonry.

C. Section 05 4000 - Cold-Formed Metal Framing: Structural steel stud framing.

D. Section 06 1000 - Rough Carpentry: Wood blocking.

E. Section 07 2500 - Weather Barriers: Water-resistive barrier over sheathing.

F. Section 07 8400 - Firestopping: Top-of-wall assemblies and penetrations at fire rated walls.

G. Section 07 9200 - Joint Sealants.

H. Section 09 3000 - Tiling.

I. Section 09 7700 - Plastic Wall Surfaces.

1.4 REFERENCE STANDARDS

A. AISI S220 - North American Standard for Cold-Formed Steel Framing - Nonstructural Members; 2015.

B. AISI S240 - North American Standard for Cold-Formed Steel Structural Framing; 2015.

C. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2018.

D. ASTM A1003/A1003M - Standard Specification for Steel Sheet, Carbon, Metallic- and Nonmetallic-Coated for Cold-Formed Framing Members; 2015.

E. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2014.

F. ASTM C475/C475M - Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board; 2015.

G. ASTM C514 - Standard Specification for Nails for the Application of Gypsum Board; 2004 (Reapproved 2014).

H. ASTM C645 - Standard Specification for Nonstructural Steel Framing Members; 2014, with Editorial Revision (2015).

I. ASTM C754 - Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products; 2017.

J. ASTM C840 - Standard Specification for Application and Finishing of Gypsum Board; 2018b.

K. ASTM C954 - Standard Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs From 0.033 in. (0.84 mm) to 0.112 in. (2.84 mm) in Thickness; 2015.

L. ASTM C1002 - Standard Specification for Steel Self-Piercing Tapping Screws for Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs; 2016.

M. ASTM C1177/C1177M - Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing; 2013.

N. ASTM C1280 - Standard Specification for Application of Exterior Gypsum Panel Products for Use as Sheathing; 2018.

O. ASTM C1396/C1396M - Standard Specification for Gypsum Board; 2017.

P. ASTM C1629/C1629M - Standard Classification for Abuse-Resistant Nondecorated Interior Gypsum Panel Products and Fiber-Reinforced Cement Panels; 2018a.

Q. ASTM C1658/C1658M - Standard Specification for Glass Mat Gypsum Panels; 2018.

R. ASTM D3273 - Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber; 2016.

S. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2018b.

T. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials; 2018c.

U. ASTM E413 - Classification for Rating Sound Insulation; 2016.

V. ASTM E1966 - Standard Test Method for Fire-Resistive Joint Systems; 2015.

W. GA-216 - Application and Finishing of Gypsum Panel Products; 2016.

X. UL (FRD) - Fire Resistance Directory; Current Edition.

Y. UL 2079 - Standard for Tests for Fire Resistance of Building Joint Systems; Current Edition, Including All Revisions.

1.5 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide data on metal framing, gypsum board, accessories, and joint finishing system.

C. Product Data: Provide manufacturer's data on partition head to structure connectors, showing compliance with requirements.

1.6 QUALITY ASSURANCE

A. Perform in accordance with ASTM C 840. Comply with requirements of GA-600 for fire-rated assemblies.

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum Ten (10) years of experience.

C. Installer Qualifications: Company specializing in performing gypsum board installation and finishing, with minimum 5 years of documented experience.

D. Manufacturer Qualifications: Member of Steel Stud Manufacturers Association (SSMA): www.ssma.com/#sle.

1.7 REGULATORY REQUIREMENTS

A. Refer to Section 01 4100 - Regulatory Requirements.

PART 2 PRODUCTS

2.1 GYPSUM BOARD ASSEMBLIES

A. Provide completed assemblies complying with ASTM C840 and GA-216.

B. Interior Partitions: Provide completed assemblies with the following characteristics:

1. Acoustic Attenuation: STC of 45-49 calculated in accordance with ASTM E413, based on tests conducted in accordance with ASTM E90.

C. Fire-Resistance-Rated Assemblies: Provide completed assemblies with the following characteristics:

1. Fire Rated Partitions: Rating as indicated on the drawings..
2. Head of Fire-Resistance-Rated Partitions: UL listed assembly No. as indicated on drawings.
3. Gypsum Association File Numbers: Comply with requirements of GA-600 for the particular assembly.
4. UL Assembly Numbers: Provide construction equivalent to that listed for the particular assembly in the current UL (FRD).

2.2 METAL FRAMING MATERIALS

A. Steel Sheet: ASTM A1003/A1003M, subject to the ductility limitations indicated in AISI S220 or equivalent.

B. Manufacturers - Metal Framing, Connectors, and Accessories:
1. Marino: www.marinoware.com.
2. Substitutions: See Section 01 2500 Substitution Procedures

C. Non-structural Framing System Components: ASTM C645; galvanized sheet steel, of size and properties necessary to comply with ASTM C754 for the spacing indicated, with maximum deflection of wall framing of L/240 at 5 psf.
1. Studs: C-shaped with knurled or embossed faces.
a. Minimum Base Metal Thickness: 16 gauge (54 mils) unless noted otherwise.
b. Depth: As indicated on drawings.
2. Runners: U shaped, sized to match studs.
3. Ceiling Channels: C-shaped.
4. Furring Members: Hat-shaped sections, minimum depth of 7/8 inch.
5. Furring Members: U-shaped sections, minimum depth of 3/4 inch.

D. Ceiling Hangers: Type and size as specified in ASTM C754 for spacing required.

E. Partition Head To Structure Connections: Provide track fastened to structure with legs of sufficient length to accommodate deflection, for friction fit of studs cut short and fastened as indicated on drawings.

F. Deflection and Firestop Track: Intumescent strip factory-applied to track flanges expands when exposed to heat or flames to provide a perimeter joint seal.
1. Products:
a. ClarkDietrich; BlazeFrame Firestop Deflection Track: www.clarkdietrich.com.

G. Flute Cover:
1. Corrugated strap for horizontal use to span flute areas of unprotected metal decks.
2. Products:
a. Clark Dietrich," (FC) Flute Cover.
a) Minimum 20 ga.
b) Non-structural.
b. Refer to Section 05 3000 Metal Deck for deck types,

H. Non-structural Framing Accessories:
1. Ceiling Hangers: Type and size as specified in ASTM C754 for spacing required.
2. Partial Height Wall Framing Support: Provides stud reinforcement and anchored connection to floor.
3. Framing Connectors: ASTM A653/A653M G90 galvanized steel clips; secures cold rolled channel to wall studs for lateral bracing.

I. Soffit Framing
1. Manufacturere:
a. Armstrong
a) SimpleSoffit Drywall framing System. See drawings for details and locations.
2. Components, General: Comply with ASTM C 754 for conditions indicated.

3. Hangers:
   a. Wire Hangers: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.162-inch diameter.
4. Carrying Channels: Cold-rolled, commercial-steel sheet with a base metal thickness of 0.0538 inch, a minimum 1/2-inch-wide flange, with ASTM A 653, G40 (Z120), hot-dip galvanized zinc coating.
   a. Depth: As indicated on drawings.
   b. Gauge: 16 (54 mils) gauge unless shown otherwise.

2.3 BOARD MATERIALS

A. Manufacturers - Gypsum-Based Board:
1. Georgia-Pacific Gypsum: www.gpgypsum.com.
2. National Gypsum Company: www.nationalgypsum.com.
3. USG Corporation: www.usg.com.
4. Substitutions: See Section 01 2500 Substitution Procedures

B. Gypsum Wallboard: Paper-faced gypsum panels as defined in ASTM C1396/C1396M; sizes to minimize joints in place; ends square cut.
1. Application: Use for vertical surfaces and ceilings, unless otherwise indicated.
2. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
   a. **Mold resistant board is required at all locations.**
3. At Assemblies Indicated with Fire-Resistance Rating: Use type required by indicated tested assembly; if no tested assembly is indicated, use Type X board, UL or WH listed.
4. Thickness:
   a. Vertical Surfaces: 5/8 inch
   b. Soffits and Ceilings: 5/8 inch.

C. Ceiling Board: Special sag resistant gypsum ceiling board as defined in ASTM C1396/C1396M; sizes to minimize joints in place; ends square cut.
1. Application: Soffits and ceilings, unless otherwise indicated.
2. Thickness: 5/8 inch.
3. Edges: Tapered.
4. Products:
   a. Georgia-Pacific Gypsum; ToughRock Span 24 Ceiling Board: www.gpgypsum.com/#sle.

2.4 GYPSUM WALLBOARD ACCESSORIES

A. Batt Insulation: See Section 07 2100.

B. Beads, Joint Accessories, and Other Trim: ASTM C1047, galvanized steel, unless noted otherwise.
1. Corner Beads: Low profile, for 90 degree outside corners.
   a. Products:
      a) CertainTeed Corporation; No-Coat Drywall Corner: www.certainteed.com.
2. L-Trim with Tear-Away Strip: Sized to fit the thickness gypsum wallboard.
   a. Products:
      a) Phillips Manufacturing Co; gripSTIK L-Tear: www.phillipsmfg.com.
3. Expansion Joints:
   a. Type: V-shaped metal with factory-installed protective tape.
   b. Products:
      a) Armstrong.

C. Joint Materials: ASTM C475/C475M and as recommended by gypsum board manufacturer for project conditions.
1. Mold resistant and asbestos free.

2. Paper Tape: 2 inch wide, creased paper tape for joints and corners, except as otherwise indicated.
3. Products:
   a. USG Imperial Brand MH Tuf-Tape.
   b. Substitutions: See Section 01 2500 Substitution Procedures
4. Joint Compound: Drying type, vinyl-based, ready-mixed.
   a. Products:
      a) USG Sheetrock Early setting MH Tuf-Set.
      b) Substitutions: See Section 01 2500 Substitution Procedures

D. Screws for Fastening of Gypsum Panel Products to Cold-Formed Steel Studs Less than 0.033 inches in Thickness and Wood Members: ASTM C1002; self-piercing tapping screws, corrosion-resistant.

E. Screws for Fastening of Gypsum Panel Products to Steel Members from 0.033 to 0.112 inch in Thickness: ASTM C954; steel drill screws, corrosion-resistant.

F. Utility angle: 2"x 2" 20 ga. for attachments of intersection framing and right angle corner enclosures.

G. Flat straps: 6", 16 ga. use for stud bridging.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that project conditions are appropriate for work of this section to commence.

3.2 FRAMING INSTALLATION

A. Metal Framing: Install in accordance with ASTM C754 and manufacturer's instructions.

B. Provide metal Bracing: at midpoint up to 8' 0"; at third point over 8'-0".

C. Studs: Space studs at 16 inches on center, unless shown otherwise
   1. Extend partition framing to structure in all locations.
   2. Partitions Terminating at Structure: Attach extended leg top runner to structure, maintain clearance between top of studs and structure, and brace both flanges of studs with continuous bridging.

D. Openings: Reinforce openings as required for weight of doors or operable panels, using not less than double studs at jambs minimum 16 gauge.

E. Standard Wall Furring: Install at masonry walls scheduled to receive gypsum board, not more than 4 inches from floor and ceiling lines and abutting walls. Secure in place on alternate channel flanges at maximum 16 inches on center.
   1. Orientation: Horizontal.
   2. Spacing: At 16 inches on center.

F. Blocking: Install blocking for support of hardware. Comply with Section 06 1000 Rough Carpentry.

G. Suspended Ceiling and Soffits: Space framing and furring members as indicated.

3.3 ACOUSTIC ACCESSORIES INSTALLATION

A. Acoustic Insulation: Place tightly within spaces, around cut openings, behind and around electrical and mechanical items within partitions, and tight to items passing through partitions.

B. Acoustic Sealant: Install in accordance with manufacturer's instructions.
   1. Place one bead continuously on substrate before installation of perimeter framing members.
   2. Place continuous bead at perimeter of each layer of gypsum board.
   3. Seal around all penetrations by conduit, pipe, ducts, and rough-in boxes, except where firestopping is provided.

3.4 BOARD INSTALLATION

A. Comply with ASTM C840, GA-216, and manufacturer's instructions. Install to minimize butt end joints, especially in highly visible locations.

B. Single-Layer Non-rated: Install gypsum board in most economical direction, with ends and edges occurring over firm bearing.
   1. Exception: Tapered edges to receive joint treatment at right angles to framing.

C. Double-Layer, Nonrated: Use gypsum board for first layer, placed parallel to framing or furring members, with ends and edges occurring over firm bearing. Place second layer perpendicular to framing or furring members. Offset joints of second layer from joints of first layer.

D. Fire-Resistance-Rated Construction: Install gypsum board in strict compliance with requirements of assembly listing.

E. Exterior Sheathing: Comply with ASTM C1280. Install sheathing vertically, with edges butted tight and ends occurring over firm bearing.
   1. Seal joints, cut edges, and holes with water-resistant sealant.
   2. Paper-Faced Sheathing: Immediately after installation, protect from weather by application of water-resistive barrier.

F. Installation on Metal Framing: Use screws for attachment of gypsum board.

3.5 INSTALLATION OF TRIM AND ACCESSORIES

A. Corner Beads: Install at external corners, using longest practical lengths.

B. Edge Trim: Install at locations where gypsum board abuts dissimilar materials.

3.6 JOINT TREATMENT

A. Finish gypsum board in accordance with levels defined in ASTM C840, as follows:
   1. Level 5: Walls and ceilings to receive semi-gloss or gloss paint finish and other areas specifically indicated.
   2. Level 4: Walls and ceilings to receive paint finish or wall coverings, unless otherwise indicated.
   3. Level 2: In utility areas, behind cabinetry, and on backing board to receive tile finish.
   4. Level 1: Wall areas above finished ceilings, whether or not accessible in the completed construction.

B. Tape, fill, and sand exposed joints, edges, and corners to produce smooth surface ready to receive finishes.
   1. Feather coats of joint compound so that camber is maximum 1/32 inch.
   2. Taping, filling, and sanding are not required at base layer of double-layer applications.

C. Where Level 5 finish is indicated, spray apply high build drywall surfacer over entire surface after joints have been properly treated; achieve a flat and tool mark-free finish.

3.7 FIRE RATED WALL MARKING AND IDENTIFICATION

A. For all walls or partitions indicated to be fire rated, or smoke rated, where there is an accessible concealed floor, ceiling or attic space adjacent to said wall. Contractor shall permanently mark with signs or stenciling within he concealed space, in accordance with IBC 703.7 in concealed spaces.
   1. Identifications shall be located within 15 feet of the end of each wall or partition and at intervals not exceeding 30 feet measured horizontally along the wall or partition.
   2. Identifications shall include lettering not less than 3 inches in height with a minimum 3/8 inch stroke width in a contrasting color incorporating the wording " FIRE AND/OR SMOKE BARRIER - PROTECT ALL OPENINGS".

3.8 TOLERANCES

A. Maximum Variation of Finished Gypsum Board Surface from True Flatness: 1/8 inch in 10 feet in any direction.

3.9 FINISH LEVEL SCHEDULE

A. Level 1: Above finished ceilings concealed from view.

B. Level 2: Utility areas and areas behind cabinetry.

C. Level 4: Walls and ceilings scheduled to receive flat or eggshell paint finish.

D. Level 5: Walls and ceilings scheduled to receive semi-gloss or gloss paint finish.

END OF SECTION

SECTION 09 3000
TILING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and other Division 1 Specification Sections, apply to this Section.

1.2 SECTION INCLUDES

A. Preparation.

B. Tile for floor applications.

C. Tile for wall applications.

D. Ceramic accessories.

E. Ceramic trim.

F. Non-ceramic trim.

1.3 RELATED REQUIREMENTS

A. Section 03 5400 - Cast Underlayment.

B. Section 04 2000 - Unit Masonry.

C. Section 07 9200 - Joint Sealants: Sealing joints between tile work and adjacent construction and fixtures.

1.4 REFERENCE STANDARDS

A. ANSI A108/A118/A136 - American National Standard Specifications for the Installation of Ceramic Tile (Compendium); 2017.
   1. ANSI A108.10 - American National Standard Specifications for Installation of Grout in Tilework; 1999 (Reaffirmed 2010).
   2. ANSI A108.19 - American National Standard Specifications for Interior Installation of Gauged Porcelain Tiles and Gauged Porcelain Tile Panels/Slabs by the Thin-Bed Method Bonded with Modified Dry-Set Cement Mortar or Improved Modified Dry-Set Cement Mortar; 2017.
   3. ANSI A118.1 - American National Standard Specifications for Dry-Set Cement Mortar; 2012 (Revised).
   4. ANSI A136.1 - American National Standard for Organic Adhesives for Installation of Ceramic Tile; 2008 (Reaffirmed 2013).
   5. ANSI A137.1 - American National Standard Specifications for Ceramic Tile; 2012.

B. ASTM C373 - Standard Test Methods for Determination of Water Absorption and Associated Properties by Vacuum Method for Pressed Ceramic Tiles and Glass Tiles and Boil Method for Extruded Ceramic Tiles and Non-tile Fired Ceramic Whiteware Products; 2017.

C. ASTM F710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring; 2017.

D. ASTM F1869 - Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride; 2016a.

E. ASTM F2170 - Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes; 2017.

F. TCNA (HB) - Handbook for Ceramic, Glass, and Stone Tile Installation; 2017.

1.5 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide manufacturers' data sheets on tile, mortar, grout, and accessories. Include instructions for using grouts and adhesives.

C. Samples: Mount tile and apply grout on two plywood panels, minimum 18 by 18 inches in size illustrating pattern, color variations, and grout joint size variations.

D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

E. Installer's Qualification Statement:

F. Maintenance Data: Include recommended cleaning methods, cleaning materials, and stain removal methods.

G. Maintenance Materials: Furnish the following for Edgemont Union Free School District's use in maintenance of project.
   1. See Section 01 6000 - Product Requirements, for additional provisions.
   2. Extra Tile: 10 square feet of each size, color, and surface finish combination.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the types of products specified in this section, with minimum five years of documented experience.

B. Installer Qualifications:
   1. Company specializing in performing tile installation, with minimum of five years of documented experience.

1.7 MOCK-UPs

A. See Section 01 4000 - Quality Requirements for general requirements for mock-up.

B. Construct tile mock-up incorporating all components specified for the location.
   1. Minimum size of mock-up is 10' x 10'.
   2. Approved mock-up may remain as part of work.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Protect adhesives from freezing or overheating in accordance with manufacturer's instructions.

1.9 FIELD CONDITIONS

A. Do not install solvent-based products in an unventilated environment.

B. Maintain ambient and substrate temperature above 50 degrees F and below 100 degrees F during installation and curing of setting materials.

PART 2 PRODUCTS

2.1 TILE

A. Glazed Wall Tile: ANSI A137.1, standard grade and as follows:
   1. Sizes: As indicated on drawings.
   2. Edges: Cushioned.
   3. Color(s): As indicated on drawings.
   4. Trim Units: Matching bullnose shapes in sizes coordinated with field tile.
   5. Products:
      a. Dal-Tile Corporation; Classic and Linear Series: www.daltile.com.
   6. Substitutions: Section 01 2500 Substitution Procedures.

B. Porcelain Tile: ANSI A137.1, standard grade.
   1. Moisture Absorption: 0 to 0.5 percent as tested in accordance with ASTM C373.
   2. Size: 12 x 24 inch, nominal.
   3. Thickness: 3/8 inch.
   4. Edges: Square.
   5. Floor Surface Finish: Natural Matt R 10 A+B, Non slip.
   6. Color(s): As indicated on drawings.

7. Pattern: As indicated on drawings..
8. Trim Units: Matching bullnose, cove base, and cove shapes in sizes coordinated with field tile.
9. Products:
    a. Manufacturer: Casalgrande basaltina
    b. Substitutions: Section 01 2500 Substitution Procedures.

2.2 TRIM AND ACCESSORIES

A. Ceramic Accessories: Glazed finish, same color and finish as adjacent field tile; same manufacturer as tile.

B. Ceramic Trim: Matching bullnose, cove base, and cove ceramic shapes in sizes coordinated with field tile.
1. Applications:
    a. Open Edges: Bullnose.
    b. Inside Corners: Jointed.
    c. Floor to Wall Joints: Cove base.
2. Manufacturers: Same as for tile.

C. Thresholds: opening width by full width of wall or frame opening; beveled edge on both long edges; without holes, cracks, or open seams.
1. Thickness: 1/2 inch.
2. Material: Marble, honed finish.
3. Color and Pattern: As indicated on drawings.
4. Applications:
    a. At toilet doorways where tile terminates and as indicated on drawings.

2.3 SETTING MATERIALS

A. Manufacturers:
1. Mapei Corporation. Product: Ultralite Mortar Pro.
2. Substitutions: Section 01 2500 Substitution Procedures.

2.4 GROUTS

A. Manufacturers:
1. Mapei Corporation ; Product Ultracolor Plus FA.
    a. Use for all areas
2. Substitutions: Section 01 2500 Substitution Procedures.

2.5 ACCESSORY MATERIALS

A. Concrete Floor Slab Crack Isolation Membrane: Material complying with ANSI A118.12; not intended as waterproofing.
1. Crack Resistance: No failure at 1/8 inch gap, minimum.

B. Tile Cleaner: A neutral cleaner capable of removing soil and residue without harming tile and grout surfaces, specifically approved for materials and installations indicated by tile and grout manufacturers

C. Grout Sealer: Manufacturer's standard silicone product for sealing grout joints that does not change color or appearance of grout.
1. Products: MAPEI Corporation; KER 003, Silicone Spray Sealer for Cementitious Tile Grout
    a. Provide sealer coat over all tile floors.

D. Expansion Joints: Refer to Section 07 9513 - Expansion Joint Cover Assemblies expansion joints for unglazed porcelain floor tile.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that subfloor surfaces are smooth and flat within the tolerances specified for that type of work and are ready to receive tile.

B. Verify that wall surfaces are smooth and flat within the tolerances specified for that type of work, are dust-free, and are ready to receive tile.

C. Verify that subfloor surfaces are dust free and free of substances that could impair bonding of setting materials to subfloor surfaces.

D. Cementitious Subfloor Surfaces: Verify that substrates are ready for tiling installation by testing for moisture and alkalinity (pH).

1. Test as Follows:
   a. Alkalinity (pH): ASTM F710.
   b. Internal Relative Humidity: ASTM F2170.
   c. Moisture Vapor Emission: ASTM F1869.
2. Obtain instructions if test results are not within limits recommended by tiling material manufacturer and setting material manufacturer and notify the Construction Manager.

3.2 PREPARATION

A. Protect surrounding work from damage.

3.3 INSTALLATION - GENERAL

A. Install tile and grout in accordance with applicable requirements of ANSI A108.1A thru A108.13, manufacturer's instructions, and TCNA (HB) recommendations.

B. Lay tile to pattern indicated. Do not interrupt tile pattern through openings.

C. Cut and fit tile to penetrations through tile, leaving sealant joint space. Form corners neatly.

D. Place tile joints uniform in width, subject to variance in tolerance allowed in tile size. Make grout joints without voids, cracks, excess mortar or excess grout, or too little grout.

E. Form internal angles square and external angles bullnosed.

F. Install ceramic accessories rigidly in prepared openings.

G. Install thresholds where indicated.

H. Sound tile after setting. Replace hollow sounding units.

I. Keep control and expansion joints free of mortar, grout, and adhesive. Refer to TCNA (HB) EJ 171 for location and frequency of joints.

J. Keep expansion joints free of adhesive or grout. Apply sealant to joints.

K. Prior to grouting, allow installation to completely cure; minimum of 48 hours.

L. Grout tile joints unless otherwise indicated.

M. At changes in plane and tile-to-tile control joints, use tile sealant instead of grout, with either bond breaker tape or backer rod as appropriate to prevent three-sided bonding.

N. Apply sealant to junction of tile and dissimilar materials and junction of dissimilar planes.

3.4 INSTALLATION - FLOORS - THIN-SET METHODS

A. Over concrete substrates, install in accordance with TCNA (HB) Method F113, dry-set or latex-Portland cement bond coat, with standard grout, unless otherwise indicated.

3.5 INSTALLATION - WALL TILE

A. Over cementitious backer units install in accordance with TCNA (HB) Method W223, organic adhesive.

B. Over interior concrete and masonry install in accordance with TCNA (HB) Method W202, thin-set with dry-set or latex-Portland cement bond coat.

3.6 CLEANING

A. Clean tile and grout surfaces.

3.7 PROTECTION

A. Do not permit traffic over finished floor surface for 4 days after installation.

END OF SECTION

SECTION 09 5100
ACOUSTICAL CEILINGS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SECTION INCLUDES

A. Removals

B. New acoustical panels and suspended grid as required and indicated on drawings.

1.3 RELATED REQUIREMENTS

A. Section 01 3000 - Administrative Requirements for coordination and coordination drawings.

B. Section 01 6116 - Volatile Organic Compound (VOC) Content Restrictions.

C. Section 07 9200 - Joint Sealants.

D. Section 09 2116 - Gypsum Board Assemblies.

E. Divisions 23 and 26 for air outlets and inlets, light fixtures, and fire alarm.

1.4 REFERENCE STANDARDS

A. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures; Most Recent Edition Cited by Referring Code or Reference Standard.

B. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2018.

C. ASTM C423 - Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method; 2017.

D. ASTM C635/C635M - Standard Specification for the Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings; 2017.

E. ASTM C636/C636M - Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels; 2013.

F. ASTM C754 - Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products.

G. ASTM C841 - - Standard Specification for Installation of Interior Lathing and Furring

H. ASTM D3273 - Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber.

I. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2018b.

J. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials; 2018c.

K. ASTM E580/E580M - Standard Practice for Installation of Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels in Areas Subject to Earthquake Ground Motions; 2017.

L. ASTM E1111/E1111M - Standard Test Method for Measuring the Interzone Attenuation of Open Office Components.

M. ASTM E1264 - Standard Classification for Acoustical Ceiling Products; 2014.

N. ASTM E1414/E1414M - Standard Test Method for Airborne Sound Attenuation Between Rooms Sharing a Common Ceiling Plenum; 2016.

O. ICC ES AC 156 - Acceptance Criteria for Seismic Certification by Shake-Table Testing of Nonstructural Components

1.5 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Shop Drawings: Indicate grid layout and related dimensioning.

C. Product Data: Provide data on suspension system components and acoustical units.

D. Samples: Submit two samples 12 x 12 inch in size illustrating material and finish of acoustical units.

E. Samples: Submit two samples each, 12 inches long, of suspension system main runner.

F. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.

1.6 QUALITY ASSURANCE

A. Designer Qualifications for Seismic Design: Perform under direct supervision of a Professional Structural Engineer experienced in design of this work and licensed in New York.

B. Fire Performance: ASTM E84 surface burning characteristics. Flame Spread index 25 or less. Smoke development index 50 or less. (UL Labeled) Class A in accordance to ASTM E1264.

C. Fire Performance Details: Suspension ceiling components will feature markings of applicable testing and inspecting organization

D. Fire-Resistance: As specified in ASTM E119 and listed in the determined ceiling design in the Underwriters Laboratories Fire Resistance Directory.

E. Suspension System Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum ten years documented experience.

F. Acoustical Unit Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum 10 years documented experience.

G. Installers Qualifications: Company specializing in the installation of acoustical ceilings specified in this section with minimum 5 years documented experience.

H. Mock-Up: Provide a mock-up for evaluation of surface preparation techniques and application workmanship.

1. Finish areas designated by Owner’s Representative.
2. Do not proceed with remaining work until workmanship, color, and sheen are approved by. Owner’s Representative
3. Refinish mock-up area as required to produce acceptable work.

I. Single-Source Responsibility: Provide acoustical panel units and grid components by a single manufacturer.

J. Pre-installation Conference: Conduct conference at Project site minimum one week before removal and installation. Agenda shall include project conditions, coordination with work of other trades, and layout of items which penetrate ceilings.

1.7 EXTRA MATERIALS

A. See Section 01 6000 - Product Requirements.

B. Deliver extra acoustical units for Owner's use in maintenance. Label and store where directed by the Construction Manager including codes used on the Drawings. Do not deliver to the Project site until the Construction Manager is prepared to receive and store maintenance materials.

1. Tile: Furnish 5 percent of total acoustic unit area of extra tile to Construction Manager.
2. Suspension System Components: Furnish 5 percent of each exposed component of the quantity installed.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver in unopened bundles and store in a dry place with adequate air circulation. Do not deliver material to building until wet conditions such as concrete, plaster, paint, and adhesives have been completed and cured.

B. Store products in manufacturer's unopened packaging until ready for installation.

C. Protect system components from excessive moisture in shipment, storage, and handling

1.9 WARRANTY

A. Warranty: Provide manufacturer's standard warranty against manufacturing defects in material or workmanship when installed in accordance with the current CISCA Handbook and ASTM C367.

1. Warranty Period: .
2. Acoustical Panel: 30 years
3. Suspension System: 40 years.

1.10 FIELD CONDITIONS

A. Maintain uniform temperature of minimum 60 degrees F, and maximum humidity of 40 percent prior to, during, and after acoustical unit installation.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acoustic Tiles/Panels:

1. Certainteed Architectural: www.certainteed.com/ceilings-and-walls/#sle.
2. Substitutions: See Section 01 2500 - Substitution Procedures.

B. Suspension Systems:

1. Same as for acoustical units.

2.2 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Ceiling systems designed to withstand the effects of earthquake motions determined according to ASCE 7 for Seismic Design Category D, E, or F and complying with the following:

1. Refer to Section 01 4100 - Regulatory Requirements.

2.3 ACOUSTICAL UNITS

A. Acoustical Tile: Painted mineral fiber, ASTM E1264 Type III, Form:2, Pattern C F (NRCP) with the following characteristics:

1. Sizes: 24 by 24 inches and 24" x 48". Seed drawings for locations.
2. Thickness: 3/4 inches.
3. Light Reflectance: 82 percent, determined in accordance with ASTM E1264.
4. Ceiling Attenuation Class (CAC): 30, determined in accordance with ASTM E1264.
5. Sag/Humidity Resistance: Standard
6. Fire Performance: Class A.
7. Edge: Square.
8. Surface Color: As indicated on drawings.
9. Suspension System: Exposed grid.
10. Products:
    a. Cashmere, High NRC.
    b. Substitutions: See Section 01 2500 - Substitution Procedures.

2.4 SUSPENSION SYSTEM(S)

A. Manufacturers:

1. CertainTeed; EZ stab Classic System;Heavy duty.

B. Metal Suspension Systems - General: Complying with ASTM C635/C635M; die cut and interlocking components, with stabilizer bars, clips, splices, and perimeter moldings as required.
   1. Materials:
      a. Steel Grid: ASTM A653/A653M, G30 coating, unless otherwise indicated.

C. Materials:
   1. Seismic Performance: Acoustical ceiling shall withstand the effects of earthquake motions determined according to ASCE 7 and ICC ES AC 156.
   2. Main Tees and Cross Tees: All suspension main tee and cross tee components are manufactured from commercial quality steel with factory punched cross tee slots, hanger holes, and integral bayonet-style end couplings. Double web stitching. The main tees are capped with steel capping affixed to a flange and is coated with factory applied baked-on enamel paint.
   3. Structural Classification Standard: ASTM C635/C635M Intermediate Duty.

D. Color: Standard white unless otherwise noted.

E. Perimeter Treatment Components:
   1. Angle Moldings: Manufactured from 0.020” thick steel and finished identical to main tees and cross tees.

2.5 ACCESSORIES

A. Support Channels and Hangers: Galvanized steel; size and type to suit application and ceiling system flatness requirement specified.

B. Hanger Wire: 12 gauge, 0.08 inch galvanized steel wire.

C. Seismic Clips: Manufacturer's standard clips for seismic conditions and to suit application.

D. Perimeter Moldings: Same metal and finish as grid.
   1. Minimum 7/8" horizontal flange

E. Acoustical Sealant For Perimeter Moldings: Specified in Section 07 9200 - Joint Sealants.

F. Touch-up Paint: Type and color to match acoustical and grid units.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that layout of hangers will not interfere with other work.

3.2 PREPARATION

A. Install after major above-ceiling work is complete.

B. Coordinate the location of hangers with other work.

3.3 INSTALLATION - SUSPENSION SYSTEM

A. Install suspension system in accordance with ASTM C636/C636M, ASTM E580/E580M, and manufacturer's instructions and as supplemented in this section.

B. Rigidly secure system, including integral mechanical and electrical components, for maximum deflection of 1:360.

C. Perimeter Molding: Install at intersection of ceiling and vertical surfaces and at junctions with other interruptions.
   1. Install in bed of acoustical sealant.
   2. Use longest practical lengths.

D. Install metal acoustical ceiling suspension assemblies to comply with ASTM C636/C636M and seismic design requirements indicated, according to manufacturer's written instructions and CISCA's "Ceiling Systems Handbook."

E. Seismic Suspension System, Seismic Design Categories D, E, F: Hang suspension system with grid ends attached to the perimeter molding on two adjacent walls; on opposite walls, maintain a 3/4 inch clearance between grid ends and wall.

F. Do not support components on main runners or cross runners if weight causes total dead load to exceed deflection capability.

G. Support fixture loads using supplementary hangers located within 6 inches of each corner, or support components independently.

H. Do not eccentrically load system or induce rotation of runners.

3.4 INSTALLATION - ACOUSTICAL UNITS

A. Install acoustical units in accordance with manufacturer's instructions.

B. Fit acoustical units in place, free from damaged edges or other defects detrimental to appearance and function.

C. Fit border trim neatly against abutting surfaces.

D. Install acoustical units level, in uniform plane, and free from twist, warp, and dents.

E. Cutting Acoustical Units:

1. Cut to fit irregular grid and perimeter edge trim.
2. Make field cut edges of same profile as factory edges.

F. Install seismic clips or stabilizer bars as per code requirements.

3.5 TOLERANCES

A. Maximum Variation from Flat and Level Surface: 1/8 inch in 10 feet.

B. Maximum Variation from Plumb of Grid Members Caused by Eccentric Loads: 2 degrees.

3.6 ADJUSTING AND CLEANING

A. Replace damaged or broken material, Clean exposed surfaces of acoustical ceilings, including trim, edge moldings, and suspension members. Comply with mfg,, touch up procedures using touch up paint as required for small nicks and minor scratches in the surface, Remove and replace any work that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

1. Provide touch up kit for Owner's use.

END OF SECTION

SECTION 09 6500
RESILIENT FLOORING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Sections, apply to this Section.

1.2 SECTION INCLUDES

A. Removals.

B. Crack repair.

C. Cast Underlayment.

D. Moisture mitigation membrane

E. Resilient tile flooring.

F. Resilient base.

G. Installation accessories.

1.3 RELATED REQUIREMENTS

A. Section 02 - Asbestos Abatement

B. Section 01 6116 - Volatile Organic Compound (VOC) Content Restrictions.

C. Section 03 5400 - Cast Underlayment.

1.4 REFERENCE STANDARDS

A. ASTM D2047 - Standard Test Method for Static Coefficient of Friction of Polish-Coated Floor Surfaces as Measured by the James Machine

B. ASTM D5116, Standard Guide for Small-Scale Environmental Chamber Determinations of Organic Emissions from Indoor Materials/Products

C. ASTM E648 - Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source; 2017.

D. ASTM E662, Standard Test Method for Specific Optical Density of Smoke Generated

E. by Solid Materials.

F. ASTM F150 - Standard Test Method for Electrical Resistance of Conductive and Static Dissipative Resilient Flooring; 2006 (Reapproved 2018).

G. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

H. d. Flexibility ASTM F137.

I. 410, Wear Layer Thickness of Resilient Floor Coverings by Optical Measurement.

J. ASTM F710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring; 2017.

K. ASTM F925: Standard Test Method for Resistance to Chemicals of Resilient Flooring.

L. ASTM F970 - Standard Test Method for Measuring Recovery Properties of Floor Coverings after Static Loading; 2017.

M. ASTM F1066 - Standard Specification for Vinyl Composition Floor Tile; 2004 (Reapproved 2018).

N. ASTM F1265, Standard Test Method for Resistance to Impact for Resilient Floor Tile.

O. ASTM F1304, Standard Test Method for Deflection of Resilient Floor Tile.

P. ASTM F1514: Standard Test Method for Measuring Heat Stability of Resilient Flooring by Color Change

Q. ASTM F1861 - Standard Specification for Resilient Wall Base; 2016.

R. ASTM F1914, Standard Test Method for Short- Term Indentation and Residual

S. Indentation of Resilient Floor Covering

T. ASTM F2170 - Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes; 2017.

U. ASTM F2055 - Standard Test Method for Size and Squareness of Resilient Floor Tile by Dial Gage Method

V. ASTM F2170 - Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs.

W. ASTM F2199, Standard Test Method for Determining Dimensional Stability of Resilient

X. Floor Tile after Exposure to Heat

Y. NFPA 253 - Standard Method of Test for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source; 2015.

Z. NFPA 258, Research Test Method for Determining Smoke Generation of Solid Materials.

1.5 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide data on specified products, describing physical and performance characteristics; including sizes, patterns and colors available; and installation instructions.

C. Shop Drawings: Indicate floor patterns.

D. Verification Samples: Submit two samples, 12" x 12" in size illustrating color and pattern for each resilient flooring product specified.

E. Sustainable Design Submittal: Submit VOC content documentation for flooring and adhesives.

F. Concrete Subfloor Test Report: Submit a copy of the moisture and alkalinity (pH) test reports.

G. Certification: Prior to installation of flooring, submit written certification by flooring manufacturer and adhesive manufacturer that condition of subfloor is acceptable.

H. Installer's Qualification Statement.

I. Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning, stripping, and re-waxing.

J. MSDS (Material Safety Data Sheets) should be submitted for all adhesives used:
   1. Membrane, primer, patch, leveler, heat weld rod, cold weld, liquid wax and cleaning agents

K. Maintenance Materials: Furnish the following for 's use in maintenance of project.
   1. See Section 01 6000 - Product Requirements, for additional provisions.
   2. Extra Materials: Furnish one box of tile for each fifty boxes or fraction thereof, for each type, color, pattern and size of the tile installed, from same manufactured lot as materials installed.
      a. Deliver extra tile to Owner after completion of work.
      b. Furnish tiles in protective packaging with identifying labels.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing specified flooring with minimum 10 years documented experience, with resilient flooring of types equivalent to those specified.

B. Installer Qualifications: Company specializing in installing specified flooring with minimum three years documented experience.

C. Testing Agency Qualifications: Independent firm specializing in performing concrete slab moisture testing and inspections of the type specified in this section.

D. Field Samples per Section 01 4000 - Quality Requirements: Provide field samples, dry laid, to demonstrate aesthetic effects of materials in situ, assisting the Architect and Owner in making final selections

1.7 DELIVERY, STORAGE, AND HANDLING

A. Upon receipt, immediately remove any shrink-wrap and check materials for damage and the correct style, color, quantity and run numbers.

B. Store all materials off of the floor in an acclimatized, weather-tight space.

C. Deliver products to Project site in manufacturer's original, unopened cartons and containers, each bearing names of product and manufacturer, Project identification, and shipping and handling instructions

1.8 MOCK UP

A. Field Samples per Section 001 4000 - Quality Requirements. Provide field samples, dry laid, to demonstrate aesthetic effects of materials in place.

1.9 FIELD CONDITIONS

A. Store materials for not less than 48 hours before, during, and 72 hours after installation, in area of installation at a temperature of 70 degrees F to achieve temperature stability. Thereafter, maintain conditions above 55 degrees F.

1.10 PRE-INSTALLATION TESTING

A. Conduct pre-installation testing as follows:
   1. ASTM F-2170 Test Method for Determining Relative Humidity in Concrete: Maximum RH: 55%.

1.11 WARRANTY

A. Provide manufacturer's non-prorated ten year limited warranty to be free from defects in material and workmanship, under normal use and service, to repair or replace all defective tiles including reasonable labor.

PART 2 PRODUCTS

2.1 TILE FLOORING

A. Homogeneuous Vinyl Tile: QHT- 1 & 2
   1. Manufacturer: Mohawk Group
   2. Product:Creative Terrain
   3. Size: 18 by 36 inches.
   4. Color: As noted on drawings.
   5. Performance:
      a. Classification: ASTM F1700 Class I; Type A
      b. Squareness: ASTM F2055 - Passes - ±0.10" max
      c. Thickness: ASTM F386 - Passes - as specified ±0.005"
      d. Flexibility: ASTM F137 - Passes - 1" mandrel
      e. Dimensional Stability: ASTM F2199 - Passes - 0.020"/linear foot max
      f. Static Load: ASTM F970 - Passes, modified at 2500 psi
      g. Residual Indentation: ASTM F1914 - Passes - Average less than 8%
      h. Slip Resistant: ASTM C1028 - Passes Wet: ?0.5
      i. Resistance To Chemicals: ASTM F925 - Passes - No more than a slight change
      j. Resistance To Light: ASTM F1515 - Passes -?E <8
      k. ASTM F1514 - Passes -?E <8
      l. Resistance To Heat: ASTM F1514 - Passes -?E <8
      m. Critical Radiant Flux: ASTM E648 - Class 1 (>0.45 W/cm2)
      n. Smoke Density: ASTM E662 Part A - Passes, Less than 450, both
      o. Seams: Weld rod. Colors as noted on drawings.

B. Installation Material
   1. Moisture vapor emission control: Ardex MC Rapid.

2. Adhesives/Primers: As recommended by the manufacturer.
3. Weld Rod
   a. Heat
4. Cove Base Accessories:
   a. Angle Profile
5. Floor Polish.
6. Provide materials listed for all areas to recieve new floor finishes.

C. Vinyl Tile - HVT-1 & 2: Homogeneous Tile .
1. Manufacturers:
   a. TOLI International, a Division of CBC AMERICA Corp, 55 Mall Drive, Commack, NY, 11725-5703; Telephone: 800.446.5476; Fax: 631.864.8151.
2. Product:
   a. Linotesta Advantage
   b. Substitutions: 01 2500 - Substitution Procedures.
3. Minimum Requirements: Comply with ASTM F1066, of Class corresponding to type specified.
4. Squareness: ASTM F2421 - Passes - ±0.10” max
5. Size and Tolerance: ASTM F2055 - Passes - ±0.016 in. per linear foot
6. Thickness: ASTM F386 - Passes - as specified ±0.005”
7. Dimensional Stability: ASTM F2199 - Passes - 0.024”/linear foot max
8. Static Load: ASTM F970 - Passes, modified - 1000 psi
9. maximum single reading 10%
10. Resistance To Light: ASTM F1515 - Passes - E < 8
11. Critical Radiant Flux (CRF): Minimum 0.45 watt per square centimeter, when tested in accordance with ASTM E 648.
12. Smoke Density: ASTM E662 Part A - Less than 450.
13. Size: 18 by 18 inches.
14. Wear Layer Thickness: 120 mils
15. VOC Content Limits: As specified in Section 01 6116.
16. Pattern: As indicated on drawings
17. Colors: As noted on drawings.
18. Installation Method: Glue Down.
19. Adhesive: M95.0 Resilient Flooring Adhesive, M99 Resilient Flooring Adhesive, or M700 Adhesive.

2.2 RESILIENT BASE

A. Resilient Base: ASTM F1861, Type TS rubber, vulcanized thermoset; top set Style B, Cove, and Style A straight for carpet installation as follows:
1. Manufacturers:
   a. Johnsonite, a Tarkett Company: www.johnsonite.com.
   b. Substitutions: See Section 01 2500 - Substitution Procedures.
2. Critical Radiant Flux (CRF): Minimum 0.45 watt per square centimeter, when tested in accordance with ASTM E 648 or NFPA 253.
3. Height: 4 inch.
4. Thickness: 0.125 inch.
5. Finish: Matte
6. Length: 4 foot sections.
7. Color: As indicated on drawings.
8. Accessories: Premolded external corners and internal corners.

2.3 ACCESSORIES

A. Subfloor Crack and Joint Repair: Two-part polyurethane repair compound .
   1. 100% solids for no shrinkage
   2. Service temperature range of -35° to 110°F (-37° to 43°C),
   3. Product:"Ardex ArdiFix", Ardex Engineered Cements, 400 Ardex Park Drive, Aliquippa, PA 15001 USA, Tel: 724-203-5000

B. Self-Drying, Cement-Based Finish Underlayment
   1. Product: "Ardex Feather Finish®", Ardex Engineered Cements, 400 Ardex Park Drive, Aliquippa, PA 15001 USA, Tel: 724-203-5000.

C. Primers: Waterproof; types recommended by flooring manufacturer.
   1. VOC Content Limits: As specified in Section 01 6116.

D. Adhesive for Vinyl Tile Flooring:
   1. Adhesive shall be as recommended by the manufacturer, compatible with tile and substrate.
      a. Note that recommendations shall be made which reflect and are compatible with the results of moisture level tests in the concrete substrate.

E. Moisture Control System: One-coat moisture control system that suppresses excessive moisture vapor emissions in existing concrete prior to the installation of finished flooring.
   1. Product: Ardex MC Rapid, Moisture Control System, Ardex Engineered Cements, 400 Ardex Park Drive, Aliquippa, PA 1500, 888-512-7339, www.ardex.com.
   2. If required, cost for mitigation contract will be adjusted by allowance as described in the Agreement.

F. Movement Joint: Vinyl tile flooring; Schluter:Dilex-EKSB-25-PG-V4A

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that surfaces are flat to tolerances acceptable to flooring manufacturer, free of cracks that might telegraph through flooring, clean, dry, and free of curing compounds, surface hardeners, and other chemicals that might interfere with bonding of flooring to substrate.

B. Verify that wall surfaces are smooth and flat within the tolerances specified for that type of work, are dust-free, and are ready to receive resilient base.

C. Cementitious Subfloor Surfaces: Verify that substrates are ready for resilient flooring installation by testing for moisture and alkalinity (pH).
   1. Test as Follows:
      a. Internal Relative Humidity: ASTM F2170.
   2. Obtain instructions if test results are not within limits recommended by resilient flooring manufacturer and adhesive materials manufacturer.

D. Moisture Testing: Moisture testing shall be performed using ASTM test method ASTM F 2170 Relative Humidity Test. The acceptable test result when using test method F 2170 should not exceed seventy five per cent (75%) AND pH readings should not exceed 9.0.

E. Verify that existing concrete sub floor do not containing curing compound by placing 1/4 cup of water on surface. If water beads up scarify surface.

F. Verify that required floor-mounted utilities are in correct location.

3.2 PREPARATION

A. Prepare floor substrates as recommended by flooring and adhesive manufacturers.

B. Concrete substrate that fully conforms to the requirements of ASTM F710 Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring is required, or as detailed in the manufacturer's Installation Guide.

C. Crack and Joint Repair: Concrete must be structurally sound, solid, dry, and free of laitance, dirt, debris, coatings, sealers, solvent base adhesives and any contaminant that may act as a bond breaker.
   1. Remove sub-floor ridges and bumps. Fill minor low spots, cracks, joints, holes, and other defects with sub-floor filler to achieve smooth, flat, hard surface up to 1/2".
   2. Dry diamond blade may be used to prepare cracks and create a clean surface for bonding.
   3. Do not use sweeping compounds, solvents or acid etching to prepare the surface.
   4. Cracks or joints should be free of dust, dirt, oils and any other debris.
   5. New concrete should be fully cured and free of movement.
   6. Prohibit traffic until filler is fully cured.

D. Underlayment: All concrete substrates must be solid, thoroughly clean and free of oil, wax, grease, asphalt, latex and gypsum compounds, curing compounds, sealers and any contaminant that might act as a bond breaker.
   1. **Mechanically profile with grinder 100% of all existing substrates receiving resilient flooring. Provide dust control as required.**
      a. After profiling test substrate by place drop of water, or other means to insure all coatings, sealers etc have been removed. Repeat profiling if necessary.

3.3 INSTALLATION GENERAL

A. Starting installation constitutes acceptance of subfloor conditions.

B. Install in accordance with manufacturer's written instructions.

C. Crack and Joint Repair: During set-up of cartridge (purging air and balancing) and initial dispensing of material, keep cartridge and nozzle assembly pointed straight up to prevent material in the nozzle from flowing back into the cartridge.
   1. Apply continuously once opened to prevent the tip from becoming clogged.
   2. Immediately broadcast clean sand size #30 or #35 into the freshly applied material.
   3. Fill the crack, joint or repair area so the material is slightly higher than the face of the concrete slab.
   4. Allow to set for approximately 10 to 15 minutes (at 75° F), and then use a sharp razor scraper to shave excess material from the top of the slab.

D. Underlayment: Installed from a true featheredge up to 1/2 in. (12.7 mm).
   1. Verify crack/joint repair has dried thoroughly.
   2. Use the least amount possible to attain the desired smoothness.
   3. Allow to dry in accordance to manufacturer's recommendations.

   Adhesive-Applied Installation:
   1. Spread only enough adhesive to permit installation of materials before initial set as recommended by the manufacturer.
   2. Fit joints and butt seams tightly.
   3. Set flooring in place, press with heavy roller to attain full adhesion.

E. Where type of floor finish, pattern, or color are different on opposite sides of door, terminate flooring under centerline of door.

F. Install edge strips at unprotected or exposed edges, where flooring terminates, and where indicated.
   1. Resilient Strips: Attach to substrate using adhesive.

G. Scribe flooring to walls, columns, cabinets, floor outlets, and other appurtenances to produce tight joints.

H. Install flooring in recessed floor access covers, maintaining floor pattern.

I. Install feature strips where indicated.

J. Do not mix manufacturing batches of a color within the same area.

K. Do not install resilient flooring over building expansion joints.

L. Do not install defective or damaged resilient flooring.

M. Layout resilient flooring to provide equal size at perimeter. Adjust layout as necessary to reduce the amount of resilient flooring which is cut to less than half full width.

N. Install resilient flooring without voids at seams. Lay seams together without stress.

O. Remove excess adhesive immediately

3.4 INSTALLATION TILE FLOORING

A. Mix tile from container to ensure shade variations are consistent when tile is placed, unless otherwise indicated in manufacturer's installation instructions.

B. Install square tile to pattern shown on drawings. Allow minimum 1/2 full size tile width at room or area perimeter.

C. Install plank tile with a random offset of at least 6 inches from adjacent rows.

D. HVT: use; Use welded rod joints as indicated.

E. Lay out tiles to match existing.

F. Roll the plank or tile with a 3-section 100 lb. roller. Re-roll the floor within the working time of the adhesive. Continue to roll the floor throughout the working day to ensure a proper bond.

3.5 INSTALLATION RESILIENT BASE

A. Fit joints tightly and make vertical. Maintain minimum dimension of 18 inches between joints.

B. Miter internal corners. At external corners, use premolded units. At exposed ends, use premolded units.

C. Install base on solid backing. Bond tightly to wall and floor surfaces.

D. Scribe and fit to door frames and other interruptions.

3.6 CLEANING

A. Remove excess adhesive from floor, base, and wall surfaces without damage.

B. Clean in accordance with manufacturer's written instructions.

C. Full maintenance instructions shall be provided by the manufacturer

3.7 PROTECTION

A. Prohibit traffic on resilient flooring for 48 hours after installation and 72 hours heavy rolling loads.

B. Use floor protection after installation. DO NOT use a plastic adhesive-based protection system.

3.8 SCHEDULE

A. Refer to Finish Schedule on drawings.

END OF SECTION

SECTION 09 7700
PLASTIC WALL SURFACES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SECTION INCLUDES

A. Pre-manufactured panel system including mounting hardware and specified accessories.

1.3 RELATED SECTIONS

A. Section 06100 - Rough Carpentry; furring, blocking, and other carpentry work that is not exposed to view.

B. Section 09 2116 - Gypsum Board Assemblies; for metal support systems not included in this section.

1.4 REFERENCES

A. American Society for Testing and Materials (ASTM) E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

1. Class 1/A - Flame Spread 0-25, Smoke Developed 450 or less.

B. Architectural Woodwork Institute (AWI) Quality Standards.

1.5 SUBMITTALS

A. Submit under provisions of Section 01 3000 - Administrative Requirements.

B. Product Data: Manufacturer's on each product to be used, including:

1. Preparation instructions and recommendations.
2. Storage and handling requirements and recommendations.
3. Installation methods.

C. Shop Drawings: Shop drawings in sufficient detail to show fabrication, installation, anchorage, and interface of the work of this Section with adjacent work.

D. Selection Samples: For each finish product specified, one complete set of color samples representing manufacturer's standard range of available colors and patterns.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications:

1. Firm with a minumum three (3) years experienced in successful production of wall systems similar to that indicated for the Project, with sufficient production capacity to produce required units without causing delay in the work.
2. Provide certificate signed by panel manufacturer certifying that products comply with specified requirements.

B. Installer Qualifications: Demonstrate five (5) years successful experience in installing architectural woodwork similar in type and quality to those required for this project.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Do not deliver wall system until painting, wet work, grinding, and similar operations that could damage, soil, or deteriorate wall system have been completed in installation areas as specified by AWI 1700-G-3.

B. If panels are stored prior to installation, store them flat in completely enclosed areas, out of the weather. If panels must be stored in other than installation areas, store only in areas where environmental conditions comply with manufacturers recommendations. Do not expose panels to continuous direct sunlight, nor to extremes in temperature and humidity. Store products in manufacturer's packaging until ready for installation.

C. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with direction of YPS Office of Facilities Management.

1.8 PROJECT CONDITIONS

A. Do not deliver or install wall system until building is enclosed, wet work is complete and HVAC system is operating and will maintain temperature and relative humidity at occupancy levels during the remainder of the construction period as specified by AWI 1700-G-3.

B. Do not install wall system until normal lighting conditions exist. Normal lighting conditions are described as those in place when the project is finished. This includes, but not limited to, design lighting (wall washers, spot lights and flood lights, and similar fixtures) and natural lighting.

C. Wall, ceilings, floors, and openings must be level, plumb, straight, in-line and square as specified by AWI 1700-G-3.

D. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer. Do not install products under environmental conditions outside manufacturer's absolute limits. Panels shall be conditioned in the environment in which they will be installed for a minimum of 72 hours prior to installation. The recommended environment is 75 degrees F (24 degrees C) and 45 percent relative humidity.

E. Environmental Conditions: Comply with Woodwork Manufacturer's recommendations for optimum temperature and humidity conditions for woodwork during its storage and installation. Do not install woodwork until these conditions have been attained and stabilized so that woodwork is within plus or minus 1.0 percent of optimum moisture content from date of installation through remainder of construction period.

1.9 WARRANTY

A. Manufacturer warrants any product it has manufactured and sold against defects in materials or workmanship for a period of five years from the date of original purchase and acceptance for use. This warranty extends to products assembled / installed and used in the manner intended and does not cover damage or failure caused by: misuse, abuse or accidents, exposure to extreme temperature, improper installation, improper maintenance and exposure to water or excessive humidity or excessive moisture.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturer: Panel Specialists, Inc.; 3115 Range Rd., Temple, TX 76504. ASD. Toll Free Tel: (800) 947-9422. Tel: (254) 774-9800. Fax: (254) 774-7222. Email: psiwalls@panelspec.com. Web: <http://www.panelspec.com>

B. Substitutions: Referr to 01 2500 - Substitution Procedures.

2.2 PANEL SYSTEMS

A. Provide prefinished decorative panels where shown on the drawings, as specified herein, and as needed for a complete and proper installation.

B. Comply with applicable requirements of "Architectural Woodwork Quality Standards" in the production and installation of the wall panel system as published by the Architectural Woodwork Institute (AWl) unless otherwise indicated.

C. Panel System: #412 as manufactured by Panel Specialists, Inc. A progressive panel system with an exposed ½ inch (12mm) recessed horizontal channel reveal and a 1/16 inch (1.4mm) vertical divider molding creating a horizontal and vertical reveal between edge banded panels. Recommended for vertical and horizontal interior installations. Maximum panel length for horizontal installations is 96 inches (2438 mm).

1. Panel Thickness: 7/16 inches (11.1 mm).
2. Horizontal Reveal: System to provide a recessed channel reveal of ½ inch (12mm) between panels.
3. Vertical Reveal: System to provide a 1/16 inch (1.5mm) reveal between panels.
4. Panel Edge Finish: Panel edges to be finish with .018 inch (.5mm) PVC edge banding or wood veneer.

5. Panel Finish: Refer to Finish Schedule ondrawings.
6. Main Laminated Panel Fire Rating:
   a. Fire Rating: ASTM E84, Class A.
7. Panel Dimensions: Refer to drawings.
8. Molding: All moldings to be .062" thick (at structural areas) 6063 alloy aluminum with T5 temper.
   a. Refer to drawings for all molding types.
   b. Divider Moldings
      a) #412 ½ in. Recess Channel Divider Molding
9. Finishes:
   a. Panel Face:
      a) Refer to drawings for all types.
   b. Panel Face Pattern Direction:
      a) Horizontal
   c. Aluminum Molding Finish:
      a) Clear Anodize

2.3 MATERIALS

A. High Pressure Decorative Laminates (VGS,VGP,VGF & HGS) and non-decorative backers (BKV) used to surface wall panels systems shall be manufactured to meet or exceed the National Electrical Manufacturing Association (NEMA LD3-2005) for thickness, performance properties and appearance.

B. Particleboard: 45# density shall be used in Class III panel composition. Fire-rated particle board shall be used for Class I and Class II panel compositions (refer to AWI Section 200)

PART 3 EXECUTION

3.1 EXAMINATION

A. Do not begin installation until substrates have been properly prepared according to AWI 1700-G-3.

B. If substrate preparation is the responsibility of another installer, notify Construction Manager of unsatisfactory preparation before proceeding.

3.2 FIELD DIMENSIONS

A. Where wall system is indicated to be fitted to other construction, check actual dimensions of other constructions by accurate field measurements before manufacturing wall system; show recorded measurements on final shop drawings. Coordinate manufacturing schedule with construction progress to avoid delay of work.

B. Where field measurements cannot be made without delaying the work, guarantee dimensions and proceed with manufacture of wall system without field measurements coordinate other construction to ensure that actual dimensions correspond to guaranteed dimensions.

3.3 PREPARATION

A. Panels must be acclimated to ambient temperature and humidity conditions in accordance with manufacturer's specifications prior to installation. Refer to PSI installation guide for proper, handling, storage and acclimation procedures.

B. Clean surfaces thoroughly prior to installation.

C. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

D. Prepare existing wall by removing all items. Grind and projections on wall to provide substrate within specified tolerances.

3.4 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Field cutting of all wall systems should be accomplished using carbide tools. All face penetrations and cutouts should have a minimal 1/8 inch (3 mm) radius in corners according to NEMA Standards Publication LD 3-2005.

C. All wall systems should receive an "S" bead of panel mastic on the back of the panel during installation.

D. Fasten all trim pieces and supports to existing concrete block with appropriate fasteners, Tapcon or similar.

E. For vertical applications, wall systems shall be mechanically fastened to horizontal metal furring strapping spaced 24 inches (610 mm) O.C. Furring straps shall be no less than 18-ga 3-1/2 inches (89 mm) wide, continuously. Metal strapping to be installed to the drywall studs prior to the application of the gypsum board by the framing contractor.

3.5 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

SECTION 09 9113
EXTERIOR PAINTING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SECTION INCLUDES

A. Surface preparation.

B. Field application of paints.

C. Scope: Finish exterior surfaces exposed to view, unless fully factory-finished and unless otherwise indicated, including the following:
   1. New and existing ferrous metal columns, angles and beams
   2. Exposed surfaces of steel lintels and ledge angles.

D. Do Not Paint or Finish the Following Items:
   1. Items factory-finished unless otherwise indicated; materials and products having factory-applied primers are not considered factory finished.
   2. Items indicated to receive other finishes.
   3. Items indicated to remain unfinished.
   4. Fire rating labels, equipment serial number and capacity labels, and operating parts of equipment.
   5. Glass.
   6. Concealed pipes, ducts, and conduits.

1.3 RELATED REQUIREMENTS

A. Section 01 6116 - Volatile Organic Compound (VOC) Content Restrictions.

B. Section 05 1200 - Structural Steel.

C. Section 05 5000 - Metal Fabrications: Shop-primed items.

D. Section 09 9123 - Interior Painting.

1.4 DEFINITIONS

A. Comply with ASTM D16 for interpretation of terms used in this section.

1.5 REFERENCE STANDARDS

A. 40 CFR 59, Subpart D - National Volatile Organic Compound Emission Standards for Architectural Coatings; U.S. Environmental Protection Agency; current edition.

B. ASTM D16 - Standard Terminology for Paint, Related Coatings, Materials, and Applications; 2016.

C. MPI (APL) - Master Painters Institute Approved Products List; Master Painters and Decorators Association; Current Edition.

D. MPI (APSM) - Master Painters Institute Architectural Painting Specification Manual; Current Edition.

E. SSPC-SP 1 - Solvent Cleaning; 2015, with Editorial Revision (2016).

F. SSPC-SP 2 - Hand Tool Cleaning; 1982, with Editorial Revision (2004).

G. SSPC-SP 3 - Power Tool Cleaning; 1982, with Editorial Revision (2004).

H. SSPC-SP 6 - Commercial Blast Cleaning; 2007.

1.6 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide complete list of products to be used, with the following information for each:

1. Manufacturer's name, product name and/or catalog number, and general product category (e.g. "alkyd enamel").
2. MPI product number (e.g. MPI #47).
3. Cross-reference to specified paint system(s) product is to be used in; include description of each system.
4. Manufacturer's installation instructions.

C. Samples: Submit three paper "draw down" samples, 8-1/2 by 11 inches in size, illustrating range of colors available for each finishing product specified.
1. Where sheen is specified, submit samples in only that sheen.
2. Where sheen is not specified, discuss sheen options with Fuller and D'Angelo, P.C. before preparing samples, to eliminate sheens not required.

D. Manufacturer's Instructions: Indicate special surface preparation procedures.

E. Maintenance Data: Submit data including product technical data sheets, material safety data sheets (MSDS), care and cleaning instructions, touch-up procedures, repair of painted and finished surfaces, and color samples of each color and finish used.

1.7 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified, with minimum five (5) years documented experience.

B. Applicator Qualifications: Company specializing in performing the type of work specified with minimum three (3) years experience.

1.8 MOCK-UPS

A. See Section 01 4000 - Quality Requirements, for general requirements for mock-up.

B. Provide column & beam assembly illustrating paint color, texture, and finish.

C. Locate where directed by Owner's Representative.

D. Mock-up may remain as part of the work.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.

B. Container Label: Include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.

C. Paint Materials: Store at minimum ambient temperature of 45 degrees F and a maximum of 90 degrees F, in ventilated area, and as required by manufacturer's instructions.

1.10 FIELD CONDITIONS

A. Do not apply materials when surface and ambient temperatures are outside the paint product manufacturer's temperature ranges.

B. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.

C. Do not apply exterior paint and finishes during rain or snow, or when relative humidity is outside the humidity ranges required by the paint product manufacturer.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Provide paints and finishes from the same manufacturer.

B. Paints:
1. Base Manufacturer: Sherwin-Williams Company; www.sherwin-williams.com.

C. Substitutions: See Section 01 2500 - Substitution Procedures

2.2 PAINTS AND FINISHES - GENERAL

A. Paints and Finishes: Ready-mixed, unless required to be a field-catalyzed paint.
   1. Where MPI paint numbers are specified, provide products listed in Master Painters Institute Approved Product List, current edition available at www.paintinfo.com, for specified MPI categories, except as otherwise indicated.
   2. Provide paints and finishes of a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating, with good flow and brushing properties, and capable of drying or curing free of streaks or sags.
   3. For opaque finishes, tint each coat including primer coat and intermediate coats, one-half shade lighter than succeeding coat, with final finish coat as base color.
   4. Supply each paint material in quantity required to complete entire project's work from a single production run.
   5. Do not reduce, thin, or dilute paint or finishes or add materials unless such procedure is described explicitly in manufacturer's product instructions.

B. Volatile Organic Compound (VOC) Content: Comply with Section 01 6116.

C. Flammability: Comply with applicable code for surface burning characteristics.

D. Colors: Black.

2.3 PAINT SYSTEMS - EXTERIOR

A. Exterior Surfaces to be Painted, Unless Otherwise Indicated.
   1. Top Coat(s): Exterior Urethane Alkyd;
      a. Products:
         Sherwin-Williams; Pro Industrial Urethane Alkyd Enamel. B54-150 Series

B. Ferrous Metals, Primed, Latex, 2 Coat:
   1. Touch-up with rust-inhibitive primer recommended by top coat manufacturer.
   2. Topcoat: Acrylic Latex applied at spreading rate recommended by manufacturer to achieve a dry film thickness of 2.5 to 4.0
      a. Sherwin Williams: Pro Industrial Acrylic.

C. Galvanized Metals, Alkyd, 3 Coat:
   1. One coat galvanize primer.
   2. Two coats of alkyd enamel:
      a. Intermediate coat: Alkyd enamel applied at spreading rate recommended by manufacturer to achieve a dry film thickness of 3.0 to 5.6.
         a) Sherwin Williams Direct To
      b. Finish coat: Alkyd enamel applied at spreading rate recommended by manufacturer to achieve a dry film thickness of 3.0 to 5.6.
         a) Sherwin Williams Direct To Metal Alkyd Enamel Semi-Gloss Pure White

2.4 PRIMERS

A. Primers: Provide the following unless other primer is required or recommended by manufacturer of top coats.
   1. Water based wash Primer for Galvanized Metal; and aluminum.
      a. Products:
         a) Sherwin Williams; DTM Wash Primer, B71Y00001.
         b) Substitutions: See Section 01 2500 - Substitution Procedures

PART 3 EXECUTION

3.1 EXAMINATION

A. Do not begin application of paints and finishes until substrates have been properly prepared.

B. Verify that surfaces are ready to receive work as instructed by the product manufacturer.

C. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially effect proper application.

D. Test shop-applied primer for compatibility with subsequent cover materials.

3.2 PREPARATION

A. Clean surfaces thoroughly and correct defects prior to application.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

C. Remove or repair existing paints or finishes that exhibit surface defects.

D. Remove or mask surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces for finishing.

E. Seal surfaces that might cause bleed through or staining of topcoat.

F. Galvanized Surfaces:
   1. Remove surface contamination and oils and wash with solvent according to SSPC-SP 1.
   2. Prepare surface according to SSPC-SP 2.

G. Ferrous Metal:
   1. Solvent clean according to SSPC-SP 1.
   2. Shop-Primed Surfaces: Sand and scrape to remove loose primer and rust. Feather edges to make touch-up patches inconspicuous. Clean surfaces with solvent. Prime bare steel surfaces.
   3. Remove rust, loose mill scale, and other foreign substances by power wire brushing, power sanding, power grinding, power tool chipping and power tool descaling, using methods recommended in writing by paint manufacturer and SSPC-SP 3. Protect from corrosion until coated.

3.3 APPLICATION

A. Remove unfinished louvers, grilles, covers, and access panels on mechanical and electrical components and paint separately.

B. Apply products in accordance with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual".

C. Where adjacent sealant is to be painted, do not apply finish coats until sealant is applied.

D. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.

E. Apply each coat to uniform appearance.

F. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.

G. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

3.4 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for general requirements for field inspection.

3.5 CLEANING

A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.

3.6 PROTECTION

A. Protect finishes until completion of project.

B. Touch-up damaged finishes after Substantial Completion.

END OF SECTION

SECTION 09 9123
INTERIOR PAINTING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Sections, apply to this Section.

1.2 SECTION INCLUDES

A. Surface preparation.

B. Field application of paints.

C. Scope: Finish interior surfaces exposed to view, unless fully factory-finished and unless otherwise indicated.
   1. Steel door frames
   2. Plaster (Existing)
   3. Concrete masonry units (CMU).
   4. Gypsum Board/Plaster walls, soffits, and ceilings.
   5. Metal trim and specialty items
   6. Exposed surfaces of steel lintels
   7. Mechanical and Electrical:
      a. In finished areas , paint conduit, boxes, insulated and exposed ducts, hangers, brackets, collars and supports, mechanical equipment, and electrical equipment, unless otherwise indicated.
      b. In finished areas, paint shop-primed items.

D. Do Not Paint or Finish the Following Items:
   1. Items factory-finished unless otherwise indicated; materials and products having factory-applied primers are not considered factory finished.
   2. Items indicated to receive other finishes.
   3. Items indicated to remain unfinished.
   4. Fire rating labels, equipment serial number and capacity labels, bar code labels, and operating parts of equipment.
   5. Stainless steel, anodized aluminum, bronze, terne-coated stainless steel, and lead items.
   6. Ceramic and other tiles.
   7. Acoustical materials, unless specifically indicated.
   8. Concealed pipes, ducts, and conduits.

1.3 RELATED REQUIREMENTS

A. Section 01 6116 - Volatile Organic Compound (VOC) Content Restrictions.

B. Section 04 2000 - Unit Masonry.

C. Section 05 5000 - Metal Fabrications: Shop-primed items.

D. Section 08 1113 - Hollow Metal Doors and Frames.

E. Section 09 2116 - Gypsum Board Assemblies.

1.4 DEFINITIONS

A. Comply with ASTM D16 for interpretation of terms used in this section.

1.5 REFERENCE STANDARDS

A. ASTM D16 - Standard Terminology for Paint, Related Coatings, Materials, and Applications; 2016.

B. ASTM D4258 - Standard Practice for Surface Cleaning Concrete for Coating; 2005 (Reapproved 2017).

C. MPI (APL) - Master Painters Institute Approved Products List; Master Painters and Decorators Association; Current Edition.

D. SSPC-SP 1 - Solvent Cleaning; 2015, with Editorial Revision (2016).

E. SSPC-SP 2 - Hand Tool Cleaning; 1982, with Editorial Revision (2004).

F. SSPC-SP 3 - Power Tool Cleaning; 1982, with Editorial Revision (2004).

G. SSPC-SP 13 - Surface Preparation of Concrete; 1997 (Reaffirmed 2003).

1.6 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide complete list of products to be used, with the following information for each:
   1. Manufacturer's name, product name and/or catalog number, and general product category (e.g., "alkyd enamel").
   2. MPI product number (e.g., MPI #47).
   3. Cross-reference to specified paint system(s) product is to be used in; include description of each system.
   4. Manufacturer's installation instructions.

C. Samples: Submit three paper "draw down" samples, 8-1/2 by 11 inches in size, illustrating range of colors available for each finishing product specified.
   1. Where sheen is specified, submit samples in only that sheen.
   2. Where sheen is not specified, discuss sheen options with Fuller and D'Angelo, P.C. before preparing samples, to eliminate sheens definitely not required.

D. Certification: By manufacturer that paints and finishes comply with VOC limits specified.

E. Manufacturer's Instructions: Indicate special surface preparation procedures.

F. Maintenance Data: Submit data including finish schedule showing where each product/color/finish was used, product technical data sheets, material safety data sheets (MSDS), care and cleaning instructions, touch-up procedures, repair of painted and finished surfaces, and color samples of each color and finish used.

G. Maintenance Materials: Furnish the following for Construction Manager's use in maintenance of project.
   1. See Section 01 6000 - Product Requirements, for additional provisions.
   2. Extra Paint and Finish Materials: 3 gallons of each color; from the same product run, store where directed.
   3. Label each container with color and type in addition to the manufacturer's label.

1.7 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified, with minimum 10 years documented experience.

B. Applicator Qualifications: Company specializing in performing the type of work specified with minimum 3 years experience.

1.8 MOCK-UP

A. See Section 01 4000 - Quality Requirements, for general requirements for mock-up.

B. Provide panel, 4 feet long by 4 feet wide, illustrating paint color, texture, and finish.

C. Provide door and frame assembly illustrating paint color, texture, and finish.

D. Locate Where directed by the Construction Manager.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.

B. Container Label: Include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.

C. Paint Materials: Store at minimum ambient temperature of 45 degrees F and a maximum of 90 degrees F, in ventilated area, and as required by manufacturer's instructions.

1.10 FIELD CONDITIONS

A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the paint product manufacturer.

B. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.

C. Minimum Application Temperatures for Paints: 50 degrees F for interiors unless required otherwise by manufacturer's instructions.

D. Provide lighting level of 80 ft candles measured mid-height at substrate surface.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Provide paints and finishes from the same manufacturer to the greatest extent possible.
   1. Substitutions: Refer to Section 01 2500 - Substitution Procedures..

B. Paints:
   1. Base Manufacturer: Sherwin-Williams Company: www.sherwin-williams.com.
   2. Primer Sealers: Same manufacturer as top coats.

C. Substitutions: 01 2500 - Substitution Procedures..

2.2 PAINTS AND FINISHES - GENERAL

A. Paints and Finishes: Ready-mixed, unless intended to be a field-catalyzed paint.
   1. Provide paints and finishes of a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating, with good flow and brushing properties, and capable of drying or curing free of streaks or sags.
   2. Provide materials that are compatible with one another and the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.
   3. For opaque finishes, tint each coat including primer coat and intermediate coats, one-half shade lighter than succeeding coat, with final finish coat as base color.
   4. Supply each paint material in quantity required to complete entire project's work from a single production run.
   5. Do not reduce, thin, or dilute paint or finishes or add materials unless such procedure is specifically described in manufacturer's product instructions.

B. Volatile Organic Compound (VOC) Content: Comply with Section 01 6116.

C. Flammability: Comply with applicable code for surface burning characteristics.

D. Sheens: Provide the sheens specified; where sheen is not specified, sheen will be selected later by Fuller and D'Angelo, P.C. from the manufacturer's full line.

E. Colors: As indicated in Finish Schedule.
   1. In finished areas, finish pipes, ducts, conduit, and equipment the same color as the wall/ceiling under which they are mounted.

2.3 PAINT SYSTEMS - INTERIOR

A. Ferrous metals, Not Primed, Acrylic Latex, 3 coat:
   1. One Coat latex primer spreading rate recommended by manufacturer to achieve a dry film thickness of 3.0 to 5.6 mils.
      a. Sherwin Williams Direct-to-Metal Semi-Gloss.
   2. Topcoat: Two coats Acrylic Latex

a. Sherwin Williams ProMar 200 Zero VOC Semi-Gloss

B. Ferrous metals, Primed, Acrylic Latex, 2 coat:
1. Touch up with latex primer.
2. Two Coats Acrylic Latex spreading rate recommended by manufacturer to achieve a dry film thickness of 4 mils wet; 1.3 nils dry to 5.6 mils:
a. Sherwin Williams ProMar 200 Zero VOC Semi-Gloss

C. Aluminum and Galvanized Metals, Not Primed, Acrylic Latex, 3 coat:
1. One Coat latex primer spreading rate recommended by manufacturer to achieve a film thickness of 5.0 to 10 mils wet; 1.8.to 3.6 mils dry..
a. Sherwin Williams Pro-Cryl Universal Primer
2. Two Coats Acrylic Latex spreading rate recommended by manufacturer to achieve a dry film thickness of 4 mils wet; 1.3 nils dry to 5.6 mils:
a. Sherwin Williams ProMar 200 Zero VOC Semi-Gloss

D. Gypsum Board/Plaster, Latex, 3 coat: (New Surfaces)
1. One Coat latex primer spreading rate recommended by manufacturer to achieve a dry film thickness of 4 mils wet and 1.3 mils dry.
a. Sherwin Williams QUICK DRY Interior Exterior Stain Blocking Primer Latex
2. Topcoat: Two Coats of Acrylic Latex spreading rate recommended by manufacturer to achieve a dry film thickness of 4 mils wet; 1.3 nils dry to 5.6 mils
a. Sherwin Williams ProMar 200 Zero VOC Semi-Gloss

E. Gypsum Board/Plaster, Latex, 2 coat: (Existing Surfaces)
1. One Coat latex primer spreading rate recommended by manufacturer to achieve a dry film thickness of 4 mils wet and 1.1 mils dry..
a. Sherwin Williams QUICK DRY Interior Exterior Stain Blocking Primer Latex
2. Topcoat: One Coat of Latex spreading rate recommended by manufacturer to achieve a dry film thickness of 4 mils wet; 1.3 nils dry to 5.6 mils
a. Sherwin Williams ProMar 200 Zero VOC Semi-Gloss

F. Concrete Floor Surface, Urethane modified alkyd resin, Two coat (Existing surfaces)
1. High Gloss: One coat Alkyd Enamel spreading rate recommended by manufacturer to achieve a dry film thickness of 2.0 to 4.0 mils.
a. Sherwin Williams Pro Industrial Urethane Alkyd Enamel

2.4 PRIMERS

A. Primers: Provide the following unless other primer is required or recommended by manufacturer of top coats.

B. Interior/Exterior Latex Block Filler; MPI #4.
1. Products:
a. Sherwin-Williams ConFlex Block Filler. (MPI #4)
b. Substitutions: See Section 01 6000 - Product Requirements

2.5 ACCESSORY MATERIALS

A. Accessory Materials: Provide primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials as required for final completion of painted surfaces.

B. Patching Material: Latex filler.

PART 3 EXECUTION

3.1 EXAMINATION

A. Do not begin application of paints and finishes until substrates have been adequately prepared.

B. Verify that surfaces are ready to receive work as instructed by the product manufacturer.

C. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application.

D. If substrate preparation is the responsibility of another installer, notify Fuller and D'Angelo, P.C. of unsatisfactory preparation before proceeding.

E. Test shop-applied primer for compatibility with subsequent cover materials.

F. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces is below the following maximums:
   1. Gypsum Wallboard: 12 percent.
   2. Plaster and Stucco: 12 percent. (Existing)
   3. Masonry, Concrete, and Concrete Masonry Units: 12 percent.
   4. Concrete Floors and Traffic Surfaces: 8 percent.

3.2 PREPARATION

A. Clean surfaces thoroughly and correct defects prior to application.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

C. Remove or mask surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces or finishing.

D. Seal surfaces that might cause bleed through or staining of topcoat.

E. Remove mildew from impervious surfaces by scrubbing with solution of tetra-sodium phosphate and bleach. Rinse with clean water and allow surface to dry.
   1. Prior to removing mildew, test any cleaner on a small, inconspicuous area prior to use.
   2. Bleach and bleaching type cleaners may damage or discolor existing paint films. Alternative cleaning solutions may be required
   3. Wear protective eye wear, waterproof gloves, and protective clothing.

F. Concrete:
   1. Remove release agents, curing compounds, efflorescence, and chalk. Do not coat surfaces if moisture content or alkalinity of surfaces to be coated exceeds that permitted in manufacturer's written instructions.
   2. Clean concrete according to ASTM D4258. Allow to dry.
   3. Prepare surface as recommended by top coat manufacturer and according to SSPC-SP 13.

G. Masonry:
   1. Remove efflorescence and chalk. Do not coat surfaces if moisture content, alkalinity of surfaces, or if alkalinity of mortar joints exceed that permitted in manufacturer's written instructions. Allow to dry.
   2. Prepare surface as recommended by top coat manufacturer.
   3. Clean surfaces with pressurized water. Use pressure range of 600 to 1,500 psi at 6 to 12 inches. Allow to dry.

H. Concrete Floors and Traffic Surfaces: Remove contamination, acid etch and rinse floors with clear water. Verify required acid-alkali balance is achieved. Allow to dry.

I. Gypsum Board: Fill minor defects with filler compound. Spot prime defects after repair.

J. Plaster: Fill hairline cracks, small holes, and imperfections with latex patching plaster. Make smooth and flush with adjacent surfaces. Wash and neutralize high alkali surfaces.

K. Galvanized Surfaces:
   1. Remove surface contamination and oils and wash with solvent according to SSPC-SP 1.

L. Ferrous Metal:
   1. Solvent clean according to SSPC-SP 1.

2. Shop-Primed Surfaces: Sand and scrape to remove loose primer and rust. Feather edges to make touch-up patches inconspicuous. Clean surfaces with solvent. Prime bare steel surfaces.
3. Remove rust, loose mill scale, and other foreign substances using using methods recommended in writing by paint manufacturer and SSPC-SP 3. Protect from corrosion until coated.

M. Cleaning Existing Walls: Remove all loose paint, plaster and other coatings.
1. Working from bottom to top, apply prepared cleaning solution to a dry surface.
2. Leave solution on the surface for 5-20 minutes. If solution begins to dry, reapply.
3. Gently scrub heavily soiled areas.
4. Rinse thoroughly with clean water with by masonry washing equipment generating 400-1000 psi with a water flow rate of 6-8 gallons per minute delivered through a 15-45 degree fan spray tip.
5. Apply after wash. Let the Afterwash stay on the surface for three to five minutes.
6. Pressure rinse from the bottom of the treated area to the top.

N. Metal Doors to be Painted: Prime metal door top and bottom edge surfaces.

3.3 APPLICATION

A. Remove unfinished louvers, grilles, covers, and access panels on mechanical and electrical components and paint separately.

B. Apply products in accordance with manufacturer's written instructions.

C. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.

D. Apply each coat to uniform appearance in thicknesses specified by manufacturer.

E. Sand metal surfaces lightly between coats to achieve required finish.

F. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.

G. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

3.4 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for general requirements for field inspection.

3.5 CLEANING

A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.

3.6 PROTECTION

A. Protect finishes until completion of project.

B. Touch-up damaged finishes after Substantial Completion.

END OF SECTION

SECTION 10 1100
VISUAL DISPLAY UNITS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SECTION INCLUDES

A. Porcelain enamel steel markerboards.

B. Tackboards.

1.3 RELATED REQUIREMENTS

A. Section 06 1000 - Rough Carpentry: Blocking and supports.

B. Section 09 2116 - Gypsum Board Assemblies: Concealed supports in metal stud walls.

1.4 REFERENCE STANDARDS

A. ASTM A424/A424M - Standard Specification for Steel, Sheet, for Porcelain Enameling; 2018.

B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2018b.

C. ASTM F793/F793M - Standard Classification of Wall Coverings by Use Characteristics; 2015.

1.5 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's data on markerboard and trim.

C. Shop Drawings: Indicate wall elevations, dimensions, joint locations, special anchor details.

D. Samples: Submit color charts for selection of color and texture of markerboard and trim.

E. Manufacturer's printed installation instructions.

F. Maintenance Data: Include data on regular cleaning, stain removal .

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum five (5) years documented experience.

1.7 WARRANTY

A. Porcelain Enamel Markerboard Warranty: Submit a written warranty executed by manufacturer agreeing to replace porcelain enamel markerboards that do not retain their original writing and erasing qualities, become slick and shiny, or exhibit crazing, cracking, or flaking within the specified warranty period, provided the manufacturer's written instructions for handling, installation, protection, and maintenance have been followed.

1. Warranty Period: 50 years from date of Substantial Completion

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Claridge Products and Equipment, Inc: www.claridgeproducts.com.

B. Substitutions: Section 01 2500 Substitution Procedures.

2.2 VISUAL DISPLAY UNITS

A. Fixed Markerboards: Porcelain enamel on steel, laminated to core.

1. Steel Face Sheet Thickness: 24 gauge, 0.0239 inch .
2. Core: Particleboard, 1/2 inch thick, laminated to face sheet.
3. Backing: Aluminum foil, laminated to core.
4. Size: As indicated on drawings.

5. Frame: Extruded aluminum, with concealed fasteners.
6. Frame Profile: As indicated on drawings.
7. Frame Finish: Anodized, natural.

B. Accessories: Provide:
1. Manufacturer's standard, continuous, box-type, aluminum chalktray with slanted front and cast-aluminum end closures for each markerboard.
2. Map Rail: Furnish map rail at top of each unit, complete with the following accessories:
a. Display Rail: Provide continuous cork display rail, 2 inches (25 or 50 mm) wide integral with map rail.
b. End Stops: Provide one end stop at each end of map rail.
c. Map Hooks: Provide 2 map hooks for every 48 inches of map rail or fraction thereof.
d. Flag Holder: Provide one flag holder for each room

C. Tackboards: Fabric laminated to cork.
1. Cork Thickness: 7/32 inch.
2. Fabric: Vinyl coated fabric.
3. Color: As selected from manufacturer's full range.
4. Backing: Hardboard, 1/4 inch thick, laminated to tack surface.
5. Surface Burning Characteristics: Flame spread index of 25, maximum, and smoke developed index of 450, maximum, when tested in accordance with ASTM E84.
6. Size: As indicated on drawings.
7. Frame: Same type and finish as for markerboard.
8. Frame Finish: Anodized, natural.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that internal wall blocking is ready to receive work and positioning dimensions are as indicated on shop drawings.

3.2 PREPARATION

A. Acclimatize tackable wall panels by removing from packaging in installation area not less than 24 hours before application.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.3 INSTALLATION

A. Install boards in accordance with manufacturer's instructions.

B. Install with top of marker tray at 34 inches above finished floor.

C. Secure units level and plumb.

D. Butt Joints: Install with tight hairline joints.

E. Install tackable wall panels in accordance with manufacturer's recommendations on specified substrates with concealed attachments.
1. Fabricate re-wrapped edges where partial panels about each other, or adjacent surfaces or trim.

3.4 CLEANING

A. Clean board surfaces in accordance with manufacturer's instructions.

B. Cover with protective cover, taped to frame.

C. Remove temporary protective cover at Date of Substantial Completion.

END OF SECTION

SECTION 10 1400
SIGNAGE

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Sections, apply to this Section.

1.2 SECTION INCLUDES

A. Provide new and replacement signage as indicated on drawings.

B. Room and Corridor Door signs.

C. Interior Directional and Informational signs.

D. Emergency evacuation maps. (Correct floor plans will be provided by Owner's Representative. (Contractor shall fabricate and install).

1.3 REFERENCE STANDARDS

A. 36 CFR 1191 - Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines; current edition.

B. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design; 2010.

C. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2017.

1.4 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Manufacturer's printed product literature for each type of sign, indicating sign styles, font, foreground and background colors, locations, overall dimensions of each sign.

C. Signage Schedule: Provide information sufficient to completely define each sign for fabrication, including room number, room name, other text to be applied, sign and letter sizes, fonts, and colors.

1. When room numbers to appear on signs differ from those on drawings, include the drawing room number on schedule.
2. Submit for approval by Owner's Representative and Fuller and D'Angelo, P.C. prior to fabrication.

D. Samples: Submit two samples of each type of sign, of size required for project, illustrating sign style, font, and method of attachment.

E. Selection Samples: Where colors are not specified, submit two sets of color selection charts or chips.

F. Manufacturer's Installation Instructions: Include installation templates and attachment devices.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum five years of documented experience.

B. Regulatory Requirements: Comply with applicable provisions in ADA-ABA Accessibility Guidelines.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Package signs as required to prevent damage before installation.

B. Store tape adhesive at normal room temperature.

1.7 FIELD CONDITIONS

A. Do not install tape adhesive when ambient temperature is lower than recommended by manufacturer.

B. Maintain this minimum temperature during and after installation of signs.

1.8 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of signs that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Deterioration of metal or polymer finishes beyond normal weathering.
b. Deterioration of embedded graphic image colors and sign lamination.

2. Warranty Period: 5 years years from date of Substantial Completion.

PART 2 PRODUCTS

2.1 PANEL SIGN

A. Manufacturers
1. Flat Signs:
a. Crown Signs, 4 Executive Plaza, Yonkers, NY 10701; (914) 375-2118.
2. Substitutions: Section 01 2500 Substitution Procedures.

B. Manufacturer's standard monolithic tactile plaque constructed utilizing a thermoforming process, which provides a fully homogeneous plaque sign. The sign body, face, raised text and Braille are compression molded to form a single dimensional component that results in a sign surface that exhibits a toughness that resists scratching, cracking, gouging and graffiti.
1. Style: Identification: Photopolymer Signs with raised lettering is physically attached, not laminated to the face plate.
a. Sign to be satin Braille and pictograms raised. "Tipping" shall be provided where just the tips or the raised areas are finished providing an extra layer of protection to the sign and paint.
b. Provide VHB Tape, holes drilled/countersunk for mounting, radius corners, and back plates.
2. Material: Extruded Engineered PVC/Acrylic alloy with Integral background colors and high impact resistance with Class A Fire Rating.
3. Frame: Plastic:
a. Thickness: 1/4 inch (3mm) or as shown on drawings.
b. Edge Treatment:
a) Standard 0.5" Radiused Corners.
c. Color: Black
4. Lettering/ Tactile Characters/Symbols: Integral Raised 1/32 inch (1 mm) from sign plate face.
a. Helvetica Med
5. Lettering Style: Typeface as selected from the manufacturer's standard typefaces, upper case letters as indicated on drawings and match existing building signage.
6. Braille: Grade 2 braille, placed as indicated on drawings
a. Integral raised, painted to match background.
7. Contrast: Letters, numbers and symbols shall contrast with background.
a. Provide colors as shown on drawings.
8. Colors: As shown on drawings.
9. Color of Background: As selected from manufacturer's standard background colors to match existing.
10. Color of Text and Raised Characters: As selected from standard colors to match existing.
11. Surface Texture: Matte

2.2 MATERIALS

A. Acrylic Sheet: ASTM D 4802, Category A-1 (cell-cast sheet), Type UVA (UV absorbing).
1. Plastic (self-extinguishing material) engraving stock with face and core piles in contrasting colors, in finishes and color combinations indicated or, if not indicated, as selected from the manufacturer's standard.

2.3 SIGNAGE APPLICATIONS

A. Accessibility Compliance: Signs are required to comply with ADA Standards and ICC A117.1 and applicable building codes, unless otherwise indicated; in the event of conflicting requirements, comply with the most comprehensive and specific requirements.
   1. Flame Spread: Less than 25.
   2. Smoke Development: Less than 450

B. Provide for locations and rooms as scheduled and shown on drawing. **In addition to those indicated on drawings**:
   1. Five (5) type 'A' signs;
   2. Six (6) type 'B' signs
   3. Six (6) type 'G' signs.

C. Emergency Evacuation Maps:
   1. Plan plans will be provided by the Owner's Representative.
   2. Fabricate and install as indicated on drawings.
   3. Second surface direct print on non-glare clear acrylic, back painted.
   4. Location: Where shown on drawings.
   5. All for one map per classroom and occupied spaces.

2.4 ACCESSORIES

A. Concealed Screws: Security type Stainless steel, galvanized steel, chrome plated, or other non-corroding metal.

B. Tape Adhesive: Double sided tape, permanent adhesive.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that substrate surfaces are ready to receive work.

3.2 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. All signs to be mechanically fastened and taped.

C. Install neatly, with horizontal edges level.

D. Locate signs and mount at heights indicated on drawings and in accordance with ADA Standards and ICC A117.1.

E. Protect from damage until Date of Substantial Completion; repair or replace damaged items.

END OF SECTION

SECTION 10 2113
PLASTIC TOILET COMPARTMENTS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of each prime contract, including General Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SECTION INCLUDES

A. Solid plastic toilet compartments including the following: (Hiny Hiders)
   1. Floor mounted overhead-braced toilet compartments.

B. Solid plastic toilet compartments.

C. Privacy screens.

1.3 RELATED REQUIREMENTS

A. Section 05 5000 - Metal Fabrications: Concealed steel support members.

B. Section 06 1000 - Rough Carpentry: Blocking and supports.

C. Section 10 2800 - Toilet, Bath, and Laundry Accessories. for accessories mounted to partitions.

1.4 REFERENCE STANDARDS

A. ASTM B 221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.

B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2018b.

C. NFPA 286 - Standard Methods of Fire Tests for Evaluating Contribution of Wall and Ceiling Interior Finish to Room Fire Growth; 2015.

1.5 QUALITY ASSURANCE

A. Manufacturer’s Qualifications: A company regularly engaged in manufacture of products specified in this section, and whose products have been in satisfactory use under similar service conditions for not less than 5 years.

B. Installer’s Qualifications: A Company or Individual, regularly engaged in installation of products specified in this Section, with a minimum of 5 years experience.

C. Materials: Doors, panels and pilasters, constructed from high density polyethylene (HDPE) resins. Partitions to be fabricated from polymer resins compounded under high pressure, forming a single component which is waterproof, nonabsorbent and has a self-lubricating surface that resists marks from pens, pencils, markers and other writing instruments. Cover all plastic components with a protective plastic masking.

D. Performance Requirements:
   1. Fire Resistance: Partition materials shall comply with the following requirements, when tested in accordance with ASTM E 84:
      a. Class A flame spread/smoke developed rating.
      b. Class B flame spread/smoke developed rating.

E. Material Fire Ratings:
   1. National Fire Protection Association (NFPA) 286: Pass.
      a. International Code Council (ICC): Class B.

1.6 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide layout drawings and installation details with location and type of hardware required.

1. Preparation instructions and recommendations.
2. Storage and handling requirements and recommendations.
3. Installation methods.

C. Shop Drawings: Provide layout drawings and installation details with location and type of hardware required. Indicate partition plan, elevation views, dimensions, details of wall supports, door swings.

D. Samples: Submit two samples of partition panels, 12 x 12 inch in size illustrating panel finish, color, and sheen.

E. Manufacturer's Installation Instructions: Indicate special procedures.

F. Manufacturer’s guarantee.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

1.8 PROJECT CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

1.9 WARRANTY

A. Manufacturer guarantees its plastic against breakage, corrosion, and delamination under normal conditions for 25 years from the date of receipt by the customer. If materials are found to be defective during that period for reasons listed above, the materials will be replaced free of charge. Labor not included in warranty.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Solid Plastic Toilet Compartments:
1. Scranton Products; Hiny Hiders Partitions: 801 E. Corey St.; Scranton, PA 18505; Toll Free Tel: 800-445-5148; Fax: 855-376-6161; www.scrantonproducts.com/#sle.
2. Substitutions: 01 2500 Substitution Procedures.

2.2 PLASTIC TOILET COMPARTMENTS

A. Toilet Compartments: Factory fabricated doors, pilasters, and divider panels made of solid molded high density polyethylene (HDPE) suitable for exposed applications, waterproof, non-absorbent, and graffiti-resistant textured surface, floor-mounted headrail-braced.
1. Recycled Content; Post Industrial: 25 percent.
2. Recycled Content; Post Industrial: 100 percent.
3. Recycled Content; Post Consumer: 100 percent.

B. Zinc Aluminum Magnesium and Copper Alloy (Zamac): ASTM B 86.

C. Stainless Steel Castings: ASTM A167, Type 304.

D. Aluminum: ASTM 6463-T5 alloy.

E. Doors:
1. Thickness: 1 inch (25 mm) thick with all edges rounded to a radius. Mount doors and dividing panels based on height of specified system.
2. Width: 24 inch.
3. Width for Handicapped Use: 36 inch, out-swinging.
4. Height: 55 inch.

F. Panels:
1. Thickness: 1 inch.
2. Height: 55 inch.

3. Depth: As indicated on drawings.

G. Aluminum heat sink provided along bottom edge.

H. Pilasters:
1. Thickness: 1 inch.
2. Width: As required to fit space; minimum 3 inch.
3. 82 inches (2083 mm) high and fastened to floor.

I. Urinal Screens: Wall mounted to with two heavy duty aluminum alloy panel brackets.
1. Thickness: 1 inch.
2. Width: 18 inch.
3. Height: 56 inch.
4. Provide screen with one piece pedestal leg.
5. Provide aluminum heat sink fastened to bottom edges.

J. Finish:
1. Color:As indicated on Finish Schedule

2.3 ACCESSORIES

A. Pilaster Shoes: Type 304, 20 gauge stainless steel. Secured to pilasters with a stainless steel tamper resistant Torx head sex bolt, 3 inches high; concealing floor fastenings. Mount shoe to floor utilizing anchors supplied by manufacturer or equal. Anchors shall have 2700 lbs of holding strength.
1. Provide adjustment for floor variations with screw jack through steel saddles integral with pilaster.

B. Head Rails: Extruded aluminum, anti-grip profile. Wall brackets, 20 gauge stainless steel satin finish , with a stainless steel tamper resistant torx head screws.
1. Size: Manufacturer's standard size.

C. Wall and Pilaster Brackets: Stainless steel; continuous type.

D. Attachments, Screws, and Bolts: Stainless steel, tamper proof type.
1. For attaching panels and pilasters to brackets: Through-bolts and nuts; tamper proof.

E. Hinges: Continuous Anodized aluminum, manufacturer's standard finish.
1. Length: 54 inches (1372 mm), self-closing.

F. Door Hardware: Anodized aluminum, manufacturer's standard finish.
1. Door Latch: Slide type with exterior emergency access feature. Heavy-duty extruded 6463-T5 alloy aluminum. Latch and housing to have a bright dip anodized finish. Slide bolt and button to have a black anodized finish.
2. Door Strike and Keeper with Rubber Bumper: Mount on pilaster in alignment with door latch.
3. Equip outswing handicapped doors with second door pull and door stop.

G. Coat Hook: One coat hook/bumper and door pull made of chrome plated Zamak. One per compartment, mounted on door.

2.4 SOLID PLASTIC PRIVACY SCREENS

A. Provide plastic privacy screens in urinal and entry toilet room applications as indicated or scheduled.

B. Panels, and pilasters, if required, 1 inch (25 mm) thick with edges rounded to a radius. Screens to be mounted at 14 inches (356 mm) above the finished floor. Color as selected by Architect from manufacturer's full line of current colors.
1. Aluminum heat sink fastened to bottom edges.

C. Screen Type: Wall mounted.
1. Urinal Screens: 18 inches (457 mm) wide by 55 inches (1397 mm) high.

PART 3 EXECUTION

3.1 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. Verify that field measurements are as indicated.

C. Verify correct spacing of and between plumbing fixtures.

D. Verify correct location of built-in framing, anchorage, and bracing.

E. If substrate preparation is the responsibility of another installer, notify Construction Manager of unsatisfactory preparation before proceeding.

F. Start of work constitutes acceptance of job.

3.2 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

C. Examine areas to receive toilet partitions and screens for correct height and spacing of anchorage/blocking and plumbing fixtures that affect installation of partitions. Report discrepancies to the architect.

3.3 INSTALLATION

A. Install partitions secure, rigid, plumb, and level in accordance with manufacturer's instructions.

B. Maintain 3/8 inch space between wall and panels and between wall and end pilasters.

C. Attach panel brackets securely to walls using anchor devices.

D. Attach panels and pilasters to brackets. Locate head rail joints at pilaster center lines.

E. No evidence of cutting, drilling, and/or patching shall be visible on the finished work.

F. All panels shall typically be mounted at 14" above finished floor

G. Field touch-up of scratches or damaged finish will not be permitted. Replace damaged or scratched materials with new materials.

3.4 TOLERANCES

A. Maximum Variation From True Position: 1/4 inch.

B. Maximum Variation From Plumb: 1/8 inch.

3.5 ADJUSTING/CLEANING

A. Adjust and align hardware to uniform clearance at vertical edge of doors, not exceeding 3/16 inch.

B. Adjust hinges to position doors in partial opening position when unlatched. Return out-swinging doors to closed position.

C. Adjust adjacent components for consistency of line or plane.

D. Finished surfaces shall be cleaned after installation and be left free of all imperfections.

3.6 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

SECTION 10 2800
TOILET, BATH, AND LAUNDRY ACCESSORIES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SECTION INCLUDES

A. Commercial toilet accessories.
   1. Grab bars.
   2. Mirror Units.
   3. Double Roll Toilet Tissue Dispenser. (Provided by Owner Installed by Contractor).
   4. Liquid Soap Dispenser. (Provided by Owner Installed by Contractor).
   5. Electric hand dryers.
   6. Partition Mounted Sanitary Napkin Disposal.
   7. Recessed Sanitary Napkin Disposal.
   8. Semi-Recess Napkin Vendor
   9. Under-lavatory pipe supply covers.

1.3 RELATED REQUIREMENTS

A. Section 10 2113 - Plastic Toilet Compartments.

1.4 REFERENCE STANDARDS

A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design; 2010.

B. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.

C. ASTM A167 - Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip; 2009.

D. ASTM A269/A269M - Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service; 2015a.

E. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2018.

F. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2015.

G. ASTM B456 - Standard Specification for Electrodeposited Coatings of Copper Plus Nickel Plus Chromium and Nickel Plus Chromium; 2017.

H. ASTM C1036 - Standard Specification for Flat Glass; 2016.

I. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass; 2018.

J. ASTM C1503 - Standard Specification for Silvered Flat Glass Mirror; 2018.

K. ASTM C1822 - Standard Specification for Insulating Covers on Accessible Lavatory Piping; 2015.

L. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2018b.

M. ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi; 2015.

1.5 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Submit data on accessories describing size, finish, details of function, and attachment methods.

C. Manufacturer's Installation Instructions: Indicate special procedures and conditions requiring special attention.

1.6 WARRANTY

A. Warranty: Contractor shall provide a warranty for two (2) years after the date of Substantial Completion of the Contractor's work or designated portion thereof.

B. Manufacturer's Mirror Warranty: Written warranty, executed by mirror manufacturer agreeing to replace mirrors that develop visible silver spoilage defects within minimum warranty period indicated.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Commercial Toilet, Shower, and Bath Accessories:
   1. Bobrick Washroom Equipment, Inc. www.bobrick.com.
   2. Substitutions: Refer to Section 01 2500 - Product Requirements.

B. Under-Lavatory Pipe Supply Covers:
   1. Truebro LavShield.
   2. Substitutions: Refer to Section 01 2500 - Product Requirements.

C. Electric Hand/Hair Dryers:
   1. Excel Dryer: www.exceldryer.com/#sle.
   2. Substitutions: . Refer to Section 01 2500 - Product Requirements

D. Provide products of each category type by single manufacturer.

2.2 MATERIALS

A. Accessories - General: Shop assembled, free of dents and scratches and packaged complete with anchors and fittings, steel anchor plates, adapters, and anchor components for installation.
   1. Grind welded joints smooth.
   2. Fabricate units made of metal sheet of seamless sheets with flat surfaces.

B. Keys: Provide two keys for each accessory to Edgemont Union Free School District; master key lockable accessories.

C. Stainless Steel Sheet: ASTM A666, Type 304.

D. Stainless Steel Tubing: ASTM A269/A269M, Grade TP304 or TP316.

E. Galvanized Sheet Steel: Hot-dipped galvanized steel sheet, ASTM A653/A653M, with G90/Z275 coating.

F. Mirror Glass: Tempered safety glass, ASTM C1048; and ASTM C1036 Type I, Class 1, Quality Q2, with silvering as required.

G. Fasteners, Screws, and Bolts: Hot dip galvanized; tamper-proof; security type.

H. Expansion Shields: Fiber, lead, or rubber as recommended by accessory manufacturer for component and substrate.

2.3 FINISHES

A. Stainless Steel: Satin finish, unless otherwise noted.

B. Chrome/Nickel Plating: ASTM B456, SC 2, polished finish, unless otherwise noted.

C. Baked Enamel: Pretreat to clean condition, apply one coat primer and minimum two coats epoxy baked enamel.

2.4 COMMERCIAL TOILET ACCESSORIES

A. Toilet Paper Dispenser: Double roll, surface mounted, for coreless type rolls.
   1. Products:
      a. San Jamar, Elkhorn, Wisconsin 53121 USA, "Oceans Twin 9"JBT

b. Provided by Owner Installed by Contractor

B. Soap Dispenser: Liquid soap dispenser, wall-mounted, surface, with stainless steel cover and horizontal stainless steel tank and working parts; push type soap valve, check valve, and window gauge refill indicator, tumbler lock.
1. Products:
a. Provided by Owner Installed by Contractor.

C. Mirrors: Stainless steel framed, 1/4 inch thick tempered safety glass; ASTM C1048.
1. Size: 78" x 30" .
2. Mirror shall have a one-piece Type-304 stainless steel angle frame, 3/4" x 3/4" (19 x 19mm) with continuous integral stiffener on all sides and beveled front to hold frame tightly against mirror; corners shall be welded, ground, and polished smooth; all exposed surfaces shall have satin finish with vertical grain. Mirror shall be tempered glass. All edges shall be protected by plastic filler strips. Backs of all glass mirrors shall be protected by full-size, shock-absorbing, water-resistant, nonabrasive, 3/16" (5mm) thick polyethylene padding. Galvanized steel back shall have integral horizontal hanging brackets located at top for mounting on concealed rectangular wall hanger. Mirror shall be secured to wall hanger with concealed Phillips-head locking screws located in bottom of frame.
3. Backing: Full-mirror sized, minimum 0.03 inch galvanized steel sheet and nonabsorptive filler material.
4. Products:
a. Bobrick #B-2908.

D. Grab Bars: Stainless steel, smooth surface.
1. 18-8, Type-304, 18-gauge (1.2mm) stainless steel tubing with satin-finish. 1-1/4" (32mm) outside diameter. Ends are heliarc welded to concealed mounting flanges. Clearance between the grab bar and wall is 1-1/2" (38mm).
2. Concealed Mounting Flanges — 18-8, Type-304, 11-gauge (3.2mm) thick, stainless steel plate; end flanges 2" x 3-1/8" (50 x 80mm) with holes for attachment to wall. Intermediate flanges 2-5/8" x 3-1/8" (65 x 80mm) wide x 3-1/8" (80mm) diameter
3. Snap Flange Covers — 18-8, Type-304, 22-gauge (0.8mm) drawn stainless steel with satin-finish. 3-1/4" (85mm) diameter x 5/8" (16mm) deep. Each cover snaps over mounting flange to conceal mounting screws.
4. Bobrick grab bars that provide 1-1/2" (38mm) clearance from wall can support loads in excess of 900 pounds (408kg) if properly installed. Other grab bar configurations can support loads in excess of 250 pounds (113kg) if properly installed, complying with accessible design (including ADAAG in the U.S.A.) for structural strength.
5. **Safety Warning:** Grab bars are no stronger than the anchors and walls to which they are attached and, therefore, must be firmly secured in order to support the loads for which they are intended. To avoid potential injury, the Construction Manager shall verify anchors are secue and insure maintenance personnel are instructed to remove the grab bar from service if the grab bar is not adequately secured to wall or if there is any observed damage to the welds.

E. Sanitary Napkin Disposal Unit: Partition Mounted Sanitary Napkin Disposal, back-to-back partition mounting with adjustable flanges, self-closing door, locking bottom panel with full-length stainless steel piano-type hinge, removable receptacle.
1. Cabinet — 18-8, Type-304, heavy-gauge stainless steel. All-welded construction. Exposed surfaces have satin finish.
2. Flange (2) — 18-8, Type-304, 22-gauge (0.8mm) stainless steel with satin finish. Drawn and beveled, one-piece, seamless construction.
3. Door — 18-8, Type-304, 22-gauge (0.8mm) stainless steel with satin finish. Secured to cabinet with a full-length stainless steel piano-hinge. Equipped with a tumbler lock keyed like other Bobrick washroom accessories.

4. Disposal Panels (2) — 18-8, Type-304, 22-gauge (0.8mm) stainless steel with satin finish. Bottom edges hemmed for safety. Secured to door and permanent panel with spring-loaded, full-length stainless steel piano-hinges. Equipped with international graphic symbols identifying sanitary napkin disposal.
5. Waste Receptacle — Leak-proof, rigid molded polyethylene. Removable for servicing. Capacity: 1.2-gal. (4.6-L).
6. Product: #B-354 manufactured by Bobrick.

F. Sanitary Napkin Disposal Unit: Stainless steel, recessed, self-closing door, locking bottom panel with full-length stainless steel piano-type hinge, removable receptacle.
1. Cabinet — 118-8, type-304, heavy-gauge stainless steel. All-welded construction. Exposed surfaces have satin finish.
2. Flange — 18-8, type-304, 22-gauge (0.8mm) stainless steel with satin finish. Drawn and beveled, one-piece, seamless construction.
3. Door — 18-8, type-304, 22-gauge (0.8mm) stainless steel with satin finish. Secured to cabinet with a full-length stainless steel piano-hinge.
4. Equipped with a tumbler lock keyed like other Bobrick washroom accessories.
5. Disposal Panel — 18-8, type-304, 22-gauge (0.8mm) stainless steel with satin finish. Bottom edge hemmed for safety. Secured to door with a spring-loaded, full-length stainless steel piano-hinge. Equipped with an international graphic symbol identifying sanitary napkin disposal
6. Waste Receptacle - Leak-proof, rigid molded polyethylene. Removable for servicing. Capacity: 1.2-gal. (4.6-L).
7. Products:
    a. Bobrick #B-353.

G. Semi-Recessed Napkin/Tampon Vendor:
1. Cabinet - 18-8, Type-304, 18-gauge (1.2mm) stainless steel. All-welded construction.
2. Flange - 18-8, Type-304, 22-gauge (0.8mm) stainless steel with satin finish. Drawn, one-piece, seamless construction. Radius on corners and return edges complement corners and edges on door
3. Skirt - 18-8, Type-304, 22-gauge (0.8mm) stainless steel with satin finish. Radius on corners complement corners and edges of flange and door.
4. Door - 18-8, Type-304, 18-gauge (1.2mm) stainless steel with satin finish. Secured to cabinet with a concealed full-length stainless steel piano-hinge. Equipped with two tumbler locks keyed like other Bobrick washroom accessories. Door has no
5. stainless steel piano-hinge. Equipped with two tumbler locks keyed like other Bobrick washroom accessories. Door has no brand-name advertising for products dispensed. Graphic symbols identify products dispensed. Graphic symbols identify products dispensed and coin denomination.
6. Products:
    a. Bobrick ConturaSeries B-47064C Semi-Recessed Free no-coin operation.

2.5 UNDER-LAVATORY PIPE AND SUPPLY COVERS

A. Under-Lavatory Pipe and Supply Covers:
1. Insulate exposed drainage piping, including hot, cold, and tempered water supplies under lavatories or sinks to comply with ADA Standards.
2. Exterior Surfaces: Smooth non-absorbent, non-abrasive surfaces.
3. Construction: 1/8 inch flexible molded plastic.
    a. Surface Burning Characteristics: Flame spread index of 25 or less and smoke developed index of 450 or less, when tested in accordance with ASTM E84.
    b. Flammability: UL-94 V-0 Rating.
    c. Microbial and Fungal Resistance: Comply with ASTM G21.
4. Color: White.
5. Products:

a. Lav-Guard manufactured by Truebro, Inc..

2.6 ELECTRIC HAND DRYERS

A. Electric Hand Dryers: Traditional fan-in-case type, with downward fixed nozzle.
1. High Efficiency Surface Mounted ADA Compliant Electric Hand Dryer
2. Operation: Automatic IR sensor-operated on and off.
3. Mounting: Surface mounted.
4. Cover: Heavy-duty, one piece formed 18 gage stainless steel satin finished on all exposed surfaces.
a. Finish: Finish: Brushed Number 4 finish.
b. Tamper-resistant screw attachment of cover to mounting plate.
5. HEPA Filtration System: Filters 99.97 percent of bacteria at 0.3 microns from the air stream
6. Controls: Automatic, activated by infrared optical sensor located next to the air outlet. Dryer will operate as long as hands are under the air outlet and has a 35-second lockout feature if hands are not removed. Control includes adjustable sound and speed control mechanism, adjustable heat control with High, Medium, Low and Off settings and a filter sensor which is activated should the filter become clogged. Sensor equipped with externally visible Red LED light that flashes error codes to assist in troubleshooting. Control assembly sealed for protection against moisture, lint, dust and vandalism.
7. Air Intake: Inlet openings on bottom of cover.
8. Air Outlet: Delivers focused air stream of 19,000 LFM at nozzle and 16,000 LFM at average hand position of 4 inches (102 mm) below air outlet.
9. Pre-Filter: Extends the lifespan and improves reliability. Reduces lint, dust and other airborne debris from entering the internal motor chamber. Filter sensor is activated if filter becomes clogged.
10. Nominal Size: 11-3/4 inches (298 mm) wide by 12-11/16 inches (322 mm) high by 6-11/16 inches (170 mm) deep.
11. Weight: 16 pounds (7.2 kg) stainless cover.
12. Power Source: 110 - 120 Volts, 11.3 - 12.2 Amps, 50/60 Hz, 1240 - 1450 Watts.
13. Combination Motor and Blower: Series commutated, through-flow discharge, vacuum type; 5/8 HP, 20,000 RPM. Airflow rate: 19,000 linear feet per minute (97 meters per second) at air outlet, 16,000 linear feet per minute (81 meters per second) at average hand position of 4 inches (102 mm) below air outlet.
14. Heater: Nichrome wire element, mounted inside blower housing to be vandal resistant. Heater Safeguard: Automatic resetting thermostat to open when airflow is restricted and close when airflow is resumed.
15. Air Temperature: 135 degrees F (55 degrees C) measured at average hand position of 4 inches (102 mm) below air outlet. Air Heater Output: 970 watts.
16. All metal parts coated according to Underwriters Laboratories, Inc. requirements.
17. Mount at the following heights above floor surface:
18. Warranty: Unit shall be warranted against defects in materials or workmanship for 5 years.
19. Electric Hand Dryer Products:
a. Acceptable Manufacturer: Excel Dryer Inc., which is located at: 357 Chestnut St. P. O. Box 365; East Longmeadow, MA 01028. ASD. Tel: 413-525-4531; Fax: 413-525-2853; Email: sales@exceldryer.com; Web: www.exceldryer.com
a) Excel Dryer Inc; Model TA-5B-110/120V : www.exceldryer.com.
b. Substitutions: Refer to Section 01 2500 - Product Requirements.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify exact location of accessories for installation.

C. For electrically-operated accessories, verify that electrical power connections are ready and in the correct locations.

D. Verify that field measurements are as indicated on drawings.

3.2 PREPARATION

A. Deliver inserts and rough-in frames to site for timely installation.

B. Provide templates and rough-in measurements as required.

3.3 INSTALLATION

A. Install accessories in accordance with manufacturers' instructions in locations indicated on drawings.

B. Install plumb and level, securely and rigidly anchored to substrate.

C. Mounting Heights: As shown on drawings and required by accessibility regulations

3.4 PROTECTION

A. Protect installed accessories from damage due to subsequent construction operations.

END OF SECTION

SECTION 10 4400
FIRE PROTECTION SPECIALTIES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SECTION INCLUDES

A. Fire extinguishers.

B. Fire extinguisher cabinets.
   1. Fire Rated in fire rated walls.

C. Accessories.

1.3 RELATED REQUIREMENTS

A. Section 06 1000 - Rough Carpentry: Wood blocking product and execution requirements.

B. Section 09 2116 - Gypsum Board Assemblies.

1.4 REFERENCE STANDARDS

A. ASTM E814 - Standard Test Method for Fire Tests of Penetration Firestop Systems; 2013a (Reapproved 2017).

B. NFPA 10 - Standard for Portable Fire Extinguishers; 2017.

C. UL (DIR) - Online Certifications Directory; Current Edition.

1.5 PERFORMANCE REQUIREMENTS

A. Conform to NFPA 10.

B. Provide extinguishers classified and labeled by Underwriters Laboratories Inc. for the purpose specified and indicated.

1.6 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide extinguisher ratings and classifications.

C. Shop Drawings: Indicate locations of cabinets and cabinet physical dimensions.

D. Manufacturer's Installation Instructions: Indicate special criteria and wall opening coordination requirements.

E. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

F. Maintenance Data: Include test, refill or recharge schedules and re-certification requirements.

1.7 FIELD CONDITIONS

A. Do not install extinguishers when ambient temperature may cause freezing of extinguisher ingredients.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Fire Extinguishers:
   1. Larsens's Manufacturing Co., 7421 Commerce Ln, Minneapolis, MN 55432, (800) 527-7367.
   2. Substitutions: Section 01 2500 Substitution Procedures.

B. Fire Extinguisher Cabinets and Accessories:
   1. Larsen's Manufacturing Co: www.larsensmfg.com.
   2. Substitutions: Section 01 2500 Substitution Procedures..

2.2 FIRE EXTINGUISHERS

A. Fire Extinguishers - General: Comply with product requirements of NFPA 10 and applicable codes, whichever is more stringent.

B. Refer to Part 3 for Fire Extinguisher Schedule..

2.3 FIRE EXTINGUISHER CABINETS

A. Fire Rating: Listed and labeled in accordance with ASTM E814 requirements for fire resistance rating of walls where being installed.

B. Cabinet Construction: Non-fire rated.
   1. Formed primed steel sheet; 0.036 inch thick base metal.

C. Fire Rated Cabinet Construction: Refer to wall rating.
   1. Steel; double wall or outer and inner boxes with 5/8 inch thick fire barrier material.

D. Metal: Formed stainless steel sheet; 0.036 inch thick base metal.

E. Cabinet Configuration: Semi-recessed.
   1. Size to accommodate fire extinguishers and accessories.
   2. Trim: Flat rolled edge, with 1/2 inch wide face.

F. Door: 0.036 inch metal thickness, reinforced for flatness and rigidity with nylon catch. Hinge doors for 180 degree opening with two butt hinges.

G. Door Glazing: Plastic, clear, 1/8 inch thick acrylic bubble. Set in resilient channel gasket glazing.

H. Cabinet Mounting Hardware: Appropriate to cabinet, with pre-drilled holes for placement of anchors.

I. Fabrication: Weld, fill, and grind components smooth.

J. Finish of Cabinet Exterior Trim and Door: No. 4 - Brushed stainless steel.

K. Finish of Cabinet Interior: White colored enamel.

2.4 FIRE CABINET ALARM

A. High impact plastic is plunger activated .

B. Provide heavy-duty 9 volt battery.

C. Provide On/off jack for convenient servicing.

D. Provide in all cabinets iinstallled in corridor and public spaces.

E. Producet: Larsen's Vigilante Alarm.

2.5 ACCESSORIES

A. Extinguisher Brackets: Formed steel, galvanized and enamel finished.

B. Cabinet Signage: "FIRE EXTINGUISHER".

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify rough openings for cabinet are correctly sized and located.

3.2 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install cabinets plumb and level in wall openings, as indicated on drawings from finished floor to inside bottom of cabinet.

C. Secure rigidly in place.

D. Place extinguishers in cabinets and on wall brackets.

3.3 SCHEDULES

A. Fire Extinguishers
   1. Model MP10
      a. Capacity: 10 lbs
      b. Weight: 18 lbs
      c. Cylinder Diameter: 5”
      d. Height: 20”
      e. Width: 7-3/4”
      f. UL rating: 4A-80B: C
      g. Standard Bracket: 5525
      h. Location: in all areas except mechanical and electrical rooms.
   2. Model DC10
      a. Capacity: 20 lbs.
      b. Weight: 38 lbs
      c. Cylinder Diameter: 7”
      d. Height: 23-1/4”
      e. Width: 7-3/4”
      f. UL rating: 2A-C
      g. Standard Bracket: 5525
      h. Location: Mechanical and electrical rooms.
   3. Model DC-10
      a. Capacity: 10 lbs.
      b. Weight: 18 lbs
      c. Cylinder Diameter: 5”
      d. Height: 20”
      e. Width: 8.5”
      f. UL rating: 60B-C
      g. Standard Bracket: 5525
      h. Locations: Science rooms.

B. Fire Extinguisher Cabinets.
   1. Larson's Cameo Series FS C2409-5R semi-recessed design suitable for fire extinguishers specified.
   2. Trim: 5/16"
   3. Acrylic Bubble.
   4. Finish: Stainless Steel #4 satin finish.
   5. Construction: High impact plastic.

END OF SECTION

SECTION 10 5113
METAL LOCKERS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SECTION INCLUDES

A. Metal new and replacement corridor lockers .

B. ADA Lockers: 5% of each locker types shall be ADA compliant. Location as selected by Owner.

C. Metal tops and filler panels.

D. Padlocks.

1.3 RELATED REQUIREMENTS

A. Section 03 3000 - Cast-in-Place Concrete: Concrete base construction.

B. Section 06 1000 - Rough Carpentry: Wood blocking and nailers.

1.4 REFERENCE STANDARDS

A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design; 2010.

B. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2018.

C. ASTM A879/A879M - Standard Specification for Steel Sheet, Zinc Coated by the Electrolytic Process for Applications Requiring Designation of the Coating Mass on Each Surface; 2012 (Reapproved 2017).

D. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2017.

1.5 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Manufacturer's published data on locker construction, sizes, and accessories.
   1. Include construction details, material descriptions, dimensions of individual components, profiles, and finishes for each type of locker.

C. Shop Drawings: Indicate locker plan layout, lockers details, fillers, trim,, base, accessories, locker numbering sequence information., and key codes.

D. Full Size Sample: One full-size locker of each construction specified for evaluation of construction.

E. Samples: Submit two samples 12 by 12 inches in size showing color and finish of metal locker material.

F. Manufacturer's Installation Instructions: Indicate component installation assembly.

G. Maintenance Data: For adjusting, repairing and replacing locker doors and latching mechanisms to be include in maintenance manuals specified in Division 1.

1.6 QUALITY ASSURANCE

A. Source Limitations: Obtain locker units and accessories through one source from a single USA manufacturer, including necessary mounting accessories, fittings, and fastenings.
   1. All of the sheet metal parts and all major hardware components used to manufacture this product to be produced in the United States of America. No exceptions will be allowed.

B. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with minimum ten (10) years of documented experience.

C. Installer Qualifications: Company specializing in performing work of type specified and with at least five (5) years of documented experience and approved by manufacturer for installation of units required for this Project.

1.7 MOCK-UP

A. Provide mock-up of each locker tier with sloped top and base, in selected colors, with built-in hasp for combination lock .

B. Locate where directed.

C. Mock-up may remain as part of the Work.

D. Manufacturer's representative shall inspect, determined anchoring by conditions at time of installation. and approve installation.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Ship lockers ready to be anchored in place in accordance with manufacturer’s instructions.

B. Storage and Protection: Protect materials from damage during delivery, handling, storage and installation

C. Protect locker finish and adjacent surfaces from damage.

1.9 WARRANTY

A. Manufacturer shall warrant the lockers for the lifetime use of the original purchaser.

1. Warranty shall all include all defects in material and workmanship, excluding finish, vandalism and improper installation.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Metal Lockers:

1. DeBourgh Manufacturing Co; "Rebel Series": 1-800-328-8829, www.debourgh.com/#sle.
   a. REBEL PLUS Hallway Lockers
2. Substitutions: Section 01 2500 Substitution Procedues..

2.2 LOCKER APPLICATIONS

A. Corridor Lockers: Metal lockers, wall mounted for concrete base.

1. Width: 15 inches.
2. Depth: 15 inches as indicated on drawings.
3. Height: 72 inches total
4. Configuration: Two tier.
5. Fittings: Size and configuration as indicated on drawings.
   a. Hat shelf.
   b. Hooks: One double prong.
6. Ventilation: Louvers at top and bottom of door panel.
7. Locking: Padlock hasps, for padlocks provided by Owner.
8. Provide sloped top factory welded and installed where not recessed.
9. Finish:
   a. Complete locker unit to be thoroughly cleaned, phosphatized and sealed.
   b. Finish to be baked powder coat with a minimum 2-3 mil thickness.
   c. As selected from manufacturer’s standard offering.
   d. Color: To be selected from manufacturer's full range by Architect; allow for 2 different colors.

2.3 METAL LOCKERS

A. Accessibility: Design units indicated on drawings as "accessible" to comply with ICC A117.1 and ADA Standards.

B. Locker Case Construction:

1. Lockers to be welded uni-body construction with exposed welds sanded smooth.

2. No bolts, screws or rivets used in assembly of locker units.
3. Ship lockers set-up, ready to be anchored in place in accordance with manufacturer's instructions
4. Body of Lockers
    a. Tops, Bottoms, Sides: Constructed of 18 gauge domestic Cold Rolled Steel (CRS) for maximum durability.
    b. Backs: Solid sheet of 20 gauge CRS welded to frames of sides and intermediate partitions.
    c. Shelves: Constructed of 18 gauge CRS welded to sides and intermediate partition construction. Shelves provided in lockers 60-inches and taller, located to provide a minimum of 15-inches clearance from top of locker.
    d. Tier Dividers: Full depth CRS securely welded on all four sides, to combine with tops, bottoms, sides, and intermediate partitions.
5. Continuous Door Strike:
    a. Tier dividers, tops and bottoms constructed to provide two-sided, continuous door strike on both hinge and latch sides for a secure, sanitary and intrusion-free locker while door is in closed position.
6. Doors
    a. Doors are 18 gauge CRS formed outer panel with double bends on both sides and a single bend on top and bottom.
    b. Doors to have 18 gauge steel formed stiffener panel securely welded inside the door to form a reinforced channel for additional torque-free strength and sound reduction when closing door.

C. Doors: Cold Rolled Steel formed outer panel with double bends on both sides and a single bend on top and bottom.;
1. Door Thickness: Corridor Lockers 16 gauge, 0.0598 inch, minimum.
    a. Doors to have 16 gauge steel formed stiffener panel securely welded inside the door to form a reinforced channel for additional torque-free strength and sound reduction when closing door. Provide on doors with multi-point latching.
2. Door Ventilation
    a. Corridor Lockers; Louvers at top and bottom of door.
3. Latching
    a. Sentry II Recessed Gravity Latch:
        a) Door containing stainless steel cup recessed into formed door (doors 18-inches and higher).
        b) 12 gauge steel finger lift mechanism.
        c) Spring activated nylon slide latch enclosed in steel latch channel allows closing of door while padlock or built-in lock is in position
        d) Rubber bumpers riveted to door stops for silent operation
    b. Hinges
        a) Continuous Hinge: 16 gauge continuous piano hinge on the right side of the opening.
            (a) Hinges welded to door and riveted to locker frame.
        b) Knuckle Hinge
            (a) Three inch, five knuckle, 14 gauge heavy-duty fast pin welded to both door and frame.
    c. Slope Tops
        a) Continuous Slope Tops
        b) Welded Slope Tops

(a) Provide 18 gauge all welded slope top with 25 degree pitch, attached at factory with concealed fasteners. Slope top to be in addition to standard 18 gauge flat top.

D. Bases
1. Concrete: As shown on drawings.

E. Filler Panels: Manufacturer's standard fabricated from 18 gauge solid steel finished to match lockers.

F. Coat Hooks: Stainless steel or heavy duty forged steel zinc-plated steel, with ball ends
1. Provide one double ceiling hook in each locker opening.

G. Number Plates: Provide rectangular shaped aluminum black anodized laser etched plates. Form numbers 1/2 inch high of block font style with ADA designation, in contrasting color.
1. Locate number plate near center of each door.
2. Owner to furnish numbering sequence.

H. Locks: As indicated in article above.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that prepared bases are in correct position and configuration.

B. Verify bases are properly sized.

C. Verify that power and ethernet are installed and enabled. See manufacturer drawings for recommended outlet or junction box placement.

3.2 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Wall Installation
1. Securely anchor every locker to wall and/or floor before use.
2. Anchoring to be determined by conditions at time of installation.
3. Install the adjacent locker units by bolting at four points, two at top and two at bottom, using ¼-inch cadmium plated bolts

C. Install lockers plumb and square.

D. Install fittings if not factory installed.

E. Replace components that do not operate smoothly.

3.3 ADJUSTING

A. General Requirements: Upon completion of installation, inspect lockers and adjust for proper door and locking mechanism operation

3.4 CLEANING

A. Clean locker interiors and exterior surfaces removing debris, dust, dirt, and foreign substances on exposed surfaces.

B. Touch up scratches and abrasions to match original finish.

C. Polish stainless steel and non-ferrous metal surfaces.

D. Replace locker units that cannot be restored to factory-finished appearance.

E. Use only materials and procedures recommended or furnished by locker manufacturer

END OF SECTION

SECTION 12 2940
ROLLER SHADES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SECTION INCLUDES

A. For locations see window schedule

B. Manual operated bead chain clutch operated roller shades.

C. Recessed pocket.

D. Accessories.

E. Emergency Rescue Window sticker.

F. Provide one roller shade for each curtain wall section. Refer to drawings.

1.3 RELATED SECTIONS

A. Section 06 1000 - Rough Carpentry: Wood blocking and grounds for mounting roller shades and accessories.

B. Section 08 4310 - Glazed Aluminum Curtain Walls.

C. Section 09 2116 - Gypsum Board Assemblies - USG: Coordination with gypsum board assemblies for installation of shade pockets, closures and related accessories.

D. Section 09 5100 - Acoustical Ceilings: Coordination with acoustical ceiling systems for installation of shade pockets, closures and related accessories.

1.4 REFERENCES

A. ASTM G 21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi.

B. C2C (DIR) - C2C Certified Products Registry.

C. NFPA 701 - Fire Tests for Flame-Resistant Textiles and Films.

D. UL (GGG) - GREENGUARD Gold Certified Products; Current Edition.

E. WCMA A100.1 - Safety of Window Covering Products; 2018.

1.5 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: One week prior to commencing work related to this section. Require attendance of all affected installers.

1.6 SUBMITTALS

A. Submit under provisions of Section 01 3000 - Administrative Requirements.

B. Manufacturer's data sheets on each product to be used, including:

1. Preparation instructions and recommendations.
2. Styles, material descriptions, dimensions of individual components, profiles, features, finishes and operating instructions.
3. Storage and handling requirements and recommendations.
4. Mounting details and installation methods.

C. Shop Drawings: Plans, elevations, sections, product details, installation details, operational clearances, and relationship to adjacent work.

1. Prepare shop drawings on AutoCAD format using base sheets provided electronically by the Architect.

D. Window Treatment Schedule: For all roller shades. Use same room designations as indicated on the Drawings and include opening sizes and key to typical mounting details.

E. Selection Samples: For each finish product specified, one set of shade cloth options and aluminum finish color samples representing manufacturer's full range of available colors and patterns.

F. Maintenance Data: Methods for maintaining roller shades, precautions regarding cleaning materials and methods, instructions for operating hardware.

G. Maintenance Materials: Furnish the following for Edgemont Union Free School District's use in maintenance of project.

1. **Extra Chains: Provide 500 linear feet of #10 qualified stainless steel chain rated to 90 lb.**
2. **Bead Stops: Provide 100 beads stops**.
3. **Chain Connectors: Provide 50 chain connector.**

H. See Section 01 6000 - Product Requirementsfor additional provisions.

1.7 QUALITY ASSURANCE

A. Manufacturer Qualifications: Obtain roller shades through one source from a single manufacturer with a minimum of twenty years experience in manufacturing products comparable to those specified in this section.

B. Installer Qualifications: Installer trained and certified by the manufacturer with a minimum of ten years experience in installing products comparable to those specified in this section and approved by the manufacturer. .

C. Fire-Test-Response Characteristics: Passes NFPA 701 small and large-scale vertical burn. Materials tested shall be identical to products proposed for use.

D. Shade Cloth: Anti-Microbial Characteristics: 'No Growth' per ASTM G 21 results for fungi ATCC9642, ATCC 9644, ATCC9645.

1.8 MOCK-UP

A. Provide a mock-up (manual shades only) of one roller shade bay assembly for evaluation of mounting, appearance and accessories.

1. Locate mock-up in window designated by Construction Manager.
2. Do not proceed with remaining work until, mock-up is accepted by Architect and Construction Manager.
3. Full-sized mock-up may become part of the final installation.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Deliver shades in factory-labeled packages, marked with manufacturer and product name, fire-test-response characteristics, and location of installation using same room designations indicated on Drawings.

B. Store and handle products per manufacturer's recommendations.

1.10 PROJECT CONDITIONS

A. Environmental Limitations: Install roller shades after finish work including painting is complete and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

1.11 WARRANTY

A. Roller Shade Hardware and Chain Warranty: Manufacturer's standard non-depreciating ten year limited warranty.

B. Standard Shadecloth: Manufacturer's standard twenty-five year warranty.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturer: MechoShade Systems, Inc., which is located at: 42-03 35th St., Long Island City, NY 11101; Tel: 718-729-2020; Fax: 718-729-2941; Email: marketing@mechoshade.com. Web: www.mechoshade.com.

B. Requests for substitutions will be considered in accordance with provisions of Section 01 2500 - Substitution Procedures.

2.2 ROLLER SHADE TYPES

A. Shade System; General:
   1. Components capable of being removed or adjusted without removing mounted shade brackets, or cassette support channel.
   2. Smoothly operation raising or lowering shades.

B. Manual operating, chain drive, sunscreen roller shades shall be provided at all exterior windows of spaces shown on the Drawings.

C. Manual Shades
   1. Shade Type: Single Roller.
   2. Mounting: Surface mounted.
   3. Drop Position: Reverse roll.
   4. Mounting: Recessed in ceiling pocket.
   5. Product: Mecho/5x.
   6. Size: As indicated on drawings.

2.3 SHADE CLOTH

A. Solar Shadecloths:
   1. Fabric: Soho Collection, 1 percent open, dense basket-weave pattern.
   2. Color: 1103 Broome (light grey) 76% PVC 24% Polyester
   3. Visually Transparent Shadecloth: MechoShade Systems, Inc., Soho Collection series, single thickness non-raveling 0.030-inch (0.762 mm) thick vinyl fabric, woven from 0.018-inch (0.457 mm) diameter extruded vinyl yarn comprising of 26 percent polyester and 74 percent reinforced PVC.
   4. Use for all shades

2.4 SHADE BAND

A. Shade Bands: Construction of shade band includes the fabric, the hem weight, hem-pocket, shade roller tube, and the attachment of the shade band to the roller tube. Sewn hems and open hem pockets are not acceptable.
   1. Hem Pockets and Hem Weights: Fabric hem pocket with RF-welded seams (including welded ends) and concealed hem weights. Hem weights shall be of appropriate size and weight for shade band. Hem weight shall be continuous inside a sealed hem pocket. Hem pocket construction and hem weights shall be similar, for all shades within one room.
   2. Shade Band and Shade Roller Attachment:
      a. Use extruded aluminum shade roller tube of a diameter and wall thickness required to support shade fabric without excessive deflection. Roller tubes less than 1.55 inch (39.37 mm) in diameter for manual shades, and less than 2.55 inches (64.77 mm) for motorize shades are not acceptable.
      b. Provide for positive mechanical engagement with drive / brake mechanism.
      c. Provide for positive mechanical attachment of shade band to roller tube; shade band shall be made removable / replaceable with a "snap-on" snap-off" spline mounting, without having to remove shade roller from shade brackets.

d. Mounting spline shall not require use of adhesives, adhesive tapes, staples, and/or rivets.
e. Any method of attaching shade band to roller tube that requires the use of: adhesive, adhesive tapes, staples, and/or rivets are not acceptable.

2.5 SHADE FABRICATI0N

A. Fabricate units to completely fill existing openings from head to sill and jamb-to-jamb, unless specifically indicated otherwise

B. Fabricate shadecloth to hang flat without buckling or distortion. Fabricate with heat-sealed trimmed edges to hang straight without curling or raveling. Fabricate unguided shadecloth to roll true and straight without shifting sideways more than 1/8 inch (3.18 mm) in either direction per 8 feet (2438 mm) of shade height due to warp distortion or weave design. Fabricate hem as follows:

C. Provide battens in standard shades as required to assure proper tracking and uniform rolling of the shadebands. Contractor shall be responsible for assuring the width-to-height (W:H) ratios shall not exceed manufacturer's standards or, in absence of such standards, shall be responsible for establishing appropriate standards to assure proper tracking and rolling of the shadecloth within specified standards. Battens shall be roll-formed stainless steel or tempered steel, as required.

D. For railroaded shadebands, provide seams in railroaded multi-width shadebands as required to meet size requirements and in accordance with seam alignment as acceptable to Architect. Seams shall be properly located. Furnish battens in place of plain seams when the width, height, or weight of the shade exceeds manufacturer's standards. In absence of such standards, assure proper use of seams or battens as required to, and assure the proper tracking of the railroaded multi-width shadebands.

2.6 COMPONENTS

A. Access and Material Requirements:
1. Provide shade hardware allowing for the removal of shade roller tube from brackets without removing hardware from opening and without requiring end or center supports to be removed.
2. Provide shade hardware that allows for removal and re-mounting of the shade bands without having to remove the shade tube, drive or operating support brackets.
3. Use only Delrin engineered plastics by DuPont for all plastic components of shade hardware. Styrene based plastics, and /or polyester, or reinforced polyester will not be acceptable.

B. Manual Operated Chain Drive Hardware and Brackets:
1. Provide for universal, regular and offset drive capacity, allowing drive chain to fall at front, rear or non-offset for all shade drive end brackets. Universal offset shall be adjustable for future change.
2. Provide hardware capable for installation of a removable fascia, for both regular and/or reverse roll, which shall be installed without exposed fastening devices of any kind.
3. Provide shade hardware system that allows for removable regular and/or reverse roll fascias to be mounted continuously across two or more shade bands without requiring exposed fasteners of any kind.
4. Provide shade hardware system that allows for operation of multiple shade bands (multi-banded shades) by a single chain operator, subject to manufacturer's design criteria. Connectors shall be offset to assure alignment from the first to the last shade band.
5. Provide shade hardware system that allows multi-banded manually operated shades to be capable of smooth operation when the axis is offset a maximum of 6 degrees on each side of the plane perpendicular to the radial line of the curve, for a 12 degrees total offset.
6. Provide positive mechanical engagement of drive mechanism to shade roller tube. Friction fit connectors for drive mechanism connection to shade roller tube are not acceptable
7. Provide shade hardware constructed of minimum 1/8-inch (3.18 mm) thick plated steel or heavier as required to support 150 percent of the full weight of each shade.
8. Drive Bracket / Brake Assembly:
a. M5 x drive sprocket and brake assembly shall rotate and be supported on a welded 3/8 inch (9.525 mm) steel pin.

b. The brake shall be an over-running clutch design which disengages to 90 percent during the raising and lowering of a shade. The brake shall withstand a pull force of 50 lbs. (22 kg) in the stopped position.

c. The braking mechanism shall be applied to an oil-impregnated hub on to which the brake system is mounted. The oil impregnated hub design includes an articulated brake assembly, which assures a smooth, non-jerky operation in raising and lowering the shades. The assembly shall be permanently lubricated. Products that require externally applied lubrication and or not permanently lubricated are not acceptable.

d. The entire M5x assembly shall be fully mounted on the steel support bracket, and fully independent of the shade tube assembly, which may be removed and reinstalled without effecting the roller shade limit adjustments.

e. Drive Chain: #10 qualified stainless steel chain rated to 90 lb. (41 kg) minimum breaking strength. Nickel plate chain shall not be accepted.

2.7 ROLLER SHADE FABRICATION

A. Dimensional Tolerances: Fabricate shades to fit openings within specified tolerances.

B. Vertical Dimensions: Fill openings from head to sill with 1/2 inch (13 mm) space between bottom bar and window stool.

C. Horizontal Dimensions: Inside Mounting

1. Fill openings from jamb to jamb.
2. Symmetrical Light Gaps on Both Sides of Shade: 3/4 inch (19.05 mm) total.

2.8 ACCESSORIES

A. Ceiling Pockets: Premanufactured metal shade pocket for recess mounting in acoustical tile or drywall ceilings; size and configuration as indicated on drawings.

1. Removable closure panel.
2. Ceiling tile support

B. Bead chain Hold Down Device: WCMA approved.

C. Rescue Labels: Windows designated on drawings as “EEW” emergency escape and rescue windows shall meet all applicable codes and shall include two (2) conforming label as follows:

"RESCUE WINDOW
FOR EMERGENCY USE ONLY”

1. Signs shall be 3” x 5” with bright yellow background with black letter.
2. Rescue labels will be provide by the window installer and shall be placed on the window treatment (roller shade, horizontal blinds etc.) and visible from occupied side when closed. Coordinate with window installer.

PART 3 EXECUTION

3.1 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. If substrate preparation is the responsibility of another installer, notify Construction Manager of unsatisfactory preparation before proceeding.

3.2 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare shade pocket work as required.

C. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.3 INSTALLATION

A. Install roller shades level, plumb, square, and true according to manufacturer's written instructions, and located so shade band is not closer than 2 inches (50 mm) to interior face of glass. Allow proper clearances for window operation hardware.

B. Adjust and balance roller shades to operate smoothly, easily, safely, and free from binding or malfunction throughout entire operational range.

C. Clean roller shade surfaces after installation, according to manufacturer's written instructions.

D. Engage Installer to train Owner's maintenance personnel to adjust, operate and maintain roller shade systems.

E. Replace shades exceeding specified tolerances at no extra cost to Owner.

3.4 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Substantial Completion.

1. Clean soiled shades and exposed components as recommended by manufacturer.
2. Replace shades that cannot be cleaned to "like new" condition.

END OF SECTION

SECTION 12 3200
PLASTIC LAMINATED CASEWORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SECTION INCLUDES

A. Provide all plastic laminated casework and accessory items as specified herein. Refer to drawings for specific details, requirements, types and locations.
   1. All casework shall be plastic laminate, unless noted otherwise and shall include but not be limited to the following:
      a. Base cabinets
      b. Wall cabinets.
      c. Tall cabinets.
      d. Lateral files.
      e. Tall cabinets
      f. Drawer cabinets.
      g. Handicapped accessible workstations
      h. Work Stations.
      i. Shelf units.
      j. Solid-surfacing-material countertops and backsplash
      k. Metal Grilles
      l. Grommets.
      m. Cable trays.
      n. Separate wood bases for laminated cabinets.
      o. Locks master keyed to room doors and other special locks.

1.3 RELATED WORK SPECIFIED ELSEWHERE

A. Section06 1000 - Rough Carpentry for blocking within walls.

B. Section 05 4000 - Cold-Formed Metal Framing.

C. Section 09 2116 - Gypsum Board Assemblies.

D. Section 09 6500 - Resilient Flooring. Base molding furnished and installed.

E. Section 12 3600 - Solid Surfacing Window Sills and Countertops for solid surface countertops.

F. Division 26 Electrical, wiring, outlets, and devices. Furnished and installed by Electrical Contractor.

1.4 DEFINITIONS

A. Identification of casework components and related products by surface visibility.
   1. Open Interiors: Any open storage unit without solid door or drawer fronts, units with full glass insert doors and/or acrylic doors, and units with sliding solid doors.
   2. Closed Interiors: Any closed storage unit behind solid door or drawer fronts.
   3. Exposed Ends: Any storage unit exterior side surface that is visible after installation.
   4. Other Exposed Surfaces: Faces of doors and drawers when closed, and tops of cabinets less than 72 inches above furnished floor.
   5. Semi-Exposed Surfaces: Interior surfaces which are exposed to view when doors or drawers are opened, bottoms of wall cabinets and tops of cabinets 72 inches or more above finished floor.
   6. Concealed Surfaces: Any surface not visible after installation

1.5 QUALITY ASSURANCE

A. System Structural Performance: Casework and support framing system shall withstand the effects of the following gravity loads and stresses without permanent deformation, excessive deflection, or binding of drawers and doors:
   1. Support Framing System: 600 lb/ft.
   2. Work Surfaces (Including Tops of Suspended Base Cabinets): 160 lb/ft
   3. Wall Cabinets (Upper Cabinets): 160 lb/ft.
   4. Shelves: 40 lb/ft .
   5. Delegated Design: Design casework, including comprehensive engineering analysis by a qualified professional engineer, using seismic performance requirements and design criteria indicated.
   6. Seismic Performance: Casework and support framing system or including attachments to other work and shall withstand the effects of earthquake motions determined according to New York State Building Code.

B. Installer Qualifications: A single installer shall perform the work of this section, and shall be a firm with not less than ten (10) continuous years of successful experience in the installation of this work, similar to that required for this project and approved by the manufacturer..
   1. The installer shall provide a list of at least five projects of comparable size and similar in design within a fifty mile radius of this project, which may be observed by the representative of the Construction Manager.
   2. Provide laminate clad casework and countertops furnished and installed by the same supplier for single responsibility and integration with other building trades.

C. Manufacturer: Minimum of 5 years experience in providing manufactured casework systems for similar types of projects, produce evidence of financial stability, bonding capacity, and adequate facilities and personnel required to perform on this project.
   1. Provide products certified as meeting or exceeding ANSI-A 161.1-2000 testing standards.
   2. Single Source Manufacturer: Casework and architectural millwork millwork products must all be engineered and built by a single source manufacturer in order to ensure consistency and quality for these related products. Splitting casework and architectural millwork between multiple manufacturers will not be permitted.
   3. Manufacturer shall be member of the Architectural Woodwork Institute and Approved Quality Certification Program.

D. Test data performed and certified by an independent testing agency, covering the following areas of product performance:

1.	Base cabinet construction racking test.	990 lbs.
2.	Cabinet front joint loading test:	650 lbs.
3.	Wall cabinet static load test:	1,850 lbs.
4.	Drawer front joint loading test:	940 lbs.
5.	Drawer construction/static load test:	920 lbs.
6.	Cabinet adjustable shelf support device:	
	a. Static load test:	1150 lbs.
7.	Particleboard screws holding power:	Face: 225 lbs. / Edge: 155 lbs.

E. Casework must conform to design quality of materials, workmanship and function of casework specified and shown on drawings.

F. Design: Door/Drawer overlay cabinet end panels, as reveal overlay design. Door/Drawer and all cabinet body edges to be 3mm PVC as specified herein. Overlay door designs and/or edging other than specified are not acceptable.

G. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

H. Preinstallation Conference: Owner's Representative shall schedule pre-installation meeting three (3) weeks prior to start of work at project site.

1.6 ADA AMERICANS WITH DISABILITIES ACT REQUIREMENTS:

A. The following special requirements shall be met, where specifically indicated on architectural plans as "ADA" or by General Note. To be in compliance with Federal Register Volume 56, No. 144, Rules and Regulations:
   1. Countertop height: with or without cabinet below not to exceed a height of 34 inches A.F.F. (Above Finished Floor), at a surface depth of 24 inches.
      a. Knee space clearance: to be a minimum 27 inches A.F.F., and 30 inches clear span width.
      b. 12 inch deep shelving, adjustable or fixed: not to exceed a range from 9 inches A.F.F. to 54 inches A.F.F.
      c. Wardrobe cabinets: to be furnished with rod/shelf adjustable to 48 inches A.F.F., and a maximum 21 inch shelf depth.
      d. Sink cabinet clearances: in addition to above, upper knee space frontal depth to be no less than 8 inches, and lower toe frontal depth to be no less than 11 inches, at a point 9 inches A.F.F. and as further described in Volume 56, Section 4.19.
      e. No cabinets shall be install closer than 18” to the pull side of any door. Co-ordinate with electrical drawings for electrical devices.

1.7 SUBMITTALS

A. Comply with Section 01 3000 - Administrative Requirements, unless otherwise indicated

B. Shop Drawings:
   1. Submit CAD production shop drawings prepared by manufacturer for laminate clad casework and countertops showing layout, elevations, ends, cross-sections, service run spaces, specific modifications, component connections, anchorage details, location methods, hardware, and installation procedures .
   2. Verify all dimensions and conditions in field.
   3. Include layout of units with relation to and clearances of surrounding walls, doors, windows, and other building components.
   4. Indicate locations of blocking and reinforcements required for installing casework.
   5. Coordinate shop drawings with other work involved.

C. Samples: When requested by Architect and Construction Manager:
   1. Submit 2-2" x 3" samples of casework manufacturer's standard decorative laminate colors, patterns and textures, for exposed and semi-exposed materials for Architect's selection. Samples will be reviewed by Architect and Construction Manager for color, texture, and pattern only. Compliance with other specified requirements is the exclusive responsibility of the contractor.
   2. Submit one full-size sample base cabinet unit with hardware, doors and drawers, without countertop.
   3. Submit one full-size sample wall cabinet unit complete with hardware, doors, and adjustable shelves.
   4. Acceptable sample units will be used for comparison inspections at the project. Unless otherwise directed, acceptable sample units may be incorporated in the work. Notify Construction Manager of their exact locations. If not incorporated in the work, retain acceptable sample units in the building until completion and acceptance of the work.
   5. Remove sample units from the premises when directed by the Construction Manager
   6. Plastic-laminate products, 8 by 10 inches, for each type, color, pattern, and surface finish.
   7. Corner pieces as follows:
      a. Miter joints for standing trim.
   8. Component samples: Two sets of samples for each of the following:

a. Decorative laminate color charts, PVC edgings, and Solid surface countertops.

1.8 PRODUCT HANDLING:

A. Deliver laminate clad casework and countertops only after wet operations in building are completed.

B. Store completed laminate clad casework and countertops in a ventilated place, protected from the weather, with relative humidity range of 25% to 55%.

C. Protect finished surfaces from soiling and damage during handling and installation. Keep covered with a protective covering.

1.9 JOB CONDITIONS:

A. Environmental Requirements: Do not install casework until permanent HVAC systems are operating and temperature and humidity have been stabilized for at least 1 week.

1. Manufacturer/Supplier shall advise Contractor of temperature and humidity requirements for architectural casework installation areas.
2. After installation, control temperature and humidity to maintain relative humidity between 25 percent and 55 percent.

B. Conditions: Do not install casework until interior concrete work, masonry, plastering and other wet operations are complete

1.10 WARRANTY:

A. All materials shall be guaranteed for a period of 5 years from manufacturer's defects and workmanship from date of acceptance.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS:

A. Basis of Design: For purpose of determining minimum performance and quality standards, this specification is based upon drawings, specifications and manufacturer’s literature fixed modular, flexible rail mounted, and mobile casework and accessories as manufactured by TMI SYSTEMS CORPORATION, 50 South Third Avenue West, Dickinson, North Dakota, 58601, Phone: 800-456-6716.

1. Substitutions: Refer to Section 01 2500 - Substitution Procedures.

B. Regardless of manufacturer or model numbers indicated, construction shall be in accordance with TMI Systems Corporation and AWI Architectural Woodwork Standards (AWS)s for modular cabinets except where modified by these specifications. Where standard manufacturers' units do not conform to layout and/or dimensions indicated, custom fabricate unit to conform to these specifications unless such non-conformance is specifically approved by the Architect.

1. Submit proof of ability to provide Certificate of Compliance in AWI, Architectural Woodwork Institute Quality Certification Program .

2.2 MATERIALS:

A. Core Materials:

1. All core material shall be a blended bio fiber composition with ultra-low formaldehyde resin system. Board shall exceed performance requirements listed below. Testing for conformance to the listed specifications must be done in accordance with procedures described in the American National Standard for Particleboard (ANSI A208.1 2016 section 5.2 Sampling for Acceptance). Board shall comply with formaldehyde emission requirements for Particleboard in CPA-ECC-2011, ANSI A208.1 2016 and CCR 93120.2 (CARB Composite Wood ATCM Phase II) Casework manufacturer shall provide documentation and certification of use within the entire cabinet. No formaldehyde, no exceptions.
2. Core material shall meet the following average performance requirements: Submit compliance data from the manufacturer prior to fabrication:
   a. Density: Minimum 45 lbs.
   b. Modulus of Rupture: 1,800 psi.

c. Modulus of Elasticity: 298,000 psi.
d. Average Internal Bond: 80 psi.
e. Screw holding Face: 2 225 lbs.
f. Screw holding Edge: 155 lbs.
g. Thickness Tolerance: 0.003+/- inches.
h. Linear expansion: 0.2%
i. Thickness swell: 5.5%
j. Thickness used are 1/4", 1/2", 3/4" and 1".
k. Plywood: Shall be 9-ply pressure treated hardwood plywood, “A” faced, hardwood veneer.
l. Provide moister resistant core material at sink locations and wet areas:
a) Meeting ANSI MR10 minimum requirements, adding protection against occasional wetting and high humidity.

B. Decorative Laminates:
1. High Pressure Decorative Laminates (HPDL) shall be as follows:
a. Product: “Wilsonart® Solicor™Laminate, Type 160.” Color through the core.
a) Sheet Thickness: 0.048 inch nominal High Wear.
b) Laminate Conformance Standard: NEMA LD 3.
c) Color, Pattern, and Finish:
(a) As indicated on drawings.
b. All laminate shall be counter balanced with heavy gauge neutral colored backing sheet.

2.3 LAMINATE PROPERTIES

A. Laminate Composition: Decorative surface papers impregnated with melamine resins and pressed over kraft paper core sheets impregnated with phenolic resin. Sheets then bonded together under pressures greater than 1,000 lbs. per sq. in. and high temperatures approaching 300 deg F (149 deg C). Finished sheets trimmed and back sanded to facilitate bonding to substrate.

B. Sustainable Design Conformance Standards:
1. UL 2818 GREENGUARD Gold Certified.
2. SCS Certified Indoor Air Quality Advantage™ Gold Certified.
3. SCS Chain of Custody Certified for FSC® Mix, FSC Controlled Wood.
4. SCS Recycled Content Certified.

C. Surface Burning Characteristics:
1. Test Standards: ASTM E 84, ASTM E 162, ASTM E 662, IMO FTP Code Part 2
2. and Part 5, and UL 723.
3. Interior Finish Classification, Fire-Rated Laminate: Class A according to NFPA 101. Flame spread less than 25 and Smoke Developed less than 450

D. Substitutions: Refer to Section 01 2500 - Substitution Procedures.

E. Laminate Color Selection as indicated on drawings are as selected by the Architect. Final acceptance of colors by other manufacturer(s) even if listed, as “acceptable manufactures” shall be at the sole discretion of the Architect.

F. Edgebanding: 3mm PVC banding, machine applied with waterproof hot melt adhesive with external edges and outside corners of door machine profiled to 1/8" radius for safety.

G. Metal Parts: Countertop support brackets, legs and miscellaneous metal parts shall be furniture steel, welded, degreased, cleaned, treated and epoxy powder coated in color selected by the Architect.

2.4 CABINET HARDWARE:

A. Hinges:
1. Shall be five knuckle, epoxy powder coated, institutional grade, 2 3/4" overlay type with hospital tip, eased edges for safety, and a full, 270º door swing for easy access Steel shall be minimum

.095" thick and have minimum of nine (9) edge and leaf fastenings. Hinges shall pass ANSI-BHMA standard A156.9, Grade 1 requirement for both vertical and horizontal set and sag (pair of hinges will hold minimum of 310 pounds); copy of test result shall be provided upon request. Casework manufacturer shall use nine specifically engineered screws for attachment of hinges; wood screws shall not be permitted. Doors 48" and over in height shall have three (3) hinges per door.

2. Magnetic door catch with maximum 5 pound pull provided, attached with screws and slotted for adjustment.
3. Color: As selected by the Architect.
4. Provide magnetic door catch with minimum seven (7) pound pull, attached with screws and slotted for adjustment. (Not ADA)

B. Pulls:
1. Wire design, Four (4) inches (101.6 mm), in Chrome Coat powder finish, As selecteed by the Architect.

C. Drawer Slides:
1. Standard use and knee space drawers shall be Accuride 3600 series or equal with epoxy coated steel finish. Slides will have a 150 pound load rating a**t full extension a**nd shall be bottom corner mounted with smooth and quiet nylon rollers, a built-in positive stop both directions, with self closing feature. Slides shall have a lifetime warranty as offered by the slide manufacturer.
a. File drawer slides shall be full extension 150-pound load rated epoxy coated steel, bottom corner mounted with smooth and quiet nylon rollers and positive stop in both directions and self-closing feature.

D. Wardrobe Rod: 1 inch diameter, 14-gauge chrome plated steel installed in captive mounting hardware.

E. File Suspension System: Extruded molding integral with top of drawer box sides to accept standard hanging file folders.

F. Grommets: Mockett, mocket.com; "BRV2" flush mounted, single slot with steel cap.
1. Finish Satin aluminum.

G. Cable/Data Trays: Provide plastic laminate tray where shown on drawings.

H. Metal Grilles: Where metal grilles are indicated for countertops and/or base cabinets to permit thermal heat flow, they shall be as follows:
1. Countertop and Similar Deck Applications: Heavy gauge extruded aluminum construction, bar type, linear design with natural anodized finish. Frame to have a 5/8" perimeter boarder and frame is to have concealed fastenings and reinforcing bands. Exposed screws in top of frame will not be accepted. Core of frame must be removable allowing for cleaning and servicing of fin tubing below and core is to be held in place by spring clips. The core consists of pencil proof design with deflecting bars 1/8" wide and placed on 1/4" centers. Sizes to be as shown on drawings.
a. Model # AAG-100/B frame as manufactured by Advance Architectural Grills, New Hyde Park, NY; 516-488-0628 approved equal.
2. Lengths shall match the length off the baseboard

2.5 LOCKS:

A. Provide for all doors and drawers. Locks shall be, removable core, pin tumbler, cam style lock with strike. Each lock shall be furnished with two (2) keys.

B. Locks shall be keyed alike for each room and MASTERKEYED. Keying shall be reviewed with Construction Manager and approved in writing by the Construction Manager.

C. Chain bolts shall be 3" long, shall have a 18" pull and an angle strike to secure inactive door on cabinets over 72" in height. Elbow catches shall be used on inactive doors-up to and including 72" in height.

2.6 SOLID SURFACING COUNTERTOP

A. Refer to Section 12 3600 - Solid Surfacing Window Sills and Countertops. See drawings.

2.7 FABRICATION

A. Detailed Requirements for Cabinet Construction:
   1. Sub-Base: Cabinet Subbase: To be separate and continuous (no cabinet body sides-to-floor), 3/4" water-resistant exterior grade plywood, 4" high, with concealed fastening to cabinet bottom. Ladder-type construction, of front, back and intermediates, to form a secure and level platform to which cabinets attach. Casework with integral sides or sides running to the floor will be rejected.
   2. Sub-base at exposed cabinet end panels shall be recessed 1/4 inch (6.4 mm) from face of finished end, for flush installation of finished base material by other trades.

B. Fabricate casework to dimensions, profiles, and details shown.
   1. Cabinet Body Construction:
      a. Fabricate casework, countertops and related products to dimensions, profiles, and details shown on shop drawings.
      b. All casework panel components must go through a supplemental sizing process after cutting, producing a panel precisely finished in size and square to within 0.010 inches, ensuring strict dimensional quality and structural integrity in the final fabricated product.
      c. Solid sub-top shall be furnished for all base and tall cabinets.
      d. At cabinets over 36 inches wide, bottoms and tops shall be joined by a fixed vertical divider.
      e. Exterior exposed wall cabinet bottoms shall be white thermally fused laminate (TFL) on both sides. Assembly devices shall be concealed on bottom side of wall cabinets
      f. Tops and bottoms are glued and doweled to cabinet sides and internal cabinet components such as fixed horizontals, rails and verticals. Minimum 6 dowels each joint for 24 inch deep cabinets and a minimum of 4 dowels each joint for 12 inch deep cabinets. (Mechanical or metal hardware fasteners joining cabinet top and bottom panels to the sides will not be accepted.)
         a) Tops, bottoms and sides of all cabinets are particleboard core
      g. Unless specifically indicated, core shall be 3/4" thick particleboard. Edging and surface finishes as indicated herein.
      h. Cabinet backs: 1/4 inch thick medium density fiberboard panel fully captured by the cabinet top, bottom and side panels. Finish to match cabinet interior. 3/4 inch x 4 inch particleboard rails will be placed behind the back panel at the top and bottom, and doweled to the sides utilizing 10mm hardwood fluted dowels. A third intermediate rail will be included on all cabinets taller than 56 inches. Utilize hot melt glue to further secure back and increase overall strength
         a) Exposed back on fixed or movable cabinets to be 3/4" particleboard, color matched to cabinet interior, exterior surface GP28 laminate as selected.
         b) Hang rails shall be located at rear of cabinet back and fastened to cabinet sides. Provide minimum of 2 at base, 2 at wall, and 3 at tall cabinets.
      i. Base units, except sink base units: Full sub-top glued and doweled to cabinet sides. (Mechanical or metal hardware fasteners joining cabinet sub-top panel to the sides will not be accepted.)
         a) Sink base units are provided with open top and a stretcher at the front, attached to the sides. Back to be split removable access panel.
      j. All end panels and vertical dividers, except sink base units, shall be prepared to receive adjustable shelf hardware at 32mm (approximately 1-1/4") centers. Door hinges, drawer slides and pull-out shelves shall mount on line boring to maintain vertical alignment of components and provide for future relocation of doors, drawers, shelves and/or pull-out shelves.

k. All exposed and semi exposed edges of basic cabinet components shall be factory edged with 3 mm PVC banding, machine applied with waterproof hot melt adhesive. Color as selected by the Architect.

l. Adjustable Shelves in Cabinets
   a) Core: Particleboard.
   b) Core Thickness: 3/4 inch up to 30 inches wide, 1 inch over 30 inches wide.
   c) Edge: 3mm PVC on Front Edge Only

m. Interior finish, units with open Interiors:
   a) Top, bottom, back, sides, horizontal and vertical members, and adjustable shelving faces with Thermally Fused Laminate (TFL).

n. Interior finish, units with closed Interiors:
   a) Top, bottom, back, sides, horizontal and vertical members, and adjustable shelving faces with Thermally Fused Laminate (TFL).

o. Exposed ends:
   a) Faced with high-pressure decorative VGS laminate. Use of TFM on exposed ends will not be permitted.

p. Wall and Tall Unit Tops: (when visible from above):
   a) The top edge of all wall and tall unit end panels shall be factory edged with 3mm PVC to match basic cabinet body color; raw edges at top of wall and tall end panels will not be permitted.
   b) Top surface will be laminated with melamine in color as selected by the Architect.

q. Balanced construction of all laminated panels is mandatory. Unfinished core stock surfaces, even on concealed surfaces (excluding edges), will not be permitted. No exceptions.

C. Drawers:

1. Sides, back and sub front shall be particleboard, 1/2" thick, laminated with TFL in dove gray, frosty white or light beige to match basic cabinet body color. The back and sub front are doweled and glued into the sides. Dowels shall be fluted, with chamfered ends and a minimum diameter of 8 mm. Top edges is banded with 3 mm PVC edging in a matching color.
   a. Drawer bottom shall be particleboard, 1/2" thick, laminated with TFL in color to match basic cabinet body color, screwed directly to the bottom edges of the drawer box. Drawer bottom less than 1/2" thick will not be permitted.
   b. Paper storage drawers: Minimum 3/4 inch thick particleboard sides, back, and sub front laminated with Thermally Fused Laminate (TFL).. Minimum 1/2 inch thick particleboard drawer bottoms screwed directly to the bottom edges of the drawer box. Provide PVC angle retaining bar at the rear of the drawer
   c. Painted finishes on drawer sides and/or bottom will not be permitted.

D. Door/Drawer Fronts:

1. Laminated door and drawer fronts shall be 13/16 inch (20.6 mm) finished thickness for all hinged and sliding doors. Drawer fronts and hinged doors shall overlay cabinet end panels, as reveal overlay design the cabinet body. Maintain a maximum 1/8 inch (3.2 mm) reveal between pairs of doors, between door and drawer front, or between multiple drawer fronts within the cabinet.
2. Double doors shall be used on all cabinets in excess of 24" wide.
3. Exterior faces shall be laminated with high pressure decorative laminate specified, color as selected. Interior face shall be high balanced with pressure cabinet liner CL20.
4. All edges shall be finished with 3mm PVC available in color as selected by the Architect. External edges and outside corners shall be machine profiled to 1/8” radius.

PART 3 - EXECUTION

3.1 INSPECTION:

A. The installer must examine the jobsite and the conditions under which the work under this section is to be performed, and notify the contractor in writing of unsatisfactory conditions. Do not proceed with work under this section until unsatisfactory conditions have been corrected in a manner acceptable to the installer.

3.2 PREPARATION:

A. Condition laminate clad casework to average prevailing humidity conditions in installation areas prior to installing.

3.3 COORDINATION:

A. Verify site dimensions of cabinet locations in building prior to fabrication.

B. Coordinate layout and installation of framing and reinforcements for support of casework, and equipment furnished by others and installed in casework..

C. Coordinate installation of roughing with other prime contractors.

D. Coordinate layout and installation of framing and reinforcements for support of casework.

E. Coordinate installation of casework with installation of other casework equipments and accessories

3.4 INSTALLATION OF CABINETS

A. Install all base cabinets on a separate wood base.

B. Install insulation to rear of cabinets as detailed.

C. Install level, plumb, and true; shim as required, using concealed shims. Where casework abuts other finished work, apply filler strips and scribe for accurate fit, with fasteners concealed where practical. Do not exceed the following tolerances:

1. Variation of Tops of Base Cabinets from Level: 1/16 inch in 10 feet.
2. Variation of Bottoms of Upper Cabinets from Level: 1/8 inch in 10 feet.
3. Variation of Faces of Cabinets from a True Plane: 1/8 inch in 10 feet.
4. Variation of Adjacent Surfaces from a True Plane (Lippage): 1/32 inch.
5. Variation in Alignment of Adjacent Door and Drawer Edges: 1/16 inch.
6. Base Cabinets: Fasten cabinets to utility-space framing, partition framing, wood blocking, or reinforcements in partitions with fasteners spaced not more than 24 inches o.c. Bolt adjacent cabinets together with joints flush, tight, and uniform.
    a. Where base cabinets are installed away from walls, fasten to floor at toe space at not more than 24 inches o.c. and at sides of cabinets with not less than 2 fasteners per side.
7. Wall Cabinets: Fasten to hanging strips, masonry, partition framing, blocking, or reinforcements in partitions. Fasten each cabinet through back, near top, at not less than 24 inches o.c.
8. Install hardware uniformly and precisely. Set hinges snug and flat in mortises.
9. Adjust casework and hardware so doors and drawers align and operate smoothly without warp or bind and contact points meet accurately. Lubricate operating hardware as recommended by manufacturer.

D. Erect casework, plumb, level, true and straight with no distortions. Shim as required. Where laminate clad casework abuts other finished work, scribe and cut to accurate fit.

E. All fasteners shall be approved by the Architect and provide with screw caps or approved washers. Gypsum board screws are not permitted.

3.5 INSTALLATION OF COUNTERTOPS

A. Abut top and edge surfaces in one true plane with flush hairline joints and with internal supports placed to prevent deflection. Locate joints only where shown on Shop Drawings.

1. Field Jointing: Where possible, make in same manner as shop-made joints using dowels, splines, fasteners, adhesives, and sealants recommended by manufacturer. Prepare edges in shop for field-made joints.
    a. Use concealed clamping devices for field-made joints in plastic-laminate countertops. Locate clamping devices within 6 inches of front and back edges and at intervals not exceeding 24 inches (600 mm). Tighten according to manufacturer's written instructions to exert a uniform heavy pressure at joints.
2. Fastening:
    a. Secure countertops, except for epoxy countertops, to cabinets with Z-type fasteners or equivalent, using two or more fasteners at each cabinet front, end, and back.
    b. Secure epoxy countertops to cabinets with epoxy cement, applied at each corner and along perimeter edges at not more than 48 inches o.c.
        a) Where necessary to penetrate countertops with fasteners, countersink heads approximately 1/8 inch and plug hole flush with material equal to countertop in chemical resistance, hardness, and appearance.
3. Provide required holes and cutouts for service fittings.
    a. Seal unfinished edges and cutouts in plastic-laminate countertops with heavy coat of polyurethane varnish.
    b. Provide scribe moldings for closures at junctures of countertop, curb, and splash with walls as recommended by manufacturer for materials involved. Match materials and finish to adjacent laboratory casework. Use chemical-resistant, permanently elastic sealing compound where recommended by manufacturer.
    c. Carefully dress joints smooth, remove surface scratches, and clean entire surface.

B. Adjust casework and hardware so that doors and drawers operate smoothly without warp or bind. Lubricate operating hardware as recommended by manufacturer.

3.6 PROTECTION

A. Storage and Protection: Casework shall be protected in storage. Store under cover in a ventilated building not exposed to extreme temperature and humidity changes. Store off the floor to prevent chipping of laminate. Do not store or install casework in building until concrete, masonry or other wet trades are dry.

3.7 ADJUSTING

A. Repair or remove and replace defective work, as directed by Construction Manager upon completion of installation.

B. Adjust doors, drawers, hardware, fixtures and other moving or operating parts to function smoothly.

3.8 CLEANING AND PROTECTION:

A. Repair or remove and replace defective work as directed upon completion of installation.
1. Clean plastic surfaces, repair minor damage per plastic laminate manufacturer's recommendations. Replace other damaged parts or units.
2. Remove all cartons, debris, sawdust, scraps, etc. and leave space ready for final cleaning.
3. Protect all casework and tops from damage by other trades until acceptance of the work by the Construction Manager.

END OF SECTION

SECTION 12 3600
SOLID SURFACING WINDOW SILLS AND COUNTERTOPS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SECTION INCLUDES

A. Window Sills.

B. Countertops for manufactured casework.

C. Countertop with metal grills where indicated.

1.3 RELATED REQUIREMENTS

A. Section 05 5000 - Metal Fabrications for metal grills.

B. Section 09 2116 - Gypsum Board Assemblies.

C. Section 12 3200 - Plastic Laminated Casework.

1.4 REFERENCE STANDARDS

A. ANSI A208.1 - American National Standard for Particleboard; 2009.

B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2018b.

C. AWI (QCP) - Quality Certification Program; current edition at www.awiqcp.org.

D. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards; 2014, with Errata (2016).

1.5 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Manufacturer's data sheets on each product to be used, including:
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.
   3. Specimen warranty.

C. Shop Drawings: Complete details of materials and installation .

D. Verification Samples: For each finish product specified, minimum size 6 inches square, representing actual product, color, and patterns.

E. Test Reports: Chemical resistance testing, showing compliance with specified requirements.

F. Certificate: Submit labels and certificates required by quality assurance and quality control programs.

G. Maintenance Data: Manufacturer's instructions and recommendations for maintenance and repair of countertop surfaces.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in performing work of the type specified in this section, with not less than 3 years of documented experience.

B. Manufacturer: Company specializing in manufacturing the products specified in this section, with minimum ten years of documented experience.

C. Quality Certification:
   1. Comply with AWI (QCP) woodwork association quality certification service/program in accordance with requirements for work specified in this section: www.awiqcp.org.
   2. Submit certifications upon completion of installation that verifies this work is in compliance with specified requirements.

1.7 MOCK-UP

A. Provide mockup for Sills, Head, and Jambs.

B. Should mock-up not be approved, rework or remake until approval is secured. Remove rejected units from Project site.

C. See Section 01 4000 - Quality Requirements for additional requirements.

D. Locate where directed.

E. Mock-up may remain as part of the Work.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

B. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

1.9 FIELD CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

1.10 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Manufacturer Warranty: Provide manufacturer’s standard warranty for material only for period of 10 years against defects and/or deficiencies.

C. Correct defective Work within a two year period after Date of Substantial Completion, at no additional cost to Edgemont Union Free School District. Defects include, but are not limited to:

1. Cracks.
2. Discoloration or lack of finish integrity.
3. Failure of adhesives.

PART 2 PRODUCTS

2.1 WINDOW ASSEMBLIES

A. Quality Standard: Custom Grade, in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), unless noted otherwise.

B. Solid Surfacing Window Sills and Countertops: Solid surfacing sheet or plastic resin casting over continuous substrate:

1. Flat Sheet Thickness: 1/2 inch, minimum.
2. Solid Surfacing Sheet and Plastic Resin Castings: Complying with ISFA 2-01 and NEMA LD 3; acrylic or polyester resin, mineral filler, and pigments; homogenous, non-porous and capable of being worked and repaired using standard woodworking tools; no surface coating; color and pattern consistent throughout thickness.
    a. Manufacturers:
        a) Dupont: www.corian.com.
    b. Substitutions: See Section 01 2500 Substitution Procedures.
3. Surface Burning Characteristics: Flame spread 25, maximum; smoke developed 25, maximum; when tested in accordance with ASTM E84.
4. Finish on Exposed Surfaces: Polished, gloss rating of 55 to 80.
5. Color and Pattern: See Finish Schedule.
6. Exposed Edge Treatment: Built up to minimum 1 inch thick; radiused edge.

2.2 MATERIALS

A. Plywood for Supporting Substrate: PS 1 Exterior Grade, A-C veneer grade, minimum 5-ply; minimum 1/2 inch thick; join lengths using metal splines.

B. Particleboard for Supporting Substrate: ANSI A208.1 Grade 2-M-2, 45 pcf minimum density; minimum 3/4 inch thick; join lengths using metal splines.

C. Adhesives: Chemical resistant waterproof adhesive as recommended by manufacturer of materials being joined.

D. Joint Sealant: Refer to Section 07 9200 - Joint Sealants.

2.3 FABRICATION

A. Field measure and verify all dimensions before fabrication is complete.

B. Provide back/end splash wherever counter edge abuts vertical surface unless otherwise indicated.
   1. Secure to countertop with concealed fasteners and with contact surfaces set in waterproof glue.
   2. Height: 4 inches, unless otherwise indicated.

C. Solid Surfacing: Fabricate sills and countertops up to 72 inches long in one piece; join pieces with adhesive sealant in accordance with manufacturer's recommendations and instructions. Form joints between components to be non conspicuous. Locate joins at window mullions.

PART 3 EXECUTION

3.1 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. If substrate preparation is the responsibility of another installer, notify Owner’s representative of unsatisfactory preparation before proceeding.

3.2 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.3 INSTALLATION

A. Attach solid surfacing sills and countertops using compatible silicone bonding material.

B. Seal joint between sills and countertops and adjacent surfaces.

C. Cut and finish edges with clean sharpe returns.

D. Dress joints smooth, remove surface scratches and clean entire surfaces.

E. Installation of Countertops
   1. Abut top and edge surfaces in one true plane with flush hairline joints and with internal supports placed to prevent deflection. Locate joints only where shown on Shop Drawings.
      a. Field Jointing: Where possible, make in same manner as shop-made joints using dowels, splines, fasteners, adhesives, and sealants recommended by manufacturer. Prepare edges in shop for field-made joints.
      b. Provide required holes and cutouts for service fittings.
         a) Provide scribe moldings for closures at junctures of countertop, curb, and splash with walls as recommended by manufacturer for materials involved. Match materials and finish to adjacent laboratory casework. Use chemical-resistant, permanently elastic sealing compound where recommended by manufacturer.
         b) Carefully dress joints smooth, remove surface scratches, and clean entire surface.

F. Install to comply with all manufactures written instructions, including for adhesive, sealers, fabrication and finishing.

3.4 TOLERANCES

A. Variation From Horizontal: 1/8 inch in 10 feet, maximum.

3.5 CLEANING

A. Clean surfaces thoroughly. Remove adhesives, sealant and other stains.

3.6 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Date of Substantial Completion.

END OF SECTION

SECTION 12 4813
ENTRANCE FLOOR MATS AND FRAMES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SECTION INCLUDES

A. Extruded aluminum entrance floor grilles.

B. Recessed mat frames.

1.3 REFERENCE STANDARDS

A. American Society for Testing and Materials (ASTM).
   1. Flammability in accordance with ASTM E648, Class 1, Critical Radiant Flux, minimum 0.45 watts/m2.
   2. Slip resistance in accordance with ASTM D-2047-96, Coefficient of Friction, minimum 0.60 for accessible routes

B. The Aluminum Association

C. The Carpet and Rug Institute (CRI)

D. The National Floor Safety Institute (NFSI)

E. International Organization for Standardization (ISO)

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum five years of documented experience.

B. Installer Qualifications: Company specializing in performing work of the type specified in this section, with not less than three years of experience .

C. Standard rolling load performance is 400 lb./wheel with larger loading requirements as specified (load applied to a solid 5” x 2” wide polyurethane wheel, 1000 passes without damage).

D. Manufacturer's certification that product meets or exceeds the specification.

1.5 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data indicating properties of walk-off surface, component dimensions and recessed frame characteristics.

C. Shop Drawings: Indicate dimensions and details for recessed frame.
   1. For recessed frames located within a dimensionally restricted area, show dimensions of space within which the frame will be installed.

D. Samples: Submit two samples, 13 by 6 inch in size illustrating pattern, color, finish , and edging.

E. Maintenance Data: Include cleaning instructions, stain removal procedures and cleaning and maintaining floor grids.

1.6 DELIVERY, STORAGE AND HANDLING

A. Deliver materials to the project site ready for use and fabricated in as large sections and assemblies as practical, in unopened original factory packaging clearly labeled to identify manufacturer.

B. Recessed Conditions: Coordination with Division 03 0000 Concrete specifications is required. For proper installation, the concrete recess must be flat and smooth throughout.
   1. If the recess is formed by a concrete contractor, the pour dimensions may require leveling grout to achieve the proper depth and a smooth finish.

2. Verify depth matches the specified product.
3. Verify side walls of the concrete recess are straight and smooth.
4. Inconsistencies shall be remediated prior to installation.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Entrance Floor Grilles and Gratings:
1. Construction Specialties, Inc; G1 Pedigrid: www.c-sgroup.com/#sle.
2. Substitutions: Section 01 2500 Substutution Procedures.

2.2 ENTRANCE FLOOR GRILLES AND GRATINGS

A. Entrance Floor Grilles: Recessed extruded aluminum grille assembly with nominal 1 inch wide tread strips running perpendicular to traffic flow, slots between treads, and perimeter frame forming sides of recess; grille hinged for access to recess.
1. Recess Depth: 1-13/16 inches.
2. Tread Surfaces: EC - Exterior Carpet .
a. Solution dyed polypropylene fibers with 50/50 blend of 600/12-denier multi filament and 595/D1 monofilament, Color as selected by the Architect.
b. The texturized fibers have ultraviolet blockers and color as an integral part of the filament. Each carpet fiber and monofilament shall be fusion-bonded to a rigid two-ply backing to prevent fraying and supplied in continuous splice-free lengths.
c. Carpet weight: 32-oz./yd².
3. Colors: To be selected by Architect from manufacturer's standard selection.
4. Length in Direction of Traffic Flow: As indicated on drawings.
5. Width Perpendicular to Traffic Flow: Full width of entrance door opening or as indicated on drawings.
6. Frame: LB-Level Base: 6063-T5 aluminum alloy with 1/2" (12.7mm) exposed surface and a depth of 1-13/16" (46.0mm). with 1/4"(6.4mm) thick heavy gauge EPDM support cushions. Frame color shall be supplied in mill (standard) to be primer coated.

B. Mounting: Top of non-resilient members level with adjacent floor.

C. Structural Capacity: Capable of supporting a rolling load of 500 pounds without permanent deformation or noticeable deflection.

D. Vibration Resistant Fabrication: All members welded, riveted, or bolted; no snap or friction connections.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that floor opening for mats are ready to receive work.

3.2 PREPARATION

A. Vacuum clean floor recess.

3.3 INSTALLATION

A. Install walk-off surface in floor recess flush with finish floor after cleaning of finish flooring.

3.4 TOLERANCES

A. Maximum Gap Formed at Recessed Frame From Mat Size: 1/4 inch.

END OF SECTION

SECTION 221116
DOMESTIC WATER PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Work Included: Provide Domestic water piping in accordance with the Contract Documents." The "General Conditions Governing All Contracts" shall apply to all work under the contract. The work of this section shall include, but not be limited to, the following:

B. Section Includes:

1. Aboveground & below grade domestic water pipes, tubes, fittings, and specialties inside the building.

1.2 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Domestic water piping and support and installation shall withstand effects of earthquake motions determined according to ASCE/SEI 7.

1.3 SUBMITTALS

A. Product Data: For the following products:

1. Specialty valves.
2. Transition fittings.
3. Dielectric fittings.
4. Flexible connectors.
5. Escutcheons.
6. Sleeves and sleeve seals.
7. Water penetration systems.

B. Coordination Drawings: For piping in equipment rooms and other congested areas, drawn to scale, on which the following items are shown and coordinated with each other, using input from Installers of the items involved:

1. Domestic water piping.

C. Field quality-control reports.

1.4 QUALITY ASSURANCE

A. Piping materials shall bear label, stamp, or other markings of specified testing agency.

1.5 COORDINATION

A. Coordinate sizes and locations of concrete bases with actual equipment provided.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

A. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, fitting materials, and joining methods for specific services, service locations, and pipe sizes.

2.2 COPPER TUBE AND FITTINGS

A. Hard Copper Tube: ASTM B 88, Type L (ASTM B 88M, Type B) water tube, drawn temper.

1. Cast-Copper Solder-Joint Fittings: ASME B16.18, pressure fittings.
2. Wrought-Copper Solder-Joint Fittings: ASME B16.22, wrought-copper pressure fittings.
3. Bronze Flanges: ASME B16.24, Class 150, with solder-joint ends.
4. Copper Unions: MSS SP-123, cast-copper-alloy, hexagonal-stock body, with ball-and-socket, metal-to-metal seating surfaces, and solder-joint or threaded ends.
5. Copper Pressure-Seal-Joint Fittings:

a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1) Elkhart Products Corporation; Industrial Division.
2) NIBCO INC.
3) Viega; Plumbing and Heating Systems.

b. NPS 2 (DN 50) and Smaller: Wrought-copper fitting with EPDM-rubber O-ring seal in each end.
c. NPS 2-1/2 to NPS 4 (DN 65 to DN 100): Cast-bronze or wrought-copper fitting with EPDM-rubber O-ring seal in each end.

6. Copper-Tube Extruded-Tee Connections:

a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1) T-DRILL Industries Inc.

b. Description: Tee formed in copper tube according to ASTM F 2014.

2.3 PIPING JOINING MATERIALS

A. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.

B. Brazing Filler Metals: AWS A5.8/A5.8M, BCuP Series, copper-phosphorus alloys for general-duty brazing unless otherwise indicated.

2.4 DIELECTRIC FITTINGS

A. General Requirements: Assembly of copper alloy and ferrous materials or ferrous material body with separating nonconductive insulating material suitable for system fluid, pressure, and temperature.

B. Dielectric Unions:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following or approved equal:

   a. Capitol Manufacturing Company.
   b. Central Plastics Company.
   c. EPCO Sales, Inc.
   d. Hart Industries International, Inc.
   e. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
   f. Zurn Plumbing Products Group; Wilkins Water Control Products.

2. Description:

   a. Pressure Rating: 150 psig at 180 deg F.
   b. End Connections: Solder-joint copper alloy and threaded ferrous.

C. Dielectric Flanges:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following or approved equal:

   a. Capitol Manufacturing Company.
   b. Central Plastics Company.
   c. EPCO Sales, Inc.
   d. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Description:

   a. Factory-fabricated, bolted, companion-flange assembly.
   b. Pressure Rating: 175 psig minimum.
   c. End Connections: Solder-joint copper alloy and threaded ferrous; threaded solder-joint copper alloy and threaded ferrous.

D. Dielectric Couplings:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following or approved equal:

   a. Calpico, Inc.
   b. Lochinvar Corporation.

2. Description:

   a. Galvanized-steel coupling.
   b. Pressure Rating: 300 psig at 225 deg F.
   c. End Connections: Female threaded.
   d. Lining: Inert and noncorrosive, thermoplastic.

E. Dielectric Nipples:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following or approved equal:

   a. Perfection Corporation; a subsidiary of American Meter Company.
   b. Precision Plumbing Products, Inc.
   c. Victaulic Company.

2. Description:

   a. Electroplated steel nipple complying with ASTM F 1545.
   b. Pressure Rating: 300 psig at 225 deg F.
   c. End Connections: Male threaded or grooved.
   d. Lining: Inert and noncorrosive, propylene.

2.5 ESCUTCHEONS

A. General: Manufactured ceiling, floor, and wall escutcheons and floor plates.

B. One Piece, Cast Brass: Polished, chrome-plated or rough-brass finish with setscrews.

C. One Piece, Deep Pattern: Deep-drawn, box-shaped brass with chrome-plated finish.

D. One Piece, Stamped Steel: Chrome-plated finish with setscrew or spring clips.

E. Split Casting, Cast Brass: Polished, chrome-plated or rough-brass finish with concealed hinge and setscrew.

F. Split Plate, Stamped Steel: Chrome-plated finish with concealed hinge, setscrew or spring clips.

G. One-Piece Floor Plates: Cast-iron flange with holes for fasteners.

H. Split-Casting Floor Plates: Cast brass with concealed hinge.

2.6 SLEEVES

A. Cast-Iron Wall Pipes: Fabricated of cast iron, and equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop unless otherwise indicated.

B. Galvanized-Steel-Sheet Sleeves: 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint.

C. Molded-PE Sleeves: Reusable, PE, tapered-cup shaped, and smooth outer surface with nailing flange for attaching to wooden forms.

D. Molded-PVC Sleeves: Permanent, with nailing flange for attaching to wooden forms.

E. PVC-Pipe Sleeves: ASTM D 1785, Schedule 40.

F. Galvanized-Steel-Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, zinc-coated, with plain ends.

G. Stack Sleeve Fittings: Manufactured, cast-iron sleeve with integral clamping flange. Include clamping ring and bolts and nuts for membrane flashing.

1. Underdeck Clamp: Clamping ring with setscrews.

2.7 SLEEVE SEALS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following or approved equal:

1. Advance Products & Systems, Inc.
2. Calpico, Inc.
3. Metraflex, Inc.
4. Pipeline Seal and Insulator, Inc.

B. Description: Modular sealing element unit, designed for field assembly, used to fill annular space between pipe and sleeve.

1. Sealing Elements: EPDM-rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
2. Pressure Plates: Stainless steel.
3. Connecting Bolts and Nuts: Stainless steel of length required to secure pressure plates to sealing elements.

PART 3 - EXECUTION

3.1 PIPING INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of domestic water piping. Indicated locations and arrangements are used to size pipe and calculate friction loss, expansion, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.

B. Install shutoff valve immediately upstream of each dielectric fitting.

C. Install domestic water piping level and plumb.

D. Install seismic restraints on piping.

E. Install piping concealed from view and protected from physical contact by building occupants unless otherwise indicated and except in equipment rooms and service areas.

F. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

G. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal, and coordinate with other services occupying that space.

H. Install piping adjacent to equipment and specialties to allow service and maintenance.

I. Install piping to permit valve servicing.

J. Install nipples, unions, special fittings, and valves with pressure ratings the same as or higher than system pressure rating used in applications below unless otherwise indicated.

K. Install piping free of sags and bends.

L. Install fittings for changes in direction and branch connections.

M. Install unions in copper tubing at final connection to each piece of equipment, machine, and specialty.

3.2 JOINT CONSTRUCTION

A. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

B. Remove scale, slag, dirt, and debris from inside and outside of pipes, tubes, and fittings before assembly.

C. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

1. Apply appropriate tape or thread compound to external pipe threads.
2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged.

D. Brazed Joints: Join copper tube and fittings according to CDA's "Copper Tube Handbook," "Brazed Joints" Chapter.

E. Soldered Joints: Apply ASTM B 813, water-flushable flux to end of tube. Join copper tube and fittings according to ASTM B 828 or CDA's "Copper Tube Handbook."

F. Extruded-Tee Connections: Form tee in copper tube according to ASTM F 2014. Use tool designed for copper tube; drill pilot hole, form collar for outlet, dimple tube to form seating stop, and braze branch tube into collar.

G. Ductile-Iron-Piping Grooved Joints: Cut groove end of pipe. Assemble coupling with housing, gasket, lubricant, and bolts. Join ductile-iron pipe and grooved-end fittings according to AWWA C606 for ductile-iron-pipe, cut-grooved joints.

H. Flanged Joints: Select appropriate asbestos-free, nonmetallic gasket material in size, type, and thickness suitable for domestic water service. Join flanges with gasket and bolts according to ASME B31.9.

I. Dissimilar-Material Piping Joints: Make joints using adapters compatible with materials of both piping systems.

3.3 VALVE INSTALLATION

A. Install shutoff valve close to water main on each branch and riser serving plumbing fixtures or equipment, on each water supply to equipment, and on each water supply to plumbing fixtures that do not have supply stops. Use ball or gate valves for piping NPS 2 (DN 50) and smaller. Use butterfly or gate valves for piping NPS 2-1/2 (DN 65) and larger.

3.4 TRANSITION FITTING INSTALLATION

A. Install transition couplings at joints of dissimilar piping.

B. Transition Fittings in Aboveground Domestic Water Piping NPS 2 (DN 50) and Smaller: Plastic-to-metal transition fittings or unions.

3.5 DIELECTRIC FITTING INSTALLATION

A. Install dielectric fittings in piping at connections of dissimilar metal piping and tubing.

B. Dielectric Fittings for NPS 2 (DN 50 and Smaller: Use dielectric unions.

C. Dielectric Fittings for NPS 2-1/2 to NPS 4 (DN 65 to DN 100): Use dielectric flanges.

3.6 HANGER AND SUPPORT INSTALLATION

A. Hangers and Supports for Plumbing Piping and Equipment.

1. Vertical Piping: MSS Type 8 or 42, clamps.
2. Individual, Straight, Horizontal Piping Runs:

    a. 100 Feet and Less: MSS Type 1, adjustable, steel clevis hangers.
    b. Longer Than 100 Feet: MSS Type 43, adjustable roller hangers.
    c. Longer Than 100 Feet If Indicated: MSS Type 49, spring cushion rolls.

3. Multiple, Straight, Horizontal Piping Runs 100 Feet (30 m) or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
4. Base of Vertical Piping: MSS Type 52, spring hangers.

B. Support vertical piping and tubing at base and at each floor.

C. Rod diameter may be reduced one size for double-rod hangers, to a minimum of 3/8 inch.

D. Install hangers for copper tubing with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 3/4 (DN 20) and Smaller: 60 inches with 3/8-inch rod.
2. NPS 1 and NPS 1-1/4 (DN 25 and DN 32): 72 inches with 3/8-inch rod.
3. NPS 1-1/2 and NPS 2 (DN 40 and DN 50): 96 inches with 3/8-inch rod.

E. Install supports for vertical copper tubing every 10 feet.

F. Install hangers for steel piping with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 1-1/4 (DN 32) and Smaller: 84 inches with 3/8-inch rod.
2. NPS 1-1/2 (DN 40): 108 inches with 3/8-inch rod.
3. NPS 2 (DN 50): 10 feet with 3/8-inch rod.

G. Install supports for vertical steel piping every 15 feet.

H. Support piping and tubing not listed in this article according to MSS SP-69 and manufacturer's written instructions.

3.7 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to equipment and machines to allow service and maintenance.

C. Connect domestic water piping to water-service piping with shutoff valve; extend and connect to the following:

1. Equipment: Cold- and hot-water supply piping as indicated, but not smaller than equipment connections. Provide shutoff valve and union for each connection. Use flanges instead of unions for NPS 2-1/2 (DN 65) and larger.

3.8 ESCUTCHEON INSTALLATION

A. Install escutcheons for penetrations of walls, ceilings, and floors.

B. Escutcheons for New Piping:

1. Piping with Fitting or Sleeve Protruding from Wall: One piece, deep pattern.
2. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One piece, cast brass with polished chrome-plated finish.
3. Bare Piping at Ceiling Penetrations in Finished Spaces: One piece, cast brass with polished chrome-plated finish.
4. Bare Piping in Unfinished Service Spaces: One piece, cast brass with rough-brass finish.
5. Bare Piping in Equipment Rooms: One piece, cast brass.
6. Bare Piping at Floor Penetrations in Equipment Rooms: One-piece floor plate.

3.9 SLEEVE INSTALLATION

A. General Requirements: Install sleeves for pipes and tubes passing through penetrations in floors, partitions, roofs, and walls.

B. Sleeves are not required for core-drilled holes.

C. Permanent sleeves are not required for holes formed by removable PE sleeves.

D. Cut sleeves to length for mounting flush with both surfaces unless otherwise indicated.

E. Install sleeves in new partitions, slabs, and walls as they are built.

F. For interior wall penetrations, seal annular space between sleeve and pipe or pipe insulation using joint sealants appropriate for size, depth, and location of joint. Comply with requirements in Division 7 Section "Joint Sealants" for joint sealants.

G. Seal space outside of sleeves in concrete slabs and walls with grout.

H. Install sleeves that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation unless otherwise indicated.

I. Install sleeve materials according to the following applications:

1. Sleeves for Piping Passing through Concrete Floor Slabs: Steel pipe.
2. Sleeves for Piping Passing through Concrete Floor Slabs of Mechanical Equipment Areas or Other Wet Areas: Steel pipe.

    a. Extend sleeves 2 inches above finished floor level.
    b. For pipes penetrating floors with membrane waterproofing, extend cast-iron sleeve fittings below floor slab as required to secure clamping ring if ring is specified. Secure flashing between clamping flanges. Install section of cast-iron soil pipe to extend sleeve to 2 inches above finished floor level.

3. Sleeves for Piping Passing through Gypsum-Board Partitions:

    a. PVC pipe sleeves for pipes smaller than NPS 6 (DN 150).
    b. Galvanized-steel sheet sleeves for pipes NPS 6 (DN 150) and larger.
    c. Exception: Sleeves are not required for water supply tubes and waste pipes for individual plumbing fixtures if escutcheons will cover openings.

4. Sleeves for Piping Passing through Interior Concrete Walls:

    a. Steel pipe sleeves for pipes smaller than NPS 6 (DN 150).

J. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Comply with requirements in Division 7 Section "Penetration Firestopping" for firestop materials and installations.

3.10 SLEEVE SEAL INSTALLATION

A. Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble sleeve seal components and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

3.11 IDENTIFICATION

A. Identify system components. Comply with requirements in Division 15 Section "Identification for Plumbing Piping and Equipment" for identification materials and installation.

B. Label pressure piping with system operating pressure.

3.12 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Piping Inspections:

1. Do not enclose, cover, or put piping into operation until it has been inspected and approved by the City of New York.
2. During installation, notify the City of New York at least one day before inspection must be made. Perform tests specified below in presence of the City of New York:

    a. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.
    b. Final Inspection: Arrange final inspection for the City of New York to observe tests specified below and to ensure compliance with requirements.

3. Reinspection: If the State of New York find that piping will not pass tests or inspections, make required corrections and arrange for reinspection.
4. Reports: Prepare inspection reports and have them signed by the State of New York.

C. Piping Tests:

1. Fill domestic water piping. Check components to determine that they are not air bound and that piping is full of water.
2. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit a separate report for each test, complete with diagram of portion of piping tested.
3. Leave new, altered, extended, or replaced domestic water piping uncovered and unconcealed until it has been tested and approved. Expose work that was covered or concealed before it was tested.
4. Cap and subject piping to static water pressure of 50 psig above operating pressure, without exceeding pressure rating of piping system materials. Isolate test source and allow to stand for four hours. Leaks and loss in test pressure constitute defects that must be repaired.
5. Repair leaks and defects with new materials and retest piping or portion thereof until satisfactory results are obtained.
6. Prepare reports for tests and for corrective action required.

D. Domestic water piping will be considered defective if it does not pass tests and inspections.

E. Prepare test and inspection reports.

3.13 ADJUSTING

A. Perform the following adjustments before operation:

1. Close drain valves, hydrants, and hose bibbs.
2. Open shutoff valves to fully open position.

3. Remove plugs used during testing of piping and for temporary sealing of piping during installation.
4. Remove and clean strainer screens. Close drain valves and replace drain plugs.
5. Check plumbing specialties and verify proper settings, adjustments, and operation.

3.14 PIPING SCHEDULE

A. Transition and special fittings with pressure ratings at least equal to piping rating may be used in applications below unless otherwise indicated.

B. Flanges and unions may be used for aboveground piping joints unless otherwise indicated.

C. Fitting Option: Extruded-tee connections and brazed joints may be used on aboveground copper tubing.

D. Aboveground domestic water piping, NPS 2 (DN 50) and smaller, shall be one of the following:

1. Galvanized-steel pipe and nipples; galvanized, gray-iron threaded fittings; and threaded joints.
2. Hard copper tube, ASTM B 88, Type L (ASTM B 88M, Type B); cast- or wrought- copper solder-joint fittings; and soldered joints.
3. Hard copper tube, ASTM B 88, Type L (ASTM B 88M, Type B); copper pressure-seal-joint fittings; and pressure-sealed joints.

4. Hard copper tube, ASTM B 88, Type L (ASTM B 88M, Type B); copper push-on-joint fittings; and push-on joints.

3.15 VALVE SCHEDULE

A. Drawings indicate valve types to be used. Where specific valve types are not indicated, the following requirements apply:

1. Shutoff Duty: Use ball or gate valves for piping NPS 2 (DN 50) and smaller.
2. Drain Duty: Hose-end drain valves.

B. Use check valves to maintain correct direction of domestic water flow to and from equipment.

C. Iron grooved-end valves may be used with grooved-end piping.

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SECTION 221316

SANITARY WASTE AND VENT PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following for soil, waste, and vent piping inside the building:

1. Pipe, tube, and fittings.
2. Special pipe fittings.
3. Encasement for underground metal piping.

1.3 DEFINITIONS

A. EPDM: Ethylene-propylene-diene terpolymer rubber.

B. NBR: Acrylonitrile-butadiene rubber.

C. TPE: Thermoplastic elastomer.

1.4 PERFORMANCE REQUIREMENTS

A. Components and installation shall be capable of withstanding the following minimum working pressure, unless otherwise indicated:

1. Soil, Waste, and Vent Piping: 10-foot head of water.

B. Seismic Performance: Soil, waste, and vent piping and support and installation shall be capable of withstanding the effects of seismic events determined according to ASCE 7, "Minimum Design Loads for Buildings and Other Structures."

1.5 SUBMITTALS

A. Product Data: For pipe, tube, fittings, and couplings.

B. Shop Drawings:

1. Design Calculations: Signed and sealed by a qualified professional engineer for selecting seismic restraints.

C. Field quality-control inspection and test reports.

1.6 QUALITY ASSURANCE

A. Piping materials shall bear label, stamp, or other markings of specified testing agency.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.

2.2 PIPING MATERIALS

A. Refer to Part 3 "Piping Applications" Article for applications of pipe, tube, fitting, and joining materials.

2.3 HUB-AND-SPIGOT, CAST-IRON SOIL PIPE AND FITTINGS

A. Pipe and Fittings: ASTM A 74, Service class(es).

B. Gaskets: ASTM C 564, rubber.

C. Calking Materials: ASTM B 29, pure lead and oakum or hemp fiber.

2.4 HUBLESS CAST-IRON SOIL PIPE AND FITTINGS

A. Pipe and Fittings: ASTM A 888 or CISPI 301.

B. Sovent Stack Fittings: ASME B16.45 or ASSE 1043, hubless, cast-iron aerator and deaerator drainage fittings.

C. Shielded Couplings: ASTM C 1277 assembly of metal shield or housing, corrosion-resistant fasteners, and rubber sleeve with integral, center pipe stop.

1. Standard, Shielded, Stainless-Steel Couplings: CISPI 310, with stainless-steel corrugated shield; stainless-steel bands and tightening devices; and ASTM C 564, rubber sleeve.

a. Available Manufacturers:

1) ANACO.
2) Fernco, Inc.
3) Ideal Div.; Stant Corp.
4) Mission Rubber Co.
5) Tyler Pipe; Soil Pipe Div.

2. Heavy-Duty, Shielded, Stainless-Steel Couplings: With stainless-steel shield, stainless-steel bands and tightening devices, and ASTM C 564, rubber sleeve.

a. Available Manufacturers:

1) ANACO.
2) Clamp-All Corp.
3) Ideal Div.; Stant Corp.
4) Mission Rubber Co.
5) Tyler Pipe; Soil Pipe Div.

3. Heavy-Duty, Shielded, Cast-Iron Couplings: ASTM A 48/A 48M, two-piece, cast-iron housing; stainless-steel bolts and nuts; and ASTM C 564, rubber sleeve.

a. Available Manufacturers:

1) MG Piping Products Co.

2.5 STEEL PIPE AND FITTINGS

A. Steel Pipe: ASTM A 53/A 53M, Type E or S, Grade A or B, Standard Weight or Schedule 40, galvanized. Include ends matching joining method.

B. Drainage Fittings: ASME B16.12, galvanized, threaded, cast-iron drainage pattern.

C. Pressure Fittings:

1. Steel Pipe Nipples: ASTM A 733, made of ASTM A 53/A 53M or ASTM A 106, Schedule 40, galvanized, seamless steel pipe. Include ends matching joining method.
2. Malleable-Iron Unions: ASME B16.39; Class 150; hexagonal-stock body with ball-and-socket, metal-to-metal, bronze seating surface; and female threaded ends.
3. Gray-Iron, Threaded Fittings: ASME B16.4, Class 125, galvanized, standard pattern.
4. Cast-Iron Flanges: ASME B16.1, Class 125.
5. Cast-Iron, Flanged Fittings: ASME B16.1, Class 125, galvanized.

D. Grooved-Joint Systems:

1. Available Manufacturers:

a. Anvil International.
b. Star Pipe Products; Star Fittings Div.
c. Victaulic Company.
d. Ward Manufacturing, Inc.

2. Grooved-End, Steel-Piping Fittings: ASTM A 47/A 47M, galvanized, malleable-iron casting; ASTM A 106, galvanized-steel pipe; or ASTM A 536, galvanized, ductile-iron casting; with dimensions matching steel pipe.
3. Grooved-End, Steel-Piping Couplings: AWWA C606, for steel-pipe dimensions. Include ferrous housing sections, gasket suitable for water, and bolts and nuts.

2.6 STAINLESS-STEEL PIPE AND FITTINGS

A. Pipe and Fittings: ASME A112.3.1, drainage pattern with socket and spigot ends.

B. Gaskets: Lip seals shaped to fit socket groove, with plastic backup ring.

1. Material: EPDM, unless NBR is indicated.

2.7 DUCTILE-IRON PIPE AND FITTINGS

A. Mechanical-Joint, Ductile-Iron Pipe: AWWA C151, with mechanical-joint bell and plain spigot end, unless grooved or flanged ends are indicated.

1. Mechanical-Joint, Ductile-Iron Fittings: AWWA C110, ductile- or gray-iron standard pattern or AWWA C153, ductile-iron compact pattern.
2. Glands, Gaskets, and Bolts: AWWA C111, ductile- or gray-iron glands, rubber gaskets, and steel bolts.

B. Push-on-Joint, Ductile-Iron Pipe: AWWA C151, with push-on-joint bell and plain spigot end, unless grooved or flanged ends are indicated.

1. Push-on-Joint, Ductile-Iron Fittings: AWWA C110, ductile- or gray-iron standard pattern or AWWA C153, ductile-iron compact pattern.
2. Gaskets: AWWA C111, rubber.

C. Grooved-Joint Systems:

1. Available Manufacturers:

a. Victaulic Company.

2. Grooved-End, Ductile-Iron Fittings: ASTM A 47/A 47M, malleable-iron castings or ASTM A 536, ductile-iron castings with dimensions matching pipe.
3. Grooved-End, Ductile-Iron-Piping Couplings: AWWA C606, for ductile-iron-pipe dimensions. Include ferrous housing sections, gasket suitable for water, and bolts and nuts.

D. Flanges: ASME 16.1, Class 125, cast iron.

2.8 SPECIAL PIPE FITTINGS

A. Flexible, Nonpressure Pipe Couplings: Comply with ASTM C 1173, elastomeric, sleeve-type, reducing or transition pattern. Include shear ring, ends of same sizes as piping to be joined, and corrosion-resistant-metal tension band and tightening mechanism on each end.

1. Available Manufacturers:

    a. Dallas Specialty & Mfg. Co.
    b. Fernco, Inc.
    c. Logan Clay Products Company (The).
    d. Mission Rubber Co.
    e. NDS, Inc.
    f. Plastic Oddities, Inc.

2. Sleeve Materials:

    a. For Cast-Iron Soil Pipes: ASTM C 564, rubber.
    b. For Plastic Pipes: ASTM F 477, elastomeric seal or ASTM D 5926, PVC.
    c. For Dissimilar Pipes: ASTM D 5926, PVC or other material compatible with pipe materials being joined.

B. Shielded Nonpressure Pipe Couplings: ASTM C 1460, elastomeric or rubber sleeve with full-length, corrosion-resistant outer shield and corrosion-resistant-metal tension band and tightening mechanism on each end.

1. Available Manufacturers:

    a. Cascade Waterworks Mfg. Co.
    b. Mission Rubber Co.

C. Expansion Joints: Two or three-piece, ductile-iron assembly consisting of telescoping sleeve(s) with gaskets and restrained-type, ductile-iron, bell-and-spigot end sections complying with AWWA C110 or AWWA C153. Select and assemble components for expansion indicated. Include AWWA C111, ductile-iron glands, rubber gaskets, and steel bolts.

1. Available Manufacturers:

    a. EBAA Iron Sales, Inc.
    b. Romac Industries, Inc.
    c. Star Pipe Products; Star Fittings Div.

D. Wall-Penetration Fittings: Compound, ductile-iron coupling fitting with sleeve and flexing sections for up to 20-degree deflection, gaskets, and restrained-joint ends complying with AWWA C110 or AWWA C153. Include AWWA C111, ductile-iron glands, rubber gaskets, and steel bolts.

1. Available Manufacturers:

    a. SIGMA Corp.

2.9 PIPING APPLICATIONS

A. Flanges and unions may be used on aboveground pressure piping, unless otherwise indicated.

B. Aboveground, soil and waste piping NPS 4 (DN 100) and smaller shall be any of the following:

1. Service class, cast-iron soil pipe and fittings; gaskets; and gasketed joints.

2. Hubless cast-iron soil pipe and fittings; standard, shielded, stainless-steel couplings; and hubless-coupling joints.
3. Steel pipe, drainage fittings, and threaded joints.
4. Stainless-steel pipe and fittings, gaskets, and gasketed joints.
5. Copper DWV tube, copper drainage fittings, and soldered joints.

C. Aboveground, vent piping NPS 4 (DN 100) and smaller shall be any of the following:

1. Service class, cast-iron soil pipe and fittings; gaskets; and gasketed joints.
2. Hubless cast-iron soil pipe and fittings; standard, shielded, stainless-steel couplings; and hubless-coupling joints.
3. Steel pipe, drainage fittings, and threaded joints.
4. Stainless-steel pipe and fittings gaskets, and gasketed joints.
5. Copper DWV tube, copper drainage fittings, and soldered joints.

    a. Option for Vent Piping, NPS 2-1/2 and NPS 3-1/2 (DN 65 and DN 90): Hard copper tube, Type M (Type C); copper pressure fittings; and soldered joints.
6. Dissimilar Pipe-Material Couplings: Flexible, Shielded, nonpressure pipe couplings for joining dissimilar pipe materials with small difference in OD.

D. Underground, soil, waste, and vent piping NPS 4 (DN 100) and smaller are to be any of the following:

1. Cast-iron soil piping; gaskets; and gasketed joints.
2. Hubless, cast-iron soil pipe and fittings; CISPI hubless-piping couplings; and coupled joints.
3. Dissimilar Pipe-Material Couplings: Shielded], nonpressure transition couplings.

Retain " any of" option in first paragraph below to allow Contractor to select piping materials from those retained.

E. Underground, soil and waste piping NPS 5 (DN 125) and larger are to be[**any of**] the following:

Retain one or more of first three subparagraphs below. If more than one type of material and joining method is used, identify various materials on Drawings and show points of transition from one material to another.

1. Cast-iron soil piping; gaskets; and gasketed joints.
2. Hubless, cast-iron soil pipe and fittings; CISPI hubless-piping couplings; coupled joints.

F. Aboveground sanitary-sewage force mains NPS 1-1/2 and NPS 2 (DN 40 and DN 50) shall be any of the following:

1. Hard copper tube, Type L (Type B); copper pressure fittings; and soldered joints.
2. Steel pipe, pressure fittings, and threaded joints.

2.10 PIPING INSTALLATION

A. Install cleanouts at grade and extend to where building sanitary drains connect to building sanitary sewers.

B. Install cast-iron sleeve with water stop and mechanical sleeve seal at each service pipe penetration through foundation wall. Select number of interlocking rubber links required to make installation watertight.

C. Install wall-penetration fitting at each service pipe penetration through foundation wall. Make installation watertight.

D. Install cast-iron soil piping according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."

1. Install encasement on underground piping according to ASTM A 674 or AWWA C105.

E. Make changes in direction for soil and waste drainage and vent piping using appropriate branches, bends, and long-sweep bends. Sanitary tees and short-sweep 1/4 bends may be used on vertical stacks if change in direction of flow is from horizontal to vertical. Use long-turn, double Y-branch and 1/8-bend fittings if 2 fixtures are installed back to back or side by side with common drain pipe. Straight tees, elbows, and crosses may be used on vent lines. Do not change direction of flow more than 90 degrees. Use proper size of standard increasers and reducers if pipes of different sizes are connected. Reducing size of drainage piping in direction of flow is prohibited.

F. Install soil and waste drainage and vent piping at the following minimum slopes, unless otherwise indicated:

1. Building Sanitary Drain: 2 percent downward in direction of flow for piping NPS 3 (DN 80) and smaller; 1 percent downward in direction of flow for piping NPS 4 (DN 100) and larger.
2. Horizontal Sanitary Drainage Piping: 2 percent downward in direction of flow.
3. Vent Piping: 1 percent down toward vertical fixture vent or toward vent stack.

G. Sleeves are not required for cast-iron soil piping passing through concrete slabs-on-grade if slab is without membrane waterproofing.

H. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.

2.11 JOINT CONSTRUCTION

A. Basic piping joint construction requirements are specified in Division 22 Section "Common Work Results for Plumbing."

B. Join hub-and-spigot, cast-iron soil piping with gasket joints according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for compression joints.

C. Join hubless cast-iron soil piping according to CISPI 310 and CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for hubless-coupling joints.

D. Soldered Joints: Use ASTM B 813, water-flushable, lead-free flux; ASTM B 32, lead-free-alloy solder; and ASTM B 828 procedure, unless otherwise indicated.

E. Grooved Joints: Assemble joint with keyed coupling, gasket, lubricant, and bolts according to coupling and fitting manufacturer's written instructions.

2.12 HANGER AND SUPPORT INSTALLATION

A. Seismic-restraint devices are specified in Division 22 Section "Vibration and Seismic Controls for Plumbing Piping and Equipment."

B. Pipe hangers and supports are specified in Division 22 Section "Hangers and Supports for Plumbing Piping and Equipment." Install the following:

1. Vertical Piping: MSS Type 8 or Type 42, clamps.
2. Install individual, straight, horizontal piping runs according to the following:

    a. 100 Feet (30 m) and Less: MSS Type 1, adjustable, steel clevis hangers.
    b. Longer Than 100 Feet (30 m): MSS Type 43, adjustable roller hangers.
    c. Longer Than 100 Feet (30 m), if Indicated: MSS Type 49, spring cushion rolls.

3. Multiple, Straight, Horizontal Piping Runs 100 Feet (30 m) or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
4. Base of Vertical Piping: MSS Type 52, spring hangers.

C. Install supports according to Division 22 Section "Hangers and Supports for Plumbing Piping and Equipment."

D. Support vertical piping and tubing at base and at each floor.

E. Rod diameter may be reduced 1 size for double-rod hangers, with 3/8-inch minimum rods.

F. Install hangers for cast-iron soil piping with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 1-1/2 and NPS 2 (DN 40 and DN 50): 60 inches with 3/8-inch rod.
2. NPS 3 (DN 80): 60 inches with 1/2-inch rod.
3. NPS 4 and NPS 5 (DN 100 and DN 125): 60 inches (1500 mm) with 5/8-inch rod.

G. Install supports for vertical cast-iron soil piping every 15 feet.

H. Install hangers for steel piping with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 1-1/4 (DN 32): 84 inches with 3/8-inch rod.
2. NPS 1-1/2 (DN 40): 108 inches with 3/8-inch rod.
3. NPS 2 (DN 50): 10 feet with 3/8-inch rod.
4. NPS 2-1/2 (DN 65): 11 feet with 1/2-inch rod.
5. NPS 3 (DN 80): 12 feet with 1/2-inch rod.
6. NPS 4 and NPS 5 (DN 100 and DN 125): 12 feet with 5/8-inch rod.

I. Install supports for vertical steel piping every 15 feet.

J. Install hangers for stainless-steel piping with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 2 (DN 50): 84 inches with 3/8-inch rod.
2. NPS 3 (DN 80): 96 inches with 1/2-inch rod.
3. NPS 4 (DN 100): 108 inches with 1/2-inch rod.

K. Install supports for vertical stainless-steel piping every 10 feet.

L. Install hangers for copper tubing with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 1-1/4 (DN 32): 72 inches with 3/8-inch rod.
2. NPS 1-1/2 and NPS 2 (DN 40 and DN 50): 96 inches with 3/8-inch rod.
3. NPS 2-1/2 (DN 65): 108 inches with 1/2-inch rod.
4. NPS 3 to NPS 5 (DN 80 to DN 125): 10 feet with 1/2-inch rod.

M. Install supports for vertical copper tubing every 10 feet.

2.13 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Connect soil and waste piping to exterior sanitary sewerage piping. Use transition fitting to join dissimilar piping materials.

C. Connect drainage and vent piping to the following:

1. Plumbing Fixtures: Connect drainage piping in sizes indicated, but not smaller than required by plumbing code.
2. Plumbing Fixtures and Equipment: Connect atmospheric vent piping in sizes indicated, but not smaller than required by authorities having jurisdiction.
3. Plumbing Specialties: Connect drainage and vent piping in sizes indicated, but not smaller than required by plumbing code.
4. Equipment: Connect drainage piping as indicated. Provide shutoff valve, if indicated, and union for each connection. Use flanges instead of unions for connections NPS 2-1/2 (DN 65) and larger.

2.14 FIELD QUALITY CONTROL

A. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction.

1. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.
2. Final Inspection: Arrange for final inspection by authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.

B. Reinspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for reinspection.

C. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

D. Test sanitary drainage and vent piping according to procedures of authorities having jurisdiction or, in absence of published procedures, as follows:

1. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.
2. Leave uncovered and unconcealed new, altered, extended, or replaced drainage and vent piping until it has been tested and approved. Expose work that was covered or concealed before it was tested.
3. Roughing-in Plumbing Test Procedure: Test drainage and vent piping, except outside leaders, on completion of roughing-in. Close openings in piping system and fill with water to point of overflow, but not less than 10-foot head of water. From 15 minutes before inspection starts to completion of inspection, water level must not drop. Inspect joints for leaks.
4. Finished Plumbing Test Procedure: After plumbing fixtures have been set and traps filled with water, test connections and prove they are gastight and watertight. Plug vent-stack openings on roof and building drains where they leave building. Introduce air into piping system equal to pressure of 1-inch wg. Use U-tube or manometer inserted in trap of water closet to measure this pressure. Air pressure must remain constant without introducing additional air throughout period of inspection. Inspect plumbing fixture connections for gas and water leaks.
5. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.
6. Prepare reports for tests and required corrective action.

2.15 CLEANING

A. Clean interior of piping. Remove dirt and debris as work progresses.

B. Protect drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.

C. Place plugs in ends of uncompleted piping at end of day and when work stops.

END OF SECTION 221316

SECTION 221319

SANITARY WASTE PIPING SPECIALTIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum and (5) the Contract the State of New York Standard Construction Contract.

B. This Section includes the following sanitary drainage piping specialties:

1. Cleanouts.
2. Roof flashing assemblies.
3. Through-penetration firestop assemblies.
4. Miscellaneous sanitary drainage piping specialties.
5. Flashing materials.

1.3 DEFINITIONS

A. ABS: Acrylonitrile-butadiene-styrene plastic.

B. FRP: Fiberglass-reinforced plastic.

C. HDPE: High-density polyethylene plastic.

D. PE: Polyethylene plastic.

E. PP: Polypropylene plastic.

F. PVC: Polyvinyl chloride plastic.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated. Include rated capacities, operating characteristics.

B. Shop Drawings: Show fabrication and installation details for frost-resistant vent terminals.

1. Wiring Diagrams: Power, signal, and control wiring.

C. Field quality-control test reports.

D. Operation and Maintenance Data: For drainage piping specialties to include in emergency, operation, and maintenance manuals.

1.5 QUALITY ASSURANCE

A. Drainage piping specialties shall bear label, stamp, or other markings of specified testing agency.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

C. Comply with NSF 14, "Plastics Piping Components and Related Materials," for plastic sanitary piping specialty components.

1.6 COORDINATION

A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 03.

B. Coordinate size and location of roof penetrations.

PART 2 - PRODUCTS

2.1 CLEANOUTS

A. Exposed Metal Cleanouts:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

   a. Josam Company; Josam Div.
   b. MIFAB, Inc.
   c. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
   d. Tyler Pipe; Wade Div.
   e. Watts Drainage Products Inc.
   f. Zurn Plumbing Products Group; Specification Drainage Operation.
   g. Josam Company; Blucher-Josam Div.

2. Standard: ASME A112.36.2M for cast iron for cleanout test tee.
3. Size: Same as connected drainage piping
4. Body Material: Hubless, cast-iron soil pipe test tee as required to match connected piping.
5. Closure: Countersunk or raised-head, cast-iron plug.
6. Closure Plug Size: Same as or not more than one size smaller than cleanout size.
7. Closure: Stainless-steel plug with seal.

B. Cast-Iron Wall Cleanouts:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

   a. Josam Company; Josam Div.
   b. MIFAB, Inc.
   c. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
   d. Tyler Pipe; Wade Div.
   e. Watts Drainage Products Inc.
   f. Zurn Plumbing Products Group; Specification Drainage Operation.

2. Standard: ASME A112.36.2M. Include wall access.
3. Size: Same as connected drainage piping.
4. Body: Hubless, cast-iron soil pipe test tee as required to match connected piping.
5. Closure: Countersunk or raised-head, cast-iron plug.
6. Closure Plug Size: Same as or not more than one size smaller than cleanout size.
7. Wall Access: Square, nickel-bronze, copper-alloy, or stainless-steel wall-installation frame and cover.

2.2 ROOF FLASHING ASSEMBLIES

A. Roof Flashing Assemblies:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

   a. Acorn Engineering Company; Elmdor/Stoneman Div.
   b. Thaler Metal Industries Ltd.

B. Description: Manufactured assembly made of 4.0-lb/sq. ft. , 0.0625-inch thick, lead flashing collar and skirt extending at least 6 inches from pipe, with galvanized-steel boot reinforcement and counterflashing fitting.

1. Open-Top Vent Cap: Without cap.
2. Low-Silhouette Vent Cap: With vandal-proof vent cap.
3. Extended Vent Cap: With field-installed, vandal-proof vent cap.

2.3 THROUGH-PENETRATION FIRESTOP ASSEMBLIES

A. Through-Penetration Firestop Assemblies:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

   a. ProSet Systems Inc.

2. Standard: UL 1479 assembly of sleeve and stack fitting with firestopping plug.
3. Size: Same as connected soil, waste, or vent stack.
4. Sleeve: Molded PVC plastic, of length to match slab thickness and with integral nailing flange on one end for installation in cast-in-place concrete slabs.

5. Stack Fitting: ASTM A 48/A 48M, gray-iron, hubless-pattern, wye branch with neoprene O-ring at base and gray-iron plug in thermal-release harness. Include PVC protective cap for plug.
6. Special Coating: Corrosion resistant on interior of fittings.

2.4 MISCELLANEOUS SANITARY DRAINAGE PIPING SPECIALTIES

A. Floor-Drain, Trap-Seal Primer Fittings:

1. Description: Cast iron, with threaded inlet and threaded or spigot outlet, and trap-seal primer valve connection.
2. Size: Same as floor drain outlet with NPS 1/2 (DN 15) side inlet.

B. Air-Gap Fittings:

1. Standard: ASME A112.1.2, for fitting designed to ensure fixed, positive air gap between installed inlet and outlet piping.
2. Body: Bronze or cast iron.
3. Inlet: Opening in top of body.
4. Outlet: Larger than inlet.
5. Size: Same as connected waste piping and with inlet large enough for associated indirect waste piping.

2.5 FLASHING MATERIALS

A. Lead Sheet: ASTM B 749, Type L51121, copper bearing, with the following minimum weights and thicknesses, unless otherwise indicated:

1. General Use: 4.0-lb/sq. ft., 0.0625-inch thickness.
2. Vent Pipe Flashing: 3.0-lb/sq. ft., 0.0469-inch thickness.
3. Burning: 6-lb/sq. ft., 0.0938-inch thickness.

B. Copper Sheet: ASTM B 152/B 152M, of the following minimum weights and thicknesses, unless otherwise indicated:

1. General Applications: 12 oz./sq. ft.
2. Vent Pipe Flashing: 8 oz./sq. ft.

C. Zinc-Coated Steel Sheet: ASTM A 653/A 653M, with 0.20 percent copper content and 0.04-inch minimum thickness, unless otherwise indicated. Include G90 (Z275) hot-dip galvanized, mill-phosphatized finish for painting if indicated.

D. Elastic Membrane Sheet: ASTM D 4068, flexible, chlorinated polyethylene, 40-mil minimum thickness.

E. Fasteners: Metal compatible with material and substrate being fastened.

F. Metal Accessories: Sheet metal strips, clamps, anchoring devices, and similar accessory units required for installation; matching or compatible with material being installed.

G. Solder: ASTM B 32, lead-free alloy.

H. Bituminous Coating: SSPC-Paint 12, solvent-type, bituminous mastic.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install cleanouts in aboveground piping and building drain piping according to the following, unless otherwise indicated:

1. Size same as drainage piping up to NPS 4 (DN 100). Use NPS 4 (DN 100) for larger drainage piping unless larger cleanout is indicated.
2. Locate at each change in direction of piping greater than 45 degrees.
3. Locate at minimum intervals of 50 feet for piping NPS 4 (DN 100) and smaller and 100 feet for larger piping.
4. Locate at base of each vertical soil and waste stack.

B. For floor cleanouts for piping below floors, install cleanout with top flush with finished floor.

C. For cleanouts located in concealed piping, install cleanout wall access covers, of types indicated, with frame and cover flush with finished wall.

D. Install floor drains at low points of surface areas to be drained. Set grates of drains flush with finished floor, unless otherwise indicated.

1. Position floor drains for easy access and maintenance.
2. Set floor drains below elevation of surrounding finished floor to allow floor drainage. Set with grates depressed according to the following drainage area radius:

a. Radius, 30 Inches or Less: Equivalent to 1 percent slope, but not less than 1/4-inch total depression.
b. Radius, 30 to 60 Inches: Equivalent to 1 percent slope.
c. Radius, 60 Inches or Larger: Equivalent to 1 percent slope, but not greater than 1-inch total depression.

3. Install floor-drain flashing collar or flange so no leakage occurs between drain and adjoining flooring. Maintain integrity of waterproof membranes where penetrated.
4. Install individual traps for floor drains connected to sanitary building drain, unless otherwise indicated.

E. Install roof flashing assemblies & fittings on sanitary stack vents and vent stacks that extend through roof.

F. Assemble open drain fittings and install with top of hub 2 inches above floor.

G. Install deep-seal traps on floor drains and other waste outlets, if indicated.

H. Install floor-drain, trap-seal primer fittings on inlet to floor drains that require trap-seal primer connection.

1. Exception: Fitting may be omitted if trap has trap-seal primer connection.
2. Size: Same as floor drain inlet.

I. Install air-gap fittings on draining-type backflow preventers and on indirect-waste piping discharge into sanitary drainage system.

J. Install sleeve flashing device with each riser and stack passing through floors with waterproof membrane.

K. Install vent caps on each vent pipe passing through roof.

L. Install frost-resistant vent terminals on each vent pipe passing through roof. Maintain 1-inch clearance between vent pipe and roof substrate.

M. Install frost-proof vent caps on each vent pipe passing through roof. Maintain 1-inch clearance between vent pipe and roof substrate.

N. Install wood-blocking reinforcement for wall-mounting-type specialties.

O. Install traps on plumbing specialty drain outlets. Omit traps on indirect wastes unless trap is indicated.

P. Install escutcheons at wall, floor, and ceiling penetrations in exposed finished locations and within cabinets and millwork. Use deep-pattern escutcheons if required to conceal protruding pipe fittings.

3.2 CONNECTIONS

A. Piping installation requirements are specified in other Division 22 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to equipment to allow service and maintenance.

C. Ground equipment according to Division 26 Section "Grounding and Bonding for Electrical Systems."

D. Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

3.3 FLASHING INSTALLATION

A. Fabricate flashing from single piece unless large pans, sumps, or other drainage shapes are required. Join flashing according to the following if required:

1. Lead Sheets: Burn joints of lead sheets 6.0-lb/sq. ft., 0.0938-inch thickness or thicker. Solder joints of lead sheets 4.0-lb/sq. ft., 0.0625-inch thickness or thinner.
2. Copper Sheets: Solder joints of copper sheets.

B. Install sheet flashing on pipes, sleeves, and specialties passing through or embedded in floors and roofs with waterproof membrane.

1. Pipe Flashing: Sleeve type, matching pipe size, with minimum length of 10 inches, and skirt or flange extending at least 8 inches around pipe.
2. Sleeve Flashing: Flat sheet, with skirt or flange extending at least 8 inches around sleeve.
3. Embedded Specialty Flashing: Flat sheet, with skirt or flange extending at least 8 inches around specialty.

C. Secure flashing into sleeve and specialty clamping ring or device.

D. Install flashing for piping passing through roofs with counterflashing or commercially made flashing fittings, according to Division 07 Section "Sheet Metal Flashing and Trim."

E. Extend flashing up vent pipe passing through roofs and turn down into pipe, or secure flashing into cast-iron sleeve having calking recess.

F. Fabricate and install flashing and pans, sumps, and other drainage shapes.

3.4 LABELING AND IDENTIFYING

A. Distinguish among multiple units, inform operator of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations, in addition to identifying unit.

3.5 FIELD QUALITY CONTROL

A. Tests and Inspections:

1. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

3.6 PROTECTION

A. Protect drains during remainder of construction period to avoid clogging with dirt or debris and to prevent damage from traffic or construction work.

B. Place plugs in ends of uncompleted piping at end of each day or when work stops.

END OF SECTION 221319

SECTION 224213.13 - COMMERCIAL WATER CLOSETS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Wall-mounted water closets.
   2. Flushometer valves.
   3. Toilet seats.
   4. Supports.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: Include diagrams for power and control wiring.

1.3 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Standards:

   1. Comply with ASME A112.19.2/CSA B45.1 for water closets.
   2. Comply with ASME A112.19.5/CSA B45.15 for flush valves and spuds for water closets and tanks.
   3. Comply with ASSE 1037/ASME A112.1037/CSA B125.37 for flush valves.
   4. Comply with IAMPO/ANSI Z124.5 for water-closet (toilet) seats.
   5. Comply with ASME A112.6.1M for water-closet supports.
   6. Comply with ICC A117.1 for ADA-compliant water closets.
   7. Comply with ASTM A1045 for flexible PVC gaskets used in connection of vitreous China water closets to sanitary drainage systems.
   8. Comply with ASME A112.4.3 for plastic fittings used in connection of vitreous China water closets to sanitary drainage systems.

2.2 WALL-MOUNTED WATER CLOSETS

A. Water Closets - Wall Mounted, Top Spud:

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

   a. American Standard.

2. Bowl:

   a. Material: Vitreous China.
   b. Type: Siphon jet.
   c. Style: Flushometer valve.
   d. Mounting Height: ADA compliant.
   e. Rim Contour: Elongated.
   f. Water Consumption: 1.28 gal. per flush.
   g. Spud Size and Location: NPS 1-1/2 (DN 40); top.
   h. Color: White.

3. Support: By Jay R. Smith model 0211RY or 0211DY.

2.3 FLUSHOMETER VALVES

A. Flushometer Valves - Diaphragm, Lever Handle: Facing left.

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

   a. Sloan Valve Company.

2. Minimum Pressure Rating: 125 psig
3. Features: Include integral check stop and backflow-prevention device.
4. Material: Brass body with corrosion-resistant components.
5. Style: Exposed.
6. Flushometer-Valve Finish: Chrome-plated.
7. Handle Finish: Chrome-plated.
8. Consumption: 1.28 gal. per flush.
9. Minimum Inlet: NPS 1 (DN 25).
10. Minimum Outlet: NPS 1-1/4 (DN 32).

B. Toilet Seats:

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

   a. American Standard.

2. Material: Plastic.
3. Type: Commercial (Heavy duty).
4. Shape: Elongated rim, open front.
5. Hinge: Self-sustaining, check.
6. Hinge Material: Noncorroding metal.
7. Color: White.

2.4 SUPPORTS

A. Water-Closet Carrier:

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

   a. Jay R. Smith Mfg Co; a division of Morris Group International.

2. Description: Waste-fitting assembly, as required to match drainage piping material and arrangement with faceplates, couplings gaskets, and feet; bolts and hardware matching fixture.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine roughing-in for water-supply piping and sanitary drainage and vent piping systems to verify actual locations of piping connections before water-closet installation.

B. Examine walls and floors for suitable conditions where water closets will be installed.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

A. Water-Closet Installation:

1. Install level and plumb.
2. Install floor-mounted water closets on bowl-to-drain connecting fitting attachments to piping or building substrate.
3. Install accessible, wall-mounted water closets at mounting height in accordance with ICC A117.1.

B. Support Installation:

1. Install supports, affixed to building substrate, for floor-mounted, back-outlet water closets.

2. Use carrier supports with waste-fitting assembly and seal.
3. Install wall-mounted, back-outlet water-closet supports with waste-fitting assembly and waste-fitting seals; and affix to building substrate.
4. Measure support height installation from finished floor, not structural floor.

C. Flushometer-Valve Installation:

1. Install flushometer-valve, water-supply fitting on each supply to each water closet.
2. Attach supply piping to supports or substrate within pipe spaces behind fixtures.
3. Install lever-handle flushometer valves for accessible water closets with handle mounted on open side of water closet.
4. Install actuators in locations easily reachable for people with disabilities.

D. Install toilet seats on water closets.

E. Wall Flange and Escutcheon Installation:

1. Install wall flanges or escutcheons at piping wall penetrations in exposed, finished locations and within cabinets and millwork.
2. Install deep-pattern escutcheons if required to conceal protruding fittings.

F. Joint Sealing:

1. Seal joints between water closets and walls and floors using sanitary-type, one-part, mildew-resistant silicone sealant.
2. Match sealant color to water-closet color.
3. Comply with sealant requirements specified in 2020 Plumbing Code per Chapter 4.

3.3 PIPING CONNECTIONS

A. Connect water closets with water supplies and soil, waste, and vent piping. Use size fittings required to match water closets.

B. Comply with water piping requirements specified in Section 221116 "Domestic Water Piping."

C. Comply with soil and waste piping requirements specified in Section 221316 "Sanitary Waste and Vent Piping."

D. Where installing piping adjacent to water closets, allow space for service and maintenance.

3.4 ADJUSTING

A. Operate and adjust water closets and controls. Replace damaged and malfunctioning water closets, fittings, and controls.

B. Adjust water pressure at flushometer valves to produce proper flow.

3.5 CLEANING AND PROTECTION

A. Clean water closets and fittings with manufacturers' recommended cleaning methods and materials.

B. Install protective covering for installed water closets and fittings.

C. Do not allow use of water closets for temporary facilities unless approved in writing by Owner.

END OF SECTION 224213.13

SECTION 224213.16 - COMMERCIAL URINALS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Wall-hung urinals.
2. Urinal flushometer valves.
3. Supports.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Sustainable Design Submittals:

1. Product Data: For water consumption.

C. Shop Drawings: Include diagrams for power, signal, and control wiring.

1.3 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

PART 2 - PRODUCTS

2.1 WALL-HUNG URINALS

A. Urinals - Wall Hung, Back Outlet, Siphon Jet: Accessible. See sheets P001, P100 & P100A for further details.

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

a. American Standard.

2. Fixture:

a. Standards: ASME A112.19.2/CSA B45.1 and ASME A112.19.5/CSA B45.15.
b. Material: Vitreous China.
c. Type: Siphon jet

d. Strainer or Trapway: Manufacturer's standard strainer with integral trap.
e. Water Consumption: 0.5 gpf
f. Spud Size and Location: NPS 3/4 (DN 20); back.
g. Outlet Size and Location: NPS 2 (DN 50); back.
h. Color: White.

3. Waste Fitting:

a. Standard: ASME A112.18.2/CSA B125.2 for coupling.
b. Size: NPS 2 (DN 50).

4. Support: Type I urinal carrier with fixture support plates and coupling with seal and fixture bolts and hardware matching fixture. Include rectangular, steel uprights.
5. Urinal Mounting Height: Standard.

2.2 URINAL FLUSHOMETER VALVES

A. Lever-Handle, Diaphragm Flushometer Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

a. Sloan Valve Company.

2. Standard: ASSE 1037/ASME 112.1037/CSA B125.37.
3. Minimum Pressure Rating: 125 psig
4. Features: Include integral check stop and backflow-prevention device.
5. Material: Brass body with corrosion-resistant components.
6. Exposed Flushometer-Valve Finish: Chrome plated.
7. Panel Finish: Chrome plated or stainless steel.
8. Style: Exposed.
9. Consumption: 0.5 gal. per flush.
10. Minimum Inlet: NPS 3/4 (DN 20).
11. Minimum Outlet: NPS 3/4 (DN 20).

2.3 SUPPORTS

A. Urinal Carrier:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Jay R. Smith Mfg Co; a division of Morris Group International.
b. Josam Company.
c. MIFAB, Inc.
d. Zurn Industries, LLC.

2. Standard: ASME A112.6.2.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Urinal Installation:

1. Install urinals level and plumb according to rough-in drawings.
2. Install wall-hung, back-outlet urinals onto waste fitting seals and attached to supports.
3. Install wall-hung, bottom-outlet urinals with tubular waste piping attached to supports.
4. Install accessible, wall-mounted urinals at mounting height for the handicapped/elderly, according to ICC A117.1.
5. Install trap-seal liquid in waterless urinals.

B. Support Installation:

1. Install supports, affixed to building substrate, for wall-hung urinals.
2. Use off-floor carriers with waste fitting and seal for back-outlet urinals.
3. Use carriers without waste fitting for urinals with tubular waste piping.
4. Use chair-type carrier supports with rectangular steel uprights for accessible urinals.

C. Flushometer-Valve Installation:

1. Install flushometer-valve water-supply fitting on each supply to each urinal.
2. Attach supply piping to supports or substrate within pipe spaces behind fixtures.
3. Install lever-handle flushometer valves for accessible urinals with handle mounted on open side of compartment.
4. Install fresh batteries in battery-powered, electronic-sensor mechanisms.

D. Wall Flange and Escutcheon Installation:

1. Install wall flanges or escutcheons at piping wall penetrations in exposed, finished locations.
2. Install deep-pattern escutcheons if required to conceal protruding fittings.
3. Comply with escutcheon requirements specified in Section 220518 "Escutcheons for Plumbing Piping."

E. Joint Sealing:

1. Seal joints between urinals and walls and floors using sanitary-type, one-part, mildew-resistant silicone sealant.
2. Match sealant color to urinal color.
3. Sealant requirements shall comply with ASME A112.4.3.

3.2 PIPING CONNECTIONS

A. Connect urinals with water supplies and soil, waste, and vent piping. Use size fittings required to match urinals.

B. Comply with water piping requirements specified in Section 221116 "Domestic Water Piping."

C. Comply with soil and waste piping requirements specified in Section 221316 "Sanitary Waste and Vent Piping."

D. Where installing piping adjacent to urinals, allow space for service and maintenance.

3.3 ADJUSTING

A. Operate and adjust urinals and controls. Replace damaged and malfunctioning urinals, fittings, and controls.

B. Adjust water pressure at flushometer valves to produce proper flow.

C. Install fresh batteries in battery-powered, electronic-sensor mechanisms.

3.4 CLEANING AND PROTECTION

A. Clean urinals and fittings with manufacturers' recommended cleaning methods and materials.

B. Install protective covering for installed urinals and fittings.

C. Do not allow use of urinals for temporary facilities unless approved in writing by Owner.

END OF SECTION 224213.16

SECTION 224216.13 - COMMERCIAL LAVATORIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Vitreous-china, wall-mounted lavatories.
2. Automatically operated lavatory faucets.
3. Supply fittings.
4. Waste fittings.
5. Lavatory supports.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: Include diagrams for power, signal, and control wiring of automatic faucets.

1.3 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Counter cutout templates for mounting of counter-mounted lavatories.

1.4 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

PART 2 - PRODUCTS

2.1 VITREOUS-CHINA, WALL-MOUNTED LAVATORIES

A. Lavatory - Rectangular, Vitreous China, Wall Mounted, with Back. See sheet P-001 schedule:

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

a. American Standard.

2. Fixture:

a. Standard: ASME A112.19.2/CSA B45.1 or ASME A112.19.3/CSA B45.4.

b. Type: For wall hanging.
c. Nominal Size: Rectangular, 20-1/2 by 18-1/4 inches.
d. Faucet-Hole Punching: Three holes, 4-inch centers.
e. Faucet-Hole Location: Top.
f. Color: White.
g. Mounting Material: Chair carrier.

3. Faucet: Automatically Operated
4. Support: Type II, concealed-arm lavatory carrier with escutcheons. Include rectangular, steel uprights.
5. Lavatory Mounting Height: Standard and Handicapped/elderly in accordance with ICC A117.1. See sheet P-100A for further information.

2.2 AUTOMATICALLY OPERATED LAVATORY FAUCETS

A. Lavatory faucets intended to convey or dispense water for human consumption are to comply with the U.S. Safe Drinking Water Act (SDWA), with requirements of the Authority Having Jurisdiction (AHJ), and with NSF 61/NSF 372, or be certified in compliance with NSF 61/NSF 372 by an American National Standards Institute (ANSI) accredited third-party certification body, that the weighted average lead content at wetted surfaces is less than or equal to 0.25 percent.

B. Lavatory Faucets - Automatic Type: Hardwired Electronic Sensor Operated, Mixing, see sheet P-001 for make/model:

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

   a. Zurn Industries, LLC.

2. Standards: ASME A112.18.1/CSA B125.1 and UL 1951.
3. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
4. General: Include hot- and cold-water indicators; coordinate faucet inlets with supplies and fixture hole punchings; coordinate outlet with spout and fixture receptor.
5. Body Type: Single hole.
6. Body Material: Commercial, solid-brass, or die-cast housing with brazed copper and brass waterway.
7. Finish: Polished chrome plate.
8. Maximum Flow Rate: **0.5 gpm**
9. Mounting Type: Deck, concealed.
10. Spout: Rigid type.
11. Spout Outlet: Spray.
12. Drain: Not part of faucet.

2.3 SUPPLY FITTINGS

A. NSF Standard: Comply with NSF 61 and NSF 372 for supply-fitting materials that will be in contact with potable water.

B. Standard: ASME A112.18.1/CSA B125.1.

C. Supply Piping: Chrome-plated-brass pipe or chrome-plated copper tube matching water-supply piping size. Include chrome-plated-brass or stainless steel wall flange.

D. Supply Stops: Chrome-plated-brass, one-quarter-turn, ball-type or compression valve with inlet connection matching supply piping.

E. Risers:
1. Chrome-plated, rigid-copper-pipe and brass straight or offset tailpieces or Chrome-plated, soft-copper flexible tube riser.

2.4 WASTE FITTINGS

A. Standard: ASME A112.18.2/CSA B125.2.

B. Drain: Grid type with NPS 1-1/4 (DN 32) offset and straight tailpiece.

C. Trap:

1. Size: NPS 1-1/2 by NPS 1-1/4 (DN 40 by DN 32).
2. Material:

a. Chrome-plated, two-piece, cast-brass trap and swivel elbow with 0.032-inch thick brass tube to wall; and chrome-plated, brass or steel wall flange.
b. Stainless steel, two-piece trap and swivel elbow with 0.012-inch thick stainless steel tube to wall; and stainless steel wall flange.

2.5 LAVATORY SUPPORTS

A. Lavatory Carrier:

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

a. Jay R. Smith Mfg Co; a division of Morris Group International.

2. Standard: ASME A112.6.2.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install lavatories level and plumb in accordance with roughing-in drawings.

B. Install supports, affixed to building substrate, for wall-mounted lavatories.

C. Install accessible wall-mounted lavatories at handicapped/elderly mounting height for people with disabilities or the elderly, in accordance with ICC A117.1.

D. Install wall flanges or escutcheons at piping wall penetrations in exposed, finished locations. Use deep-pattern escutcheons if required to conceal protruding fittings.

E. Seal joints between lavatories, counters, and walls using sanitary-type, one-part, mildew-resistant silicone sealant. Match sealant color to fixture color. Sealant requirements shall comply with ASME A112.4.3.

F. Install protective shielding pipe covers and enclosures on exposed supplies and waste piping of accessible lavatories.

3.2 PIPING CONNECTIONS

A. Connect fixtures with water supplies, stops, and risers, and with traps, soil, waste, and vent piping. Use size fittings required to match fixtures.

B. Comply with water piping requirements specified in Section 221116 "Domestic Water Piping."

C. Comply with soil and waste piping requirements specified in Section 221316 "Sanitary Waste and Vent Piping."

3.3 ELECTRICAL CONNECTIONS

A. Connect wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

B. Ground equipment according to Section 260526 "Grounding and Bonding for Electrical Systems."

C. Install electrical devices furnished by manufacturer, but not factory mounted in accordance with NFPA 70 and NECA 1.

D. Install nameplate for each electrical connection, indicating electrical equipment designation and circuit number feeding connection.

1. Nameplate to be laminated acrylic or melamine plastic signs, as specified in Section 260553 "Identification for Electrical Systems."
2. Nameplate to be laminated acrylic or melamine plastic signs with a black background and engraved white letters at least 1/2 inch high.

3.4 ADJUSTING

A. Operate and adjust lavatories and controls. Replace damaged and malfunctioning lavatories, fittings, and controls.

3.5 CLEANING AND PROTECTION

A. After completing installation of lavatories, inspect and repair damaged finishes.

B. Clean lavatories, faucets, and other fittings with manufacturers' recommended cleaning methods and materials.

C. Provide protective covering for installed lavatories and fittings.

D. Do not allow use of lavatories for temporary facilities unless approved in writing by Owner.

END OF SECTION 224216.13

SECTION 230130

EXISTING HVAC AIR DISTRIBUTION SYSTEM CLEANING

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes cleaning existing HVAC air-distribution equipment, ducts, plenums, and system components.

1.2 DEFINITIONS

A. ACAC: American Council for Accredited Certification.

B. AIHA-LAP: American Industrial Hygiene Association Lab Accreditation Program

C. ASCS: Air systems cleaning specialist.

D. CESB: Council of Engineering and Scientific Specialty Boards.

E. CMI: Certified Microbial Investigator.

F. CMC: Certified Microbial Consultant.

G. CMR: Certified Microbial Remediator.

H. CMRS: Certified Microbial Remediation Supervisor.

I. EMLAP: Environmental Microbiology Laboratory Accreditation Program.

J. IEP: Indoor Environmental Professional.

K. IICRC: Institute of Inspection, Cleaning, and Restoration Certification.

L. NADCA: National Air Duct Cleaners Association.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.4 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.5 QUALITY ASSURANCE

A. ASCS Qualifications: A certified member of NADCA

1. Certification: Employ an ASCS certified by NADCA on a full-time basis
2. Supervisor Qualifications: Certified as an ASCS by NADCA

B. IEP Qualifications: CMI who is certified by ACAC and accredited by CESB.

C. IEP Qualifications: CMC who is certified by ACAC and accredited by CESB.

D. CMR Qualifications: Certified by ACAC and accredited by CESB.

E. CMRS Qualifications: Certified by ACAC and accredited by CESB.

PART 2 - PRODUCTS

2.1 HVAC CLEANING AGENTS

A. Description:

1. Formulated for each specific soiled coil condition that needs remedy.

2.2 ANTIMICROBIAL SURFACE TREATMENT

A. Description: Specific product selected shall be as recommended by the IEP based on the specific antimicrobial needs of the specific Project conditions.

1. Formulated to kill and inhibit growth of microorganisms.
2. EPA-registered for use in HVAC systems and for the specific application in which it will be used.
3. Have no residual action after drying, with zero VOC off-gassing.
4. OSHA compliant.
5. Treatment shall dry clear to allow continued visual observation of the treated surface.

PART 3 - EXECUTION

3.1 PREPARATION

A. Inspect HVAC air-distribution equipment, ducts, plenums, and system components to determine appropriate methods, tools, and equipment required for performance of the Work.

B. Cleaning Plan: Prepare a written plan for air-distribution system cleaning that includes strategies and step-by-step procedures.

C. Proceed with work only after conditions detrimental to performance of the Work have been corrected and cleaning plan has been approved.

D. Use the existing service openings, as required for proper cleaning, at various points of the HVAC system for physical and mechanical entry and for inspection.

E. Mark the position of manual volume dampers and air-directional mechanical devices inside the system prior to cleaning.

3.2 CLEANING

A. Comply with NADCA ACR.

B. Perform electrical lockout and tagout according to Owner's standards or authorities having jurisdiction.

C. Remove non-adhered substances and deposits from within the HVAC system.

D. Systems and Components to Be Cleaned: All air-moving and -distribution equipment.

E. Collect debris removed during cleaning. Ensure that debris is not dispersed outside the HVAC system during the cleaning process.

1. Particulate Collection: For particulate collection equipment, include adequate filtration to contain debris removed. Locate equipment downwind and away from all air intakes and other points of entry into the building.
2. HEPA filtration with 99.97 percent collection efficiency for particles sized 0.3 micrometer or larger shall be used where the particulate collection equipment is exhausting inside the building,

F. Control odors and mist vapors during the cleaning and restoration process.

G. Mark the position of manual volume dampers and air-directional mechanical devices inside the system prior to cleaning. Restore them to their marked position on completion of cleaning.

H. System components shall be cleaned so that all HVAC system components are visibly clean. On completion, all components must be returned to those settings recorded just prior to cleaning operations.

I. Clean all air-distribution devices, registers, grilles, diffusers, louvers, and insect screens.

J. Clean non-adhered substance deposits according to NADCA ACR and the following:

1. Clean air-handling units, airstream surfaces, components, condensate collectors, and drains.
2. Ensure that a suitable operative drainage system is in place prior to beginning wash-down procedures.
3. Clean evaporator coils, reheat coils, and other airstream components.

K. Air-Distribution Systems:

1. Create service openings in the HVAC system as necessary to accommodate cleaning.
2. Mechanically clean air-distribution systems specified to remove all visible contaminants, so that the systems are capable of passing the HVAC System Cleanliness Tests (see NADCA ACR).

L. Debris removed from the HVAC system shall be disposed of according to applicable Federal, state, and local requirements.

M. Mechanical Cleaning Methodology:

1. Source-Removal Cleaning Methods: The HVAC system shall be cleaned using source-removal mechanical cleaning methods designed to extract contaminants from within the HVAC system and to safely remove these contaminants from the facility. No cleaning method, or combination of methods, shall be used that could potentially damage components of the HVAC system or negatively alter the integrity of the system.

    a. Use continuously operating vacuum-collection devices to keep each section being cleaned under negative pressure.
    b. Cleaning methods that require mechanical agitation devices to dislodge debris that is adhered to interior surfaces of HVAC system components shall be equipped to safely remove these devices. Cleaning methods shall not damage the integrity of HVAC system components or damage porous surface materials, such as duct and plenum liners.

2. Cleaning Mineral-Fiber Insulation Components:

    a. Fibrous-glass thermal or acoustical insulation elements present in equipment or ductwork shall be thoroughly cleaned with HEPA vacuuming equipment while the HVAC system is under constant negative pressure and shall not be permitted to get wet according to NADCA ACR.
    b. Cleaning methods used shall not cause damage to fibrous-glass components and will render the system capable of passing the HVAC System Cleanliness Tests (see NADCA ACR).
    c. Fibrous materials that become wet shall be discarded and replaced.

N. Coil Cleaning:

1. See NADCA ACR, "Coil Surface Cleaning" Section. Type 1, or Type 1 and Type 2, cleaning methods shall be used to render the coil visibly clean and capable of passing coil cleaning verification.
2. Coil drain pans shall be subject to NADCA ACR, "Non-Porous Surfaces Cleaning Verification." Ensure that condensate drain pans are operational.
3. Electric-resistance coils shall be de-energized, locked out, and tagged before cleaning.
4. Cleaning methods shall not cause any appreciable damage to, cause displacement of, inhibit heat transfer, or cause erosion of the coil surface or fins, and shall comply with coil manufacturer's written recommendations.
5. Rinse thoroughly with clean water to remove any latent residues.

O. Application of Antimicrobial Treatment:

1. Apply antimicrobial agents and coatings if active fungal growth is determined by the IEP to be at Condition 2 or Condition 3 status according to IICRC S520, as analyzed by a laboratory accredited by AIHA-LAP with an EMLAP certificate and with results interpreted by an IEP. Apply antimicrobial agents and coatings according to manufacturer's written recommendations and EPA registration listing after the removal of surface deposits and debris.
2. Apply antimicrobial treatments and coatings after the system is rendered clean.
3. Apply antimicrobial agents and coatings directly onto surfaces of interior ductwork.
4. Microbial remediation shall be performed by a qualified CMR and CMRS.

3.3 CLEANLINESS VERIFICATION

A. Verify cleanliness according to NADCA ACR, "Verification of HVAC System Cleanliness" Section.

B. Surface-Cleaning Verification: Perform visual inspection for cleanliness. If no contaminants are evident through visual inspection, the HVAC system shall be considered clean. If visible contaminants are evident through visual inspection, those portions of the system where contaminants are visible shall be re-cleaned and subjected to re-inspection for cleanliness.

C. Verification of Coil Cleaning: Coil will be considered clean if the coil is free of foreign matter and chemical residue, based on a thorough visual inspection.

D. Prepare a written cleanliness verification report.

3.4 RESTORATION

A. Restore and repair HVAC air-distribution equipment, ducts, plenums, and components according to NADCA ACR, "Restoration and Repair of Mechanical Systems" Section.

B. Restore service openings capable of future reopening. Comply with requirements in Section 233113 "Metal Ducts".

C. Reseal fibrous-glass ducts. Comply with requirements in Section 233116 "Nonmetal Ducts."

D. Replace fibrous-glass materials that cannot be restored by cleaning or resurfacing. Comply with requirements in Section 233113 "Metal Ducts" and Section 233116 "Nonmetal Ducts."

E. Replace damaged insulation according to Section 230713 "Duct Insulation."

F. Ensure that closures do not hinder or alter airflow.

G. New closure materials, including insulation, shall match opened materials and shall have removable closure panels fitted with gaskets and fasteners.

H. Restore manual volume dampers and air-directional mechanical devices inside the system to their marked position on completion of cleaning.

END OF SECTION 230130

SECTION 23 0485 – COMMISSIONING OF HVAC SYSTEMS

PART 1 - GENERAL

1.1 DESCRIPTION

A. Commissioning. Commissioning is a systematic process of ensuring that all building systems perform interactively according to the design intent and the owner's operational needs. This is achieved by beginning in the design phase and documenting design intent and continuing through construction, acceptance and the warranty period with actual verification of performance. The commissioning process shall encompass and coordinate the traditionally separate functions of system documentation, equipment startup, control system calibration, testing and balancing, performance testing and training.

Commissioning during the construction phase is intended to achieve the following specific objectives according to the Contract Documents:

1) Verify that applicable equipment and systems are installed according to the manufacturer's recommendations and to industry accepted minimum standards and that they receive adequate operational checkout by installing contractors.
2) Verify and document proper performance of equipment and systems.
3) Verify that O&M documentation left on site is complete.
4) Verify that the Owner's operating personnel are adequately trained.

B. The commissioning process does not take away from or reduce the responsibility of the system designers or installing contractors to provide a finished and fully functioning product.

C. Abbreviations. The following are common abbreviations used in this Specification and in the Commissioning Plan to be developed. Definitions are found in Section 1.6.

A/E-	Architect and design engineers	FT-	Functional performance test
CA-	Commissioning authority	GC-	General contractor (prime)
CC	Controls contractor	MC-	Mechanical contractor
CM-	Construction Manager (the owner's representative)	PC-	Pre-functional checklist
Cx-	Commissioning	PM-	Project manager (of the Owner)
Cx Plan-	Commissioning Plan document	Subs-	Subcontractors to General
EC-	Electrical contractor	TAB-	Test and balance contractor

1.2 COORDINATION

A. Commissioning Team. The members of the commissioning team consist of the Commissioning authority (CA), the Project Manager (PM), , the General Contractor (GC or Contractor), the architect and design engineers (particularly the mechanical engineer), the Mechanical Contractor (MC), the Electrical Contractor (EC), the TAB representative, the Controls Contractor (CC), any other installing subcontractors or suppliers of equipment. If known, the Owner's building or plant operator/engineer is also a member of the commissioning team.

B. Management. The CA directs and coordinates the commissioning activities.

C. Scheduling. The CA will work with the Contractor according to established protocols to schedule the commissioning activities. The CA will provide sufficient notice to the Contractor for scheduling commissioning activities. The Contractor will integrate all commissioning activities into the master schedule. All parties will address scheduling problems and make necessary notifications in a timely manner in order to expedite the commissioning process.

The Contractor will provide the initial schedule of primary commissioning events at the commissioning scoping meeting. The *Commissioning Plan—Construction Phase* shall provide a format for this schedule. As construction progresses more detailed schedules are developed by the CA. The Commissioning Plan shall also provide a format for detailed schedules.

1.3 COMMISSIONING PROCESS

A. Commissioning Specifications. The commissioning specifications shall be provided as part of the bid documents and is binding on the Contractor. The commissioning plan provides guidance in the execution of the commissioning process. The CA shall present a preliminary *Commissioning Plan* for the Construction Phase at the pre-construction or initial commissioning coordination meeting. Just after the initial commissioning scoping meeting the CA will update the plan which is then considered the "final" plan, though it will continue to evolve and expand as the project progresses. The *Specifications* will take precedence over the *Commissioning Plan*.

B. Commissioning Process. The following narrative provides a brief overview of the typical commissioning tasks during construction and the general order in which they occur.

1. Commissioning during construction begins with a scoping meeting conducted by the CA where the commissioning process is reviewed with the commissioning team members.
2. Additional meetings will be required throughout construction, scheduled by the CA with necessary parties attending, to plan, scope, coordinate, schedule future activities and resolve problems.
3. Equipment documentation is submitted to the CA during normal submittals, including detailed start-up procedures.
4. The CA works with the Subs in developing startup plans and startup documentation formats, including providing the Subs with pre-functional checklists to be completed, during the startup process.
5. In general, the checkout and performance verification proceeds from simple to complex; from component level to equipment to systems and intersystem levels with pre-functional checklists being completed before functional testing.

6. The Subs, under their own direction, execute and document the pre-functional checklists and perform startup and initial checkout. The CA documents that the checklists and startup were completed according to the approved plans. This may include the CA witnessing start-up of selected equipment.
7. The CA develops specific equipment and system functional performance test procedures. The Subs review the procedures.
8. The procedures are executed by the Subs, under the direction of, and documented by, the CA.
9. Items of non-compliance in material, installation or setup are corrected at the Sub's expense and the system retested.
10. The CA reviews the O&M documentation for completeness.
11. Commissioning is completed before Substantial Completion.
12. The CA reviews, pre-approves and coordinates the training provided by the Subs and verifies that is was completed.
13. Deferred testing is conducted, as specified or required.

1.4 RELATED WORK

A. Specific commissioning requirements shall be given in and/or amended to the following sections of these specifications. All of the following sections apply to the Work of this section.

15900 Instrumentation and Control for HVAC Lists special requirements and alerts the controls contractor of the special requirements of the control contractor and control system.

15950 Testing, Adjusting and Balancing (TAB). Alerts the TAB of Cx responsibilities.

1.5 RESPONSIBILITIES

A. Commissioning Authority (CA)

The CA (if not also the designer) is not responsible for design concept, design criteria, compliance with codes, design or general construction scheduling, cost estimating, or construction management. The CA may assist with problem-solving of non-conformance or deficiencies, but ultimately that responsibility resides with the general contractor and the A/E. The primary role of the CA is to develop and coordinate the execution of a testing plan, observe and document performance—that systems are functioning in accordance with the documented design intent and in accordance with the Contract Documents. The Contractors will provide all tools or the use of tools to start, check-out and functionally test equipment and systems, except for specified testing with portable data-loggers, which shall be supplied and installed by the CA.

Construction and Acceptance Phase

1. Coordinates and directs the commissioning activities in a logical, sequential and efficient manner using consistent protocols and forms, centralized documentation, clear and regular communications and consultations with all necessary parties, frequently updated timelines and schedules and technical expertise.
2. Coordinate the commissioning work and, with the Contractor, ensure that commissioning activities are being scheduled into the master schedule.
3. Develop and revise, as necessary, the *Commissioning Plan—Construction Phase.*
4. Plan and conduct a commissioning scoping meeting and other commissioning meetings.

5. Request and review additional information required to perform commissioning tasks, including O&M materials, contractor start-up and checkout procedures.
6. Before startup, gather and review the current control sequences and interlocks and work with contractors and design engineers until sufficient clarity has been obtained, in writing, to be able to write detailed testing procedures.
7. Review and approve normal Contractor submittals applicable to systems being commissioned for compliance with commissioning needs, concurrent with the A/E reviews.
8. Write and distribute pre-functional tests and checklists.
9. Develop an enhanced start-up and initial systems checkout plan with Subs.
10. Perform site visits, as necessary, to observe component and system installations. Attend selected planning and job-site meetings to obtain information on construction progress. Review construction meeting minutes for revisions/substitutions relating to the commissioning process. Assist in resolving any discrepancies.
11. Witness all or part of the HVAC piping test and flushing procedure, sufficient to be confident that proper procedures were followed. Document this testing and include the documentation in O&M manuals. Notify owners project manager of any deficiencies in results or procedures.
12. Witness all or part of any ductwork testing and cleaning procedures, sufficient to be confident that proper procedures were followed. Document this testing and include the documentation in O&M manuals. Notify owner's project manager of any deficiencies in results or procedures.
13. Approve pre-functional tests and checklist completion by reviewing pre-functional checklist reports and by selected site observation and spot checking.
14. Approve systems startup by reviewing start-up reports and by selected site observation.
15. Review TAB execution plan.
16. Oversee sufficient functional testing of the control system and approve it to be used for TAB, before TAB is executed.
17. Approve air and water systems balancing by spot testing, by reviewing completed reports and by selected site observation.
18. With necessary assistance and review from installing contractors, write the functional performance test procedures for equipment and systems. This may include energy management control system trending, stand-alone datalogger monitoring or manual functional testing. Submit to the A/E and PM for review, and for approval if required.
19. Analyze any functional performance trend logs and monitoring data to verify performance.
20. Coordinate, witness and approve manual functional performance tests performed by installing contractors. Coordinate retesting as necessary until satisfactory performance is achieved. Perform actual functional testing without contractors on any equipment so specified in Section 230800
21. Maintain a master deficiency and resolution log and a separate testing record. Provide the A/E and PM with written progress reports and test results with recommended actions.
22. Review equipment warranties to ensure that the Owner's responsibilities are clearly defined.
23. Oversee and approve the training of the Owner's operating personnel.
24. Compile and maintain a commissioning record and building systems book(s).
25. Review and approve the preparation of the O&M manuals.
26. Provide a final commissioning report (as described in this section).

Warranty Period

1. Coordinate and supervise required seasonal or deferred testing and deficiency corrections.

2. Return to the site at 10 months into the 12 month warranty period and review with facility staff the current building operation and the condition of outstanding issues related to the original and seasonal commissioning. Also interview facility staff and identify problems or concerns they have operating the building as originally intended. Make suggestions for improvements and for recording these changes in the O&M manuals. Identify areas that may come under warranty or under the original construction contract. Assist facility staff in developing reports, documents and requests for services to remedy outstanding problems.

B. Contractor

Construction and Acceptance Phase

1. Facilitate the coordination of the commissioning work by the CA, and with the Contractor and CA ensure that commissioning activities are being scheduled into the master schedule.
2. Furnish a copy of all construction documents, addenda, change orders and approved submittals and shop drawings related to commissioned equipment to the CA.
3. In each purchase order or subcontract written, include requirements for submittal data, O&M data, commissioning tasks and training.
4. Ensure that all Subs execute their commissioning responsibilities according to the Contract Documents and schedule.
5. A representative shall attend a commissioning scoping meeting and other necessary meetings scheduled by the CA to facilitate the Cx process.
6. Coordinate the training of owner personnel.
7. Prepare O&M manuals, according to the Contract Documents, including clarifying and updating the original sequences of operation to as-built conditions.

Warranty Period

1. Ensure that Subs execute seasonal or deferred functional performance testing, witnessed by the CA, according to the specifications.
2. Ensure that Subs correct deficiencies and make necessary adjustments to O&M manuals and as-built drawings for applicable issues identified in any seasonal testing.

C. Equipment Suppliers

1. Provide all requested submittal data, including detailed start-up procedures and specific responsibilities of the Owner to keep warranties in force.
2. Assist in equipment testing per agreements with Subs.
3. Include all special tools and instruments (only available from vendor, specific to a piece of equipment) required for testing equipment according to these Contract Documents in the base bid price to the Contractor, except for stand-alone datalogging equipment that may be used by the CA.
4. Through the contractors they supply products to, analyze specified products and verify that the designer has specified the newest most updated equipment reasonable for this project's scope and budget.
5. Provide information requested by CA regarding equipment sequence of operation and testing procedures.
6. Review test procedures for equipment installed by factory representatives.

1.6 DEFINITIONS

Acceptance Phase - phase of construction after startup and initial checkout when functional performance tests, O&M documentation review and training occurs.

Approval - acceptance that a piece of equipment or system has been properly installed and is functioning in the tested modes according to the Contract Documents.

Architect / Engineer (A/E) - the architect and engineering consultants who comprise the design team, generally the HVAC mechanical designer/engineer and the electrical designer/engineer.

Commissioning authority (CA) - an independent agent, not otherwise associated with the A/E team members or the Contractor. The CA directs and coordinates the day-to-day commissioning activities

Commissioning Plan - an overall plan, developed after bidding that provides the structure, schedule and coordination planning for the commissioning process.

Control system - the central building energy management control system (or DDC System).

Datalogging - monitoring flows, currents, status, pressures, etc. of equipment using stand-alone dataloggers separate from the control system.

Deferred Functional Tests - FTs that are performed later, after substantial completion, due to partial occupancy, equipment, seasonal requirements, design or other site conditions that disallow the test from being performed.

Deficiency - a condition in the installation or function of a component, piece of equipment or system that is not in compliance with the Contract Documents (that is, does not perform properly or is not complying with the design intent).

Design Intent - a dynamic document that provides the explanation of the ideas, concepts and criteria that are considered to be very important to the owner. It is initially the outcome of the programming and conceptual design phases.

Design Narrative or Design Documentation - sections of either the Design Intent or Basis of Design.

Factory Testing - testing of equipment on-site or at the factory-by-factory personnel with an Owner's representative present.

Functional Performance Test (FT) - test of the dynamic function and operation of equipment and systems using manual (direct observation) or monitoring methods. Functional testing is the dynamic testing of systems (rather than just components) under full operation (e.g., the chiller pump is tested interactively with the chiller functions to see if the pump ramps up and down to maintain the differential pressure setpoint). Systems are tested under various modes, such as during low cooling or heating loads, high loads, component failures, unoccupied, varying outside air temperatures, fire alarm, power failure, etc. The systems are run through all the control system's sequences of operation and components are verified to be responding as the sequences state. Traditional air or water test and balancing (TAB) is not functional testing, in the commissioning sense of the word. TAB's primary work is setting up the system flows and pressures as specified, while functional testing is verifying that which has already been set up. The commissioning authority develops the functional test procedures in a sequential written form, coordinates, oversees and documents the actual testing, which is usually performed by the installing contractor or vendor. FTs are performed after pre-functional checklists and startup are complete.

Indirect Indicators - indicators of a response or condition, such as a reading from a control system screen reporting a damper to be 100% closed.

Manual Test - using hand-held instruments, immediate control system readouts or direct observation to verify performance (contrasted to analyzing monitored data taken over time to make the "observation").

Monitoring - the recording of parameters (flow, current, status, pressure, etc.) of equipment operation using dataloggers or the trending capabilities of control systems.

Non-Compliance - see Deficiency.

Non-Conformance - see Deficiency.

Over-written Value - writing over a sensor value in the control system to see the response of a system (e.g., changing the outside air temperature value from 50F to 75F to verify economizer operation). See also "Simulated Signal."

Owner-Contracted Tests - tests paid for by the Owner outside the GC's contract and for which the CA does not oversee. These tests will not be repeated during functional tests if properly documented.

Phased Commissioning - commissioning that is completed in phases (by floors, for example) due to the size of the structure or other scheduling issues, in order minimize the total construction time.

Pre-functional Checklist (PC) - a list of items to inspect and elementary component tests to conduct to verify proper installation of equipment, provided by the CA to the Sub. Pre-functional checklists are primarily static inspections and procedures to prepare the equipment or system for initial operation (e.g., belt tension, oil levels OK, labels affixed, gages in place, sensors calibrated, etc.). However, some pre-functional checklist items entail simple testing of the function of a component, a piece of equipment or system (such as measuring the voltage imbalance on a three-phase pump motor of a chiller system). The word pre-functional refers to before functional testing. Prefunctional checklists augment and are combined with the manufacturer's start-up checklist. Even without a commissioning process, contractors typically perform some, if not many, of the pre-functional checklist items a commissioning authority will recommend. However, few contractors document in writing the execution of these checklist items. Therefore, for most equipment, the contractors execute the checklists on their own. The commissioning authority only requires that the procedures be documented in writing, and does not witness much of the pre-functional checklisting, except for larger or more critical pieces of equipment.

Project Manager (PM) - the contracting and managing authority for the owner over the design and/or construction of the project, a staff position.

Sampling. - functionally testing only a fraction of the total number of identical or near identical pieces of equipment. Refer to Section 019113, Part 3.6, F for details.

Seasonal Performance Tests - FT that are deferred until the system(s) will experience conditions closer to their design conditions.

Simulated Condition - condition that is created for the purpose of testing the response of a system (e.g., applying a hair blower to a space sensor to see the response in a VAV box).

Simulated Signal - disconnecting a sensor and using a signal generator to send an amperage, resistance or pressure to the transducer and DDC system to simulate a sensor value.

Startup - the initial starting or activating of dynamic equipment, including executing pre-functional checklists.

Test Procedures - the step-by-step process which must be executed to fulfill the test requirements. The test procedures are developed by the CA.

Test Requirements - requirements specifying what modes and functions, etc. shall be tested. The test requirements are not the detailed test procedures. The test requirements are specified in the Division 23 Specifications.

Trending - monitoring using the building control system.

Vendor - supplier of equipment.

Warranty Period - warranty period for entire project, including equipment components. Warranty begins at Substantial Completion and extends for at least one year, unless specifically noted otherwise in the Contract Documents and accepted submittals.

1.7 SYSTEMS TO BE COMMISSIONED

A. All equipment depicted in mechanical equipment schedules and controls riser diagrams will be commissioned in this project.

PART 2 - PRODUCTS

2.1 TEST EQUIPMENT

A. All standard testing equipment required to perform startup and initial checkout and required functional performance testing shall be provided by the Division contractor for the equipment being tested. For example, the mechanical contractor of Division 23 shall ultimately be responsible for all standard testing equipment for the HVAC system and controls system in Division 23, except for equipment specific to and used by TAB in their commissioning responsibilities.

B. Special equipment, tools and instruments (only available from vendor, specific to a piece of equipment) required for testing equipment, according to these Contract Documents shall be included in the base bid price to the Contractor and left on site, except for stand-alone datalogging equipment that may be used by the CA.

C. Datalogging equipment and software required to test equipment will be provided by the CA, but shall not become the property of the Owner.

D. All testing equipment shall be of sufficient quality and accuracy to test and/or measure system performance with the tolerances specified in the *Specifications.* All equipment shall be calibrated according to the manufacturer's recommended intervals and when dropped or damaged. Calibration tags shall be affixed or certificates readily available.

E. Refer to Section 019113, Part 3.6 E for details regarding equipment that may be required to simulate required test conditions.

PART 3 - EXECUTION

3.1 MEETINGS

A. Scoping Meeting. Within 60 days of commencement of construction, the CA will schedule, plan and conduct a commissioning scoping meeting with the entire commissioning team in attendance.

Meeting minutes will be distributed to all parties by the CA. Information gathered from this meeting will allow the CA to revise the *Commissioning Plan* to its "final" version, which will also be distributed to all parties.

B. Miscellaneous Meetings. Other meetings will be planned and conducted by the CA as construction progresses. These meetings will cover coordination, deficiency resolution and planning issues with particular Subs. The CA will plan these meetings and will minimize unnecessary time being spent by Subs. For large projects, these meetings may be held monthly, until the final 3 months of construction when they may be held as frequently as one per week.

3.2 REPORTING

A. The CA will provide regular reports to the PM, depending on the management structure, with increasing frequency as construction and commissioning progresses. Standard forms are provided and referenced in the *Commissioning Plan.*

B. The CA will regularly communicate with all members of the commissioning team, keeping them apprised of commissioning progress and scheduling changes through memos, progress reports, etc.

C. Testing or review approvals and non-conformance and deficiency reports are made regularly with the review and testing as described in later sections.

D. A final summary report (about four to six pages, not including backup documentation) by the CA will be provided to the PM, focusing on evaluating commissioning process issues and identifying areas where the process could be improved. All acquired documentation, logs, minutes, reports, deficiency lists, communications, findings, unresolved issues, etc., will be compiled in appendices and provided with the summary report. Pre-functional checklists, functional tests and monitoring reports will not be part of the final report, but will be stored in the Commissioning Record in the O&M manuals.

3.3 SUBMITTALS

A. The CA will provide appropriate contractors with a specific request for the type of submittal documentation the CA requires to facilitate the commissioning work. These requests will be integrated into the normal submittal process and protocol of the construction team. At minimum, the request will include the manufacturer and model number, the manufacturer's printed installation and detailed start-up procedures, full sequences of operation, O&M data, performance data, any performance test procedures, control drawings and details of owner contracted tests. In addition, the installation and checkout materials that are actually shipped inside the equipment and the actual field checkout sheet forms to be used by the factory or field technicians shall be submitted to the Commissioning authority. All documentation requested by the CA will be included by the Subs in their O&M manual contributions.

B. The Commissioning authority will review and approve submittals related to the commissioned equipment for conformance to the Contract Documents as it relates to the commissioning process, to the functional performance of the equipment and adequacy for developing test procedures. This review is intended primarily to aid in the development of functional testing procedures and only secondarily to verify compliance with equipment specifications. The Commissioning authority

will notify the, PM or A/E as requested, of items missing or areas that are not in conformance with Contract Documents and which require resubmission.

C. The CA may request additional design narrative from the Controls Contractor, depending on the completeness of the design intent documentation and sequences provided with the Specifications.

D. These submittals to the CA do not constitute compliance for O&M manual documentation. The O&M manuals are the responsibility of the Contractor, though the CA will review and approve them.

3.4 START-UP, PREFUNCTIONAL CHECKLISTS AND INITIAL CHECKOUT

A. The following procedures apply to all equipment to be commissioned, according to Section 1.7, Systems to be Commissioned. Some systems that are not comprised so much of actual dynamic machinery, e.g., electrical system power quality, may have very simplified PCs and startup.

B. General. Pre-functional checklists are important to ensure that the equipment and systems are hooked up and operational. It ensures that functional performance testing (in-depth system checkout) may proceed without unnecessary delays. Each piece of equipment receives full pre-functional checkout. No sampling strategies are used. The pre-functional testing for a given system must be successfully completed prior to formal functional performance testing of equipment or subsystems of the given system.

C. Start-up and Initial Checkout Plan. The CA shall assist the commissioning team members responsible for startup of any equipment in developing detailed start-up plans for all equipment. The primary role of the CA in this process is to ensure that there is written documentation that each of the manufacturer-recommended procedures have been completed. Parties responsible for pre-functional checklists and startup are identified in the commissioning scoping meeting and in the checklist forms. Parties responsible for executing functional performance tests are identified in the testing requirements in Section 230800.

1. The CA develops, if necessary, the representative pre-functional checklists based on the examples provided in this Section 019113. These checklists indicate required procedures to be executed as part of startup and initial checkout of the systems and the party responsible for their execution. The checklists will be provided as part of the *Commissioning Plan – Construction Phase*.
2. These checklists and tests are provided by the CA to the Contractor. The Contractor determines which trade is responsible for executing and documenting each of the line item tasks and notes that trade on the form. Each form will have more than one trade responsible for its execution.
3. The subcontractor responsible for the purchase of the equipment develops the full start-up plan by combining (or adding to) the CA's checklists with the manufacturer's detailed start-up and checkout procedures from the O&M manual and the normally used field checkout sheets. The plan will include checklists and procedures with specific boxes or lines for recording and documenting the checking and inspections of each procedure and a summary statement with a signature block at the end of the plan.

   The full start-up plan could consist of something as simple as:
   a. The CA's pre-functional checklists.

b. The manufacturer's standard written start-up procedures copied from the installation manuals with check boxes by each procedure and a signature block added by hand at the end.
c. The manufacturer's normally used field checkout sheets.

4. The subcontractor submits the full startup plan to the CA for review and approval.
5. The CA reviews and approves the procedures and the format for documenting them, noting any procedures that need to be added.
6. The full start-up procedures and the approval form may be provided to the A/E or PM for review and approval, depending on management protocol.

D. Sensor and Actuator Calibration.

All field-installed temperature, relative humidity, CO_2 and pressure sensors and gages, and all actuators (dampers and valves) on all equipment shall be calibrated using the methods described below. Alternate methods may be used, if approved by the Owner before-hand. All test instruments shall have had a certified calibration within the last 12 months. Sensors installed *in* the unit at the factory with calibration certification provided need not be field calibrated.

All procedures used shall be fully documented on the pre-functional checklists or other suitable forms, clearly referencing the procedures followed and written documentation of initial, intermediate and final results.

Sensor Calibration Methods

All Sensors. Verify that all sensor locations are appropriate and away from causes of erratic operation. Verify that sensors with shielded cable, are grounded only at one end. For sensor pairs that are used to determine a temperature or pressure difference, make sure they are reading within 0.2°F of each other for temperature and within a tolerance equal to 2% of the reading, of each other, for pressure. Tolerances for critical applications may be tighter.

Sensors Without Transmitters--Standard Application. Make a reading with a calibrated test instrument within 6 inches of the site sensor. Verify that the sensor reading (via the permanent thermostat, gage or building automation system (BAS)) is within the tolerances in the table below of the instrument-measured value. If not, install offset in BAS, calibrate or replace sensor.

Sensors With Transmitters--Standard Application. Disconnect sensor. Connect a signal generator in place of sensor. Connect ammeter in series between transmitter and BAS control panel. Using manufacturer's resistance-temperature data, simulate minimum desired temperature. Adjust transmitter potentiometer zero until 4 mA or 0 VDC is read by the ammeter/voltmeter. Repeat for the maximum temperature matching 20 mA or 10VDC to the potentiometer span or maximum and verify at the BAS. Record all values and recalibrate controller as necessary to conform with specified control ramps, reset schedules, proportional relationship, reset relationship and P/I reaction. Reconnect sensor. Make a reading with a calibrated test instrument within 6 inches of the site sensor. Verify that the sensor reading (via the permanent thermostat, gage or building automation system (BAS)) is within the tolerances in the table below of the instrument-measured value. If not, replace sensor and repeat. For pressure sensors, perform a similar process with a suitable signal generator.

Critical Applications. For critical applications (process, manufacturing, etc.) more rigorous calibration techniques may be required for selected sensors. Describe any such methods used on an attached sheet.

Tolerances, Standard Applications

Sensor	Required Tolerance (+/-)	Sensor	Required Tolerance (+/-)
Cooling coil, chilled and condenser water temps	0.4F	Flow rates, water	4% of design
AHU wet bulb or dew point	2.0F	Relative humidity	2% of design
Hot water coil and boiler water temp	1.0F		
Outside air, space air, duct air temps	0.4F		
CO_2 monitor	0.1 % pts		
Pressures, air, water and gas	3% of design		

Valve and Damper Stroke Setup and Check
EMS Readout. For all valve and damper actuator positions checked, verify the actual position against the BAS readout.
Set pumps or fans to normal operating mode. Command valve or damper closed, visually verify that valve or damper is closed and adjust output zero signal as required. Command valve or damper open, verify position is full open and adjust output signal as required. Command valve or damper to a few intermediate positions.
Closure for heating coil valves (NO): Set heating setpoint 20°F above room temperature. Observe valve open. Remove control air or power from the valve and verify that the valve stem and actuator position do not change. Restore to normal. Set heating setpoint to 20°F below room temperature. Observe the valve close. Restore to normal.

Closure for cooling coil valves (NC): Set cooling setpoint 20°F above room temperature. Observe the valve close. Remove control air or power from the valve and verify that the valve stem and actuator position do not change. Restore to normal. Set cooling setpoint to 20°F below room temperature. Observe valve open. Restore to normal.

E. Execution of Pre-functional Checklists and Startup.

1. Four weeks prior to startup, the Subs and vendors schedule startup and checkout with the, Contractor and CA. The performance of the pre-functional checklists, startup and checkout are directed and executed by the Sub or vendor. When checking off pre-functional checklists, signatures may be required of other Subs for verification of completion of their work.
2. The CA shall observe, at minimum, the procedures for each piece of primary equipment, unless there are multiple units, (in which case a sampling strategy may be used as approved by the A/E). In no case will the number of units witnessed be less than four on any one building, nor less than 20% of the total number of identical or very similar units.
3. For lower-level components of equipment, (e.g., VAV boxes, sensors, controllers), the CA shall observe a sampling of the pre-functional and start-up procedures. The sampling procedures shall be identified in the commissioning plan.

4. The Subs and vendors shall execute startup and provide the CA with a signed and dated copy of the completed start-up and pre-functional tests and checklists.
5. Only individuals that have direct knowledge and witnessed that a line item task on the pre-functional checklist was actually performed shall initial or check that item off. It is not acceptable for witnessing supervisors to fill out these forms.

F. Deficiencies, Non-Conformance and Approval in Checklists and Startup.

1. The Subs shall clearly list any outstanding items of the initial start-up and pre-functional procedures that were not completed successfully, at the bottom of the procedures form or on an attached sheet. The procedures form and any outstanding deficiencies are provided to the CA within two days of test completion.
2. The CA reviews the report and submits either a non-compliance report or an approval form to the Sub or PM. The CA shall work with the Subs and vendors to correct and retest deficiencies or uncompleted items. The CA will involve the Contractor and others as necessary. The installing Subs or vendors shall correct all areas that are deficient or incomplete in the checklists and tests in a timely manner, and shall notify the CA as soon as outstanding items have been corrected and resubmit an updated start-up report and a Statement of Correction on the original non-compliance report. When satisfactorily completed, the CA recommends approval of the execution of the checklists and startup of each system to the Contractor using a standard form.
3. Items left incomplete, which later cause deficiencies or delays during functional testing may result in backcharges to the responsible party. Refer to Part 3.7 herein for details.

3.5 PHASED COMMISSIONING

A. Phasing will be planned and scheduled, if necessary, in a coordination meeting of the CA, , mechanical, TAB and controls and the Contractor. Results will be added to the master and commissioning schedule.

3.6 FUNCTIONAL PERFORMANCE TESTING

A. This sub-section applies to all commissioning functional testing for all divisions.

B. The general list of equipment to be commissioned is found in Section 019113, Part 1.7. The specific equipment and modes to be tested are found in the Division 23 Sections

C. The parties responsible to execute each test are listed with each test in Section 230800

D. Objectives and Scope. The objective of functional performance testing is to demonstrate that each system is operating according to the documented design intent and Contract Documents. Functional testing facilitates bringing the systems from a state of substantial completion to full dynamic operation. Additionally, during the testing process, areas of deficient performance are identified and corrected, improving the operation and functioning of the systems.

In general, each system should be operated through all modes of operation (seasonal, occupied, unoccupied, warm-up, cool-down, part- and full-load) where there is a specified system response. Verifying each sequence in the sequences of operation is required. Proper responses to such modes and conditions as power failure, freeze condition, low oil pressure, no flow, equipment

failure, etc. shall also be tested. Specific modes required in this project are given in the Division 23 Sections .

E. Development of Test Procedures. Before test procedures are written, the CA shall obtain all requested documentation and a current list of change orders affecting equipment or systems, including an updated points list, program code, control sequences and parameters. Using the testing parameters and requirements in Division 23 , the CA shall develop specific test procedures and forms to verify and document proper operation of each piece of equipment and system. Each Sub or vendor responsible to execute a test, shall provide limited assistance to the CA in developing the procedures review (answering questions about equipment, operation, sequences, etc.). Prior to execution, the CA shall provide a copy of the test procedures to the Sub(s) who shall review the tests for feasibility, safety, equipment and warranty protection. The CA may submit the tests to the A/E for review, if requested.

The CA shall review owner-contracted, factory testing or required owner acceptance tests which the CA is not responsible to oversee, including documentation format, and shall determine what further testing or format changes may be required to comply with the *Specifications*. Redundancy of testing shall be minimized.

The purpose of any given specific test is to verify and document compliance with the stated criteria of acceptance given on the test form.

The test procedure forms developed by the CA shall include (but not be limited to) the following information:

1. System and equipment or component name(s)
2. Equipment location and ID number
3. Unique test ID number, and reference to unique pre-functional checklist and start-up documentation ID numbers for the piece of equipment
4. Date
5. Project name
6. Participating parties
7. A copy of the specification section describing the test requirements
8. A copy of the specific sequence of operations or other specified parameters being verified
9. Formulas used in any calculations
10. Required pre-test field measurements
11. Instructions for setting up the test.
12. Special cautions, alarm limits, etc.
13. Specific step-by-step procedures to execute the test, in a clear, sequential and repeatable format
14. Acceptance criteria of proper performance with a Yes / No check box to allow for clearly marking whether or not proper performance of each part of the test was achieved.
15. A section for comments
16. Signatures and date block for the CA

F. Test Methods.

1. Functional performance testing and verification may be achieved by manual testing (persons manipulate the equipment and observe performance) or by monitoring the performance and

analyzing the results using the control system's trend log capabilities or by stand-alone dataloggers. Division 23 sections specify which methods shall be used for each test. The CA may substitute specified methods or require an additional method to be executed, other than what was specified, with the approval of the A/E. This may require a change order and adjustment in charge to the Owner. The CA will determine which method is most appropriate for tests that do not have a method specified.

2. Simulated Conditions. Simulating conditions (not by an overwritten value) shall be allowed, though timing the testing to experience actual conditions is encouraged wherever practical.
3. Overwritten Values. Overwriting sensor values to simulate a condition, such as overwriting the outside air temperature reading in a control system to be something other than it really is, shall be allowed, but shall be used with caution and avoided when possible. Such testing methods often can only test a part of a system, as the interactions and responses of other systems will be erroneous or not applicable. Simulating a condition is preferable. e.g., for the above case, by heating the outside air sensor with a hair blower rather than overwriting the value or by altering the appropriate setpoint to see the desired response. Before simulating conditions or overwriting values, sensors, transducers and devices shall have been calibrated.
4. Simulated Signals. Using a signal generator which creates a simulated signal to test and calibrate transducers and DDC constants is generally recommended over using the sensor to act as the signal generator via simulated conditions or overwritten values.
5. Altering Setpoints. Rather than overwriting sensor values, and when simulating conditions is difficult, altering setpoints to test a sequence is acceptable. For example, to see the AC compressor lockout work at an outside air temperature below 55F, when the outside air temperature is above 55F, temporarily change the lockout setpoint to be 2F above the current outside air temperature.
6. Indirect Indicators. Relying on indirect indicators for responses or performance shall be allowed only after visually and directly verifying and documenting, over the range of the tested parameters, that the indirect readings through the control system represent actual conditions and responses. Much of this verification is completed during pre-functional testing.
7. Setup. Each function and test shall be performed under conditions that simulate actual conditions as close as is practically possible. The Sub executing the test shall provide all necessary materials, system modifications, etc. to produce the necessary flows, pressures, temperatures, etc. necessary to execute the test according to the specified conditions. At completion of the test, the Sub shall return all affected building equipment and systems, due to these temporary modifications, to their pre-test condition.
8. Sampling. Multiple identical pieces of non-life-safety or otherwise non-critical equipment may be functionally tested using a sampling strategy. Significant application differences and significant sequence of operation differences in otherwise identical equipment invalidates their common identity. A small size or capacity difference, alone, does not constitute a difference. It is noted that no sampling by Subs is allowed in pre-functional checklist execution.

   A common sampling strategy referenced in the *Specifications* as the "xx% Sampling—yy% Failure Rule" is defined by the following example.

   xx = the percent of the group of identical equipment to be included in each sample.
   yy = the percent of the sample that if failing, will require another sample to be tested.

   The example below describes a 20% Sampling—10% Failure Rule.

a. Randomly test at least 20% (xx) of each group of identical equipment. In no case test less than three units in each group. This 20%, or three, constitute the "first sample."
b. If 10% (yy) of the units in the first sample fail the functional performance tests, test another 20% of the group (the second sample).
c. If 10% of the units in the second sample fail, test all remaining units in the whole group.
d. If at any point, frequent failures are occurring and testing is becoming more troubleshooting than verification, the CA may stop the testing and require the responsible Sub to perform and document a checkout of the remaining units, prior to continuing with functionally testing the remaining units.

G. Coordination and Scheduling. The Subs shall provide sufficient notice to the CA regarding their completion schedule for the pre-functional checklists and startup of all equipment and systems. The CA will schedule functional tests through the, Contractor. The CA shall direct, witness and document the functional testing of all equipment and systems. The Subs shall execute the tests.

In general, functional testing is conducted after pre-functional testing and startup has been satisfactorily completed. The control system is sufficiently tested and approved by the CA before it is used for TAB or to verify performance of other components or systems. The air balancing and water balancing is completed and debugged before functional testing of air-related or water-related equipment or systems. Testing proceeds from components to subsystems to systems. When the proper performance of all interacting individual systems has been achieved, the interface or coordinated responses between systems is checked.

H. Test Equipment. Refer to Section 019113, Part 2.1 for test equipment requirements.

3.7 DOCUMENTATION, NON-CONFORMANCE AND APPROVAL OF TESTS

A. Documentation. The CA shall witness and document the results of all functional performance tests using the specific procedural forms developed for that purpose. Prior to testing, these forms are provided to the Contractor for review and approval. The CA will include the filled out forms in the O&M manuals.

B. Non-Conformance.

1. The CA will record the results of the functional test on the procedure or test form. All deficiencies or non-conformance issues shall be noted and reported to the Contractor on a standard non-compliance form.
2. Corrections of minor deficiencies identified may be made during the tests at the discretion of the CA. In such cases the deficiency and resolution will be documented on the procedure form.
3. Every effort will be made to expedite the testing process and minimize unnecessary delays, while not compromising the integrity of the procedures. However, the CA will not be pressured into overlooking deficient work or loosening acceptance criteria to satisfy scheduling or cost issues, unless there is an overriding reason to do so at the request of the PM.

4. As tests progress and a deficiency is identified, the CA discusses the issue with the executing contractor.
   a. When there is no dispute on the deficiency and the Sub accepts responsibility to correct it:
      1) The CA documents the deficiency and the Sub's response and intentions and they go on to another test or sequence. After the day's work, the CA submits the non-compliance reports to the Contractor for signature, if required. A copy is provided to the Sub and CA. The Sub corrects the deficiency, signs the statement of correction at the bottom of the non-compliance form certifying that the equipment is ready to be retested and sends it back to the CA.
      2) The CA reschedules the test and the test is repeated.

   b. If there is a dispute about a deficiency, regarding whether it is a deficiency or who is responsible:
      1) The deficiency shall be documented on the non-compliance form with the Sub's response and a copy given to the GC and to the Sub representative assumed to be responsible.
      2) Resolutions are made at the lowest management level possible. Other parties are brought into the discussions as needed. Final interpretive authority is with the A/E.
      3) The CA documents the resolution process.
      4) Once the interpretation and resolution have been decided, the appropriate party corrects the deficiency, signs the statement of correction on the non-compliance form and provides it to the CA. The CA reschedules the test and the test is repeated until satisfactory performance is achieved.

5. Cost of Retesting.

   a. The cost to retest a pre-functional or functional test, if the Contractor is responsible for the deficiency, shall be born by the Contractor.
   b. For a deficiency identified, not related to any pre-functional checklist or start-up fault, the following shall apply: The CA will direct the retesting of the equipment once at no "charge" to the GC for their time. However, the CA's time for a second retest will be charged to the GC, who may choose to recover costs from the responsible Sub.
   c. The time for the CA to direct any retesting required because a specific *pre-functional* checklist or start-up test item, reported to have been successfully completed, but determined during functional testing to be faulty, will be backcharged to the Contractor,.
   d. Refer to the sampling section of 019113, Part 3.6 for requirements for testing and retesting identical equipment.

6. The Contractor shall respond in writing to the CA at least as often as commissioning meetings are being scheduled concerning the status of each apparent outstanding discrepancy identified during commissioning. Discussion shall cover explanations of any disagreements and proposals for their resolution.
7. The CA retains the original non-conformance forms until the end of the project.
8. Any required retesting by any contractor shall not be considered a justified reason for a claim of delay or for a time extension by the prime contractor.

C. Failure Due to Manufacturer Defect. If 10%, or three, whichever is greater, of identical pieces (size alone does not constitute a difference) of equipment fail to perform to the Contract Documents (mechanically or substantively) due to manufacturing defect, not allowing it to meet its submitted performance spec, all identical units may be considered unacceptable by the A/E. In such case, the Contractor shall provide the A/E with the following:

a. Within one week of notification from the A/E, the Contractor or manufacturer's representative shall examine all other identical units making a record of the findings. The findings shall be provided to the A/E within two weeks of the original notice.
b. Within two weeks of the original notification, the Contractor or manufacturer shall provide a signed and dated, written explanation of the problem, cause of failures, etc. and all proposed solutions which shall include full equipment submittals. The proposed solutions shall not significantly exceed the specification requirements of the original installation.
c. The A/E will determine whether a replacement of all identical units or a repair is acceptable.
d. Two examples of the proposed solution will be installed by the Contractor and the CA will test the installations for up to one week, upon which the A/E will decide whether to accept the solution. The Contractor will be responsible for the cost of such testing.
e. Upon acceptance, the Contractor and/or manufacturer shall replace or repair all identical items, at their expense and extend the warranty accordingly, if the original equipment warranty had begun. The replacement/repair work shall proceed with reasonable speed beginning within one week from when parts can be obtained.

D. Approval. The CA notes each satisfactorily demonstrated function on the test form. Formal approval of the functional test is made later after review by the CA, if necessary. The CA recommends acceptance of each test to the A/E using a standard form. The A/E gives final approval on each test using the same form, providing a signed copy to the CA and the Contractor.

3.8. OPERATION AND MAINTENANCE MANUALS

A. Standard O&M Manuals.

1. The specific content and format requirements for the standard O&M manuals are detailed in Section 017823. Special requirements for the controls contractor and TAB contractor are found Section 230800

2. CA Review and Approval. Prior to substantial completion, the CA shall review the O&M manuals, documentation and redline as-builds *for systems that were commissioned* and to verify compliance with the *Specifications*. The CA will communicate deficiencies in the manuals to the, PM or A/E, as requested. Upon a successful review of the corrections, the CA recommends approval and acceptance of these sections of the O&M manuals to the PM or A/E. The CA also reviews each equipment warranty and verifies that all requirements to keep the warranty valid are clearly stated. This work does not supersede the A/E's review of the O&M manuals according to the A/E's contract.

B. Commissioning Record in O&M Manuals.

1. The CA is responsible to compile, organize and index the following commissioning data by equipment into labeled, indexed and tabbed, three-ring binders and deliver it to the

Contractor, to be included with the O&M manuals. Three copies of the manuals will be provided. The format of the manuals shall be:

Tab I-1 Commissioning Plan
Tab I-2 Final Commissioning Report (see (B.2) below)
Tab 01 System Type 1 (chiller system, packaged unit, boiler system, etc.)
Sub-Tab A Design narrative and criteria, sequences, approvals for Equipment 1

Sub-Tab B Startup plan and report, approvals, corrections, blank pre-functional checklists

Colored Separator Sheets—for each equipment type (fans, pumps, chiller, etc.)

Sub-Tab C Functional tests (completed), trending and analysis, approvals and corrections, training plan, record and approvals, blank functional test forms and a recommended recommissioning schedule.
Tab 02 System Type 2.....repeat as per System 1

2. Final Report Details. The final commissioning report shall include an executive summary, list of participants and roles, brief building description, overview of commissioning and testing scope and a general description of testing and verification methods. For each piece of commissioned equipment, the report should contain the disposition of the commissioning authority regarding the adequacy of the equipment, documentation and training meeting the contract documents in the following areas: 1) Equipment meeting the equipment specifications, 2) Equipment installation, 3) Functional performance and efficiency, 4) Equipment documentation and design intent, and 5) Operator training. All outstanding non-compliance items shall be specifically listed. Recommendations for improvement to equipment or operations, future actions, commissioning process changes, etc. shall also be listed. Each non-compliance issue shall be referenced to the specific functional test, inspection, trend log, etc. where the deficiency is documented. The functional performance and efficiency section for each piece of equipment shall include a brief description of the verification method used (manual testing, BAS trend logs, data loggers, etc.) and include observations and conclusions from the testing.

3. Other documentation will be retained by the CA.

3.9 TRAINING OF OWNER PERSONNEL

A. The Contractor shall be responsible for training coordination and scheduling and ultimately for ensuring that training is completed.
B. The CA shall be responsible for overseeing and approving the content and adequacy of the training of Owner personnel for commissioned equipment.

1. The CA shall interview the facility manager and lead engineer to determine the special needs and areas where training will be most valuable. The Owner and CA shall decide how rigorous the training should be for each piece of commissioned equipment. The CA shall communicate the results to the Subs and vendors who have training responsibilities.
2. In addition to these general requirements, the specific training requirements of Owner personnel by Subs and vendors is specified in Divisions 23 and 26. .

3. Each Sub and vendor responsible for training will submit a written training plan to the CA for review and approval prior to training. The plan will cover the following elements:
   a. Equipment (included in training)
   b. Intended audience
   c. Location of training
   d. Objectives
   e. Subjects covered (description, duration of discussion, special methods, etc.)
   f. Duration of training on each subject
   g. Instructor for each subject
   h. Methods (classroom lecture, video, site walk-through, actual operational demonstrations, written handouts, etc.)
   i. Instructor and qualifications
4. For the primary HVAC equipment, the Controls Contractor shall provide a short discussion of the control of the equipment during the mechanical or electrical training conducted by others.
5. The CA develops an overall training plan and coordinates and schedules, with the Contractor, the overall training for the commissioned systems. The CA develops criteria for determining that the training was satisfactorily completed, including attending some of the training, etc. The CA recommends approval of the training to the A/E using a standard form. The PM also signs the approval form.
6. At one of the training sessions, the CA will give a presentation discussing the use of the blank functional test forms for re-commissioning equipment.
7. Video taping of the training sessions will be provided by the CA with tapes cataloged by the CA and added to the O&M manuals.
8. The mechanical design engineer shall at the first training session present the overall system design concept and the design concept of each equipment section. This presentation shall include a review of all systems using the simplified system schematics (one-line drawings).

3.10 DEFERRED TESTING

A. Unforeseen Deferred Tests. If any check or test cannot be completed due to the building structure, required occupancy condition or other deficiency, execution of checklists and functional testing may be delayed upon approval of the A/E. These tests will be conducted in the same manner as the seasonal tests as soon as possible. Services of necessary parties will be negotiated.

B. Seasonal Testing. During the warranty period, seasonal testing (tests delayed until weather conditions are closer to the system's design) of heating or refrigeration equipment shall be completed as part of this contract. The CA shall coordinate this activity. Tests will be executed, documented and deficiencies corrected by the appropriate Subs, with facilities staff and the CA witnessing. Any final adjustments to the O&M manuals and as-builds due to the testing will be made.

3.11 WRITTEN WORK PRODUCTS

A. The commissioning process generates a number of written work products described in various parts of the *Specifications.* The *Commissioning Plan—Construction Phase,* lists all the formal written work products, describes briefly their contents, who is responsible to create them, their due

dates, who receives and approves them and the location of the specification to create them. In summary, the written products are:

Product	Developed By
1. Final commissioning plan	CA
2. Meeting minutes	CA
3. Commissioning schedules	CA with Contractor
4. Equipment documentation submittals	Subs
5. Sequence clarifications	Subs and A/E as needed
6. Pre-functional checklists	CA (already in Specs)
Product	Developed By
7. Startup and initial checkout plan	Subs and CA (compilation of existing documents)
8. Startup and initial checkout forms filled out	Subs
9. Final TAB report	TAB
10. Issues log (deficiencies)	CA
11. Commissioning Progress Record	CA
12. Deficiency reports	CA
13. Functional test forms	CA
14. Commissioning Specifications	CA
15. Filled out functional tests	CA
16. O&M manuals	Subs
17. Commissioning record book	CA
18. Overall training plan	CA
19. Specific training agendas	Subs
20. Final commissioning report	CA
21. Misc. approvals	CA

END OF COMMISSIONING REQUIREMENTS

SECTION 230500

BASIC MECHANICAL MATERIALS AND METHODS

PART 1 - GENERAL

1.1 SUMMARY

A. Work Included: Provide basic mechanical materials and methods in accordance with the Contract Documents. The "General Conditions Governing All Contracts" shall apply to all work under the contract. The work of this section shall include, but not be limited to, the following:
   1. HVAC demolition.
   2. Equipment installation requirements common to equipment sections.
   3. Painting and finishing.
   4. Concrete bases.
   5. Supports and anchorages.

1.2 DEFINITIONS

A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct chases, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.

B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.

C. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.

D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and chases.

E. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.

PART 2 - EXECUTION

2.1 HVAC DEMOLITION

A. Disconnect, demolish, and remove HVAC systems, equipment, and components indicated to be removed.
   1. Ducts to Be Removed: Remove portion of ducts indicated to be removed and plug remaining ducts with same or compatible ductwork material.
   2. Ducts to Be Abandoned in Place: Cap or plug ducts with same or compatible ductwork material.
   3. Equipment to Be Removed: Disconnect and cap services and remove equipment.
   4. Equipment to Be Removed and Reinstalled: Disconnect and cap services and remove, clean, and store equipment; when appropriate, reinstall, reconnect, and make equipment operational.

5. Equipment to Be Removed and Salvaged: Disconnect and cap services and remove equipment and deliver to the City of New York.

B. If pipe, insulation, or equipment to remain is damaged in appearance or is unserviceable, remove damaged or unserviceable portions and replace with new products of equal capacity and quality.

2.2 EQUIPMENT INSTALLATION - COMMON REQUIREMENTS

A. Install equipment to allow maximum possible headroom unless specific mounting heights are not indicated.

B. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, unless otherwise indicated.

C. Install HVAC equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference to other installations. Extend grease fittings to accessible locations.

D. Install equipment to allow right of way for piping installed at required slope.

2.3 PAINTING

A. Painting of HVAC systems, equipment, and components is specified in Division 9 Sections "Interior Painting" and "Exterior Painting."

B. Damage and Touchup: Repair marred and damaged factory-painted finishes with materials and procedures to match original factory finish.

2.4 CONCRETE BASES

A. Concrete Bases: Anchor equipment to concrete base according to equipment manufacturer's written instructions and according to seismic codes at Project.

1. Construct concrete bases of dimensions indicated, but not less than 4 inches (100 mm) larger in both directions than supported unit.
2. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch (450-mm) centers around the full perimeter of the base.
3. Install epoxy-coated anchor bolts for supported equipment that extend through concrete base, and anchor into structural concrete floor.
4. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
5. Install anchor bolts to elevations required for proper attachment to supported equipment.
6. Install anchor bolts according to anchor-bolt manufacturer's written instructions.
7. Use 3000-psi (20.7-MPa) 28-day compressive-strength concrete and reinforcement as specified in Division 3 Section "Cast-in-Place Concrete."

2.5 ERECTION OF METAL SUPPORTS AND ANCHORAGES

A. Refer to Division 5 Section "Metal Fabrications" for structural steel.

B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor HVAC materials and equipment.

C. Field Welding: Comply with AWS D1.1.

2.6 ERECTION OF WOOD SUPPORTS AND ANCHORAGES

A. Cut, fit, and place wood grounds, nailers, blocking, and anchorages to support, and anchor HVAC materials and equipment.

B. Select fastener sizes that will not penetrate members if opposite side will be exposed to view or will receive finish materials. Tighten connections between members. Install fasteners without splitting wood members.

C. Attach to substrates as required to support applied loads.

END OF SECTION

SECTION 230517 - SLEEVES AND SLEEVE SEALS FOR HVAC PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Sleeves without waterstop.
2. Sleeves with waterstop.
3. Sleeve-seal systems.
4. Grout.
5. Silicone sealants.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.3 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

PART 2 - PRODUCTS

2.1 SLEEVES WITHOUT WATERSTOP

A. Cast-Iron Pipe Sleeves: Cast or fabricated of cast or ductile iron and equivalent to ductile-iron pressure pipe, with plain ends.

B. Steel Pipe Sleeves: ASTM A53/A53M, Type E, Grade B, Schedule 40, hot-dip galvanized, with plain ends.

C. Steel Sheet Sleeves: ASTM A653/A653M, 0.0239-inch minimum thickness; hot-dip galvanized, round tube closed with welded longitudinal joint.

D. PVC Pipe Sleeves: ASTM D1785, Schedule 40.

2.2 SLEEVES WITH WATERSTOP

A. Description: Manufactured PVC/HDPE, sleeve-type, waterstop assembly, made for imbedding in concrete slab or wall.

B. Description: Manufactured, Dura-coated or Duco-coated cast-iron sleeve with integral cast flashing flange for use in waterproof floors and roofs. Include clamping ring, bolts, and nuts for membrane flashing.

1. Underdeck Clamp: Clamping ring with setscrews.

2.3 SLEEVE-SEAL SYSTEMS

A. Description: Modular sealing-element unit, designed for field assembly, for filling annular space between piping and sleeve.

1. Designed to form a hydrostatic seal of 20 psig.
2. Sealing Elements: EPDM-rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size.
3. Pressure Plates: Stainless steel.
4. Connecting Bolts and Nuts: Stainless steel of length required to secure pressure plates to sealing elements.

2.4 GROUT

A. Description: Nonshrink, for interior and exterior sealing openings in non-fire-rated walls or floors.

B. Standard: ASTM C1107/C1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.

C. Design Mix: 5000 psi, 28-day compressive strength.

D. Packaging: Premixed and factory packaged.

2.5 SILICONE SEALANTS

A. Silicone, S, NS, 25, NT: Single-component, nonsag, plus 25 percent and minus 25 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant.
1. Standard: ASTM C920, Type S, Grade NS, Class 25, Use NT.

B. Silicone, S, P, T, NT: Single-component, 25, pourable, movement capability, traffic- and nontraffic-use, neutral-curing silicone joint sealant.
1. Standard: ASTM C920, Type S, Grade P, Class 25, Uses T and NT.

PART 3 - EXECUTION

3.1 INSTALLATION OF SLEEVES - GENERAL

A. Install sleeves for piping passing through penetrations in floors, partitions, roofs, and walls.

B. For sleeves that will have sleeve-seal system installed, select sleeves of size large enough to provide 1-inch annular clear space between piping and concrete slabs and walls.

1. Sleeves are not required for core-drilled holes.

C. Install sleeves in concrete floors, concrete roof slabs, and concrete walls as new slabs and walls are constructed.

1. Permanent sleeves are not required for holes in slabs formed by molded-PE or -PP sleeves.
2. Cut sleeves to length for mounting flush with both surfaces.

a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches above finished floor level.

3. Using silicone sealant, seal space outside of sleeves in slabs and walls without sleeve-seal system.

D. Install sleeves for pipes passing through interior partitions.

1. Cut sleeves to length for mounting flush with both surfaces.
2. Install sleeves that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation.
3. Seal annular space between sleeve and piping or piping insulation; use sealants appropriate for size, depth, and location of joint.

E. Fire-Resistance-Rated Penetrations, Horizontal Assembly Penetrations, and Smoke-Barrier Penetrations: Maintain indicated fire or smoke rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with fire- and smoke-stop materials. Comply with requirements for firestopping and fill materials specified in Section 078413 "Penetration Firestopping."

3.2 INSTALLATION OF SLEEVES WITH WATERSTOP

A. Install sleeve with waterstop as new walls and slabs are constructed.

B. Assemble fitting components of length to be flush with both surfaces of concrete slabs and walls. Position waterstop flange to be centered in concrete slab or wall.

C. Secure nailing flanges to concrete forms.

D. Using silicone sealant, seal space around outside of sleeves.

3.3 INSTALLATION OF SLEEVE-SEAL SYSTEMS

A. Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at service piping entries into building, and passing through exterior walls.

B. Select type, size, and number of sealing elements required for piping material and size and for sleeve ID or hole size. Position piping in center of sleeve. Center piping in penetration, assemble sleeve-seal-system components, and install in annular space between piping and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make a watertight seal.

3.4 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. Leak Test: After allowing for a full cure, test sleeves and sleeve seals for leaks. Repair leaks and retest until no leaks exist.
2. Sleeves and sleeve seals will be considered defective if they do not pass tests and inspections.

B. Prepare test and inspection reports.

3.5 SLEEVE SCHEDULE

A. Use sleeves and sleeve seals for the following piping-penetration applications:

1. Exterior Concrete Walls above and below Grade:

    a. Sleeves with waterstops.

        1) Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.

2. Concrete Slabs-on-Grade:

    a. Sleeves with waterstops.

        1) Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.

3. Concrete Slabs above Grade:

    a. Sleeves with waterstops.

4. Interior Walls and Partitions:

   a. Sleeves without waterstops.

END OF SECTION 230517

SECTION 230519

METERS AND GAGES FOR HVAC PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Work Included: Provide meter and gages for HVAC piping in accordance with the Contract Documents. The "General Conditions Governing All Contracts" shall apply to all work under the contract. The work of this section shall include, but not be limited to, the following:

1. Liquid-in-glass thermometers.
2. Thermowells.
3. Dial-type pressure gages.
4. Gage attachments.
5. Test plugs.

1.2 DEFINITIONS

A. CR: Chlorosulfonated polyethylene synthetic rubber.

B. EPDM: Ethylene-propylene-diene terpolymer rubber.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated; include performance curves.

PART 2 - PRODUCTS

2.1 METAL-CASE, LIQUID-IN-GLASS THERMOMETERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Flo Fab Inc.
2. Miljoco Corporation.
3. Palmer Wahl Instrumentation Group.
4. Tel-Tru Manufacturing Company.
5. Trerice, H. O. Co.
6. Weiss Instruments, Inc.
7. Winters Instruments - U.S.

B. Standard: ASME B40.200.

C. Case: Cast aluminum; 9-inch (229-mm) nominal size unless otherwise indicated.

D. Case Form: Adjustable angle unless otherwise indicated

E. Glass with magnifying lens and blue or red organic liquid.

F. Tube Background: Nonreflective aluminum with permanently etched scale markings graduated in deg F (deg C).

G. Window: Glass.

H. Stem: Aluminum and of length to suit installation.

1. Design for Air-Duct Installation: With ventilated shroud.
2. Design for Thermowell Installation: Bare stem.

I. Connector: 1-1/4 inches (32 mm), with ASME B1.1 screw threads.

J. Accuracy: Plus or minus 1 percent of scale range or one scale division, to a maximum of 1.5 percent of scale range.

2.2 DUCT-THERMOMETER MOUNTING BRACKETS

A. Description: Flanged bracket with screw holes, for attachment to air duct and made to hold thermometer stem.

2.3 THERMOWELLS

A. Standard: ASME B40.200.

B. Description: Pressure-tight, socket-type fitting made for insertion into piping tee fitting.

C. Material for Use with Copper Tubing: CNR.

D. Material for Use with Steel Piping: CRES.

E. Type: Stepped shank unless straight or tapered shank is indicated.

F. External Threads: NPS 1/2, NPS 3/4, or NPS 1, (DN 15, DN 20, or NPS 25,) ASME B1.20.1 pipe threads.

G. Internal Threads: 1/2, 3/4, and 1 inch (13, 19, and 25 mm), with ASME B1.1 screw threads.

H. Bore: Diameter required to match thermometer bulb or stem.

I. Insertion Length: Length required to match thermometer bulb or stem.

J. Lagging Extension: Include on thermowells for insulated piping and tubing.

K. Bushings: For converting size of thermowell's internal screw thread to size of thermometer connection.

L. Heat-Transfer Medium: Mixture of graphite and glycerin.

2.4 DIRECT-MOUNTED, METAL-CASE, DIAL-TYPE PRESSURE GAGES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. AMETEK, Inc.; U.S. Gauge Div.

2. Ashcroft Inc.
3. Ernst Flow Industries.
4. Flo Fab Inc.
5. Marsh Bellofram.
6. Miljoco Corporation.
7. Noshok.
8. Palmer Wahl Instrumentation Group.
9. REOTEMP Instrument Corporation.
10. Tel-Tru Manufacturing Company.
11. Trerice, H. O. Co.
12. Watts Regulator Co.; a div. of Watts Water Technologies, Inc.
13. Weiss Instruments, Inc.
14. WIKA Instrument Corporation - USA.
15. Winters Instruments - U.S.

B. Standard: ASME B40.100.

C. Case: Sealed type; cast aluminum or drawn steel; 4-1/2-inch (114-mm) nominal diameter.

D. Pressure-Element Assembly: Bourdon tube, unless otherwise indicated.

E. Pressure Connection: Brass, with NPS 1/4 or NPS 1/2 (DN 8 or DN 15), ASME B1.20.1 pipe threads and bottom-outlet type unless back-outlet type is indicated.

F. Movement: Mechanical, with link to pressure element and connection to pointer.

G. Dial: Nonreflective aluminum with permanently etched scale markings graduated in psi (kPa).

H. Pointer: Dark-colored metal.

I. Window: Glass.

J. Ring: Metal, brass, or stainless steel.

K. Accuracy: Grade A, plus or minus 1 percent of middle half of scale range.

2.5 GAGE ATTACHMENTS

A. Siphons: Loop-shaped section of brass or stainless-steel pipe with NPS 1/4 or NPS 1/2 (DN 8 or DN 15) pipe threads.

B. Valves: Brass or stainless-steel needle, with NPS 1/4 or NPS 1/2 (DN 8 or DN 15), ASME B1.20.1 pipe threads.

2.6 TEST PLUGS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Flow Design, Inc.
2. Miljoco Corporation.
3. National Meter, Inc.
4. Peterson Equipment Co., Inc.

5. Sisco Manufacturing Company, Inc.
6. Trerice, H. O. Co.
7. Watts Regulator Co.; a div. of Watts Water Technologies, Inc.
8. Weiss Instruments, Inc.

B. Description: Corrosion-resistant brass or stainless-steel body with core inserts and gasketed and threaded cap, with extended stem for units to be installed in insulated piping.

C. Minimum Pressure and Temperature Rating: 500 psig at 200 deg F (3450 kPa at 93 deg C).

D. Core Inserts: One or two self-sealing rubber valves.

1. Insert material for air, water, oil, or gas service at 20 to 200 deg F (minus 7 to plus 93 deg C) shall be CR.
2. Insert material for air or water service at minus 30 to plus 275 deg F (minus 35 to plus 136 deg C) shall be EPDM.

E. Test Kit: Furnish one test kit containing one pressure gage and adaptor, one thermometer, and carrying case. Pressure gage, adapter probes, and thermometer sensing elements shall be of diameter to fit test plugs and of length to project into piping.

1. Pressure Gage: Small bourdon-tube insertion type with 2- to 3-inch- (51- to 76-mm-) diameter dial and probe. Dial range shall be 0 to 200 psig (0 to 1380 kPa).
2. High-Range Thermometer: Small bimetallic insertion type with 1- to 2-inch- (25- to 51-mm-) diameter dial and tapered-end sensing element. Dial ranges shall be 0 to 220 deg F (minus 18 to plus 104 deg C).
3. Carrying case shall have formed instrument padding.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install thermowells with socket extending to center of pipe and in vertical position in piping tees.

B. Install thermowells of sizes required to match thermometer connectors. Include bushings if required to match sizes.

C. Install thermowells with extension on insulated piping.

D. Fill thermowells with heat-transfer medium.

E. Install direct-mounted thermometers in thermowells and adjust vertical and tilted positions.

F. Install remote-mounted thermometer bulbs in thermowells and install cases on panels; connect cases with tubing and support tubing to prevent kinks. Use minimum tubing length.

G. Install duct-thermometer mounting brackets in walls of ducts. Attach to duct with screws.

H. Install direct-mounted pressure gages in piping tees with pressure gage located on pipe at the most readable position.

I. Install remote-mounted pressure gages on panel.

J. Install valve in piping for each pressure gage for fluids (except steam).

K. Install valve and syphon fitting in piping for each pressure gage for steam.

L. Install test plugs in piping tees.

M. Install liquid-in-glass thermometers in the following locations:

1. Inlet and outlet of each hydronic zone.
2. Inlet and outlet of each hydronic coil in air-handling units.
3. Outside-, return-, supply-, and mixed-air ducts.

N. Provide the following temperature ranges for thermometers:

1. Heating Hot Water: 0 to 250 deg F (0 to 150 deg C).
2. Condenser Water: 0 to 150 deg F (Minus 20 to plus 70 deg C).
3. Chilled Water: 0 to 150 deg F (Minus 20 to plus 70 deg C).
4. Air Ducts: Minus 40 to plus 110 deg F (Minus 40 to plus 45 deg C).

O. Install dial-type pressure gages in the following locations:

1. Discharge of each pressure-reducing valve.
2. Suction and discharge of each pump.

P. Provide the following scale ranges for pressure gages:

1. Heating Hot Water: 0 to 100 psi (0 to 600 kPa).

3.2 CONNECTIONS

A. Install meters and gages adjacent to machines and equipment to allow service and maintenance for meters, gages, machines, and equipment.

3.3 ADJUSTING

A. After installation, calibrate meters according to manufacturer's written instructions.

B. Adjust faces of meters and gages to proper angle for best visibility.

END OF SECTION

SECTION 23 0523

GENERAL-DUTY VALVES FOR HVAC PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Work Included: Provide general- duty valves for HVAC piping in accordance with the Contract Documents. The "General Conditions Governing All Contracts" shall apply to all work under the contract. The work of this section shall include, but not be limited to, the following:

1. Bronze ball valves.
2. Iron, single-flange lug-style butterfly valves.
3. High-performance butterfly valves.
4. Bronze swing check valves.
5. Iron swing check valves.
6. Bronze gate valves.
7. Iron gate valves.
8. Bronze globe valves.
9. Iron globe valves.

B. Related Sections:

1. Division 23 HVAC piping Sections for specialty valves applicable to those Sections only.
2. Division 23 Section "Identification for HVAC Piping and Equipment" for valve tags and schedules.

1.2 DEFINITIONS

A. CWP: Cold working pressure.

B. EPDM: Ethylene propylene copolymer rubber.

C. NBR: Acrylonitrile-butadiene, Buna-N, or nitrile rubber.

D. NRS: Nonrising stem.

E. OS&Y: Outside screw and yoke.

F. RS: Rising stem.

G. SWP: Steam working pressure.

1.3 SUBMITTALS

A. Product Data: For each type of valve indicated.

1.4 QUALITY ASSURANCE

A. Source Limitations for Valves: Obtain each type of valve from single source from single manufacturer.

B. ASME Compliance:

1. ASME B16.10 and ASME B16.34 for ferrous valve dimensions and design criteria.
2. ASME B31.1 for power piping valves.
3. ASME B31.9 for building services piping valves.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Prepare valves for shipping as follows:

1. Protect internal parts against rust and corrosion.
2. Protect threads, flange faces, grooves, and weld ends.
3. Set angle, gate, and globe valves closed to prevent rattling.
4. Set ball and plug valves open to minimize exposure of functional surfaces.
5. Set butterfly valves closed or slightly open.
6. Block check valves in either closed or open position.

B. Use the following precautions during storage:

1. Maintain valve end protection.
2. Store valves indoors and maintain at higher than ambient dew point temperature. If outdoor storage is necessary, store valves off the ground in watertight enclosures.

C. Use sling to handle large valves; rig sling to avoid damage to exposed parts. Do not use handwheels or stems as lifting or rigging points.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR VALVES

A. Refer to HVAC valve schedule articles for applications of valves.

B. Valve Pressure and Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.

C. Valve Sizes: Same as upstream piping unless otherwise indicated.

D. Valve Actuator Types:

1. Gear Actuator: For quarter-turn valves NPS 8 (DN 200) and larger.
2. Handwheel: For valves other than quarter-turn types.
3. Handlever: For quarter-turn valves NPS 6 (DN 150) and smaller.
4. Locking Lever Handle: For butterfly valves NPS 6 (DN 150) and smaller.
5. Chainwheel: Device for attachment to valve handwheel, stem, or other actuator; of size and with chain for mounting height, as indicated in the "Valve Installation" Article.

E. Valves in Insulated Piping: With 2-inch (50-mm) stem extensions and the following features:

1. Gate Valves: With rising stem.
2. Ball Valves: With extended operating handle of non-thermal-conductive material, and protective sleeve that allows operation of valve without breaking the vapor seal or disturbing insulation.

3. Butterfly Valves: With extended neck.

F. Valve-End Connections:

1. Flanged: With flanges according to ASME B16.1 for iron valves.
2. Threaded: With threads according to ASME B1.20.1.

G. Valve Bypass and Drain Connections: MSS SP-45.

2.2 BRONZE BALL VALVES

A. Two-Piece, Full-Port, Bronze Ball Valves with Bronze Trim:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Conbraco Industries, Inc.; Apollo Valves.
b. Crane Co.; Crane Valve Group; Crane Valves.
c. Hammond Valve.
d. Milwaukee Valve Company.
e. NIBCO INC.
f. Red-White Valve Corporation.
g. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Description:

a. Standard: MSS SP-110.
b. SWP Rating: 150 psig (1035 kPa).
c. CWP Rating: 600 psig (4140 kPa).
d. Body Design: Two piece.
e. Body Material: Bronze.
f. Ends: Threaded.
g. Seats: PTFE or TFE.
h. Stem: Bronze.
i. Ball: Chrome-plated brass.
j. Port: Full.

B. Two-Piece, Full-Port, Bronze Ball Valves with Stainless-Steel Trim:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Conbraco Industries, Inc.; Apollo Valves.
b. Crane Co.; Crane Valve Group; Crane Valves.
c. Hammond Valve.
d. Milwaukee Valve Company.
e. NIBCO INC.
f. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Description:

a. Standard: MSS SP-110.

b. SWP Rating: 150 psig (1035 kPa).
c. CWP Rating: 600 psig (4140 kPa).
d. Body Design: Two piece.
e. Body Material: Bronze.
f. Ends: Threaded.
g. Seats: PTFE or TFE.
h. Stem: Stainless steel.
i. Ball: Stainless steel, vented.
j. Port: Full.

2.3 IRON, SINGLE-FLANGE LUG-STYLE BUTTERFLY VALVES

A. 200 CWP, Iron, Single-Flange Lug-Style Butterfly Valves with EPDM Seat and Aluminum-Bronze Disc:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Conbraco Industries, Inc.; Apollo Valves.
b. Cooper Cameron Valves; a division of Cooper Cameron Corp.
c. Crane Co.; Crane Valve Group; Jenkins Valves.
d. Crane Co.; Crane Valve Group; Stockham Division.
e. Hammond Valve.
f. Kitz Corporation.
g. Milwaukee Valve Company.
h. NIBCO INC.
i. Red-White Valve Corporation.
j. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Description:

a. Standard: MSS SP-67, Type I.
b. CWP Rating: 200 psig (1380 kPa).
c. Body Design: Lug type; suitable for bidirectional dead-end service at rated pressure without use of downstream flange.
d. Body Material: ASTM A 126, cast iron or ASTM A 536, ductile iron.
e. Seat: EPDM.
f. Stem: One- or two-piece stainless steel.
g. Disc: Aluminum bronze.

B. 200 CWP, Iron, Single-Flange Lug-Style Butterfly Valves with NBR Seat and Aluminum-Bronze Disc:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Conbraco Industries, Inc.; Apollo Valves.
b. Cooper Cameron Valves; a division of Cooper Cameron Corp.
c. Crane Co.; Crane Valve Group; Jenkins Valves.
d. Crane Co.; Crane Valve Group; Stockham Division.
e. Hammond Valve.
f. Kitz Corporation.
g. Milwaukee Valve Company.
h. NIBCO INC.
i. Red-White Valve Corporation.

j. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Description:

a. Standard: MSS SP-67, Type I.
b. CWP Rating: 200 psig (1380 kPa).
c. Body Design: Lug type; suitable for bidirectional dead-end service at rated pressure without use of downstream flange.
d. Body Material: ASTM A 126, cast iron or ASTM A 536, ductile iron.
e. Seat: NBR.
f. Stem: One- or two-piece stainless steel.
g. Disc: Aluminum bronze.

C. 200 CWP, Iron, Single-Flange Lug-Style Butterfly Valves with EPDM Seat and Stainless-Steel Disc:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Conbraco Industries, Inc.; Apollo Valves.
b. Cooper Cameron Valves; a division of Cooper Cameron Corp.
c. Crane Co.; Crane Valve Group; Jenkins Valves.
d. Crane Co.; Crane Valve Group; Stockham Division.
e. Hammond Valve.
f. Kitz Corporation.
g. Milwaukee Valve Company.
h. Mueller Steam Specialty; a division of SPX Corporation.
i. NIBCO INC.
j. Red-White Valve Corporation.
k. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Description:

a. Standard: MSS SP-67, Type I.
b. CWP Rating: 200 psig (1380 kPa).
c. Body Design: Lug type; suitable for bidirectional dead-end service at rated pressure without use of downstream flange.
d. Body Material: ASTM A 126, cast iron or ASTM A 536, ductile iron.
e. Seat: EPDM.
f. Stem: One- or two-piece stainless steel.
g. Disc: Stainless steel.

D. 200 CWP, Iron, Single-Flange Lug-Style Butterfly Valves with NBR Seat and Stainless-Steel Disc:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Conbraco Industries, Inc.; Apollo Valves.
b. Cooper Cameron Valves; a division of Cooper Cameron Corp.
c. Crane Co.; Crane Valve Group; Jenkins Valves.
d. Crane Co.; Crane Valve Group; Stockham Division.
e. Hammond Valve.
f. Kitz Corporation.
g. Milwaukee Valve Company.

h. Mueller Steam Specialty; a division of SPX Corporation.
i. NIBCO INC.
j. Red-White Valve Corporation.
k. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Description:

a. Standard: MSS SP-67, Type I.
b. CWP Rating: 200 psig (1380 kPa).
c. Body Design: Lug type; suitable for bidirectional dead-end service at rated pressure without use of downstream flange.
d. Body Material: ASTM A 126, cast iron or ASTM A 536, ductile iron.
e. Seat: NBR.
f. Stem: One- or two-piece stainless steel.
g. Disc: Stainless steel.

2.4 HIGH-PERFORMANCE BUTTERFLY VALVES

A. Class 150, Single-Flange, High-Performance Butterfly Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Cooper Cameron Valves; a division of Cooper Cameron Corp.
b. Crane Co.; Crane Valve Group; Flowseal.
c. Crane Co.; Crane Valve Group; Stockham Division.
d. Hammond Valve.
e. Jamesbury; a subsidiary of Metso Automation.
f. Milwaukee Valve Company.
g. NIBCO INC.

2. Description:

a. Standard: MSS SP-68.
b. CWP Rating: 285 psig (1965 kPa) at 100 deg F (38 deg C).
c. Body Design: Lug type; suitable for bidirectional dead-end service at rated pressure without use of downstream flange.
d. Body Material: Carbon steel, cast iron, ductile iron, or stainless steel.
e. Seat: Reinforced PTFE or metal.
f. Stem: Stainless steel; offset from seat plane.
g. Disc: Carbon steel.
h. Service: Bidirectional.

B. Class 300, Single-Flange, High-Performance Butterfly Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Cooper Cameron Valves; a division of Cooper Cameron Corp.
b. Crane Co.; Crane Valve Group; Flowseal.
c. Crane Co.; Crane Valve Group; Stockham Division.
d. Hammond Valve.
e. Jamesbury; a subsidiary of Metso Automation.

f. Milwaukee Valve Company.
g. NIBCO INC.

2. Description:

a. Standard: MSS SP-68.
b. CWP Rating: 720 psig (4965 kPa) at 100 deg F (38 deg C).
c. Body Design: Lug type; suitable for bidirectional dead-end service at rated pressure without use of downstream flange.
d. Body Material: Carbon steel, cast iron, or ductile iron.
e. Seat: Reinforced PTFE or metal.
f. Stem: Stainless steel; offset from seat plane.
g. Disc: Carbon steel.
h. Service: Bidirectional.

2.5 BRONZE SWING CHECK VALVES

A. Class 150, Bronze Swing Check Valves with Nonmetallic Disc:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Crane Co.; Crane Valve Group; Crane Valves.
b. Crane Co.; Crane Valve Group; Jenkins Valves.
c. Hammond Valve.
d. Milwaukee Valve Company.
e. NIBCO INC.
f. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Description:

a. Standard: MSS SP-80, Type 4.
b. CWP Rating: 300 psig (2070 kPa).
c. Body Design: Horizontal flow.
d. Body Material: ASTM B 62, bronze.
e. Ends: Threaded.
f. Disc: PTFE or TFE.

2.6 IRON SWING CHECK VALVES

A. Class 125, Iron Swing Check Valves with Metal Seats:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Crane Co.; Crane Valve Group; Crane Valves.
b. Crane Co.; Crane Valve Group; Jenkins Valves.
c. Crane Co.; Crane Valve Group; Stockham Division.
d. Hammond Valve.
e. Kitz Corporation.
f. Milwaukee Valve Company.
g. NIBCO INC.
h. Powell Valves.

i. Red-White Valve Corporation.
j. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Description:

a. Standard: MSS SP-71, Type I.
b. NPS 2-1/2 to NPS 12 (DN 65 to DN 300), CWP Rating: 200 psig (1380 kPa).
c. NPS 14 to NPS 24 (DN 350 to DN 600), CWP Rating: 150 psig (1035 kPa).
d. Body Design: Clear or full waterway.
e. Body Material: ASTM A 126, gray iron with bolted bonnet.
f. Ends: Flanged.
g. Trim: Bronze.
h. Gasket: Asbestos free.

B. Class 125, Iron Swing Check Valves with Nonmetallic-to-Metal Seats:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Crane Co.; Crane Valve Group; Crane Valves.
b. Crane Co.; Crane Valve Group; Stockham Division.

2. Description:

a. Standard: MSS SP-71, Type I.
b. NPS 2-1/2 to NPS 12 (DN 65 to DN 300), CWP Rating: 200 psig (1380 kPa).
c. NPS 14 to NPS 24 (DN 350 to DN 600), CWP Rating: 150 psig (1035 kPa).
d. Body Design: Clear or full waterway.
e. Body Material: ASTM A 126, gray iron with bolted bonnet.
f. Ends: Flanged.
g. Trim: Composition.
h. Seat Ring: Bronze.
i. Disc Holder: Bronze.
j. Disc: PTFE or TFE.
k. Gasket: Asbestos free.

C. Class 250, Iron Swing Check Valves with Metal Seats:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Crane Co.; Crane Valve Group; Crane Valves.
b. Crane Co.; Crane Valve Group; Jenkins Valves.
c. Crane Co.; Crane Valve Group; Stockham Division.
d. Hammond Valve.
e. Milwaukee Valve Company.
f. NIBCO INC.
g. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Description:

a. Standard: MSS SP-71, Type I.
b. NPS 2-1/2 to NPS 12 (DN 65 to DN 300), CWP Rating: 500 psig (3450 kPa).

c. NPS 14 to NPS 24 (DN 350 to DN 600), CWP Rating: 300 psig (2070 kPa).
d. Body Design: Clear or full waterway.
e. Body Material: ASTM A 126, gray iron with bolted bonnet.
f. Ends: Flanged.
g. Trim: Bronze.
h. Gasket: Asbestos free.

2.7 BRONZE GATE VALVES

A. Class 150, RS Bronze Gate Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Crane Co.; Crane Valve Group; Crane Valves.
b. Crane Co.; Crane Valve Group; Stockham Division.
c. Hammond Valve.
d. Kitz Corporation.
e. Milwaukee Valve Company.
f. NIBCO INC.
g. Powell Valves.
h. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Description:

a. Standard: MSS SP-80, Type 2.
b. CWP Rating: 300 psig (2070 kPa).
c. Body Material: ASTM B 62, bronze with integral seat and union-ring bonnet.
d. Ends: Threaded.
e. Stem: Bronze.
f. Disc: Solid wedge; bronze.
g. Packing: Asbestos free.
h. Handwheel: Malleable iron.

2.8 IRON GATE VALVES

A. Class 125, OS&Y, Iron Gate Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Crane Co.; Crane Valve Group; Crane Valves.
b. Crane Co.; Crane Valve Group; Jenkins Valves.
c. Crane Co.; Crane Valve Group; Stockham Division.
d. Hammond Valve.
e. Kitz Corporation.
f. Milwaukee Valve Company.
g. NIBCO INC.
h. Powell Valves.
i. Red-White Valve Corporation.
j. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Description:

a. Standard: MSS SP-70, Type I.
b. NPS 2-1/2 to NPS 12 (DN 65 to DN 300), CWP Rating: 200 psig (1380 kPa).
c. NPS 14 to NPS 24 (DN 350 to DN 600), CWP Rating: 150 psig (1035 kPa).
d. Body Material: ASTM A 126, gray iron with bolted bonnet.
e. Ends: Flanged.
f. Trim: Bronze.
g. Disc: Solid wedge.
h. Packing and Gasket: Asbestos free.

B. Class 250, OS&Y, Iron Gate Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Crane Co.; Crane Valve Group; Crane Valves.
b. Crane Co.; Crane Valve Group; Stockham Division.
c. Hammond Valve.
d. Milwaukee Valve Company.
e. NIBCO INC.
f. Powell Valves.
g. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Description:

a. Standard: MSS SP-70, Type I.
b. NPS 2-1/2 to NPS 12 (DN 65 to DN 300), CWP Rating: 500 psig (3450 kPa).
c. NPS 14 to NPS 24 (DN 350 to DN 600), CWP Rating: 300 psig (2070 kPa).
d. Body Material: ASTM A 126, gray iron with bolted bonnet.
e. Ends: Flanged.
f. Trim: Bronze.
g. Disc: Solid wedge.
h. Packing and Gasket: Asbestos free.

2.9 BRONZE GLOBE VALVES

A. Class 150, Bronze Globe Valves with Nonmetallic Disc:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Crane Co.; Crane Valve Group; Crane Valves.
b. Hammond Valve.
c. Kitz Corporation.
d. Milwaukee Valve Company.
e. NIBCO INC.
f. Powell Valves.
g. Red-White Valve Corporation.
h. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Description:

a. Standard: MSS SP-80, Type 2.
b. CWP Rating: 300 psig (2070 kPa).

c. Body Material: ASTM B 62, bronze with integral seat and union-ring bonnet.
d. Ends: Threaded.
e. Stem: Bronze.
f. Disc: PTFE or TFE.
g. Packing: Asbestos free.
h. Handwheel: Malleable iron.

2.10 IRON GLOBE VALVES

A. Class 125, Iron Globe Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Crane Co.; Crane Valve Group; Crane Valves.
b. Crane Co.; Crane Valve Group; Jenkins Valves.
c. Crane Co.; Crane Valve Group; Stockham Division.
d. Hammond Valve.
e. Kitz Corporation.
f. Milwaukee Valve Company.
g. NIBCO INC.
h. Powell Valves.
i. Red-White Valve Corporation.
j. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Description:

a. Standard: MSS SP-85, Type I.
b. CWP Rating: 200 psig (1380 kPa).
c. Body Material: ASTM A 126, gray iron with bolted bonnet.
d. Ends: Flanged.
e. Trim: Bronze.
f. Packing and Gasket: Asbestos free.

B. Class 250, Iron Globe Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Crane Co.; Crane Valve Group; Crane Valves.
b. Crane Co.; Crane Valve Group; Jenkins Valves.
c. Crane Co.; Crane Valve Group; Stockham Division.
d. Hammond Valve.
e. Milwaukee Valve Company.
f. NIBCO INC.
g. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Description:

a. Standard: MSS SP-85, Type I.
b. CWP Rating: 500 psig (3450 kPa).
c. Body Material: ASTM A 126, gray iron with bolted bonnet.
d. Ends: Flanged.

e. Trim: Bronze.
f. Packing and Gasket: Asbestos free.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine valve interior for cleanliness, freedom from foreign matter, and corrosion. Remove special packing materials, such as blocks, used to prevent disc movement during shipping and handling.

B. Operate valves in positions from fully open to fully closed. Examine guides and seats made accessible by such operations.

C. Examine threads on valve and mating pipe for form and cleanliness.

D. Examine mating flange faces for conditions that might cause leakage. Check bolting for proper size, length, and material. Verify that gasket is of proper size, that its material composition is suitable for service, and that it is free from defects and damage.

E. Do not attempt to repair defective valves; replace with new valves.

3.2 VALVE INSTALLATION

A. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.

B. Locate valves for easy access and provide separate support where necessary.

C. Install valves in horizontal piping with stem at or above center of pipe.

D. Install valves in position to allow full stem movement.

E. Install check valves for proper direction of flow and as follows:

1. Swing Check Valves: In horizontal position with hinge pin level.

3.3 ADJUSTING

A. Adjust or replace valve packing after piping systems have been tested and put into service but before final adjusting and balancing. Replace valves if persistent leaking occurs.

3.4 GENERAL REQUIREMENTS FOR VALVE APPLICATIONS

A. If valve applications are not indicated, use the following:

1. Shutoff Service: Ball, butterfly, or gate valves.
2. Butterfly Valve Dead-End Service: Single-flange (lug) type.
3. Throttling Service except Steam: Ball, butterfly, or globe valves.
4. Throttling Service, Steam: Butterfly or globe valves.
5. Pump-Discharge Check Valves:

a. NPS 2 (DN 50) and Smaller: Bronze swing check valves with nonmetallic disc.

B. If valves with specified SWP classes or CWP ratings are not available, the same types of valves with higher SWP classes or CWP ratings may be substituted.

C. Select valves, except wafer types, with the following end connections:

1. For Copper Tubing, NPS 2 (DN 50) and Smaller: Threaded ends.
2. For Copper Tubing, NPS 2-1/2 to NPS 4 (DN 65 to DN 100): Flanged ends.
3. For Copper Tubing, NPS 5 (DN 125) and Larger: Flanged ends.
4. For Steel Piping, NPS 2 (DN 50) and Smaller: Threaded ends.
5. For Steel Piping, NPS 2-1/2 to NPS 4 (DN 65 to DN 100): Flanged ends.
6. For Steel Piping, NPS 5 (DN 125) and Larger: Flanged ends.

3.5 VALVE APPLICATIONS

A. Heating-Water Piping: Use the following types of valves:

1. Angle Valves, NPS 2 (DN 50) and Smaller: Type 2, Class 150, bronze.
2. Angle Valves, NPS 2-1/2 (DN 65) and Larger: Type II, Class 125, cast iron.
3. Ball Valves, NPS 2 (DN 50) and Smaller: Two-piece, 600-psig (4140-kPa) CWP rating, copper alloy.
4. Ball Valves, NPS 2-1/2 (DN 65) and Larger: Class 150, ferrous alloy.
5. Butterfly Valves, NPS 2-1/2 (DN 65) and Larger: Lug Style 150-psig (1035-kPa) CWP rating, ferrous alloy, with EPDM liner.
6. Swing Check Valves, NPS 2 (DN 50) and Smaller: Type 4, Class 150, bronze.
7. Swing Check Valves, NPS 2-1/2 (DN 65) and Larger: Type II, Class 125, gray iron.
8. Wafer Check Valves, NPS 2-1/2 (DN 65) and Larger: Dual-plate, wafer, Class 125 or 150 ferrous alloy.
9. Gate Valves, NPS 2 (DN 50) and Smaller: Type 2, Class 150, bronze.
10. Gate Valves, NPS 2-1/2 (DN 65) and Larger: Type I, Class 125, OS&Y, bronze-mounted cast iron.
11. Globe Valves, NPS 2 (DN 50) and Smaller: Type 2, Class 150, bronze.
12. Globe Valves, NPS 2-1/2 (DN 65) and Larger: Type I, Class 125, bronze-mounted cast iron.

B. Chilled-Water Piping: Use the following types of valves:

1. Angle Valves, NPS 2 (DN 50) and Smaller: Type 2, Class 150, bronze.
2. Angle Valves, NPS 2-1/2 (DN 65) and Larger: Type II, Class 125, cast iron.
3. Ball Valves, NPS 2 (DN 50) and Smaller: Two-piece, 600-psig (4140-kPa) CWP rating, copper alloy.
4. Ball Valves, NPS 2-1/2 (DN 65) and Larger: Class 150, ferrous alloy.
5. Butterfly Valves, NPS 2-1/2 (DN 65) and Larger: Lug Style 150-psig (1035-kPa) CWP rating, ferrous alloy, with EPDM liner.
6. Swing Check Valves, NPS 2 (DN 50) and Smaller: Type 4, Class 150, bronze.
7. Swing Check Valves, NPS 2-1/2 (DN 65) and Larger: Type II, Class 125, gray iron.
8. Wafer Check Valves, NPS 2-1/2 (DN 65) and Larger: Dual-plate, wafer, Class 125 or 150 ferrous alloy.
9. Gate Valves, NPS 2 (DN 50) and Smaller: Type 2, Class 150, bronze.
10. Gate Valves, NPS 2-1/2 (DN 65) and Larger: Type I, Class 125, OS&Y, bronze-mounted cast iron.
11. Globe Valves, NPS 2 (DN 50) and Smaller: Type 2, Class 150, bronze.
12. Globe Valves, NPS 2-1/2 (DN 65) and Larger: Type I, Class 125, bronze-mounted cast iron.

C. Low-Pressure Steam Piping: Use the following types of valves:

1. Angle Valves, NPS 2 (DN 50) and Smaller: Type 2, Class 150, bronze.
2. Angle Valves, NPS 2-1/2 (DN 65) and Larger: Type II, Class 125, cast iron.
3. Ball Valves, NPS 2 (DN 50) and Smaller: Three-piece, 600-psig (4140-kPa) CWP rating, copper alloy.
4. Ball Valves, NPS 2-1/2 (DN 65) and Larger: Class 150, ferrous alloy.
5. Swing Check Valves, NPS 2 (DN 50) and Smaller: Type 4, Class 150, bronze.
6. Swing Check Valves, NPS 2-1/2 (DN 65) and Larger: Type II, Class 125, gray iron.
7. Gate Valves, NPS 2 (DN 50) and Smaller: Type 3, Class 150, bronze.
8. Gate Valves, NPS 2-1/2 (DN 65) and Larger: Type I, Class 125, OS&Y, bronze-mounted cast iron.
9. Globe Valves, NPS 2 (DN 50) and Smaller: Type 2, Class 150, bronze.
10. Globe Valves, NPS 2-1/2 (DN 65) and Larger: Type I, Class 125, bronze-mounted cast iron.

D. Steam Condensate Piping: Use the following types of valves:

1. Ball Valves, NPS 2 (DN 50) and Smaller: Three-piece, 600-psig (4140-kPa) CWP rating, copper alloy.
2. Ball Valves, NPS 2-1/2 (DN 65) and Larger: Class 150, ferrous alloy.
3. Swing Check Valves, NPS 2 (DN 50) and Smaller: Type 4, Class 200, bronze.
4. Swing Check Valves, NPS 2-1/2 (DN 65) and Larger: Type II, Class 125, gray iron.
5. Gate Valves, NPS 2 (DN 50) and Smaller: Type 3, Class 200, bronze.
6. Gate Valves, NPS 2-1/2 (DN 65) and Larger: Type I, Class 125, OS&Y, bronze-mounted cast iron.
7. Globe Valves, NPS 2 (DN 50) and Smaller: Type 2, Class 200, bronze.
8. Globe Valves, NPS 2-1/2 (DN 65) and Larger: Type I, Class 125, bronze-mounted cast iron.
9. Plug Valves, NPS 2 (DN 50) and Larger: Class 125 or 150, lubricated-type, cast iron.

END OF SECTION

SECTION 23 0529

HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Metal pipe hangers and supports.
2. Trapeze pipe hangers.
3. Metal framing systems.
4. Thermal-hanger shield inserts.
5. Fastener systems.
6. Equipment supports.

B. Related Sections:

1. Section 05 5000 "Metal Fabrications" for structural-steel shapes and plates for trapeze hangers for pipe and equipment supports.
2. Section 23 3113 "Metal Ducts" for duct hangers and supports.

1.3 DEFINITIONS

A. MSS: Manufacturers Standardization Society of The Valve and Fittings Industry Inc.

1.4 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design trapeze pipe hangers and equipment supports, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

B. Structural Performance: Hangers and supports for HVAC piping and equipment shall withstand the effects of gravity loads and stresses within limits and under conditions indicated according to ASCE/SEI 7.

1. Design supports for multiple pipes, including pipe stands, capable of supporting combined weight of supported systems, system contents, and test water.
2. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Signed and sealed by a qualified professional engineer. Show fabrication and installation details and include calculations for the following; include Product Data for components:

1. Trapeze pipe hangers.

C. Delegated-Design Submittal: For trapeze hangers indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1. Detail fabrication and assembly of trapeze hangers.
2. Design Calculations: Calculate requirements for designing trapeze hangers.

1.6 INFORMATIONAL SUBMITTALS

A. Welding certificates.

1.7 QUALITY ASSURANCE

A. Structural Steel Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

B. Pipe Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.

PART 2 - PRODUCTS

2.1 METAL PIPE HANGERS AND SUPPORTS

A. Carbon-Steel Pipe Hangers and Supports:

1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
2. Galvanized Metallic Coatings: Pregalvanized or hot dipped.
3. Nonmetallic Coatings: Plastic coating, jacket, or liner.
4. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.
5. Hanger Rods: Continuous-thread rod, nuts, and washer made of carbon steel.

B. Copper Pipe Hangers:

1. Description: MSS SP-58, Types 1 through 58, copper-coated-steel, factory-fabricated components.
2. Hanger Rods: Continuous-thread rod, nuts, and washer made of copper-coated steel.

2.2 TRAPEZE PIPE HANGERS

A. Description: MSS SP-69, Type 59, shop- or field-fabricated pipe-support assembly made from structural carbon-steel shapes with MSS SP-58 carbon-steel hanger rods, nuts, saddles, and U-bolts.

2.3 METAL FRAMING SYSTEMS

A. MFMA Manufacturer Metal Framing Systems:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Allied Tube & Conduit.
    b. Cooper B-Line, Inc.
    c. Flex-Strut Inc.
    d. GS Metals Corp.
    e. Thomas & Betts Corporation.
    f. Unistrut Corporation; Tyco International, Ltd.
    g. Wesanco, Inc.

2. Description: Shop- or field-fabricated pipe-support assembly for supporting multiple parallel pipes.
3. Standard: MFMA-4.
4. Channels: Continuous slotted steel channel with inturned lips.
5. Channel Nuts: Formed or stamped steel nuts or other devices designed to fit into channel slot and, when tightened, prevent slipping along channel.
6. Hanger Rods: Continuous-thread rod, nuts, and washer made of carbon steel.
7. Metallic Coating: Electroplated zinc or Hot-dipped galvanized.

B. Non-MFMA Manufacturer Metal Framing Systems:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Anvil International; a subsidiary of Mueller Water Products Inc.
    b. Empire Industries, Inc.
    c. ERICO International Corporation.
    d. Haydon Corporation; H-Strut Division.
    e. NIBCO INC.
    f. PHD Manufacturing, Inc.
    g. PHS Industries, Inc.

2. Description: Shop- or field-fabricated pipe-support assembly made of steel channels, accessories, fittings, and other components for supporting multiple parallel pipes.
3. Standard: Comply with MFMA-4.
4. Channels: Continuous slotted steel channel with inturned lips.
5. Channel Nuts: Formed or stamped steel nuts or other devices designed to fit into channel slot and, when tightened, prevent slipping along channel.
6. Hanger Rods: Continuous-thread rod, nuts, and washer made of carbon steel.
7. Coating: Zinc.

2.4 THERMAL-HANGER SHIELD INSERTS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Carpenter & Paterson, Inc.
2. Clement Support Services.
3. ERICO International Corporation.
4. National Pipe Hanger Corporation.
5. PHS Industries, Inc.
6. Pipe Shields, Inc.; a subsidiary of Piping Technology & Products, Inc.
7. Piping Technology & Products, Inc.
8. Rilco Manufacturing Co., Inc.
9. Value Engineered Products, Inc.

B. Insulation-Insert Material for Cold Piping: ASTM C 552, Type II cellular glass with 100-psig minimum compressive strength and vapor barrier.

C. Insulation-Insert Material for Hot Piping: Water-repellent treated, ASTM C 533, Type I calcium silicate with 100-psig minimum compressive strength.

D. For Trapeze or Clamped Systems: Insert and shield shall cover entire circumference of pipe.

E. For Clevis or Band Hangers: Insert and shield shall cover lower 180 degrees of pipe.

F. Insert Length: Extend 2 inches beyond sheet metal shield for piping operating below ambient air temperature.

2.5 FASTENER SYSTEMS

A. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

B. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated steel anchors, for use in hardened portland cement concrete; with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

2.6 EQUIPMENT SUPPORTS

A. Description: Welded, shop- or field-fabricated equipment support made from structural carbon-steel shapes.

2.7 MISCELLANEOUS MATERIALS

A. Structural Steel: ASTM A 36/A 36M, carbon-steel plates, shapes, and bars; black and galvanized.

B. Grout: ASTM C 1107, factory-mixed and -packaged, dry, hydraulic-cement, nonshrink and nonmetallic grout; suitable for interior and exterior applications.

1. Properties: Nonstaining, noncorrosive, and nongaseous.
2. Design Mix: 5000-psi, 28-day compressive strength.

PART 3 - EXECUTION

3.1 HANGER AND SUPPORT INSTALLATION

A. Metal Pipe-Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from the building structure.

B. Metal Trapeze Pipe-Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Arrange for grouping of parallel runs of horizontal piping, and support together on field-fabricated trapeze pipe hangers.

1. Pipes of Various Sizes: Support together and space trapezes for smallest pipe size or install intermediate supports for smaller diameter pipes as specified for individual pipe hangers.
2. Field fabricate from ASTM A 36/A 36M, carbon-steel shapes selected for loads being supported. Weld steel according to AWS D1.1/D1.1M.

C. Metal Framing System Installation: Arrange for grouping of parallel runs of piping, and support together on field-assembled metal framing systems.

D. Thermal-Hanger Shield Installation: Install in pipe hanger or shield for insulated piping.

E. Fastener System Installation:

1. Install powder-actuated fasteners for use in lightweight concrete or concrete slabs less than 4 inches thick in concrete after concrete is placed and completely cured. Use operators that are licensed by powder-actuated tool manufacturer. Install fasteners according to powder-actuated tool manufacturer's operating manual.
2. Install mechanical-expansion anchors in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.

F. Install hangers and supports complete with necessary attachments, inserts, bolts, rods, nuts, washers, and other accessories.

G. Equipment Support Installation: Fabricate from welded-structural-steel shapes.

H. Install hangers and supports to allow controlled thermal and seismic movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.

I. Install building attachments within concrete slabs or attach to structural steel. Install additional attachments at concentrated loads, including valves, flanges, and strainers, NPS 2-1/2 and larger and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten inserts to forms and install reinforcing bars through openings at top of inserts.

J. Load Distribution: Install hangers and supports so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.

K. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and to not exceed maximum pipe deflections allowed by ASME B31.9 for building services piping.

L. Insulated Piping:

1. Attach clamps and spacers to piping.

   a. Piping Operating above Ambient Air Temperature: Clamp may project through insulation.
   b. Piping Operating below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.
   c. Do not exceed pipe stress limits allowed by ASME B31.9 for building services piping.

2. Install MSS SP-58, Type 39, protection saddles if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.

   a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.

3. Install MSS SP-58, Type 40, protective shields on cold piping with vapor barrier. Shields shall span an arc of 180 degrees.

   a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.

4. Shield Dimensions for Pipe: Not less than the following:

   a. NPS 1/4 to NPS 3-1/2: 12 inches long and 0.048 inch thick.
   b. NPS 4: 12 inches long and 0.06 inch thick.
   c. NPS 5 and NPS 6: 18 inches long and 0.06 inch thick.
   d. NPS 8 to NPS 14: 24 inches long and 0.075 inch thick.
   e.

5. Pipes NPS 8 and Larger: Include wood or reinforced calcium-silicate-insulation inserts of length at least as long as protective shield.
6. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.

3.2 EQUIPMENT SUPPORTS

A. Fabricate structural-steel stands to suspend equipment from structure overhead or to support equipment above floor.

B. Grouting: Place grout under supports for equipment and make bearing surface smooth.

C. Provide lateral bracing, to prevent swaying, for equipment supports.

3.3 METAL FABRICATIONS

A. Cut, drill, and fit miscellaneous metal fabrications for trapeze pipe hangers and equipment supports.

B. Fit exposed connections together to form hairline joints. Field weld connections that cannot be shop welded because of shipping size limitations.

C. Field Welding: Comply with AWS D1.1/D1.1M procedures for shielded, metal arc welding; appearance and quality of welds; and methods used in correcting welding work; and with the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. Finish welds at exposed connections so no roughness shows after finishing and so contours of welded surfaces match adjacent contours.

3.4 ADJUSTING

A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.

B. Trim excess length of continuous-thread hanger and support rods to 1-1/2 inches.

3.5 PAINTING

A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.

1. Apply paint by brush or spray to provide a minimum dry film thickness of 2.0 mils.

B. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

3.6 HANGER AND SUPPORT SCHEDULE

A. Specific hanger and support requirements are in Sections specifying piping systems and equipment.

B. Comply with MSS SP-69 for pipe-hanger selections and applications that are not specified in piping system Sections.

C. Use hangers and supports with galvanized metallic coatings for piping and equipment that will not have field-applied finish.

D. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.

E. Use carbon-steel pipe hangers and supports, metal trapeze pipe hangers and metal framing systems and attachments for general service applications.

F. Use copper-plated pipe hangers and copper attachments for copper piping and tubing.

G. Use padded hangers for piping that is subject to scratching.

H. Use thermal-hanger shield inserts for insulated piping and tubing.

I. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Adjustable, Steel Clevis Hangers (MSS Type 1): For suspension of noninsulated or insulated, stationary pipes NPS 1/2 to NPS 30.
2. Yoke-Type Pipe Clamps (MSS Type 2): For suspension of up to 1050 deg F, pipes NPS 4 to NPS 24, requiring up to 4 inches of insulation.
3. Carbon- or Alloy-Steel, Double-Bolt Pipe Clamps (MSS Type 3): For suspension of pipes NPS 3/4 to NPS 36, requiring clamp flexibility and up to 4 inches of insulation.
4. Steel Pipe Clamps (MSS Type 4): For suspension of cold and hot pipes NPS 1/2 to NPS 24 if little or no insulation is required.
5. Pipe Hangers (MSS Type 5): For suspension of pipes NPS 1/2 to NPS 4, to allow off-center closure for hanger installation before pipe erection.
6. Adjustable, Swivel Split- or Solid-Ring Hangers (MSS Type 6): For suspension of noninsulated, stationary pipes NPS 3/4 to NPS 8.
7. Adjustable, Steel Band Hangers (MSS Type 7): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8.
8. Adjustable Band Hangers (MSS Type 9): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8.
9. Adjustable, Swivel-Ring Band Hangers (MSS Type 10): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8.
10. Split Pipe Ring with or without Turnbuckle Hangers (MSS Type 11): For suspension of noninsulated, stationary pipes NPS 3/8 to NPS 8.
11. Extension Hinged or Two-Bolt Split Pipe Clamps (MSS Type 12): For suspension of noninsulated, stationary pipes NPS 3/8 to NPS 3.
12. U-Bolts (MSS Type 24): For support of heavy pipes NPS 1/2 to NPS 30.
13. Clips (MSS Type 26): For support of insulated pipes not subject to expansion or contraction.
14. Pipe Saddle Supports (MSS Type 36): For support of pipes NPS 4 to NPS 36, with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate.
15. Pipe Stanchion Saddles (MSS Type 37): For support of pipes NPS 4 to NPS 36, with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate, and with U-bolt to retain pipe.
16. Adjustable Pipe Saddle Supports (MSS Type 38): For stanchion-type support for pipes NPS 2-1/2 to NPS 36 if vertical adjustment is required, with steel-pipe base stanchion support and cast-iron floor flange.
17. Single-Pipe Rolls (MSS Type 41): For suspension of pipes NPS 1 to NPS 30, from two rods if longitudinal movement caused by expansion and contraction might occur.
18. Adjustable Roller Hangers (MSS Type 43): For suspension of pipes NPS 2-1/2 to NPS 24, from single rod if horizontal movement caused by expansion and contraction might occur.
19. Complete Pipe Rolls (MSS Type 44): For support of pipes NPS 2 to NPS 42 if longitudinal movement caused by expansion and contraction might occur but vertical adjustment is not necessary.
20. Pipe Roll and Plate Units (MSS Type 45): For support of pipes NPS 2 to NPS 24 if small horizontal movement caused by expansion and contraction might occur and vertical adjustment is not necessary.
21. Adjustable Pipe Roll and Base Units (MSS Type 46): For support of pipes NPS 2 to NPS 30 if vertical and lateral adjustment during installation might be required in addition to expansion and contraction.

J. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers NPS 3/4 to NPS 24.
2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers NPS 3/4 to NPS 24 if longer ends are required for riser clamps.

K. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel Turnbuckles (MSS Type 13): For adjustment up to 6 inches for heavy loads.
2. Steel Clevises (MSS Type 14): For 120 to 450 deg F piping installations.
3. Swivel Turnbuckles (MSS Type 15): For use with MSS Type 11, split pipe rings.
4. Malleable-Iron Sockets (MSS Type 16): For attaching hanger rods to various types of building attachments.
5. Steel Weldless Eye Nuts (MSS Type 17): For 120 to 450 deg F piping installations.

L. Building Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel or Malleable Concrete Inserts (MSS Type 18): For upper attachment to suspend pipe hangers from concrete ceiling.
2. Top-Beam C-Clamps (MSS Type 19): For use under roof installations with bar-joist construction, to attach to top flange of structural shape.
3. Side-Beam or Channel Clamps (MSS Type 20): For attaching to bottom flange of beams, channels, or angles.
4. Center-Beam Clamps (MSS Type 21): For attaching to center of bottom flange of beams.
5. Welded Beam Attachments (MSS Type 22): For attaching to bottom of beams if loads are considerable and rod sizes are large.
6. C-Clamps (MSS Type 23): For structural shapes.
7. Top-Beam Clamps (MSS Type 25): For top of beams if hanger rod is required tangent to flange edge.
8. Side-Beam Clamps (MSS Type 27): For bottom of steel I-beams.
9. Steel-Beam Clamps with Eye Nuts (MSS Type 28): For attaching to bottom of steel I-beams for heavy loads.
10. Linked-Steel Clamps with Eye Nuts (MSS Type 29): For attaching to bottom of steel I-beams for heavy loads, with link extensions.
11. Malleable-Beam Clamps with Extension Pieces (MSS Type 30): For attaching to structural steel.
12. Welded-Steel Brackets: For support of pipes from below or for suspending from above by using clip and rod. Use one of the following for indicated loads:

    a. Light (MSS Type 31): 750 lb.
    b. Medium (MSS Type 32): 1500 lb.
    c. Heavy (MSS Type 33): 3000 lb.

13. Side-Beam Brackets (MSS Type 34): For sides of steel or wooden beams.
14. Plate Lugs (MSS Type 57): For attaching to steel beams if flexibility at beam is required.
15. Horizontal Travelers (MSS Type 58): For supporting piping systems subject to linear horizontal movement where headroom is limited.

M. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel-Pipe-Covering Protection Saddles (MSS Type 39): To fill interior voids with insulation that matches adjoining insulation.
2. Protection Shields (MSS Type 40): Of length recommended in writing by manufacturer to prevent crushing insulation.
3. Thermal-Hanger Shield Inserts: For supporting insulated pipe.

N. Spring Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Restraint-Control Devices (MSS Type 47): Where indicated to control piping movement.
2. Spring Cushions (MSS Type 48): For light loads if vertical movement does not exceed 1-1/4 inches.
3. Spring-Cushion Roll Hangers (MSS Type 49): For equipping Type 41, roll hanger with springs.
4. Spring Sway Braces (MSS Type 50): To retard sway, shock, vibration, or thermal expansion in piping systems.
5. Variable-Spring Hangers (MSS Type 51): Preset to indicated load and limit variability factor to 25 percent to allow expansion and contraction of piping system from hanger.
6. Variable-Spring Base Supports (MSS Type 52): Preset to indicated load and limit variability factor to 25 percent to allow expansion and contraction of piping system from base support.
7. Variable-Spring Trapeze Hangers (MSS Type 53): Preset to indicated load and limit variability factor to 25 percent to allow expansion and contraction of piping system from trapeze support.
8. Constant Supports: For critical piping stress and if necessary to avoid transfer of stress from one support to another support, critical terminal, or connected equipment. Include auxiliary stops for erection, hydrostatic test, and load-adjustment capability. These supports include the following types:

    a. Horizontal (MSS Type 54): Mounted horizontally.
    b. Vertical (MSS Type 55): Mounted vertically.
    c. Trapeze (MSS Type 56): Two vertical-type supports and one trapeze member.

O. Comply with MSS SP-69 for trapeze pipe-hanger selections and applications that are not specified in piping system Sections.

P. Comply with MFMA-103 for metal framing system selections and applications that are not specified in piping system Sections.

Q. Use powder-actuated fasteners or mechanical-expansion anchors instead of building attachments where required in concrete construction.

END OF SECTION

SECTION 23 0548

VIBRATION CONTROLS FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Work Included: Provide vibration controls for HVAC piping and equipment in accordance with the Contract Documents. The "General Conditions Governing All Contracts" shall apply to all work under the contract. The work of this section shall include, but not be limited to, the following:

1. Isolation pads.
2. Isolation mounts.
3. Freestanding spring isolators.
4. Elastomeric hangers.
5. Spring hangers.

1.2 SUBMITTALS

A. Product Data: For the following:

1. Include rated load, rated deflection, and overload capacity for each vibration isolation device.

B. Shop Drawings: Include the following:

1. Design Calculations: Calculate requirements for selecting vibration isolators and for designing vibration isolation bases.
2. Vibration Isolation Base Details: Detail fabrication, including anchorages and attachments to structure and to supported equipment. Include auxiliary motor slides and rails, base weights, equipment static loads, power transmission, component misalignment, and cantilever loads.

C. Welding certificates.

D. Field quality-control test reports.

1.3 QUALITY ASSURANCE

A. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

PART 2 - PRODUCTS

A. Delegated-Design Submittal:

1. For each wind-load protection device, that is required by this Section or is indicated on Drawings, submit the following:

a. Wind-Load Restraint, and Vibration Isolation Base Selection: Select vibration isolators, wind-load restraints, and vibration isolation bases complying with performance requirements, design criteria, and analysis data.

b. Riser Supports: Include riser diagrams and calculations showing anticipated expansion and contraction at each support point, initial and final loads on building structure, spring deflection changes, and seismic loads. Include certification by professional engineer that riser system was examined for excessive stress and that none exists.
c. Concrete Anchors and Inserts: Include calculations showing anticipated seismic and wind loads. Include certification that device is approved by an NRTL for seismic reinforcement use.
f. Wind-Load Design Calculations: Submit all static and dynamic loading calculations prepared under "Wind-Load Design Calculations" Paragraph in "Performance Requirements" Article.
g. Qualified Professional Engineer: All designated-design submittals for seismic- and wind-restraint calculations are to be signed and sealed by qualified professional engineer responsible for their preparation.

2. Wind Restraint Detail Drawing:

a. Design Analysis: To support selection and arrangement of wind restraints. Include calculations of combined tensile and shear loads.
b. Details: Indicate fabrication and arrangement. Detail attachments of restraints to restrained items and to the structure. Show attachment locations, methods, and spacings. Identify components, list their strengths, and indicate directions and values of forces transmitted to the structure during seismic events. Indicate association with vibration isolation devices.
d. Coordinate seismic-restraint and vibration isolation details with wind-restraint details required for equipment mounted outdoors. Comply also with requirements in other Sections for equipment mounted outdoors.

3. All delegated-design submittals for wind-restraint detail Drawings are to be signed and sealed by qualified professional engineer responsible for their preparation.
4. Design Calculations for Vibration Isolation Devices: Calculate static and dynamic loading due to equipment weight and operating forces required to select proper vibration isolators, and to design vibration isolation bases.
5. Riser Supports: Include riser diagrams and calculations showing anticipated expansion and contraction at each support point, initial and final loads on building structure, and spring deflection changes. Include certification that riser system was examined for excessive stress and that none exists.

2.2 VIBRATION ISOLATORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Ace Mountings Co., Inc.
2. Amber/Booth Company, Inc.
3. Isolation Technology, Inc.
4. Kinetics Noise Control.
5. Mason Industries.
6. Vibration Mountings & Controls, Inc.

B. Pads: Arranged in single or multiple layers of sufficient stiffness for uniform loading over pad area, molded with a nonslip pattern and galvanized-steel baseplates, and factory cut to sizes that match requirements of supported equipment.

1. Resilient Material: Oil- and water-resistant neoprene or rubber.

C. Mounts: Double-deflection type, with molded, oil-resistant rubber, hermetically sealed compressed fiberglass, or neoprene isolator elements with factory-drilled, encapsulated top plate for bolting to equipment and with baseplate for bolting to structure. Color-code or otherwise identify to indicate capacity range.

1. Materials: Cast-ductile-iron or welded steel housing containing two separate and opposing, oil-resistant rubber or neoprene elements that prevent central threaded element and attachment hardware from contacting the housing during normal operation.
2. Neoprene: Shock-absorbing materials compounded according to the standard for bridge-bearing neoprene as defined by AASHTO.

D. Spring Isolators: Freestanding, laterally stable, open-spring isolators.

1. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
2. Minimum Additional Travel: 50 percent of the required deflection at rated load.
3. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
4. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
5. Baseplates: Factory drilled for bolting to structure and bonded to 1/4-inch- thick, rubber isolator pad attached to baseplate underside. Baseplates shall limit floor load to 500 psig.
6. Top Plate and Adjustment Bolt: Threaded top plate with adjustment bolt and cap screw to fasten and level equipment.

E. Elastomeric Hangers: Single or double-deflection type, fitted with molded, oil-resistant elastomeric isolator elements bonded to steel housings with threaded connections for hanger rods. Color-code or otherwise identify to indicate capacity range.

F. Spring Hangers: Combination coil-spring and elastomeric-insert hanger with spring and insert in compression.

1. Frame: Steel, fabricated for connection to threaded hanger rods and to allow for a maximum of 30 degrees of angular hanger-rod misalignment without binding or reducing isolation efficiency.
2. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
3. Minimum Additional Travel: 50 percent of the required deflection at rated load.
4. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
5. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
6. Elastomeric Element: Molded, oil-resistant rubber or neoprene. Steel-washer-reinforced cup to support spring and bushing projecting through bottom of frame.
7. Self-centering hanger rod cap to ensure concentricity between hanger rod and support spring coil.

2.3 FACTORY FINISHES

A. Finish: Manufacturer's standard paint applied to factory-assembled and -tested equipment before shipping.

1. Powder coating on springs and housings.
2. All hardware shall be galvanized. Hot-dip galvanize metal components for exterior use.
3. Baked enamel or powder coat for metal components on isolators for interior use.
4. Color-code or otherwise mark vibration isolation devices to indicate capacity range.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and equipment to receive vibration isolation devices for compliance with requirements for installation tolerances and other conditions affecting performance.

B. Examine roughing-in of reinforcement and cast-in-place anchors to verify actual locations before installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 APPLICATIONS

A. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits.

3.3 VIBRATION-CONTROL DEVICE INSTALLATION

A. Attachment to Structure: If specific attachment is not indicated, anchor bracing to structure at flanges of beams, at upper truss chords of bar joists, or at concrete members.

B. Drilled-in Anchors:

1. Identify position of reinforcing steel and other embedded items prior to drilling holes for anchors. Do not damage existing reinforcing or embedded items during coring or drilling. Notify the Commissioner if reinforcing steel or other embedded items are encountered during drilling. Locate and avoid prestressed tendons, electrical and telecommunications conduit, and gas lines.
2. Do not drill holes in concrete or masonry until concrete, mortar, or grout has achieved full design strength.
3. Wedge Anchors: Protect threads from damage during anchor installation. Heavy-duty sleeve anchors shall be installed with sleeve fully engaged in the structural element to which anchor is to be fastened.
4. Adhesive Anchors: Clean holes to remove loose material and drilling dust prior to installation of adhesive. Place adhesive in holes proceeding from the bottom of the hole and progressing toward the surface in such a manner as to avoid introduction of air pockets in the adhesive.
5. Set anchors to manufacturer's recommended torque, using a torque wrench.
6. Install zinc-coated steel anchors for interior and stainless-steel anchors for exterior applications.

3.4 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Tests and Inspections:

1. Measure isolator deflection.
2. If a device fails test, modify all installations of same type and retest until satisfactory results are achieved.

C. Remove and replace malfunctioning units and retest as specified above.

D. Prepare test and inspection reports.

3.5 ADJUSTING

A. Adjust isolators after piping system is at operating weight.

B. Adjust active height of spring isolators.

END OF SECTION

SECTION 23 0553

IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Equipment labels.
2. Warning signs and labels.
3. Pipe labels.
4. Stencils.
5. Warning tags.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Samples: For color, letter style, and graphic representation required for each identification material and device.

C. Equipment Label Schedule: Include a listing of all equipment to be labeled with the proposed content for each label.

D. Valve numbering scheme.

E. Valve Schedules: For each piping system to include in maintenance manuals.

1.4 COORDINATION

A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.

B. Coordinate installation of identifying devices with locations of access panels and doors.

C. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2 - PRODUCTS

2.1 EQUIPMENT LABELS

A. Plastic Labels for Equipment:

1. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8 inch thick, and having predrilled holes for attachment hardware.
2. Letter Color: White.
3. Background Color: Black.
4. Maximum Temperature: Able to withstand temperatures up to 160 deg F.
5. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
6. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
7. Fasteners: Stainless-steel rivets or self-tapping screws.
8. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

B. Label Content: Include equipment's Drawing designation or unique equipment number, Drawing numbers where equipment is indicated (plans, details, and schedules), plus the Specification Section number and title where equipment is specified.

C. Equipment Label Schedule: For each item of equipment to be labeled, on 8-1/2-by-11-inch bond paper. Tabulate equipment identification number and identify Drawing numbers where equipment is indicated (plans, details, and schedules), plus the Specification Section number and title where equipment is specified. Equipment schedule shall be included in operation and maintenance data.

2.2 WARNING SIGNS AND LABELS

A. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8 inch thick, and having predrilled holes for attachment hardware.

B. Letter Color: White.

C. Background Color: Red.

D. Maximum Temperature: Able to withstand temperatures up to 160 deg F.

E. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.

F. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.

G. Fasteners: Stainless-steel rivets or self-tapping screws.

H. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

I. Label Content: Include caution and warning information, plus emergency notification instructions.

2.3 PIPE LABELS

A. General Requirements for Manufactured Pipe Labels: Preprinted, color-coded, with lettering indicating service, and showing flow direction.

B. Pretensioned Pipe Labels: Precoiled, semirigid plastic formed to cover full circumference of pipe and to attach to pipe without fasteners or adhesive.

C. Self-Adhesive Pipe Labels: Printed plastic with contact-type, permanent-adhesive backing.

D. Pipe Label Contents: Include identification of piping service using same designations or abbreviations as used on Drawings, pipe size, and an arrow indicating flow direction.

1. Flow-Direction Arrows: Integral with piping system service lettering to accommodate both directions, or as separate unit on each pipe label to indicate flow direction.
2. Lettering Size: At least 1-1/2 inches high.

2.4 DUCT LABELS

A. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/16 inch thick, and having predrilled holes for attachment hardware.

B. Letter Color: Black

C. Background Color: White

D. Maximum Temperature: Able to withstand temperatures up to 160 deg F.

E. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.

F. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.

G. Fasteners: Stainless-steel rivets or self-tapping screws

H. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

I. Duct Label Contents: Include identification of duct service using same designations or abbreviations as used on Drawings, duct size, and an arrow indicating flow direction. Duct service identification shall include air handler or fan that ducts are connected to and whether supply, return, etc.

1. Flow-Direction Arrows: Integral with duct system service lettering to accommodate both directions, or as separate unit on each duct label to indicate flow direction.
2. Lettering Size: At least 1-1/2 incheshigh.

2.5 STENCILS

A. Stencils: Prepared with letter sizes according to ASME A13.1 for piping; minimum letter height of 1-1/4 inches for ducts; and minimum letter height of 3/4 inch for access panel and door labels, equipment labels, and similar operational instructions.

1. Stencil Material: Fiberboard or metal.
2. Stencil Paint: Exterior, gloss, acrylic enamel black unless otherwise indicated. Paint may be in pressurized spray-can form.
3. Identification Paint: Exterior, acrylic enamel in colors according to ASME A13.1 unless otherwise indicated.

2.6 WARNING TAGS

A. Warning Tags: Preprinted or partially preprinted, accident-prevention tags, of plasticized card stock with matte finish suitable for writing.

1. Size: Approximately 4 by 7 inches.
2. Fasteners: Brass grommet and wire.
3. Nomenclature: Large-size primary caption such as "DANGER," "CAUTION," or "DO NOT OPERATE."
4. Color: Yellow background with black lettering.

PART 3 - EXECUTION

3.1 PREPARATION

A. Clean piping and equipment surfaces of substances that could impair bond of identification devices, including dirt, oil, grease, release agents, and incompatible primers, paints, and encapsulants.

3.2 EQUIPMENT LABEL INSTALLATION

A. Install or permanently fasten labels on each major item of mechanical equipment.

B. Locate equipment labels where accessible and visible.

3.3 PIPE LABEL INSTALLATION

A. Stenciled Pipe Label Option: Stenciled labels may be provided instead of manufactured pipe labels, at Installer's option. Install stenciled pipe labels with painted, color-coded bands or rectangles, complying with ASME A13.1, on each piping system.

1. Identification Paint: Use for contrasting background.
2. Stencil Paint: Use for pipe marking.

B. Locate pipe labels where piping is exposed or above accessible ceilings in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior exposed locations as follows:

1. Near each valve and control device.
2. Near each branch connection, excluding short takeoffs for fixtures and terminal units. Where flow pattern is not obvious, mark each pipe at branch.
3. Near penetrations through walls, floors, ceilings, and inaccessible enclosures.
4. At access doors, manholes, and similar access points that permit view of concealed piping.
5. Near major equipment items and other points of origination and termination.
6. Spaced at maximum intervals of 50 feet along each run. Reduce intervals to 25 feet in areas of congested piping and equipment.
7. On piping above removable acoustical ceilings. Omit intermediately spaced labels.

C. Pipe Label Color Schedule:

1. Refrigeration Piping:

a. Background Color: Green
b. Letter Color: White

3.4 DUCT LABEL INSTALLATION

A. Locate stencils near points where ducts enter into concealed spaces and at maximum intervals of 50 feet in each space where ducts are exposed or concealed by removable ceiling system.

3.5 WARNING-TAG INSTALLATION

A. Write required message on, and attach warning tags to, equipment and other items where required.

END OF SECTION

SECTION 23 0593

TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 - GENERAL

1.1 SUMMARY

A. Work Included: Provide testing, adjusting, and balancing for HVAC in accordance with the Contract Documents. The "General Conditions Governing All Contracts" shall apply to all work under the contract. The work of this section shall include, but not be limited to, the following:

1. Balancing Air Systems:

a. Constant-volume air systems.

b. Variable volume air systems.

1.2 DEFINITIONS

A. AABC: Associated Air Balance Council.

B. NEBB: National Environmental Balancing Bureau.

C. TAB: Testing, adjusting, and balancing.

D. TABB: Testing, Adjusting, and Balancing Bureau.

E. TAB Specialist: An entity engaged to perform TAB Work.

1.3 SUBMITTALS

A. Qualification Data: Within 30 days of Contractor's Notice to Proceed, submit documentation that the TAB contractor and this Project's TAB team members meet the qualifications specified in "Quality Assurance" Article.

B. Contract Documents Examination Report: Within 30 days of Contractor's Notice to Proceed, submit the Contract Documents review report as specified in Part 3.

C. Strategies and Procedures Plan: Within 30 days of Contractor's Notice to Proceed, submit TAB strategies and step-by-step procedures as specified in "Preparation" Article.

D. Certified TAB reports.

E. Sample report forms.

F. Instrument calibration reports, to include the following:

1. Instrument type and make.
2. Serial number.
3. Application.

4. Dates of use.
5. Dates of calibration.

1.4 QUALITY ASSURANCE

A. TAB Contractor Qualifications: Engage a TAB entity certified by either AABC or NEBB.

1. TAB Field Supervisor: Employee of the TAB contractor and certified by either AABC or NEBB.
2. TAB Technician: Employee of the TAB contractor and who is certified by either AABC or NEBB as a TAB technician.

B. TAB Conference: Meet with the City of New York and Commissioner's representatives on approval of TAB strategies and procedures plan to develop a mutual understanding of the details. Ensure the participation of TAB team members, equipment manufacturers' authorized service representatives, HVAC controls installers, and other support personnel. Provide seven days' advance notice of scheduled meeting time and location.

1. Agenda Items: Include at least the following:

a. Submittal distribution requirements.
b. The Contract Documents examination report.
c. TAB plan.
d. Work schedule and Project-site access requirements.
e. Coordination and cooperation of trades and subcontractors.
f. Coordination of documentation and communication flow.

C. Certification of TAB Reports: Certify TAB field data reports. This certification includes the following:

1. Review field data reports to validate accuracy of data and to prepare certified TAB reports.
2. Certify that TAB team complied with approved TAB plan and the procedures specified and referenced in this Specification.

D. TAB Report Forms: Use standard forms from AABC's "National Standards for Testing and Balancing Heating, Ventilating, and Air Conditioning Systems", NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems", or SMACNA's "HVAC Systems - Testing, Adjusting, and Balancing."

E. Instrumentation Type, Quantity, and Accuracy: As described in AABC's "National Standards for Testing and Balancing Heating, Ventilating, and Air Conditioning Systems or NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems," Section II, "Required Instrumentation for NEBB Certification."

F. Instrumentation Type, Quantity, Accuracy, and Calibration: As described in ASHRAE 111, Section 5, "Instrumentation."

G. Instrumentation Calibration: Calibrate instruments at least every six months or more frequently if required by instrument manufacturer.

1. Keep an updated record of instrument calibration that indicates date of calibration and the name of party performing instrument calibration.

1.5 PROJECT CONDITIONS

A. Partial City of New York Occupancy: City of New York may occupy completed areas of building before Substantial Completion. Cooperate with City of New York during TAB operations to minimize conflicts with City of New York operations.

1.6 COORDINATION

A. Notice: Provide **seven** days' advance notice for each test. Include scheduled test dates and times.

B. Perform TAB after leakage and pressure tests on air and water distribution systems have been satisfactorily completed.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine the Contract Documents to become familiar with Project requirements and to discover conditions in systems' designs that may preclude proper TAB of systems and equipment.

B. Examine systems for installed balancing devices, such as test ports, gage cocks, thermometer wells, flow-control devices, balancing valves and fittings, and manual volume dampers. Verify that locations of these balancing devices are accessible.

C. Examine the approved submittals for HVAC systems and equipment.

D. Examine design data including HVAC system descriptions, statements of design assumptions for environmental conditions and systems' output, and statements of philosophies and assumptions about HVAC system and equipment controls.

E. Examine ceiling plenums and underfloor air plenums used for supply, return, or relief air to verify that they meet the leakage class of connected ducts as specified in Division 23 Section "Metal Ducts" and are properly separated from adjacent areas. Verify that penetrations in plenum walls are sealed and fire-stopped if required.

F. Examine equipment performance data including fan and pump curves.

1. Relate performance data to Project conditions and requirements, including system effects that can create undesired or unpredicted conditions that cause reduced capacities in all or part of a system.
2. Calculate system-effect factors to reduce performance ratings of HVAC equipment when installed under conditions different from the conditions used to rate equipment performance. To calculate system effects for air systems, use tables and charts found in AMCA 201, "Fans and Systems," or in SMACNA's "HVAC Systems - Duct Design." Compare results with the design data and installed conditions.

G. Examine system and equipment installations and verify that field quality-control testing, cleaning, and adjusting specified in individual Sections have been performed.

H. Examine test reports specified in individual system and equipment Sections.

I. Examine HVAC equipment and filters and verify that bearings are greased, belts are aligned and tight, and equipment with functioning controls is ready for operation.

J. Examine terminal units, such as variable-air-volume boxes, and verify that they are accessible and their controls are connected and functioning.

K. Examine strainers. Verify that startup screens are replaced by permanent screens with indicated perforations.

L. Examine three-way valves for proper installation for their intended function of diverting or mixing fluid flows.

M. Examine heat-transfer coils for correct piping connections and for clean and straight fins.

N. Examine system pumps to ensure absence of entrained air in the suction piping.

O. Examine operating safety interlocks and controls on HVAC equipment.

P. Report deficiencies discovered before and during performance of TAB procedures. Observe and record system reactions to changes in conditions. Record default set points if different from indicated values.

3.2 PREPARATION

A. Prepare a TAB plan that includes strategies and step-by-step procedures.

B. Complete system-readiness checks and prepare reports. Verify the following:

1. Permanent electrical-power wiring is complete.
2. Hydronic systems are filled, clean, and free of air.
3. Automatic temperature-control systems are operational.
4. Equipment and duct access doors are securely closed.
5. Balance, smoke, and fire dampers are open.
6. Isolating and balancing valves are open and control valves are operational.
7. Ceilings are installed in critical areas where air-pattern adjustments are required and access to balancing devices is provided.
8. Windows and doors can be closed so indicated conditions for system operations can be met.

3.3 GENERAL PROCEDURES FOR TESTING AND BALANCING

A. Perform testing and balancing procedures on each system according to the procedures contained in AABC's "National Standards for Total System Balance", ASHRAE 111, NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems", and SMACNA's "HVAC Systems - Testing, Adjusting, and Balancing" and in this Section.

1. Comply with requirements in ASHRAE 62.1-2004, Section 7.2.2, "Air Balancing."

B. Cut insulation, ducts, pipes, and equipment cabinets for installation of test probes to the minimum extent necessary for TAB procedures.

1. After testing and balancing, patch probe holes in ducts with same material and thickness as used to construct ducts.

2. After testing and balancing, install test ports and duct access doors that comply with requirements in Division 23 Section "Air Duct Accessories."
3. Install and join new insulation that matches removed materials. Restore insulation, coverings, vapor barrier, and finish according to Division 23 Section "HVAC Insulation."

C. Mark equipment and balancing devices, including damper-control positions, valve position indicators, fan-speed-control levers, and similar controls and devices, with paint or other suitable, permanent identification material to show final settings.

D. Take and report testing and balancing measurements in inch-pound (IP) units.

3.4 GENERAL PROCEDURES FOR BALANCING AIR SYSTEMS

A. Prepare test reports for both fans and outlets. Obtain manufacturer's outlet factors and recommended testing procedures. Crosscheck the summation of required outlet volumes with required fan volumes.

B. Prepare schematic diagrams of systems' "as-built" duct layouts.

C. For variable-air-volume systems, develop a plan to simulate diversity.

D. Determine the best locations in main and branch ducts for accurate duct-airflow measurements.

E. Check airflow patterns from the outdoor-air louvers and dampers and the return- and exhaust-air dampers through the supply-fan discharge and mixing dampers.

F. Locate start-stop and disconnect switches, electrical interlocks, and motor starters.

G. Verify that motor starters are equipped with properly sized thermal protection.

H. Check dampers for proper position to achieve desired airflow path.

I. Check for airflow blockages.

J. Check condensate drains for proper connections and functioning.

K. Check for proper sealing of air-handling-unit components.

L. Verify that air duct system is sealed as specified in Division 23 Section "Metal Ducts."

3.5 PROCEDURES FOR CONSTANT-VOLUME AIR SYSTEMS

A. Adjust fans to deliver total indicated airflows within the maximum allowable fan speed listed by fan manufacturer.

1. Measure total airflow.

a. Where sufficient space in ducts is unavailable for Pitot-tube traverse measurements, measure airflow at terminal outlets and inlets and calculate the total airflow.

2. Measure fan static pressures as follows to determine actual static pressure:

a. Measure outlet static pressure as far downstream from the fan as practical and upstream from restrictions in ducts such as elbows and transitions.
b. Measure static pressure directly at the fan outlet or through the flexible connection.
c. Measure inlet static pressure of single-inlet fans in the inlet duct as near the fan as possible, upstream from the flexible connection, and downstream from duct restrictions.
d. Measure inlet static pressure of double-inlet fans through the wall of the plenum that houses the fan.

3. Measure static pressure across each component that makes up an air-handling unit, rooftop unit, and other air-handling and -treating equipment.

a. Report the cleanliness status of filters and the time static pressures are measured.

4. Measure static pressures entering and leaving other devices, such as sound traps, heat-recovery equipment, and air washers, under final balanced conditions.
5. Review Record Documents to determine variations in design static pressures versus actual static pressures. Calculate actual system-effect factors. Recommend adjustments to accommodate actual conditions.
6. Comply with requirements in Division 23 Sections for air-handling units for adjustment of fans, belts, and pulley sizes to achieve indicated air-handling-unit performance.
7. Do not make fan-speed adjustments that result in motor overload. Consult equipment manufacturers about fan-speed safety factors. Modulate dampers and measure fan-motor amperage to ensure that no overload will occur. Measure amperage in full-cooling, full-heating, economizer, and any other operating mode to determine the maximum required brake horsepower.

B. Adjust volume dampers for main duct, submain ducts, and major branch ducts to indicated airflows within specified tolerances.

1. Measure airflow of submain and branch ducts.

a. Where sufficient space in submain and branch ducts is unavailable for Pitot-tube traverse measurements, measure airflow at terminal outlets and inlets and calculate the total airflow for that zone.

2. Measure static pressure at a point downstream from the balancing damper, and adjust volume dampers until the proper static pressure is achieved.
3. Remeasure each submain and branch duct after all have been adjusted. Continue to adjust submain and branch ducts to indicated airflows within specified tolerances.

C. Measure air outlets and inlets without making adjustments.

1. Measure terminal outlets using a direct-reading hood or outlet manufacturer's written instructions and calculating factors.

D. Adjust air outlets and inlets for each space to indicated airflows within specified tolerances of indicated values. Make adjustments using branch volume dampers rather than extractors and the dampers at air terminals.

1. Adjust each outlet in same room or space to within specified tolerances of indicated quantities without generating noise levels above the limitations prescribed by the Contract Documents.
2. Adjust patterns of adjustable outlets for proper distribution without drafts.

3.6 PROCEDURES FOR MOTORS

A. Motors, 1/2 HP and Larger: Test at final balanced conditions and record the following data:

1. Manufacturer's name, model number, and serial number.
2. Motor horsepower rating.
3. Motor rpm.
4. Efficiency rating.
5. Nameplate and measured voltage, each phase.
6. Nameplate and measured amperage, each phase.
7. Starter thermal-protection-element rating.

B. Motors Driven by Variable-Frequency Controllers: Test for proper operation at speeds varying from minimum to maximum. Test the manual bypass of the controller to prove proper operation. Record observations including name of controller manufacturer, model number, serial number, and nameplate data.

3.7 PROCEDURES FOR HEAT-TRANSFER COILS

A. Measure, adjust, and record the following data for each water coil:

1. Entering- and leaving-water temperature.
2. Water flow rate.
3. Water pressure drop.
4. Dry-bulb temperature of entering and leaving air.
5. Wet-bulb temperature of entering and leaving air for cooling coils.
6. Airflow.
7. Air pressure drop.

B. Measure, adjust, and record the following data for each electric heating coil:

1. Nameplate data.
2. Airflow.
3. Entering- and leaving-air temperature at full load.
4. Voltage and amperage input of each phase at full load and at each incremental stage.
5. Calculated kilowatt at full load.
6. Fuse or circuit-breaker rating for overload protection.

C. Measure, adjust, and record the following data for each steam coil:

1. Dry-bulb temperature of entering and leaving air.
2. Airflow.
3. Air pressure drop.
4. Inlet steam pressure.

D. Measure, adjust, and record the following data for each refrigerant coil:

1. Dry-bulb temperature of entering and leaving air.
2. Wet-bulb temperature of entering and leaving air.
3. Airflow.
4. Air pressure drop.
5. Refrigerant suction pressure and temperature.

3.8 PROCEDURES FOR TESTING, ADJUSTING, AND BALANCING EXISTING SYSTEMS

A. Perform a preconstruction inspection of existing equipment that is to remain and be reused.

1. Measure and record the operating speed, airflow, and static pressure of each fan.
2. Measure motor voltage and amperage. Compare the values to motor nameplate information.
3. Check the refrigerant charge.
4. Check the condition of filters.
5. Check the condition of coils.
6. Check the operation of the drain pan and condensate-drain trap.
7. Check bearings and other lubricated parts for proper lubrication.
8. Report on the operating condition of the equipment and the results of the measurements taken. Report deficiencies.

B. Before performing testing and balancing of existing systems, inspect existing equipment that is to remain and be reused to verify that existing equipment has been cleaned and refurbished. Verify the following:

1. New filters are installed.
2. Coils are clean and fins combed.
3. Drain pans are clean.
4. Fans are clean.
5. Bearings and other parts are properly lubricated.
6. Deficiencies noted in the preconstruction report are corrected.

C. Perform testing and balancing of existing systems to the extent that existing systems are affected by the renovation work.

1. Compare the indicated airflow of the renovated work to the measured fan airflows, and determine the new fan speed and the face velocity of filters and coils.
2. Verify that the indicated airflows of the renovated work result in filter and coil face velocities and fan speeds that are within the acceptable limits defined by equipment manufacturer.
3. If calculations increase or decrease the air flow rates and water flow rates by more than 5 percent, make equipment adjustments to achieve the calculated rates. If increase or decrease is 5 percent or less, equipment adjustments are not required.
4. Balance each air outlet.

3.9 TOLERANCES

A. Set HVAC system's air flow rates and water flow rates within the following tolerances:

1. Supply, Return, and Exhaust Fans and Equipment with Fans: Plus or minus 5 percent .
2. Air Outlets and Inlets: Plus or minus 5 percent
3. Heating-Water Flow Rate: Plus or minus 5 percent
4. Cooling-Water Flow Rate: Plus or minus 5 percent .

3.10 REPORTING

A. Initial Construction-Phase Report: Based on examination of the Contract Documents as specified in "Examination" Article, prepare a report on the adequacy of design for systems' balancing devices. Recommend changes and additions to systems' balancing devices to facilitate proper performance measuring and balancing. Recommend changes and additions to HVAC systems and general construction to allow access for performance measuring and balancing devices.

B. Status Reports: Prepare monthly progress reports to describe completed procedures, procedures in progress, and scheduled procedures. Include a list of deficiencies and problems found in systems being tested and balanced. Prepare a separate report for each system and each building floor for systems serving multiple floors.

3.11 FINAL REPORT

A. General: Prepare a certified written report; tabulate and divide the report into separate sections for tested systems and balanced systems.

1. Include a certification sheet at the front of the report's binder, signed and sealed by the certified testing and balancing Commissioner.
2. Include a list of instruments used for procedures, along with proof of calibration.

B. Final Report Contents: In addition to certified field-report data, include the following:

1. Pump curves.
2. Fan curves.
3. Manufacturers' test data.
4. Field test reports prepared by system and equipment installers.
5. Other information relative to equipment performance; do not include Shop Drawings and product data.

C. General Report Data: In addition to form titles and entries, include the following data:

1. Title page.
2. Name and address of the TAB contractor.
3. Project name.
4. Project location.
5. Commissioner's name and address.
6. Commissioner name and address.
7. Contractor's name and address.
8. Report date.
9. Signature of TAB supervisor who certifies the report.
10. Table of Contents with the total number of pages defined for each section of the report. Number each page in the report.
11. Summary of contents including the following:

    a. Indicated versus final performance.
    b. Notable characteristics of systems.
    c. Description of system operation sequence if it varies from the Contract Documents.

12. Nomenclature sheets for each item of equipment.
13. Data for terminal units, including manufacturer's name, type, size, and fittings.
14. Notes to explain why certain final data in the body of reports vary from indicated values.
15. Test conditions for fans and pump performance forms including the following:

    a. Settings for outdoor-, return-, and exhaust-air dampers.
    b. Conditions of filters.
    c. Cooling coil, wet- and dry-bulb conditions.
    d. Face and bypass damper settings at coils.
    e. Fan drive settings including settings and percentage of maximum pitch diameter.
    f. Inlet vane settings for variable-air-volume systems.

g. Settings for supply-air, static-pressure controller.
h. Other system operating conditions that affect performance.

D. System Diagrams: Include schematic layouts of air and hydronic distribution systems. Present each system with single-line diagram and include the following:

1. Quantities of outdoor, supply, return, and exhaust airflows.
2. Water and steam flow rates.
3. Duct, outlet, and inlet sizes.
4. Pipe and valve sizes and locations.
5. Terminal units.
6. Balancing stations.
7. Position of balancing devices.

E. Air-Handling-Unit Test Reports: For air-handling units with coils, include the following:

1. Unit Data:

a. Unit identification.
b. Location.
c. Make and type.
d. Model number and unit size.
e. Manufacturer's serial number.
f. Unit arrangement and class.
g. Discharge arrangement.
h. Sheave make, size in inches (mm), and bore.
i. Center-to-center dimensions of sheave, and amount of adjustments in inches (mm).
j. Number, make, and size of belts.
k. Number, type, and size of filters.

2. Motor Data:

a. Motor make, and frame type and size.
b. Horsepower and rpm.
c. Volts, phase, and hertz.
d. Full-load amperage and service factor.
e. Sheave make, size in inches (mm), and bore.
f. Center-to-center dimensions of sheave, and amount of adjustments in inches (mm).

3. Test Data (Indicated and Actual Values):

a. Total air flow rate in cfm (L/s).
b. Total system static pressure in inches wg (Pa).
c. Fan rpm.
d. Discharge static pressure in inches wg (Pa).
e. Filter static-pressure differential in inches wg (Pa).
f. Preheat-coil static-pressure differential in inches wg (Pa).
g. Cooling-coil static-pressure differential in inches wg (Pa).
h. Heating-coil static-pressure differential in inches wg (Pa).
i. Outdoor airflow in cfm (L/s).
j. Return airflow in cfm (L/s).
k. Outdoor-air damper position.
l. Return-air damper position.

m. Vortex damper position.

F. Apparatus-Coil Test Reports:

1. Coil Data:

a. System identification.
b. Location.
c. Coil type.
d. Number of rows.
e. Fin spacing in fins per inch (mm) o.c.
f. Make and model number.
g. Face area in sq. ft. (sq. m).
h. Tube size in NPS (DN).
i. Tube and fin materials.
j. Circuiting arrangement.

2. Test Data (Indicated and Actual Values):

a. Air flow rate in cfm (L/s).
b. Average face velocity in fpm (m/s).
c. Air pressure drop in inches wg (Pa).
d. Outdoor-air, wet- and dry-bulb temperatures in deg F (deg C).
e. Return-air, wet- and dry-bulb temperatures in deg F (deg C).
f. Entering-air, wet- and dry-bulb temperatures in deg F (deg C).
g. Leaving-air, wet- and dry-bulb temperatures in deg F (deg C).
h. Water flow rate in gpm (L/s).
i. Water pressure differential in feet of head or psig (kPa).
j. Entering-water temperature in deg F (deg C).
k. Leaving-water temperature in deg F (deg C).
l. Refrigerant expansion valve and refrigerant types.
m. Refrigerant suction pressure in psig (kPa).
n. Refrigerant suction temperature in deg F (deg C).
o. Inlet steam pressure in psig (kPa).

G. Fan Test Reports: For supply, return, and exhaust fans, include the following:

1. Fan Data:

a. System identification.
b. Location.
c. Make and type.
d. Model number and size.
e. Manufacturer's serial number.
f. Arrangement and class.
g. Sheave make, size in inches (mm), and bore.
h. Center-to-center dimensions of sheave, and amount of adjustments in inches (mm).

2. Motor Data:

a. Motor make, and frame type and size.
b. Horsepower and rpm.
c. Volts, phase, and hertz.

d. Full-load amperage and service factor.
e. Sheave make, size in inches (mm), and bore.
f. Center-to-center dimensions of sheave, and amount of adjustments in inches (mm).
g. Number, make, and size of belts.

3. Test Data (Indicated and Actual Values):

a. Total airflow rate in cfm (L/s).
b. Total system static pressure in inches wg (Pa).
c. Fan rpm.
d. Discharge static pressure in inches wg (Pa).
e. Suction static pressure in inches wg (Pa).

H. Round, Flat-Oval, and Rectangular Duct Traverse Reports: Include a diagram with a grid representing the duct cross-section and record the following:

1. Report Data:

a. System and air-handling-unit number.
b. Location and zone.
c. Traverse air temperature in deg F (deg C).
d. Duct static pressure in inches wg (Pa).
e. Duct size in inches (mm).
f. Duct area in sq. ft. (sq. m).
g. Indicated air flow rate in cfm (L/s).
h. Indicated velocity in fpm (m/s).
i. Actual air flow rate in cfm (L/s).
j. Actual average velocity in fpm (m/s).
k. Barometric pressure in psig (Pa).

I. Air-Terminal-Device Reports:

1. Unit Data:

a. System and air-handling unit identification.
b. Location and zone.
c. Apparatus used for test.
d. Area served.
e. Make.
f. Number from system diagram.
g. Type and model number.
h. Size.
i. Effective area in sq. ft. (sq. m).

2. Test Data (Indicated and Actual Values):

a. Air flow rate in cfm (L/s).
b. Air velocity in fpm (m/s).
c. Preliminary air flow rate as needed in cfm (L/s).
d. Preliminary velocity as needed in fpm (m/s).
e. Final air flow rate in cfm (L/s).
f. Final velocity in fpm (m/s).
g. Space temperature in deg F (deg C).

J. System-Coil Reports: For reheat coils and water coils of terminal units, include the following:

1. Unit Data:

a. System and air-handling-unit identification.
b. Location and zone.
c. Room or riser served.
d. Coil make and size.
e. Flowmeter type.

2. Test Data (Indicated and Actual Values):

a. Air flow rate in cfm (L/s).
b. Entering-water temperature in deg F (deg C).
c. Leaving-water temperature in deg F (deg C).
d. Water pressure drop in feet of head or psig (kPa).
e. Entering-air temperature in deg F (deg C).
f. Leaving-air temperature in deg F (deg C).

K. Instrument Calibration Reports:

1. Report Data:

a. Instrument type and make.
b. Serial number.
c. Application.
d. Dates of use.
e. Dates of calibration.

3.12 INSPECTIONS

A. Initial Inspection:

1. After testing and balancing are complete, operate each system and randomly check measurements to verify that the system is operating according to the final test and balance readings documented in the final report.
2. Check the following for each system:

a. Measure airflow of at least 10 percent of air outlets.
b. Measure water flow of at least 5 percent of terminals.
c. Measure room temperature at each thermostat/temperature sensor. Compare the reading to the set point.
d. Verify that balancing devices are marked with final balance position.
e. Note deviations from the Contract Documents in the final report.

B. Final Inspection:

1. After initial inspection is complete and documentation by random checks verifies that testing and balancing are complete and accurately documented in the final report, request that a final inspection be made by Commissioning Contractor.
2. The TAB contractor's test and balance Commissioner shall conduct the inspection in the presence of Commissioning Contractor.

3. Commissioning Contractor shall randomly select measurements, documented in the final report, to be rechecked. Rechecking shall be limited to either 10 percent of the total measurements recorded or the extent of measurements that can be accomplished in a normal 8-hour business day.
4. If rechecks yield measurements that differ from the measurements documented in the final report by more than the tolerances allowed, the measurements shall be noted as "FAILED."
5. If the number of "FAILED" measurements is greater than 10 percent of the total measurements checked during the final inspection, the testing and balancing shall be considered incomplete and shall be rejected.

C. TAB Work will be considered defective if it does not pass final inspections. If TAB Work fails, proceed as follows:

1. Recheck all measurements and make adjustments. Revise the final report and balancing device settings to include all changes; resubmit the final report and request a second final inspection.
2. If the second final inspection also fails, the City of New York may contract the services of another TAB contractor to complete TAB Work according to the Contract Documents and deduct the cost of the services from the original TAB contractor's final payment.

D. Prepare test and inspection reports.

3.13 ADDITIONAL TESTS

A. Seasonal Periods: If initial TAB procedures were not performed during near-peak summer and winter conditions, perform additional TAB during near-peak summer and winter conditions.

END OF SECTION

SECTION 23 0715

HVAC DUCT INSULATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes insulating the following duct services:

1. Indoor, concealed supply and outdoor air.
2. Indoor, concealed return located in unconditioned space.
3. Outdoor, exposed supply and return.

B. Related Sections:

1. Section 23 0716 "HVAC Equipment Insulation."
2. Section 23 0719 "HVAC Piping Insulation."
3. Section 23 3113 "Metal Ducts" for duct liners.

1.2 DEFINITIONS

A. ASJ: All-service jacket.

B. FSK: Foil, scrim, kraft paper.

C. FSP: Foil, scrim, polyethylene.

D. PVDC: Polyvinylidene chloride.

E. SSL: Self-sealing lap.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated, identify thermal conductivity, thickness, and jackets (both factory and field applied, if any).

B. Shop Drawings: Show details for the following:

1. Application of protective shields, saddles, and inserts at hangers for each type of insulation and hanger.
2. Attachment and covering of heat tracing inside insulation.
3. Insulation application at pipe expansion joints for each type of insulation.
4. Insulation application at elbows, fittings, flanges, valves, and specialties for each type of insulation.
5. Removable insulation at piping specialties, equipment connections, and access panels.
6. Application of field-applied jackets.
7. Application at linkages of control devices.
8. Field application for each equipment type.

C. Installer Certificates: Signed by Contractor certifying that installers comply with requirements.

D. Material Test Reports: From a qualified testing agency acceptable to authorities having jurisdiction indicating, interpreting, and certifying test results for compliance of insulation materials, sealers, attachments, cements, and jackets, with requirements indicated. Include dates of tests and test methods employed.

E. Field quality-control inspection reports.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Skilled mechanics who have successfully completed an apprenticeship program or another craft training program certified by the Department of Labor, Bureau of Apprenticeship and Training.

B. Fire-Test-Response Characteristics: Insulation and related materials shall have fire-test-response characteristics indicated, as determined by testing identical products per ASTM E 84, by a testing and inspecting agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, and cement material containers, with appropriate markings of applicable testing and inspecting agency.

1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Packaging: Insulation material containers shall be marked by manufacturer with appropriate ASTM standard designation, type and grade, and maximum use temperature.

1.6 COORDINATION

A. Coordinate size and location of supports, hangers, and insulation shields specified in Division 23 Section "Hangers and Supports for HVAC Piping and Equipment."

B. Coordinate clearance requirements with piping Installer for piping insulation application, duct Installer for duct insulation application, and equipment Installer for equipment insulation application. Before preparing piping and ductwork Shop Drawings, establish and maintain clearance requirements for installation of insulation and field-applied jackets and finishes and for space required for maintenance.

C. Coordinate installation and testing of heat tracing.

1.7 SCHEDULING

A. Schedule insulation application after pressure testing systems and, where required, after installing and testing heat tracing. Insulation application may begin on segments that have satisfactory test results.

B. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

PART 2 - PRODUCTS

2.1 INSULATION MATERIALS

A. Refer to Part 3 schedule articles for requirements about where insulating materials shall be applied.

B. Products shall not contain asbestos, lead, mercury, or mercury compounds.

C. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.

D. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.

E. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.

F. Flexible Elastomeric: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534, Type I for tubular materials and Type II for sheet materials.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Aeroflex USA Inc.; Aerocel.
b. Armacell LLC; AP Armaflex.
c. K-Flex USA; Insul-Lock, Insul-Tube, and K-FLEX LS.

G. Mineral-Fiber Blanket Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 553, Type II and ASTM C 1290, Type III with factory-applied FSP jacket. Factory-applied jacket requirements are specified in Part 2 "Factory-Applied Jackets" Article.

1. Products: Subject to compliance with requirements, provide one of the following:

a. CertainTeed Corp.; SoftTouch Duct Wrap.
b. Johns Manville; Microlite.
c. Knauf Insulation; Friendly Feel Duct Wrap.
d. Manson Insulation Inc.; Alley Wrap.
e. Owens Corning; SOFTR All-Service Duct Wrap.

H. Mineral-Fiber Board Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 612, Type IA or Type IB. For duct and plenum applications, provide insulation factory-applied FSK jacket. For equipment applications, provide insulation with factory-applied ASJ. Factory-applied jacket requirements are specified in Part 2 "Factory-Applied Jackets" Article.

1. Products: Subject to compliance with requirements, provide one of the following:

a. CertainTeed Corp.; Commercial Board.
b. Fibrex Insulations Inc.; FBX.
c. Johns Manville; 800 Series Spin-Glas.
d. Knauf Insulation; Insulation Board.
e. Manson Insulation Inc.; AK Board.
f. Owens Corning; Fiberglas 700 Series.

I. Mineral-Fiber, Preformed Pipe Insulation:

1. Products: Subject to compliance with requirements, provide one of the following:

    a. Fibrex Insulations Inc.; Coreplus 1200.
    b. Johns Manville; Micro-Lok.
    c. Knauf Insulation; 1000-Degree Pipe Insulation.
    d. Manson Insulation Inc.; Alley-K.
    e. Owens Corning; Fiberglas Pipe Insulation.

2. Type I, 850 deg F (454 deg C) Materials: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 547, Type I, Grade A, with factory-applied ASJ or ASJ-SSL. Factory-applied jacket requirements are specified in Part 2 "Factory-Applied Jackets" Article.
3. Type II, 1200 deg F (649 deg C) Materials: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 547, Type II, Grade A, with factory-applied ASJ or ASJ-SSL. Factory -applied jacket requirements are specified in Part 2 "Factory-Applied Jackets" Article.

J. Mineral-Fiber, Pipe Insulation Wicking System: Preformed pipe insulation complying with ASTM C 547, Type I, Grade A, with absorbent cloth factory applied to the entire inside surface of preformed pipe insulation and extended through the longitudinal joint to outside surface of insulation under insulation jacket. Factory apply a white, polymer, vapor-retarder jacket with self-sealing adhesive tape seam and evaporation holes running continuously along the longitudinal seam, exposing the absorbent cloth.

1. Products: Subject to compliance with requirements, provide one of the following:

    a. Knauf Insulation; Permawick Pipe Insulation.
    b. Owens Corning; VaporWick Pipe Insulation.

2.2 ADHESIVES

A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated, unless otherwise indicated.

B. Calcium Silicate Adhesive: Fibrous, sodium-silicate-based adhesive with a service temperature range of 50 to 800 deg F (10 to 427 deg C).

1. Products: Subject to compliance with requirements, provide one of the following:

    a. Childers Products, Division of ITW; CP-97.
    b. Foster Products Corporation, H. B. Fuller Company; 81-27/81-93.
    c. Marathon Industries, Inc.; 290.
    d. Mon-Eco Industries, Inc.; 22-30.
    e. Vimasco Corporation; 760.

C. Flexible Elastomeric Adhesive: Comply with MIL-A-24179A, Type II, Class I.

1. Products: Subject to compliance with requirements, provide one of the following:

    a. Aeroflex USA Inc.; Aeroseal.
    b. Armacell LCC; 520 Adhesive.
    c. Foster Products Corporation, H. B. Fuller Company; 85-75.
    d. RBX Corporation; Rubatex Contact Adhesive.

2. For indoor applications, use adhesive that has a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

D. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Childers Products, Division of ITW; CP-82.
b. Foster Products Corporation, H. B. Fuller Company; 85-20.
c. ITW TACC, Division of Illinois Tool Works; S-90/80.
d. Marathon Industries, Inc.; 225.
e. Mon-Eco Industries, Inc.; 22-25.

E. ASJ Adhesive, and FSK and PVDC Jacket Adhesive: Comply with MIL-A-3316C, Class 2, Grade A for bonding insulation jacket lap seams and joints.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Childers Products, Division of ITW; CP-82.
b. Foster Products Corporation, H. B. Fuller Company; 85-20.
c. ITW TACC, Division of Illinois Tool Works; S-90/80.
d. Marathon Industries, Inc.; 225.
e. Mon-Eco Industries, Inc.; 22-25.

F. PVC Jacket Adhesive: Compatible with PVC jacket.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Dow Chemical Company (The); 739, Dow Silicone.
b. Johns-Manville; Zeston Perma-Weld, CEEL-TITE Solvent Welding Adhesive.
c. P.I.C. Plastics, Inc.; Welding Adhesive.
d. Red Devil, Inc.; Celulon Ultra Clear.
e. Speedline Corporation; Speedline Vinyl Adhesive.

2.3 MASTICS

A. Materials shall be compatible with insulation materials, jackets, and substrates; comply with MIL-C-19565C, Type II.

B. Vapor-Barrier Mastic: Water based; suitable for indoor and outdoor use on below ambient services.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Childers Products, Division of ITW; CP-35.
b. Foster Products Corporation, H. B. Fuller Company; 30-90.
c. ITW TACC, Division of Illinois Tool Works; CB-50.
d. Marathon Industries, Inc.; 590.
e. Mon-Eco Industries, Inc.; 55-40.
f. Vimasco Corporation; 749.

2. Water-Vapor Permeance: ASTM E 96, Procedure B, 0.013 perm (0.009 metric perm) at 43-mil (1.09-mm) dry film thickness.
3. Service Temperature Range: Minus 20 to plus 180 deg F (Minus 29 to plus 82 deg C).

4. Solids Content: ASTM D 1644, 59 percent by volume and 71 percent by weight.
5. Color: White.

C. Vapor-Barrier Mastic: Solvent based; suitable for outdoor use on below ambient services.

1. Products: Subject to compliance with requirements, provide one of the following:

   a. Childers Products, Division of ITW; Encacel.
   b. Foster Products Corporation, H. B. Fuller Company; 60-95/60-96.
   c. Marathon Industries, Inc.; 570.
   d. Mon-Eco Industries, Inc.; 55-70.

2. Water-Vapor Permeance: ASTM F 1249, 0.05 perm (0.033 metric perm) at 30-mil (0.8-mm) dry film thickness.
3. Service Temperature Range: Minus 50 to plus 220 deg F (Minus 46 to plus 104 deg C).
4. Solids Content: ASTM D 1644, 33 percent by volume and 46 percent by weight.
5. Color: White.

D. Breather Mastic: Water based; suitable for indoor and outdoor use on above ambient services.

1. Products: Subject to compliance with requirements, provide one of the following:

   a. Childers Products, Division of ITW; CP-10.
   b. Foster Products Corporation, H. B. Fuller Company; 35-00.
   c. ITW TACC, Division of Illinois Tool Works; CB-05/15.
   d. Marathon Industries, Inc.; 550.
   e. Mon-Eco Industries, Inc.; 55-50.
   f. Vimasco Corporation; WC-1/WC-5.

2. Water-Vapor Permeance: ASTM F 1249, 3 perms (2 metric perms) at 0.0625-inch (1.6-mm) dry film thickness.
3. Service Temperature Range: Minus 20 to plus 200 deg F (Minus 29 to plus 93 deg C).
4. Solids Content: 63 percent by volume and 73 percent by weight.
5. Color: White.

2.4 LAGGING ADHESIVES

A. Description: Comply with MIL-A-3316C Class I, Grade A and shall be compatible with insulation materials, jackets, and substrates.

1. Products: Subject to compliance with requirements, provide one of the following:

   a. Childers Products, Division of ITW; CP-52.
   b. Foster Products Corporation, H. B. Fuller Company; 81-42.
   c. Marathon Industries, Inc.; 130.
   d. Mon-Eco Industries, Inc.; 11-30.
   e. Vimasco Corporation; 136.

2. Fire-resistant, water-based lagging adhesive and coating for use indoors to adhere fire-resistant lagging cloths over duct, equipment, and pipe insulation.
3. Service Temperature Range: Minus 50 to plus 180 deg F (Minus 46 to plus 82 deg C).
4. Color: White.

2.5 SEALANTS

A. Joint Sealants:

1. Joint Sealants for Cellular-Glass, Phenolic, and Polyisocyanurate Products: Subject to compliance with requirements, provide one of the following:

   a. Childers Products, Division of ITW; CP-76.
   b. Foster Products Corporation, H. B. Fuller Company; 30-45.
   c. Marathon Industries, Inc.; 405.
   d. Mon-Eco Industries, Inc.; 44-05.
   e. Pittsburgh Corning Corporation; Pittseal 444.
   f. Vimasco Corporation; 750.

2. Materials shall be compatible with insulation materials, jackets, and substrates.
3. Permanently flexible, elastomeric sealant.
4. Service Temperature Range: Minus 100 to plus 300 deg F (Minus 73 to plus 149 deg C).
5. Color: White or gray.

B. FSK and Metal Jacket Flashing Sealants:

1. Products: Subject to compliance with requirements, provide one of the following:

   a. Childers Products, Division of ITW; CP-76-8.
   b. Foster Products Corporation, H. B. Fuller Company; 95-44.
   c. Marathon Industries, Inc.; 405.
   d. Mon-Eco Industries, Inc.; 44-05.
   e. Vimasco Corporation; 750.

2. Materials shall be compatible with insulation materials, jackets, and substrates.
3. Fire- and water-resistant, flexible, elastomeric sealant.
4. Service Temperature Range: Minus 40 to plus 250 deg F (Minus 40 to plus 121 deg C).
5. Color: Aluminum.

C. ASJ Flashing Sealants, and Vinyl, PVDC, and PVC Jacket Flashing Sealants:

1. Products: Subject to compliance with requirements, provide the following:

   a. Childers Products, Division of ITW; CP-76.

2. Materials shall be compatible with insulation materials, jackets, and substrates.
3. Fire- and water-resistant, flexible, elastomeric sealant.
4. Service Temperature Range: Minus 40 to plus 250 deg F (Minus 40 to plus 121 deg C).
5. Color: White.

2.6 FACTORY-APPLIED JACKETS

A. Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:

1. ASJ: White, kraft-paper, fiberglass-reinforced scrim with aluminum-foil backing; complying with ASTM C 1136, Type I.

2. ASJ-SSL: ASJ with self-sealing, pressure-sensitive, acrylic-based adhesive covered by a removable protective strip; complying with ASTM C 1136, Type I.
3. FSK Jacket: Aluminum-foil, fiberglass-reinforced scrim with kraft-paper backing; complying with ASTM C 1136, Type II.
4. FSP Jacket: Aluminum-foil, fiberglass-reinforced scrim with polyethylene backing; complying with ASTM C 1136, Type II.
5. PVDC Jacket for Indoor Applications: 4-mil- (0.10-mm-) thick, white PVDC biaxially oriented barrier film with a permeance at 0.02 perms (0.013 metric perms) when tested according to ASTM E 96 and with a flame-spread index of 5 and a smoke-developed index of 20 when tested according to ASTM E 84.
6. PVDC Jacket for Outdoor Applications: 6-mil- (0.15-mm-) thick, white PVDC biaxially oriented barrier film with a permeance at 0.01 perms (0.007 metric perms) when tested according to ASTM E 96 and with a flame-spread index of 5 and a smoke-developed index of 25 when tested according to ASTM E 84.
7. PVDC-SSL Jacket: PVDC jacket with a self-sealing, pressure-sensitive, acrylic-based adhesive covered by a removable protective strip.

    a. Products: Subject to compliance with requirements, provide the following:

        1) Dow Chemical Company (The); Saran 540 Vapor Retarder Film and Saran 560 Vapor Retarder Film.

8. Vinyl Jacket: UL-rated white vinyl with a permeance of 1.3 perms (0.86 metric perms) when tested according to ASTM E 96, Procedure A, and complying with NFPA 90A and NFPA 90B.

2.7 FIELD-APPLIED CLOTHS

A. Woven Glass-Fiber Fabric: Comply with MIL-C-20079H, Type I, plain weave, and presized a minimum of 8 oz./sq. yd. (271 g/sq. m).

1. Products: Subject to compliance with requirements, provide the following:

    a. Alpha Associates, Inc.; Alpha-Maritex 84215 and 84217/9485RW, Luben 59.

2.8 FIELD-APPLIED JACKETS

A. Field-applied jackets shall comply with ASTM C 921, Type I, unless otherwise indicated.

B. FSK Jacket: Aluminum-foil-face, fiberglass-reinforced scrim with kraft-paper backing.

C. PVC Jacket: High-impact-resistant, UV-resistant PVC complying with ASTM D 1784, Class 16354-C; thickness as scheduled; roll stock ready for shop or field cutting and forming. Thickness is indicated in field-applied jacket schedules.

1. Products: Subject to compliance with requirements, provide one of the following:

    a. Johns Manville; Zeston.
    b. P.I.C. Plastics, Inc.; FG Series.
    c. Proto PVC Corporation; LoSmoke.
    d. Speedline Corporation; SmokeSafe.

2. Adhesive: As recommended by jacket material manufacturer.
3. Color: White.

4. Factory-fabricated fitting covers to match jacket if available; otherwise, field fabricate.

    a. Shapes: 45- and 90-degree, short- and long-radius elbows, tees, valves, flanges, unions, reducers, end caps, soil-pipe hubs, traps, mechanical joints, and P-trap and supply covers for lavatories.

5. Factory-fabricated tank heads and tank side panels.

D. Metal Jacket:

1. Products: Subject to compliance with requirements, provide one of the following:

    a. Childers Products, Division of ITW; Metal Jacketing Systems.
    b. PABCO Metals Corporation; Surefit.
    c. RPR Products, Inc.; Insul-Mate.

2. Aluminum Jacket: Comply with ASTM B 209 (ASTM B 209M), Alloy 3003, 3005, 3105 or 5005, Temper H-14.

    a. Sheet and roll stock ready for shop or field sizing or factory cut and rolled to size.
    b. Moisture Barrier for Indoor Applications: 1-mil- (0.025-mm-) thick, heat-bonded polyethylene and kraft paper.
    c. Moisture Barrier for Outdoor Applications: 3-mil- (0.075-mm-) thick, heat-bonded polyethylene and kraft paper.
    d. Factory-Fabricated Fitting Covers:

        1) Same material, finish, and thickness as jacket.
        2) Preformed 2-piece or gore, 45- and 90-degree, short- and long-radius elbows.
        3) Tee covers.
        4) Flange and union covers.
        5) End caps.
        6) Beveled collars.
        7) Valve covers.
        8) Field fabricate fitting covers only if factory-fabricated fitting covers are not available.

3. Stainless-Steel Jacket: ASTM A 167 or ASTM A 240/A 240M.

    a. Sheet and roll stock ready for shop or field sizing or factory cut and rolled to size.
    b. Moisture Barrier for Indoor Applications: 1-mil- (0.025-mm-) thick, heat-bonded polyethylene and kraft paper.
    c. Moisture Barrier for Outdoor Applications: 3-mil- (0.075-mm-) thick, heat-bonded polyethylene and kraft paper.
    d. Factory-Fabricated Fitting Covers:

        1) Same material, finish, and thickness as jacket.
        2) Preformed 2-piece or gore, 45- and 90-degree, short- and long-radius elbows.
        3) Tee covers.
        4) Flange and union covers.
        5) End caps.
        6) Beveled collars.
        7) Valve covers.
        8) Field fabricate fitting covers only if factory-fabricated fitting covers are not available.

E. PVDC Jacket for Indoor Applications: 4-mil- (0.10-mm-) thick, white PVDC biaxially oriented barrier film with a permeance at 0.02 perms (0.013 metric perms) when tested according to ASTM E 96 and with a flame-spread index of 5 and a smoke-developed index of 20 when tested according to ASTM E 84.

1. Products: Subject to compliance with requirements, provide the following:

a. Dow Chemical Company (The), Saran 540 Vapor Retarder Film.

F. PVDC-SSL Jacket: PVDC jacket with a self-sealing, pressure-sensitive, acrylic-based adhesive covered by a removable protective strip.

2.9 TAPES

A. ASJ Tape: White vapor-retarder tape matching factory-applied jacket with acrylic adhesive, complying with ASTM C 1136 and UL listed.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0835.
b. Compac Corp.; 104 and 105.
c. Ideal Tape Co., Inc., an American Biltrite Company; 428 AWF ASJ.
d. Venture Tape; 1540 CW Plus, 1542 CW Plus, and 1542 CW Plus/SQ.

2. Width: 3 inches (75 mm).
3. Thickness: 11.5 mils (0.29 mm).
4. Adhesion: 90 ounces force/inch (1.0 N/mm) in width.
5. Elongation: 2 percent.
6. Tensile Strength: 40 lbf/inch (7.2 N/mm) in width.
7. ASJ Tape Disks and Squares: Precut disks or squares of ASJ tape.

B. FSK Tape: Foil-face, vapor-retarder tape matching factory-applied jacket with acrylic adhesive; complying with ASTM C 1136 and UL listed.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0827.
b. Compac Corp.; 110 and 111.
c. Ideal Tape Co., Inc., an American Biltrite Company; 491 AWF FSK.
d. Venture Tape; 1525 CW, 1528 CW, and 1528 CW/SQ.

2. Width: 3 inches (75 mm).
3. Thickness: 6.5 mils (0.16 mm).
4. Adhesion: 90 ounces force/inch (1.0 N/mm) in width.
5. Elongation: 2 percent.
6. Tensile Strength: 40 lbf/inch (7.2 N/mm) in width.
7. FSK Tape Disks and Squares: Precut disks or squares of FSK tape.

C. PVC Tape: White vapor-retarder tape matching field-applied PVC jacket with acrylic adhesive. Suitable for indoor and outdoor applications.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0555.

b. Compac Corp.; 130.
c. Ideal Tape Co., Inc., an American Biltrite Company; 370 White PVC tape.
d. Venture Tape; 1506 CW NS.

2. Width: 2 inches (50 mm).
3. Thickness: 6 mils (0.15 mm).
4. Adhesion: 64 ounces force/inch (0.7 N/mm) in width.
5. Elongation: 500 percent.
6. Tensile Strength: 18 lbf/inch (3.3 N/mm) in width.

D. Aluminum-Foil Tape: Vapor-retarder tape with acrylic adhesive and UL listed.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0800.
b. Compac Corp.; 120.
c. Ideal Tape Co., Inc., an American Biltrite Company; 488 AWF.
d. Venture Tape; 3520 CW.

2. Width: 2 inches (50 mm).
3. Thickness: 3.7 mils (0.093 mm).
4. Adhesion: 100 ounces force/inch (1.1 N/mm) in width.
5. Elongation: 5 percent.
6. Tensile Strength: 34 lbf/inch (6.2 N/mm) in width.

E. PVDC Tape for Indoor Applications: White vapor-retarder PVDC tape with acrylic adhesive.

1. Products: Subject to compliance with requirements, provide the following:

a. Dow Chemical Company (The); Saran 540 Vapor Retarder Tape.

2. Width: 3 inches (75 mm).
3. Film Thickness: 4 mils (0.10 mm).
4. Adhesive Thickness: 1.5 mils (0.04 mm).
5. Elongation at Break: 145 percent.
6. Tensile Strength: 55 lbf/inch (10.1 N/mm) in width.

2.10 SECUREMENTS

A. Bands:

1. Products: Subject to compliance with requirements, provide one of the following:

a. Childers Products; Bands.
b. PABCO Metals Corporation; Bands.
c. RPR Products, Inc.; Bands.

2. Stainless Steel: ASTM A 167 or ASTM A 240/A 240M, Type 304 or Type 316; 0.015 inch (0.38 mm) thick, 1/2 inch (13 mm) or 3/4 inch (19 mm) wide with wing or closed seal.
3. Aluminum: ASTM B 209 (ASTM B 209M), Alloy 3003, 3005, 3105, or 5005; Temper H-14, 0.020 inch (0.51 mm) thick, 1/2 inch (13 mm) or 3/4 inch (19 mm) wide with wing or closed seal.
4. Springs: Twin spring set constructed of stainless steel with ends flat and slotted to accept metal bands. Spring size determined by manufacturer for application.

B. Insulation Pins and Hangers:

1. Capacitor-Discharge-Weld Pins: Copper- or zinc-coated steel pin, fully annealed for capacitor-discharge welding, [0.106-inch- (2.6-mm-)] [0.135-inch- (3.5-mm-)] diameter shank, length to suit depth of insulation indicated.

   a. Products: Subject to compliance with requirements, provide one of the following:

      1) AGM Industries, Inc.; CWP-1.
      2) GEMCO; CD.
      3) Midwest Fasteners, Inc.; CD.
      4) Nelson Stud Welding; TPA, TPC, and TPS.

2. Cupped-Head, Capacitor-Discharge-Weld Pins: Copper- or zinc-coated steel pin, fully annealed for capacitor-discharge welding, [0.106-inch- (2.6-mm-)] [0.135-inch- (3.5-mm-)] diameter shank, length to suit depth of insulation indicated with integral 1-1/2-inch (38-mm) galvanized carbon-steel washer.

   a. Products: Subject to compliance with requirements, provide one of the following:

      1) AGM Industries, Inc.; CWP-1.
      2) GEMCO; Cupped Head Weld Pin.
      3) Midwest Fasteners, Inc.; Cupped Head.
      4) Nelson Stud Welding; CHP.

3. Metal, Adhesively Attached, Perforated-Base Insulation Hangers: Baseplate welded to projecting spindle that is capable of holding insulation, of thickness indicated, securely in position indicated when self-locking washer is in place. Comply with the following requirements:

   a. Products: Subject to compliance with requirements, provide one of the following:

      1) AGM Industries, Inc.; Tactoo Insul-Hangers, Series T.
      2) GEMCO; Perforated Base.
      3) Midwest Fasteners, Inc.; Spindle.

   b. Baseplate: Perforated, galvanized carbon-steel sheet, 0.030 inch (0.76 mm) thick by 2 inches (50 mm) square.
   c. Spindle: Copper- or zinc-coated, low carbon steel, Aluminum, or Stainless steel, fully annealed, 0.106-inch- (2.6-mm-) diameter shank, length to suit depth of insulation indicated.
   d. Adhesive: Recommended by hanger manufacturer. Product with demonstrated capability to bond insulation hanger securely to substrates indicated without damaging insulation, hangers, and substrates.

4. Nonmetal, Adhesively Attached, Perforated-Base Insulation Hangers: Baseplate fastened to projecting spindle that is capable of holding insulation, of thickness indicated, securely in position indicated when self-locking washer is in place. Comply with the following requirements:

   a. Products: Subject to compliance with requirements, provide one of the following:

      1) GEMCO; Nylon Hangers.
      2) Midwest Fasteners, Inc.; Nylon Insulation Hangers.

b. Baseplate: Perforated, nylon sheet, 0.030 inch (0.76 mm) thick by 1-1/2 inches (38 mm) in diameter.
c. Spindle: Nylon, 0.106-inch- (2.6-mm-) diameter shank, length to suit depth of insulation indicated, up to 2-1/2 inches (63 mm).
d. Adhesive: Recommended by hanger manufacturer. Product with demonstrated capability to bond insulation hanger securely to substrates indicated without damaging insulation, hangers, and substrates.

5. Self-Sticking-Base Insulation Hangers: Baseplate welded to projecting spindle that is capable of holding insulation, of thickness indicated, securely in position indicated when self-locking washer is in place. Comply with the following requirements:

a. Products: Subject to compliance with requirements, provide one of the following:

1) AGM Industries, Inc.; Tactoo Insul-Hangers, Series TSA.
2) GEMCO; Press and Peel.
3) Midwest Fasteners, Inc.; Self Stick.

b. Baseplate: Galvanized carbon-steel sheet, 0.030 inch (0.76 mm) thick by 2 inches square.
c. Spindle: Copper- or zinc-coated, low carbon steel, Aluminum, or Stainless steel, fully annealed, 0.106-inch- (2.6-mm-) diameter shank, length to suit depth of insulation indicated.
d. Adhesive-backed base with a peel-off protective cover.

6. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch thick, galvanized-steel, aluminum, or stainless-steel sheet, with beveled edge sized as required to hold insulation securely in place but not less than 1-1/2 inches (38 mm) in diameter.

a. Products: Subject to compliance with requirements, provide one of the following:

1) AGM Industries, Inc.; RC-150.
2) GEMCO; R-150.
3) Midwest Fasteners, Inc.; WA-150.
4) Nelson Stud Welding; Speed Clips.

b. Protect ends with capped self-locking washers incorporating a spring steel insert to ensure permanent retention of cap in exposed locations.

7. Nonmetal Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch- thick nylon sheet, with beveled edge sized as required to hold insulation securely in place but not less than 1-1/2 inches (38 mm) in diameter.

a. Products: Subject to compliance with requirements, provide one of the following:

1) GEMCO.
2) Midwest Fasteners, Inc.

C. Staples: Outward-clinching insulation staples, nominal 3/4-inch- (19-mm-) wide, stainless steel or Monel.

D. Wire: 0.062-inch (1.6-mm) soft-annealed, stainless steel.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. ACS Industries, Inc.
    b. C & F Wire.
    c. Childers Products.
    d. PABCO Metals Corporation.
    e. RPR Products, Inc.

2.11 CORNER ANGLES

A. PVC Corner Angles: 30 mils (0.8 mm) thick, minimum 1 by 1 inch, PVC according to ASTM D 1784, Class 16354-C. White or color-coded to match adjacent surface.

B. Aluminum Corner Angles: 0.040 inch (1.0 mm) thick, minimum 1 by 1 inch, aluminum according to ASTM B 209 (ASTM B 209M), Alloy 3003, 3005, 3105 or 5005; Temper H-14.

C. Stainless-Steel Corner Angles: 0.024 inch (0.61 mm) thick, minimum 1 by 1 inch, stainless steel according to ASTM A 167 or ASTM A 240/A 240M, Type 304 or 316.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions for compliance with requirements for installation and other conditions affecting performance of insulation application.

1. Verify that systems and equipment to be insulated have been tested and are free of defects.
2. Verify that surfaces to be insulated are clean and dry.
3. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

B. Surface Preparation: Clean and prepare surfaces to be insulated. Before insulating, apply a corrosion coating to insulated surfaces as follows:

1. Stainless Steel: Coat 300 series stainless steel with an epoxy primer 5 mils thick and an epoxy finish 5 mils thick if operating in a temperature range between 140 and 300 deg F. Consult coating manufacturer for appropriate coating materials and application methods for operating temperature range.
2. Carbon Steel: Coat carbon steel operating at a service temperature between 32 and 300 deg F with an epoxy coating. Consult coating manufacturer for appropriate coating materials and application methods for operating temperature range.

3.3 GENERAL INSTALLATION REQUIREMENTS

A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of equipment, ducts and fittings, and piping including fittings, valves, and specialties.

B. Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item of equipment, duct system, and pipe system as specified in insulation system schedules.

C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.

D. Install insulation with longitudinal seams at top and bottom of horizontal runs.

E. Install multiple layers of insulation with longitudinal and end seams staggered.

F. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.

G. Keep insulation materials dry during application and finishing.

H. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.

I. Install insulation with least number of joints practical.

J. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.

1. Install insulation continuously through hangers and around anchor attachments.
2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
4. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect jacket from tear or puncture by hanger, support, and shield.

K. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.

L. Install insulation with factory-applied jackets as follows:

1. Draw jacket tight and smooth.
2. Cover circumferential joints with 3-inch- (75-mm-) wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches (100 mm) o.c.
3. Overlap jacket longitudinal seams at least 1-1/2 inches (38 mm). Install insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 2 inches (50 mm) or 4 inches (100 mm) o.c.

    a. For below ambient services, apply vapor-barrier mastic over staples.

4. Cover joints and seams with tape as recommended by insulation material manufacturer to maintain vapor seal.
5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to duct and pipe flanges and fittings.

M. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.

N. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.

O. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches (100 mm) beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.

P. For above ambient services, do not install insulation to the following:

1. Vibration-control devices.
2. Testing agency labels and stamps.
3. Nameplates and data plates.
4. Manholes.
5. Handholes.
6. Cleanouts.

3.4 PENETRATIONS

A. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.

B. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Install insulation continuously through penetrations of fire-rated walls and partitions. Terminate insulation at fire damper sleeves for fire-rated wall and partition penetrations. Externally insulate damper sleeves to match adjacent insulation and overlap duct insulation at least 2 inches (50 mm).

1. Firestopping and fire-resistive joint sealers are specified in Division 7 Section "Through-Penetration Firestop Systems."

C. Insulation Installation at Floor Penetrations:

1. Duct: Install insulation continuously through floor penetrations that are not fire rated. For penetrations through fire-rated assemblies, terminate insulation at fire damper sleeves and externally insulate damper sleeve beyond floor to match adjacent duct insulation. Overlap damper sleeve and duct insulation at least 2 inches (50 mm).
2. Pipe: Install insulation continuously through floor penetrations.
3. Seal penetrations through fire-rated assemblies according to Division 07 Section "Through-Penetration Firestop Systems."

3.5 FINISHES

A. Duct, Equipment, and Pipe Insulation with ASJ, Glass-Cloth, or Other Paintable Jacket Material: Paint jacket with paint system identified below and as specified in Division 9 painting Sections.

1. Flat Acrylic Finish: Two finish coats over a primer that is compatible with jacket material and finish coat paint. Add fungicidal agent to render fabric mildew proof.

a. Finish Coat Material: Interior, flat, latex-emulsion size.

B. Flexible Elastomeric Thermal Insulation: After adhesive has fully cured, apply two coats of insulation manufacturer's recommended protective coating.

C. Color: Final color as selected by the Commissioner. Vary first and second coats to allow visual inspection of the completed Work.

D. Do not field paint aluminum or stainless-steel jackets.

3.6 DUCT INSULATION SCHEDULE, GENERAL

A. Plenums and Ducts Requiring Insulation:

1. Indoor, supply-air ducts.
2. Indoor, outdoor-air ducts.
3. Indoor, exhaust-air ducts between isolation damper and penetration of building exterior.

B. Items Not Insulated:

1. Fibrous-glass ducts.
2. Metal ducts with duct liner of sufficient thickness to comply with energy code and ASHRAE/IESNA 90.1.
3. Factory-insulated flexible ducts.
4. Factory-insulated plenums and casings.
5. Flexible connectors.
6. Vibration-control devices.
7. Factory-insulated access panels and doors.

3.7 INDOOR DUCT AND PLENUM INSULATION SCHEDULE

A. Concealed, duct and plenum insulation shall be the following:

1. Mineral-Fiber Blanket: 2 inches thick and 0.75-lb/cu. ft. nominal density.

B. All ductwork within 15 feet of a fan/blower shall be internal lined with 1" thick acoustic duct liner.

3.8 OUTDOOR DUCT AND PLENUM INSULATION SCHEDULE

A. Exterior Ductwork: Internally insulate with 1" thick liner and cover with 1.5" rigid board insulation. Alternatively, omit lining and cover with 2" rigid board. Install weatherproof self-stick membrane following installation of insulation.

B. In addition to exterior treatment, all ductwork within 15 feet of a fan/blower shall be internal lined with 1" thick acoustic duct liner.

END OF SECTION

SECTION 230719

HVAC PIPING INSULATION

PART 1 - GENERAL

1.1 SUMMARY

A. Work Included: Provide HVAC piping insulation in accordance with the Contract Documents. The "General Conditions Governing All Contracts" shall apply to all work under the Contract. The Work of this Section shall include, but not be limited to, the following:

1.2 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, apply to this Section.

1.3 SUMMARY

A. Section includes insulating the following HVAC piping systems:

1. Steam piping, indoors.
2. Steam condensate piping, indoors.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include thermal conductivity, water-vapor permeance thickness, and jackets (both factory and field applied if any).

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

1. Detail application of protective shields, saddles, and inserts at hangers for each type of insulation and hanger.
2. Detail attachment and covering of heat tracing inside insulation.
3. Detail insulation application at pipe expansion joints for each type of insulation.
4. Detail insulation application at elbows, fittings, flanges, valves, and specialties for each type of insulation.
5. Detail removable insulation at piping specialties.
6. Detail application of field-applied jackets.
7. Detail application at linkages of control devices.

C. Samples: For each type of insulation and jacket indicated. Identify each Sample, describing product and intended use.

1. Preformed Pipe Insulation Materials: 12 inches long by NPS 2.
2. Sheet Form Insulation Materials: 12 inches square.
3. Jacket Materials for Pipe: 12 inches long by NPS 2.
4. Sheet Jacket Materials: 12 inches square.

5. Manufacturer's Color Charts: For products where color is specified, show the full range of colors available for each type of finish material.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Installer.

B. Material Test Reports: From a qualified testing agency acceptable to authorities having jurisdiction indicating, interpreting, and certifying test results for compliance of insulation materials, sealers, attachments, cements, and jackets, with requirements indicated. Include dates of tests and test methods employed.

C. Field quality-control reports.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: Skilled mechanics who have successfully completed an apprenticeship program or another craft training program certified by the Department of Labor, Bureau of Apprenticeship and Training.

B. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products according to ASTM E 84, by a testing and inspecting agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing agency.

1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.

C. Mockups: Before installing insulation, build mockups for each type of insulation and finish listed below to demonstrate quality of insulation application and finishes. Build mockups in the location indicated or, if not indicated, as directed by commissioner. Use materials indicated for the completed Work.

1. Piping Mockups:

   a. One 10-foot (3-m) section of NPS 2 (DN 50) straight pipe.
   b. One each of a 90-degree threaded, welded, and flanged elbow.
   c. One each of a threaded, welded, and flanged tee fitting.
   d. One NPS 2 (DN 50) or smaller valve, and one NPS 2-1/2 (DN 65) or larger valve.
   e. Four support hangers including hanger shield and insert.
   f. One threaded strainer and one flanged strainer with removable portion of insulation.
   g. One threaded reducer and one welded reducer.
   h. One pressure temperature tap.
   i. One mechanical coupling.

2. For each mockup, fabricate cutaway sections to allow observation of application details for insulation materials, adhesives, mastics, attachments, and jackets.
3. Notify commissioner seven days in advance of dates and times when mockups will be constructed.
4. Obtain commissioner's approval of mockups before starting insulation application.
5. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless commissioner specifically approves such deviations in writing.

6. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
7. Demolish and remove mockups when directed.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Packaging: Insulation material containers shall be marked by manufacturer with appropriate ASTM standard designation, type and grade, and maximum use temperature.

1.8 COORDINATION

A. Coordinate sizes and locations of supports, hangers, and insulation shields specified in Section 23 0529 "Hangers and Supports for HVAC Piping and Equipment."

B. Coordinate clearance requirements with piping Installer for piping insulation application. Before preparing piping Shop Drawings, establish and maintain clearance requirements for installation of insulation and field-applied jackets and finishes and for space required for maintenance.

1.9 SCHEDULING

A. Schedule insulation application after pressure testing systems and, where required, after installing and testing heat tracing. Insulation application may begin on segments that have satisfactory test results.

B. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

PART 2 - PRODUCTS

2.1 INSULATION MATERIALS

A. Comply with requirements in "Piping Insulation Schedule, General," "Indoor Piping Insulation Schedule," "Outdoor, Aboveground Piping Insulation Schedule," and "Outdoor, Underground Piping Insulation Schedule" articles for where insulating materials shall be applied.

B. Products shall not contain asbestos, lead, mercury, or mercury compounds.

C. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.

D. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.

E. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.

F. Flexible Elastomeric Insulation: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534, Type I for tubular materials.

1. Products:

a. Aeroflex USA, Inc.; Aerocel.
b. Armacell LLC; AP Armaflex.
c. K-Flex USA; Insul-Lock, Insul-Tube, and K-FLEX LS.

G. Mineral-Fiber, Preformed Pipe Insulation:

1. Products:

a. Fibrex Insulations Inc.; Coreplus 1200.
b. Johns Manville; Micro-Lok.
c. Knauf Insulation; 1000-Degree Pipe Insulation.
d. Manson Insulation Inc.; Alley-K.
e. Owens Corning; Fiberglas Pipe Insulation.

2. Type I, 850 deg F (454 deg C) Materials: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 547, Type I, Grade A, without factory-applied jacket. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

H. Mineral-Fiber, Pipe and Tank Insulation: Mineral or glass fibers bonded with a thermosetting resin. Semirigid board material with factory-applied **FSK jacket** complying with ASTM C 1393, Type II or Type IIIA Category 2, or with properties similar to ASTM C 612, Type IB. Nominal density is 2.5 lb/cu. ft. (40 kg/cu. m) or more. Thermal conductivity (k-value) at 100 deg F (55 deg C) is 0.29 Btu x in./h x sq. ft. x deg F (0.042 W/m x K) or less. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

1. Products:

a. CertainTeed Corp.; CrimpWrap.
b. Johns Manville; MicroFlex.
c. Knauf Insulation; Pipe and Tank Insulation.
d. Manson Insulation Inc.; AK Flex.
e. Owens Corning; Fiberglas Pipe and Tank Insulation.

2.2 INSULATING CEMENTS

A. Mineral-Fiber Insulating Cement: Comply with ASTM C 195.

1. Products:

a. Ramco Insulation, Inc.; Super-Stik.

B. Expanded or Exfoliated Vermiculite Insulating Cement: Comply with ASTM C 196.

1. Products:

a. Ramco Insulation, Inc.; Thermokote V.

C. Mineral-Fiber, Hydraulic-Setting Insulating and Finishing Cement: Comply with ASTM C 449.

1. Products:

a. Ramco Insulation, Inc.; Ramcote 1200 and Quik-Cote.

2.3 ADHESIVES

A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated unless otherwise indicated.

B. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.

1. Products:]:

a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-127.
b. Eagle Bridges - Marathon Industries; 225.
c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 85-60/85-70.
d. Mon-Eco Industries, Inc.; 22-25.

2. For indoor applications, adhesive shall have a VOC content of 80 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
3. Adhesive shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

C. ASJ Adhesive, and FSK and PVDC Jacket Adhesive: Comply with MIL-A-3316C, Class 2, Grade A for bonding insulation jacket lap seams and joints.

1. Products: Subject to compliance with requirements,

a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-82.
b. Eagle Bridges - Marathon Industries; 225.
c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 85-50.
d. Mon-Eco Industries, Inc.; 22-25.

2. For indoor applications, adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
3. Adhesive shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

D. PVC Jacket Adhesive: Compatible with PVC jacket.

1. Products:

a. Dow Corning Corporation; 739, Dow Silicone.
b. Johns Manville; Zeston Perma-Weld, CEEL-TITE Solvent Welding Adhesive.
c. P.I.C. Plastics, Inc.; Welding Adhesive.
d. Speedline Corporation; Polyco VP Adhesive.

2. For indoor applications, adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
3. Adhesive shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.4 MASTICS

A. Materials shall be compatible with insulation materials, jackets, and substrates; comply with MIL-PRF-19565C, Type II.

1. For indoor applications, use mastics that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.5 LAGGING ADHESIVES

A. Description: Comply with MIL-A-3316C, Class I, Grade A and shall be compatible with insulation materials, jackets, and substrates.

1. For indoor applications, use lagging adhesives that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
2. Products:

a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-50 AHV2.
b. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 30-36.
c. Vimasco Corporation; 713 and 714.

3. Fire-resistant, water-based lagging adhesive and coating for use indoors to adhere fire-resistant lagging cloths over pipe insulation.
4. Service Temperature Range: 0 to plus 180 deg F (Minus 18 to plus 82 deg C).
5. Color: White.

2.6 SEALANTS

A. Joint Sealants:

1. Joint Sealants for Cellular-Glass, Phenolic, and Polyisocyanurate Products

a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-76.
b. Eagle Bridges - Marathon Industries; 405.
c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 30-45.
d. Mon-Eco Industries, Inc.; 44-05.
e. Pittsburgh Corning Corporation; Pittseal 444.

2. Joint Sealants for Polystyrene Products:

a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-70.
b. Eagle Bridges - Marathon Industries; 405.
c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 30-45.
d. Mon-Eco Industries, Inc.; 44-05.

3. Materials shall be compatible with insulation materials, jackets, and substrates.

4. Permanently flexible, elastomeric sealant.
5. Service Temperature Range: Minus 100 to plus 300 deg F (Minus 73 to plus 149 deg C).
6. Color: White or gray.
7. For indoor applications, sealants shall have a VOC content of 420 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
8. Sealants shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

B. FSK and Metal Jacket Flashing Sealants:

1. Products: Subject to compliance with requirements,

   a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-76.
   b. Eagle Bridges - Marathon Industries; 405.
   c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 95-44.
   d. Mon-Eco Industries, Inc.; 44-05.
   e.

2. Materials shall be compatible with insulation materials, jackets, and substrates.
3. Fire- and water-resistant, flexible, elastomeric sealant.
4. Service Temperature Range: Minus 40 to plus 250 deg F (Minus 40 to plus 121 deg C).
5. Color: Aluminum.
6. For indoor applications, sealants shall have a VOC content of 420 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
7. Sealants shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

C. ASJ Flashing Sealants, and Vinyl, PVDC, and PVC Jacket Flashing Sealants:

1. Products: Subject to compliance with requirements

   a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-76.

2. Materials shall be compatible with insulation materials, jackets, and substrates.
3. Fire- and water-resistant, flexible, elastomeric sealant.
4. Service Temperature Range: Minus 40 to plus 250 deg F (Minus 40 to plus 121 deg C).
5. Color: White.
6. For indoor applications, sealants shall have a VOC content of 420 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
7. Sealants shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.7 FACTORY-APPLIED JACKETS

A. Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:

1. ASJ: White, kraft-paper, fiberglass-reinforced scrim with aluminum-foil backing; complying with ASTM C 1136, Type I.
2. ASJ-SSL: ASJ with self-sealing, pressure-sensitive, acrylic-based adhesive covered by a removable protective strip; complying with ASTM C 1136, Type I.
3. FSK Jacket: Aluminum-foil, fiberglass-reinforced scrim with kraft-paper backing; complying with ASTM C 1136, Type II.
4. FSP Jacket: Aluminum-foil, fiberglass-reinforced scrim with polyethylene backing; complying with ASTM C 1136, Type II.
5. PVDC Jacket for Indoor Applications: 4-mil- (0.10-mm-) thick, white PVDC biaxially oriented barrier film with a permeance at 0.02 perm (0.013 metric perm) when tested according to ASTM E 96/E 96M and with a flame-spread index of 5 and a smoke-developed index of 20 when tested according to ASTM E 84.

    a. Products: Subject to compliance with requirements,

        1) Dow Chemical Company (The); Saran 540 Vapor Retarder Film and Saran 560 Vapor Retarder Film.

6. PVDC Jacket for Outdoor Applications: 6-mil- (0.15-mm-) thick, white PVDC biaxially oriented barrier film with a permeance at 0.01 perm (0.007 metric perm) when tested according to ASTM E 96/E 96M and with a flame-spread index of 5 and a smoke-developed index of 25 when tested according to ASTM E 84.

    a. Products:

        1) Dow Chemical Company (The); Saran 540 Vapor Retarder Film and Saran 560 Vapor Retarder Film.

7. PVDC-SSL Jacket: PVDC jacket with a self-sealing, pressure-sensitive, acrylic-based adhesive covered by a removable protective strip.

    a. Products:

        1) Dow Chemical Company (The); Saran 540 Vapor Retarder Film and Saran 560 Vapor Retarder Film.

8. Vinyl Jacket: White vinyl with a permeance of 1.3 perms (0.86 metric perms) when tested according to ASTM E 96/E 96M, Procedure A, and complying with NFPA 90A and NFPA 90B.

2.8 SECUREMENTS

A. Bands:

1. Products: Subject to compliance with requirements,

    a. ITW Insulation Systems; Gerrard Strapping and Seals.
    b. RPR Products, Inc.; Insul-Mate Strapping, Seals, and Springs.

2. Stainless Steel: ASTM A 167 or ASTM A 240/A 240M, Type 304 or Type 316; 0.015 inch thick, 1/2 inch or 3/4 inch wide with wing seal or closed seal.
3. Aluminum: ASTM B 209 (ASTM B 209M), Alloy 3003, 3005, 3105, or 5005; Temper H-14, 0.020 inch thick 3/4 inch wide with wing seal or closed seal.

4. Springs: Twin spring set constructed of stainless steel with ends flat and slotted to accept metal bands. Spring size determined by manufacturer for application.

B. Staples: Outward-clinching insulation staples, nominal 3/4-inch- (19-mm-) wide, stainless steel or Monel.

C. Wire: 0.062-inch soft-annealed, stainless .

1. Manufacturers:

a. C & F Wire.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of insulation application.

1. Verify that systems to be insulated have been tested and are free of defects.
2. Verify that surfaces to be insulated are clean and dry.
3. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

B. Surface Preparation: Clean and prepare surfaces to be insulated. Before insulating, apply a corrosion coating to insulated surfaces as follows:

1. Stainless Steel: Coat 300 series stainless steel with an epoxy primer 5 mils thick and an epoxy finish 5 mils thick if operating in a temperature range between 140 and 300 deg F). Consult coating manufacturer for appropriate coating materials and application methods for operating temperature range.
2. Carbon Steel: Coat carbon steel operating at a service temperature between 32 and 300 deg F with an epoxy coating. Consult coating manufacturer for appropriate coating materials and application methods for operating temperature range.

C. Coordinate insulation installation with the trade installing heat tracing. Comply with requirements for heat tracing that apply to insulation.

D. Mix insulating cements with clean potable water; if insulating cements are to be in contact with stainless-steel surfaces, use demineralized water.

3.3 GENERAL INSTALLATION REQUIREMENTS

A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of piping including fittings, valves, and specialties.

B. Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item of pipe system as specified in insulation system schedules.

C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.

D. Install insulation with longitudinal seams at top and bottom of horizontal runs.

E. Install multiple layers of insulation with longitudinal and end seams staggered.

F. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.

G. Keep insulation materials dry during application and finishing.

H. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.

I. Install insulation with least number of joints practical.

J. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.

1. Install insulation continuously through hangers and around anchor attachments.
2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
4. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect jacket from tear or puncture by hanger, support, and shield.

K. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.

L. Install insulation with factory-applied jackets as follows:

1. Draw jacket tight and smooth.
2. Cover circumferential joints with 3-inch-wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches o.c.
3. Overlap jacket longitudinal seams at least 1-1/2 inches. Install insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 2 inches o.c.

    a. For below-ambient services, apply vapor-barrier mastic over staples.

4. Cover joints and seams with tape, according to insulation material manufacturer's written instructions, to maintain vapor seal.
5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to pipe flanges and fittings.

M. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.

N. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.

O. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches (100 mm) beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.

P. For above-ambient services, do not install insulation to the following:

1. Vibration-control devices.
2. Testing agency labels and stamps.
3. Nameplates and data plates.
4. Cleanouts.

3.4 PENETRATIONS

A. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.

B. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Install insulation continuously through penetrations of fire-rated walls and partitions.

1. Comply with requirements in Section 07 8413 "Penetration Firestopping" for firestopping and fire-resistive joint sealers.

C. Insulation Installation at Floor Penetrations:

1. Pipe: Install insulation continuously through floor penetrations.
2. Seal penetrations through fire-rated assemblies. Comply with requirements in Section 07 8413 "Penetration Firestopping."

3.5 GENERAL PIPE INSULATION INSTALLATION

A. Requirements in this article generally apply to all insulation materials except where more specific requirements are specified in various pipe insulation material installation articles.

B. Insulation Installation on Fittings, Valves, Strainers, Flanges, and Unions:

1. Install insulation over fittings, valves, strainers, flanges, unions, and other specialties with continuous thermal and vapor-retarder integrity unless otherwise indicated.
2. Insulate pipe elbows using preformed fitting insulation or mitered fittings made from same material and density as adjacent pipe insulation. Each piece shall be butted tightly against adjoining piece and bonded with adhesive. Fill joints, seams, voids, and irregular surfaces with insulating cement finished to a smooth, hard, and uniform contour that is uniform with adjoining pipe insulation.
3. Insulate tee fittings with preformed fitting insulation or sectional pipe insulation of same material and thickness as used for adjacent pipe. Cut sectional pipe insulation to fit. Butt each section closely to the next and hold in place with tie wire. Bond pieces with adhesive.
4. Insulate valves using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. For valves, insulate up to and including the bonnets, valve stuffing-box studs, bolts, and nuts. Fill joints, seams, and irregular surfaces with insulating cement.
5. Insulate strainers using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. Fill

joints, seams, and irregular surfaces with insulating cement. Insulate strainers so strainer basket flange or plug can be easily removed and replaced without damaging the insulation and jacket. Provide a removable reusable insulation cover. For below-ambient services, provide a design that maintains vapor barrier.

6. Insulate flanges and unions using a section of oversized preformed pipe insulation. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker.
7. Cover segmented insulated surfaces with a layer of finishing cement and coat with a mastic. Install vapor-barrier mastic for below-ambient services and a breather mastic for above-ambient services. Reinforce the mastic with fabric-reinforcing mesh. Trowel the mastic to a smooth and well-shaped contour.
8. For services not specified to receive a field-applied jacket except for flexible elastomeric and polyolefin, install fitted PVC cover over elbows, tees, strainers, valves, flanges, and unions. Terminate ends with PVC end caps. Tape PVC covers to adjoining insulation facing using PVC tape.
9. Stencil or label the outside insulation jacket of each union with the word "union." Match size and color of pipe labels.

C. Insulate instrument connections for thermometers, pressure gages, pressure temperature taps, test connections, flow meters, sensors, switches, and transmitters on insulated pipes. Shape insulation at these connections by tapering it to and around the connection with insulating cement and finish with finishing cement, mastic, and flashing sealant.

D. Install removable insulation covers at locations indicated. Installation shall conform to the following:

1. Make removable flange and union insulation from sectional pipe insulation of same thickness as that on adjoining pipe. Install same insulation jacket as adjoining pipe insulation.
2. When flange and union covers are made from sectional pipe insulation, extend insulation from flanges or union long at least two times the insulation thickness over adjacent pipe insulation on each side of flange or union. Secure flange cover in place with stainless-steel or aluminum bands. Select band material compatible with insulation and jacket.
3. Construct removable valve insulation covers in same manner as for flanges, except divide the two-part section on the vertical center line of valve body.
4. When covers are made from block insulation, make two halves, each consisting of mitered blocks wired to stainless-steel fabric. Secure this wire frame, with its attached insulation, to flanges with tie wire. Extend insulation at least 2 inches (50 mm) over adjacent pipe insulation on each side of valve. Fill space between flange or union cover and pipe insulation with insulating cement. Finish cover assembly with insulating cement applied in two coats. After first coat is dry, apply and trowel second coat to a smooth finish.
5. Unless a PVC jacket is indicated in field-applied jacket schedules, finish exposed surfaces with a metal jacket.

3.6 INSTALLATION OF MINERAL-FIBER INSULATION

A. Insulation Installation on Straight Pipes and Tubes:

1. Secure each layer of preformed pipe insulation to pipe with wire or bands and tighten bands without deforming insulation materials.
2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
3. For insulation with factory-applied jackets on above-ambient surfaces, secure laps with outward-clinched staples at 6 inches (150 mm) o.c.

4. For insulation with factory-applied jackets on below-ambient surfaces, do not staple longitudinal tabs. Instead, secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.

B. Insulation Installation on Pipe Flanges:

1. Install preformed pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with mineral-fiber blanket insulation.
4. Install jacket material with manufacturer's recommended adhesive, overlap seams at least 1 inch (25 mm), and seal joints with flashing sealant.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install preformed sections of same material as straight segments of pipe insulation when available.
2. When preformed insulation elbows and fittings are not available, install mitered sections of pipe insulation, to a thickness equal to adjoining pipe insulation. Secure insulation materials with wire or bands.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed sections of same material as straight segments of pipe insulation when available.
2. When preformed sections are not available, install mitered sections of pipe insulation to valve body.
3. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
4. Install insulation to flanges as specified for flange insulation application.

3.7 FIELD-APPLIED JACKET INSTALLATION

A. Where glass-cloth jackets are indicated, install directly over bare insulation or insulation with factory-applied jackets.

1. Draw jacket smooth and tight to surface with 2-inch overlap at seams and joints.
2. Embed glass cloth between two 0.062-inch- thick coats of lagging adhesive.
3. Completely encapsulate insulation with coating, leaving no exposed insulation.

B. Where FSK jackets are indicated, install as follows:

1. Draw jacket material smooth and tight.
2. Install lap or joint strips with same material as jacket.
3. Secure jacket to insulation with manufacturer's recommended adhesive.
4. Install jacket with 1-1/2-inch laps at longitudinal seams and 3-inch- wide joint strips at end joints.
5. Seal openings, punctures, and breaks in vapor-retarder jackets and exposed insulation with vapor-barrier mastic.

C. Where PVC jackets are indicated, install with 1-inch overlap at longitudinal seams and end joints; for horizontal applications. Seal with manufacturer's recommended adhesive.

1. Apply two continuous beads of adhesive to seams and joints, one bead under lap and the finish bead along seam and joint edge.

D. Where metal jackets are indicated, install with 2-inch overlap at longitudinal seams and end joints. Overlap longitudinal seams arranged to shed water. Seal end joints with weatherproof sealant recommended by insulation manufacturer. Secure jacket with stainless-steel bands 12 inches (300 mm) o.c. and at end joints.

E. Where PVDC jackets are indicated, install as follows:

1. Apply three separate wraps of filament tape per insulation section to secure pipe insulation to pipe prior to installation of PVDC jacket.
2. Wrap factory-presized jackets around individual pipe insulation sections with one end overlapping the previously installed sheet. Install presized jacket with an approximate overlap at butt joint of 2 inches over the previous section. Adhere lap seal using adhesive or SSL, and then apply 1-1/4 circumferences of appropriate PVDC tape around overlapped butt joint.
3. Continuous jacket can be spiral-wrapped around a length of pipe insulation. Apply adhesive or PVDC tape at overlapped spiral edge. When electing to use adhesives, refer to manufacturer's written instructions for application of adhesives along this spiral edge to maintain a permanent bond.
4. Jacket can be wrapped in cigarette fashion along length of roll for insulation systems with an outer circumference of 33-1/2 inches (850 mm) or less. The 33-1/2-inch- (850-mm-) circumference limit allows for 2-inch- (50-mm-) overlap seal. Using the length of roll allows for longer sections of jacket to be installed at one time. Use adhesive on the lap seal. Visually inspect lap seal for "fishmouthing," and use PVDC tape along lap seal to secure joint.
5. Repair holes or tears in PVDC jacket by placing PVDC tape over the hole or tear and wrapping a minimum of 1-1/4 circumferences to avoid damage to tape edges.

3.8 FINISHES

A. Pipe Insulation with ASJ, Glass-Cloth, or Other Paintable Jacket Material: Paint jacket with paint system identified below and as specified in Section 09 9113 "Exterior Painting" and Section 09 9123 "Interior Painting."

1. Flat Acrylic Finish: Two finish coats over a primer that is compatible with jacket material and finish coat paint. Add fungicidal agent to render fabric mildew proof.

a. Finish Coat Material: Interior, flat, latex-emulsion size.

B. Flexible Elastomeric Thermal Insulation: After adhesive has fully cured, apply two coats of insulation manufacturer's recommended protective coating.

C. Color: Final color as selected by commissioner. Vary first and second coats to allow visual inspection of the completed Work.

D. Do not field paint aluminum or stainless-steel jackets.

3.9 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Tests and Inspections:

1. Inspect pipe, fittings, strainers, and valves, randomly selected by commissioner, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of

inspection shall be limited to three locations of straight pipe, three locations of threaded fittings, three locations of welded fittings, two locations of threaded strainers, two locations of welded strainers, three locations of threaded valves, and three locations of flanged valves for each pipe service defined in the "Piping Insulation Schedule, General" Article.

C. All insulation applications will be considered defective Work if sample inspection reveals noncompliance with requirements.

3.10 PIPING INSULATION SCHEDULE, GENERAL

A. Acceptable preformed pipe and tubular insulation materials and thicknesses are identified for each piping system and pipe size range. If more than one material is listed for a piping system, selection from materials listed is Contractor's option.

B. Items Not Insulated: Unless otherwise indicated, do not install insulation on the following:

1. Drainage piping located in crawl spaces.
2. Underground piping.
3. Chrome-plated pipes and fittings unless there is a potential for personnel injury.

3.11 INDOOR PIPING INSULATION SCHEDULE

A. Steam piping:

1. NPS 3 inches and Smaller: Insulation shall be the following:
   a. Mineral-Fiber, Preformed Pipe Insulation, Type I: 2-1/2 inches thick.

B. Steam Condensate piping:

1. NPS 1.5 inches and and Smaller: Insulation shall be the following:
   a. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1-1/2 inches thick.

3.12 INDOOR, FIELD-APPLIED JACKET SCHEDULE

A. Install jacket over insulation material. For insulation with factory-applied jacket, install the field-applied jacket over the factory-applied jacket.

B. If more than one material is listed, selection from materials listed is Contractor's option.

C. Piping, Exposed:

1. None.
2. PVC: 20 mils thick.
3. Aluminum, Smooth : 0.020 inch thick.
4. Painted Aluminum, Smooth: 0.020 inch o r0.024 inch Stainless Steel, Type 304 or Type 316, Smooth 2B Finish.

END OF SECTION

SECTION 23 0993

SEQUENCE OF OPERATIONS FOR HVAC CONTROLS

PART 1 - GENERAL

1.1 SUMMARY

A. Work Included: Provide sequence of operations for HVAC controls in accordance with the Contract Documents. The "General Conditions Governing All Contracts" shall apply to all work under the contract. The work of this section shall include, but not be limited to, the following:

1. Control sequences for HVAC systems, subsystems, and equipment.

1.2 VRF FAN COIL UNITS AND HEAT PUMPS

A. System shall be capable of simultaneous heating and cooling. System mode shall automatically change over at individual zone thermostat.

B. During a call for cooling (ie. above 75°F), factory controller shall stage compressors at heat pump to maintain space temperature setpoint.

C. During a call for heat (ie. below 68°F), factory controller shall stage compressors at heat pump to maintain space temperature setpoint.

D. Outdoor heat pump unit compressor shall modulate as required to satisfy heating and/or cooling demands of connected fan coil units. Unit defrost cycle shall operate according to factory sequence.

E. Branch boxes shall automatically meter refrigerant between indoor and outdoor equipment.

F. Leak sensors in emergency drain pains shall interrupt power to Ducted Fan Coil units when water is present. Sensors must be manually reset by building personnel.

1.3 PACKAGED DOAS WITH HEAT PUMP AND STEAM AUXILIARY HEAT

A. DOAS fans shall run according to the occupancy schedule at BAS. Fans shall run when building is occupied and stop when building is unoccupied. Motorized dampers in ducts shall be open when fan is running and closed when fan stops.

B. DOAS shall modulate compressors to maintain neutral (70 deg F, adjustable) supply air temperature at all times.

C. In the event SAT falls below 68 deg F for 10 minutes and outdoor air temp is 60 deg F or below, backup heat shall be enabled. Control system shall modulate Steam control valve to maintain SAT setpoint.

D. DOAS fans shall stop when building fire alarm system is alarming. Fans shall resume to last command when alarm is cleared.

E. When return air relative humidity exceeds setpoint (60% adjustable), unit shall enter Dehumidification mode. Unit compressors shall run at full capacity and steam control valve shall modulate to maintain 70 deg F SAT. When RA humidity is 55% or below, Dehumidification mode shall disengage and unit shall resume normal operation.

SECTION 232213
STEAM AND CONDENSATE HEATING PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes pipe and fittings for LP steam less than 15 psig and condensate piping.

1. Steel pipe and fittings.
2. Joining materials.

B. Related Requirements:

1. Section 232216 "Steam and Condensate Heating Piping Specialties" for strainers, flash tanks, special-duty valves, steam traps, thermostatic air vents and vacuum breakers, and steam and condensate meters.

1.2 ACTION SUBMITTALS

A. Delegated-Design Submittal:

1. Design calculations and detailed fabrication and assembly of pipe anchors and alignment guides, hangers and supports for multiple pipes, expansion joints and loops, and attachments of the same to the building structure.
2. Locations of pipe anchors and alignment guides and expansion joints and loops.
3. Locations of and details for penetrations, including sleeves and sleeve seals for exterior walls, floors, basement, and foundation walls.
4. Locations of and details for penetration and firestopping for fire- and smoke-rated wall and floor and ceiling assemblies.

1.3 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.4 QUALITY ASSURANCE

A. ASME Compliance: Comply with [ASME B31.1, "Power Piping,"] [and] [ASME B31.9, "Building Services Piping,"] for materials, products, and installation.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Components and installation shall be capable of withstanding the following minimum working pressures and temperatures unless otherwise indicated:

1. LP Steam Piping: 2 psig.
2. Condensate Piping: 250 deg F.
3. Safety-Valve-Inlet and -Outlet Piping: Equal to pressure of the piping system to which it is attached.

2.2 STEEL PIPE AND FITTINGS

A. Steel Pipe: ASTM A 53/A 53M, black steel, plain ends, welded and seamless, Grade B, and Schedule as indicated in piping applications articles.

B. Cast-Iron Threaded Fittings: ASME B16.4; Classes 125, 150, and 300 as indicated in piping applications articles.

C. Cast-Iron Threaded Flanges and Flanged Fittings: ASME B16.1, Classes 125 and 250 as indicated in piping applications articles; raised ground face, and bolt holes spot faced.

2.3 JOINING MATERIALS

A. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.

1. ASME B16.21, nonmetallic, flat, asbestos free, 1/8-inch maximum thickness unless otherwise indicated.

a. Full-Face Type: For flat-face, Class 125, cast-iron and cast-bronze flanges.
b. Narrow-Face Type: For raised-face, Class 250, cast-iron and steel flanges.

B. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.

PART 3 - EXECUTION

3.1 LP STEAM PIPING APPLICATIONS

A. LP Steam Piping: Schedule 40, Type S, Grade B, steel pipe; Class 125 cast-iron fittings; and threaded joints.

B. Condensate Piping above Grade: Schedule 80, Type S, Grade B, steel pipe; Class 125 cast-iron fittings; and threaded joints.

C. Condensate Piping below Grade: Schedule 80, Type S, Grade B, steel pipe; Class 125 cast-iron fittings; and threaded joints.

3.2 ANCILLARY PIPING APPLICATIONS

A. Blowdown-Drain Piping: Same materials and joining methods as for piping specified for the service in which blowdown drain is installed.

B. Vacuum-Breaker Piping: Outlet, same as service where installed.

C. Safety-Valve-Inlet and -Outlet Piping: Same materials and joining methods as for piping specified for the service in which safety valve is installed.

3.3 PIPING INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.

B. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.

C. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless otherwise indicated.

D. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

E. Install piping to permit valve servicing.

F. Install piping free of sags and bends.

G. Install fittings for changes in direction and branch connections.

H. Install piping to allow application of insulation.

I. Select system components with pressure rating equal to or greater than system operating pressure.

J. Install groups of pipes parallel to each other, spaced to permit applying insulation and servicing of valves.

K. Install drains, consisting of a tee fitting, NPS 3/4 full port-ball valve, and short NPS 3/4 threaded nipple with cap, at low points in piping system mains and elsewhere as required for system drainage.

L. Install steam supply piping at a minimum uniform grade of 0.2 percent downward in direction of steam flow.

M. Install condensate return piping at a minimum uniform grade of 0.4 percent downward in direction of condensate flow.

N. Reduce pipe sizes using eccentric reducer fitting installed with level side down.

O. Install branch connections to mains using[mechanically formed] tee fittings in main pipe, with the branch connected to top of main pipe.

P. Install valves according to the following Sections or other Sections as needed:

1. Section 230523.11 "Globe Valves for HVAC Piping."
2. Section 230523.12 "Ball Valves for HVAC Piping."
3. Section 230523.14 "Check Valves for HVAC Piping."
4. Section 230523.15 "Gate Valves for HVAC Piping."

Q. Install unions in piping, NPS 2 and smaller, adjacent to valves, at final connections of equipment, and elsewhere as indicated.

R. Install flanges in piping, NPS 2-1/2 and larger, at final connections of equipment and elsewhere as indicated.

S. Install shutoff valve immediately upstream of each dielectric fitting.

T. Install strainers on supply side of control valves, pressure-reducing valves, traps, and elsewhere as indicated. Install NPS 3/4 nipple and full port ball valve in blowdown connection of strainers NPS 2 and larger. Match size of strainer blowoff connection for strainers smaller than NPS 2.

U. Comply with requirements in Section 230516 "Expansion Fittings and Loops for HVAC Piping" for installation of expansion loops, expansion joints, anchors, and pipe alignment guides.

V. Comply with requirements in Section 230553 "Identification for HVAC Piping and Equipment" for identifying piping.

W. Install drip legs at low points and natural drainage points such as ends of mains, bottoms of risers, and ahead of pressure regulators, and control valves.

1. On straight runs with no natural drainage points, install drip legs at intervals not exceeding 300 feet.
2. Size drip legs same size as main. In steam mains NPS 6 and larger, drip leg size can be reduced, but to no less than NPS 4.

X. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 230517 "Sleeves and Sleeve Seals for HVAC Piping."

Y. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Section 230517 "Sleeves and Sleeve Seals for HVAC Piping."

Z. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 230518 "Escutcheons for HVAC Piping."

3.4 STEAM AND CONDENSATE PIPING SPECIALTIES INSTALLATION

A. Comply with requirements in Section 232216 "Steam and Condensate Heating Piping Specialties" for installation requirements for strainers, flash tanks, special-duty valves, steam traps, thermostatic air vents and vacuum breakers, and steam and condensate meters.

3.5 INSTALLATION OF HANGERS AND SUPPORTS

A. Comply with requirements for seismic restraints in Section 230548 "Vibration and Seismic Controls for HVAC."

B. Comply with requirements in Section 230529 "Hangers and Supports for HVAC Piping and Equipment" for installation of hangers, supports, and anchor devices.

C. Install the following pipe attachments:

1. Adjustable steel clevis hangers for individual horizontal piping less than 20 feet long.
2. Adjustable roller hangers and spring hangers for individual horizontal piping 20 feet or longer.
3. Pipe Roller: MSS SP-58, Type 44 for multiple horizontal piping 20 feet or longer, supported on a trapeze.
4. Spring hangers to support vertical runs.

D. Install hangers for steel steam supply piping and steam condensate piping, with maximum horizontal spacing and minimum rod diameters, to comply with MSS-58, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.

E. Support horizontal piping within [12 inches] <Insert dimension> of each fitting.

F. Support vertical runs of steel steam supply piping and steel steam condensate piping to comply with MSS-58, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.

3.6 PIPE JOINT CONSTRUCTION

A. Ream ends of pipes and remove burrs. Bevel plain ends of steel pipe.

B. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

C. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

D. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.

3.7 TERMINAL EQUIPMENT CONNECTIONS

A. Size for supply and return piping connections shall be the same as or larger than equipment connections.

B. Install traps and control valves in accessible locations close to connected equipment.

C. Install bypass piping with globe valve around control valve. If parallel control valves are installed, only one bypass is required.

D. Install vacuum breakers downstream from control valve, close to coil inlet connection.

E. Install a drip leg at coil outlet.

3.8 FIELD QUALITY CONTROL

A. Prepare steam and condensate piping according to [ASME B31.1, "Power Piping,"] [and] [ASME B31.9, "Building Services Piping,"] and as follows:

1. Leave joints, including welds, uninsulated and exposed for examination during test.
2. Provide temporary restraints for expansion joints that cannot sustain reactions due to test pressure. If temporary restraints are impractical, isolate expansion joints from testing.
3. Flush system with clean water. Clean strainers.
4. Isolate equipment from piping. If a valve is used to isolate equipment, its closure shall be capable of sealing against test pressure without damage to valve. Install blinds in flanged joints to isolate equipment.

B. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

C. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.

D. Perform the following tests and inspections

1. Use ambient temperature water as a testing medium unless there is risk of damage due to freezing. Another liquid that is safe for workers and compatible with piping may be used.
2. Subject piping system to hydrostatic test pressure that is not less than 1.5 times the working pressure. Test pressure shall not exceed maximum pressure for any vessel, pump, valve, or other component in system under test. Verify that stress due to pressure at bottom of vertical runs does not exceed 90 percent of specified minimum yield strength.
3. After hydrostatic test pressure has been applied for at least 10 minutes, examine piping, joints, and connections for leakage. Eliminate leaks by tightening, repairing, or replacing components, and repeat hydrostatic test until there are no leaks.

E. Prepare test and inspection reports.

END OF SECTION 232213

SECTION 232216
STEAM AND CONDENSATE HEATING PIPING SPECIALTIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes the following piping specialties for steam and condensate piping:

1. Strainers.
2. Stop-check valves.
3. Steam traps.
4. Thermostatic air vents and vacuum breakers.

B. Related Requirements:
1. Section 230923.11 "Control Valves" for automatic control valve and sensor specifications, installation requirements, and locations.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Strainer.
2. Valve.
3. Steam trap.
4. Air vent and vacuum breaker.
5. Connector.

1.3 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

1.4 QUALITY ASSURANCE

A. Pipe Welding: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Components and installation shall be capable of withstanding the following minimum working pressures and temperatures unless otherwise indicated:
   1. LP Steam Piping: 2 psig.
   2. Condensate Piping: 250 deg F.
   3. Air-Vent and Vacuum-Breaker Piping: Equal to pressure of the piping system to which it is attached.
   4. Safety-Valve-Inlet and -Outlet Piping: Equal to pressure of the piping system to which it is attached.

2.2 STRAINERS

A. Y-Pattern Strainers, Cast Iron:
   1. Body: ASTM A126, Class B cast iron, with bolted cover and bottom drain connection.
   2. End Connections: Threaded ends for strainers NPS 2 and smaller; flanged ends for strainers NPS 2-1/2 and larger.
   3. Strainer Screen: Stainless steel, 40 mesh strainer or perforated stainless steel basket.
   4. Tapped blowoff plug.
   5. CWP Rating: 250-psig working steam pressure.

2.3 STOP-CHECK VALVES

A. Stop-Check Valves:
   1. Body and Bonnet: Malleable iron.
   2. End Connections: Flanged.
   3. Disc: Cylindrical with removable liner and machined seat.
   4. Stem: Brass alloy.
   5. Operator: Outside screw and yoke with cast-iron handwheel.
   6. Packing: PTFE-impregnated packing with two-piece packing gland assembly.
   7. Pressure Class: 250.

2.4 STEAM SAFETY VALVES

A. Brass Steam Safety Valves: ASME labeled.
   1. Disc Material: Forged copper alloy.
   2. End Connections: Threaded inlet and outlet.
   3. Spring: Fully enclosed steel spring with adjustable pressure range and positive shutoff; factory set and sealed.
   4. Pressure Class: 250.
   5. Drip-Pan Elbow: Cast iron and having threaded inlet and outlet, with threads complying with ASME B1.20.1.

6. Size and Capacity: As required for equipment according to ASME Boiler and Pressure Vessel Code.

2.5 STEAM TRAPS

A. Float and Thermostatic Steam Traps, Cast Iron:
   1. Body and Bolted Cap: ASTM A126 cast iron.
   2. End Connections: Threaded.
   3. Float Mechanism: Replaceable, stainless steel.
   4. Seat: Hardened stainless steel.
   5. Trap Type: Balanced pressure.
   6. Thermostatic Bellows: Stainless steel or monel.
   7. Thermostatic air vent capable of withstanding 45 deg F of superheat and resisting water hammer without sustaining damage.
   8. Vacuum Breaker: Thermostatic with phosphor bronze bellows, and stainless steel cage, valve, and seat.
   9. Maximum Operating Pressure: 125 psig.

2.6 THERMOSTATIC AIR VENTS AND VACUUM BREAKERS

A. Thermostatic Air Vents:
   1. Body: Cast iron, bronze, or stainless steel.
   2. End Connections: Threaded.
   3. Float, Valve, and Seat: Stainless steel.
   4. Thermostatic Element: Phosphor bronze bellows in a stainless steel cage.
   5. Pressure Rating: 125 psig.
   6. Maximum Temperature Rating: 350 deg F.

B. Vacuum Breakers:
   1. Body: Cast iron, bronze, or stainless steel.
   2. End Connections: Threaded.
   3. Sealing Ball, Retainer, Spring, and Screen: Stainless steel.
   4. O-Ring Seal: Ethylene propylene rubber.
   5. Pressure Rating: 125 psig.
   6. Maximum Temperature Rating: 350 deg F.

PART 3 - EXECUTION

3.1 VALVE APPLICATIONS

A. Install shutoff duty valves at branch connections to steam supply mains, at steam supply connections to equipment, and at the outlet of steam traps.

B. Install safety valves on pressure-reducing stations and elsewhere as required by ASME Boiler and Pressure Vessel Code. Install safety-valve discharge piping, without valves, to nearest floor

drain or as indicated on Drawings. Comply with ASME Boiler and Pressure Vessel Code: Section VIII, Division 1, for installation requirements.

3.2 INSTALLATION OF PIPING

A. Install piping to permit valve servicing.

B. Install drains, consisting of a tee fitting, NPS 3/4 full-port ball valve, and short NPS 3/4 threaded nipple with cap, at low points in piping system mains and elsewhere as required for system drainage.

C. Install unions in piping, NPS 2 and smaller, adjacent to valves, at final connections of equipment and elsewhere as indicated.

D. Install flanges in piping, NPS 2-1/2 and larger, at final connections of equipment and elsewhere as indicated.

E. Install shutoff valve immediately upstream of each dielectric fitting.

F. Install strainers on supply side of control valves, pressure-reducing valves, traps, and elsewhere as indicated. Install NPS 3/4 nipple and full-port ball valve in blowdown connection of strainers NPS 2 and larger. Match size of strainer blowoff connection for strainers smaller than NPS 2.

3.3 INSTALLATION OF STEAM TRAPS

A. Install steam traps in accessible locations as close as possible to connected equipment.

B. Install full-port ball valve, strainer, and union upstream from trap; install union, check valve, and full-port ball valve downstream from trap unless otherwise indicated.

3.4 INSTALLATION OF SAFETY VALVES

A. Install safety valves according to ASME B31.9, "Building Services Piping."

B. Pipe safety-valve discharge without valves to atmosphere outside the building.

C. Install drip-pan elbow fitting adjacent to safety valve and pipe drain connection to nearest floor drain.

D. Install exhaust head with drain to waste, on vents equal to or larger than NPS 2-1/2.

3.5 TERMINAL EQUIPMENT CONNECTIONS

A. Install traps and control valves in accessible locations close to connected equipment.

B. Install bypass piping with globe valve around control valve. If parallel control valves are installed, only one bypass is required.

C. Install vacuum breakers downstream from control valve, close to coil inlet connection.

END OF SECTION 232216

SECTION 23 2300

REFRIGERANT PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Refrigerant pipes and fittings.
2. Refrigerant piping valves and specialties.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of valve, refrigerant piping, and refrigerant piping specialty.

B. Shop Drawings:

1. Show piping size and piping layout, including oil traps, double risers, specialties, and pipe and tube sizes to accommodate, as a minimum, equipment provided, elevation difference between compressor and evaporator, and length of piping to ensure proper operation and compliance with warranties of connected equipment.
2. Show interface and spatial relationships between piping and equipment.
3. Shop Drawing Scale: 3/8" equals 1 foot.

1.3 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For refrigerant valves and piping specialties to include in maintenance manuals.

1.5 QUALITY ASSURANCE

A. Comply with ASHRAE 15, "Safety Code for Refrigeration Systems."

B. Comply with ASME B31.5, "Refrigeration Piping and Heat Transfer Components."

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Line Test Pressure for Refrigerant R-410A:

1. Suction Lines for Air-Conditioning Applications: 300 psig.
2. Suction Lines for Heat-Pump Applications: 535 psig.
3. Hot-Gas and Liquid Lines: 535 psig.

2.2 COPPER TUBE AND FITTINGS

A. Copper Tube: ASTM B 280, Type ACR.

B. Wrought-Copper Fittings: ASME B16.22.

C. Wrought-Copper Unions: ASME B16.22.

D. Solder Filler Metals: ASTM B 32. Use 95-5 tin antimony or alloy HB solder to join copper socket fittings on copper pipe.

E. Brazing Filler Metals: AWS A5.8/A5.8M.

F. Flexible Connectors:

1. Body: Tin-bronze bellows with woven, flexible, tinned-bronze-wire-reinforced protective jacket.
2. End Connections: Socket ends.
3. Offset Performance: Capable of minimum 3/4-inch misalignment in minimum 7-inch- long assembly.
4. Working Pressure Rating: Factory test at minimum 500 psig.
5. Maximum Operating Temperature: 250 deg F.

G. Copper Pressure-Seal Fitting for Refrigerant Piping:
1. Standard: UL 207; certified by UL for field installation. Certification as a UL-recognized component alone is unacceptable.
2. Housing: Copper.
3. O-Rings: HNBR or compatible with specific refrigerant.
4. Tools: Manufacturer's approved special tools.
5. Minimum Rated Pressure: 700 psig.

2.3 VALVES AND SPECIALTIES

A. Diaphragm Packless Valves:
1. Body and Bonnet: Forged brass or cast bronze; globe design with straight-through or angle pattern.
2. Diaphragm: Phosphor bronze and stainless steel with stainless-steel spring.
3. Operator: Rising stem and hand wheel.
4. Seat: Nylon.
5. End Connections: Socket, union, or flanged.

6. Working Pressure Rating: 500 psig.
7. Maximum Operating Temperature: 275 deg F.

B. Packed-Angle Valves:
1. Body and Bonnet: Forged brass or cast bronze.
2. Packing: Molded stem, back seating, and replaceable under pressure.
3. Operator: Rising stem.
4. Seat: Nonrotating, self-aligning polytetrafluoroethylene.
5. Seal Cap: Forged-brass or valox hex cap.
6. End Connections: Socket, union, threaded, or flanged.
7. Working Pressure Rating: 500 psig.
8. Maximum Operating Temperature: 275 deg F.

C. Check Valves:
1. Body: Ductile iron, forged brass, or cast bronze; globe pattern.
2. Bonnet: Bolted ductile iron, forged brass, or cast bronze; or brass hex plug.
3. Piston: Removable polytetrafluoroethylene seat.
4. Closing Spring: Stainless steel.
5. Manual Opening Stem: Seal cap, plated-steel stem, and graphite seal.
6. End Connections: Socket, union, threaded, or flanged.
7. Maximum Opening Pressure: 0.50 psig.
8. Working Pressure Rating: 500 psig.
9. Maximum Operating Temperature: 275 deg F.

D. Service Valves:
1. Body: Forged brass with brass cap including key end to remove core.
2. Core: Removable ball-type check valve with stainless-steel spring.
3. Seat: Polytetrafluoroethylene.
4. End Connections: Copper spring.
5. Working Pressure Rating: 500 psig.

E. Solenoid Valves: Comply with AHRI 760 and UL 429; listed and labeled by a National Recognized Testing Laboratory (NRTL).
1. Body and Bonnet: Plated steel.
2. Solenoid Tube, Plunger, Closing Spring, and Seat Orifice: Stainless steel.
3. Seat: Polytetrafluoroethylene.
4. End Connections: Threaded.
5. Electrical: Molded, watertight coil in NEMA 250 enclosure of type required by location with 1/2-inch conduit adapter, and 24-V ac coil.
6. Working Pressure Rating: 400 psig.
7. Maximum Operating Temperature: 240 deg F.

F. Safety Relief Valves: Comply with 2010 ASME Boiler and Pressure Vessel Code; listed and labeled by an NRTL.
1. Body and Bonnet: Ductile iron and steel, with neoprene O-ring seal.
2. Piston, Closing Spring, and Seat Insert: Stainless steel.
3. Seat: Polytetrafluoroethylene.
4. End Connections: Threaded.
5. Working Pressure Rating: 400 psig.
6. Maximum Operating Temperature: 240 deg F.

PART 3 - EXECUTION

3.1 PIPING APPLICATIONS FOR REFRIGERANT R-410A

A. Suction Lines: Copper, Type ACR, annealed-temper tubing and wrought-copper fittings with brazed joints.

B. Hot-Gas and Liquid Lines, and Suction Lines for Heat-Pump Applications: Copper, Type ACR annealed- or drawn-temper tubing and wrought-copper fittings with brazed joints.

C. Safety-Relief-Valve Discharge Piping: Copper, Type ACR, drawn-temper tubing and wrought-copper fittings with Alloy HB soldered joints.

3.2 VALVE AND SPECIALTY APPLICATIONS

A. Install packed-angle valves in suction and discharge lines of compressor.

B. Install service valves for gage taps at inlet and outlet of hot-gas bypass valves and strainers if they are not an integral part of valves and strainers.

C. Install a check valve at the compressor discharge and a liquid accumulator at the compressor suction connection.

D. Except as otherwise indicated, install packed-angle valves on inlet and outlet side of filter dryers.

E. Install a full-size, three-valve bypass around filter dryers.

F. Install solenoid valves upstream from each expansion valve and hot-gas bypass valve. Install solenoid valves in horizontal lines with coil at top.

G. Install thermostatic expansion valves as close as possible to distributors on evaporators.

1. Install valve so diaphragm case is warmer than bulb.
2. Secure bulb to clean, straight, horizontal section of suction line using two bulb straps. Do not mount bulb in a trap or at bottom of the line.
3. If external equalizer lines are required, make connection where it will reflect suction-line pressure at bulb location.

H. Install safety relief valves where required by 2010 ASME Boiler and Pressure Vessel Code. Pipe safety-relief-valve discharge line to outside according to ASHRAE 15.

I. Install moisture/liquid indicators in liquid line at the inlet of the thermostatic expansion valve or at the inlet of the evaporator coil capillary tube.

J. Install strainers upstream from and adjacent to the following unless they are furnished as an integral assembly for the device being protected:

1. Solenoid valves.
2. Thermostatic expansion valves.
3. Hot-gas bypass valves.

4. Compressor.

K. Install filter dryers in liquid line between compressor and thermostatic expansion valve.

L. Install receivers sized to accommodate pump-down charge.

M. Install flexible connectors at compressors.

3.3 PIPING INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems; indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Shop Drawings.

B. Install refrigerant piping according to ASHRAE 15.

C. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.

D. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

E. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

F. Install piping adjacent to machines to allow service and maintenance.

G. Install piping free of sags and bends.

H. Install fittings for changes in direction and branch connections.

I. Select system components with pressure rating equal to or greater than system operating pressure.

J. Refer to Section 23 0923 "Direct Digital Control (DDC) System for HVAC" and Section 23 0993.11 "Sequence of Operations for HVAC DDC" for solenoid valve controllers, control wiring, and sequence of operation.

K. Install piping as short and direct as possible, with a minimum number of joints, elbows, and fittings.

L. Arrange piping to allow inspection and service of refrigeration equipment. Install valves and specialties in accessible locations to allow for service and inspection. Install access doors or panels as specified in Section 08 3113 "Access Doors and Frames" if valves or equipment requiring maintenance is concealed behind finished surfaces.

M. Install refrigerant piping in protective conduit where installed belowground.

N. Install refrigerant piping in rigid or flexible conduit in locations where exposed to mechanical injury.

O. Slope refrigerant piping as follows:

1. Install horizontal hot-gas discharge piping with a uniform slope downward away from compressor.

2. Install horizontal suction lines with a uniform slope downward to compressor.
3. Install traps and double risers to entrain oil in vertical runs.
4. Liquid lines may be installed level.

P. When brazing or soldering, remove solenoid-valve coils and sight glasses; also remove valve stems, seats, and packing, and accessible internal parts of refrigerant specialties. Do not apply heat near expansion-valve bulb.

Q. Install piping with adequate clearance between pipe and adjacent walls and hangers or between pipes for insulation installation.

R. Identify refrigerant piping and valves according to Section 23 0553 "Identification for HVAC Piping and Equipment."

S. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 23 0517 "Sleeves and Sleeve Seals for HVAC Piping."

T. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Section 23 0517 "Sleeves and Sleeve Seals for HVAC Piping."

U. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 23 0518 "Escutcheons for HVAC Piping."

3.4 PIPE JOINT CONSTRUCTION

A. Ream ends of pipes and tubes and remove burrs.

B. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

C. Soldered Joints: Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook."

D. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," Chapter "Pipe and Tube."

1. Use Type BCuP (copper-phosphorus) alloy for joining copper socket fittings with copper pipe.
2. Use Type BAg (cadmium-free silver) alloy for joining copper with bronze or steel.

3.5 INSTALLATION OF HANGERS AND SUPPORTS

A. Comply with requirements for seismic restraints in Section 23 0548 "Vibration and Seismic Controls for HVAC."

B. Comply with Section 23 0529 "Hangers and Supports for HVAC Piping and Equipment" for hangers, supports, and anchor devices.

C. Install the following pipe attachments:

1. Adjustable steel clevis hangers for individual horizontal runs less than 20 feet long.
2. Roller hangers and spring hangers for individual horizontal runs 20 feet or longer.
3. Pipe Roller: MSS SP-58, Type 44 for multiple horizontal piping 20 feet or longer, supported on a trapeze.

4. Spring hangers to support vertical runs.
5. Copper-clad hangers and supports for hangers and supports in direct contact with copper pipe.

D. Install hangers for copper tubing, with maximum horizontal spacing and minimum rod diameters, to comply with MSS-58, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.

E. Support horizontal piping within 12 inches of each fitting.

F. 58, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.

G.

3.6 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. Comply with ASME B31.5, Chapter VI.
2. Test refrigerant piping, specialties, and receivers. Isolate compressor, condenser, evaporator, and safety devices from test pressure if they are not rated above the test pressure.
3. Test high- and low-pressure side piping of each system separately at not less than the pressures indicated in "Performance Requirements" Article.

    a. Fill system with nitrogen to the required test pressure.
    b. System shall maintain test pressure at the manifold gage throughout duration of test.
    c. Test joints and fittings with electronic leak detector or by brushing a small amount of soap and glycerin solution over joints.
    d. Remake leaking joints using new materials, and retest until satisfactory results are achieved.

B. Prepare test and inspection reports.

3.7 SYSTEM CHARGING

A. Charge system using the following procedures:

1. Install core in filter dryers after leak test but before evacuation.
2. Evacuate entire refrigerant system with a vacuum pump to 500 micrometers. If vacuum holds for 12 hours, system is ready for charging.
3. Break vacuum with refrigerant gas, allowing pressure to build up to 2 psig.
4. Charge system with a new filter-dryer core in charging line.

3.8 ADJUSTING

A. Adjust thermostatic expansion valve to obtain proper evaporator superheat.

B. Adjust high- and low-pressure switch settings to avoid short cycling in response to fluctuating suction pressure.

C. Adjust set-point temperature of air-conditioning or chilled-water controllers to the system design temperature.

D. Perform the following adjustments before operating the refrigeration system, according to manufacturer's written instructions:

1. Open shutoff valves in condenser water circuit.
2. Verify that compressor oil level is correct.
3. Open compressor suction and discharge valves.
4. Open refrigerant valves except bypass valves that are used for other purposes.
5. Check open compressor-motor alignment and verify lubrication for motors and bearings.

E. Replace core of replaceable filter dryer after system has been adjusted and after design flow rates and pressures are established.

END OF SECTION

SECTION 23 3113

METAL DUCTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Work Included: Provide metal ducts in accordance with the Contract Documents. The "General Conditions Governing All Contracts" shall apply to all work under the contract. The work of this section shall include, but not be limited to, the following:

1. Single-wall rectangular ducts and fittings.
2. Single-wall round ducts and fittings.
3. Sheet metal materials.
4. Duct liner.
5. Sealants and gaskets.
6. Hangers and supports.

B. Related Sections:

1. Division 23 Section "Duct Accessories" for dampers, sound-control devices, duct-mounting access doors and panels, turning vanes, and flexible ducts.
2. Division 23 Section "Testing, Adjusting, and Balancing" for testing, adjusting, and balancing requirements for metal ducts.

1.2 PERFORMANCE REQUIREMENTS

A. Duct Construction: Duct construction, including sheet metal thicknesses, seam and joint construction, reinforcements, and hangers and supports, shall comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" and performance requirements and design criteria indicated in "Duct Schedule" Article.

B. Structural Performance: Duct hangers and supports shall withstand the effects of gravity loads and stresses within limits and under conditions described in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible".

1.3 SUBMITTALS

A. Product Data: For each type of the following products:

1. Liners and adhesives.
2. Sealants and gaskets.

B. Shop Drawings:

1. Fabrication, assembly, and installation, including plans, elevations, sections, components, and attachments to other work.
2. Factory- and shop-fabricated ducts and fittings.
3. Duct layout indicating sizes, configuration, liner material, and static-pressure classes.
4. Elevation of top of ducts.
5. Dimensions of main duct runs from building grid lines.

6. Fittings.
7. Reinforcement and spacing.
8. Seam and joint construction.
9. Penetrations through partitions.
10. Equipment installation based on equipment being used on Project.
11. Locations for duct accessories, including dampers, turning vanes, and access doors and panels.
12. Hangers and supports, including methods for duct and building attachment and vibration isolation.

C. Welding certificates.

D. Field quality-control reports.

1.4 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.1/D1.1M, "Structural Welding Code - Steel," for hangers and supports.
2. AWS D9.1M/D9.1, "Sheet Metal Welding Code," for duct joint and seam welding.

B. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1-2004, Section 5 - "Systems and Equipment" and Section 7 - "Construction and System Start-Up."

C. ASHRAE/IESNA Compliance: Applicable requirements in ASHRAE/IESNA 90.1-2004, Section 6.4.4 - "HVAC System Construction and Insulation."

PART 2 - PRODUCTS

2.1 SINGLE-WALL RECTANGULAR DUCTS AND FITTINGS

A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" based on indicated static-pressure class unless otherwise indicated.

B. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 1-4, "Transverse (Girth) Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

C. Transverse Joints: Prefabricated slide-on joints and components constructed using manufacturer's guidelines for material thickness, reinforcement size and spacing, and joint reinforcement.

1. Manufacturers:

a. Ductmate Industries, Inc.
b. Nexus Inc.
c. Ward Industries, Inc.

D. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 1-5, "Longitudinal Seams - Rectangular Ducts," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

E. Elbows, Transitions, Offsets, Branch Connections, and Other Duct Construction: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible,"

Chapter 2, "Fittings and Other Construction," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

F. Formed-On Flanges: Construct according to SMACNA's "HVAC Duct Construction Standards--Metal and Flexible," Figure 1-4, using corner, bolt, cleat, and gasket details.

1. Manufacturers:

a. Ductmate Industries, Inc.
b. Lockformer.

2. Duct Size: Maximum 30 inches (750 mm) wide and up to 2-inch wg (500-Pa) pressure class.
3. Longitudinal Seams: Pittsburgh lock sealed with noncuring polymer sealant.

2.2 SINGLE-WALL ROUND DUCTS AND FITTINGS

A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 3, "Round, Oval, and Flexible Duct," based on indicated static-pressure class unless otherwise indicated.

B. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-2, "Transverse Joints - Round Duct," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

1. Transverse Joints in Ducts Larger Than 60 Inches (1524 mm) in Diameter: Flanged.

C. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-1, "Seams - Round Duct and Fittings," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

1. Fabricate round ducts larger than 90 inches (2286 mm) in diameter with butt-welded longitudinal seams.
2. Fabricate flat-oval ducts larger than 72 inches (1830 mm) in width (major dimension) with butt-welded longitudinal seams.

D. Tees and Laterals: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-4, "90 Degree Tees and Laterals," and Figure 3-5, "Conical Tees," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

2.3 LISTED DUCTWORK FOR REMOVAL OF GREASE AND SMOKE LADEN VAPORS

1. Available Manufacturers:

a. Listed Double-Wall Insulated grease duct shall be model IPIC 2G grease duct manufactured by Metal-Fab, Inc

A. The grease duct shall be insulated double-wall factory –built type for use with Type I kitchen hoods, as

described in NFPA-96 for the transportation of air and grease-laden vapors from commercial cooking operation.

B. Product Description:
   a. Metal-Fab Series 2G Grease Duct.
   b. Factory prefabricated, double wall type, listed for venting of grease laden air from kitchen hoods requiring grease duct as described in NFPA 96.
   c. Rated for continuous operation at 500° F and intermittent operation at 2000° F.
   d. All components of the grease duct system shall be provided by the manufacturer to ensure the system meets the requirements of the listing including duct supports, guides, fittings, cleanouts, and expansion joints required to install the duct.
   e. Grease duct shall be listed by the following agencies with the associated listed reports:
      i. UL 1978 (File MH8251) - Grease Ducts for Restaurant Cooking Appliances.
      ii. UL103HT (MH8251) - Standard for factory built chimneys and building heating appliances.
      iii. UL2221 (File R 15388) – Condition B – evaluated as an alternative to a 2 hour site-built and chased installation with 3 inches minimum clearance to a fully enclosed combustible construction.
   f. The duct sections shall be constructed of an inner wall and an outer wall with ceramic fiber insulation between the walls.
      i. The inner wall shall be constructed of 304, 316 or 430 stainless steel.
         1. 6 through 36 inch diameter materials: 0.035 inch thick inner wall.
         2. 38 through 48 inch diameter materials: 0.048 inch thick inner wall.
      ii. The outer wall shall be constructed of aluminized steel, 304 or 316 stainless steel.
         1. 6 thru 22 diameter inch materials: 0.024 inch thick outer wall.
         2. 24 thru 48 inch diameter materials: 0.034 thick outer wall.
      iii. The duct shall include a 2" thickness of body soluble ceramic fiber insulation between the inner and outer walls.
   g. The duct wall assembly is Tested and Listed to 1 inch clearance to combustibles for 6 inch to 18 inch diameters, 2 inches clearance to combustibles for 20 to 32 inch diameters, 3 inches clearance to combustibles for 34 to 42 inch diameters, 4 inches clearance to combustibles for 44 to 48 inch diameters.

2.4 SHEET METAL MATERIALS

A. General Material Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.

B. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.

   1. Galvanized Coating Designation: G90.
   2. Finishes for Surfaces Exposed to View: Mill phosphatized.

C. PVC-Coated, Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.

   1. Galvanized Coating Designation: G90.
   2. Minimum Thickness for Factory-Applied PVC Coating: 4 mils (0.10 mm) thick.
   3. Coating Materials: Acceptable to authorities having jurisdiction for use on ducts listed and labeled by an NRTL for compliance with UL 181, Class 1.

D. Carbon-Steel Sheets: Comply with ASTM A 1008/A 1008M, with oiled, matte finish for exposed ducts.

E. Stainless-Steel Sheets: Comply with ASTM A 480/A 480M, Type 304 or 316, as indicated in the "Duct Schedule" Article; cold rolled, annealed, sheet. Exposed surface finish shall be No. 2B, No. 2D, No. 3, or No. 4 as indicated in the "Duct Schedule" Article.

F. Factory- or Shop-Applied Antimicrobial Coating:

1. Apply to the surface of sheet metal that will form the interior surface of the duct. An untreated clear coating shall be applied to the exterior surface.
2. Antimicrobial compound shall be tested for efficacy by an NRTL and registered by the EPA for use in HVAC systems.
3. Coating containing the antimicrobial compound shall have a hardness of 2H, minimum, when tested according to ASTM D 3363.
4. Surface-Burning Characteristics: Maximum flame-spread index of 25 and maximum smoke-developed index of 50 when tested according to UL 723; certified by an NRTL.
5. Shop-Applied Coating Color: Black.
6. Antimicrobial coating on sheet metal is not required for duct containing liner treated with antimicrobial coating.

G. Reinforcement Shapes and Plates: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.

1. Where black- and galvanized-steel shapes and plates are used to reinforce aluminum ducts, isolate the different metals with butyl rubber, neoprene, or EPDM gasket materials.

H. Tie Rods: Galvanized steel, 1/4-inch (6-mm) minimum diameter for lengths 36 inches (900 mm) or less; 3/8-inch (10-mm) minimum diameter for lengths longer than 36 inches (900 mm).

2.5 DUCT LINER

A. Fibrous-Glass Duct Liner: Comply with ASTM C 1071, NFPA 90A, or NFPA 90B; and with NAIMA AH124, "Fibrous Glass Duct Liner Standard."

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. CertainTeed Corporation; Insulation Group.
b. Johns Manville.
c. Knauf Insulation.
d. Owens Corning.

2. Maximum Thermal Conductivity:

a. Type I, Flexible: 0.27 Btu x in./h x sq. ft. x deg F at 75 deg F mean temperature.
b. Johns Manville.
c. Knauf Insulation.

3. Minimum Thermal Conductivity (R-Value): 5.80.
4. Minimum Thickness: 1-1/2 inches.
5. Antimicrobial Erosion-Resistant Coating: Apply to the surface of the liner that will form the interior surface of the duct to act as a moisture repellent and erosion-resistant coating. Antimicrobial compound shall be tested for efficacy by an NRTL and registered by the EPA for use in HVAC systems.
6. Liner Adhesive: Comply with NFPA 90A or NFPA 90B and with ASTM C 916.

B. Insulation Pins and Washers:

1. Cupped-Head, Capacitor-Discharge-Weld Pins: Copper- or zinc-coated steel pin, fully annealed for capacitor-discharge welding, 0.106-inch- (2.6-mm-) diameter shank, length to suit depth of insulation indicated with integral 1-1/2-inch (38-mm) galvanized carbon-steel washer.
2. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch- (0.41-mm-) thick galvanized steel or stainless steel; with beveled edge sized as required to hold insulation securely in place but not less than 1-1/2 inches (38 mm) in diameter.

C. Shop Application of Duct Liner: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-19, "Flexible Duct Liner Installation."

1. Adhere a single layer of indicated thickness of duct liner with at least 90 percent adhesive coverage at liner contact surface area. Attaining indicated thickness with multiple layers of duct liner is prohibited.
2. Apply adhesive to transverse edges of liner facing upstream that do not receive metal nosing.
3. Butt transverse joints without gaps, and coat joint with adhesive.
4. Fold and compress liner in corners of rectangular ducts or cut and fit to ensure butted-edge overlapping.
5. Do not apply liner in rectangular ducts with longitudinal joints, except at corners of ducts, unless duct size and dimensions of standard liner make longitudinal joints necessary.
6. Apply adhesive coating on longitudinal seams in ducts with air velocity of 2500 fpm.
7. Secure liner with mechanical fasteners 4 inches from corners and at intervals not exceeding 12 inches transversely; at 3 inches from transverse joints and at intervals not exceeding 18 inches longitudinally.
8. Secure transversely oriented liner edges facing the airstream with metal nosings that have either channel or "Z" profiles or are integrally formed from duct wall. Fabricate edge facings at the following locations:

    a. Fan discharges.
    b. Intervals of lined duct preceding unlined duct.
    c. Upstream edges of transverse joints in ducts where air velocities are higher than 2500 fpm or where indicated.

9. Terminate inner ducts with buildouts attached to fire-damper sleeves, dampers, turning vane assemblies, or other devices. Fabricated buildouts (metal hat sections) or other buildout means are optional; when used, secure buildouts to duct walls with bolts, screws, rivets, or welds.

2.6 SEALANT AND GASKETS

A. General Sealant and Gasket Requirements: Surface-burning characteristics for sealants and gaskets shall be a maximum flame-spread index of 25 and a maximum smoke-developed index of 50 when tested according to UL 723; certified by an NRTL.

B. Water-Based Joint and Seam Sealant:

1. Application Method: Brush on.
2. Solids Content: Minimum 65 percent.
3. Shore A Hardness: Minimum 20.
4. Water resistant.
5. Mold and mildew resistant.
6. VOC: Maximum 75 g/L (less water).
7. Maximum Static-Pressure Class: 10-inch wg, positive and negative.
8. Service: Indoor or outdoor.

9. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum sheets.

C. Solvent-Based Joint and Seam Sealant:

1. Application Method: Brush on.
2. Base: Synthetic rubber resin.
3. Solvent: Toluene and heptane.
4. Solids Content: Minimum 60 percent.
5. Shore A Hardness: Minimum 60.
6. Water resistant.
7. Mold and mildew resistant.
8. VOC: Maximum 395 g/L.
9. Maximum Static-Pressure Class: 10-inch wg, positive or negative.
10. Service: Indoor or outdoor.
11. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum sheets.

D. Flanged Joint Sealant: Comply with ASTM C 920.

1. General: Single-component, acid-curing, silicone, elastomeric.
2. Type: S.
3. Grade: NS.
4. Class: 25.
5. Use: O.

E. Flange Gaskets: Butyl rubber, neoprene, or EPDM polymer with polyisobutylene plasticizer.

F. Round Duct Joint O-Ring Seals:

1. Seal shall provide maximum leakage class of 3 cfm/100 sq. ft. at 1-inch wg and shall be rated for 10-inch wg static-pressure class, positive or negative.
2. EPDM O-ring to seal in concave bead in coupling or fitting spigot.
3. Double-lipped, EPDM O-ring seal, mechanically fastened to factory-fabricated couplings and fitting spigots.

2.7 HANGERS AND SUPPORTS

A. Hanger Rods for Noncorrosive Environments: Cadmium-plated steel rods and nuts.

B. Hanger Rods for Corrosive Environments: Electrogalvanized, all-thread rods or galvanized rods with threads painted with zinc-chromate primer after installation.

C. Strap and Rod Sizes: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 4-1 (Table 4-1M), "Rectangular Duct Hangers Minimum Size," and Table 4-2, "Minimum Hanger Sizes for Round Duct."

D. Steel Cables for Galvanized-Steel Ducts: Galvanized steel complying with ASTM A 603.

E. Steel Cables for Stainless-Steel Ducts: Stainless steel complying with ASTM A 492.

F. Steel Cable End Connections: Cadmium-plated steel assemblies with brackets, swivel, and bolts designed for duct hanger service; with an automatic-locking and clamping device.

G. Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.

H. Trapeze and Riser Supports:

1. Supports for Galvanized-Steel Ducts: Galvanized-steel shapes and plates.
2. Supports for Stainless-Steel Ducts: Stainless-steel shapes and plates.

PART 3 - EXECUTION

3.1 DUCT INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of duct system. Indicated duct locations, configurations, and arrangements were used to size ducts and calculate friction loss for air-handling equipment sizing and for other design considerations. Install duct systems as indicated unless deviations to layout are approved on Shop Drawings and Coordination Drawings.

B. Install ducts according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" unless otherwise indicated.

C. Install round ducts in maximum practical lengths.

D. Install ducts with fewest possible joints.

E. Install factory- or shop-fabricated fittings for changes in direction, size, and shape and for branch connections.

F. Unless otherwise indicated, install ducts vertically and horizontally, and parallel and perpendicular to building lines.

G. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building.

H. Install ducts with a clearance of 1 inch (25 mm), plus allowance for insulation thickness.

I. Route ducts to avoid passing through transformer vaults and electrical equipment rooms and enclosures.

J. Where ducts pass through non-fire-rated interior partitions and exterior walls and are exposed to view, cover the opening between the partition and duct or duct insulation with sheet metal flanges of same metal thickness as the duct. Overlap openings on four sides by at least 1-1/2 inches (38 mm).

K. Where ducts pass through fire-rated interior partitions and exterior walls, install fire dampers. Comply with requirements in Division 23 Section "Duct Accessories" for fire and smoke dampers.

L. Protect duct interiors from moisture, construction debris and dust, and other foreign materials. Comply with SMACNA's "Duct Cleanliness for New Construction Guidelines."

3.2 INSTALLATION OF EXPOSED DUCTWORK

A. Protect ducts exposed in finished spaces from being dented, scratched, or damaged.

B. Trim duct sealants flush with metal. Create a smooth and uniform exposed bead. Do not use two-part tape sealing system.

C. Grind welds to provide smooth surface free of burrs, sharp edges, and weld splatter. When welding stainless steel with a No. 3 or 4 finish, grind the welds flush, polish the exposed welds, and treat the welds to remove discoloration caused by welding.

D. Maintain consistency, symmetry, and uniformity in the arrangement and fabrication of fittings, hangers and supports, duct accessories, and air outlets.

E. Repair or replace damaged sections and finished work that does not comply with these requirements.

3.3 DUCT SEALING

A. Seal ducts for duct static-pressure, seal classes, and leakage classes specified in "Duct Schedule" Article according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

B. Seal ducts to the following seal classes according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible":

1. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
2. Outdoor, Supply-Air Ducts: Seal Class A.
3. Outdoor, Exhaust Ducts: Seal Class C.
4. Outdoor, Return-Air Ducts: Seal Class C.
5. Unconditioned Space, Supply-Air Ducts in Pressure Classes 2-Inch wg (500 Pa) and Lower: Seal Class B.
6. Unconditioned Space, Supply-Air Ducts in Pressure Classes Higher Than 2-Inch wg (500 Pa): Seal Class A.
7. Unconditioned Space, Exhaust Ducts: Seal Class C.
8. Unconditioned Space, Return-Air Ducts: Seal Class B.
9. Conditioned Space, Supply-Air Ducts in Pressure Classes2-Inch wg (500 Pa) and Lower: Seal Class C.
10. Conditioned Space, Supply-Air Ducts in Pressure Classes Higher Than 2-Inch wg (500 Pa): Seal Class B.
11. Conditioned Space, Exhaust Ducts: Seal Class B.
12. Conditioned Space, Return-Air Ducts: Seal Class C.

3.4 HANGER AND SUPPORT INSTALLATION

A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 4, "Hangers and Supports."

B. Building Attachments: Fasteners appropriate for construction materials to which hangers are being attached.

C. Hanger Spacing: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 4-1 (Table 4-1M), "Rectangular Duct Hangers Minimum Size," and Table 4-2, "Minimum Hanger Sizes for Round Duct," for maximum hanger spacing; install hangers and supports within 24 inches (610 mm) of each elbow and within 48 inches (1200 mm) of each branch intersection.

D. Hangers Exposed to View: Threaded rod and angle or channel supports.

E. Support vertical ducts with steel angles or channel secured to the sides of the duct with welds, bolts, sheet metal screws, or blind rivets; support at each floor and at a maximum intervals of 16 feet (5 m).

F. Install upper attachments to structures. Select and size upper attachments with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

3.5 CONNECTIONS

A. Make connections to equipment with flexible connectors complying with Division 23 Section "Duct Accessories."

B. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for branch, outlet and inlet, and terminal unit connections.

3.6 PAINTING

A. Paint interior of metal ducts that are visible through registers and grilles and that do not have duct liner. Apply one coat of flat, black, latex paint over a compatible galvanized-steel primer.

3.7 DUCT CLEANING

A. Clean new duct systems before testing, adjusting, and balancing.

B. Use service openings for entry and inspection.

1. Create new openings and install access panels appropriate for duct static-pressure class if required for cleaning access. Provide insulated panels for insulated or lined duct. Patch insulation and liner as recommended by duct liner manufacturer. Comply with Division 23 Section "Duct Accessories" for access panels and doors.
2. Disconnect and reconnect flexible ducts as needed for cleaning and inspection.
3. Remove and reinstall ceiling to gain access during the cleaning process.

C. Particulate Collection and Odor Control:

1. When venting vacuuming system inside the building, use HEPA filtration with 99.97 percent collection efficiency for 0.3-micron-size (or larger) particles.
2. When venting vacuuming system to outdoors, use filter to collect debris removed from HVAC system, and locate exhaust downwind and away from air intakes and other points of entry into building.

D. Clean the following components by removing surface contaminants and deposits:

1. Air outlets and inlets (registers, grilles, and diffusers).
2. Supply, return, and exhaust fans including fan housings, plenums (except ceiling supply and return plenums), scrolls, blades or vanes, shafts, baffles, dampers, and drive assemblies.
3. Air-handling unit internal surfaces and components including mixing box, coil section, air wash systems, spray eliminators, condensate drain pans, humidifiers and dehumidifiers, filters and filter sections, and condensate collectors and drains.
4. Coils and related components.
5. Return-air ducts, dampers, actuators, and turning vanes except in ceiling plenums and mechanical equipment rooms.
6. Supply-air ducts, dampers, actuators, and turning vanes.
7. Dedicated exhaust and ventilation components and makeup air systems.

E. Mechanical Cleaning Methodology:

1. Clean metal duct systems using mechanical cleaning methods that extract contaminants from within duct systems and remove contaminants from building.
2. Use vacuum-collection devices that are operated continuously during cleaning. Connect vacuum device to downstream end of duct sections so areas being cleaned are under negative pressure.
3. Use mechanical agitation to dislodge debris adhered to interior duct surfaces without damaging integrity of metal ducts, duct liner, or duct accessories.
4. Clean fibrous-glass duct liner with HEPA vacuuming equipment; do not permit duct liner to get wet. Replace fibrous-glass duct liner that is damaged, deteriorated, or delaminated or that has friable material, mold, or fungus growth.
5. Clean coils and coil drain pans according to NADCA 1992. Keep drain pan operational. Rinse coils with clean water to remove latent residues and cleaning materials; comb and straighten fins.
6. Provide drainage and cleanup for wash-down procedures.
7. Antimicrobial Agents and Coatings: Apply EPA-registered antimicrobial agents if fungus is present. Apply antimicrobial agents according to manufacturer's written instructions after removal of surface deposits and debris.

3.8 START UP

A. Air Balance: Comply with requirements in Division 23 Section "Testing, Adjusting, and Balancing."

3.9 DUCT SCHEDULE

A. Fabricate ducts with galvanized sheet steel except as otherwise indicated and as follows:

1. Rectangular Ducts Located in the Basement or in Crawl Spaces: PVC-coated, galvanized sheet steel with thicker coating on duct exterior.

B. Supply Ducts:

1. Pressure Class: Positive 2-inch wg (500 Pa).

C. Return Ducts:

1. Pressure Class: Positive or negative 2-inch wg (500 Pa).

D. Exhaust Ducts:

1. Pressure Class: Negative 2-inch wg (500 Pa).

E. Intermediate Reinforcement:

1. Galvanized-Steel Ducts: Galvanized steel or carbon steel coated with zinc-chromate primer.

F. Liner:

1. Supply Air Ducts: Fibrous glass, Type I, 1-1/2 inches thick.
2. Return Air Ducts: Fibrous glass, Type I, 1-1/2 inches thick.
3. Exhaust Air Ducts: Fibrous glass, Type I, 1 inch thick.

G. Elbow Configuration:

1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-2, "Rectangular Elbows."

a. Radius Type RE 1 with minimum 1.5 radius-to-diameter ratio.
b. Radius Type RE 3 with minimum 1.0 radius-to-diameter ratio and two vanes.
c. Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-3, "Vanes and Vane Runners," and Figure 2-4, "Vane Support in Elbows."

2. Round Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-3, "Round Duct Elbows."

a. Minimum Radius-to-Diameter Ratio and Elbow Segments: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 3-1, "Mitered Elbows." Elbows with less than 90-degree change of direction have proportionately fewer segments.

1) Radius-to Diameter Ratio: 1.5.

b. Round Elbows, 12 Inches (305 mm) and Smaller in Diameter: Stamped or pleated.
c. Round Elbows, 14 Inches (356 mm) and Larger in Diameter: Standing seam or welded.

H. Branch Configuration:

1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-6, "Branch Connections."

a. Rectangular Main to Rectangular Branch: 45-degree entry.
b. Rectangular Main to Round Branch: Spin in.

2. Round and Flat Oval: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-4, "90 Degree Tees and Laterals," and Figure 3-5, "Conical Tees." Saddle taps are permitted in existing duct.

a. Velocity 1000 fpm or Lower: 90-degree tap.
b. Velocity 1000 to 1500 fpm: Conical tap.
c. Velocity 1500 fpm or Higher: 45-degree lateral.

END OF SECTION

SECTION 23 3300

DUCT ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A. Work Included: Provide duct accessories in accordance with the Contract Documents. The "General Conditions Governing All Contracts" shall apply to all work under the contract. The work of this section shall include, but not be limited to, the following:

1. Manual volume dampers.
2. Control dampers.
3. Fire dampers.
4. Ceiling dampers.
5. Flange connectors.
6. Turning vanes.
7. Duct-mounting access doors.
8. Flexible connectors.
9. Duct accessory hardware.

B. Related Sections include the following:

1. Division 28 Section "Digital, Addressable Fire-Alarm System" for duct-mounting fire and smoke detectors.
2. Division 23 Section "HVAC Instrumentation and Controls" for damper actuators.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated.

1. For duct silencers, include pressure drop and dynamic insertion loss data. Include breakout noise calculations for high transmission loss casings.

B. Shop Drawings: For duct accessories. Include plans, elevations, sections, details and attachments to other work.

1. Detail duct accessories fabrication and installation in ducts and other construction. Include dimensions, weights, loads, and required clearances; and method of field assembly into duct systems and other construction. Include the following:

a. Special fittings.
b. Manual volume damper installations.
c. Control damper installations.
d. Fire-damper, smoke-damper, combination fire- and smoke-damper, ceiling, and corridor damper installations, including sleeves; and duct-mounted access doors and remote damper operators.
e. Duct security bars.
f. Wiring Diagrams: For power, signal, and control wiring.

C. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which ceiling-mounted access panels and access doors required for access to duct accessories are shown and coordinated with each other, using input from Installers of the items involved.

D. Source quality-control reports.

E. Operation and Maintenance Data: For air duct accessories to include in operation and maintenance manuals.

1.3 QUALITY ASSURANCE

A. Comply with NFPA 90A, "Installation of Air Conditioning and Ventilating Systems," and NFPA 90B, "Installation of Warm Air Heating and Air Conditioning Systems."

B. Comply with AMCA 500-D testing for damper rating.

1.4 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Fusible Links: Furnish quantity equal to 10 percent of amount installed.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 SHEET METAL MATERIALS

A. Comply with SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods, unless otherwise indicated.

B. Galvanized Sheet Steel: Lock-forming quality; complying with ASTM A 653/A 653M and having G90 (Z275) coating designation; ducts shall have mill-phosphatized finish for surfaces exposed to view.

C. Reinforcement Shapes and Plates: Galvanized-steel reinforcement where installed on galvanized sheet metal ducts; compatible materials for aluminum and stainless-steel ducts.

D. Tie Rods: Galvanized steel, 1/4-inch (6-mm) minimum diameter for lengths 36 inches (900 mm) or less; 3/8-inch (10-mm) minimum diameter for lengths longer than 36 inches (900 mm).

2.3 MANUAL VOLUME DAMPERS

A. Manufacturers:

1. Air Balance Inc.; a division of Mestek, Inc.
2. Flexmaster U.S.A., Inc.

3. McGill AirFlow LLC.
4. METALAIRE, Inc.
5. Nailor Industries Inc.
6. Ruskin Company.
7. Trox USA Inc.

B. General Description: Factory fabricated, with required hardware and accessories. Stiffen damper blades for stability. Include locking device to hold single-blade dampers in a fixed position without vibration. Close duct penetrations for damper components to seal duct consistent with pressure class.

C. Standard Volume Dampers: Multiple- or single-blade, parallel- or opposed-blade design as indicated, standard leakage rating, with linkage outside airstream, and suitable for horizontal or vertical applications.

1. Steel Frames: Hat-shaped, galvanized sheet steel channels, minimum of 0.064 inch thick, with mitered and welded corners; frames with flanges where indicated for attaching to walls and flangeless frames where indicated for installing in ducts.
2. Roll-Formed Steel Blades: 0.064-inch- (1.62-mm-) thick, galvanized sheet steel.
3. Blade Axles: Galvanized steel.
4. Tie Bars and Brackets: Galvanized steel.

D. Low-Leakage Volume Dampers: Multiple- or single-blade, parallel- or opposed-blade design as indicated, low-leakage rating, with linkage outside airstream, and suitable for horizontal or vertical applications.

1. Steel Frames: Hat-shaped, galvanized sheet steel channels, minimum of 0.064 inch thick, with mitered and welded corners; frames with flanges where indicated for attaching to walls and flangeless frames where indicated for installing in ducts.
2. Roll-Formed Steel Blades: 0.064-inch- (1.62-mm-) thick, galvanized sheet steel.
3. Blade Axles: Galvanized steel.
4. Blade Seals: Neoprene.
5. Tie Bars and Brackets: Galvanized steel.

E. Jackshaft: 1-inch diameter, galvanized-steel pipe rotating within pipe-bearing assembly mounted on supports at each mullion and at each end of multiple-damper assemblies.

1. Length and Number of Mountings: Appropriate to connect linkage of each damper in multiple-damper assembly.

F. Damper Hardware: Zinc-plated, die-cast core with dial and handle made of 3/32-inch- (2.4-mm-) thick zinc-plated steel, and a 3/4-inch (19-mm) hexagon locking nut. Include center hole to suit damper operating-rod size. Include elevated platform for insulated duct mounting.

2.4 CONTROL DAMPERS

A. Manufacturers:
1. Duro Dyne Inc.
2. Flexmaster U.S.A., Inc.
3. Greenheck Fan Corporation.
4. McGill AirFlow LLC.
5. METALAIRE, Inc.
6. Nailor Industries Inc.
7. Ruskin Company.
8. Vent Products Company, Inc.

9. Young Regulator Company.

B. General Description: AMCA-rated, opposed-blade design; minimum of 0.1084-inch- (2.8-mm) thick, galvanized-steel frames with holes for duct mounting; minimum of 0.0635-inch- (1.61-mm) thick, galvanized-steel damper blades with maximum blade width of 8 inches (203 mm).

1. Secure blades to 1/2-inch- diameter, zinc-plated axles using zinc-plated hardware, with nylon blade bearings, blade-linkage hardware of zinc-plated steel and brass, ends sealed against spring-stainless-steel blade bearings, and thrust bearings at each end of every blade.
2. Operating Temperature Range: From minus 40 to plus 200 deg F.
3. Provide parallel- or opposed-blade design with inflatable seal blade edging, or replaceable rubber seals, rated for leakage at less than 10 cfm per sq. ft. of damper area, at differential pressure of 4-inch wg (995 Pa) when damper is being held by torque of 50 in. x lbf; when tested according to AMCA 500D.

2.5 FIRE DAMPERS

A. Manufacturers:
1. Cesco Products; a division of Mestek, Inc.
2. Greenheck Fan Corporation.
3. McGill AirFlow LLC.
4. METALAIRE, Inc.
5. Nailor Industries Inc.
6. NCA Manufacturing, Inc.
7. Pottorff; a division of PCI Industries, Inc.
8. Ruskin Company.

B. Fire dampers shall be labeled according to UL 555.

C. Fire Rating: 1-1/2 hours.

D. Frame: Curtain type with blades outside airstream; fabricated with roll-formed, 0.034-inch thick galvanized steel; with mitered and interlocking corners.

E. Mounting Sleeve: Factory- or field-installed, galvanized sheet steel.

1. Minimum Thickness: 0.052 or 0.138 inch thick as indicated and of length to suit application.
2. Exceptions: Omit sleeve where damper frame width permits direct attachment of perimeter mounting angles on each side of wall or floor, and thickness of damper frame complies with sleeve requirements.

F. Mounting Orientation: Vertical or horizontal as indicated.

G. Blades: Roll-formed, interlocking, 0.034-inch- (0.85-mm-) thick, galvanized sheet steel. In place of interlocking blades, use full-length, 0.034-inch- (0.85-mm-) thick, galvanized-steel blade connectors.

H. Horizontal Dampers: Include blade lock and stainless-steel closure spring.

I. Fusible Links: Replaceable, 165 deg F (74 deg C) rated.

2.6 CEILING DAMPERS

A. Manufacturers:

1. Cesco Products; a division of Mestek, Inc.
2. McGill AirFlow LLC.
3. METALAIRE, Inc.
4. Nailor Industries Inc.
5. Ruskin Company.

B. General Description: Labeled according to UL 555C; comply with construction details for tested floor- and roof-ceiling assemblies as indicated in UL's "Fire Resistance Directory."

C. Frame: Galvanized sheet steel, round or rectangular, style to suit ceiling construction.

D. Blades: Galvanized sheet steel with refractory insulation.

E. Fusible Links: Replaceable, 165 deg F (74 deg C) rated.

2.7 FLANGE CONNECTORS

A. Manufacturers:

1. Ductmate Industries, Inc.
2. Ward Industries, Inc.; a division of Hart & Cooley, Inc.

B. Description: Add-on or roll-formed, factory-fabricated, slide-on transverse flange connectors, gaskets, and components.

C. Material: Galvanized steel.

D. Gage and Shape: Match connecting ductwork.

2.8 TURNING VANES

A. Fabricate to comply with SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" for vanes and vane runners. Vane runners shall automatically align vanes.

B. Manufactured Turning Vanes: Fabricate 1-1/2-inch- (38-mm-) wide, double-vane, curved blades of galvanized sheet steel set 3/4 inch (19 mm) o.c.; support with bars perpendicular to blades set 2 inches (50 mm) o.c.; and set into vane runners suitable for duct mounting.

1. Manufacturers:

a. Ductmate Industries, Inc.
b. Duro Dyne Corp.
c. METALAIRE, Inc.
d. SEMCO Incorporated.
e. Ward Industries, Inc.; a division of Hart & Cooley, Inc

C. Acoustic Turning Vanes: Fabricate airfoil-shaped aluminum extrusions with perforated faces and fibrous-glass fill.

2.9 DUCT-MOUNTING ACCESS DOORS

A. General Description: Fabricate doors airtight and suitable for duct pressure class.

B. Door: Double wall, duct mounting, and rectangular; fabricated of galvanized sheet metal with insulation fill and thickness as indicated for duct pressure class. Include vision panel where indicated. Include 1-by-1-inch butt or piano hinge and cam latches.

1. Manufacturers:

a. American Warming and Ventilating; a division of Mestek, Inc.
b. Ductmate Industries, Inc.
c. Greenheck Fan Corporation.
d. McGill AirFlow LLC.
e. Nailor Industries Inc.
f. Ward Industries, Inc.; a division of Hart & Cooley, Inc.

2. Frame: Galvanized sheet steel, with bend-over tabs and foam gaskets.
3. Provide number of hinges and locks as follows:

a. Less Than 12 Inches Square: Secure with two sash locks.
b. Up to 18 Inches Square: Two hinges and two sash locks.
c. Up to 24 by 48 Inches: Three hinges and two compression latches.
d. Sizes 24 by 48 Inches and Larger: One additional hinge.

C. Door: Double wall, duct mounting, and round; fabricated of galvanized sheet metal with insulation fill and 1-inch thickness. Include cam latches.

1. Manufacturers:

a. Ductmate Industries, Inc.
b. Flexmaster U.S.A., Inc.

D. Seal around frame attachment to duct and door to frame with neoprene or foam rubber.

E. Insulation: 1-inch-thick, fibrous-glass or polystyrene-foam board.

2.10 FLEXIBLE CONNECTORS

A. Manufacturers:

1. Ductmate Industries, Inc.
2. Duro Dyne Inc.
3. Ventfabrics, Inc.
4. Ward Industries, Inc.; a division of Hart & Cooley, Inc.

B. General Description: Flame-retardant or noncombustible fabrics, coatings, and adhesives complying with UL 181, Class 1.

C. Metal-Edged Connectors: Factory fabricated with a fabric strip 3-1/2 inches (89 mm) or 5-3/4 inches (146 mm) wide attached to two strips of 2-3/4-inch- (70-mm-) wide, 0.028-inch- (0.7-mm-) thick, galvanized sheet steel or 0.032-inch- (0.8-mm-) thick aluminum sheets. Select metal compatible with ducts.

D. Indoor System, Flexible Connector Fabric: Glass fabric double coated with neoprene.

1. Minimum Weight: 26 oz./sq. yd.

2. Tensile Strength: 480 lbf/inch in the warp and 360 lbf/inch in the filling.
3. Service Temperature: Minus 40 to plus 200 deg F.

2.11 DUCT ACCESSORY HARDWARE

A. Instrument Test Holes: Cast iron or cast aluminum to suit duct material, including screw cap and gasket. Size to allow insertion of pitot tube and other testing instruments and of length to suit duct insulation thickness.

B. Adhesives: High strength, quick setting, neoprene based, waterproof, and resistant to gasoline and grease.

PART 3 - EXECUTION

3.1 APPLICATION AND INSTALLATION

A. Install duct accessories according to applicable details in SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" for metal ducts and in NAIMA AH116, "Fibrous Glass Duct Construction Standards," for fibrous-glass ducts.

B. Install duct accessories of materials suited to duct materials; use galvanized-steel accessories in galvanized-steel and fibrous-glass ducts, stainless-steel accessories in stainless-steel ducts, and aluminum accessories in aluminum ducts.

C. Install volume dampers at points on supply, return, and exhaust systems where branches extend from larger ducts. Where dampers are installed in ducts having duct liner, install dampers with hat channels of same depth as liner, and terminate liner with nosing at hat channel.

1. Install steel volume dampers in steel ducts.
2. Install aluminum volume dampers in aluminum ducts.

D. Set dampers to fully open position before testing, adjusting, and balancing.

E. Install test holes at fan inlets and outlets and elsewhere as indicated.

F. Install fire dampers according to UL listing.

G. Connect ducts to duct silencers rigidly.

H. Install duct access doors on sides of ducts to allow for inspecting, adjusting, and maintaining accessories and equipment at the following locations:

1. On both sides of duct coils.
2. At outdoor-air intakes and mixed-air plenums.
3. At drain pans and seals.
4. Downstream from manual volume dampers, control dampers, backdraft dampers, and equipment.
5. Adjacent to and close enough to fire or smoke dampers, to reset or reinstall fusible links. Access doors for access to fire or smoke dampers having fusible links shall be pressure relief access doors and shall be outward operation for access doors installed upstream from dampers and inward operation for access doors installed downstream from dampers.
6. At each change in direction and at maximum 50-foot (15-m) spacing.
7. Upstream or downstream from duct silencers.
8. Control devices requiring inspection.

9. Elsewhere as indicated.

I. Install access doors with swing against duct static pressure.

J. Install the following minimum sizes for duct-mounting, rectangular access doors:

1. As shown on Mechanical Details of Drawings.
2. One-Hand or Inspection Access: 12 by 12 inches.
3. Two-Hand Access: 12 by 12 inches.
4. Head and Hand Access: 16 by 20 inches.
5. Head and Shoulders Access: 16 by 20 inches.
6. Body Access: 24 by 24 inches.
7. Body Plus Ladder Access: 24 by 24 inches.

K. Install the following minimum sizes for duct-mounting, round access doors:

1. One-Hand or Inspection Access: 12 inches in diameter.
2. Two-Hand Access: 12 inches in diameter.
3. Head and Hand Access: 18 inches in diameter.
4. Head and Shoulders Access: 18 inches in diameter.
5. Body Access: 24 inches in diameter.

L. Label access doors according to Division 23 Section "Identification for HVAC Piping and Equipment" to indicate the purpose of access door.

M. Install flexible connectors immediately adjacent to equipment in ducts associated with fans and motorized equipment supported by vibration isolators.

N. For fans developing static pressures of 5-inch wg and higher, cover flexible connectors with loaded vinyl sheet held in place with metal straps.

O. Connect diffusers to ducts directly. Flexible duct is not permitted for this project.

P. Install duct test holes where required for testing and balancing purposes.

3.2 FIELD QUALITY CONTROL

A. Tests and Inspections:

1. Operate dampers to verify full range of movement.
2. Inspect locations of access doors and verify that purpose of access door can be performed.
3. Operate fire, smoke, and combination fire and smoke dampers to verify full range of movement and verify that proper heat-response device is installed.
4. Inspect turning vanes for proper and secure installation.
5. Operate remote damper operators to verify full range of movement of operator and damper.

END OF SECTION

SECTION 23 3713

DIFFUSERS, REGISTERS, AND GRILLES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Work Included: Provide diffusers, registers, and grilles in accordance with the Contract Documents.

B. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated, include the following:

1. Data Sheet: Indicate materials of construction, finish, and mounting details; and performance data including throw and drop, static-pressure drop, and noise ratings.
2. Diffuser, Register, and Grille Schedule: Indicate drawing designation, room location, quantity, model number, size, and accessories furnished.

B. Samples for Initial Selection: For diffusers, registers, and grilles with factory-applied color finishes.

C. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from Installers of the items involved:

1. Ceiling suspension assembly members.
2. Method of attaching hangers to building structure.
3. Size and location of initial access modules for acoustical tile.
4. Ceiling-mounted items including lighting fixtures, diffusers, grilles, speakers, sprinklers, access panels, and special moldings.
5. Duct access panels.

D. Source quality-control reports.

PART 2 - PRODUCTS

2.1 MANUFACTURED UNITS

A. Diffusers, registers, and grilles are scheduled on Drawings.

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Titus.
2. Price Industries.

2.2 SOURCE QUALITY CONTROL

A. Testing: Test performance according to ASHRAE 70, "Method of Testing for Rating the Performance of Air Outlets and Inlets."

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas where diffusers, registers, and grilles are to be installed for compliance with requirements for installation tolerances and other conditions affecting performance of equipment. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install diffusers, registers, and grilles level and plumb, according to manufacturer's written instructions, Coordination Drawings, original design, and referenced standards.

B. Ceiling-Mounted Outlets and Inlets: Drawings indicate general arrangement of ducts, fittings, and accessories. Air outlet and inlet locations have been indicated to achieve design requirements for air volume, noise criteria, airflow pattern, throw, and pressure drop. Make final locations where indicated, as much as practicable. For units installed in lay-in ceiling panels, locate units in the center of the panel. Where architectural features or other items conflict with installation, notify Architect for a determination of final location.

C. Install diffusers, registers, and grilles with airtight connection to ducts and to allow service and maintenance of dampers, air extractors, and fire dampers.

3.3 ADJUSTING

A. After installation, adjust diffusers, registers, and grilles to air patterns indicated, or as directed, before starting air balancing.

3.4 CLEANING

A. After installation of diffusers, registers, and grilles, inspect exposed finish. Clean exposed surfaces to remove burrs, dirt, and smudges. Replace diffusers, registers, and grilles that have damaged finishes.

END OF SECTION

SECTION 23 7200

AIR-TO-AIR ENERGY RECOVERY EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Packaged energy recovery ventilator (ERV)

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, furnished specialties, and accessories.

B. Shop Drawings: For air-to-air energy recovery equipment. Include plans, elevations, sections, details, and attachments to other work.

   1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
   2. Wiring Diagrams: For power, signal, and control wiring.

1.4 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Plans, elevations, and other details, drawn to scale, on which the following items are shown and coordinated with each other, using input from Installers of the items involved:

   1. Suspended ceiling components.
   2. Structural members to which equipment or suspension systems will be attached.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For air-to-air energy recovery equipment to include in maintenance manuals.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Filters: One set(s) of each type of filter specified.

1.7 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. ARI Compliance:

1. Capacity ratings for air-to-air energy recovery equipment shall comply with ARI 1060, "Performance Rating of Air-to-Air Heat Exchangers for Energy Recovery Ventilation Equipment."
2. Capacity ratings for air coils shall comply with ARI 410, "Forced-Circulation Air- Cooling and Air-Heating Coils."

C. ASHRAE Compliance:

1. Applicable requirements in ASHRAE 62.1, Section 5 - "Systems and Equipment" and Section 7 - "Construction and Startup."
2. Capacity ratings for air-to-air energy recovery equipment shall comply with ASHRAE 84, "Method of Testing Air-to-Air Heat Exchangers."

D. UL Compliance:

1. Packaged heat recovery ventilators shall comply with requirements in UL 1812, "Ducted Heat Recovery Ventilators"; or UL 1815, "Nonducted Heat Recovery Ventilators."
2. Electric coils shall comply with requirements in UL 1995, "Heating and Cooling Equipment."

1.8 COORDINATION

A. Coordinate layout and installation of air-to-air energy recovery equipment and suspension system with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system, and partition assemblies.

B. Coordinate sizes and locations of concrete bases with actual equipment provided.

C. Coordinate sizes and locations of roof curbs, equipment supports, and roof penetrations with actual equipment provided.

1.9 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of air-to-air energy recovery equipment that fail in materials or workmanship within specified warranty period.

1. Warranty Period for Packaged Energy Recovery Units: One years.
2. Warranty Period for Energy Transfer Core: 10 years.

PART 2 - PRODUCTS

2.1 PACKAGED ENERGY RECOVERY VENTILATOR

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following
1. RenewAire LLC.
2. Lossnay Corp.
3. Oxygen 8.

B. Unit Cabinet: Fabricated of galvanized steel, and covered with polyurethane foam insulation as necessary with steel mounting points securely attached.

C. Blowers:
1. Direct drive centrifugal blowers running simultaneously supplying and extracting air at the same rate for balanced ventilation air flow
2. The blower motors shall be a directly connected to the blower wheels and have permanently lubricated bearings

D. Heat Exchanger:
1. The enthalpic heat exchanger element shall be constructed of specially treated cellulous fiber membrane separated by corrugated layers to allow

total heat (sensible and latent) energy recovery from the exhaust air to the supply air or from the supply air to the exhaust air as determined by design conditions.

2. Heat exchanger does not require condensate drain

E. Bypass Damper:

1. Automatic supply side by-pass damper to allow inbound ventilation air to by-pass the heat exchanger element when factory-installed thermistors measure outside ambient temperature being at least 7 degrees cooler than air returned from interlocked indoor units running in cooling mode
2. The mechanism for opening and closing the bypass damper shall be a 208V-230V synchronous electric motor through an actuator. The motor will drive a steel cable connected to a mechanical damper flap to allow fresh air to bypass the element

F. Air Filters: Factory installed, washable air filters located at each intake face (both supply and exhaust sides) of the heat exchanger element

2.2 CONTROLS

A. Independent control by contact closure from other sensor driven controller.

B. Electric-Coils Controls:

1. Factory-mounted sensor in unit discharge with sensor adjustment located in control panel to control electric coil to maintain temperature.
2. Wall-mounted, space-temperature sensor with temperature adjustment to control electric coil to maintain temperature.
3. Coil Controls: Multiple steps.

2.3 CAPACITIES AND CHARACTERISTICS

A. See equipment schedules on drawings for capacities and characteristics

PART 3 - EXECUTION (Not Applicable)

END OF SECTION

SECTION 23 7223

OUTDOOR ENERGY RECOVERY UNITS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Packaged energy recovery ventilator (ERV)

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, furnished specialties, and accessories.

B. Shop Drawings: For air-to-air energy recovery equipment. Include plans, elevations, sections, details, and attachments to other work.

   1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
   2. Wiring Diagrams: For power, signal, and control wiring.

1.4 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Plans, elevations, and other details, drawn to scale, on which the following items are shown and coordinated with each other, using input from Installers of the items involved:

   1. Suspended ceiling components.
   2. Structural members to which equipment or suspension systems will be attached.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For air-to-air energy recovery equipment to include in maintenance manuals.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Filters: One set(s) of each type of filter specified.

1.7 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. ARI Compliance:

1. Capacity ratings for air-to-air energy recovery equipment shall comply with ARI 1060, "Performance Rating of Air-to-Air Heat Exchangers for Energy Recovery Ventilation Equipment."
2. Capacity ratings for air coils shall comply with ARI 410, "Forced-Circulation Air- Cooling and Air-Heating Coils."

C. ASHRAE Compliance:

1. Applicable requirements in ASHRAE 62.1, Section 5 - "Systems and Equipment" and Section 7 - "Construction and Startup."
2. Capacity ratings for air-to-air energy recovery equipment shall comply with ASHRAE 84, "Method of Testing Air-to-Air Heat Exchangers."

D. UL Compliance:

1. Packaged heat recovery ventilators shall comply with requirements in UL 1812, "Ducted Heat Recovery Ventilators"; or UL 1815, "Nonducted Heat Recovery Ventilators."
2. Electric coils shall comply with requirements in UL 1995, "Heating and Cooling Equipment."

1.8 COORDINATION

A. Coordinate layout and installation of air-to-air energy recovery equipment and suspension system with other construction that penetrates ceilings or is supported by

them, including light fixtures, HVAC equipment, fire-suppression system, and partition assemblies.

B. Coordinate sizes and locations of concrete bases with actual equipment provided.

C. Coordinate sizes and locations of roof curbs, equipment supports, and roof penetrations with actual equipment provided.

1.9 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of air-to-air energy recovery equipment that fail in materials or workmanship within specified warranty period.

1. Warranty Period for Packaged Energy Recovery Units: One years.
2. Warranty Period for Energy Transfer Core: 10 years.

PART 2 - PRODUCTS

2.1 PACKAGED ENERGY RECOVERY VENTILATOR

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following

1. Mitsubishi Electric Sales Canada Inc.
2. RenewAire LLC.

B. Unit Cabinet: Fabricated of galvanized steel, and covered with polyurethane foam insulation as necessary with steel mounting points securely attached.

C. Blowers:
1. Direct drive centrifugal blowers running simultaneously supplying and extracting air at the same rate for balanced ventilation air flow
2. The blower motors shall be a directly connected to the blower wheels and have permanently lubricated bearings

D. Heat Exchanger:
1. The enthalpic heat exchanger element shall be constructed of specially treated cellulous fiber membrane separated by corrugated layers to allow total heat (sensible and latent) energy recovery from the exhaust air to the supply air or from the supply air to the exhaust air as determined by design conditions.
2. Heat exchanger does not require condensate drain

E. Bypass Damper:

1. Automatic supply side by-pass damper to allow inbound ventilation air to by-pass the heat exchanger element when factory-installed thermistors measure outside ambient temperature being at least 7 degrees cooler than air returned from interlocked indoor units running in cooling mode
2. The mechanism for opening and closing the bypass damper shall be a 208V-230V synchronous electric motor through an actuator. The motor will drive a steel cable connected to a mechanical damper flap to allow fresh air to bypass the element

F. Air Filters: Factory installed, washable air filters located at each intake face (both supply and exhaust sides) of the heat exchanger element

2.2 CONTROLS

A. Independent control by contact closure from other sensor driven controller.

B. Electric-Coils Controls:

1. Factory-mounted sensor in unit discharge with sensor adjustment located in control panel to control electric coil to maintain temperature.
2. Wall-mounted, space-temperature sensor with temperature adjustment to control electric coil to maintain temperature.
3. Coil Controls: Multiple steps.

2.3 CAPACITIES AND CHARACTERISTICS

A. See equipment schedules on drawings for capacities and characteristics

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 237223

SECTION 237433

DEDICATED OUTDOOR-AIR UNITS

PART 1 - GENERAL

1.1. SUMMARY

A. This section includes units for outdoor installation. Integral Energy Recovery device shall be a rotary air-to-air total enthalpy wheel. Integral heat source shall be air-source heat pump with hot water heat. Integral cooling source shall be air-source heat pump. Airflow arrangement shall be Outdoor Air only. Each unit shall incorporate additional product requirements as listed in Section 2 of this specification.

B. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2. SUBMITTALS

A. Product Data: For each type or model include the following:

1. Complete fan performance curves for both Supply Air and Exhaust Air, with system operating conditions indicated, as tested in an AMCA certified chamber.
2. Sound performance data for both Supply Air and Exhaust Air, as tested in an AMCA certified chamber.
3. Motor ratings, electrical characteristics and motor and fan accessories.
4. Dimensioned drawings for each type of installation, showing isometric and plan views, to include location of attached ductwork and service clearance requirements.
5. Estimated gross weight of each installed unit.
6. Installation, Operating and Maintenance manual (IOM) for each model.
7. Microprocessor Controller (DDC) specifications to include available options and operating protocols. Include complete data on all factory-supplied input devices.
8. Energy recovery performance data for both summer and winter operation.

1.3. QUALITY ASSURANCE

A. Source Limitations: Obtain unit with all appurtenant components or accessories from a single manufacturer.

B. For the actual fabrication, installation, and testing of work under this section, use only thoroughly trained and experienced workers completely familiar with the items required and with the manufacturer's current recommended methods of installation.

C. Product Options: Drawings must indicate size, profiles and dimensional requirements of unit and are to be based on the specific system indicated. Refer to Division 1 Section "Product Requirements".

D. End of line test with full report available upon request.

E. Certifications

1. Entire unit shall be ETL Certified per U.L. 60335-2-40 and bear an ETL sticker.
2. Energy Recovery Device shall be AHRI Certified, per Standard 1060.

1.4. COORDINATION

A. Coordinate size and location of all building penetrations required for installation of each unit and associated plumbing and electrical systems.

B. Coordinate location of water system fittings to ensure correct positioning for connection to the water coil and condensate drain pipe.

PART 2 - PRODUCTS

2.1. MANUFACTURERS

A. Available Manufacturers: Subject to compliance with specifications contained within this document, manufacturers offering products that may be incorporated into the work include, but are not limited to:

1. Greenheck Fan Corporation

2.2. MANUFACTURED UNITS

A. Unit shall be fully assembled at the factory and consist of an insulated metal cabinet, exhaust air blower, energy wheel, hot gas reheat coil, air-source heat pump, motorized dampers, filter assembly intake air, supply air blower assembly, exhaust/relief blower assembly, filter assembly for exhaust air, and an electrical control center. All specified components and internal accessories factory installed are tested and prepared for single-point high voltage connection except with electric post heat and exhaust fan only power which have dual point power.

2.3. CABINET

A. Cabinet Insulation: Comply with NFPA 90A and NFPA 90B and erosion requirements of UL 181.

1. Materials: Rigid urethane injected foam. Foam board not acceptable.
   a. Thickness: 2 inch (50.8 mm)
   b. Thermal Resistance R13
   c. Thermally broken
   d. Meets UL94HF-1 flame requirements.
   e. Location and application: Full coverage of entire cabinet exterior to include walls, roof of unit, unit base, and doors.
2. Materials: Fiberglass insulation. If insulation other than fiberglass is used, it must also meet the Fire Hazard Classification shown below.
   a. Thickness: 2 inch (50.8 mm)
   b. Thermal Resistance R8
   c. Fire Hazard Classification: Maximum flame spread of 25 and smoke developed of 50, when tested in accordance with ASTM C 411.
   d. Location and application: Divider panels between outdoor air and return air/exhaust air streams.

B. Roof Insulation: 2 inch (50.8 mm) fiberglass located above the 1 inch (25.4 mm) foam panel.

C. Access panels / doors: Unit shall be equipped with insulated, hinged doors or removable access panels to provide easy access to all major components. Doors and access panels shall be fabricated of 18 gauge galvanized G90 steel or painted galvannealed steel.

D. Supply Air blower assemblies: Blower assembly shall consist of an electric motor and direct-drive fans. Assembly shall be mounted on heavy gauge galvanized steel rails and further

mounted on 1.125 inch thick neoprene vibration isolators. Blower motors shall be capable of continuous speed modulation and controlled by a VFD.

E. Exhaust Air blower assemblies: Blower assembly shall consist of an electric motor and a direct-drive fan. Assembly shall be mounted on heavy gauge galvanized steel rails and further mounted on 1.125 inch thick neoprene vibration isolators. Blower motor shall be capable of continuous speed modulation and controlled by a VFD.

F. Control panel / connections: Units shall have an electrical control center where all high and low voltage connections are made. Control center shall be constructed to permit single-point high voltage power supply connections. RTU shall be equipped with a Unit Disconnect Switch.

G. Condensate drain pan: Drain Pan shall be an integral part of the unit whenever a cooling option is included. Pan shall be formed of welded austenitic stainless steel sheet material and provided with a welded stainless steel drain connection at the front for connection to a P trap. Drain pan shall be sloped in two directions to provide positive draining and drain connector shall be sealed at penetration through cabinet wall.

H. P trap: If the unit is equipped with a condensate drain pan, contractor shall provide, or fabricate, and install an appropriate P trap, in accordance with all local and area codes and Best Practices.

I. Energy wheel: Unit energy wheel shall be sized for the full volume of outdoor and exhaust air without an energy wheel bypass damper(s). Energy wheel shall be of total enthalpy, rotary air-to-air type and shall be an element of a removable energy wheel cassette. The cassette shall consist of a galvanized steel framework (designed to produce laminar air flow through the wheel), an energy wheel as specified and a motor and drive assembly. The cassette shall incorporate a pre-tensioned urethane drive belt or a link style belt with a five-year warranty. The wheel media shall be a polymer film matrix in a stainless-steel framework and be comprised of individual segments that are removable for servicing. Non-segmented energy wheels are not acceptable. Silica gel desiccant shall be permanently bonded to the polymer film and is designed and constructed to permit cleaning and servicing. The energy wheel is to have a five-year warranty. Performance criteria are to be as specified in AHRI Standard 1060, complying with the Combined Efficiency data in the submittal.

J. Reheat coil with factory installed modulating hot gas reheat valve.

K. Air-Source Heat Pump: Unit shall have an integral compressor(s) and indoor coil located within the weather-tight unit housing. Outdoor coils and appurtenant outdoor fan assemblies shall be factory installed as integral subassemblies of the unit and mounted on the exterior of the unit. Lead fan(s) will have an electronically commutated (EC) motor that will modulate to maintain a refrigerant pressure set point.] Motors shall be UL Recognized and CSA Certified. The lead refrigerant compressor shall be inverter hermetic scroll-type. Additional compressor shall be single stage hermetic scroll-type paired in tandem with lead inverter compressor. Compressors shall be equipped with liquid line filter drier, individual sight glass for heating and cooling operation, electronic expansion valves (EEV), manual reset high pressure and low pressure cutouts and all appurtenant sensors, service ports, leak detection sensors and safety devices. Compressed refrigerant system shall be fully charged with R-454B refrigerant. Each compressor shall be factory-equipped with an electric crankcase heater to boil off liquid refrigerant from the oil.

L. Condenser Fans: Fan blades must be constructed of aluminum or a composite material and have a geometry designed and documented to reduce sound and energy when compared to a traditional rectangular blade fan. Traditional rectangular blade fans are not allowed due to increased noise generated and increase power utilized. Condenser fan motors shall be three phase, external rotor, type 56 frame, open air over and shaft up. Each condenser fan motor shall have a vented frame, rated for continuous duty and be equipped with an automatic reset thermal protector. Lead condenser fan(s) will have an electronically commutated (EC) motor that will

modulate to maintain a head pressure set point.] Motors shall be UL Recognized and CSA Certified. Single condenser fan running at max RPM and design static pressure shall not exceed an A-weighted sound power level of 75 db at free inlet/outlet test conditions.

M. Motorized dampers / Intake Air, Motorized dampers of low leakage type shall be factory installed.

N. Service receptacle: 120 VAC GFCI service outlet shall be factory-provided and installed by this contractor in a location designated by the A / E. Service outlet requires a dedicated single phase electric circuit. Unit contains a 120 VAC transformer to provide power to service outlet.

2.4. BLOWER

A. Blower section construction, Supply Air: direct drive motor and blower shall be assembled on a 14 gauge galvanized steel platform and shall be equipped with 1.125 inch thick neoprene vibration isolation devices.

B. Blower assemblies: Shall be statically and dynamically balanced and designed for continuous operation at maximum rated fan speed and horsepower.

C. Fan: Direct drive, airfoil plenum fan with steel wheel statically and dynamically balanced. Prop or belt-drive fan not acceptable due to low static capabilities.

D. Blades: Painted steel blades only.

E. Blower section motor source quality control: Blower performance shall be factory tested for flow rate, pressure, power, air density, rotation speed and efficiency. Ratings are to be established in accordance with AMCA 210, "Laboratory Methods of Testing Fans for Rating".

2.5. MOTORS

A. General: Blower motors greater than 1/2 horsepower shall be "NEMA Premium" unless otherwise indicated. Compliance with EPAct minimum energy-efficiency standards for single speed ODP and TE enclosures is not acceptable. Motors shall be heavy-duty, permanently lubricated type to match the fan load and furnished at the specified voltage, phase and enclosure.

B. Motors shall be 60 cycle, 3 phase 460 volts.

2.6. UNIT CONTROLS

A. The unit shall be constructed so that it can function as a stand-alone heating and cooling system controlled by factory-supplied controllers, thermostats and sensors or it can be operated as a heating and cooling system controlled by a Building Management System (BMS). This unit shall be controlled by a factory-installed microprocessor programmable controller (DDC) that is connected to various optional sensors.

B. Unit shall incorporate a DDC controller with integral LCD screen that provides text readouts of status. DDC controller shall have a built-in keypad to permit operator to access read-out screens without the use of ancillary equipment, devices or software. DDC controllers that require the use of equipment or software that is not factory-installed in the unit are not acceptable. Alarm readouts consisting of flashing light codes are not acceptable. Owner-specified ventilating conditions can be input by means of pushbuttons.

C. Refer to section 230993 Sequence of Operation for HVAC control for additional information and requirements.

2.7. FILTERS

A. Unit shall have permanent 2 inch (50.8 mm) aluminum filters located in the outdoor air intake and shall be accessible from the exterior of the unit. MERV 8 disposable pleated filters shall be provided in the supply air stream. MERV 8 and MERV 13 disposable pleated filters shall be provided in the supply final air stream and MERV 8 filters in the exhaust air stream.

PART 3 - EXECUTION

3.1. EXAMINATION

A. Prior to start of installation, examine area and conditions to verify correct location for compliance with installation tolerances and other conditions affecting unit performance. See unit IOM.

B. Examine roughing-in of plumbing, electrical and HVAC services to verify actual location and compliance with unit requirements. See unit IOM.

C. Proceed with installation only after all unsatisfactory conditions have been corrected.

3.2. INSTALLATION

A. Installation shall be accomplished in accordance with these written specifications, project drawings, manufacturer's installation instructions as documented in manufacturer's IOM, Best Practices and all applicable building codes.

3.3. CONNECTIONS

A. In all cases, industry Best Practices shall be incorporated. Connections are to be made subject to the installation requirements shown above.

B. Piping installation requirements are specified in Division 22 (Plumbing). Drawings indicate general arrangement of piping, fittings and specialties.

C. Duct installation and connection requirements are specified in Division 23 of this document.

D. Electrical installation requirements are specified in Division 26 of this document.

3.4. FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory authorized service representative to inspect field assembled components and equipment installation, to include electrical and piping connections. Report results to A / E in writing. Inspection must include a complete startup checklist to include (as a minimum) the following: Completed Start-Up Checklists as found in manufacturer's IOM.

3.5. START-UP SERVICE

A. Engage a factory authorized service representative to perform startup service. Clean entire unit, comb coil fins as necessary, install clean filters. Measure and record electrical values for voltage and amperage. Refer to Division 23 "Testing, Adjusting and Balancing" and comply with provisions therein.

3.6. DEMONSTRATION AND TRAINING

A. Engage a factory authorized service representative to train owner's maintenance personnel to adjust, operate and maintain the entire unit. Refer to Division 01 Section Closeout Procedures and Demonstration and Training.

SECTION 23 8126

SPLIT-SYSTEM AIR-CONDITIONERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes split-system air-conditioning and heat-pump units consisting of separate evaporator-fan and compressor-condenser components.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

1.3 INFORMATIONAL SUBMITTALS

A. Warranty: Sample of special warranty.

1.4 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

1.5 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. ASHRAE Compliance:

1. Fabricate and label refrigeration system to comply with ASHRAE 15, "Safety Standard for Refrigeration Systems."
2. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 4 - "Outdoor Air Quality," Section 5 - "Systems and Equipment," Section 6 - " Procedures," and Section 7 - "Construction and System Start-up."

C. ASHRAE/IES Compliance: Applicable requirements in ASHRAE/IES 90.1.

1.6 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of split-system air-conditioning units that fail in materials or workmanship within specified warranty period.

1. Warranty Period:

a. For Compressor: Five years from date of Substantial Completion.
b. For Parts: One year from date of Substantial Completion.
c. For Labor: One year from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Provide a product by one of the following:
1. Trane Mitsubishi Electric Corp.
2. Carrier Corp.

2.2 INDOOR UNITS (5 TONS OR LESS)

A. Concealed Evaporator-Fan Components:

1. Chassis: Galvanized steel with flanged edges, removable panels for servicing, and insulation on back of panel.
2. Insulation: Faced, glass-fiber duct liner.
3. Refrigerant Coil: Copper tube, with mechanically bonded aluminum fins and thermal-expansion valve. Comply with ARI 206/110.
4. Water Coil: Copper tube, with mechanically bonded aluminum fins spaced no closer than 0.1 inch; leak tested to 300 psig underwater; with a two-position control valve.
5. Electric Coil: Helical, nickel-chrome, resistance-wire heating elements; with refractory ceramic support bushings, automatic-reset thermal cutout, built-in magnetic contactors, manual-reset thermal cutout, airflow proving device, and one-time fuses in terminal box for overcurrent protection.
6. Fan: Forward-curved, double-width wheel of galvanized steel; directly connected to motor.
7. Fan Motors:

a. Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements specified in Section 230513 "Common Motor Requirements for HVAC Equipment."

b. Multitapped, multispeed with internal thermal protection and permanent lubrication.
c. Wiring Terminations: Connect motor to chassis wiring with plug connection.

8. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.
9. Filters: Permanent, cleanable.
10. Condensate Drain Pans:

a. Fabricated with one percent slope in at least two planes to collect condensate from cooling coils (including coil piping connections, coil headers, and return bends) and humidifiers, and to direct water toward drain connection.

1) Length: Extend drain pan downstream from leaving face to comply with ASHRAE 62.1.
2) Depth: A minimum of 2 inches deep.

b. Single-wall, galvanized-steel sheet.
c. Double-wall, galvanized-steel sheet with space between walls filled with foam insulation and moisture-tight seal.
d. Drain Connection: Located at lowest point of pan and sized to prevent overflow. Terminate with threaded nipple on one end of pan.

1) Minimum Connection Size: NPS 1.

e. Pan-Top Surface Coating: Asphaltic waterproofing compound.
f. Units with stacked coils shall have an intermediate drain pan to collect condensate from top coil.

B. Wall-Mounted, Evaporator-Fan Components:

1. Cabinet: Enameled steel with removable panels on front and ends in color selected by Architect, and discharge drain pans with drain connection.
2. Refrigerant Coil: Copper tube, with mechanically bonded aluminum fins and thermal-expansion valve. Comply with ARI 206/110.
3. Electric Coil: Helical, nickel-chrome, resistance-wire heating elements; with refractory ceramic support bushings, automatic-reset thermal cutout, built-in magnetic contactors, manual-reset thermal cutout, airflow proving device, and one-time fuses in terminal box for overcurrent protection.
4. Fan: Direct drive, centrifugal.
5. Fan Motors:

a. Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements specified in Section 230513 "Common Motor Requirements for HVAC Equipment."
b. Multitapped, multispeed with internal thermal protection and permanent lubrication.
c. Enclosure Type: Totally enclosed, fan cooled.
d. NEMA Premium (TM) efficient motors as defined in NEMA MG 1.

e. Controllers, Electrical Devices, and Wiring: Comply with requirements for electrical devices and connections specified in electrical Sections.
f. Mount unit-mounted disconnect switches on exterior of unit.

6. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.
7. Condensate Drain Pans:

a. Fabricated with one percent slope in at least two planes to collect condensate from cooling coils (including coil piping connections, coil headers, and return bends) and humidifiers, and to direct water toward drain connection.

1) Length: Extend drain pan downstream from leaving face to comply with ASHRAE 62.1.
2) Depth: A minimum of 1 inch deep.

b. Single-wall, galvanized-steel sheet.
c. Double-wall, galvanized-steel sheet with space between walls filled with foam insulation and moisture-tight seal.
d. Drain Connection: Located at lowest point of pan and sized to prevent overflow. Terminate with threaded nipple on one end of pan.

1) Minimum Connection Size: NPS 1.

e. Pan-Top Surface Coating: Asphaltic waterproofing compound.

8. Air Filtration Section:

a. General Requirements for Air Filtration Section:

1) Comply with NFPA 90A.
2) Minimum MERV according to ASHRAE 52.2.
3) Filter-Holding Frames: Arranged for flat or angular orientation, with access doors on both sides of unit. Filters shall be removable from one side or lifted out from access plenum.

2.3 OUTDOOR UNITS (5 TONS OR LESS)

A. Air-Cooled, Compressor-Condenser Components:

1. Casing: Steel, finished with baked enamel in color selected by Architect, with removable panels for access to controls, weep holes for water drainage, and mounting holes in base. Provide brass service valves, fittings, and gage ports on exterior of casing.
2. Compressor: Hermetically sealed with crankcase heater and mounted on vibration isolation device. Compressor motor shall have thermal- and current-sensitive overload devices, start capacitor, relay, and contactor.

a. Compressor Type: Scroll.
b. Two-speed compressor motor with manual-reset high-pressure switch and automatic-reset low-pressure switch.
c. Refrigerant: R-32.
d. Refrigerant Coil: Copper tube, with mechanically bonded aluminum fins and liquid subcooler. Comply with ARI 206/110.

3. Heat-Pump Components: Reversing valve and low-temperature-air cutoff thermostat.
4. Fan: Aluminum-propeller type, directly connected to motor.
5. Motor: Permanently lubricated, with integral thermal-overload protection.
6. Low Ambient Kit: Permits operation down to 45 deg F.
7. Mounting Base: Polyethylene.

2.4 ACCESSORIES

A. Control equipment and sequence of operation are specified in Section 230923 "Direct Digital Control (DDC) System for HVAC" and Section 230993.11 "Sequence of Operations for HVAC DDC."

B. Thermostat: Low voltage with subbase to control compressor and evaporator fan.

C. Thermostat: Wireless infrared functioning to remotely control compressor and evaporator fan, with the following features:

1. Compressor time delay.
2. 24-hour time control of system stop and start.
3. Liquid-crystal display indicating temperature, set-point temperature, time setting, operating mode, and fan speed.
4. Fan-speed selection including auto setting.

D. Automatic-reset timer to prevent rapid cycling of compressor.

E. Refrigerant Line Kits: Soft-annealed copper suction and liquid lines factory cleaned, dried, pressurized, and sealed; factory-insulated suction line with flared fittings at both ends.

F. Drain Hose: For condensate.

G. Monitoring:

1. Monitor constant and variable motor loads.
2. Monitor variable-frequency-drive operation.
3. Monitor economizer cycle.
4. Monitor cooling load.
5. Monitor air distribution static pressure and ventilation air volumes.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install units level and plumb.

B. Install evaporator-fan components using manufacturer's standard mounting devices securely fastened to building structure.

C. Install roof-mounted, compressor-condenser components on equipment supports specified in Section 077200 "Roof Accessories." Anchor units to supports with removable, cadmium-plated fasteners.

D. Equipment Mounting:

1. Install ground-mounted, compressor-condenser components on cast-in-place concrete equipment base(s). Comply with requirements for equipment bases and foundations specified in Section 033000 "Cast-in-Place Concrete."
2. Install ground-mounted, compressor-condenser components on polyethylene mounting base.
3. Comply with requirements for vibration isolation and seismic control devices specified in Section 230548 "Vibration and Seismic Controls for HVAC."
4. Comply with requirements for vibration isolation devices specified in Section 230548.13 "Vibration Controls for HVAC."

E. Install and connect precharged refrigerant tubing to component's quick-connect fittings. Install tubing to allow access to unit.

3.2 CONNECTIONS

A. Piping installation requirements are specified in other Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

1. Water Coil Connections: Comply with requirements specified in Section 232113 "Hydronic Piping" and Section 232116 "Hydronic Piping Specialties." Connect hydronic piping to supply and return coil connections with shutoff-duty valve and union or flange on the supply connection and with throttling-duty valve and union or flange on the return connection.
2. Remote, Water-Cooled Condenser Connections: Comply with requirements specified in Section 232113 "Hydronic Piping" and Section 232116 "Hydronic Piping Specialties." Connect hydronic piping to supply and return connections with shutoff-duty valve and union or flange on the supply connection and with throttling-duty valve and union or flange on the return connection.

B. Where piping is installed adjacent to unit, allow space for service and maintenance of unit.

C. Duct Connections: Duct installation requirements are specified in Section 233113 "Metal Ducts." Drawings indicate the general arrangement of ducts. Connect supply and return ducts to split-system air-conditioning units with flexible duct connectors. Flexible duct connectors are specified in Section 233300 "Air Duct Accessories."

3.3 FIELD QUALITY CONTROL

A. Perform tests and inspections.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

B. Tests and Inspections:

1. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
2. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

C. Remove and replace malfunctioning units and retest as specified above.

D. Prepare test and inspection reports.

3.4 DEMONSTRATION

A. Train Owner's maintenance personnel to adjust, operate, and maintain units.

END OF SECTION 238126

SECTION 238129 - VARIABLE-REFRIGERANT-FLOW HVAC SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes complete VRF HVAC system(s) including, but not limited to the following components to make a complete operating system(s) according to requirements indicated:

1. Indoor, concealed, ceiling-mounted units for ducting.
2. Indoor, concealed, floor-mounted units for ducting.
3. Indoor, exposed, wall-mounted units.
4. Indoor, recessed, ceiling-mounted units.
5. Indoor, suspended, ceiling-mounted units.
6. Outdoor, air-source, heat pump units.
7. Outdoor, air-source heat recovery units.
8. Heat recovery control units.
9. System controls.
10. System refrigerant and oil.
11. System condensate drain piping.
12. System hydronic piping.
13. System refrigerant piping.
14. Metal hangers and supports.
15. Metal framing systems.
16. Fastener systems.
17. Pipe stands.
18. Equipment stands.
19. Miscellaneous support materials.
20. Piping and tubing insulation.
21. System control cable and raceways.

1.2 DEFINITIONS

A. Air-Conditioning System Operation: System capable of operation with all zones in cooling only.

B. Heat-Pump System Operation: System capable of operation with all zones in either heating or cooling, but not with simultaneous heating and cooling zones that transfer heat between zones.

C. Heat Recovery System Operation: System capable of operation with simultaneous heating and cooling zones that transfer heat between zones.

D. HRCU: Heat Recovery Control Unit. HRCUs are used in heat recovery VRF HVAC systems to manage and control refrigerant between indoor units to provide simultaneous heating and cooling zones. "Heat Recovery Control Unit" is the term used by ASHRAE for what different

manufacturers term as branch circuit controller, branch selector box, changeover box, flow selector unit, mode change unit, and other such terms.

E. Low Voltage: As defined in NFPA 70 for circuits and equipment operating at less than 50 V or for remote-control, signaling power-limited circuits.

F. Plenum: A space forming part of the air distribution system to which one or more air ducts are connected. An air duct is a passageway, other than a plenum, for transporting air to or from heating, ventilating, or air-conditioning equipment.

G. Three-Pipe System Design: One high pressure refrigerant vapor line, one low pressure refrigerant vapor line, and one refrigerant liquid line connect a single outdoor unit or multiple manifold outdoor units in a single system to associated system HRCUs. One liquid line and refrigerant vapor line connect HRCUs to associated indoor units.

H. Two-Pipe System Design: One refrigerant vapor line and one refrigerant liquid line connect a single outdoor unit or multiple manifold outdoor units in a single system to associated system HRCUs. One refrigerant liquid line and refrigerant vapor line connect HRCUs to associated indoor units. HRCUs used in two pipe systems act as an intermediate heat exchanger and include diverting valves and gas/liquid separators to move high and low pressure refrigerant between indoor units.

I. VRF: Variable refrigerant flow.

1.3 ACTION SUBMITTALS

A. Product data.

B. Shop Drawings: For VRF HVAC systems.

1. Include plans, elevations, sections, and attachment details.
2. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
3. Vibration Isolation Base Details: Detail fabrication including anchorages and attachments to structure and to supported equipment. Include adjustable motor bases, rails, and frames for equipment mounting.
4. Include diagrams and details of refrigerant piping and tubing showing installation requirements for manufacturer-furnished divided flow fittings.
5. Include diagrams for power, signal, and control wiring.

C. Samples for Initial Selection: For fully and partially exposed indoor units with factory finishes viewable by occupants.

D. Delegated-Design Submittals:

1. Include design calculations for selecting vibration isolators and for designing vibration isolation bases.

2. Include design calculations with corresponding diagram of refrigerant piping and tubing sizing for each system installed.
3. Include design calculations with corresponding floor plans indicating that refrigerant concentration limits are within allowable limits of ASHRAE 15 and governing codes.
4. Include calculations showing that system travel distance for refrigerant piping and controls cabling are within horizontal and vertical travel distances set by manufacturer. Provide a comparison table for each system installed.

1.4 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Plans, elevations, sections, and details, drawn to scale, using input from installers of the items involved.

B. Qualification Data:

1. For Installer.
2. For VRF HVAC system manufacturer.
3. For VRF HVAC system provider.

C. Seismic Qualification Data: Certificates, for equipment, accessories, and components, from manufacturer.

D. Product Certificates: For each type of product.

E. Product test reports.

F. Source quality-control reports.

G. Field quality-control reports.

H. Sample warranties.

1.5 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

B. Software and Firmware Operational Documentation:

1. Software operating and upgrade manuals.
2. Program Software Backup: On CD or DVD, USB media, or approved cloud storage platform, complete with data files.
3. Device address list.
4. Printout of software application and graphic screens.

1.6 QUALITY ASSURANCE

A. Factory-Authorized Service Representative Qualifications:

1. Authorized representative of, and trained by, VRF HVAC system manufacturer.
2. In-place facility located within reasonable distance of Project.
3. Demonstrated past experience with products being installed for period within three consecutive years before time of bid.
4. Demonstrated past experience on five projects of similar complexity, scope, and value.

    a. Each person assigned to Project shall have demonstrated past experience.

5. Staffing resources of competent and experienced full-time employees that are assigned to execute work according to schedule.
6. Service and maintenance staff assigned to support Project during warranty period.
7. Product parts inventory to support ongoing system operation for a period of not less than five years after Substantial Completion.
8. VRF HVAC system manufacturer's backing to take over execution of Work if necessary to comply with requirements indicated. Include Project-specific written letter, signed by manufacturer's corporate officer, if requested.

B. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by VRF HVAC system manufacturer.

1. Each employee shall be certified by manufacturer for proper installation of systems, including, but not limited to, equipment, piping, controls, and accessories indicated and furnished for installation.
2. Installer certification shall be valid and current for duration of Project.
3. Retain copies of Installer certificates on-site and make available on request.
4. Each person assigned to Project shall have demonstrated past experience.

    a. Demonstrated past experience with products being installed for period within three consecutive years before time of bid.
    b. Demonstrated past experience on five projects of similar complexity, scope, and value.

C. ISO Compliance: System equipment and components furnished by VRF HVAC system manufacturer shall be manufactured in an ISO 9001 and ISO 14001 facility.

1.7 WARRANTY

A. Manufacturer's Warranty: Manufacturer agrees to repair or replace equipment and components that fail(s) in materials or workmanship within specified warranty period.

1. Warranty Period:

    a. For Compressor: 10 years from date of Substantial Completion.
    b. For Parts, Including Controls: Seven years from date of Substantial Completion.
    c. For Labor: Five > years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by the following:

1. Daikin Applied.

2. Trane-Mistubishi

3. Carrier Corp.

2.2 SYSTEM DESCRIPTION

A. Direct-expansion (DX) VRF HVAC system(s) with variable capacity in response to varying cooling and heating loads. System shall consist of multiple indoor units, [HRCUs,]outdoor unit(s), piping, controls, and electrical power to make complete operating system(s) complying with requirements indicated.

1. [Two-pipe] or three-pipe system design.
2. System(s) operation: heat recovery as indicated on Drawings.
3. Each system with one refrigerant circuit shared by all indoor units connected to system.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. AHRI Compliance: System and equipment performance certified according to AHRI 1230[and products listed in AHRI directory].

D. ASHRAE Compliance:

1. ASHRAE 15: For safety code for mechanical refrigeration.
2. ASHRAE 62.1: For indoor air quality.
3. ASHRAE 135: For control network protocol with remote communication.
4. ASHRAE/IES 90.1 Compliance: For system and component energy efficiency.

E. UL Compliance: Comply with UL 1995.

2.3 PERFORMANCE REQUIREMENTS

1. Provide system refrigerant calculations.

a. Refrigerant concentration limits shall be within allowable limits of ASHRAE 15 and governing codes.
b. Indicate compliance with manufacturer's maximum vertical and horizontal travel distances. Prepare a comparison table for each system showing calculated distances compared to manufacturer's maximum allowed distances.

2. Include a mechanical ventilation system and gas detection system as required to comply with ASHRAE 15 and governing codes.
3. System Refrigerant Piping and Tubing:

    a. Arrangement: Arrange piping to interconnect indoor units[, HRCUs,] and outdoor unit(s) in compliance with manufacturer requirements and requirements indicated.
    b. Routing: Conceal piping above ceilings and behind walls to maximum extent possible.
    c. Sizing: Size piping system, using a software program acceptable to manufacturer, to provide performance requirements indicated. Consider requirements to accommodate future change requirements.

4. System Controls:

    a. Network arrangement.
    b. Network interface with other building systems.
    c. Product selection.
    d. Sizing.

B. Service Access:

1. Provide and document service access requirements.
2. Locate equipment, system isolation valves, and other system components that require service and inspection in easily accessible locations. Avoid locations that are difficult to access if possible.
3. Where serviceable components are installed behind walls and above inaccessible ceilings, provide finished assembly with access doors or panels to gain access. Properly size the openings to allow for service, removal, and replacement.
4. If less than full and unrestricted access is provided, locate components within an 18-inch reach of the finished assembly.
5. Where ladder access is required to service elevated components, provide an installation that provides for sufficient access within ladder manufacturer's written instructions for use.
6. Comply with OSHA regulations.

C. System Design and Installation Requirements:

1. Design and install systems indicated according to manufacturer's recommendations and written instructions.
2. Where manufacturer's requirements differ from requirements indicated, contact Architect for direction. The most stringent requirements should apply unless otherwise directed in writing by Architect.

D. System Adaptability to Future Changes: Arrange and size system refrigerant piping to accommodate future changes to system without having to resize and replace existing refrigerant piping.

1. Future changes to system(s) indicated on Drawings.

2. Each branch circuit shall accommodate addition of one indoor unit minimum with unit capacity equal to average capacity requirement indoor unit connected to the branch circuit.
3. Each branch circuit shall accommodate deletion of one indoor unit minimum with unit capacity equal to average capacity requirement indoor unit connected to the branch circuit.
4. Owner approval required for future changes.

E. Isolation of Equipment: Provide isolation valves to isolate each [HRCU,]indoor unit and outdoor unit for service, removal, and replacement without interrupting system operation.

F. System Capacity Ratio: The sum of connected capacity of all indoor units shall be within the following range of outdoor-unit rated capacity:

1. Not less than [50] percent.
2. Not more than [130] percent.
3. Range acceptable to manufacturer.

G. System Turndown: Stable operation down to [20] percent of outdoor-unit capacity.

H. System Auto Refrigerant Charge: Each system shall have an automatic refrigerant charge function to ensure the proper amount of refrigerant is installed in system.

I. Outdoor Conditions:

1. Suitable for outdoor ambient conditions encountered.

    a. Design equipment and supports to withstand wind loads of governing code [and ASCE/SEI 7]
    b. Design equipment and supports to withstand snow and ice loads of governing code [and ASCE/SEI 7]
    c. Provide corrosion-resistant coating for components and supports where located in coastal or industrial climates that are known to be harmful to materials and finishes.

2. Maximum System Operating Outdoor Temperature: [See Drawings] .
3. Minimum System Operating Outdoor Temperature: [See Drawings] .

J. Seismic Performance: VRF HVAC system(s) shall withstand the effects of earthquake motions determined according to [ASCE/SEI 7] .

1. The term "withstand" means "the system will remain in place without separation of any parts when subjected to the seismic forces specified [and the system will be fully operational after the seismic event]."
2. Component Importance Factor: [1.5]
3. Compliant Component Amplification Factor and Component Response Modification Factor shall be used.

K. Sound Performance: Sound levels generated by operating HVAC equipment shall be within requirements indicated.

1. Indoor: [See Drawings.] [Within design guidelines of "2015 ASHRAE HANDBOOK-HVAC Applications."]
2. Outdoor: [See Drawings] [Within ordinance of governing authorities] .

L. Thermal Movements: Allow for controlled thermal movements from ambient, surface, and system temperature changes.

M. Capacities and Characteristics: As indicated on Drawings.

2.4 INDOOR, CONCEALED, CEILING-MOUNTED UNITS FOR DUCTING

A. Description: Factory-assembled[and -tested] complete unit with components, piping, wiring, and controls required for mating to ductwork, piping, power, and controls field connections.

B. Cabinet:

1. Material: [Galvanized] [or] [painted] steel.
2. Insulation: Manufacturer's standard internal insulation[, complying with ASHRAE 62.1,] to provide thermal resistance and prevent condensation.
3. Duct Connections: Extended collar or flange, or designated exterior cabinet surface, designed for attaching field-installed ductwork.
4. Mounting: Manufacturer-designed provisions for field installation.
5. Internal Access: Removable panels or hinged doors of adequate size for field access to internal components for inspection, cleaning, service, and replacement.

C. DX Coil Assembly:

1. Coil Casing: Aluminum, galvanized, or stainless steel.
2. Coil Fins: Aluminum, mechanically bonded to tubes, with arrangement required by performance.
3. Coil Tubes: Copper, of diameter and thickness required by performance.
4. Expansion Valve: Electronic modulating type with linear or proportional characteristics.
5. Unit Internal Tubing: Copper tubing with brazed joints.
6. Unit Internal Tubing Insulation: Manufacturer's standard insulation, of thickness to prevent condensation.
7. Field Piping Connections: Manufacturer's standard.
8. Factory Charge: Dehydrated air or nitrogen.
9. Testing: Factory pressure tested and verified to be without leaks.

D. Drain Assembly:

1. Pan: Non-ferrous material, with bottom sloped to low point drain connection.
2. Condensate Removal: Unit-mounted pump or other integral lifting mechanism, capable of lifting drain water to an elevation above top of cabinet.
3. Field Piping Connection: Non-ferrous material[with threaded NPT].

E. Fan and Motor Assembly:

1. Fan(s):

    a. Direct-drive arrangement.
    b. Single or multiple fans connected to a common motor shaft and driven by a single motor.
    c. Fabricated from non-ferrous components or ferrous components with corrosion-resistant finish.
    d. Wheels statically and dynamically balanced.

2. Motor: Brushless dc or electronically commutated with permanently lubricated bearings.
3. Motor Protection: Integral protection against thermal, overload, and voltage fluctuations.
4. Speed Settings and Control: Two (low, high), three (low, medium, high), or more than three speed settings or variable speed with a speed range of least 50 percent.
5. Vibration Control: Integral isolation to dampen vibration transmission.

F. Filter Assembly:

1. Access: Bottom, side, or rear to accommodate field installation without removing ductwork and to accommodate filter replacement without need for tools.
2. Efficiency: [ASHRAE 52.2, MERV 7] [ASHRAE 52.2, MERV 11] [ASHRAE 52.2, MERV 13] .
3. Media:[If more than one filter type is indicated, Contractor has option to choose.]

    a. Replaceable: Extended surface, panel, or cartridge with antimicrobial treatment fiber media.
    b. Washable: Manufacturer's standard filter with antimicrobial treatment.

G. Unit Accessories:

1. Outdoor Air Ventilation Kit: Connection, motorized damper, and control sized to allow sequence of operation indicated on Drawings.
2. Remote Room Temperature Sensor Kit: Wall-mounted, hardwired room temperature sensor kit for use in rooms that do not have room temperature measurement.
3. .

H. Unit Controls:

1. Enclosure: Metal, suitable for indoor locations.
2. Factory-Installed Controller: Configurable digital control.
3. Factory-Installed Sensors:

    a. Unit inlet air temperature.
    b. Coil entering refrigerant temperature.
    c. Coil leaving refrigerant temperature.
    d. Sensor.

4. Features and Functions:

a. Self-diagnostics.
b. Time delay.
c. Auto-restart.
d. External static pressure control.
e. Auto operation mode.
f. Manual operation mode.
g. Filter service notification.
h. Power consumption display.
i. Drain assembly high water level safety shutdown and notification.
j. Run test switch.

5. Communication: Network communication with other indoor and outdoor units.
6. Cable and Wiring: Manufacturer's standard with each connection labeled and corresponding to a unit-mounted wiring diagram.
7. Field Connection: Manufacturer's standard with each connection labeled and corresponding to a unit-mounted wiring diagram.

I. Unit Electrical:

1. Enclosure: Metal, suitable for indoor locations.
2. Field Connection: Single point connection to power unit and integral controls.
3. Disconnecting Means: Factory-mounted circuit breaker or switch.
4. Control Transformer: Manufacturer's standard. Coordinate requirements with field power supply.
5. Wiring: Manufacturer's standard with each connection labeled and corresponding to a unit-mounted wiring diagram.
6. Raceways: Enclose line voltage wiring in [metal]raceways.

2.5 INDOOR, CONCEALED, FLOOR-MOUNTED UNITS FOR DUCTING

A. Description: Factory-assembled[and -tested] complete unit with components, piping, wiring, and controls required for mating to ductwork, piping, power, and controls field connections.

B. Cabinet:

1. Material: [Galvanized] [or] [painted] steel.
2. Insulation: Manufacturer's standard internal insulation[, complying with ASHRAE 62.1,] to provide thermal resistance and prevent condensation.
3. Duct Connections: Extended collar or flange, or designated exterior cabinet surface, designed for attaching field-installed ductwork.
4. Mounting: Manufacturer-designed provisions for field installation.
5. Internal Access: Removable panels or hinged doors of adequate size for field access to internal components for inspection, cleaning, service, and replacement.

C. DX Coil Assembly:

1. Coil Casing: Aluminum, galvanized, or stainless steel.

2. Coil Fins: Aluminum, mechanically bonded to tubes, with arrangement required by performance.
3. Coil Tubes: Copper, of diameter and thickness required by performance.
4. Expansion Valve: Electronic modulating type with linear or proportional characteristics.
5. Unit Internal Tubing: Copper tubing with brazed joints.
6. Unit Internal Tubing Insulation: Manufacturer's standard insulation, of thickness to prevent condensation.
7. Field Piping Connections: Manufacturer's standard.
8. Factory Charge: Dehydrated air or nitrogen.
9. Testing: Factory pressure tested and verified to be without leaks.

D. Drain Assembly:

1. Pan: Non-ferrous material, with bottom sloped to low point drain connection.
2. Condensate Removal: Unit-mounted pump or other integral lifting mechanism, capable of lifting drain water to an elevation above top of cabinet.
3. Field Piping Connection: Non-ferrous material[with threaded NPT].

E. Fan and Motor Assembly:

1. Fan(s):

    a. Direct-drive arrangement.
    b. Single or multiple fans connected to a common motor shaft and driven by a single motor.
    c. Materials: Non-ferrous components or ferrous components with corrosion resistant finish.
    d. Statically and dynamically balanced.

2. Motor: Brushless dc or electronically commutated with permanently lubricated bearings.
3. Motor Protection: Integral protection against thermal, overload, and voltage fluctuations.
4. Speed Settings and Control: Two (low, high), three (low, medium, high), or more than three speed settings or variable speed with a speed range of least 50 percent.
5. Vibration Control: Integral isolation to dampen vibration transmission.

F. Filter Assembly:

1. Access: Bottom, side, or rear to accommodate field installation without removing ductwork and to accommodate filter replacement without need for tools.
2. Efficiency: ASHRAE 52.2, MERV 7

    a. Replaceable: Extended surface, panel, or cartridge with antimicrobial treatment fiber media.
    b. Washable: Manufacturer's standard filter with antimicrobial treatment.

G. Unit Accessories:

1. Outdoor Air Ventilation Kit: Connection, motorized damper, and control sized to allow sequence of operation indicated on Drawings.

2. Remote Room Temperature Sensor Kit: Wall-mounted, hardwired room temperature sensor kit for use in rooms that do not have room temperature measurement.

H. Unit Controls:

1. Enclosure: Metal, suitable for indoor locations.
2. Factory-Installed Controller: Configurable digital control.
3. Factory-Installed Sensors:

   a. Unit inlet air temperature.
   b. Coil entering refrigerant temperature.
   c. Coil leaving refrigerant temperature.
   d. Sensor.

4. Features and Functions:

   a. Self-diagnostics.
   b. Time delay, auto-restart.
   c. External static pressure control.
   d. Auto operation mode.
   e. Manual operation mode.
   f. Filter service notification.
   g. Power consumption display.
   h. Drain assembly high water level safety shutdown and notification.
   i. Run test switch.

5. Communication: Network communication with other indoor units and outdoor unit(s).
6. Cable and Wiring: Manufacturer's standard with each connection labeled and corresponding to a unit-mounted wiring diagram.
7. Field Connection: Manufacturer's standard with each connection labeled and corresponding to a unit-mounted wiring diagram.

I. Unit Electrical:

1. Enclosure: Metal, similar to enclosure, and suitable for indoor locations.
2. Field Connection: Single point connection to power unit and integral controls.
3. Disconnecting Means: Factory-mounted circuit breaker or switch.
4. Control Transformer: Manufacturer's standard. Coordinate requirements with field power supply.
5. Wiring: Manufacturer's standard with each connection labeled and corresponding to a unit-mounted wiring diagram.
6. Raceways: Enclose line voltage wiring in [metal]raceways.

2.6 INDOOR, EXPOSED, FLOOR-MOUNTED UNITS

A. Description: Factory-assembled[and -tested] complete unit with components, piping, wiring, and controls required for mating to piping, power, and controls field connections.

B. Cabinet:

1. Material: Painted steel, or coated steel frame covered by a plastic cabinet, with an architectural acceptable finish suitable for tenant occupancy on exposed surfaces.
2. Insulation: Manufacturer's standard internal insulation[, complying with ASHRAE 62.1,] to provide thermal resistance and prevent condensation.
3. Mounting: Manufacturer-designed provisions for field installation.
4. Internal Access: Removable panels of adequate size for field access to internal components for inspection, cleaning, service, and replacement.

C. DX Coil Assembly:

1. Coil Casing: Aluminum, galvanized, or stainless steel.
2. Coil Fins: Aluminum, mechanically bonded to tubes, with arrangement required by performance.
3. Coil Tubes: Copper, of diameter and thickness required by performance.
4. Expansion Valve: Electronic modulating type with linear or proportional characteristics.
5. Unit Internal Tubing: Copper tubing with brazed joints.
6. Unit Internal Tubing Insulation: Manufacturer's standard insulation, of thickness to prevent condensation.
7. Field Piping Connections: Manufacturer's standard.
8. Factory Charge: Dehydrated air or nitrogen.
9. Testing: Factory pressure tested and verified to be without leaks.

D. Drain Assembly:

1. Pan: Non-ferrous material, with bottom sloped to low point drain connection.
2. Condensate Removal: Gravity.

    a. If a floor drain is not available at unit, provide unit with field-installed condensate pump accessory.

3. Field Piping Connection: Non-ferrous material[with threaded NPT].

E. Fan and Motor Assembly:

1. Fan(s):

    a. Direct-drive arrangement.
    b. Single or multiple fans connected to a common motor shaft and driven by a single motor.
    c. Materials: Non-ferrous components or ferrous components with corrosion-resistant finish.
    d. Statically and dynamically balanced.

2. Motor: Brushless dc or electronically commutated with permanently lubricated bearings.
3. Motor Protection: Integral protection against thermal, overload, and voltage fluctuations.
4. Speed Settings and Control: Two (low, high), three (low, medium, high), or more than three speed settings or variable speed with a speed range of least 50 percent.

5. Vibration Control: Integral isolation to dampen vibration transmission.

F. Filter Assembly:

1. Access: Front, to accommodate filter replacement without the need for tools.
2. Efficiency: Code Compliant
3. Washable Media: Manufacturer's standard filter with antimicrobial treatment.

G. Grille Assembly: Manufacturer's standard discharge grille[with field-adjustable air pattern] mounted in top of unit cabinet.

H. Unit Accessories:

1. Remote Room Temperature Sensor Kit: Wall-mounted, hardwired room temperature sensor kit for use in rooms that do not have room temperature measurement.
2. Condensate Pump: Integral reservoir and control with electrical power connection through unit power.

I. Unit Controls:

1. Enclosure: Manufacturer's standard, and suitable for indoor locations.
2. Factory-Installed Controller: Configurable digital control.
3. Factory-Installed Sensors:

   a. Unit inlet air temperature.
   b. Coil entering refrigerant temperature.
   c. Coil leaving refrigerant temperature.
   d. Sensor.

4. Field-Customizable I/O Capability:

   a. Analog Inputs: [Two] [Three] or [Four] for use in customizable control strategies.
   b. Digital Inputs: [Two] [Three] or [Four] for use in customizable control strategies.
   c. Digital Outputs: [Two] [Three] or [Four] for use in customizable control strategies.

5. Features and Functions:

   a. Self-diagnostics.
   b. Time delay.
   c. Auto-restart.
   d. External static pressure control.
   e. Auto operation mode.
   f. Manual operation mode.
   g. Filter service notification
   h. Power consumption display.
   i. Drain assembly high water level safety shutdown and notification.
   j. Run test switch.

6. Communication: Network communication with other indoor units and outdoor unit(s).

7. Cable and Wiring: Manufacturer's standard with each connection labeled and corresponding to a unit-mounted wiring diagram.
8. Field Connection: Manufacturer's standard with each connection labeled and corresponding to a unit-mounted wiring diagram.

J. Unit Electrical:

1. Enclosure: Manufacturer's standard, and suitable for indoor locations.
2. Field Connection: Single point connection to power entire unit and integral controls.
3. Disconnecting Means: Factory-mounted circuit breaker or switch.
4. Control Transformer: Manufacturer's standard. Coordinate requirements with field power supply.
5. Wiring: Manufacturer's standard with each connection labeled and corresponding to a unit-mounted wiring diagram.
6. Raceways: Enclose line voltage wiring in [metal]raceways.

2.7 INDOOR, EXPOSED, WALL-MOUNTED UNITS

A. Description: Factory-assembled[and -tested] complete unit with components, piping, wiring, and controls required for mating to piping, power, and controls field connections.

B. Cabinet:

1. Material: Painted steel, or coated steel frame covered by a plastic cabinet, with an architectural acceptable finish suitable for tenant occupancy on exposed surfaces.
2. Insulation: Manufacturer's standard internal insulation[, complying with ASHRAE 62.1,] to provide thermal resistance and prevent condensation.
3. Mounting: Manufacturer-designed provisions for field installation.
4. Internal Access: Removable panels of adequate size for field access to internal components for inspection, cleaning, service, and replacement.

C. DX Coil Assembly:

1. Coil Casing: Aluminum, galvanized, or stainless steel.
2. Coil Fins: Aluminum, mechanically bonded to tubes, with arrangement required by performance.
3. Coil Tubes: Copper, of diameter and thickness required by performance.
4. Expansion Valve: Electronic modulating type with linear or proportional characteristics.
5. Unit Internal Tubing: Copper tubing with brazed joints.
6. Unit Internal Tubing Insulation: Manufacturer's standard insulation, of thickness to prevent condensation.
7. Field Piping Connections: Manufacturer's standard.
8. Factory Charge: Dehydrated air or nitrogen.
9. Testing: Factory pressure tested and verified to be without leaks.

D. Drain Assembly:

1. Pan: Non-ferrous material, with bottom sloped to low point drain connection.

2. Condensate Removal: Gravity.

    a. If a floor drain is not available at unit, provide unit with field-installed condensate pump accessory.

3. Field Piping Connection: Non-ferrous material[with threaded NPT].

E. Fan and Motor Assembly:

1. Fan(s):

    a. Direct-drive arrangement.
    b. Single or multiple fans connected to a common motor shaft and driven by a single motor.
    c. Fabricated from non-ferrous components or ferrous components with corrosion protection finish.
    d. Wheels statically and dynamically balanced.

2. Motor: Brushless dc or electronically commutated with permanently lubricated bearings.
3. Motor Protection: Integral protection against thermal, overload, and voltage fluctuations.
4. Speed Settings and Control: Two (low, high), three (low, medium, high), or more than three speed settings or variable speed with a speed range of least 50 percent.
5. Vibration Control: Integral isolation to dampen vibration transmission.

F. Filter Assembly:

1. Access: Front, to accommodate filter replacement without the need for tools.
2. Efficiency: Code Compliant
3. Washable Media: Manufacturer's standard filter with antimicrobial treatment.

G. Grille Assembly: Manufacturer's standard discharge grille[with field-adjustable air pattern] mounted in top [or front face]of unit cabinet.

H. Unit Accessories:

1. Remote Room Temperature Sensor Kit: Wall-mounted, hardwired room temperature sensor kit for use in rooms that do not have room temperature measurement.
2. Condensate Pump: Integral reservoir and control with electrical power connection through unit power.

I. Unit Controls:

1. Enclosure: Manufacturer's standard, and suitable for indoor locations.
2. Factory-Installed Controller: Configurable digital control.
3. Factory-Installed Sensors: [Unit inlet air temperature] [Coil entering refrigerant temperature] [Coil leaving refrigerant temperature] .
4. Field-Customizable I/O Capability:

    a. Analog Inputs: [Two] [Three] or [Four] for use in customizable control strategies.

b. Digital Inputs: [Two] [Three] or [Four] for use in customizable control strategies.
c. Digital Outputs: [Two] [Three] or [Four] for use in customizable control strategies.

5. Features and Functions: Self-diagnostics, time delay, auto-restart.
6. Communication: Network communication with other indoor units and outdoor unit(s).
7. Cable and Wiring: Manufacturer's standard with each connection labeled and corresponding to a unit-mounted wiring diagram.
8. Field Connection: Manufacturer's standard with each connection labeled and corresponding to a unit-mounted wiring diagram.

J. Unit Electrical:

1. Enclosure: Manufacturer's standard, and suitable for indoor locations.
2. Field Connection: Single point connection to power entire unit and integral controls.
3. Disconnecting Means: Factory-mounted circuit breaker or switch, complying with NFPA 70.
4. Control Transformer: Manufacturer's standard. Coordinate requirements with field power supply.
5. Wiring: Manufacturer's standard with each connection labeled and corresponding to a unit-mounted wiring diagram.
6. Raceways: Enclose line voltage wiring in [metal]raceways to comply with NFPA 70.

2.8 INDOOR, RECESSED, CEILING-MOUNTED UNITS

A. Description: Factory-assembled[and -tested] complete unit with components, piping, wiring, and controls required for mating to ductwork, piping, power, and controls field connections.

B. Cabinet:

1. Material: Painted steel, or coated steel frame covered by a plastic cabinet, with an architectural acceptable finish suitable for tenant occupancy on exposed surfaces.
2. Insulation: Manufacturer's standard internal insulation[, complying with ASHRAE 62.1,] to provide thermal resistance and prevent condensation.
3. Mounting: Manufacturer-designed provisions for field installation.
4. Internal Access: Removable panels of adequate size for field access to internal components for inspection, cleaning, service, and replacement.

C. DX Coil Assembly:

1. Coil Casing: Aluminum, galvanized, or stainless steel.
2. Coil Fins: Aluminum, mechanically bonded to tubes, with arrangement required by performance.
3. Coil Tubes: Copper, of diameter and thickness required by performance.
4. Expansion Valve: Electronic modulating type with linear or proportional characteristics.
5. Internal Tubing: Copper tubing with brazed joints.
6. Internal Tubing Insulation: Manufacturer's standard insulation, of thickness to prevent condensation.
7. Field Piping Connections: Manufacturer's standard.

8. Factory Charge: Dehydrated air or nitrogen.
9. Testing: Factory pressure tested and verified to be without leaks.

D. Drain Assembly:

1. Pan: Non-ferrous material, with bottom sloped to low point drain connection.
2. Condensate Removal: Unit-mounted pump or other integral lifting mechanism, capable of lifting drain water to an elevation above top of cabinet.
3. Field Piping Connection: Non-ferrous material[with threaded NPT].

E. Fan and Motor Assembly:

1. Fan(s):

    a. Direct-drive arrangement.
    b. Single or multiple fans connected to a common motor shaft and driven by a single motor.
    c. Fabricated from non-ferrous components or ferrous components with corrosion protection finish.
    d. Wheels statically and dynamically balanced.

2. Motor: Brushless dc or electronically commutated with permanently lubricated bearings.
3. Motor Protection: Integral protection against thermal, overload, and voltage fluctuations.
4. Speed Settings and Control: Two (low, high), three (low, medium, high), or more than three speed settings or variable speed with a speed range of least 50 percent.
5. Vibration Control: Integral isolation to dampen vibration transmission.

F. Filter Assembly:

1. Access: Bottom, to accommodate filter replacement without the need for tools.
2. Efficiency: ASHRAE 52.2, MERV 7

    a. Replaceable: Extended surface, panel, or cartridge with antimicrobial treatment fiber media.
    b. Washable: Manufacturer's standard filter with antimicrobial treatment.

G. Discharge-Air Grille Assembly: Mounted in bottom of unit cabinet.

1. Discharge Pattern: One-, two-, three-, or four-way throw as indicated on Drawings.

    a. Discharge Pattern Adjustment: Field-adjustable limits for up and down range of motion.
    b. Discharge Pattern Closure: Ability to close individual discharges of units with multiple patterns.

2. Motorized Vanes: Modulating up and down flow pattern for uniform room air distribution.
3. Additional Branch Supply Duct Connection: Sheet metal knockout for optional connection to one additional supply branch duct.

H. Return-Air Grille Assembly: Manufacturer's standard grille mounted in bottom of unit cabinet.

I. Outdoor Air Ventilation Connection: Sheet metal knockout for optional connection to outdoor air ventilation duct.

J. Unit Accessories:

1. Outdoor Air Ventilation Kit: Connection, motorized damper, and control to satisfy unit control sequence of operation indicated on Drawings.
2. Remote Room Temperature Sensor Kit: Wall-mounted, hardwired room temperature sensor kit for use in rooms that do not have room temperature measurement.

K. Unit Controls:

1. Enclosure: Manufacturer's standard, and suitable for indoor locations.
2. Factory-Installed Controller: Configurable digital control.
3. Factory-Installed Sensors: [Unit inlet air temperature] [Coil entering refrigerant temperature] [Coil leaving refrigerant temperature] .
4. Communication: Network communication with other indoor units and outdoor unit(s).
5. Cable and Wiring: Manufacturer's standard with each connection labeled and corresponding to a unit-mounted wiring diagram.
6. Field Connection: Manufacturer's standard with each connection labeled and corresponding to a unit-mounted wiring diagram.

L. Unit Electrical:

1. Enclosure: Manufacturer's standard, and suitable for indoor locations.
2. Field Connection: Single point connection to power entire unit and integral controls.
3. Disconnecting Means: Factory-mounted circuit breaker or switch, complying with NFPA 70.
4. Control Transformer: Manufacturer's standard. Coordinate requirements with field power supply.
5. Wiring: Manufacturer's standard with each connection labeled and corresponding to a unit-mounted wiring diagram.
6. Raceways: Enclose line voltage wiring in [metal]raceways to comply with NFPA 70.

2.9 INDOOR, SUSPENDED, CEILING-MOUNTED UNITS

A. Description: Factory-assembled[and -tested] complete unit with components, piping, wiring, and controls required for mating to piping, power, and controls field connections.

B. Cabinet:

1. Material: Painted steel, or coated steel frame covered by a plastic cabinet, with an architectural acceptable finish suitable for tenant occupancy on exposed surfaces.
2. Insulation: Manufacturer's standard internal insulation[, complying with ASHRAE 62.1,] to provide thermal resistance and prevent condensation.
3. Mounting: Manufacturer-designed provisions for field installation.

4. Internal Access: Removable panels of adequate size for field access to internal components for inspection, cleaning, service, and replacement.

C. DX Coil Assembly:

1. Coil Casing: Aluminum, galvanized, or stainless steel.
2. Coil Fins: Aluminum, mechanically bonded to tubes, with arrangement required by performance.
3. Coil Tubes: Copper, of diameter and thickness required by performance.
4. Expansion Valve: Electronic modulating type with linear or proportional characteristics.
5. Internal Tubing: Copper tubing with brazed joints.
6. Internal Tubing Insulation: Manufacturer's standard insulation, of thickness to prevent condensation.
7. Field Piping Connections: Manufacturer's standard.
8. Factory Charge: Dehydrated air or nitrogen.
9. Testing: Factory pressure tested and verified to be without leaks.

D. Drain Assembly:

1. Pan: Non-ferrous material, with bottom sloped to low point drain connection.
2. Condensate Removal: Gravity.

    a. If a floor drain is not available at unit, provide unit with field-installed condensate pump accessory.

3. Field Piping Connection: Non-ferrous material[with threaded NPT].

E. Fan and Motor Assembly:

1. Fan(s):

    a. Direct-drive arrangement.
    b. Single or multiple fans connected to a common motor shaft and driven by a single motor.
    c. Fabricated from non-ferrous components or ferrous components with corrosion protection finish.
    d. Wheels statically and dynamically balanced.

2. Motor: Brushless dc or electronically commutated with permanently lubricated bearings.
3. Motor Protection: Integral protection against thermal, overload, and voltage fluctuations.
4. Speed Settings and Control: Two (low, high), three (low, medium, high), or more than three speed settings or variable speed with a speed range of least 50 percent.
5. Vibration Control: Integral isolation to dampen vibration transmission.

F. Filter Assembly:

1. Access: Front, to accommodate filter replacement without the need for tools.
2. Efficiency: Code Compliant.
3. Washable Media: Manufacturer's standard filter with antimicrobial treatment.

G. Discharge-Air Grille Assembly: Mounted in front of unit cabinet.

1. Discharge Pattern: One-way throw.
2. Discharge Pattern Adjustment: Field-adjustable limits for range of pattern.
3. Motorized Vanes: Modulating up and down flow pattern for uniform room air distribution.

H. Return-Air Grille Assembly: Manufacturer's standard.

I. Outdoor Air Ventilation Connection: Sheet metal knockout for optional connection to outdoor air ventilation duct.

J. Unit Accessories:

1. Remote Room Temperature Sensor Kit: Wall-mounted, hardwired room temperature sensor kit for use in rooms that do not have room temperature measurement.
2. Condensate Pump: Integral reservoir and control with electrical power connection through unit power.

K. Unit Controls:

1. Enclosure: Manufacturer's standard, and suitable for indoor locations.
2. Factory-Installed Controller: Configurable digital control.
3. Factory-Installed Sensors: Unit inlet air temperature
4. Communication: Network communication with other indoor units and outdoor unit(s).
5. Cable and Wiring: Manufacturer's standard with each connection labeled and corresponding to a unit-mounted wiring diagram.
6. Field Connection: Manufacturer's standard with each connection labeled and corresponding to a unit-mounted wiring diagram.

L. Unit Electrical:

1. Enclosure: Manufacturer's standard, and suitable for indoor locations.
2. Field Connection: Single point connection to power entire unit and integral controls.
3. Disconnecting Means: Factory-mounted circuit breaker or switch, complying with NFPA 70.
4. Control Transformer: Manufacturer's standard. Coordinate requirements with field power supply.
5. Wiring: Manufacturer's standard with each connection labeled and corresponding to a unit-mounted wiring diagram.
6. Raceways: Enclose line voltage wiring in metal raceways to comply with NFPA 70.

2.10 OUTDOOR, AIR-SOURCE HEAT-PUMP UNITS

A. Description: Factory-assembled and -tested complete unit with components, piping, wiring, and controls required for mating to piping, power, and controls field connections.

1. Specially designed for use in systems with either all heating or all cooling demands, but not for use in systems with simultaneous heating and cooling.
2. Systems shall consist of one unit, or multiple unit modules that are designed by variable refrigerant system manufacturer for field interconnection to make a single refrigeration circuit that connects multiple indoor units.
3. All units installed shall be from the same product development generation.

B. Cabinet:

1. Galvanized steel and coated with a corrosion-resistant finish.

    a. Coating with documented salt spray test performance of [1000] hours according ASTM B117 surface scratch test (SST) procedure.

2. Mounting: Manufacturer-designed provisions for field installation.
3. Internal Access: Removable panels or hinged doors of adequate size for field access to internal components for inspection, cleaning, service, and replacement.

C. Compressor and Motor Assembly:

1. One or more positive-displacement, direct-drive and hermetically sealed scroll compressor(s) with inverter drive and turndown to [15] percent of rated capacity.
2. Protection: Integral protection against the following:

    a. High refrigerant pressure.
    b. Low oil level.
    c. High oil temperature.
    d. Thermal and overload.
    e. Voltage fluctuations.
    f. Phase failure and phase reversal.
    g. Short cycling.

3. Speed Control: Variable to automatically maintain refrigerant suction and condensing pressures while varying refrigerant flow to satisfy system cooling and heating loads.
4. Vibration Control: Integral isolation to dampen vibration transmission.
5. Oil management system to ensure safe and proper lubrication over entire operating range.
6. Crankcase heaters with integral control to maintain safe operating temperature.
7. Fusible plug.

D. Condenser Coil Assembly:

1. Plate Fin Coils:

    a. Casing: Aluminum, galvanized, or stainless steel.
    b. Fins: Aluminum or copper, mechanically bonded to tubes, with arrangement required by performance.
    c. Tubes: Copper, of diameter and thickness required by performance.

2. Aluminum Microchannel Coils:

a. Series of flat tubes containing a series of multiple, parallel-flow microchannels layered between refrigerant header manifolds.
b. Single- or multiple-pass arrangement.
c. Construct fins, tubes, and header manifolds of aluminum alloy.

3. Coating: [None] [Corrosion resistant].
4. Hail Protection: Provide condenser coils with louvers, baffles, or hoods to protect against hail damage.

E. Condenser Fan and Motor Assembly:

1. Fan(s): Propeller type.

a. Direct-drive arrangement.
b. Fabricated from non-ferrous components or ferrous components with corrosion protection finish to match performance indicated for condenser coil.
c. [Statically and]dynamically balanced.

2. Fan Guards: Removable safety guards complying with OSHA regulations. If using metal materials, coat with corrosion-resistant coating to match performance indicated for condenser coil.
3. Motor(s): Brushless dc or electronically commutated with permanently lubricated bearings and rated for outdoor duty.
4. Motor Protection: Integral protection against thermal, overload, and voltage fluctuations.
5. Speed Settings and Control: Variable speed with a speed range of least [75] percent.
6. Vibration Control: Integral isolation to dampen vibration transmission.

F. Drain Pan: If required by manufacturer's design, provide unit with non-ferrous drain pan with bottom sloped to a low point drain connection.

G. Unit Controls:

1. Enclosure: Manufacturer's standard, and suitable for unprotected outdoor locations.
2. Factory-Installed Controller: Configurable digital control.
3. Factory-Installed Sensors:

a. Refrigerant suction temperature.
b. Refrigerant discharge temperature.
c. Outdoor air temperature.
d. Refrigerant high pressure.
e. Refrigerant low pressure.
f. Oil level.

4. Communication: Network communication with indoor units and other outdoor unit(s).
5. Cable and Wiring: Manufacturer's standard with each connection labeled and corresponding to a unit-mounted wiring diagram.
6. Field Connection: Manufacturer's standard with each connection labeled and corresponding to a unit-mounted wiring diagram.

H. Unit Electrical:

1. Enclosure: Metal, similar to enclosure, and suitable for unprotected outdoor locations.
2. Field Connection: Single point connection to power entire unit and integral controls.
3. Disconnecting Means: Factory-mounted circuit breaker or switch, complying with NFPA 70.
4. Control Transformer: Manufacturer's standard. Coordinate requirements with field power supply.
5. Wiring: Manufacturer's standard with each connection labeled and corresponding to a unit-mounted wiring diagram.
6. Raceways: Enclose line voltage wiring in [metal]raceways to comply with NFPA 70.

I. Unit Hardware: Zinc-plated steel, or stainless steel. Coat exposed surfaces with additional corrosion-resistant coating if required to prevention corrosion when exposed to salt spray test for [1000] hours according ASTM B117.

J. Unit Piping:

1. Unit Tubing: Copper tubing with brazed joints.
2. Unit Tubing Insulation: Manufacturer's standard insulation, of thickness to prevent condensation.
3. Field Piping Connections: Manufacturer's standard.
4. Factory Charge: Dehydrated air or nitrogen.
5. Testing: Factory pressure tested and verified to be without leaks.

2.11 OUTDOOR, AIR-SOURCE HEAT RECOVERY UNITS

A. Description: Factory-assembled and -tested complete unit with components, piping, wiring, and controls required for mating to piping, power, and controls field connections.

1. Specially designed for use in systems with simultaneous heating and cooling.
2. Systems shall consist of one unit, or multiple unit modules that are designed by variable refrigerant system manufacturer for field interconnection to make a single refrigeration circuit that connects multiple indoor units.
3. All units installed shall be from the same product development generation.

B. Cabinet:

1. Galvanized steel and coated with a corrosion-resistant finish.

a. Coating with documented salt spray test performance of [1000] hours according ASTM B117 surface scratch test (SST) procedure.

2. Mounting: Manufacturer-designed provisions for field installation.
3. Internal Access: Removable panels or hinged doors of adequate size for field access to internal components for inspection, cleaning, service, and replacement.

C. Compressor and Motor Assembly:

1. One or more positive-displacement, direct-drive and hermetically sealed scroll compressor(s) with inverter drive and turndown to [15] percent of rated capacity.
2. Protection: Integral protection against the following:

    a. High refrigerant pressure.
    b. Low oil level.
    c. High oil temperature.
    d. Thermal and overload.
    e. Voltage fluctuations.
    f. Phase failure and phase reversal.
    g. Short cycling.

3. Speed Control: Variable to automatically maintain refrigerant suction and condensing pressures while varying refrigerant flow to satisfy system cooling and heating loads.
4. Vibration Control: Integral isolation to dampen vibration transmission.
5. Oil management system to ensure safe and proper lubrication over entire operating range.
6. Crankcase heaters with integral control to maintain safe operating temperature.
7. Fusible plug.

D. Condenser Coil Assembly:

1. Plate Fin Coils:

    a. Casing: Aluminum, galvanized, or stainless steel.
    b. Fins: Aluminum or copper, mechanically bonded to tubes, with arrangement required by performance.
    c. Tubes: Copper, of diameter and thickness required by performance.

2. Aluminum Microchannel Coils:

    a. Series of flat tubes containing a series of multiple, parallel-flow microchannels layered between refrigerant header manifolds.
    b. Single- or multiple-pass arrangement.
    c. Construct fins, tubes, and header manifolds of aluminum alloy.

3. Coating: [None] [Corrosion resistant].
4. Hail Protection: Provide condenser coils with louvers, baffles, or hoods to protect against hail damage.

E. Condenser Fan and Motor Assembly:

1. Fan(s): Propeller type.

    a. Direct-drive arrangement.
    b. Fabricated from non-ferrous components or ferrous components with corrosion protection finish to match performance indicated for condenser coil.
    c. [Statically and]dynamically balanced.

2. Fan Guards: Removable safety guards complying with OSHA regulations. If using metal materials, coat with corrosion-resistant coating to match performance indicated for condenser coil.
3. Motor(s): Brushless dc or electronically commutated with permanently lubricated bearings and rated for outdoor duty.
4. Motor Protection: Integral protection against thermal, overload, and voltage fluctuations.
5. Speed Settings and Control: Variable speed with a speed range of least [75] > percent.
6. Vibration Control: Integral isolation to dampen vibration transmission.

F. Drain Pan: If required by manufacturer's design, provide unit with non-ferrous drain pan with bottom sloped to a low point drain connection.

G. Unit Controls:

1. Enclosure: Manufacturer's standard, and suitable for unprotected outdoor locations.
2. Factory-Installed Controller: Configurable digital control.
3. Factory-Installed Sensors:

    a. Refrigerant suction temperature.
    b. Refrigerant discharge temperature.
    c. Outdoor air temperature.
    d. Refrigerant high pressure.
    e. Refrigerant low pressure.
    f. Oil level.
    g. <Insert sensor>.

4. Features and Functions: Self-diagnostics, time delay, auto-restart, fuse protection[, auto operation mode] [, manual operation mode] [, night setback control] [, power consumption display] [, run test switch] [equalize run time between multiple same components] .
5. Communication: Network communication with indoor units and other outdoor unit(s).
6. Cable and Wiring: Manufacturer's standard with each connection labeled and corresponding to a unit-mounted wiring diagram.
7. Field Connection: Manufacturer's standard with each connection labeled and corresponding to a unit-mounted wiring diagram.

H. Unit Electrical:

1. Enclosure: Metal, similar to enclosure, and suitable for unprotected outdoor locations.
2. Field Connection: Single point connection to power entire unit and integral controls.
3. Disconnecting Means: Factory-mounted circuit breaker or switch, complying with NFPA 70.
4. Control Transformer: Manufacturer's standard. Coordinate requirements with field power supply.
5. Wiring: Manufacturer's standard with each connection labeled and corresponding to a unit-mounted wiring diagram.
6. Raceways: Enclose line voltage wiring in [metal]raceways to comply with NFPA 70.

I. Unit Hardware: Zinc-plated steel, or stainless steel. Coat exposed surfaces with additional corrosion-resistant coating if required to prevention corrosion when exposed to salt spray test for [1000] hours according ASTM B117.

J. Unit Piping:

1. Unit Tubing: Copper tubing with brazed joints.
2. Unit Tubing Insulation: Manufacturer's standard insulation, of thickness to prevent condensation.
3. Field Piping Connections: Manufacturer's standard.
4. Factory Charge: Dehydrated air or nitrogen.
5. Testing: Factory pressure tested and verified to be without leaks.

2.12 HEAT RECOVERY CONTROL UNITS (HRCUs)

A. Description: Factory-assembled and -tested complete unit with components, piping, wiring, and controls required for mating to piping, power, and controls field connections.

1. Specially designed for use in systems with simultaneous heating and cooling.
2. Systems shall consist of one unit, or multiple unit that are designed by variable refrigerant system manufacturer for field interconnection to make a single refrigeration circuit that connects multiple indoor units.

B. Cabinet:

1. Galvanized-steel construction.
2. Insulation: Manufacturer's standard internal insulation to provide thermal resistance and prevent condensation.
3. Mounting: Manufacturer-designed provisions for field installation.
4. Internal Access: Removable panels or hinged doors of adequate size for field access to internal components for inspection, cleaning, service, and replacement.

C. Drain Pan: If required by manufacturer's design, provide unit with non-ferrous drain pan with bottom sloped to a low point drain connection.

D. Refrigeration Assemblies and Specialties:

1. Specially designed by manufacturer for type of VRF HVAC system being installed, either two or three pipe.
2. Each refrigerant branch circuit shall have refrigerant control valve(s) to control refrigerant flow.
3. Spares: Each heat recovery control unit shall include at least [one] branch circuit port(s) for future use.
4. Each system piping connection upstream of heat recovery unit shall be fitted with an isolation valve to allow for service to any heat recovery control unit in the system without interrupting operation of the system.

5. Each branch circuit connection shall be fitted with an isolation valve and capped service port to allow for service to any individual branch circuit without interrupting operation of the system.

    a. If not available as an integral part of the heat recovery control unit, isolation valves shall be field installed adjacent to the unit pipe connection.

E. Unit Controls:

1. Enclosure: Manufacturer's standard, and suitable for indoor locations.
2. Factory-Installed Controller: Configurable digital control.
3. Factory-Installed Sensors:
4. "Features and Functions" Subparagraph below indicates requirements that may not be available on some products from some manufacturers. Consult manufacturers for availability.
5. Features and Functions: Self-diagnostics, fuse protection.
6. Communication: Network communication with indoor units and outdoor unit(s).
7. Cable and Wiring: Manufacturer's standard with each connection labeled and corresponding to a unit-mounted wiring diagram.
8. Field Connection: Manufacturer's standard with each connection labeled and corresponding to a unit-mounted wiring diagram.

F. Unit Electrical:

1. Enclosure: Metal, similar to enclosure, and suitable for indoor locations.
2. Field Connection: Single point connection to power entire unit and integral controls.
3. Disconnecting Means: Factory-mounted circuit breaker or switch, complying with NFPA 70.
4. Control Transformer: Manufacturer's standard. Coordinate requirements with field power supply.
5. Wiring: Manufacturer's standard with each connection labeled and corresponding to a unit-mounted wiring diagram.
6. Raceways: Enclose line voltage wiring in [metal]raceways to comply with NFPA 70.

G. Unit Piping:

1. Unit Tubing: Copper tubing with brazed joints.
2. Unit Tubing Insulation: Manufacturer's standard insulation, of thickness to prevent condensation.
3. Field Piping Connections: Manufacturer's standard.
4. Factory Charge: Dehydrated air or nitrogen.
5. Testing: Factory pressure tested and verified to be without leaks.

2.13 SYSTEM CONTROLS

A. General Requirements:

1. Network: Indoor units[, HRCUs,] and outdoor units shall include integral controls and connect through a [TIA-485A] [or] [manufacturer-selected] control network.
2. Network Communication Protocol: [Manufacturer proprietary] [or] [open] control communication between interconnected units.
3. Integration with Building Automation System: ASHRAE 135, BACnet IP and certified by BACnet Testing Lab (BTL), including the following:

    a. Ethernet connection via RJ-45 connectors and port with transmission at [100] Mbps or higher.
    b. Integration devices shall be connected to local uninterruptible power supply unit(s) to provide at least [5 minutes] of battery backup operation after a power loss.
    c. Integration shall include [control] [monitoring] [scheduling] [change of value notifications] .

4. Operator Interface:

    a. Operators shall interface with system and unit controls through the following:

        1) Operator interfaces integral to controllers.
        2) Owner-furnished PC connected to central controller(s).
        3) Web interface through web browser software.
        4) Integration with Building Automation System.

    b. Users shall be capable of interface with controllers for control of indoor units to extent privileges are enabled. Control features available to users shall include the following:

        1) On/off control.
        2) Temperature set-point adjustment.

B. VRF HVAC System Operator Software for PC:

1. Software offered by VRF HVAC system manufacturer shall provide system operators with ability to monitor and control VRF HVAC system(s) from a single dedicated Owner-furnished PC.
2. Software shall provide operator with a graphic user interface to allow monitoring and control of multiple central controllers from a single device location through point-and-click mouse exchange.
3. Plan views shall show building plans with location of indoor units and identification superimposed on plans.
4. Controls operation mode of indoor units as individual units, by selected groups of indoor units, or as collection of all indoor units. Operation modes available through central controller shall match those operation modes of controllers for indoor units.
5. Schedules operation of indoor units as individual units, by selected groups of indoor units, or as collection of all indoor units. Schedules daily, weekly, and annual events.
6. Changes operating set points of indoor units as individual units, by selected groups of indoor units, or as collection of all indoor units.
7. Optimized start feature to start indoor units before scheduled time to reach temperature set-point at scheduled time based on operating history.

8. Night setback feature to operate indoor units at energy-conserving heating and cooling temperature set-points during unoccupied periods.
9. Supports Multiple Languages: [English] [or] [Spanish]
10. Supports Imperial and Metric Temperature Units: [Fahrenheit] [or] [Celsius] [Fahrenheit and Celsius].
11. Displays service notifications and error codes.
12. Monitors and displays up to [3000] item error history and [10000] item operation history for regular reporting and further archiving.
13. Monitors and displays cumulative operating time of indoor units.
14. Able to disable and enable operation of individual controllers for indoor units.
15. Information displayed on individual controllers shall also be available for display.
16. Information displayed for outdoor units, including refrigerant high and low pressures [percent capacity] <Insert outdoor unit displays>.

C. Central Controllers:

1. Centralized control for all indoor and outdoor units from a single central controller location.

    a. Include multiple interconnected controllers as required.

2. Controls operation mode of indoor units as individual units, by selected groups of indoor units, or as collection of all indoor units. Operation modes available through central controller shall match those operation modes of controllers for indoor units.
3. Schedule operation of indoor units as individual units, by selected groups of indoor units, or as collection of all indoor units.

    a. Sets schedule for daily, weekly, and annual events.
    b. Schedule options available through central controller shall at least include the schedule options of controllers for indoor units.

4. Changes operating set points of indoor units as individual units, by selected groups of indoor units, or as collection of all indoor units.
5. Optimized start feature to start indoor units before scheduled time to reach temperature set-point at scheduled time based on operating history.
6. Night setback feature to operate indoor units at energy-conserving heating and cooling temperature set-points during unoccupied periods.
7. Service diagnostics tool.
8. Able to disable and enable operation of individual controllers for indoor units.
9. Information displayed on individual controllers shall also be available for display through central controller.
10. Information displayed for outdoor units, including refrigerant high and low pressures [percent capacity] .
11. Multiple RJ-45 ports for direct connection to a local PC and an Ethernet network switch.
12. Operator interface through a backlit, high-resolution color display touch panel[and web accessible through standard web browser software].

D. Wired Controllers for Indoor Units:

1. Single controller capable of controlling multiple indoor units as group.
2. Auto Timeout Touch Screen LCD: Timeout duration shall be adjustable.
3. Multiple Language: [English] [or [Spanish] .
4. Temperature Units: [Fahrenheit] [or] [Celsius] [Fahrenheit and Celsius].
5. On/Off: Turns indoor unit on or off.
6. Hold: Hold operation settings until hold is released.
7. Operation Mode: Cool, Heat, Auto, Dehumidification, Fan Only, and Setback.
8. Temperature Display: 1-degree increments.
9. Temperature Set-Point: Separate set points for Cooling, Heating, and Setback. Adjustable in 1-degree increments.
10. Relative Humidity Display: 1 percent increments.
11. Relative Humidity Set-Point: Adjustable in 1 percent increments.
12. Fan Speed Setting: Select between available options furnished with the unit.
13. Airflow Direction Setting: If applicable to unit, select between available options furnished with the unit.
14. Seven-day programmable operating schedule with up to [eight] events per day. Operations shall include On/Off, Operation Mode, and Temperature Set-Point.
15. Auto Off Timer: Operates unit for an adjustable time duration and then turns unit off.
16. Occupancy detection.
17. Service Notification Display: "Filter".
18. Service Run Tests: Limit use by service personnel to troubleshoot operation.
19. Error Code Notification Display: Used by service personnel to troubleshoot abnormal operation and equipment failure.
20. User and Service Passwords: Capable of preventing adjustments by unauthorized users.
21. Setting stored in nonvolatile memory to ensure that settings are not lost if power is lost. Battery backup for date and time only.
22. Low-voltage power required for controller shall be powered through non-polar connections to indoor unit.

E. Wireless Controllers for Indoor Units:

1. Wireless Communication:

    a. Controller communicates to remote-mounted receiver that is wired to indoor unit(s).

        1) Include receivers with wireless controllers as required to complete installation.
        2) Low-voltage power required for receivers shall be powered through non-polar connections to indoor unit.

    b. One wireless controller shall be capable of communicating with one or multiple receivers to control one or multiple indoor units as a group.

2. Controller Battery Life: [Three] years.
3. Auto Timeout Touch Screen LCD: Timeout duration shall be adjustable.
4. Multiple Language: [English] [or] [Spanish] .
5. Temperature Units: [Fahrenheit] [or] [Celsius] [Fahrenheit and Celsius].
6. On/Off: Turns indoor unit on or off.

7. Hold: Hold operation settings until hold is released.
8. Operation Mode: Cool, Heat, Auto, Dehumidification, Fan Only, and Setback.
9. Temperature Display: 1-degree increments.
10. Temperature Set-Point: Separate set points for Cooling, Heating, and Setback. Adjustable in 1-degree increments.
11. Relative Humidity Display: 1 percent increments.
12. Relative Humidity Set-Point: Adjustable in 1 percent increments.
13. Fan Speed Setting: Select between available options furnished with the unit.
14. Airflow Direction Setting: If applicable to unit, select between available options furnished with the unit.
15. Seven-day programmable operating schedule with up to [eight] events per day. Operations shall include On/Off, Operation Mode, and Temperature Set-Point.
16. Auto Off Timer: Operates unit for an adjustable time duration and then turns unit off.
17. Occupancy detection.
18. Service Notification Display: "Filter"
19. Service Run Tests: Limit use by service personnel to troubleshoot operation.
20. Error Code Notification Display: Used by service personnel to troubleshoot abnormal operation and equipment failure.
21. User and Service Passwords: Capable of preventing adjustments by unauthorized users.
22. Setting stored in non-volatile memory to ensure that settings are not lost if power is lost. Battery for date and time only.

2.14 SYSTEM REFRIGERANT AND OIL

A. Refrigerant:

1. As required by VRF HVAC system manufacturer for system to comply with performance requirements indicated.
2. ASHRAE 34, [Class A1] refrigerant classification.
3. [R-410a].

B. Oil:

1. As required by VRF HVAC system manufacturer and to comply with performance requirements indicated.

2.15 SYSTEM CONDENSATE DRAIN PIPING

A. If more than one material is listed, material selection is Contractor's option.

B. Copper Tubing:

1. Drawn-Temper Tubing: According to ASTM B88, Type L
2. Wrought-Copper Fittings: ASME B16.22.
3. Wrought-Copper Unions: ASME B16.22.
4. Solder Filler Metals: ASTM B32, lead-free alloys, and water-flushable flux according to ASTM B813.

C. CPVC plastic pipe according to ASTM F441/F441M, Schedule 40, with socket-type pipe fittings according to ASTM F438 and solvent cement according to ASTM F493.

D. PVC plastic pipe according to ASTM D1785, Schedule 40, with socket-type pipe fittings according to ASTM D2466 and solvent cement according to ASTM D2564, primer according to ASTM F656.

2.16 SYSTEM HYDRONIC PIPING

A. Comply with requirements in Section 232113 "Hydronic Piping" for system piping requirements.

2.17 SYSTEM REFRIGERANT PIPING

A. Comply with requirements in Section 232300 "Refrigerant Piping" for system piping requirements.

B. Refrigerant Piping:

1. Copper Tube: [ASTM B280, Type ACR] .
2. Wrought-Copper Fittings: ASME B16.22.
3. Brazing Filler Metals: AWS A5.8/A5.8M.

C. Refrigerant Tubing Kits:

1. Furnished by VRF HVAC system manufacturer.
2. Factory-rolled and -bundled, soft-copper tubing with tubing termination fittings at each end.
3. Standard one-piece length for connecting to indoor units.
4. Pre-insulated with flexible elastomeric insulation of thickness to comply with governing energy code and sufficient to eliminate condensation.
5. Factory Charge: [Dehydrated air or nitrogen] .

D. Divided-Flow Specialty Fittings: Where required by VRF HVAC system manufacturer for proper system operation, VRF HVAC system manufacturer shall furnish specialty fittings with identification and instructions for proper installation by Installer.

E. Refrigerant Isolation Ball Valves:

1. Description: Uni-body full port design, rated for maximum system temperature and pressure, and factory tested under pressure to ensure tight shutoff. Designed for valve operation without removing seal cap.
2. Seals: Compatible with system refrigerant and oil. Seal service life of at least 20 years.
3. Valve Connections: Flare or sweat depending on size.

2.18 METAL HANGERS AND SUPPORTS

A. Copper Tube Hangers:

1. Description: MSS SP-58, Types 1 through 58, copper-coated-steel, factory-fabricated components.
2. Hanger Rods: Continuous-thread rod, nuts, and washer made of [galvanized or copper-coated steel] [stainless steel] .

B. Plastic Pipe Hangers:

1. Description: MSS SP-58, Types 1 through 58, galvanized-steel, factory-fabricated components.
2. Hanger Rods: Continuous-thread rod, nuts, and washer made of [galvanized steel] [stainless steel] .

2.19 METAL FRAMING SYSTEMS

A. MFMA Manufacturer Metal Framing Systems:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Unistrut; Atkore International.
   b. Wesanco, Inc.

2. Description: Shop- or field-fabricated, pipe-support assembly made of steel channels, accessories, fittings, and other components for supporting multiple parallel pipes.

3. Standard: Comply with MFMA-4 factory-fabricated components for field assembly.
4. Channels: Continuous slotted [carbon-steel] [stainless steel, Type 304] [stainless steel, Type 316] [extruded-aluminum] channel with inturned lips.
5. Channel Nuts: Formed or stamped steel nuts or other devices designed to fit into channel slot and, when tightened, prevent slipping along channel.
6. Hanger Rods: Continuous-thread rod, nuts, and washer made of [galvanized steel] <Insert material> for use indoors and of [stainless steel] <Insert material> for use outdoors.
7. Metallic Coating for Use Indoors: [No coating] [Electroplated zinc] [Hot-dip galvanized] [Gold (yellow zinc dichromate) galvanized].
8. Plastic Coating for Use Outdoors: [PVC] [polyurethane] [epoxy] [or] [polyester].

2.20 FASTENER SYSTEMS

A. Powder-Actuated Fasteners: Threaded, zinc-coated steel stud, for use in hardened portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

B. Mechanical-Expansion Anchors: Insert-wedge-type anchors, for use in hardened portland cement concrete; with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

1. Indoor Applications: [Zinc-coated] [or] [stainless] steel.
2. Outdoor Applications: Stainless steel.

2.21 PIPE STANDS

A. General Requirements for Pipe Stands: Shop- or field-fabricated assemblies made of manufactured corrosion-resistant components to support roof-mounted piping.

B. Compact Pipe Stand:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

   a. MIRO Industries.
   b. PHP Systems/Design.
   c. RectorSeal HVAC; a CSW Industrials Company.
   d. Rooftop Support Systems; Eberl Iron Works, Inc.

2. Description: Single base unit with integral-rod roller, pipe clamps, or V-shaped cradle to support pipe, for roof installation without membrane penetration.

3. Base: Single, vulcanized rubber, molded polypropylene, or polycarbonate.

   a. Recycled content.>

4. Hardware: Galvanized steel or polycarbonate.
5. Accessories: Protection pads.

C. Low-Profile, Single-Base, Single-Pipe Stand:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

   a. MIRO Industries.
   b. PHP Systems/Design.
   c. Rooftop Support Systems; Eberl Iron Works, Inc.

2. Description: Single base with vertical and horizontal members, and pipe support, for roof installation without membrane protection.

3. Base: Single, vulcanized rubber, molded polypropylene, or polycarbonate.

   a. Recycled content.>

4. Vertical Members: Two, [galvanized-steel] [stainless steel], continuous-thread 1/2-inch rods.
5. Horizontal Member: Adjustable horizontal, [galvanized-steel] [stainless steel] pipe support channels.
6. Pipe Supports: [Roller] [Strut clamps] [Clevis hanger] [Swivel hanger].
7. Hardware: [Galvanized] [Stainless] steel.
8. Accessories: Protection pads.
9. Height: [12 inches above roof] .

D. High-Profile, Single-Base, Single-Pipe Stand:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. MIRO Industries.
    b. PHP Systems/Design.
    c. Rooftop Support Systems; Eberl Iron Works, Inc.

2. Description: Single base, vertical and horizontal members, and pipe support, for roof installation without membrane penetration.

3. Base: Single vulcanized rubber or molded polypropylene.

    a. Recycled content.>

4. Vertical Members: Two, [galvanized-steel] [stainless steel], continuous-thread 1/2-inch rods.
5. Horizontal Member: One, adjustable height, [galvanized-steel] [or] [stainless steel] pipe support slotted channel or plate.
6. Pipe Supports: [Roller] [Clevis hanger] [Swivel hanger].
7. Hardware: [Galvanized] [Stainless] steel.
8. Accessories: Protection pads[, 1/2-inch continuous-thread galvanized-steel rod] [, 1/2-inch continuous-thread stainless steel rod].
9. Height: [36 inches above roof] .

E. High-Profile, Multiple-Pipe Stand:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. MIRO Industries.
    b. PHP Systems/Design.
    c. RectorSeal HVAC; a CSW Industrials Company.
    d. Rooftop Support Systems; Eberl Iron Works, Inc.

2. Description: Assembly of bases, vertical and horizontal members, and pipe supports, for roof installation without membrane penetration.

3. Bases: Two or more; [vulcanized rubber] [molded polypropylene] .

   a. Recycled content.>

4. Vertical Members: Two or more, [galvanized-steel] [stainless steel] channels.
5. Horizontal Members: One or more, adjustable height, [galvanized-steel] [stainless steel] pipe support.
6. Pipe Supports: [Roller] [Strut clamps] [Clevis hanger] [Swivel hanger].
7. Hardware: [Galvanized] [Stainless] steel.
8. Accessories: Protection pads[, 1/2-inch continuous-thread rod].
9. Height: [36 inches above roof] <Insert lesser dimension above roof>.

F. Curb-Mounted-Type Pipe Stands: Shop- or field-fabricated pipe supports made from structural-steel shapes, continuous-thread rods, and rollers, for mounting on permanent stationary roof curb.

2.22 OUTDOOR EQUIPMENT STANDS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. MIRO Industries.
2. RectorSeal HVAC; a CSW Industrials Company.
3. RectorSeal HVAC; a CSW Industrials Company.
4. Rooftop Support Systems; Eberl Iron Works, Inc.

B. Description: Individual foot supports with elevated adjustable channel cross bars and clamps/fasteners/bolts for ground or roof-supported outdoor equipment components, without roof membrane penetration, in a prefabricated system that can be modularly assembled on-site.

C. Foot Material: Rubber or polypropylene.

D. Rails Material: Hot-dip galvanized carbon steel.

E. Wind/Sliding Load Resistance: Up to [100 mph].

2.23 MISCELLANEOUS SUPPORT MATERIALS

A. Grout: ASTM C1107, factory-mixed and -packaged, dry, hydraulic-cement, nonshrink and nonmetallic grout; suitable for interior and exterior applications.

1. Properties: Nonstaining, noncorrosive, and nongaseous.
2. Design Mix: 5000-psi, 28-day compressive strength.

B. Structural Steel: ASTM A36/A36M, carbon-steel plates, shapes, and bars; galvanized.

C. Threaded Rods: Continuously threaded. Zinc-plated steel or galvanized steel for indoor applications and stainless steel for outdoor applications. Mating nuts and washers of similar material as rods.

2.24 PIPING AND TUBING INSULATION

A. Comply with requirements in Section 230719 "HVAC Piping Insulation" for system piping insulation requirements.

B. Condensate Drain Piping and Tubing Insulation and Jacket Requirements:

1. Flexible Elastomeric Insulation:

   a. Closed-cell, sponge- or expanded-rubber materials, complying with ASTM C534, Type I for tubular materials.
   b. Indoors: 1/2 inch thick.
   c. Outdoors: 3/4 inch thick.

2. Field-Applied Jacket:

   a. Concealed: None required.
   b. Indoors, Exposed to View: Factory ASJ with vaport barrier.
   c. Outdoors, Exposed to View: Aluminum, smooth, 0.020 inch thick .

C. Refrigerant Tubing Insulation and Jacket Requirements:

1. Flexible Elastomeric Insulation:

   a. Closed-cell, sponge- or expanded-rubber materials, complying with ASTM C534, Type I for tubular materials.
   b. Indoors: 1 inch thick.
   c. Outdoors: 1 inch thick.

2. Field-Applied Jacket:

   a. Concealed: None required.
   b. Indoors, Exposed to View: None required
   c. Outdoors, Exposed to View: [None required] [Aluminum, smooth, 0.020 inch thick] .

D. Flexible Elastomeric Insulation Adhesive: Comply with MIL-A-24179A, Type II, Class I.

1. Llow emitting adhesives.>

E. PVC Jacket Adhesive: Compatible with PVC jacket.

1. Low emitting adhesives.>

F. Metal Jacket Flashing Sealants:

1. Materials shall be compatible with insulation materials, jackets, and substrates.
2. Fire- and water-resistant, flexible, elastomeric sealant.
3. Service Temperature Range: Minus 40 to plus 250 deg F.
4. Color: Aluminum.
5. Sealants.>

2.25 SYSTEM CONTROL CABLE AND RACEWAYS

A. Low-Voltage Control Cabling:

1. Plenum-Rated, Paired Cable: NFPA 70, Type CMP.

B. TIA-485A Network Cabling:

1. Standard Cable: NFPA 70, Type CMG.
2. Plenum-Rated Cable: NFPA 70, Type CMP.

C. Ethernet Network Cabling: TIA-568-C.2 Category [6] [6a] cable with [RJ-45] connectors.

D. Comply with requirements in Section 260533 "Raceways and Boxes for Electrical Systems" for control wiring and cable raceways.

2.26 MATERIALS

A. Steel:

1. ASTM A36/A36M for carbon structural steel.
2. ASTM A568/A568M for steel sheet.

B. Stainless Steel:

1. Manufacturer's standard grade for casing.
2. Manufacturer's standard type, ASTM A240/A240M for bare steel exposed to airstream or moisture.

C. Galvanized Steel: ASTM A653/A653M.

D. Aluminum: ASTM B209.

E. Comply with Section 230546 "Coatings for HVAC" for corrosion-resistant coating.

F. Corrosion-Resistant Coating: Coat with a corrosion-resistant coating capable of withstanding a [3000] -hour salt-spray test according to ASTM B117.

1. Standards:

a. ASTM B117 for salt spray.
b. ASTM D2794 for minimum impact resistance of 100 in-lb .

c. ASTM B3359 for cross-hatch adhesion of 5B.

2. Application: [Immersion] [Spray].
3. Thickness: [1 mil].
4. Gloss: Minimum gloss of 60 on a 60-degree meter.

2.27 SOURCE QUALITY CONTROL

A. Factory Tests: Test and inspect factory-assembled equipment.

B. Equipment will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports for historical record. Submit reports only if requested.

PART 3 - EXECUTION

3.1 EQUIPMENT INSTALLATION

A. Clearance:

1. Maintain manufacturer's recommended clearances for service and maintenance.
2. Maintain clearances required by governing code.

B. Loose Components: Install components, devices, and accessories furnished by manufacturer, with equipment, that are not factory mounted.

1. Loose components shall be installed by [manufacturer's service representative] [or] [system Installer under supervision of manufacturer's service representative].

C. Equipment Restraint Installation: Install equipment with seismic-restraint device. Comply with requirements for seismic-restraint devices specified in Section 230548 "Vibration and Seismic Controls for HVAC."

D. Indoor Unit Installations:

1. Install units to be level and plumb while providing a neat and finished appearance.
2. Unless otherwise required by VRF HVAC system manufacturer, support ceiling-mounted units from structure above using threaded rods; minimum rod size of 3/8 inch.
3. Adjust supports of exposed and recessed units to draw units tight to adjoining surfaces.
4. Protect finished surfaces of ceilings, floors, and walls that come in direct contact with units. Refinish or replaced damaged areas after units are installed.
5. In rooms with ceilings, conceal piping and tubing, controls, and electrical power serving units above ceilings.
6. In rooms without ceiling, arrange piping and tubing, controls, and electrical power serving units to provide a neat and finished appearance.
7. Provide lateral bracing if needed to limit movement of suspended units to not more than [0.25 inch].

8. For floor- and wall-mounted units that are exposed, conceal piping and tubing, controls, and electrical power serving units within walls.
9. Floor-mounted units located in [mechanical] rooms.
10. Install floor-mounted units on support structure indicated on Drawings.
11. Install floor-mounted units on cast-in-place concrete equipment bases. Comply with requirements for equipment bases and foundations specified in Section 033000 "Cast-in-Place Concrete."
12. Attachment: Install hardware for proper attachment to supported equipment.
13. Grouting: Place grout under equipment supports and make bearing surface smooth.

E. Outdoor Unit Installations:

1. Install units to be level and plumb while providing a neat and finished appearance.
2. Install outdoor units on support structures indicated on Drawings.
3. Pad-Mounted Installations: Install outdoor units on cast-in-place concrete equipment bases. Comply with requirements for equipment bases and foundations specified in Section 033000 "Cast-in-Place Concrete."

    a. Attachment: Install anchor bolts to elevations required for proper attachment to supported equipment.
    b. Grouting: Place grout under equipment supports and make bearing surface smooth.

4. Roof-Mounted Installations: Install outdoor units on equipment supports specified in Section 077200 "Roof Accessories." Anchor units to supports with removable, stainless-steel fasteners.

3.2 GENERAL REQUIREMENTS FOR PIPING AND TUBING INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping and tubing systems. Install piping and tubing as indicated unless deviations to layout are approved on coordination drawings.

B. Install piping and tubing in concealed locations unless otherwise indicated and except in equipment rooms and service areas.

C. Install piping and tubing at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

D. Install piping and tubing above accessible ceilings to allow sufficient space for ceiling panel removal.

E. Install piping and tubing to permit valve servicing.

F. Install piping and tubing at indicated slopes.

G. Install piping and tubing free of sags.

H. Install fittings for changes in direction and branch connections.

I. Install piping and tubing to allow application of insulation.

J. Install groups of pipes and tubing parallel to each other, spaced to permit applying insulation with service access between insulated piping and tubing.

K. Install sleeves for piping and tubing penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 230517 "Sleeves and Sleeve Seals for HVAC Piping."

L. Install escutcheons for piping and tubing penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 230518 "Escutcheons for HVAC Piping."

3.3 CONDENSATE DRAIN PIPE AND TUBING INSTALLATION

A. General Requirements for Drain Piping and Tubing:

1. Install a union in piping at each threaded unit connection.
2. Install an adjustable stainless-steel hose clamp with adjustable gear operator on unit hose connections. Tighten clamp to provide a leak-free installation.
3. If required for unit installation, provide a trap assembly in drain piping to prevent air circulated through unit from passing through drain piping. Comply with more stringent of the following:

    a. Details indicated on Drawings.
    b. Manufacturer's requirements.
    c. Governing codes.
    d. In the absence of requirements, comply with requirements of ASHRAE handbooks.

4. Extend drain piping from units with drain connections to drain receptors as indicated on Drawings. If not indicated on Drawings, terminate drain connection at nearest accessible location that is not exposed to view by occupants.
5. Provide each 90-degree change in direction with a Y- or T-fitting. Install a threaded plug connection in the dormant side of fitting or future use as a service cleanout.

B. Gravity Drains:

1. Slope piping from unit connection toward drain termination at a constant slope of not less than [one to two] percent.

C. Pumped Drains:

1. If unit condensate pump or lift mechanism is not included with an integral check valve, install a full-size check valve in each branch pipe near unit connection to prevent backflow into unit.

3.4 HYDRONIC PIPING AND TUBING INSTALLATION

A. Comply with requirements for hydronic pipe and tubing specified in Section 232113 "Hydronic Piping."

B. Comply with requirements for hydronic specialties specified in Section 232116 "Hydronic Piping Specialties."

C. Comply with requirements for ball valves specified in Section 230523.12 "Ball Valves for HVAC Piping."

D. Comply with requirements for butterfly valves specified in Section 230523.13 "Butterfly Valves for HVAC Piping."

E. Comply with requirements for check valves specified in Section 230523.14 "Check Valves for HVAC Piping."

F. Install continuous-thread hanger rods and [elastomeric] [spring] hangers of size required to support equipment weight.

1. Comply with requirements for vibration isolation devices specified in Section 230548.13 "Vibration Controls for HVAC." Fabricate brackets or supports as required.
2. Comply with requirements for hangers and supports specified in Section 230529 "Hangers and Supports for HVAC Piping and Equipment."

G. Where installing piping and tubing adjacent to equipment, allow space for service and maintenance.

3.5 REFRIGERANT PIPING AND TUBING INSTALLATION

A. Refrigerant Tubing Kits:

1. Unroll and straighten tubing to suit installation. Deviations in straightness of exposed tubing shall be unnoticeable to observer.
2. Support tubing using hangers and supports indicated at intervals not to exceed [5 feet]. Minimum rod size, 1/4 inch.
3. Prepare tubing ends and make mating connections to provide a pressure tight and leak-free installation.

B. Install refrigerant piping according to ASHRAE 15 and governing codes.

C. Select system components with pressure rating equal to or greater than system operating pressure.

D. Install piping as short and direct as possible, with a minimum number of joints and fittings.

E. Arrange piping to allow inspection and service of equipment. Install valves and specialties in accessible locations to allow for service and inspection. Install access doors or panels as

specified in Section 083113 "Access Doors and Frames" if valves or equipment requiring maintenance is concealed behind finished surfaces.

F. Install refrigerant piping and tubing in protective conduit where installed belowground.

G. Install refrigerant piping and tubing in rigid or flexible conduit in locations where exposed to mechanical damage.

H. Unless otherwise required by VRF HVAC system manufacturer, slope refrigerant piping and tubing as follows:

1. Install horizontal hot-gas discharge piping and tubing with a uniform slope downward away from compressor.
2. Install horizontal suction lines with a uniform slope downward to compressor.
3. Install traps to entrain oil in vertical runs.
4. Liquid lines may be installed level.

I. When brazing, remove or protect components that could be damaged by heat.

J. Before installation, clean piping, tubing, and fittings to cleanliness level required by VRF HVAC system manufacturer.

K. Joint Construction:

1. Ream ends of tubes and remove burrs.
2. Remove scale, slag, dirt, and debris from inside and outside of tube and fittings before assembly.
3. Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter.

    a. Use Type BCuP (copper-phosphorus) alloy for joining copper fittings with copper tubing.
    b. Use Type BAg (cadmium-free silver) alloy for joining copper with bronze.

3.6 PIPE AND TUBING INSULATION INSTALLATION

A. Seal longitudinal seams and end joints with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated. Installation to maintain a continuous vapor barrier.

B. Insulation Installation on Pipe Fittings and Elbows:

1. Install mitered sections of pipe insulation.
2. Secure insulation materials and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

C. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed valve covers manufactured of same material as pipe insulation when available.

2. When preformed valve covers are unavailable, install cut sections of pipe and sheet insulation to valve body. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
3. Secure insulation to valves and specialties and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

D. Where PVC jackets are indicated, install with 1-inch overlap at longitudinal seams and end joints; for horizontal applications. Seal with manufacturer's recommended adhesive.

1. Apply two continuous beads of adhesive to seams and joints, one bead under lap and the finish bead along seam and joint edge.

E. Where metal jackets are indicated, install with 2-inch overlap at longitudinal seams and end joints. Overlap longitudinal seams arranged to shed water. Seal end joints with weatherproof sealant recommended by insulation manufacturer. Secure jacket with stainless-steel bands 12 inches o.c. and at end joints.

3.7 DUCT, ACCESSORIES, AND AIR OUTLETS INSTALLATION

A. Where installing ductwork adjacent to equipment, allow space for service and maintenance.

B. Comply with requirements for metal ducts specified in Section 233113 "Metal Ducts."

C. Comply with requirements for nonmetal ducts specified in Section 233116 "Nonmetal Ducts."

D. Comply with requirements for air duct accessories specified in Section 233300 "Air Duct Accessories."

E. Comply with requirements for flexible ducts specified in Section 233346 "Flexible Ducts."

F. Comply with requirements for air diffusers specified in Section 233713.13 "Air Diffusers."

G. Comply with requirements for registers and grilles specified in Section 233713.23 "Registers and Grilles."

3.8 SOFTWARE

A. Cybersecurity:

1. Software:

a. Coordinate security requirements with [IT department] [CIO] .
b. Ensure that latest stable software release is installed and properly operating.
c. Disable or change default passwords to password using a combination of uppercase and lower letters, numbers, and symbols at least eight characters in length. Record passwords and turn over to party responsible for system operation and administration.

2. Hardware:

    a. Coordinate location and access requirements with [IT department] [CIO] .
    b. Enable highest level of wireless encryption that is compatible with Owner's ICT network.
    c. Disable dual network connections.

3.9 FIRESTOPPING

A. Comply with requirements in Section 078413 "Penetration Firestopping."

B. Comply with TIA-569-D, Annex A, "Firestopping."

C. Comply with BICSI TDMM, "Firestopping" Chapter.

3.10 FIELD QUALITY CONTROL

A. Perform the following tests and inspections with the assistance of manufacturer's service representative:

1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
2. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
3. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

B. Refrigerant Tubing Positive Pressure Testing:

1. Comply with more stringent of VRF HVAC system manufacturer's requirements and requirements indicated.
2. After completion of tubing installation, pressurize tubing systems to a test pressure of not less than [1.2] times VRF HVAC system operating pressure, but not less than [600 psig] , using [dry nitrogen] .
3. Successful testing shall maintain a test pressure for a continuous and uninterrupted period of [24] hours. Allowance for pressure changes attributed to changes in ambient temperature are acceptable.
4. Prepare test report to record the following information for each test:

    a. Name of person starting test, company name, phone number, and e-mail address.
    b. Name of manufacturer's service representative witnessing test, company name, phone number, and e-mail address.
    c. Detailed description of extent of tubing tested.
    d. Date and time at start of test.
    e. Test pressure at start of test.

f. Outdoor temperature at start of test.
g. Name of person ending test, company name, phone number, and e-mail address.
h. Date and time at end of test.
i. Test pressure at end of test.
j. Outdoor temperature at end of test.
k. Remarks:

5. Submit test reports for Project record.

C. Refrigerant Tubing Evacuation Testing:

1. Comply with more stringent of VRF HVAC system manufacturer's requirements and requirements indicated.
2. After completion of tubing positive-pressure testing, evacuate tubing systems to a pressure of [500] microns.
3. Successful testing shall maintain a test pressure for a continuous and uninterrupted period of [one] hour(s) with no change.
4. Prepare test report to record the following information for each test:

a. Name of person starting test, company name, phone number, and e-mail address.
b. Name of manufacturer's service representative witnessing test, company name, phone number, and e-mail address.
c. Detailed description of extent of tubing tested.
d. Date and time at start of test.
e. Test pressure at start of test.
f. Outdoor temperature at start of test.
g. Name of person ending test, company name, phone number, and e-mail address.
h. Date and time at end of test.
i. Test pressure at end of test.
j. Outdoor temperature at end of test.
k. Remarks:

5. Submit test reports for Project record.
6. Upon successful completion of evacuation testing, system shall be charged with refrigerant.

D. System Refrigerant Charge:

1. Using information collected from the refrigerant tubing evacuation testing, system Installer shall consult variable refrigerant system manufacturer to determine the correct system refrigerant charge.
2. Installer shall charge system following VRF HVAC system manufacturer's written instructions.
3. System refrigerant charging shall be witnessed by system manufacturer's representative.
4. Total refrigerant charge shall be recorded and permanently displayed at the system's outdoor unit.

E. Products will be considered defective if they do not pass tests and inspections.

F. Prepare test and inspection reports.

3.11 STARTUP SERVICE

A. Engage a VRF HVAC system manufacturer's service representative to perform system(s) startup service.

1. Service representative shall be [an employee] [or] [a factory-trained and -authorized service representative] of VRF HVAC system manufacturer.
2. Complete startup service of each separate system.
3. Complete system startup service according to manufacturer's written instructions.

B. Startup checks shall include, but not be limited to, the following:

1. Check control communications of equipment and each operating component in system(s).
2. Check each indoor unit's response to demand for cooling and heating.
3. Check each indoor unit's response to changes in airflow settings.
4. Check each indoor unit[, HRCU,] and outdoor unit for proper condensate removal.
5. Check sound levels of each indoor[and outdoor] unit.

C. Installer shall accompany manufacturer's service representative during startup service and provide manufacturer's service representative with requested documentation and technical support during startup service.

1. Installer shall correct deficiencies found during startup service for reverification.

D. System Operation Report:

1. After completion of startup service, manufacturer shall issue a report for each separate system.
2. Report shall include complete documentation describing each startup check, the result, and any corrective action required.
3. Manufacturer shall electronically record not less than [two] hours of continuous operation of each system and submit with report for historical reference.

    a. All available system operating parameters shall be included in the information submitted.

E. Witness:

1. Invite [Architect] [Owner] [and] [Commissioning Agent] to witness startup service procedures.
2. Provide written notice not less than [20] business days before start of startup service.

3.12 ADJUSTING

A. Adjust equipment and components to function smoothly, and lubricate as recommended by manufacturer.

B. Adjust initial temperature and humidity set points. Adjust initial airflow settings and discharge airflow patterns.

C. Set field-adjustable switches and circuit-breaker trip ranges according to VRF HVAC system manufacturer's written instructions, and as indicated.

D. Occupancy Adjustments: When requested within [12] months from date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to [two] visits to Project during other-than-normal occupancy hours for this purpose.

3.13 SOFTWARE SERVICE AGREEMENT

A. Technical Support: Beginning at Substantial Completion, service agreement shall include software support for [two] years.

B. Upgrade Service: At Substantial Completion, update software to latest version. Install and program software upgrades that become available within [two] years from date of Substantial Completion. Upgrading software shall include operating system and new or revised licenses for using software.

1. Upgrade Notice: At least [30] days to allow Owner to schedule and access the system and to upgrade computer equipment if necessary.

3.14 DEMONSTRATION

A. Engage a VRF HVAC system manufacturer's [employed training instructor] [or] [factory-authorized service representative] to train Owner's maintenance personnel to adjust, operate, and maintain entire system.

END OF SECTION 238129

SECTION 238219

FAN COIL UNITS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes ductless fan coil units and accessories.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings:

1. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
2. Include diagrams for power, signal, and control wiring.

C. Samples: For units with factory-applied color finishes.

1.3 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Floor plans, reflected ceiling plans, and other details, drawn to scale and coordinated with each other based on input from installers of the items involved:

B. Seismic Qualification Certificates: For fan coil units, accessories, and components, from manufacturer.

C. Field quality-control reports.

D. Sample warranty.

1.4 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

1.5 QUALITY ASSURANCE

A. Comply with NFPA 70.

B. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 5 - "Systems and Equipment" and Section 7 - "Construction and Startup."

C. ASHRAE/IES 90.1 Compliance: Applicable requirements in ASHRAE/IES 90.1, Section 6 - "Heating, Ventilating, and Air-Conditioning."

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Factory-packaged and -tested units rated according to AHRI 440, ASHRAE 33, and UL 1995.

2.2 FAN COIL UNITS

A. Furnish and install a unit by one of the following manufacturers:
1. The Trane Company.
2. Carrier Corporation.

B. Fan Coil Unit Configurations: [**Row**] [**Face**] split.

1. Number of Heating Coils: One with two-pipe system.
2. Number of Cooling Coils: One with two-pipe system.

C. Main and Auxiliary Drain Pans: Plastic. Fabricate pans and drain connections to comply with ASHRAE 62.1.

D. Chassis: Galvanized steel where exposed to moisture, with powder-coat finish and removable access panel. Floor-mounting units shall have leveling screws.

E. Cabinet: Steel with baked-enamel finish in manufacturer's standard paint color as selected by Architect.

F. Filters: Minimum arrestance and a minimum efficiency reporting value (MERV) according to ASHRAE 52.2 and all addendums.

1. MERV Rating: 6 when tested according to ASHRAE 52.2.
2. Washable Foam: 70 percent arrestance and MERV 3.
3. Glass Fiber Treated with Adhesive: 80 percent arrestance and MERV 5.
4. Pleated Cotton-Polyester Media: 90 percent arrestance and MERV 7.

G. Hydronic Coils: Copper tube, with mechanically bonded aluminum fins spaced no closer than 0.1 inch, rated for a minimum working pressure of 200 psig and a maximum entering-water temperature of 220 deg F. Include manual air vent and drain valve.

H. Fan and Motor Board: Removable.

1. Fan: Forward curved, double width, centrifugal; directly connected to motor. Thermoplastic or painted-steel wheels, and aluminum, painted-steel, or galvanized-steel fan scrolls.
2. Motor: Permanently lubricated, multispeed; resiliently mounted on motor board. Comply with requirements in Section 230513 "Common Motor Requirements for HVAC Equipment."
3. Wiring Termination: Connect motor to chassis wiring with plug connection.

I. Factory, Hydronic Piping Package: ASTM B88, Type M copper tube with wrought-copper fittings and brazed joints. Label piping to indicate service, inlet, and outlet.

1. Two-way, modulating control valve for dual-temperature coil.
2. Hose Kits: Minimum 400-psig working pressure and operating temperatures from 33 to 211 deg F. Tag hose kits to equipment designations.

    a. Length: 24 inches.
    b. Minimum Diameter: Equal to fan coil unit connection size.

3. Two-Piece Ball Valves: Bronze body with full-port, chrome-plated bronze ball; PTFE or TFE seats; and 600-psig minimum CWP rating and blowout-proof stem.
4. Calibrated-Orifice Balancing Valves: Bronze body, ball type; 125-psig working pressure, 250 deg F maximum operating temperature; with calibrated orifice or venturi, connections for portable differential pressure meter with integral seals, threaded ends, and a memory stop to retain set position.
5. Automatic Flow-Control Valve: Brass or ferrous-metal body; 300-psig working pressure at 250 deg F; with removable, corrosion-resistant, tamperproof, self-cleaning piston spring; factory set to maintain constant indicated flow with plus or minus 10 percent over differential pressure range of 2 to 80 psig.
6. Y-Pattern Hydronic Strainers: Cast-iron body (ASTM A126, Class B); 125-psig working pressure; with threaded connections, bolted cover, perforated stainless-steel basket, and bottom drain connection. Include minimum NPS 1/2 hose-end, full-port, ball-type blowdown valve in drain connection.
7. Wrought-Copper Unions: ASME B16.22.
8. Risers: ASTM B88, Type M copper pipe with hose and ball valve for system flushing.

J. Control devices and operational sequences are specified in Section 230923 "Direct Digital Control (DDC) System for HVAC" and Section 230993.11 "Sequence of Operations for HVAC DDC."

K. Basic Unit Controls:

1. Control voltage transformer.
2. Wall-mounting thermostat with the following features:

    a. Heat-cool-off switch.
    b. Fan on-auto switch.

c. Fan-speed switch.
d. Automatic changeover.
e. Adjustable deadband.
f. Concealed set point.
g. Concealed indication.
h. Degree F indication.

L. DDC]Terminal Controller:

1. Scheduled Operation: Occupied and unoccupied periods on seven-day clock with a minimum of four programmable periods per day.
2. Unoccupied-Period-Override Operation: Two hours.
3. Unit Supply-Air Fan Operation:

a. Occupied Periods: Fan runs continuously.
b. Unoccupied Periods: Fan cycles to maintain room setback temperature.

4. Dual-Temperature Hydronic-Coil Operation:

a. Occupied Periods: When chilled water is available, open control valve if room temperature exceeds thermostat set point. When hot water is available, open control valve if temperature falls below thermostat set point.
b. Unoccupied Periods: When chilled water is available, close control valve. When hot water is available, modulate control valve if room temperature falls below thermostat setback temperature.

5. Controller shall have volatile-memory backup.

M. Electrical Connection: Factory wire motors and controls for a single electrical connection.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install fan coil units level and plumb.

B. Install fan coil units to comply with NFPA 90A.

C. Suspend fan coil units from structure with elastomeric hangers. Vibration isolators are specified in Section 230548 "Vibration and Seismic Controls for HVAC Piping and Equipment."

D. Verify locations of thermostats, humidistats, and other exposed control sensors with Drawings and room details before installation. Install devices 60 inches above finished floor.

E. Install new filters in each fan coil unit within two weeks after Substantial Completion.

F. Piping installation requirements are specified in other Sections. Drawings indicate general arrangement of piping, fittings, and specialties. Specific connection requirements are as follows:

1. Install piping adjacent to machine to allow service and maintenance.
2. Connect piping to fan coil unit factory hydronic piping package. Install piping package if shipped loose.
3. Connect condensate drain to indirect waste.

    a. Install condensate trap of adequate depth to seal against fan pressure. Install cleanouts in piping at changes of direction.

G. Ground equipment according to Section 260526 "Grounding and Bonding for Electrical Systems."

H. Connect wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

3.2 FIELD QUALITY CONTROL

A. Perform the following tests and inspections with the assistance of a factory-authorized service representative:

1. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
2. Operate electric heating elements through each stage to verify proper operation and electrical connections.
3. Test and adjust controls and safety devices. Replace damaged and malfunctioning controls and equipment.

B. Remove and replace malfunctioning units and retest as specified above.

C. Prepare test and inspection reports.

3.3 ADJUSTING

A. Adjust initial temperature and humidity set points.

B. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to two visits to Project during other-than-normal occupancy hours for this purpose.

END OF SECTION 238219

SECTION 26 0519

LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Copper building wire rated 600 V or less.
2. Metal-clad cable, Type MC, rated 600 V or less.
3. Fire-alarm wire and cable.
4. Connectors, splices, and terminations rated 600 V and less.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

PART 2 - PRODUCTS

2.1 COPPER BUILDING WIRE

A. Description: Flexible, insulated and uninsulated, drawn copper current-carrying conductor with an overall insulation layer or jacket, or both, rated 600 V or less.

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Alpha Wire; brand of Belden, Inc.
2. Belden Inc.
3. Encore Wire Corporation.
4. General Cable; Prysmian Group North America.
5. Southwire Company, LLC.

C. Standards:

1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.
2. Conductor and Cable Marking: Comply with wire and cable marking according to UL's "Wire and Cable Marking and Application Guide."

D. Conductors: Copper, complying with ASTM B3 for bare annealed copper and with ASTM B8 for stranded conductors.

E. Conductor Insulation:
1. Type RHH and Type RHW-2: Comply with UL 44.

2. Type USE-2 and Type SE: Comply with UL 854.
3. Type THHN and Type THWN-2: Comply with UL 83.
4. Type THW and Type THW-2: Comply with NEMA WC-70/ICEA S-95-658 and UL 83.
5. Type XHHW-2: Comply with UL 44.

2.2 METAL-CLAD CABLE, TYPE MC

A. Description: A factory assembly of one or more current-carrying insulated conductors in an overall metallic sheath.

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. AFC Cable Systems; Atkore International.
2. Alpha Wire; brand of Belden, Inc.
3. Encore Wire Corporation.
4. General Cable; Prysmian Group North America.
5. Southwire Company, LLC.

C. Standards:

1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.
2. Comply with UL 1569.
3. Conductor and Cable Marking: Comply with wire and cable marking according to UL's "Wire and Cable Marking and Application Guide."

D. Circuits:

1. Single circuit.
2. Power-Limited Fire-Alarm Circuits: Comply with UL 1424.

E. Conductors: Copper, complying with ASTM B3 for bare annealed copper and with ASTM B8 for stranded conductors.

F. Ground Conductor: Insulated.

G. Conductor Insulation:

1. Type TFN/THHN/THWN-2: Comply with UL 83.
2. Type XHHW-2: Comply with UL 44.

H. Armor: Aluminum, interlocked.

I. Jacket: PVC applied over armor.

2.3 FIRE-ALARM WIRE AND CABLE

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Allied Wire & Cable Inc.

2. Prysmian Cables and Systems; Prysmian Group North America.
3. Radix Wire.
4. Southwire.
5. West Penn Wire; brand of Belden, Inc.

B. General Wire and Cable Requirements: NRTL listed and labeled as complying with NFPA 70, Article 760.

C. Signaling Line Circuits: Twisted, shielded pair, not less than No. 16 AWG.

1. Circuit Integrity Cable: Twisted shielded pair, NFPA 70, Article 760, Classification CI, for power-limited fire-alarm signal service Type FPL. NRTL listed and labeled as complying with UL 1424 and UL 2196 for a two-hour rating.

D. Non-Power-Limited Circuits: Solid-copper conductors with 600 V rated, 75 deg C, color-coded insulation, and complying with requirements in UL 2196 for a two-hour rating.

1. Low-Voltage Circuits: No. 16 AWG, minimum, in pathway.
2. Line-Voltage Circuits: No. 12 AWG, minimum, in pathway.

2.4 CONNECTORS AND SPLICES

A. Description: Factory-fabricated connectors, splices, and lugs of size, ampacity rating, material, type, and class for application and service indicated; listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. 3M Electrical Products.
2. ABB, Electrification Business.
3. AFC Cable Systems; Atkore International.
4. Hubbell Utility Solutions; Hubbell Incorporated.
5. ILSCO.
6. Ideal Industries, Inc.
7. NSi Industries LLC.
8. O-Z/Gedney; brand of Emerson Electric Co., Automation Solutions, Appleton Group.
9. TE Connectivity Ltd.

C. Jacketed Cable Connectors: For steel and aluminum jacketed cables, zinc die-cast with set screws, designed to connect conductors specified in this Section.

PART 3 - EXECUTION

3.1 CONDUCTOR MATERIAL APPLICATIONS

A. Feeders:

1. Copper; solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

B. Branch Circuits:

1. Copper, Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

C. Power-Limited Fire Alarm and Control: Solid for No. 12 AWG and smaller.

3.2 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

A. Service Entrance: Type THHN/THWN-2, single conductors in raceway.

B. Exposed Feeders: Type THHN/THWN-2, single conductors in raceway.

C. Feeders Concealed in Ceilings, Walls, Partitions, and Crawlspaces: Type THHN/THWN-2, single conductors in raceway.

D. Feeders Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN/THWN-2, single conductors in raceway.

E. Exposed Branch Circuits, Including in Crawlspaces: Type THHN/THWN-2, single conductors in raceway.

F. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Type THHN/THWN-2, single conductors in raceway or Metal-clad cable, Type MC.

G. Branch Circuits Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN/THWN-2, single conductors in raceway.

3.3 INSTALLATION OF CONDUCTORS AND CABLES

A. Conceal cables in finished walls, ceilings, and floors unless otherwise indicated.

B. Complete raceway installation between conductor and cable termination points according to Section 26 0533 "Raceways and Boxes for Electrical Systems" prior to pulling conductors and cables.

C. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.

D. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.

E. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.

F. Support cables according to Section 26 0529 "Hangers and Supports for Electrical Systems."

3.4 INSTALLATION OF FIRE-ALARM WIRE AND CABLE

A. Comply with NFPA 72.

B. Wiring Method: Install wiring in metal pathway according to Section 28 0528 "Pathways for Electronic Safety and Security."

1. Install plenum cable in environmental airspaces, including plenum ceilings.
2. Fire-alarm circuits and equipment control wiring associated with fire-alarm system must be installed in a dedicated pathway system.

    a. Cables and pathways used for fire-alarm circuits, and equipment control wiring associated with fire-alarm system, may not contain any other wire or cable.

3. Fire-Rated Cables: Use of two-hour, fire-rated fire-alarm cables, NFPA 70, Types MI and CI, is permitted.
4. Signaling Line Circuits: Power-limited fire-alarm cables must not be installed in the same cable or pathway as signaling line circuits.

C. Wiring within Enclosures: Separate power-limited and non-power-limited conductors as recommended by manufacturer. Install conductors parallel with or at right angles to sides and back of the enclosure. Bundle, lace, and train conductors to terminal points with no excess. Connect conductors that are terminated, spliced, or interrupted in any enclosure associated with fire-alarm system to terminal blocks. Mark each terminal according to system's wiring diagrams. Make all connections with approved crimp-on terminal spade lugs, pressure-type terminal blocks, or plug connectors.

D. Cable Taps: Use numbered terminal strips in junction, pull, and outlet boxes, cabinets, or equipment enclosures where circuit connections are made.

E. Color-Coding: Color-code fire-alarm conductors differently from the normal building power wiring. Use one color-code for alarm circuit wiring and another for supervisory circuits. Color-code audible alarm-indicating circuits differently from alarm-initiating circuits. Use different colors for visible alarm-indicating devices. Paint fire-alarm system junction boxes and covers red.

3.5 CONNECTIONS

A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A-486B.

B. Make splices, terminations, and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.

C. Wiring at Outlets: Install conductor at each outlet, with at least 6 inch of slack.

D. Comply with requirements in Section 28 4621.11 "Addressable Fire-Alarm Systems" for connecting, terminating, and identifying wires and cables.

3.6 IDENTIFICATION

A. Identify and color-code conductors and cables according to Section 26 0553 "Identification for Electrical Systems."

B. Identify each spare conductor at each end with identity number and location of other end of conductor, and identify as spare conductor.

3.7 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Section 26 0544 "Sleeves and Sleeve Seals for Electrical Raceways and Cabling."

3.8 FIRESTOPPING

A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly according to Section 07 8413 "Penetration Firestopping."

END OF SECTION

SECTION 26 0526

GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes grounding and bonding systems and equipment.

B. Section includes grounding and bonding systems and equipment, plus the following special applications:

1. Underground distribution grounding.
2. Ground bonding common with lightning protection system.
3. Foundation steel electrodes.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with UL 467 for grounding and bonding materials and equipment.

2.2 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Burndy; Part of Hubbell Electrical Systems.
2. Dossert; AFL Telecommunications LLC.
3. ERICO International Corporation.
4. Fushi Copperweld Inc.
5. Galvan Industries Inc.; Electrical Products Division, LLC.
6. Harger Lighting and Grounding.
7. ILSCO.
8. O-Z/Gedney; A Brand of the EGS Electrical Group.
9. Robbins Lighting, Inc.
10. Siemens Power Transmission & Distribution, Inc..

2.3 CONDUCTORS

A. Insulated Conductors: Copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.

B. Bare Copper Conductors:

1. Solid Conductors: ASTM B3.
2. Stranded Conductors: ASTM B8.
3. Bonding Cable: 28 kcmil, 14 strands of No. 17 AWG conductor, 1/4 inch in diameter.
4. Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.
5. Bonding Jumper: Copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.

C. Grounding Bus: Predrilled rectangular bars of annealed copper, 1/4 by 4 inches in cross section, with 9/32-inch holes spaced 1-1/8 inches apart. Stand-off insulators for mounting shall comply with UL 891 for use in switchboards, 600 V and shall be Lexan or PVC, impulse tested at 5000 V.

2.4 CONNECTORS

A. Listed and labeled by an NRTL acceptable to authorities having jurisdiction for applications in which used and for specific types, sizes, and combinations of conductors and other items connected.

B. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.

C. Bus-Bar Connectors: Compression type, copper or copper alloy, with two wire terminals.

D. Beam Clamps: Mechanical type, terminal, ground wire access from four directions, with dual, tin-plated or silicon bronze bolts.

E. Cable-to-Cable Connectors: Compression type, copper or copper alloy.

F. Cable Tray Ground Clamp: Mechanical type, zinc-plated malleable iron.

G. Conduit Hubs: Mechanical type, terminal with threaded hub.

H. Ground Rod Clamps: Mechanical type, copper or copper alloy, terminal with hex head bolt.

I. Signal Reference Grid Clamp: Mechanical type, stamped-steel terminal with hex head screw.

J. Straps: Solid copper, copper lugs. Rated for 600 A.

K. U-Bolt Clamps: Mechanical type, copper or copper alloy, terminal listed for direct burial.

L. Water Pipe Clamps:

1. Mechanical type, two pieces with zinc-plated bolts.

a. Material: Die-cast zinc alloy.
b. Listed for direct burial.

2. U-bolt type with malleable-iron clamp and copper ground connector.

2.5 GROUNDING ELECTRODES

A. Ground Rods: Copper-clad steel; 3/4 inch by 10 feet.

B. Ground Plates: 1/4 inch thick, hot-dip galvanized.

PART 3 - EXECUTION

3.1 APPLICATIONS

A. Conductors: Install solid conductor for No. 8 AWG and smaller, and stranded conductors for No. 6 AWG and larger unless otherwise indicated.

B. Underground Grounding Conductors: Install barecopper conductor, No. 2/0 AWG minimum.

1. Bury at least 30 inches below grade.

C. Grounding Bus: Install in electrical equipment rooms, in rooms housing service equipment, and elsewhere as indicated.

1. Install bus horizontally, on insulated spacers 2 inches minimum from wall, 6 inches above finished floor unless otherwise indicated.
2. Where indicated on both sides of doorways, route bus up to top of door frame, across top of doorway, and down; connect to horizontal bus.

D. Conductor Terminations and Connections:

1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
2. Underground Connections: Welded connectors except at test wells and as otherwise indicated.
3. Connections to Ground Rods at Test Wells: Bolted connectors.
4. Connections to Structural Steel: Welded connectors.

3.2 GROUNDING AT THE SERVICE

A. Equipment grounding conductors and grounding electrode conductors shall be connected to the ground bus. Install a main bonding jumper between the neutral and ground buses.

3.3 GROUNDING UNDERGROUND DISTRIBUTION SYSTEM COMPONENTS

A. Comply with IEEE C2 grounding requirements.

B. Grounding Manholes and Handholes: Install a driven ground rod through manhole or handhole floor, close to wall, and set rod depth so 4 inches will extend above finished floor. If necessary, install ground rod before manhole is placed and provide No. 1/0 AWG bare, tinned-copper conductor from ground rod into manhole through a waterproof sleeve in manhole wall. Protect ground rods passing through concrete

floor with a double wrapping of pressure-sensitive insulating tape or heat-shrunk insulating sleeve from 2 inches above to 6 inches below concrete. Seal floor opening with waterproof, nonshrink grout.

C. Grounding Connections to Manhole Components: Bond exposed-metal parts such as inserts, cable racks, pulling irons, ladders, and cable shields within each manhole or handhole, to ground rod or grounding conductor. Make connections with No. 4 AWG minimum, stranded, hard-drawn copper bonding conductor. Train conductors level or plumb around corners and fasten to manhole walls. Connect to cable armor and cable shields according to written instructions by manufacturer of splicing and termination kits.

D. Pad-Mounted Transformers and Switches: Install two ground rods and ground ring around the pad. Ground pad-mounted equipment and noncurrent-carrying metal items associated with substations by connecting them to underground cable and grounding electrodes. Install tinned-copper conductor not less than No. 2 AWG for ground ring and for taps to equipment grounding terminals. Bury ground ring not less than 6 inches from the foundation.

3.4 EQUIPMENT GROUNDING

A. Install insulated equipment grounding conductors with the following items, in addition to those required by NFPA 70:

1. Feeders and branch circuits.
2. Lighting circuits.
3. Receptacle circuits.
4. Single-phase motor and appliance branch circuits.
5. Three-phase motor and appliance branch circuits.
6. Flexible raceway runs.
7. Armored and metal-clad cable runs.

B. Air-Duct Equipment Circuits: Install insulated equipment grounding conductor to duct-mounted electrical devices operating at 120 V and more, including air cleaners, heaters, dampers, humidifiers, and other duct electrical equipment. Bond conductor to each unit and to air duct and connected metallic piping.

C. Water Heater, Heat-Tracing, and Antifrost Heating Cables: Install a separate insulated equipment grounding conductor to each electric water heater and heat-tracing cable. Bond conductor to heater units, piping, connected equipment, and components.

3.5 INSTALLATION

A. Grounding Conductors: Route along shortest and straightest paths possible unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.

B. Ground Rods: Drive rods until tops are 2 inches below finished floor or final grade unless otherwise indicated.

1. Interconnect ground rods with grounding electrode conductor below grade and as otherwise indicated. Make connections without exposing steel or damaging coating if any.

C. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance except where routed through short lengths of conduit.

1. Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate any adjacent parts.
2. Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install bonding so vibration is not transmitted to rigidly mounted equipment.
3. Use exothermic-welded connectors for outdoor locations; if a disconnect-type connection is required, use a bolted clamp.

D. Grounding and Bonding for Piping:

1. Metal Water Service Pipe: Install insulated copper grounding conductors, in conduit, from building's main service equipment, or grounding bus, to main metal water service entrances to building. Connect grounding conductors to main metal water service pipes; use a bolted clamp connector or bolt a lug-type connector to a pipe flange by using one of the lug bolts of the flange. Where a dielectric main water fitting is installed, connect grounding conductor on street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.
2. Water Meter Piping: Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with a bolted connector.
3. Bond each aboveground portion of gas piping system downstream from equipment shutoff valve.

3.6 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Tests and Inspections:

1. After installing grounding system but before permanent electrical circuits have been energized, test for compliance with requirements.
2. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with a calibrated torque wrench according to manufacturer's written instructions.
3. Test completed grounding system at each location where a maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal, and at individual ground rods. Make tests at ground rods before any conductors are connected.

    a. Measure ground resistance no fewer than two full days after last trace of precipitation and without soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance.
    b. Perform tests by fall-of-potential method according to IEEE 81.

4. Prepare dimensioned Drawings locating each test well, ground rod and ground-rod assembly, and other grounding electrodes. Identify each by letter in alphabetical order, and key to the record of tests and observations. Include the number of rods driven and their depth at each location, and include observations of weather and other phenomena that may affect test results. Describe measures taken to improve test results.

C. Grounding system will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

E. Report measured ground resistances that exceed the following values:

1. Power and Lighting Equipment or System with Capacity of 500 kVA and Less: 10 ohms.
2. Power and Lighting Equipment or System with Capacity of 500 to 1000 kVA: 5 ohms.

3. Power and Lighting Equipment or System with Capacity More Than 1000 kVA: 3 ohms.
4. Substations and Pad-Mounted Equipment: 5 ohms.

F. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Architect promptly and include recommendations to reduce ground resistance.

END OF SECTION

SECTION 26 0529

HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Steel slotted support systems.
2. Conduit and cable support devices.
3. Support for conductors in vertical conduit.
4. Structural steel for fabricated supports and restraints.
5. Mounting, anchoring, and attachment components, including powder-actuated fasteners, mechanical expansion anchors, concrete inserts, clamps, through bolts, toggle bolts, and hanger rods.
6. Fabricated metal equipment support assemblies.

PART 2 - PRODUCTS

2.1 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

A. Steel Slotted Support Systems: Preformed steel channels and angles with minimum 13/32-inch-diameter holes at a maximum of 8 inches o.c. in at least one surface.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. ABB, Electrification Business.
b. Allied Tube & Conduit; Atkore International.
c. Cooper B-line; brand of Eaton, Electrical Sector.
d. Unistrut; Atkore International.
e. Wesanco, Inc.

2. Standard: Comply with MFMA-4 factory-fabricated components for field assembly.
3. Material for Channel, Fittings, and Accessories: Galvanized steel.
4. Channel Width: Selected for applicable load criteria.
5. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.

B. Conduit and Cable Support Devices: Steel and malleable-iron hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.

C. Support for Conductors in Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug or plugs for nonarmored electrical conductors or cables in riser conduits. Plugs shall have number, size, and shape of conductor gripping pieces as required to suit individual conductors or cables supported. Body shall be made of malleable iron.

D. Structural Steel for Fabricated Supports and Restraints: ASTM A 36/A 36M steel plates, shapes, and bars; black and galvanized.

E. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:

1. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete, steel, or wood, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.

a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1) Hilti, Inc.
2) ITW Ramset/Red Head; Illinois Tool Works, Inc.
3) MKT Fastening, LLC.
4) Simpson Strong-Tie Co., Inc.

2. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated steel, for use in hardened portland cement concrete, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.

a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1) Cooper B-line; brand of Eaton, Electrical Sector.
2) Empire Industries, Inc.
3) Hilti, Inc.
4) ITW Ramset/Red Head; Illinois Tool Works, Inc.
5) MKT Fastening, LLC.

3. Concrete Inserts: Steel or malleable-iron, slotted support system units are similar to MSS Type 18 units and comply with MFMA-4 or MSS SP-58.
4. Clamps for Attachment to Steel Structural Elements: MSS SP-58 units are suitable for attached structural element.
5. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM F 3125/F 3125M, Grade A325.
6. Toggle Bolts: All-steel springhead type.
7. Hanger Rods: Threaded steel.

PART 3 - EXECUTION

3.1 APPLICATION

A. Comply with the following standards for application and installation requirements of hangers and supports, except where requirements on Drawings or in this Section are stricter:

1. NECA 1.
2. NECA 101
3. NECA 102.

B. Comply with requirements in Section 07 8413 "Penetration Firestopping" for firestopping materials and installation for penetrations through fire-rated walls, ceilings, and assemblies.

C. Comply with requirements for raceways and boxes specified in Section 26 0533 "Raceways and Boxes for Electrical Systems."

D. Maximum Support Spacing and Minimum Hanger Rod Size for Raceways: Space supports for EMT, IMC, and RMC as NFPA 70. Minimum rod size shall be 1/4 inch in diameter.

E. Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slotted support system, sized so capacity can be increased by at least 25 percent in future without exceeding specified design load limits.

1. Secure raceways and cables to these supports with two-bolt conduit clamps.

3.2 SUPPORT INSTALLATION

A. Comply with NECA 1 and NECA 101 for installation requirements except as specified in this article.

B. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb .

C. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code:

1. To Wood: Fasten with lag screws or through bolts.
2. To New Concrete: Bolt to concrete inserts.
3. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
4. To Existing Concrete: Expansion anchor fasteners.
5. Instead of expansion anchors, powder-actuated driven threaded studs provided with lock washers and nuts may be used in existing standard-weight concrete 4 inches thick or greater. Do not use for anchorage to lightweight-aggregate concrete or for slabs less than 4 inches thick.
6. To Steel: Welded threaded studs complying with AWS D1.1/D1.1M, with lock washers and nuts.
7. To Light Steel: Sheet metal screws.
8. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices on slotted-channel racks attached to substrate.

D. Drill holes for expansion anchors in concrete at locations and to depths that avoid the need for reinforcing bars.

END OF SECTION

SECTION 26 0533

RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Type EMT-S raceways and elbows.
2. Type ERMC-S raceways, elbows, couplings, and nipples.
3. Type FMC-S and Type FMC-A raceways.
4. Type IMC raceways.
5. Type LFMC raceways.
6. Type PVC raceways and fittings.
7. Fittings for conduit, tubing, and cable.
8. Threaded metal joint compound.
9. Solvent cements.
10. Surface metal raceways and fittings.
11. Metallic outlet boxes, device boxes, and covers.
12. Junction boxes, and pull boxes.
13. Cover plates for device boxes.
14. Hoods for outlet boxes.

1.2 ACTION SUBMITTALS

A. Product Data: For the following:

1. Wireways and auxiliary gutters.
2. Surface metal raceways.
3. Floor boxes.
4. Cabinets and cutout boxes.

PART 2 - PRODUCTS

2.1 TYPE EMT-S RACEWAYS AND ELBOWS

A. Steel Electrical Metal Tubing (EMT-S) and Elbows:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. AFC Cable Systems, Inc..
   b. Allied Tube & Conduit.
   c. Anamet Electrical, Inc..
   d. Electric-Flex Company.
   e. O-Z/Gedney.

f. Southwire Company.
g. Thomas & Betts Corporation.
h. Wheatland Tube Company.

2. Applicable Standards:

a. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
b. General Characteristics:

1) Reference Standards: UL 797 and UL Category Control Number FJMX.
2) Material: Steel.
3) Exterior Coating: Zinc.
4) Interior Coating: Zinc with organic top coating.

c. Options:

1) Minimum Trade Size: 1/2 inch.
2) Colors: As indicated on Drawings.

2.2 TYPE ERMC-S RACEWAYS, ELBOWS, COUPLINGS, AND NIPPLES

A. Galvanized-Steel Electrical Rigid Metal Conduit (ERMC-S-G), Elbows, Couplings, and Nipples:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
a. AFC Cable Systems, Inc..
b. Allied Tube & Conduit.
c. Anamet Electrical, Inc..
d. Electric-Flex Company.
e. O-Z/Gedney.
f. Southwire Company.
g. Thomas & Betts Corporation.
h. Wheatland Tube Company.

2. Applicable Standards:

a. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
b. General Characteristics:

1) Reference Standards: UL 6 and UL Category Control Number DYIX.
2) Exterior Coating: Zinc.
3) Interior Coating: Zinc with organic top coating.

c. Options:

1) Minimum Trade Size: 1/2 inch.
2) Colors: As indicated on Drawings.

2.3 TYPE FMC-S AND TYPE FMC-A RACEWAYS

A. Steel Flexible Metal Conduit (FMC-S):

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. AFC Cable Systems, Inc..
   b. Allied Tube & Conduit.
   c. Anamet Electrical, Inc..
   d. Electric-Flex Company.
   e. O-Z/Gedney.
   f. Southwire Company.
   g. Thomas & Betts Corporation.
   h. Wheatland Tube Company.

2. Applicable Standards:

   a. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
   b. General Characteristics:

      1) Reference Standard: UL 1 and UL Category Control Number DXUZ.
      2) Material: Steel.

   c. Options:

      1) Minimum Trade Size: 1/2 inch.
      2) Colors: As indicated on Drawings.

2.4 TYPE IMC RACEWAYS

A. Steel Electrical Intermediate Metal Conduit (IMC):

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. AFC Cable Systems, Inc..
   b. Allied Tube & Conduit.
   c. Anamet Electrical, Inc..
   d. Electric-Flex Company.
   e. O-Z/Gedney.
   f. Southwire Company.
   g. Thomas & Betts Corporation.
   h. Wheatland Tube Company.

2. Applicable Standards:

   a. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
   b. General Characteristics:

      1) Reference Standard: UL 1242 and UL Category Control Number DYBY.
      2) Exterior Coating: Zinc.

3) Interior Coating: Zinc with organic top coating.

c. Options:

1) Minimum Trade Size: 1/2 inch.
2) Colors: As indicated on Drawings.

2.5 TYPE LFMC RACEWAYS

A. Steel Liquidtight Flexible Metal Conduit (LFMC-S):

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. AFC Cable Systems, Inc..
   b. Allied Tube & Conduit.
   c. Anamet Electrical, Inc..
   d. Electric-Flex Company.
   e. O-Z/Gedney.
   f. Southwire Company.
   g. Thomas & Betts Corporation.
   h. Wheatland Tube Company.
2. Applicable Standards:

   a. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
   b. General Characteristics:

      1) Reference Standard: UL 360 and UL Category Control Number DXHR.
      2) Material: Steel.

   c. Options:

      1) Minimum Trade Size: 1/2 inch.

3. Colors: As indicated on Drawings.

2.6 TYPE PVC RACEWAYS AND FITTINGS

A. Schedule 40 Rigid PVC Conduit (PVC-40) and Fittings:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. AFC Cable Systems, Inc..
   b. Allied Tube & Conduit.
   c. Anamet Electrical, Inc..
   d. Electric-Flex Company.
   e. O-Z/Gedney.
   f. Southwire Company.
   g. Thomas & Betts Corporation.
   h. Wheatland Tube Company.
2. Applicable Standards:

a. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
b. General Characteristics:

1) Reference Standards: UL 651 and UL Category Control Number DZYR.
2) Dimensional Specifications: Schedule 40.

c. Options:

1) Minimum Trade Size: 1/2 inch.

B. Schedule 80 Rigid PVC Conduit (PVC-80) and Fittings:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
a. AFC Cable Systems, Inc..
b. Allied Tube & Conduit.
c. Anamet Electrical, Inc..
d. Electric-Flex Company.
e. O-Z/Gedney.
f. Southwire Company.
g. Thomas & Betts Corporation.
h. Wheatland Tube Company.
2. Applicable Standards:

a. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
b. General Characteristics:

1) Reference Standards: UL 651 and UL Category Control Number DZYR.
2) Dimensional Specifications: Schedule 80.

c. Options:

1) Minimum Trade Size: 1/2 inch.

2.7 FITTINGS FOR CONDUIT, TUBING, AND CABLE

A. Fittings for Type ERMC, Type IMC, and Type PVC Raceways:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
a. AFC Cable Systems, Inc..
b. Allied Tube & Conduit.
c. Anamet Electrical, Inc..
d. Electric-Flex Company.
e. O-Z/Gedney.
f. Southwire Company.
g. Thomas & Betts Corporation.
h. Wheatland Tube Company.
2. Applicable Standards:

a. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
b. General Characteristics:

1) Reference Standards: UL 514B and UL Category Control Number DWTT.
2) Material: Steel.
3) Coupling Method: Compression coupling or Raintight compression coupling with distinctive color gland nut.

c. Options:

1) Conduit Fittings for Hazardous (Classified) Locations: UL 1203.
2) Expansion and Deflection Fittings: UL 651 with flexible external bonding jumper.

B. Fittings for Type EMT Raceways:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
a. AFC Cable Systems, Inc..
b. Allied Tube & Conduit.
c. Anamet Electrical, Inc..
d. Electric-Flex Company.
e. O-Z/Gedney.
f. Southwire Company.
g. Thomas & Betts Corporation.
h. Wheatland Tube Company.
2. Applicable Standards:

a. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
b. General Characteristics:

1) Reference Standards: UL 514B and UL Category Control Number FKAV.
2) Material: Steel.
3) Coupling Method: Setscrew coupling. Setscrew couplings with only single screw per conduit are unacceptable.

c. Options:

1) Conduit Fittings for Hazardous (Classified) Locations: UL 1203.
2) Expansion and Deflection Fittings: UL 651 with flexible external bonding jumper.

C. Fittings for Type FMC Raceways:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
a. AFC Cable Systems, Inc..
b. Allied Tube & Conduit.
c. Anamet Electrical, Inc..
d. Electric-Flex Company.
e. O-Z/Gedney.
f. Southwire Company.
g. Thomas & Betts Corporation.

h. Wheatland Tube Company.

2. Applicable Standards:

a. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.

b. General Characteristics:

1) Reference Standards: UL 514B and UL Category Control Number ILNR.

D. Fittings for Type LFMC Raceways:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. AFC Cable Systems, Inc..
   b. Allied Tube & Conduit.
   c. Anamet Electrical, Inc..
   d. Electric-Flex Company.
   e. O-Z/Gedney.
   f. Southwire Company.
   g. Thomas & Betts Corporation.
   h. Wheatland Tube Company.
2. Applicable Standards:

a. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.

b. General Characteristics:

1) Reference Standards: UL 514B and UL Category Control Number DXAS.

2.8 SOLVENT CEMENTS

A. Solvent Cements for Type PVC Raceways and Fittings:
1. Applicable Standards:

a. General Characteristics:

1) Reference Standards: As recommended by conduit manufacturer in accordance with UL 514B and UL Category Control Number DWTT.

2.9 SURFACE METAL RACEWAYS AND FITTINGS

A. Surface Metal Raceways and Fittings with Metal Covers:

1. Manufacturers: Subject to compliance with requirements, provide products by:
   a. Legrand; Wiremold
2. Applicable Standards:

a. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.

b. General Characteristics:

1) Reference Standards: UL 5 and UL Category Control Number RJBT.

c. Options:

1) Galvanized steel base with snap-on covers.
2) Prime coated, ready for field painting.
3) Wiring Channels: [**Single**] [**Dual**] [**Triple**]. Multiple channels must be capable of housing a standard 20 to 30 A NEMA device flush within the raceway.

2.10 METALLIC OUTLET BOXES, DEVICE BOXES, AND COVERS

A. Metallic Outlet Boxes:

1. Description: Box having pryout openings, knockouts, threaded entries, or hubs in either the sides of the back, or both, for entrance of conduit, conduit or cable fittings, or cables, with provisions for mounting outlet box cover, but without provisions for mounting wiring device directly to box.
2. Applicable Standards:

a. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
b. General Characteristics:

1) Reference Standards: UL 514A and UL Category Control Number QCIT.

c. Options:

1) Material: Sheet steel.
2) Sheet Metal Depth: Minimum 1.5 inch.
3) Luminaire Outlet Boxes and Covers: Nonadjustable, listed and labeled for attachment of luminaire weighing up to 50 lb.

B. Metallic Conduit Bodies:

1. Description: Means for providing access to interior of conduit or tubing system through one or more removable covers at junction or terminal point. In the United States, conduit bodies are listed in accordance with outlet box requirements.
2. Applicable Standards:

a. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
b. General Characteristics:

1) Reference Standards: UL 514A and UL Category Control Number QCIT.

C. Metallic Device Boxes:

1. Description: Box with provisions for mounting wiring device directly to box.
2. Applicable Standards:

a. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.

b. General Characteristics:

1) Reference Standards: UL 514A and UL Category Control Number QCIT.

c. Options:

1) Material: Sheet steel.
2) Sheet Metal Depth: minimum 1.5 inch.
3) Luminaire Outlet Boxes and Covers: Nonadjustable, listed and labeled for attachment of luminaire weighing up to 50 lb.

D. Metallic Floor Boxes and Floor Box Covers:

1. Description: Box mounted in floor with floor box cover and other components to complete floor box enclosure.
2. Applicable Standards:

a. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
b. General Characteristics:

1) Reference Standards: UL 514A and UL Category Control Number QCIT.

E. Metallic Recessed Access-Floor Boxes and Recessed Floor Box Covers:

1. Description: Floor box with provisions for mounting wiring devices below floor surface and floor box cover with provisions for passage of cords to recessed wiring devices mounted within floor box.
2. Applicable Standards:

a. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
b. General Characteristics:

1) Reference Standards: UL 514A and UL Category Control Number QCIT.

F. Metallic Concrete Boxes and Covers:

1. Description: Box intended for use in poured concrete.
2. Applicable Standards:

a. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
b. General Characteristics:

1) Reference Standards: UL 514A and UL Category Control Number QCIT.

2.11 JUNCTION BOXES AND PULL BOXES

A. Indoor Sheet Metal Junction and Pull Boxes:

1. Description: Box with a blank cover that serves the purpose of joining different runs of raceway or cable.
2. Applicable Standards:

    a. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
    b. General Characteristics:

        1) Reference Standards: UL Category Control Number BGUZ.

            a) Non-Environmental Characteristics: UL 50.
            b) Environmental Characteristics: UL 50E.

    c. Options:

        1) Degree of Protection: Type 1.

B. Indoor Cast-Metal Junction and Pull Boxes:

1. Description: Box with a blank cover that serves the purpose of joining different runs of raceway or cable.
2. Applicable Standards:

    a. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
    b. General Characteristics:

        1) Reference Standards: UL Category Control Number BGUZ.

            a) Non-Environmental Characteristics: UL 50.
            b) Environmental Characteristics: UL 50E.

    c. Options:

        1) Degree of Protection: Type 1.

C. Indoor Polymeric Junction and Pull Boxes:

1. Description: Box with a blank cover that serves the purpose of joining different runs of raceway or cable.
2. Applicable Standards:

    a. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
    b. General Characteristics:

        1) Reference Standards: UL Category Control Number BGUZ.

            a) Non-Environmental Characteristics: UL 50.
            b) Environmental Characteristics: UL 50E.

    c. Options:

1) Degree of Protection: Type 1.

D. Outdoor Sheet Metal Junction and Pull Boxes:

1. Description: Box with a blank cover that serves the purpose of joining different runs of raceway or cable.
2. Applicable Standards:

a. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
b. General Characteristics:

1) Reference Standards: UL Category Control Number BGUZ.

a) Non-Environmental Characteristics: UL 50.
b) Environmental Characteristics: UL 50E.

c. Options:

1) Degree of Protection: Type 3R.

E. Outdoor Cast-Metal Junction and Pull Boxes:

1. Description: Box with a blank cover that serves the purpose of joining different runs of raceway or cable.
2. Applicable Standards:

a. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
b. General Characteristics:

1) Reference Standards: UL Category Control Number BGUZ.

a) Non-Environmental Characteristics: UL 50.
b) Environmental Characteristics: UL 50E.

c. Options:

1) Degree of Protection: Type 3R.

F. Outdoor Polymeric Junction and Pull Boxes:

1. Description: Box with a blank cover that serves the purpose of joining different runs of raceway or cable.
2. Applicable Standards:

a. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
b. General Characteristics:

1) Reference Standards: UL Category Control Number BGUZ.

a) Non-Environmental Characteristics: UL 50.
b) Environmental Characteristics: UL 50E.

c. Options:

1) Degree of Protection: Type 3R.

2.12 HOODS FOR OUTLET BOXES

A. Retractable or Reattachable Hoods for Outlet Boxes:

1. Applicable Standards:

a. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
b. General Characteristics:

1) Reference Standards: UL 514D and UL Category Control Numbers QCIT and QCMZ.
2) Receptacle, hood, cover plate, gaskets, and seals comply with UL 498 Supplement SA when mated with box or enclosure complying with UL 514A, UL 514C, or UL 50E.
3) Mounts to box using fasteners different from wiring device.

c. Options:

1) Provides clear, weatherproof, "while-in-use" cover.

B. Extra-Duty, While-in-Use Hoods for Outlet Boxes:

1. Applicable Standards:

a. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
b. General Characteristics:

1) Reference Standards: UL 514D and UL Category Control Numbers QCIT and QCMZ.
2) Marked "Extra-Duty" in accordance with UL 514D.
3) Receptacle, hood, cover plate, gaskets, and seals comply with UL 498 Supplement SA when mated with box or enclosure complying with UL 514A, UL 514C, or UL 50E.
4) Mounts to box using fasteners different from wiring device.

c. Options:

1) Provides clear, weatherproof, "while-in-use" cover.
2) Manufacturer may combine nonmetallic device box with hood as extra-duty rated assembly.

PART 3 - EXECUTION

3.1 SELECTION OF RACEWAYS

A. Unless more stringent requirements are specified in Contract Documents or manufacturers' written instructions, comply with NFPA 70 for selection of raceways. Consult Architect for resolution of conflicting requirements.

B. Outdoors:

1. Exposed Conduit: ERMC or IMC.
2. Concealed Conduit, Aboveground: ERMC or IMC.
3. Direct-Buried Conduit: PVC-40.
4. Concrete-Encased Conduit Not in Trench: PVC-40.
5. Concrete-Encased Conduit in Trench: PVC-40.
6. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.

C. Indoors:

1. Exposed and Subject to Physical Damage: ERMC. Raceway locations include the following:

    a. Loading docks.
    b. Corridors used for traffic of mechanized carts, forklifts, and pallet-handling units.
    c. Mechanical rooms.
    d. Gymnasiums.

2. Exposed, Not Subject to Physical Damage: IMC.
3. Concealed in Ceilings and Interior Walls and Partitions: EMT.
4. Damp or Wet Locations: ERMC or IMC.
5. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC.

D. Stub-ups to Above Recessed Ceilings: Provide EMT, IMC, or ERMC for raceways.

E. Raceway Fittings: Select fittings in accordance with NEMA FB 2.10 guidelines.

1. ERMC and IMC: Provide threaded type fittings unless otherwise indicated.

3.2 SELECTION OF BOXES AND ENCLOSURES

A. Unless more stringent requirements are specified in Contract Documents or manufacturers' written instructions, comply with NFPA 70 for selection of boxes and enclosures. Consult Architect for resolution of conflicting requirements.

B. Degree of Protection:

1. Outdoors:

    a. Type 3R unless otherwise indicated.
    b. Locations Exposed to Hosedown: Type 4.

c. Locations Subject to Potential Flooding: Type 6P.
d. Locations Aboveground Where Mechanism Must Operate When Ice Covered: Type 3S.
e. Locations in-Ground or Exposed to Corrosive Agents: Type 4X.
f. Locations in-Ground or Exposed to Corrosive Agents Where Mechanism Must Operate When Ice Covered: Type 3SX.

2. Indoors:

a. Type 1 unless otherwise indicated.
b. Damp or Dusty Locations: Type 12.
c. Surface Mounted in Kitchens and Other Locations Exposed to Oil or Coolants: Type 12.
d. Flush Mounted in Kitchens and Other Locations Exposed to Oil or Coolants: Type 12.
e. Locations Exposed to Airborne Dust, Lint, Fibers, or Flyings: Type 4.
f. Locations Exposed to Hosedown: Type 4.
g. Locations Exposed to Brief Submersion: Type 6P.
h. Locations Exposed to Prolonged Submersion: Type 6P.
i. Locations Exposed to Corrosive Agents: Type 4X.
j. Locations Exposed to Spraying Oil or Coolants: Type 13.

C. Exposed Boxes Installed Less Than 6.5 ft. Above Floor:

1. Boxes with knockouts or unprotected openings are prohibited.
2. Provide exposed cover. Flat covers with angled mounting slots or knockouts are prohibited.

3.3 INSTALLATION OF RACEWAYS

A. Installation Standards:

1. Unless more stringent requirements are specified in Contract Documents or manufacturers' written instructions, comply with NFPA 70 for installation of raceways. Consult Architect for resolution of conflicting requirements.
2. Comply with NFPA 70 limitations for types of raceways allowed in specific occupancies and number of floors.
3. Comply with requirements in Section 26 0529 "Hangers and Supports for Electrical Systems" for hangers and supports.
4. Comply with NECA NEIS 101 for installation of steel raceways.
5. Comply with NECA NEIS 111 for installation of nonmetallic raceways.
6. Install raceways square to the enclosure and terminate at enclosures without hubs with locknuts on both sides of enclosure wall. Install locknuts hand tight, plus one-quarter turn more.
7. Terminate threaded conduits into threaded hubs or with locknuts on inside and outside of boxes or cabinets. Install bushings on conduits up to 1-1/4 inch trade size and insulated throat metal bushings on 1-1/2 inch trade size and larger conduits terminated with locknuts.
8. Raceway Terminations at Locations Subject to Moisture or Vibration:

a. Provide insulating bushings to protect conductors, including conductors smaller than No. 4 AWG.

B. General Requirements for Installation of Raceways:

1. Complete raceway installation before starting conductor installation.

2. Provide stub-ups through floors with coupling threaded inside for plugs, set flush with finished floor. Plug coupling until conduit is extended above floor to final destination or a minimum of 2 ft. above finished floor.
3. Make bends in raceway using large-radius preformed ells except for parallel bends. Field bending must be in accordance with NFPA 70 minimum radii requirements. Provide only equipment specifically designed for material and size involved.
4. Conceal conduit within finished walls, ceilings, and floors unless otherwise indicated. Install conduits parallel or perpendicular to building lines.
5. Support conduit within 12 inch of enclosures to which attached.
6. Install raceway sealing fittings at accessible locations in accordance with NFPA 70 and fill them with listed sealing compound. For concealed raceways, install fitting in flush steel box with blank cover plate having finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings in accordance with NFPA 70.
7. Install devices to seal raceway interiors at accessible locations. Locate seals so no fittings or boxes are between the seal and the following changes of environments. Seal interior of raceways at the following points:

    a. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
    b. Where an underground service raceway enters a building or structure.
    c. Conduit extending from interior to exterior of building.
    d. Conduit extending into pressurized duct and equipment.
    e. Conduit extending into pressurized zones that are automatically controlled to maintain different pressure set points.
    f. Where otherwise required by NFPA 70.

8. Do not install raceways or electrical items on "explosion-relief" walls or rotating equipment.
9. Do not install conduits within 2 inch of the bottom side of a metal deck roof.
10. Keep raceways at least 6 inch away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.
11. Cut conduit perpendicular to the length. For conduits 2 inch trade size and larger, use roll cutter or a guide to make cut straight and perpendicular to the length. Ream inside of conduit to remove burrs.
12. Install pull wires in empty raceways. Provide polypropylene or monofilament plastic line with not less than 200 lb tensile strength. Leave at least 12 inch of slack at both ends of pull wire. Cap underground raceways designated as spare above grade alongside raceways in use.

C. Requirements for Installation of Specific Raceway Types:

1. Types ERMC and IMC:

    a. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound that maintains electrical conductivity to threads of raceway and fittings before making up joints. Follow compound manufacturer's written instructions.

2. Types FMC and LFMC:

    a. Comply with NEMA RV 3. Provide a maximum of 36 inch of flexible conduit for recessed and semirecessed luminaires, equipment subject to vibration, noise transmission, or movement; and for transformers and motors.

3. Type PVC:

a. Do not install Type PVC conduit where ambient temperature exceeds 122 deg F. Conductor ratings must be limited to 75 deg C except where installed in a trench outside buildings with concrete encasement, where 90 deg C conductors are permitted.
b. Comply with manufacturer's written instructions for solvent welding and fittings.

D. Raceways Embedded in Slabs:

1. Run raceways larger than 1 inch trade size below concrete slab..
2. Arrange raceways to cross building expansion joints with expansion fittings at right angles to the joint.
3. Arrange raceways to ensure that each is surrounded by a minimum of 2 inch of concrete without voids.
4. Do not embed threadless fittings in concrete unless locations have been specifically approved by Architect.

E. Stub-ups to Above Recessed Ceilings:

1. Provide EMT, IMC, or ERMC for raceways.
2. Provide a conduit bushing or insulated fitting to terminate stub-ups not terminated in hubs or in an enclosure.

F. Raceway Fittings: Install fittings in accordance with NEMA FB 2.10 guidelines.

1. ERMC-S-PVC: Provide only fittings listed for use with this type of conduit. Patch and seal joints, nicks, and scrapes in PVC coating after installing conduits and fittings. Provide sealant recommended by fitting manufacturer and apply in thickness and number of coats recommended by manufacturer.
2. EMT: Provide setscrew, steel fittings. Comply with NEMA FB 2.10.
3. Flexible Conduit: Provide only fittings listed for use with flexible conduit type. Comply with NEMA FB 2.20.

G. Expansion-Joint Fittings:

1. Install in runs of aboveground PVC that are located where environmental temperature change may exceed 30 deg F and that have straight-run length that exceeds 25 ft.. Install in runs of aboveground ERMC and EMT conduit that are located where environmental temperature change may exceed 100 deg F and that have straight-run length that exceeds 100 ft..
2. Install type and quantity of fittings that accommodate temperature change listed for the following locations:

a. Outdoor Locations Not Exposed to Direct Sunlight: 125 deg F temperature change.
b. Outdoor Locations Exposed to Direct Sunlight: 155 deg F temperature change.
c. Indoor Spaces Connected with Outdoors without Physical Separation: 125 deg F temperature change.

3. Install fitting(s) that provide expansion and contraction for at least 0.00041 inch per foot of length of straight run per deg F of temperature change for PVC conduits. Install fitting(s) that provide expansion and contraction for at least 0.000078 inch per foot of length of straight run per deg F of temperature change for metal conduits.
4. Install expansion fittings at locations where conduits cross building or structure expansion joints.
5. Install expansion-joint fitting with position, mounting, and piston setting selected in accordance with manufacturer's written instructions for conditions at specific location at time of installation. Install conduit supports to allow for expansion movement.

H. Raceways Penetrating Rooms or Walls with Acoustical Requirements:

1. Seal raceway openings on both sides of rooms or walls with acoustically rated putty.

3.4 INSTALLATION OF SURFACE RACEWAYS

A. Install surface raceways only where indicated on Drawings.

B. Install surface raceway with a minimum 2 inch radius control at bend points.

C. Secure surface raceway with screws or other anchor-type devices at intervals not exceeding 48 inch mm) and with no less than two supports per straight raceway section. Support surface raceway in accordance with manufacturer's written instructions. Tape and glue are unacceptable support methods.

3.5 INSTALLATION OF BOXES AND ENCLOSURES

A. Provide boxes in wiring and raceway systems wherever required for pulling of wires, making connections, and mounting of devices or fixtures.

B. Mount boxes at heights indicated on Drawings. If mounting heights of boxes are not individually indicated, give priority to ADA requirements.

C. Recessed Boxes in Masonry Walls: Saw-cut opening for box in center of cell of masonry block, and install box flush with surface of wall. Prepare block surfaces to provide a flat surface for a raintight connection between box and cover plate or supported equipment and box, whether installed indoors or outdoors.

D. Horizontally separate boxes mounted on opposite sides of walls so they are not in the same vertical channel.

E. Locate boxes so that cover or plate will not span different building finishes.

F. Support boxes in recessed ceilings independent of ceiling tiles and ceiling grid.

G. Support boxes of three gangs or more from more than one side by spanning two framing members or mounting on brackets specifically designed for purpose.

H. Fasten junction and pull boxes to, or support from, building structure. Do not support boxes by conduits.

I. Set metal floor boxes level and flush with finished floor surface.

J. Set nonmetallic floor boxes level. Trim after installation to fit flush with finished floor surface.

K. Do not install aluminum boxes, enclosures, or fittings in contact with concrete or earth.

L. Do not rely on locknuts to penetrate nonconductive coatings on enclosures. Remove coatings in the locknut area prior to assembling conduit to enclosure to ensure a continuous ground path.

M. Boxes and Enclosures in Areas or Walls with Acoustical Requirements:

1. Seal openings and knockouts in back and sides of boxes and enclosures with acoustically rated putty.
2. Provide gaskets for wallplates and covers.

3.6 FIRESTOPPING

A. Install firestopping at penetrations of fire-rated floor and wall assemblies. Comply with requirements in Section 07 8413 "Penetration Firestopping."

3.7 PROTECTION

A. Protect coatings, finishes, and cabinets from damage and deterioration.

1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
2. Repair damage to PVC coatings or paint finishes with matching touchup coating recommended by manufacturer.

3.8 CLEANING

A. Boxes: Remove construction dust and debris from device boxes, outlet boxes, and floor-mounted enclosures before installing wallplates, covers, and hoods.

END OF SECTION

SECTION 26 0543

UNDERGROUND DUCTS AND RACEWAYS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Direct-buried conduit, ducts, and duct accessories.
2. Concrete-encased conduit, ducts, and duct accessories.
3. Handholes and boxes.
4. Manholes.

1.2 DEFINITIONS

A. Trafficways: Locations where vehicular or pedestrian traffic is a normal course of events.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include duct-bank materials, including separators and miscellaneous components.
2. Include ducts and conduits and their accessories, including elbows, end bells, bends, fittings, and solvent cement.
3. Include accessories for manholes, handholes, boxes.
4. Include warning tape.
5. Include warning planks.

B. Shop Drawings:

1. Precast or Factory-Fabricated Underground Utility Structures:

a. Include plans, elevations, sections, details, attachments to other work, and accessories.
b. Include duct entry provisions, including locations and duct sizes.
c. Include reinforcement details.
d. Include frame and cover design and manhole frame support rings.
e. Include [Ladder] [Step] details.
f. Include grounding details.
g. Include dimensioned locations of cable rack inserts, pulling-in and lifting irons, and sumps.
h. Include joint details.

2. Factory-Fabricated Handholes and Boxes Other Than Precast Concrete:

a. Include dimensioned plans, sections, and elevations, and fabrication and installation details.
b. Include duct entry provisions, including locations and duct sizes.

c. Include cover design.
d. Include grounding details.
e. Include dimensioned locations of cable rack inserts, and pulling-in and lifting irons.

1.4 MAINTENANCE MATERIALS SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1.5 FIELD CONDITIONS

A. Interruption of Existing Electrical Service: Do not interrupt electrical service to facilities occupied by Owner or others unless permitted under the following conditions, and then only after arranging to provide temporary electrical service according to requirements indicated:

1. Notify Construction Manager no fewer than two days in advance of proposed interruption of electrical service.
2. Do not proceed with interruption of electrical service without Construction Manager's written permission.

B. Ground Water: Assume ground-water level is at grade level unless a lower water table is noted on Drawings.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR DUCTS AND RACEWAYS

A. Comply with ANSI C2.

2.2 CONDUIT

A. Rigid Steel Conduit: Galvanized. Comply with ANSI C80.1.

B. RNC: NEMA TC 2, Type EPC-40-PVC, UL 651, with matching fittings by same manufacturer as the conduit, complying with NEMA TC 3 and UL 514B.

2.3 NONMETALLIC DUCTS AND DUCT ACCESSORIES

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. ARNCO Corp.
2. Beck Manufacturing.
3. Cantex, Inc.
4. CertainTeed Corporation.
5. Condux International, Inc.

6. ElecSys, Inc.
7. Electri-Flex Company.
8. IPEX Inc.
9. Lamson & Sessions; Carlon Electrical Products.
10. Spiraduct/AFC Cable Systems, Inc.
11. <Insert manufacturer's name>.

B. Underground Plastic Utilities Duct: NEMA TC 2, UL 651, ASTM F 512, Type EPC-80 and Type EPC-40, with matching fittings complying with NEMA TC 3 by same manufacturer as the duct.

C. Duct Accessories:

1. Duct Separators: Factory-fabricated rigid PVC interlocking spacers, sized for type and size of ducts with which used, and selected to provide minimum duct spacing indicated while supporting ducts during concreting or backfilling.
2. Warning Tape: Underground-line warning tape specified in Section 26 0553 "Identification for Electrical Systems."
3. Concrete Warning Planks: Nominal 12 by 24 by 3 inches in size, manufactured from 6000-psi concrete.

    a. Color: Red dye added to concrete during batching.
    b. Mark each plank with "ELECTRIC" in 2-inch- high, 3/8-inch- deep letters.

2.4 HANDHOLES AND BOXES OTHER THAN PRECAST CONCRETE

A. General Requirements for Handholes and Boxes: Comply with SCTE 77. Comply with tier requirements in "Underground Enclosure Application" Article.

1. Color: Green.
2. Configuration: Units shall be designed for flush burial and have closed bottom unless otherwise indicated.
3. Cover: Weatherproof, secured by tamper-resistant locking devices and having structural load rating consistent with enclosure.
4. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.
5. Cover Legend: Molded lettering, "ELECTRIC."
6. Direct-Buried Wiring Entrance Provisions: Knockouts equipped with insulated bushings or end-bell fittings, selected to suit box material, sized for wiring indicated, and arranged for secure, fixed installation in enclosure wall.
7. Duct Entrance Provisions: Duct-terminating fittings shall mate with entering ducts for secure, fixed installation in enclosure wall.
8. Handholes 12 inches wide by 24 inches long and larger shall have factory-installed inserts for cable racks and pulling-in irons.

B. Polymer Concrete Handholes and Boxes with Polymer Concrete Cover: Molded of sand and aggregate, bound together with a polymer resin, and reinforced with steel or fiberglass or a combination of the two.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Armorcast Products Company.
    b. Carson Industries LLC.
    c. NewBasis.

d. Quazite: Hubbell Power System, Inc.

2.5 UTILITY STRUCTURE ACCESSORIES

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Bilco Company (The).
2. Campbell Foundry Company.
3. Christy Concrete Products.
4. East Jordan Iron Works, Inc.
5. Elmhurst-Chicago Stone Co.
6. McKinley Iron Works, Inc.
7. Neenah Foundry Company.
8. NewBasis.
9. Oldcastle Precast Group.
10. Osburn Associates, Inc.
11. Pennsylvania Insert Corporation.
12. Quazite:Hubbell Power Systems, Inc.
13. Rinker Group, Ltd.
14. Riverton Concrete Products.
15. Underground Devices, Inc.
16. Utility Concrete Products, LLC.
17. Utility Vault Co.
18. Wausau Tile Inc.

B. Pulling Eyes in Concrete Walls: Eyebolt with reinforcing-bar fastening insert, 2-inch- diameter eye, and 1-by-4-inch bolt.

1. Working Load Embedded in 6-Inch, 4000-psi Concrete: 13,000-lbf minimum tension.

C. Pulling Eyes in Nonconcrete Walls: Eyebolt with reinforced fastening, 1-1/4-inch- diameter eye, rated 2500-lbf minimum tension.

D. Expansion Anchors for Installation after Concrete Is Cast: Zinc-plated, carbon-steel-wedge type with stainless-steel expander clip with 1/2-inch bolt, 5300-lbf rated pullout strength, and minimum 6800-lbf rated shear strength.

E. Duct-Sealing Compound: Nonhardening, safe for contact with human skin, not deleterious to cable insulation, and workable at temperatures as low as 35 deg F. Capable of withstanding temperature of 300 deg F without slump and adhering to clean surfaces of plastic ducts, metallic conduits, conduit coatings, concrete, masonry, lead, cable sheaths, cable jackets, insulation materials, and common metals.

F. Cover Hooks: Heavy duty, designed for lifts 60 lbf and greater. Two required.

2.6 SOURCE QUALITY CONTROL

A. Test and inspect precast concrete utility structures according to ASTM C 1037.

B. Nonconcrete Handhole and Pull-Box Prototype Test: Test prototypes of manholes and boxes for compliance with SCTE 77. Strength tests shall be for specified tier ratings of products supplied.

1. Tests of materials shall be performed by an independent testing agency.
2. Testing machine pressure gages shall have current calibration certification, complying with ISO 9000 and ISO 10012, and traceable to NIST standards.

PART 3 - EXECUTION

3.1 PREPARATION

A. Coordinate layout and installation of ducts, handholes, and boxes with final arrangement of other utilities, site grading, and surface features as determined in the field. Notify Construction Manager if there is a conflict between areas of excavation and existing structures or archaeological sites to remain.

B. Coordinate elevations of ducts and duct-bank entrances into handholes, and boxes with final locations and profiles of ducts and duct banks, as determined by coordination with other utilities, underground obstructions, and surface features. Revise locations and elevations as required to suit field conditions and to ensure that duct runs drain to manholes and handholes, and as approved by Construction Manager.

C. Clear and grub vegetation to be removed, and protect vegetation to remain according to Section 31 1100 "Clearing and Grubbing." Remove and stockpile topsoil for reapplication according to Section 31 1100 "Clearing and Grubbing."

3.2 UNDERGROUND DUCT APPLICATION

A. Ducts for Electrical Feeders 600 V and Less: RNC, NEMA Type EPC-40-PVC, in concrete-encased duct bank unless otherwise indicated.

B. Ducts for Electrical Feeders 600 V and Less: RNC, NEMA Type EPC-80-PVC, in direct-buried duct bank unless otherwise indicated.

C. Underground Ducts Crossing Paved Paths Walks and Driveways: RNC, NEMA Type EPC-40-PVC, encased in reinforced concrete.

3.3 DUCT INSTALLATION

A. Install ducts according to NEMA TCB 2.

B. Slope: Pitch ducts a minimum slope of 1:300 down toward handholes and away from buildings and equipment. Slope ducts from a high point in runs between two manholes, to drain in both directions.

C. Curves and Bends: Use 5-degree angle couplings for small changes in direction. Use manufactured long sweep bends with a minimum radius of 25 feet, both horizontally and vertically, at other locations unless otherwise indicated.

D. Joints: Use solvent-cemented joints in ducts and fittings and make watertight according to manufacturer's written instructions. Stagger couplings so those of adjacent ducts do not lie in same plane.

E. Duct Entrances to Polymer Concrete Handholes: Use end bells, spaced approximately 10 inches o.c. for 5-inch ducts, and vary proportionately for other duct sizes.

1. Begin change from regular spacing to end-bell spacing 10 feet from the end bell without reducing duct line slope and without forming a trap in the line.
2. Direct-Buried Duct Banks: Install an expansion and deflection fitting in each conduit in the area of disturbed earth adjacent to manhole or handhole. Install an expansion fitting near the center of all straight line direct-buried duct banks with calculated expansion of more than 3/4 inch.
3. Grout end bells into structure walls from both sides to provide watertight entrances.

F. Sealing: Provide temporary closure at terminations of ducts that have cables pulled. Seal spare ducts at terminations. Use sealing compound and plugs to withstand at least 15-psig hydrostatic pressure.

G. Pulling Cord: Install 100-lbf- test nylon cord in empty ducts.

H. Direct-Buried Duct Banks:

1. Excavate trench bottom to provide firm and uniform support for duct bank. Comply with requirements in Section 31 2000 "Earth Moving" for preparation of trench bottoms for pipes less than 6 inches in nominal diameter.
2. Support ducts on duct separators coordinated with duct size, duct spacing, and outdoor temperature.
3. Space separators close enough to prevent sagging and deforming of ducts, with not less than five spacers per 20 feet of duct. Secure separators to earth and to ducts to prevent displacement during backfill and yet permit linear duct movement due to expansion and contraction as temperature changes. Stagger spacers approximately 6 inches between tiers.
4. Depth: Install top of duct bank at least 36 inches below finished grade unless otherwise indicated.
5. Set elevation of bottom of duct bank below frost line.
6. Install ducts with a minimum of 3 inches between ducts for like services and 6 inches between power and signal ducts.
7. Elbows: Install manufactured duct elbows for stub-ups at poles and equipment, at building entrances through floor, and at changes of direction in duct run unless otherwise indicated. Encase elbows for stub-up ducts throughout length of elbow.
8. Install manufactured rigid steel conduit elbows for stub-ups at poles and equipment, at building entrances through floor, and at changes of direction in duct run.

    a. Couple steel conduits to ducts with adapters designed for this purpose, and encase coupling with 3 inches of concrete.
    b. For equipment mounted on outdoor concrete bases, extend steel conduit horizontally a minimum of 60 inches from edge of equipment pad or foundation. Install insulated grounding bushings on terminations at equipment.

9. After installing first tier of ducts, backfill and compact. Start at tie-in point and work toward end of duct run, leaving ducts at end of run free to move with expansion and contraction as temperature changes during this process. Repeat procedure after placing each tier. After placing last tier, hand place backfill to 4 inches over ducts and hand tamp. Firmly tamp backfill around ducts to provide maximum supporting strength. Use hand tamper only. After placing controlled backfill over final tier, make final duct connections at end of run and complete backfilling with normal compaction. Comply with requirements in Section 31 2000 "Earth Moving" for installation of backfill materials.

    a. Place minimum 3 inches of sand as a bed for duct bank. Place sand to a minimum of 6 inches above top level of duct bank.
    b. Place minimum 6 inches of engineered fill above concrete encasement of duct bank.

I. Warning Planks: Bury warning planks approximately 12 inches above direct-buried ducts and duct banks, placing them 24 inches o.c. Align planks along the width and along the centerline of duct bank. Provide an additional plank for each 12-inch increment of duct-bank width over a nominal 18 inches. Space additional planks 12 inches apart, horizontally.

J. Warning Tape: Bury warning tape approximately 12 inches above all concrete-encased ducts and duct banks. Align tape parallel to and within 3 inches of centerline of duct bank. Provide an additional warning tape for each 12-inch increment of duct-bank width over a nominal 18 inches. Space additional tapes 12 inches apart, horizontally.

3.4 INSTALLATION OF HANDHOLES AND BOXES OTHER THAN PRECAST CONCRETE

A. Install handholes and boxes level and plumb and with orientation and depth coordinated with connecting ducts, to minimize bends and deflections required for proper entrances. Use box extension if required to match depths of ducts, and seal joint between box and extension as recommended by manufacturer.

B. Unless otherwise indicated, support units on a level bed of crushed stone or gravel, graded from 1/2-inch sieve to No. 4 sieve and compacted to same density as adjacent undisturbed earth.

C. Elevation: In paved areas and trafficways, set cover flush with finished grade. Set covers of other handholes 1 inch above finished grade.

D. Install handholes and boxes with bottom below frost line, below grade.

E. Install removable hardware, including pulling eyes, cable stanchions, cable arms, and insulators, as required for installation and support of cables and conductors and as indicated. Select arm lengths to be long enough to provide spare space for future cables, but short enough to preserve adequate working clearances in enclosure.

F. Field cut openings for ducts and conduits according to enclosure manufacturer's written instructions. Cut wall of enclosure with a tool designed for material to be cut. Size holes for terminating fittings to be used, and seal around penetrations after fittings are installed.

3.5 GROUNDING

A. Ground underground ducts and utility structures according to Section 26 0526 "Grounding and Bonding for Electrical Systems."

3.6 FIELD QUALITY CONTROL

A. Perform the following tests and inspections and prepare test reports:

1. Demonstrate capability and compliance with requirements on completion of installation of underground ducts and utility structures.
2. Pull solid aluminum or wood test mandrel through duct to prove joint integrity and adequate bend radii, and test for out-of-round duct. Provide a minimum 6-inch- long mandrel equal to 80 percent fill of duct. If obstructions are indicated, remove obstructions and retest.

3. Test handhole grounding to ensure electrical continuity of grounding and bonding connections. Measure and report ground resistance as specified in Section 26 0526 "Grounding and Bonding for Electrical Systems."

B. Correct deficiencies and retest as specified above to demonstrate compliance.

3.7 CLEANING

A. Pull leather-washer-type duct cleaner, with graduated washer sizes, through full length of ducts. Follow with rubber duct swab for final cleaning and to assist in spreading lubricant throughout ducts.

B. Clean internal surfaces of manholes, including sump. Remove foreign material.

END OF SECTION

SECTION 26 0544

SLEEVES AND SLEEVE SEALS FOR ELECTRICAL RACEWAYS AND CABLING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Round sleeves.
2. Rectangular sleeves.
3. Sleeve seal systems.
4. Grout.
5. Pourable sealants.
6. Foam sealants.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

PART 2 - PRODUCTS

2.1 ROUND SLEEVES

A. Wall Sleeves, Steel:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Advance Products & Systems, LLC.
   b. CCI Piping Systems.
   c. Flexicraft Industries.
   d. GPT; an EnPro Industries company.

2. Description: ASTM A53/A53M, Type E, Grade B, Schedule 40, zinc coated, plain ends and integral waterstop.

B. Pipe Sleeves, PVC:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. CCI Piping Systems.
   b. GPT; an EnPro Industries company.
   c. Metraflex Company (The).

2. Description: ASTM D1785, Schedule 40.

C. Sheet Metal Sleeves, Galvanized Steel, Round:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Benefast.
b. Specified Technologies, Inc.

2. Description: Galvanized-steel sheet; thickness not less than 0.0239 inch; round tube closed with welded longitudinal joint, with tabs for screw-fastening the sleeve to the board.

2.2 RECTANGULAR SLEEVES

A. Sheet Metal Sleeves, Galvanized Steel, Rectangular:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Abesco Fire LLC.
b. Specified Technologies, Inc.
c. Wiremold; Legrand North America, LLC.

2. Description:

a. Material: Galvanized sheet steel.
b. Minimum Metal Thickness:

1) For sleeve cross-section rectangle perimeter less than 50 inch and with no side larger than 16 inch, thickness must be 0.052 inch.
2) For sleeve cross-section rectangle perimeter not less than 50 inch or with one or more sides larger than 16 inch, thickness must be 0.138 inch.

2.3 SLEEVE SEAL SYSTEMS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Advance Products & Systems, LLC.
2. CALPICO, Inc.
3. Flexicraft Industries.
4. Metraflex Company (The).
5. Proco Products, Inc.

B. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and raceway or cable or between raceway and cable.

1. Sealing Elements: EPDM rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
2. Pressure Plates: Carbon steel.

3. Connecting Bolts and Nuts: Carbon steel, with corrosion-resistant coating, of length required to secure pressure plates to sealing elements.

2.4 GROUT

A. Description: Nonshrink; recommended for interior and exterior sealing openings in non-fire-rated walls or floors.

1. Standard: ASTM C1107/C1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.
2. Design Mix: 5000 psi, 28-day compressive strength.
3. Packaging: Premixed and factory packaged.

2.5 POURABLE SEALANTS

A. Description: Single-component, neutral-curing elastomeric sealants of grade indicated below.

1. Grade: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces that are not fire rated.

2.6 FOAM SEALANTS

A. Description: Multicomponent, liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam. Foam expansion must not damage cables or crack penetrated structure.

PART 3 - EXECUTION

3.1 INSTALLATION OF SLEEVES FOR NON-FIRE-RATED ELECTRICAL PENETRATIONS

A. Sleeves for Conduits Penetrating Above-Grade, Non-Fire-Rated, Concrete and Masonry-Unit Floors and Walls:

1. Interior Penetrations of Non-Fire-Rated Walls and Floors:

   a. Seal space outside of sleeves with mortar or grout. Pack sealing material solidly between sleeve and wall or floor so no voids remain. Tool exposed surfaces smooth; protect material while curing.
   b. Seal annular space between sleeve and raceway or cable, using joint sealant appropriate for size, depth, and location of joint. Comply with requirements in Section 07 9200 "Joint Sealants."

2. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.
3. Size pipe sleeves to provide 1/4 inch annular clear space between sleeve and raceway or cable, unless sleeve seal system is to be installed.
4. Install sleeves for wall penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of walls. Cut sleeves to length for mounting flush with both surfaces of walls. Deburr after cutting.

B. Sleeves for Conduits Penetrating Non-Fire-Rated Wall Assemblies:

1. Use circular metal sleeves unless penetration arrangement requires rectangular sleeved opening.
2. Seal space outside of sleeves with approved joint compound for wall assemblies.

C. Roof-Penetration Sleeves: Seal penetration of individual raceways and cables with flexible boot-type flashing units applied in coordination with roofing work.

D. Aboveground, Exterior-Wall Penetrations: Seal penetrations using steel pipe sleeves and mechanical sleeve seal systems. Size sleeves to allow for 1 inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.

E. Underground, Exterior-Wall and Floor Penetrations:
1. Install steel pipe sleeves. Size sleeves to allow for 1 inch annular clear space between raceway or cable and sleeve for installing sleeve seal system. Grout sleeve into wall or floor opening.

3.2 INSTALLATION OF RECTANGULAR SLEEVES AND SLEEVE SEALS

A. Install sleeves in existing walls without compromising structural integrity of walls. Do not cut structural elements without reinforcing the wall to maintain the designed weight bearing and wall stiffness.

B. Install conduits and cable with no crossings within the sleeve.

C. Fill opening around conduits and cables with expanding foam without leaving voids.

D. Provide metal sheet covering at both wall surfaces and finish to match surrounding surfaces. Metal sheet must be same material as sleeve.

3.3 INSTALLATION OF SLEEVE SEAL SYSTEMS

A. Install sleeve seal systems in sleeves in exterior concrete walls and slabs-on-grade at raceway entries into building.

B. Install type and number of sealing elements recommended by manufacturer for raceway or cable material and size. Position raceway or cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between raceway or cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

END OF SECTION

SECTION 26 0553

IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Color and legend requirements for raceways, conductors, and warning labels and signs.
2. Labels.
3. Bands and tubes.
4. Tapes and stencils.
5. Tags.
6. Signs.
7. Cable ties.
8. Paint for identification.
9. Fasteners for labels and signs.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Comply with ASME A13.1.

B. Comply with NFPA 70.

C. Comply with 29 CFR 1910.144 and 29 CFR 1910.145.

D. Comply with ANSI Z535.4 for safety signs and labels.

E. Adhesive-attached labeling materials, including label stocks, laminating adhesives, and inks used by label printers, shall comply with UL 969.

F. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.

1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

2.2 COLOR AND LEGEND REQUIREMENTS

A. Raceways and Cables Carrying Circuits at 600 V or Less:

1. Black letters on an orange field.
2. Legend: Indicate voltage and system or service type.

B. Color-Coding for Phase- and Voltage-Level Identification, 600 V or Less: Use colors listed below for ungrounded service, feeder, and branch-circuit conductors.

1. Color shall be factory applied.
2. Colors for 208/120-V Circuits:

    a. Phase A: Black.
    b. Phase B: Red.
    c. Phase C: Blue.

3. Colors for 480/277-V Circuits:

    a. Phase A: Brown.
    b. Phase B: Orange.
    c. Phase C: Yellow.

4. Color for Neutral: White.
5. Color for Equipment Grounds: Green.
6. Colors for Isolated Grounds: Green two or more yellow stripes.

C. Warning Label Colors:

1. Identify system voltage with black letters on an orange background.

D. Warning labels and signs shall include, but are not limited to, the following legends:

1. Multiple Power Source Warning: "DANGER - ELECTRICAL SHOCK HAZARD - EQUIPMENT HAS MULTIPLE POWER SOURCES."
2. Workspace Clearance Warning: "WARNING - OSHA REGULATION - AREA IN FRONT OF ELECTRICAL EQUIPMENT MUST BE KEPT CLEAR FOR 36 INCHES."

E. Equipment Identification Labels:

1. Black letters on a white field.
2. Panelboards shall be labeled with their name, voltage, phase, main & bus ampacities, and where they are fed from panelboard or switchboard name and position.
3. Transformers shall be labeled with their name, voltages, phase, kVA rating, and where they are fed from panelboard or switchboard name and position, what panelboard or switchboard they feed.

2.3 LABELS

A. Vinyl Wraparound Labels: Preprinted, flexible labels laminated with a clear, weather- and chemical-resistant coating and matching wraparound clear adhesive tape for securing label ends.

B. Snap-around Labels: Slit, pretensioned, flexible, preprinted, color-coded acrylic sleeves, with diameters sized to suit diameter and that stay in place by gripping action.

C. Self-Adhesive Wraparound Labels: Preprinted, 3-mil-thick, polyester flexible label with acrylic pressure-sensitive adhesive.

1. Self-Lamination: Clear; UV-, weather- and chemical-resistant; self-laminating, protective shield over the legend. Labels sized such that the clear shield overlaps the entire printed legend.
2. Marker for Labels: Machine-printed, permanent, waterproof, black ink recommended by printer manufacturer.

D. Self-Adhesive Labels: Polyester, thermal, transfer-printed, 3-mil-thick, multicolor, weather- and UV-resistant, pressure-sensitive adhesive labels, configured for intended use and location.

1. Minimum Nominal Size:

a. 1-1/2 by 6 inches for raceway and conductors.
b. 3-1/2 by 5 inches for equipment.
c. As required by authorities having jurisdiction.

2.4 BANDS AND TUBES

A. Snap-around, Color-Coding Bands: Slit, pretensioned, flexible, solid-colored acrylic sleeves, 2 inches long, with diameters sized to suit diameter and that stay in place by gripping action.

B. Heat-Shrink Preprinted Tubes: Flame-retardant polyolefin tubes with machine-printed identification labels, sized to suit diameters of and shrunk to fit firmly around item being identified. Full shrink recovery occurs at a maximum of 200 deg F. Comply with UL 224.

2.5 TAPES AND STENCILS

A. Marker Tapes: Vinyl or vinyl-cloth, self-adhesive wraparound type, with circuit identification legend machine printed by thermal transfer or equivalent process.

B. Self-Adhesive Vinyl Tape: Colored, heavy duty, waterproof, fade resistant; not less than 3 mils thick by 1 to 2 inches wide; compounded for outdoor use.

C. Tape and Stencil: 4-inch-wide black stripes on 10-inch centers placed diagonally over orange background and is 12 inches wide. Stop stripes at legends.

D. Floor Marking Tape: 2-inch-wide, 5-mil pressure-sensitive vinyl tape, with yellow and black stripes and clear vinyl overlay.

E. Underground-Line Warning Tape:

1. Tape:

a. Recommended by manufacturer for the method of installation and suitable to identify and locate underground electrical and telecommunication utility lines.
b. Printing on tape shall be permanent and shall not be damaged by burial operations.

c. Tape material and ink shall be chemically inert and not subject to degradation when exposed to acids, alkalis, and other destructive substances commonly found in soils.

2. Color and Printing:

a. Comply with ANSI Z535.1, ANSI Z535.2, ANSI Z535.3, ANSI Z535.4, and ANSI Z535.5.
b. Inscriptions for Red-Colored Tapes: "ELECTRIC LINE, HIGH VOLTAGE".
c. Inscriptions for Orange-Colored Tapes: "TELEPHONE CABLE, CATV CABLE, COMMUNICATIONS CABLE, OPTICAL FIBER CABLE".

3. Tag: Type I:

a. Pigmented polyolefin, bright colored, continuous-printed on one side with the inscription of the utility, compounded for direct-burial service.
b. Width: 3 inches.
c. Thickness: 4 mils.
d. Weight: 18.5 lb/1000 sq. ft..
e. Tensile according to ASTM D882: 30 lbf and 2500 psi.

4. Tag: Type ID:

a. Detectable three-layer laminate, consisting of a printed pigmented polyolefin film, a solid aluminum-foil core, and a clear protective film that allows inspection of the continuity of the conductive core; bright colored, continuous-printed on one side with the inscription of the utility, compounded for direct-burial service.
b. Width: 3 inches.
c. Overall Thickness: 5 mils.
d. Foil Core Thickness: 0.35 mil.
e. Weight: 28 lb/1000 sq. ft..
f. Tensile according to ASTM D882: 70 lbf and 4600 psi.

F. Stenciled Legend: In nonfading, waterproof, black ink or paint. Minimum letter height shall be 1 inch.

2.6 TAGS

A. Write-on Tags:

1. Polyester Tags: 0.010 inch thick, with corrosion-resistant grommet and cable tie for attachment.
2. Marker for Tags: Permanent, waterproof, black ink marker recommended by tag manufacturer.
3. Marker for Tags: Machine-printed, permanent, waterproof, black ink marker recommended by printer manufacturer.

2.7 SIGNS

A. Baked-Enamel Signs:

1.

2. Preprinted aluminum signs,punched or drilled for fasteners, with colors, legend, and size required for application.

3. 1/4-inch grommets in corners for mounting.
4. Nominal Size: 7 by 10 inches.

B. Metal-Backed Butyrate Signs:

1. Weather-resistant, nonfading, preprinted, cellulose-acetate butyrate signs, with 0.0396-inch galvanized-steel backing, punched and drilled for fasteners, and with colors, legend, and size required for application.
2. 1/4-inch grommets in corners for mounting.
3. Nominal Size: 10 by 14 inches.

C. Laminated Acrylic or Melamine Plastic Signs:

1. Engraved legend.
2. Thickness:

a. For signs up to 20 sq. in., minimum 1/16 inch thick.
b. For signs larger than 20 sq. in., 1/8 inch thick.
c. Engraved legend with white letters on a dark gray background.
d. Punched or drilled for mechanical fasteners with 1/4-inch grommets in corners for mounting.
e. Framed with mitered acrylic molding and arranged for attachment at applicable equipment.

2.8 CABLE TIES

A. General-Purpose Cable Ties: Fungus inert, self-extinguishing, one piece, self-locking, and Type 6/6 nylon.

1. Minimum Width: 3/16 inch.
2. Tensile Strength at 73 Deg F according to ASTM D638: 12,000 psi.
3. Temperature Range: Minus 40 to plus 185 deg F.
4. Color: Black, except where used for color-coding.

B. UV-Stabilized Cable Ties: Fungus inert, designed for continuous exposure to exterior sunlight, self-extinguishing, one piece, self-locking, and Type 6/6 nylon.

1. Minimum Width: 3/16 inch.
2. Tensile Strength at 73 Deg F according to ASTM D638: 12,000 psi.
3. Temperature Range: Minus 40 to plus 185 deg F.
4. Color: Black.

C. Plenum-Rated Cable Ties: Self-extinguishing, UV stabilized, one piece, and self-locking.

1. Minimum Width: 3/16 inch.
2. Tensile Strength at 73 Deg F according to ASTM D638: 7000 psi.
3. UL 94 Flame Rating: 94V-0.
4. Temperature Range: Minus 50 to plus 284 deg F.
5. Color: Black.

2.9 MISCELLANEOUS IDENTIFICATION PRODUCTS

A. Paint: Comply with requirements in painting Sections for paint materials and application requirements. Retain paint system applicable for surface material and location (exterior or interior).

B. Fasteners for Labels and Signs: Self-tapping, stainless-steel screws or stainless-steel machine screws with nuts and flat and lock washers.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Verify and coordinate identification names, abbreviations, colors, and other features with requirements in other Sections requiring identification applications, Drawings, Shop Drawings, manufacturer's wiring diagrams, and operation and maintenance manual. Use consistent designations throughout Project.

B. Install identifying devices before installing acoustical ceilings and similar concealment.

C. Verify identity of each item before installing identification products.

D. Coordinate identification with Project Drawings, manufacturer's wiring diagrams, and operation and maintenance manual.

E. Apply identification devices to surfaces that require finish after completing finish work.

F. Install signs with approved legend to facilitate proper identification, operation, and maintenance of electrical systems and connected items.

G. Self-Adhesive Identification Products: Before applying electrical identification products, clean substrates of substances that could impair bond, using materials and methods recommended by manufacturer of identification product.

H. System Identification for Raceways and Cables under 600 V: Identification shall completely encircle cable or conduit. Place identification of two-color markings in contact, side by side.

1. Secure tight to surface of conductor, cable, or raceway.

I. Auxiliary Electrical Systems Conductor Identification: Identify field-installed alarm, control, and signal connections.

J. Elevated Components: Increase sizes of labels, signs, and letters to those appropriate for viewing from the floor.

K. Vinyl Wraparound Labels:

1. Secure tight to surface at a location with high visibility and accessibility.
2. Attach labels that are not self-adhesive type with clear vinyl tape, with adhesive appropriate to the location and substrate.

L. Snap-around Labels: Secure tight to surface at a location with high visibility and accessibility.

M. Self-Adhesive Wraparound Labels: Secure tight to surface of raceway or cable at a location with high visibility and accessibility.

N. Self-Adhesive Labels:

1. On each unit of equipment, install unique designation label that is consistent with wiring diagrams, schedules, and operation and maintenance manual.
2. Unless otherwise indicated, provide a single line of text with 1/2-inch-high letters on 1-1/2-inch-high label; where two lines of text are required, use labels 2 inches high.

O. Snap-around Color-Coding Bands: Secure tight to surface at a location with high visibility and accessibility.

P. Heat-Shrink, Preprinted Tubes: Secure tight to surface at a location with high visibility and accessibility.

Q. Marker Tapes: Secure tight to surface at a location with high visibility and accessibility.

R. Self-Adhesive Vinyl Tape: Secure tight to surface at a location with high visibility and accessibility.

1. Field-Applied, Color-Coding Conductor Tape: Apply in half-lapped turns for a minimum distance of 6 inches where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding.

S. Tape and Stencil: Comply with requirements in painting Sections for surface preparation and paint application.

T. Floor Marking Tape: Apply stripes to finished surfaces following manufacturer's written instructions.

U. Underground Line Warning Tape:

1. During backfilling of trenches, install continuous underground-line warning tape directly above cable or raceway at 6 to 8 inches below finished grade. Use multiple tapes where width of multiple lines installed in a common trench exceeds 16 inches overall.
2. Install underground-line warning tape for direct-buried cables and cables in raceways.

V. Write-on Tags:

1. Place in a location with high visibility and accessibility.
2. Secure using UV-stabilized cable ties.

W. Baked-Enamel Signs:

1. Attach signs that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.
2. Unless otherwise indicated, provide a single line of text with 1/2-inch-high letters on minimum 1-1/2-inch-high sign; where two lines of text are required, use signs minimum 2 inches high.

X. Metal-Backed Butyrate Signs:

1. Attach signs that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.

2. Unless otherwise indicated, provide a single line of text with 1/2-inch-high letters on minimum 1-1/2-inch-high sign; where two lines of text are required, use signs minimum 2 inches high.

Y. Laminated Acrylic or Melamine Plastic Signs:

1. Attach signs and plastic labels that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.
2. Unless otherwise indicated, provide a single line of text with 1/2-inch-high letters on minimum 1-1/2-inch-high sign; where two lines of text are required, use signs minimum 2 inches high.

Z. Cable Ties: General purpose, for attaching tags, except as listed below:

1. Outdoors: UV-stabilized nylon.
2. In Spaces Handling Environmental Air: Plenum rated.

3.2 IDENTIFICATION SCHEDULE

A. Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment. Install access doors or panels to provide view of identifying devices.

B. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, pull points, and locations of high visibility. Identify by system and circuit designation.

C. Accessible Raceways and Metal-Clad Cables, 600 V or Less, for Service, Feeder, and Branch Circuits, More Than 30 A and 120 V to Ground: Identify with self-adhesive raceway labels.

1. Locate identification at changes in direction, at penetrations of walls and floors, at 50-foot maximum intervals in straight runs, and at 25-foot maximum intervals in congested areas.

D. Power-Circuit Conductor Identification, 600 V or Less: For conductors in vaults, pull and junction boxes, manholes, and handholes, use self-adhesive wraparound labels to identify the phase.

1. Locate identification at changes in direction, at penetrations of walls and floors, at 50-foot maximum intervals in straight runs, and at 25-foot maximum intervals in congested areas.

E. Control-Circuit Conductor Identification: For conductors and cables in pull and junction boxes, manholes, and handholes, use self-adhesive wraparound labels with the conductor or cable designation, origin, and destination.

F. Control-Circuit Conductor Termination Identification: For identification at terminations, provide heat-shrink preprinted tubes with the conductor designation.

G. Conductors to Be Extended in the Future: Attach write-on tags to conductors and list source.

H. Locations of Underground Lines: Underground-line warning tape for power, lighting, communication, and control wiring and optical-fiber cable.

I. Workspace Indication: Apply floor marking tape to finished surfaces. Show working clearances in the direction of access to live parts. Workspace shall comply with NFPA 70 and 29 CFR 1926.403 unless

otherwise indicated. Do not install at flush-mounted panelboards and similar equipment in finished spaces.

J. Instructional Signs: Self-adhesive labels, including the color code for grounded and ungrounded conductors.

K. Operating Instruction Signs: Self-adhesive labels.

L. Equipment Identification Labels:

1. Indoor Equipment: Laminated acrylic or melamine plastic sign.
2. Outdoor Equipment: Laminated acrylic or melamine sign.

END OF SECTION

SECTION 26 0573

POWER SYSTEM STUDIES

PART 1 - GENERAL

1.1 SUMMARY

A. The Work of this Section Includes:

1. Short-circuit study.
2. Overcurrent protective device coordination study.
3. Load-flow and voltage-drop study.
4. Motor-starting study.
5. Arc-flash hazard study.
6. Digital-twin modeling.

1.2 DEFINITIONS

A. Digital Twin: The digital representation of a real-world entity, concept, or notion, either physical or perceived.

1.3 ACTION SUBMITTALS

A. Product Data: For power system analysis software to be used for studies.

1. Product Certificates: For power system study software applications, include certificate stating compliance with specified requirements, signed by software manufacturer.

B. Power System Study Reports:

1. Submit reports after approval of system protective devices submittals. Submittals must be in digital form.
2. Submit short-circuit study input data, including completed computer-program input data sheets.
3. Submit coordination study input data, including completed computer-program input data sheets.

    a. Submit load-flow, voltage-drop, and motor-starting data with coordination study.

4. Submit arc-flash study input data, including completed computer-program input data sheets.
5. Submit study report for action prior to receiving final approval of distribution equipment submittals. If formal completion of studies will cause delay in equipment manufacturing, obtain approval from Architect for preliminary submittal of sufficient study data to ensure that selection of devices and associated characteristics is satisfactory.
6. Submit revised one-line diagram, reflecting field investigation results and results of short-circuit study.

C. Data files for studies in format compatible with Owner's power system analysis software.

D. Digital-twin models.

1.4 QUALITY ASSURANCE

A. Submittals for power system studies must be signed and sealed by qualified electrical professional engineer responsible for their preparation.

B. Studies must be performed using commercially developed and distributed software designed specifically for power system analysis.

C. Software algorithms must comply with requirements of standards and guides specified in this Section.

D. Manual calculations are unacceptable.

PART 2 - PRODUCTS

2.1 POWER SYSTEM ANALYSIS SOFTWARE

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. CYME International T&D Inc.; subsidiary of Eaton Corporation plc
2. EasyPower; brand of Bentley Systems, Inc.
3. ETAP; brand of Operation Technology, Inc.; subsidiary of Schneider Electric
4. Power Tools for Windows (PTW); brand of SKM Systems Analysis, Inc.

B. Standard Features:

1. Power System Analysis:

   a. Power-systems-analysis software applications must have analytical capability to calculate "mandatory," "very desirable," and "desirable" features as listed in IEEE 3002 series standards.
   b. Computer software application must be capable of plotting and diagramming time-current-characteristic curves as part of its output. Computer software program must report device settings and ratings of overcurrent protective devices and must demonstrate selective coordination by computer-generated, time-current coordination plots.
   c. Computer software application must be designed to perform arc-flash analysis or have function, component, or add-on module designed to perform arc-flash analysis.

2. Analysis Standards:

   a. Short-Circuit Current Analysis: In accordance with IEEE 3002.3.
   b. Device Coordination Analysis: In accordance with IEEE 3004.3 and IEEE 3004.5.
   c. Load-Flow Analysis: In accordance with IEEE 3002.2.
   d. Motor-Starting Analysis: In accordance with IEEE 3002.7.
   e. Harmonic Analysis: In accordance with IEEE 3002.8.
   f. Transient Stability Analysis: In accordance with IEEE P3002.9.
   g. Arc-Flash Hazard Analysis: In accordance with IEEE 1584.

3. Capable of printing arc-flash hazard warnings for equipment on polyester, weather- and UV-resistant, pressure-sensitive adhesive labels complying with NFPA 70E.

   a. Label must have orange header with wording, "WARNING, ARC-FLASH HAZARD," and must include the following information taken directly from arc-flash hazard study:

1) Equipment designation.
2) Nominal voltage.
3) Protection boundaries.

   a) Arc-flash boundary.
   b) Restricted approach boundary.
   c) Limited approach boundary.

4) Arc-flash PPE category.
5) Required minimum arc rating of PPE in Cal/cm squared.
6) Available incident energy.
7) Working distance.
8) Engineering report number, revision number, and issue date.

C. Other Available Features Required by the Project:

1. Simultaneous faults.
2. Explicit negative sequence.
3. Mutual coupling in zero sequence.
4. Digital-Twin Model: Ability to create a [**cloud-based,**]digital-twin model for life-cycle operation and maintenance of the facility's electrical power system.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Collect and analyze data for power system studies.

1. Verify completeness of data supplied in one-line diagram on Drawings. Call discrepancies to Architect's attention.
2. For equipment included as Work on the Project, use characteristics submitted under provisions of action submittals and information submittals for the Project.
3. For equipment that is existing to remain, obtain required electrical distribution system data by field investigation and surveys, conducted by qualified technicians and engineers in accordance with NFPA 70E.
4. Gather and tabulate required input data to support power system studies. Comply with requirements in Section 01 7839 "Project Record Documents" for recording circuit protective device characteristics. Record data on Record Document copy of one-line diagram. Comply with recommendations in IEEE 3002 series standards as to amount of detail that is required to be acquired in field. Field data gathering must be by, or under supervision of, qualified electrical professional engineer. Data include, but are not limited to, the following:

   a. Product data for the Project's overcurrent protective devices involved in overcurrent protective device coordination studies. Use equipment designation tags that are consistent with electrical distribution system diagrams, overcurrent protective device submittals, input and output data, and recommended device settings.
   b. Electrical power utility impedance at service.
   c. Power sources and ties.
   d. Short-circuit current at each system bus (three phase and line to ground).
   e. Full-load current of loads.
   f. Voltage level at each bus.
   g. For transformers, include kVA, primary and secondary voltages, connection type,

impedance, X/R ratio, taps measured in percent, and phase shift.

h. For reactors, provide manufacturer and model designation, voltage rating, and impedance.
i. For circuit breakers and fuses, provide manufacturer and model designation. List type of breaker, type of trip and available range of settings, SCCR, current rating, and breaker settings.
j. Generator short-circuit current contribution data, including short-circuit reactance, rated kVA, rated voltage, and X/R ratio.
k. For relays, provide manufacturer and model designation, current transformer ratios, potential transformer ratios, and relay settings.
l. Maximum demands from service meters.
m. Busway manufacturer and model designation, current rating, impedance, lengths, and conductor material.
n. Motor horsepower and NEMA MG 1 code letter designation.
o. Low-voltage cable sizes, lengths, number, conductor material, and conduit material (magnetic or nonmagnetic).
p. Medium-voltage cable sizes, lengths, conductor material, cable construction, metallic shield performance parameters, and conduit material (magnetic or nonmagnetic).
q. Derating factors.

3.2 PREPARATION

A. Preparation of Data for Short-Circuit Study:

1. Verify completeness of data supplied on one-line diagram. Call discrepancies to Architect's attention.
2. For equipment included as Work on the Project, use characteristics submitted under provisions of action submittals and information submittals for the Project.
3. Prepare one-line diagram of modeled power system, showing the following:

a. Protective device designations and ampere ratings.
b. Conductor types, sizes, and lengths.
c. Transformer kVA and voltage ratings.
d. Motor and generator designations and kVA ratings.
e. Switchgear, switchboard, motor-control center, and panelboard designations and ratings.
f. Derating factors and environmental conditions.
g. Revisions to electrical equipment required by study.

B. Preparation of Data for Overcurrent Protective Device Coordination Study:

1. Prepare data sheets to supplement electrical distribution system one-line diagram, cross-referenced with tag numbers on diagram, indicating the following:

a. Special load considerations, including starting inrush currents and frequent starting and stopping.
b. Transformer characteristics, including primary protective device, magnetic inrush current, and overload capability.
c. Motor full-load current, locked rotor current, service factor, starting time, type of start, and thermal-damage curve.
d. Generator thermal-damage curve.
e. Ratings, types, and settings of utility company's overcurrent protective devices.
f. Special overcurrent protective device settings or types stipulated by utility company.
g. Time-current-characteristic curves of devices indicated to be coordinated.
h. Manufacturer, frame size, interrupting rating in amperes root mean square (rms)

symmetrical, ampere or current sensor rating, long-time adjustment range, short-time adjustment range, and instantaneous adjustment range for circuit breakers.

i. Manufacturer and type, ampere-tap adjustment range, time-delay adjustment range, instantaneous attachment adjustment range, and current transformer ratio for overcurrent relays.

j. Switchgear, switchboards, motor-control centers, and panelboards ampacity, and SCCR in amperes rms symmetrical.

k. Identify series-rated interrupting devices for condition where available fault current is greater than interrupting rating of downstream equipment. Obtain device data details to allow verification that series application of these devices complies with NFPA 70 and UL 489 requirements.

2. Examine the Project's overcurrent protective device submittals for compliance with electrical distribution system coordination requirements and other conditions affecting performance of the Work. Devices to be coordinated are indicated on Drawings.

3. Proceed with coordination study only after relevant equipment submittals have been assembled. Overcurrent protective devices that have not been submitted and approved prior to coordination study may not be used in study.

C. Preparation of Data for Arc-Flash Hazard Study:

1. Assemble data from short-circuit study and overcurrent protective device coordination study.

2. Proceed with arc-flash study only after relevant equipment submittals have been assembled. Overcurrent protective devices that have not been submitted and approved prior to arc-flash study may not be used in study.

3.3 SHORT-CIRCUIT STUDY

A. Base study on device characteristics supplied by device manufacturer.

B. Extent of electrical power system to be studied is indicated on Drawings.

C. Begin short-circuit current analysis at service, extending down to system overcurrent protective devices as follows:

1. To normal system low-voltage load buses where fault current is 5 kA or less.

D. Study electrical distribution system from normal and alternate power sources throughout electrical distribution system for the Project. Study cases of system-switching configurations and alternate operations that could result in maximum fault conditions.

E. Include AC fault-current decay from induction motors, synchronous motors, and asynchronous generators and apply to low- and medium-voltage, three-phase AC systems. Also account for fault-current DC decrement to address asymmetrical requirements of interrupting equipment.

F. Calculate short-circuit momentary and interrupting duties for three-phase bolted fault and single line-to-ground fault at equipment indicated on one-line diagram.

1. For grounded systems, provide bolted line-to-ground fault-current study for areas as defined for three-phase bolted fault short-circuit study.

G. Include in report identification of protective device applied outside its capacity.

3.4 OVERCURRENT PROTECTIVE DEVICE COORDINATION STUDY

A. Base study on device characteristics supplied by device manufacturer.

B. Extent of electrical power system to be studied is indicated on Drawings.

C. Begin analysis at service, extending down to system overcurrent protective devices as follows:

1. To normal system low-voltage load buses where fault current is 5 kA or less.

D. Study electrical distribution system from normal and alternate power sources throughout electrical distribution system for the Project. Study cases of system-switching configurations and alternate operations that could result in maximum fault conditions.

E. Transformer Primary Overcurrent Protective Devices:

1. Device must not operate in response to the following:

a. Inrush current when first energized.
b. Self-cooled, full-load current or forced-air-cooled, full-load current, whichever is specified for that transformer.
c. Permissible transformer overloads in accordance with IEEE C57.96 if required by unusual loading or emergency conditions.

2. Device settings must protect transformers in accordance with IEEE C57.12.00, for fault currents.

F. Motor Protection:

1. Select protection for low-voltage motors in accordance with IEEE 3004.8 and NFPA 70.
2. Select protection for motors served at voltages more than 600 V in accordance with IEEE 620.

G. Conductor Protection: Protect cables against damage from fault currents in accordance with ICEA P-32-382, ICEA P-45-482, and protection recommendations in IEEE 3004.7. Demonstrate that equipment withstands maximum short-circuit current for time equivalent to tripping time of primary relay protection or total clearing time of fuse. To determine temperatures that damage insulation, use curves from cable manufacturers or from listed standards indicating conductor size and short-circuit current.

H. Generator Protection: Select protection in accordance with manufacturer's published instructions and IEEE C37.102.

I. Include AC fault-current decay from induction motors, synchronous motors, and asynchronous generators and apply to low- and medium-voltage, three-phase AC systems. Also account for fault-current DC decrement, to address asymmetrical requirements of interrupting equipment.

J. Include coordination of ground-fault protection devices.

K. Calculate short-circuit momentary and interrupting duties for three-phase bolted fault and single line-to-ground fault at equipment indicated on one-line diagram.

1. For grounded systems, provide bolted line-to-ground fault-current study for areas as defined for three-phase bolted fault short-circuit study.

L. Protective Device Evaluation:

1. Evaluate equipment and protective devices and compare to short-circuit ratings.
2. Adequacy of switchgear, motor-control centers, and panelboard bus bars to withstand short-circuit stresses.
3. Application of series-rated devices must be recertified, complying with requirements in NFPA 70.
4. Include in report identification of protective device applied outside its capacity.

3.5 ARC-FLASH HAZARD STUDY

A. Comply with NFPA 70E, including Annex D, for arc-flash hazard study.

B. Preparatory Studies: Obtain short-circuit study and overcurrent protective device coordination study results prior to starting arc-flash hazard study.

C. Calculate maximum and minimum contributions of fault-current size.

1. Maximum calculation must assume maximum contribution from utility and must assume motors to be operating under full-load conditions.
2. Calculate arc-flash energy at 85 percent of maximum short-circuit current in accordance with IEEE 1584 recommendations.
3. Calculate arc-flash energy at 38 percent of maximum short-circuit current in accordance with NFPA 70E recommendations.
4. Calculate arc-flash energy with utility contribution at minimum and assume no motor contribution.

D. Calculate arc-flash protection boundary and incident energy at locations in electrical distribution system where personnel could perform work on energized parts.

E. Include medium- and low-voltage equipment locations.

F. Calculate limited, restricted, and prohibited approach boundaries for each location.

G. Incident energy calculations must consider accumulation of energy over time when performing arc-flash calculations on buses with multiple sources. Iterative calculations must account for changing current contributions, as sources are interrupted or decremented with time. Fault contribution from motors and generators must be decremented as follows:

1. Fault contribution from induction motors must not be considered beyond three to five cycles.
2. Fault contribution from synchronous motors and generators must be decayed to match actual decrement of each as closely as possible (for example, contributions from permanent magnet generators will typically decay from 10 p.u. to 3 p.u. after 10 cycles).

H. Arc-flash energy must generally be reported for maximum of line or load side of circuit breaker. However, arc-flash computation must be performed and reported for both line and load side of circuit breaker as follows:

1. When circuit breaker is in separate enclosure.
2. When line terminals of circuit breaker are separate from work location.

I. Base arc-flash calculations on actual overcurrent protective device clearing time. Cap maximum clearing time at two seconds based on IEEE 1584, Section B.1.2.

3.6 POWER SYSTEM STUDY REPORTS

A. Preparation of Power System Study Reports: Prepare and submit the following:

1. Short-Circuit Study Report Contents:

   a. Executive summary of study findings.
   b. Study descriptions, purpose, basis, and scope. Include case descriptions, definition of terms, and guide for interpretation of results.
   c. One-line diagram of modeled power system, showing the following:

      1) Protective device designations and ampere ratings.
      2) Conductor types, sizes, and lengths.
      3) Transformer kVA and voltage ratings.
      4) Motor and generator designations and kVA ratings.
      5) Switchgear, switchboard, motor-control center, and panelboard designations and ratings.
      6) Derating factors and environmental conditions.
      7) Revisions to electrical equipment required by study.

   d. Comments and recommendations for system improvements or revisions in written document, separate from one-line diagram.
   e. Short-Circuit Study Input Data:

      1) One-line diagram of system being studied.
      2) Power sources available.
      3) Manufacturer, model, and interrupting rating of protective devices.
      4) Conductors.
      5) Transformer data.

   f. Protective Device Evaluation:

      1) Evaluate equipment and protective devices and compare to available short-circuit currents. Verify that equipment withstand ratings exceed available short-circuit current at equipment installation locations.
      2) Tabulations of circuit breaker, fuse, and other protective device ratings versus calculated short-circuit duties.
      3) For 600 V overcurrent protective devices, ensure that interrupting ratings are equal to or higher than calculated 1/2-cycle symmetrical fault current.
      4) For devices and equipment rated for asymmetrical fault current, apply multiplication factors listed in standards to 1/2-cycle symmetrical fault current.
      5) Verify adequacy of phase conductors at maximum three-phase bolted fault currents; verify adequacy of equipment grounding conductors and grounding electrode conductors at maximum ground-fault currents. Ensure that short-circuit withstand ratings are equal to or higher than calculated 1/2-cycle symmetrical fault current.

   g. Short-Circuit Study Output Reports:

      1) Low-Voltage Fault Report: Three-phase and unbalanced fault calculations, showing the following for each overcurrent device location:

         a) Voltage.
         b) Calculated fault-current magnitude and angle.
         c) Fault-point X/R ratio.

d) Equivalent impedance.

2) Momentary Duty Report: Three-phase and unbalanced fault calculations, showing the following for each overcurrent device location:

a) Voltage.
b) Calculated symmetrical fault-current magnitude and angle.
c) Fault-point X/R ratio.
d) Calculated asymmetrical fault currents based on fault-point X/R ratio; based on calculated symmetrical value multiplied by 1.6; and based on calculated symmetrical value multiplied by 2.7.

3) Interrupting Duty Report: Three-phase and unbalanced fault calculations, showing the following for each overcurrent device location:

a) Voltage.
b) Calculated symmetrical fault-current magnitude and angle.
c) Fault-point X/R ratio.
d) No AC Decrement (NACD) ratio.
e) Equivalent impedance.
f) Multiplying factors for 2-, 3-, 5-, and 8-cycle circuit breakers rated on symmetrical basis.
g) Multiplying factors for 2-, 3-, 5-, and 8-cycle circuit breakers rated on total basis.

2. Overcurrent Protection Device Coordination Study Report Contents:

a. Executive summary of study findings.
b. Study descriptions, purpose, basis, and scope. Include case descriptions, definition of terms, and guide for interpretation of results.
c. One-line diagram of modeled power system, showing the following:

1) Protective device designations and ampere ratings.
2) Conductor types, sizes, and lengths.
3) Transformer kVA and voltage ratings.
4) Motor and generator designations and kVA ratings.
5) Switchgear, switchboard, motor-control center, and panelboard designations.
6) Revisions to electrical equipment required by study.

d. Report recommended settings of protective devices, ready to be applied in field. Use manufacturer's data sheets for recording recommended setting of overcurrent protective devices when available.

1) Phase and Ground Relays:

a) Device tag.
b) Relay current transformer ratio and tap, time dial, and instantaneous pickup value.
c) Recommendations on improved relaying systems, if applicable.

2) Circuit Breakers:

a) Adjustable pickups and time delays (long time, short time, and ground).
b) Adjustable time-current characteristic.

c) Adjustable instantaneous pickup.
d) Recommendations on improved trip systems, if applicable.

3) Fuses: Show current rating, voltage, and class.

e. Time-Current Coordination Curves: Determine settings of overcurrent protective devices to achieve selective coordination. Graphically illustrate that adequate time separation exists between devices installed in series, including power utility company's upstream devices. Prepare separate sets of curves for switching schemes and for emergency periods where power source is local generation. Show the following information:

1) Device tag and title, one-line diagram with legend identifying portion of system covered.
2) Terminate device characteristic curves at point reflecting maximum symmetrical or asymmetrical fault current to which device is exposed.
3) Identify device associated with each curve by manufacturer type, function, and, if applicable, tap, time delay, and instantaneous settings recommended.
4) Plot the following listed characteristic curves, as applicable:

a) Power utility's overcurrent protective device.
b) Medium-voltage equipment overcurrent relays.
c) Medium- and low-voltage fuses including manufacturer's minimum melt, total clearing, tolerance, and damage bands.
d) Low-voltage equipment circuit-breaker trip devices, including manufacturer's tolerance bands.
e) Transformer full-load current, magnetizing inrush current, and ANSI through-fault protection curves.
f) Cables and conductors damage curves.
g) Ground-fault protective devices.
h) Motor-starting characteristics and motor damage points.
i) Generator short-circuit decrement curve and generator damage point.
j) Largest feeder circuit breaker in each motor-control center and panelboard.

5) Maintain selectivity for tripping currents caused by overloads.
6) Maintain maximum achievable selectivity for tripping currents caused by overloads on series-rated devices.
7) Provide adequate time margins between device characteristics such that selective operation is achieved.
8) Comments and recommendations for system improvements.

3. Arc-Flash Hazard Study Report Contents:

a. Executive summary of study findings.
b. Study descriptions, purpose, basis, and scope. Include case descriptions, definition of terms, and guide for interpretation of results.
c. One-line diagram, showing the following:

1) Protective device designations and ampere ratings.
2) Conductor types, sizes, and lengths.
3) Transformer kVA and voltage ratings, including derating factors and environmental conditions.
4) Motor and generator designations and kVA ratings.
5) Switchgear, switchboard, motor-control center, panelboard designations, and ratings.

d. Short-circuit study output data.
e. Overcurrent protective device coordination study report contents.
f. Arc-Flash Study Output Reports:

1) Interrupting Duty Report: Three-phase and unbalanced fault calculations, showing the following for each equipment location included in report:

a) Voltage.
b) Calculated symmetrical fault-current magnitude and angle.
c) Fault-point X/R ratio.
d) No AC Decrement (NACD) ratio.
e) Equivalent impedance.
f) Multiplying factors for 2-, 3-, 5-, and 8-cycle circuit breakers rated on symmetrical basis.
g) Multiplying factors for 2-, 3-, 5-, and 8-cycle circuit breakers rated on total basis.

g. Incident Energy and Flash Protection Boundary Calculations:

1) Arcing fault magnitude.
2) Protective device clearing time.
3) Duration of arc.
4) Arc-flash boundary.
5) Restricted approach boundary.
6) Limited approach boundary.
7) Working distance.
8) Incident energy.
9) Hazard risk category.
10) Recommendations for arc-flash energy reduction.

h. Fault study input data, case descriptions, and fault-current calculations including definition of terms and guide for interpretation of computer printout.

3.7 FIELD ADJUSTMENT FOR DEVICE COORDINATION

A. Adjust relay and protective device settings in accordance with recommended settings provided by coordination study. Field adjustments must be completed by engineering service division of equipment manufacturer under "Startup and Acceptance Testing" contract portion.

B. Make minor modifications to equipment as required to accomplish compliance with short-circuit and protective device coordination studies.

C. Testing and adjusting must be by qualified low-voltage electrical testing and inspecting agency.

1. Perform each visual and mechanical inspection and electrical test stated in NETA ATS. Certify compliance with test parameters. Perform NETA tests and inspections for adjustable overcurrent protective devices.

3.8 WARNING LABELING OF ARC-FLASH HAZARDS

A. Apply onearc-flash label on front cover of each section of equipment for each equipment included in study, including each piece of equipment listed below:

1. Medium-voltage switchgear.
2. Medium-voltage switches.
3. Medium voltage transformers.
4. Low-voltage switchgear.
5. Switchboards.
6. Panelboards.
7. Motor-control centers.
8. Low voltage transformers.
9. Safety switches.
10. Control panels.

B. Base arc-flash label data on highest values calculated at each location.

C. Machine print warning labels with no handwritten or field-applied markings.

D. Install arc-flash warning labels under direct supervision and control of qualified electrical professional engineer.

E. Indicate on record Drawings location of equipment where personnel could be exposed to arc-flash hazard during their work.

1. Indicate arc-flash energy.
2. Indicate protection level required.

END OF SECTION 26 0573

SECTION 26 2213

LOW-VOLTAGE DISTRIBUTION TRANSFORMERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes distribution, dry-type transformers with a nominal primary and secondary rating of 600 V and less, with capacities up to 1500 kVA.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings:

1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
2. Vibration Isolation Base Details: Detail fabrication including anchorages and attachments to structure and to supported equipment.
3. Include diagrams for power, signal, and control wiring.

1.3 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
3. Siemens Energy & Automation, Inc.
4. Square D; a brand of Schneider Electric.

2.2 GENERAL TRANSFORMER REQUIREMENTS

A. Description: Factory-assembled and -tested, air-cooled units for 60-Hz service.

B. Comply with NFPA 70.

1. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.

C. Transformers Rated 15 kVA and Larger:

1. Comply with 10 CFR 431 (DOE 2016) efficiency levels.
2. Marked as compliant with DOE 2016 efficiency levels by an NRTL.

D. Cores: Electrical grade, non-aging silicon steel with high permeability and low hysteresis losses.

E. Coils: Continuous windings without splices except for taps.

1. Coil Material: Aluminum.
2. Internal Coil Connections: Brazed or pressure type.
3. Terminal Connections: Welded.

F. Shipping Restraints: Paint or otherwise color-code bolts, wedges, blocks, and other restraints that are to be removed after installation and before energizing. Use fluorescent colors that are easily identifiable inside the transformer enclosure.

2.3 DISTRIBUTION TRANSFORMERS

A. Comply with NFPA 70.

B. Cores: One leg per phase.

C. Enclosure: Ventilated.

1. NEMA 250, Type 2: Core and coil shall be encapsulated within resin compound to seal out moisture and air.
2. KVA Ratings: Based on convection cooling only and not relying on auxiliary fans.
3. Wiring Compartment: Sized for conduit entry and wiring installation.

D. Enclosure: Ventilated.

1. NEMA 250, Type 3R: Core and coil shall be encapsulated within resin compound, sealing out moisture and air.
2. Wiring Compartment: Sized for conduit entry and wiring installation.

E. Taps for Transformers 7.5 to 24 kVA: One 5 percent tap above and one 5 percent tap below normal full capacity.

F. Taps for Transformers 25 kVA and Larger: Two 2.5 percent taps above and two 2.5 percent taps below normal full capacity.

G. Insulation Class, Smaller Than 30 kVA: 180 deg C, UL-component-recognized insulation system with a maximum of 115 deg C rise above 40 deg C ambient temperature.

H. Insulation Class, 30 kVA and Larger: 220 deg C, UL-component-recognized insulation system with a maximum of 115 deg C rise above 40 deg C ambient temperature.

I. Grounding: Provide ground-bar kit or a ground bar installed on the inside of the transformer enclosure.

J. Wall Brackets: Manufacturer's standard brackets.

2.4 IDENTIFICATION

A. Nameplates: Engraved, laminated-acrylic or melamine plastic signs for each distribution transformer, mounted with corrosion-resistant screws. Nameplates and label products are specified in Section 26 0553 "Identification for Electrical Systems."

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine conditions for compliance with enclosure- and ambient-temperature requirements for each transformer.

B. Verify that field measurements are as needed to maintain working clearances required by NFPA 70 and manufacturer's written instructions.

C. Examine walls, floors, roofs, and concrete bases for suitable mounting conditions where transformers will be installed.

D. Verify that ground connections are in place and requirements in Section 26 0526 "Grounding and Bonding for Electrical Systems" have been met. Maximum ground resistance shall be 5 ohms at location of transformer.

E. Environment: Enclosures shall be rated for the environment in which they are located. Covers for NEMA 250, Type 4X enclosures shall not cause accessibility problems.

3.2 INSTALLATION

A. Install transformers level and plumb on a concrete base with vibration-dampening supports. Locate transformers away from corners and not parallel to adjacent wall surface.

B. Construct concrete bases according to Section 03 3000 "Cast-in-Place Concrete" and anchor floor-mounted transformers according to manufacturer's written instructions and requirements in Section 26 0529 "Hangers and Supports for Electrical Systems."

1. Coordinate size and location of concrete bases with actual transformer provided. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified with concrete.

C. Secure transformer to concrete base according to manufacturer's written instructions.

D. Secure covers to enclosure and tighten all bolts to manufacturer-recommended torques to reduce noise generation.

E. Remove shipping bolts, blocking, and wedges.

3.3 CONNECTIONS

A. Ground equipment according to Section 26 0526 "Grounding and Bonding for Electrical Systems."

B. Connect wiring according to Section 26 0519 "Low-Voltage Electrical Power Conductors and Cables."

C. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A-486B.

D. Provide flexible connections at all conduit and conductor terminations and supports to eliminate sound and vibration transmission to the building structure.

3.4 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Small (Up to 167-kVA Single-Phase or 500-kVA Three-Phase) Dry-Type Transformer Field Tests:

1. Visual and Mechanical Inspection.

    a. Inspect physical and mechanical condition.
    b. Inspect anchorage, alignment, and grounding.
    c. Verify that resilient mounts are free and that any shipping brackets have been removed.
    d. Verify the unit is clean.
    e. Perform specific inspections and mechanical tests recommended by manufacturer.
    f. Verify that as-left tap connections are as specified.
    g. Verify the presence of surge arresters and that their ratings are as specified.

2. Electrical Tests:

    a. Measure resistance at each winding, tap, and bolted connection.
    b. Perform insulation-resistance tests winding-to-winding and each winding-to-ground. Apply voltage according to manufacturer's published data. In the absence of manufacturer's published data, comply with NETA ATS, Table 100.5. Calculate polarization index: the value of the index shall not be less than 1.0.
    c. Perform turns-ratio tests at all tap positions. Test results shall not deviate by more than one-half percent from either the adjacent coils or the calculated ratio. If test fails, replace the transformer.
    d. Verify correct secondary voltage, phase-to-phase and phase-to-neutral, after energization and prior to loading.

C. Remove and replace units that do not pass tests or inspections and retest as specified above.

D. Test Labeling: On completion of satisfactory testing of each unit, attach a dated and signed "Satisfactory Test" label to tested component.

3.5 CLEANING

A. Vacuum dirt and debris; do not use compressed air to assist in cleaning.

END OF SECTION

SECTION 26 2413

SWITCHBOARDS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Service and distribution switchboards rated 600 V and less.
2. Surge protection devices.
3. Disconnecting and overcurrent protective devices.
4. Instrumentation.
5. Control power.
6. Accessory components and features.
7. Identification.

1.2 ACTION SUBMITTALS

A. Product Data: For each switchboard, overcurrent protective device, surge protection device, ground-fault protector, accessory, and component.

B. Shop Drawings: For each switchboard and related equipment.

1. Include dimensioned plans, elevations, sections, and details, including required clearances and service space around equipment. Show tabulations of installed devices, equipment features, and ratings.
2. Detail enclosure types for types other than NEMA 250, Type 1.
3. Detail bus configuration, current, and voltage ratings.
4. Detail short-circuit current rating of switchboards and overcurrent protective devices.
5. Detail utility company's metering provisions with indication of approval by utility company.
6. Include evidence of NRTL listing for series rating of installed devices.
7. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.
8. Include time-current coordination curves for each type and rating of overcurrent protective device included in switchboards. Submit on translucent log-log graft paper; include selectable ranges for each type of overcurrent protective device.
9. Include schematic and wiring diagrams for power, signal, and control wiring.

1.3 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: An employer of workers qualified as defined in NEMA PB 2.1 and trained in electrical safety as required by NFPA 70E.

B. Testing Agency Qualifications: Member company of NETA or an NRTL.

1.5 FIELD CONDITIONS

A. Installation Pathway: Remove and replace access fencing, doors, lift-out panels, and structures to provide pathway for moving switchboards into place.

B. Environmental Limitations:

1. Do not deliver or install switchboards until spaces are enclosed and weathertight, wet work in spaces is complete and dry, work above switchboards is complete, and HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.
2. Rate equipment for continuous operation under the following conditions unless otherwise indicated:

    a. Ambient Temperature: Not exceeding 104 deg F.
    b. Altitude: Not exceeding 6600 feet.

1.6 WARRANTY

A. Manufacturer's Warranty: Manufacturer agrees to repair or replace switchboard enclosures, buswork, overcurrent protective devices, accessories, and factory installed interconnection wiring that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Three years from date of Substantial Completion.

B. Manufacturer's Warranty: Manufacturer's agrees to repair or replace surge protection devices that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SWITCHBOARDS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
3. Siemens Energy & Automation, Inc.
4. Square D; a brand of Schneider Electric.

B. Source Limitations: Obtain switchboards, overcurrent protective devices, components, and accessories from single source from single manufacturer.

C. Product Selection for Restricted Space: Drawings indicate maximum dimensions for switchboards including clearances between switchboards and adjacent surfaces and other items. Comply with indicated maximum dimensions.

D. Comply with NEMA PB 2.

E. Comply with NFPA 70.

F. Comply with UL 891.

G. Front-Connected, Front-Accessible Switchboards:

1. Main Devices: Fixed, individually mounted.
2. Branch Devices: Panel mounted.
3. Sections front and rear aligned.

H. Indoor Enclosures: Steel, NEMA 250, Type 1.

I. Outdoor Enclosures: Type 3R.

1. Finish: Factory-applied finish in manufacturer's standard color; undersurfaces treated with corrosion-resistant undercoating.
2. Enclosure: Downward, rearward sloping roof; bolt-on rear covers for each section, with provisions for padlocking.

J. Space Heaters: Factory-installed electric space heaters of sufficient wattage in each vertical section to maintain enclosure temperature above expected dew point.

1. Space-Heater Control: Thermostats to maintain temperature of each section above expected dew point.
2. Space-Heater Power Source: Transformer, factory installed in switchboard.

K. Service Entrance Rating: Switchboards intended for use as service entrance equipment shall contain from one to six service disconnecting means with overcurrent protection, a neutral bus with disconnecting link, a grounding electrode conductor terminal, and a main bonding jumper.

L. Utility Metering Compartment: Barrier compartment and section complying with utility company's requirements; hinged sealable door; buses provisioned for mounting utility company's current transformers and potential transformers or potential taps as required by utility company. If separate vertical section is required for utility metering, match and align with basic switchboard. Provide service entrance label and necessary applicable service entrance features.

M. Bus Transition and Incoming Pull Sections: Matched and aligned with basic switchboard.

N. Hinged Front Panels: Allow access to circuit breaker, metering, accessory, and blank compartments.

O. Buses and Connections: Three phase, four wire unless otherwise indicated.

1. Provide phase bus arrangement A, B, C from front to back, top to bottom, and left to right when viewed from the front of the switchboard.
2. Phase- and Neutral-Bus Material: Hard-drawn copper of 98 percent conductivity, with copper circuit-breaker line connections.
3. Ground Bus: 1/4-by-2-inch- hard-drawn copper of 98 percent conductivity, equipped with mechanical connectors for feeder and branch-circuit ground conductors.
4. Main-Phase Buses and Equipment-Ground Buses: Uniform capacity for entire length of switchboard's main and distribution sections. Provide for future extensions from both ends.
5. Disconnect Links:

    a. Isolate neutral bus from incoming neutral conductors.
    b. Bond neutral bus to equipment-ground bus for switchboards utilized as service equipment or separately derived systems.

6. Neutral Buses: 100 percent of the ampacity of phase buses unless otherwise indicated, equipped with mechanical connectors for outgoing circuit neutral cables. Brace bus extensions for busway feeder neutral bus.

P. Future Devices: Equip compartments with mounting brackets, supports, bus connections, and appurtenances at full rating of circuit-breaker compartment.

2.2 SURGE PROTECTION DEVICES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
3. Siemens Energy & Automation, Inc.
4. Square D; a brand of Schneider Electric.

B. SPDs: Listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with UL 1449, Type 2.

C. Features and Accessories:

1. Integral disconnect switch.
2. Internal thermal protection that disconnects the SPD before damaging internal suppressor components.
3. Indicator light display for protection status.
4. Form-C contacts rated at 5 A and 250-V ac, one normally open and one normally closed, for remote monitoring of protection status. Contacts shall reverse on failure of any surge diversion module or on opening of any current-limiting device. Coordinate with building power monitoring and control system.
5. Surge counter.

D. Peak Surge Current Rating: The minimum single-pulse surge current withstand rating per phase shall not be less than 200 kA. The peak surge current rating shall be the arithmetic sum of the ratings of the individual MOVs in a given mode.

E. Protection modes and UL 1449 VPR for grounded wye circuits with 480Y/277 V, three-phase, four-wire circuits shall not exceed the following:

1. Line to Neutral: 1200 V for 480Y/277 V.
2. Line to Ground: 1200 V for 480Y/277 V.
3. Line to Line: 2000 V for 480Y/277 V.

F. Protection modes and UL 1449 VPR for 240/120 V, single-phase, three-wire circuits shall not exceed the following:

1. Line to Neutral: 700 V.
2. Line to Ground: 700 V.
3. Line to Line: 1000 V.

G. SCCR: Equal or exceed 100 kA.

H. Nominal Rating: 20 kA.

2.3 DISCONNECTING AND OVERCURRENT PROTECTIVE DEVICES

A. Molded-Case Circuit Breaker (MCCB): Comply with UL 489, with interrupting capacity to meet available fault currents.

1. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
2. Electronic trip circuit breakers with rms sensing; field-replaceable rating plug or field-replicable electronic trip; and the following field-adjustable settings:
   a. Long- and short-time pickup levels.
   b. Long and short time adjustments.
   c. Ground-fault pickup level, time delay, and I squared t response.

3. Current-Limiting Circuit Breakers: Frame sizes 400 A and smaller; let-through ratings less than NEMA FU 1, RK-5.
4. GFCI Circuit Breakers: Single- and double-pole configurations with Class A ground-fault protection (6-mA trip).
5. Ground-Fault Equipment Protection (GFEP) Circuit Breakers: Class B ground-fault protection (30-mA trip).
6. MCCB Features and Accessories:

   a. Standard frame sizes, trip ratings, and number of poles.
   b. Lugs: Mechanical style, suitable for number, size, trip ratings, and conductor material.
   c. Ground-Fault Protection: Integrally mounted relay and trip unit with adjustable pickup and time-delay settings, push-to-test feature, and ground-fault indicator.

2.4 INSTRUMENTATION

A. Multifunction Digital-Metering Monitor: Microprocessor-based unit suitable for three- or four-wire systems and with the following features:

1. Switch-selectable digital display of the following values with maximum accuracy tolerances as indicated:

a. Phase Currents, Each Phase: Plus or minus 0.5 percent.
b. Phase-to-Phase Voltages, Three Phase: Plus or minus 0.5 percent.
c. Phase-to-Neutral Voltages, Three Phase: Plus or minus 0.5 percent.
d. Megawatts: Plus or minus 1 percent.
e. Megavars: Plus or minus 1 percent.
f. Power Factor: Plus or minus 1 percent.
g. Frequency: Plus or minus 0.1 percent.
h. Accumulated Energy, Megawatt Hours: Plus or minus 1 percent; accumulated values unaffected by power outages up to 72 hours.
i. Megawatt Demand: Plus or minus 1 percent; demand interval programmable from five to 60 minutes.
j. Contact devices to operate remote impulse-totalizing demand meter.

2. Mounting: Display and control unit flush or semiflush mounted in instrument compartment door.

2.5 CONTROL POWER

A. Control Circuits: 120-V ac, supplied through secondary disconnecting devices from control-power transformer.

2.6 IDENTIFICATION

A. Service Equipment Label: NRTL labeled for use as service equipment for switchboards with one or more service disconnecting and overcurrent protective devices.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Receive, inspect, handle, and store switchboards according to NEMA PB 2.1.

B. Install switchboards and accessories according to NEMA PB 2.1.

C. Equipment Mounting: Install switchboards on concrete base, 4-inch nominal thickness. Comply with requirements for concrete base specified in Section 03 3000 "Cast-in-Place Concrete."

1. Install conduits entering underneath the switchboard, entering under the vertical section where the conductors will terminate. Install with couplings flush with the concrete base. Extend 2 inches above concrete base after switchboard is anchored in place.
2. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of concrete base.
3. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete floor.
4. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
5. Install anchor bolts to elevations required for proper attachment to switchboards.

D. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, straps and brackets, and temporary blocking of moving parts from switchboard units and components.

E. Operating Instructions: Frame and mount the printed basic operating instructions for switchboards, including control and key interlocking sequences and emergency procedures. Fabricate frame of finished wood or metal and cover instructions with clear acrylic plastic. Mount on front of switchboards.

F. Install filler plates in unused spaces of panel-mounted sections.

G. Install overcurrent protective devices, surge protection devices, and instrumentation.

1. Set field-adjustable switches and circuit-breaker trip ranges.

H. Comply with NECA 1.

3.2 IDENTIFICATION

A. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs complying with requirements for identification specified in Section 26 0553 "Identification for Electrical Systems."

B. Switchboard Nameplates: Label each switchboard compartment with a nameplate complying with requirements for identification specified in Section 26 0553 "Identification for Electrical Systems."

C. Device Nameplates: Label each disconnecting and overcurrent protective device and each meter and control device mounted in compartment doors with a nameplate complying with requirements for identification specified in Section 26 0553 "Identification for Electrical Systems."

3.3 FIELD QUALITY CONTROL

A. Perform the following tests and inspections with the assistance of a factory-authorized service representative:

1. Acceptance Testing:

a. Test insulation resistance for each switchboard bus, component, connecting supply, feeder, and control circuit. Open control and metering circuits within the switchboard, and remove neutral connection to surge protection and other electronic devices prior to insulation test. Reconnect after test.
b. Test continuity of each circuit.

2. Test ground-fault protection of equipment for service equipment per NFPA 70.
3. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
4. Correct malfunctioning units on-site where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
5. Test and adjust controls, remote monitoring, and safeties. Replace damaged and malfunctioning controls and equipment.

B. Switchboard will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports, including a certified report that identifies switchboards included and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.4 DEMONSTRATION

A. Train Owner's maintenance personnel to adjust, operate, and maintain switchboards, overcurrent protective devices, instrumentation, and accessories.

END OF SECTION

SECTION 26 2416

PANELBOARDS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Distribution panelboards.
2. Lighting and appliance branch-circuit panelboards.

1.2 DEFINITIONS

A. MCCB: Molded-case circuit breaker.

B. SPD: Surge protective device.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of panelboard.

B. Shop Drawings: For each panelboard and related equipment.

1. Include dimensioned plans, elevations, sections, and details.
2. Detail enclosure types including mounting and anchorage, environmental protection, knockouts, corner treatments, covers and doors, gaskets, hinges, and locks.
3. Detail bus configuration, current, and voltage ratings.
4. Short-circuit current rating of panelboards and overcurrent protective devices.
5. Include evidence of NRTL listing for SPD as installed in panelboard.
6. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.
7. Include wiring diagrams for power, signal, and control wiring.
8. Include time-current coordination curves for each type and rating of overcurrent protective device included in panelboards.

1.4 INFORMATIONAL SUBMITTALS

A. Panelboard schedules for installation in panelboards.

1.5 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

1.6 WARRANTY

A. Manufacturer's Warranty: Manufacturer agrees to repair or replace panelboards that fail in materials or workmanship within specified warranty period.

1. Panelboard Warranty Period: 24 months from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PANELBOARDS COMMON REQUIREMENTS

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with NEMA PB 1.

C. Comply with NFPA 70.

D. Enclosures: Flush and Surface-mounted, dead-front cabinets.

1. Rated for environmental conditions at installed location.

a. Indoor Dry and Clean Locations: NEMA 250, Type 1.
b. Outdoor Locations: NEMA 250, Type 3R.
c. Wash-Down Areas: NEMA 250, Type 4X, stainless steel.
d. Other Wet or Damp Indoor Locations: NEMA 250, Type 4.
e. Indoor Locations Subject to Dust, Falling Dirt, and Dripping Noncorrosive Liquids: NEMA 250, Type 12.

2. Height: 84 inches maximum.
3. Hinged Front Cover: Entire front trim hinged to box and with standard door within hinged trim cover. Trims shall cover all live parts and shall have no exposed hardware.

E. Phase, Neutral, and Ground Buses: Hard-drawn copper, 98 percent conductivity.

F. Conductor Connectors: Suitable for use with conductor material and sizes.

1. Material: Hard-drawn copper, 98 percent conductivity.
2. Main and Neutral Lugs: Compression type, with a lug on the neutral bar for each pole in the panelboard.
3. Ground Lugs and Bus-Configured Terminators: Compression type, with a lug on the bar for each pole in the panelboard.
4. Feed-Through Lugs: Compression type, suitable for use with conductor material. Locate at opposite end of bus from incoming lugs or main device.
5. Subfeed (Double) Lugs: Compression type suitable for use with conductor material. Locate at same end of bus as incoming lugs or main device.

G. NRTL Label: Panelboards shall be labeled by an NRTL acceptable to authority having jurisdiction for use as service equipment with one or more main service disconnecting and overcurrent protective devices.

Panelboards shall have meter enclosures, wiring, connections, and other provisions for utility metering. Coordinate with utility company for exact requirements.

H. Future Devices: Panelboards shall have mounting brackets, bus connections, filler plates, and necessary appurtenances required for future installation of devices.

I. Panelboard Short-Circuit Current Rating: Fully rated to interrupt symmetrical short-circuit current available at terminals. Assembly listed by an NRTL for 100 percent interrupting capacity.

2.2 POWER PANELBOARDS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
3. Siemens Energy & Automation, Inc.
4. Square D; a brand of Schneider Electric.

B. Panelboards: NEMA PB 1, distribution type.

C. Doors: Secured with vault-type latch with tumbler lock; keyed alike.

1. For doors more than 36 inches high, provide two latches, keyed alike.

D. Mains: As indicated on drawings.

E. Branch Overcurrent Protective Devices for Circuit-Breaker Frame Sizes 125 A and Smaller: Plug-in circuit breakers where individual positive-locking device requires mechanical release for removal.

F. Branch Overcurrent Protective Devices for Circuit-Breaker Frame Sizes Larger Than 125 A: Plug-in circuit breakers where individual positive-locking device requires mechanical release for removal.

2.3 LIGHTING AND APPLIANCE BRANCH-CIRCUIT PANELBOARDS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
3. Siemens Energy & Automation, Inc.
4. Square D; a brand of Schneider Electric.

B. Panelboards: NEMA PB 1, lighting and appliance branch-circuit type.

C. Mains: As indicated on drawings.

D. Branch Overcurrent Protective Devices: Plug-in circuit breakers, replaceable without disturbing adjacent units.

E. Doors: Concealed hinges; secured with flush latch with tumbler lock; keyed alike.

2.4 DISCONNECTING AND OVERCURRENT PROTECTIVE DEVICES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
3. Siemens Energy & Automation, Inc.
4. Square D; a brand of Schneider Electric.

B. MCCB: Comply with UL 489, with interrupting capacity to meet available fault currents.

1. Thermal-Magnetic Circuit Breakers:

a. Inverse time-current element for low-level overloads.
b. Instantaneous magnetic trip element for short circuits.
c. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.

2. Electronic Trip Circuit Breakers:

a. RMS sensing.
b. Field-replaceable rating plug or electronic trip.
c. Digital display of settings, trip targets, and indicated metering displays.
d. Multi-button keypad to access programmable functions and monitored data.
e. Ten-event, trip-history log. Each trip event shall be recorded with type, phase, and magnitude of fault that caused the trip.
f. Integral test jack for connection to portable test set or laptop computer.
g. Field-Adjustable Settings:
1) Long- and short-time pickup levels.
2) Long and short time adjustments.
3) Ground-fault pickup level, time delay, and I squared T response.

3. Current-Limiting Circuit Breakers: Frame sizes 400 A and smaller; let-through ratings less than NEMA FU 1, RK-5.
4. GFCI Circuit Breakers: Single- and double-pole configurations with Class A ground-fault protection (6-mA trip).
5. GFEP Circuit Breakers: Class B ground-fault protection (30-mA trip).
6. Arc-Fault Circuit Interrupter Circuit Breakers: Comply with UL 1699; 120/240-V, single-pole configuration.
7. Subfeed Circuit Breakers: Vertically mounted.
8. MCCB Features and Accessories:

a. Standard frame sizes, trip ratings, and number of poles.
b. Breaker handle indicates tripped status.
c. UL listed for reverse connection without restrictive line or load ratings.
d. Lugs: Compression style, suitable for number, size, trip ratings, and conductor materials.
e. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HID for feeding fluorescent and HID lighting circuits.
f. Ground-Fault Protection: Integrally mounted relay and trip unit with adjustable pickup and time-delay settings, push-to-test feature, and ground-fault indicator.

2.5 IDENTIFICATION

A. Panelboard Label: Manufacturer's name and trademark, voltage, amperage, number of phases, and number of poles shall be located on the interior of the panelboard door.

B. Breaker Labels: Faceplate shall list current rating, UL and IEC certification standards, and AIC rating.

C. Circuit Directory: Directory card inside panelboard door, mounted in transparent card holder.

2.6 ACCESSORY COMPONENTS AND FEATURES

A. Portable Test Set: For testing functions of solid-state trip devices without removing from panelboard. Include relay and meter test plugs suitable for testing panelboard meters and switchboard class relays.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with NECA 1.

B. Install panelboards and accessories according to NEMA PB 1.1.

C. Mount top of trim 90 inches above finished floor unless otherwise indicated.

D. Mount panelboard cabinet plumb and rigid without distortion of box.

E. Mount recessed panelboards with fronts uniformly flush with wall finish and mating with back box.

F. Install overcurrent protective devices and controllers not already factory installed.

1. Set field-adjustable, circuit-breaker trip ranges.

G. Make grounding connections and bond neutral for services and separately derived systems to ground. Make connections to grounding electrodes, separate grounds for isolated ground bars, and connections to separate ground bars.

H. Install filler plates in unused spaces.

I. Arrange conductors in gutters into groups and bundle and wrap with wire ties.

3.2 IDENTIFICATION

A. Identify field-installed conductors, interconnecting wiring, and components; install warning signs complying with requirements in Section 26 0553 "Identification for Electrical Systems."

B. Create a directory to indicate installed circuit loads; incorporate Owner's final room designations. Obtain approval before installing. Handwritten directories are not acceptable. Install directory inside panelboard door.

C. Panelboard Nameplates: Label each panelboard with a nameplate complying with requirements for identification specified in Section 26 0553 "Identification for Electrical Systems."

D. Device Nameplates: Label each branch circuit device in power panelboards with a nameplate complying with requirements for identification specified in Section 26 0553 "Identification for Electrical Systems."

E. Install warning signs complying with requirements in Section 26 0553 "Identification for Electrical Systems" identifying source of remote circuit.

3.3 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Acceptance Testing Preparation:

1. Test insulation resistance for each panelboard bus, component, connecting supply, feeder, and control circuit.
2. Test continuity of each circuit.

C. Tests and Inspections:

1. Perform each visual and mechanical inspection and electrical test for low-voltage air circuit breakers stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.

D. Panelboards will be considered defective if they do not pass tests and inspections.

E. Prepare test and inspection reports, including a certified report that identifies panelboards included and that describes scanning results, with comparisons of the two scans. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

END OF SECTION

SECTION 26 2726

WIRING DEVICES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Standard-grade receptacles, 125 V, 20 A.
2. GFCI receptacles, 125 V, 20 A.
3. Toggle switches, 120/277 V, 20 A.
4. Decorator-style devices, 20 A.
5. Occupancy sensors.
6. Wall plates.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.3 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

PART 2 - PRODUCTS

2.1 GENERAL WIRING-DEVICE REQUIREMENTS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Pass & Seymour/Legrand (Pass & Seymour).
2. Hubbell Incorporated; Wiring Device Kellems (Hubbell).
3. Cooper Wiring Devices; Division of Cooper Industries Inc. (Cooper).

B. Wiring Devices, Components, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.

C. Comply with NFPA 70.

D. RoHS compliant.

E. Comply with NEMA WD 1.

F. Device Color:

1. Wiring Devices Connected to Normal Power System: White unless otherwise indicated or required by NFPA 70 or device listing.

G. Wall Plate Color: For plastic covers, match device color.

H. Source Limitations: Obtain each type of wiring device and associated wall plate from single source from single manufacturer.

2.2 STANDARD-GRADE RECEPTACLES, 125 V, 20 A

A. Duplex Receptacles, 125 V, 20 A:
1. Description: Two pole, three wire, and self-grounding.
2. Configuration: NEMA WD 6, Configuration 5-20R.
3. Standards: Comply with UL 498 and FS W-C-596.

B. Tamper-Resistant Duplex Receptacles, 125 V, 20 A:
1. Description: Two pole, three wire, and self-grounding. Integral shutters that operate only when a plug is inserted in the receptacle.
2. Configuration: NEMA WD 6, Configuration 5-20R.
3. Standards: Comply with UL 498 and FS W-C-596.
4. Marking: Listed and labeled as complying with NFPA 70, "Tamper-Resistant Receptacles" Article.

C. Weather-Resistant Duplex Receptacle, 125 V, 20 A:
1. Description: Two pole, three wire, and self-grounding. Integral shutters that operate only when a plug is inserted in the receptacle. Square face.
2. Configuration: NEMA WD 6, Configuration 5-20R.
3. Standards: Comply with UL 498.
4. Marking: Listed and labeled as complying with NFPA 70, "Receptacles in Damp or Wet Locations" Article.

D. Tamper- and Weather-Resistant Duplex Receptacles, 125 V, 20 A:
1. Description: Two pole, three wire, and self-grounding. Integral shutters that operate only when a plug is inserted in the receptacle. Square face.
2. Configuration: NEMA WD 6, Configuration 5-20R.
3. Standards: Comply with UL 498.
4. Marking: Listed and labeled as complying with NFPA 70, "Tamper-Resistant Receptacles" and "Receptacles in Damp or Wet Locations" articles.

2.3 STANDARD-GRADE RECEPTACLES, 125 V, 15 A

A. Duplex Receptacles, 125 V, 15 A:
1. Description: Two pole, three wire, and self-grounding.
2. Configuration: NEMA WD 6, Configuration 5-15R.
3. Standards: Comply with UL 498 and FS W-C-596.

B. Tamper-Resistant Duplex Receptacles, 125 V, 15 A:
1. Description: Two pole, three wire, and self-grounding. Integral shutters that operate only when a plug is inserted in the receptacle.
2. Configuration: NEMA WD 6, Configuration 5-15R.
3. Standards: Comply with UL 498 and FS W-C-596.

4. Marking: Listed and labeled as complying with NFPA 70, "Tamper-Resistant Receptacles" Article.

C. Weather-Resistant Duplex Receptacle, 125 V, 15 A:
1. Description: Two pole, three wire, and self-grounding. Integral shutters that operate only when a plug is inserted in the receptacle. Square face.
2. Configuration: NEMA WD 6, Configuration 5-15R.
3. Standards: Comply with UL 498.
4. Marking: Listed and labeled as complying with NFPA 70, "Receptacles in Damp or Wet Locations" Article.

D. Tamper- and Weather-Resistant Duplex Receptacles, 125 V, 15 A:
1. Description: Two pole, three wire, and self-grounding. Integral shutters that operate only when a plug is inserted in the receptacle. Square face.
2. Configuration: NEMA WD 6, Configuration 5-15R.
3. Standards: Comply with UL 498.
4. Marking: Listed and labeled as complying with NFPA 70, "Tamper-Resistant Receptacles" and "Receptacles in Damp or Wet Locations" articles.

2.4 GFCI RECEPTACLES, 125 V, 20 A

A. Duplex GFCI Receptacles, 125 V, 20 A:
1. Description: Integral GFCI with "Test" and "Reset" buttons and LED indicator light. Two pole, three wire, and self-grounding.
2. Configuration: NEMA WD 6, Configuration 5-20R.
3. Type: Non-feed through.
4. Standards: Comply with UL 498, UL 943 Class A, and FS W-C-596.

B. Tamper-Resistant Duplex GFCI Receptacles, 125 V, 20 A:
1. Description: Integral GFCI with "Test" and "Reset" buttons and LED indicator light. Two pole, three wire, and self-grounding. Integral shutters that operate only when a plug is inserted in the receptacle.
2. Configuration: NEMA WD 6, Configuration 5-20R.
3. Type: Non-feed through.
4. Standards: Comply with UL 498, UL 943 Class A, and FS W-C-596.
5. Marking: Listed and labeled as complying with NFPA 70, "Tamper-Resistant Receptacles" Article.

C. Tamper- and Weather-Resistant, GFCI Duplex Receptacles, 125 V, 20 A:
1. Description: Integral GFCI with "Test" and "Reset" buttons and LED indicator light. Two pole, three wire, and self-grounding. Integral shutters that operate only when a plug is inserted in the receptacle. Square face.
2. Configuration: NEMA WD 6, Configuration 5-15R.
3. Type: Non-feed through.
4. Standards: Comply with UL 498 and UL 943 Class A.
5. Marking: Listed and labeled as complying with NFPA 70, "Tamper-Resistant Receptacles" and "Receptacles in Damp or Wet Locations" articles.

2.5 TOGGLE SWITCHES, 120/277 V, 15 A

A. Single-Pole Switches, 120/277 V, 15 A:

1. Standards: Comply with UL 20 and FS W-S-896.

B. Two-Pole Switches, 120/277 V, 15 A:
1. Comply with UL 20 and FS W-S-896.
2. Description: Contact surfaces treated with a coating that kills 99.9 percent of certain common bacteria within two hours when regularly and properly cleaned.
3. Standards: Comply with UL 20 and FS W-S-896.

C. Three-Way Switches, 120/277 V, 15 A:
1. Comply with UL 20 and FS W-S-896.

D. Four-Way Switches, 120/277 V, 15 A:
1. Standards: Comply with UL 20 and FS W-S-896.

2.6 TOGGLE SWITCHES, 120/277 V, 20 A

A. Single-Pole Switches, 120/277 V, 20 A:
1. Standards: Comply with UL 20 and FS W-S-896.

B. Two-Pole Switches, 120/277 V, 20 A:
1. Comply with UL 20 and FS W-S-896.

C. Three-Way Switches, 120/277 V, 20 A:
1. Comply with UL 20 and FS W-S-896.

D. Four-Way Switches, 120/277 V, 20 A:
1. Standards: Comply with UL 20 and FS W-S-896.

2.7 OCCUPANCY SENSORS

A. Wall Switch Sensor Light Switch, Dual Technology:
1. Description: Switchbox-mounted, combination lighting-control sensor and conventional switch lighting-control unit using dual (ultrasonic and passive infrared) technology.
2. Standards: Comply with UL 20.
3. Rated 960 W at 120 V ac for tungsten lighting, 10 A at 120 V ac or 10 A at 277 V ac for fluorescent or LED lighting, and 1/4 hp at 120 V ac.
4. Adjustable time delay of 10 minutes.
5. Able to be locked to Automatic or Manual-On mode.
6. Automatic Light-Level Sensor: Adjustable from 2 to 200 fc.
7. Connections: Provisions for connection to BAS.
8. Connections: RJ-45 communications outlet.
9. Connections: Integral wireless networking.

2.8 DIMMERS

2.9 WALL PLATES

A. Single Source: Obtain wall plates from same manufacturer of wiring devices.

B. Single and combination types shall match corresponding wiring devices.

1. Plate-Securing Screws: Metal with head color to match plate finish.
2. Material for Finished Spaces: Smooth, high-impact thermoplastic.
3. Material for Unfinished Spaces: Galvanized steel.
4. Material for Damp Locations: Thermoplastic with spring-loaded lift cover, and listed and labeled for use in wet and damp locations.

C. Wet-Location, Weatherproof Cover Plates: NEMA 250, complying with Type 3R, weather-resistant, die-cast aluminum with lockable cover.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with NECA 1, including mounting heights listed in that standard, unless otherwise indicated.

B. Coordination with Other Trades:

1. Keep outlet boxes free of plaster, drywall joint compound, mortar, cement, concrete, dust, paint, and other material that may contaminate the raceway system, conductors, and cables.
2. Install device boxes in brick or block walls so that the cover plate does not cross a joint unless the joint is troweled flush with the face of the wall.
3. Install wiring devices after all wall preparation, including painting, is complete.

C. Device Installation:

1. Connect devices to branch circuits using pigtails that are not less than 6 inches in length.
2. When mounting into metal boxes, remove the fiber or plastic washers used to hold device-mounting screws in yokes, allowing metal-to-metal contact.

D. Device Plates: Do not use oversized or extra-deep plates. Repair wall finishes and remount outlet boxes when standard device plates do not fit flush or do not cover rough wall opening.

E. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical and with grounding terminal of receptacles on top. Group adjacent switches under single, multigang wall plates.

F. Adjust locations of floor service outlets and service poles to suit arrangement of partitions and furnishings.

3.2 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:
1. Test Instruments: Use instruments that comply with UL 1436.
2. Test Instrument for Receptacles: Digital wiring analyzer with digital readout or illuminated digital-display indicators of measurement.

B. Tests for Receptacles:

1. Line Voltage: Acceptable range is 105 to 132 V.
2. Percent Voltage Drop under 15-A Load: A value of 6 percent or higher is unacceptable.
3. Ground Impedance: Values of up to 2 ohms are acceptable.
4. GFCI Trip: Test for tripping values specified in UL 1436 and UL 943.
5. Using the test plug, verify that the device and its outlet box are securely mounted.

C. Wiring device will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

END OF SECTION

SECTION 26 2816

ENCLOSED SWITCHES AND CIRCUIT BREAKERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Fusible switches.
2. Nonfusible switches.
3. Molded-case circuit breakers (MCCBs).
4. Molded-case switches.
5. Enclosures.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of enclosed switch, circuit breaker, accessory, and component indicated. Include nameplate ratings, dimensioned elevations, sections, weights, and manufacturers' technical data on features, performance, electrical characteristics, ratings, accessories, and finishes.

1. Include time-current coordination curves (average melt) for each type and rating of overcurrent protective device; include selectable ranges for each type of overcurrent protective device. Provide in PDF electronic format.

1.3 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

1.4 QUALITY ASSURANCE

A. Testing Agency Qualifications: Accredited by NETA.

1. Testing Agency's Field Supervisor: Currently certified by NETA to supervise on-site testing.

1.5 WARRANTY

A. Manufacturer's Warranty: Manufacturer and Installer agree to repair or replace components that fail in materials or workmanship within specified warranty period.

1. Warranty Period: One year(s) from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS

A. Source Limitations: Obtain enclosed switches and circuit breakers, overcurrent protective devices, components, and accessories, within same product category, from single manufacturer.

B. Product Selection for Restricted Space: Drawings indicate maximum dimensions for enclosed switches and circuit breakers, including clearances between enclosures, and adjacent surfaces and other items. Comply with indicated maximum dimensions.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by an NRTL, and marked for intended location and application.

D. Comply with NFPA 70.

2.2 FUSIBLE SWITCHES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. ABB, Electrification Business.
2. Eaton.
3. Siemens Industry, Inc., Energy Management Division.
4. Square D; Schneider Electric USA.

B. Type HD, Heavy Duty:

1. Single throw.
2. Three pole.
3. 600-V ac.
4. 1200 A and smaller.
5. UL 98 and NEMA KS 1, horsepower rated, with clips or bolt pads to accommodate specified fuses.
6. Lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.

C. Accessories:

1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
3. Class R Fuse Kit: Provides rejection of other fuse types when Class R fuses are specified.

2.3 NONFUSIBLE SWITCHES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. ABB, Electrification Business.

2. Eaton.
3. Siemens Industry, Inc., Energy Management Division.
4. Square D; Schneider Electric USA.

B. Type HD, Heavy Duty, Three Pole, Single Throw, 600-V ac, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.

C. Accessories:

1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
3. Class R Fuse Kit: Provides rejection of other fuse types when Class R fuses are specified.

2.4 MOLDED-CASE CIRCUIT BREAKERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. ABB, Electrification Business.
2. Eaton.
3. Siemens Industry, Inc., Energy Management Division.
4. Square D; Schneider Electric USA.

B. Circuit breakers shall be constructed using glass-reinforced insulating material. Current carrying components shall be completely isolated from the handle and the accessory mounting area.

C. Circuit breakers shall have a toggle operating mechanism with common tripping of all poles, which provides quick-make, quick-break contact action. The circuit-breaker handle shall be over center, be trip free, and reside in a tripped position between on and off to provide local trip indication. Circuit-breaker escutcheon shall be clearly marked on and off in addition to providing international I/O markings. Equip circuit breaker with a push-to-trip button, located on the face of the circuit breaker to mechanically operate the circuit-breaker tripping mechanism for maintenance and testing purposes.

D. The maximum ampere rating and UL, IEC, or other certification standards with applicable voltage systems and corresponding interrupting ratings shall be clearly marked on face of circuit breaker. Circuit breakers shall be 100 percent rated. combinations for series connected interrupting ratings shall be listed by UL as recognized component combinations.

E. MCCBs shall be equipped with a device for locking in the isolated position.

F. Lugs shall be suitable for 75 deg C rated wire.

G. Standards: Comply with UL 489 with interrupting capacity to comply with available fault currents.

H. Thermal-Magnetic Circuit Breakers: Inverse time-current thermal element for low-level overloads and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.

I. Electronic Trip Circuit Breakers: Field-replaceable rating plug, rms sensing, with the following field-adjustable settings:

1. Long- and short-time pickup levels.
2. Long- and short-time time adjustments.
3. Ground-fault pickup level, time delay, and I-squared t response.

J. Features and Accessories:

1. Standard frame sizes, trip ratings, and number of poles.

2.5 ENCLOSURES

A. Enclosed Switches and Circuit Breakers: UL 489, NEMA KS 1, NEMA 250, and UL 50, to comply with environmental conditions at installed location.

B. Enclosure Finish: The enclosure shall be finished with gray baked enamel paint, electrodeposited on cleaned, phosphatized steel (NEMA 250 Type 1) or gray baked enamel paint, electrodeposited on cleaned, phosphatized galvannealed steel (NEMA 250 Types 3R, 12).

C. Conduit Entry: NEMA 250 Types 4, 4X, and 12 enclosures shall contain no knockouts. NEMA 250 Types 7 and 9 enclosures shall be provided with threaded conduit openings in both endwalls.

D. Operating Mechanism: The circuit-breaker operating handle shall be externally operable with the operating mechanism being an integral part of the box, not the cover. The cover interlock mechanism shall have an externally operated override. The override shall not permanently disable the interlock mechanism, which shall return to the locked position once the override is released. The tool used to override the cover interlock mechanism shall not be required to enter the enclosure in order to override the interlock.

E. Enclosures designated as NEMA 250 Type 4, 4X stainless steel, 12, or 12K shall have a dual cover interlock mechanism to prevent unintentional opening of the enclosure cover when the circuit breaker is ON and to prevent turning the circuit breaker ON when the enclosure cover is open.

PART 3 - EXECUTION

3.1 ENCLOSURE ENVIRONMENTAL RATING APPLICATIONS

A. Enclosed Switches and Circuit Breakers: Provide enclosures at installed locations with the following environmental ratings.

1. Indoor, Dry and Clean Locations: NEMA 250, Type 1.
2. Outdoor Locations: NEMA 250, Type 3R.
3. Wash-Down Areas: NEMA 250, Type 4X, stainless steel.
4. Other Wet or Damp, Indoor Locations: NEMA 250, Type 4.
5. Indoor Locations Subject to Dust, Falling Dirt, and Dripping Noncorrosive Liquids: NEMA 250, Type 12.

3.2 INSTALLATION

A. Coordinate layout and installation of switches, circuit breakers, and components with equipment served and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

B. Install individual wall-mounted switches and circuit breakers with tops at uniform height unless otherwise indicated.

C. Temporary Lifting Provisions: Remove temporary lifting of eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.

D. Install fuses in fusible devices.

E. Comply with NFPA 70 and NECA 1.

F. Set field-adjustable circuit-breaker trip ranges as specified in Section 26 0573.16 "Coordination Studies."

3.3 IDENTIFICATION

A. Comply with requirements in Section 26 0553 "Identification for Electrical Systems."

1. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs.
2. Label each enclosure with engraved metal or laminated-plastic nameplate.

3.4 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Tests and Inspections for Switches:

1. Visual and Mechanical Inspection:

a. Inspect physical and mechanical condition.
b. Inspect anchorage, alignment, grounding, and clearances.
c. Verify that the unit is clean.
d. Verify blade alignment, blade penetration, travel stops, and mechanical operation.
e. Verify that fuse sizes and types match the Specifications and Drawings.
f. Verify that each fuse has adequate mechanical support and contact integrity.
g. Inspect bolted electrical connections for high resistance using one of the two following methods:

1) Use a low-resistance ohmmeter.

a) Compare bolted connection resistance values to values of similar connections. Investigate values that deviate from those of similar bolted connections by more than 50 percent of the lowest value.

2) Verify tightness of accessible bolted electrical connections by calibrated torque-wrench method in accordance with manufacturer's published data or NETA ATS Table 100.12.

a) Bolt-torque levels shall be in accordance with manufacturer's published data. In the absence of manufacturer's published data, use NETA ATS Table 100.12.

h. Verify that operation and sequencing of interlocking systems is as described in the Specifications and shown on the Drawings.
i. Verify correct phase barrier installation.
j. Verify lubrication of moving current-carrying parts and moving and sliding surfaces.

2. Electrical Tests:

a. Perform resistance measurements through bolted connections with a low-resistance ohmmeter. Compare bolted connection resistance values to values of similar connections. Investigate values that deviate from adjacent poles or similar switches by more than 50 percent of the lowest value.
b. Measure contact resistance across each switchblade fuseholder. Drop values shall not exceed the high level of the manufacturer's published data. If manufacturer's published data are not available, investigate values that deviate from adjacent poles or similar switches by more than 50 percent of the lowest value.
c. Perform insulation-resistance tests for one minute on each pole, phase-to-phase and phase-to-ground with switch closed, and across each open pole. Apply voltage in accordance with manufacturer's published data. In the absence of manufacturer's published data, use Table 100.1 from the NETA ATS. Investigate values of insulation resistance less than those published in Table 100.1 or as recommended in manufacturer's published data.
d. Measure fuse resistance. Investigate fuse-resistance values that deviate from each other by more than 15 percent.
e. Perform ground fault test according to NETA ATS 7.14 "Ground Fault Protection Systems, Low-Voltage."

C. Tests and Inspections for Molded Case Circuit Breakers:

1. Visual and Mechanical Inspection:

a. Verify that equipment nameplate data are as described in the Specifications and shown on the Drawings.
b. Inspect physical and mechanical condition.
c. Inspect anchorage, alignment, grounding, and clearances.
d. Verify that the unit is clean.
e. Operate the circuit breaker to ensure smooth operation.
f. Inspect bolted electrical connections for high resistance using one of the two following methods:

1) Use a low-resistance ohmmeter.

a) Compare bolted connection resistance values to values of similar connections. Investigate values that deviate from those of similar bolted connections by more than 50 percent of the lowest value.

2) Verify tightness of accessible bolted electrical connections by calibrated torque-wrench method in accordance with manufacturer's published data or NETA ATS Table 100.12.

a) Bolt-torque levels shall be in accordance with manufacturer's published data. In the absence of manufacturer's published data, use NETA ATS Table 100.12.

g. Inspect operating mechanism, contacts, and chutes in unsealed units.
h. Perform adjustments for final protective device settings in accordance with the coordination study.

2. Electrical Tests:

a. Perform resistance measurements through bolted connections with a low-resistance ohmmeter. Compare bolted connection resistance values to values of similar connections. Investigate values that deviate from adjacent poles or similar switches by more than 50 percent of the lowest value.
b. Perform insulation-resistance tests for one minute on each pole, phase-to-phase and phase-to-ground with circuit breaker closed, and across each open pole. Apply voltage in accordance with manufacturer's published data. In the absence of manufacturer's published data, use Table 100.1 from the NETA ATS. Investigate values of insulation resistance less than those published in Table 100.1 or as recommended in manufacturer's published data.
c. Perform a contact/pole resistance test. Drop values shall not exceed the high level of the manufacturer's published data. If manufacturer's published data are not available, investigate values that deviate from adjacent poles or similar switches by more than 50 percent of the lowest value.
d. Perform insulation resistance tests on all control wiring with respect to ground. Applied potential shall be 500-V dc for 300-V rated cable and 1000-V dc for 600-V rated cable. Test duration shall be one minute. For units with solid state components, follow manufacturer's recommendation. Insulation resistance values shall be no less than two megohms.
e. Determine the following by primary current injection:

1) Long-time pickup and delay. Pickup values shall be as specified. Trip characteristics shall not exceed manufacturer's published time-current characteristic tolerance band, including adjustment factors.
2) Short-time pickup and delay. Short-time pickup values shall be as specified. Trip characteristics shall not exceed manufacturer's published time-current characteristic tolerance band, including adjustment factors.
3) Ground-fault pickup and time delay. Ground-fault pickup values shall be as specified. Trip characteristics shall not exceed manufacturer's published time-current characteristic tolerance band, including adjustment factors.
4) Instantaneous pickup. Instantaneous pickup values shall be as specified and within manufacturer's published tolerances.

f. Test functionality of the trip unit by means of primary current injection. Pickup values and trip characteristics shall be as specified and within manufacturer's published tolerances.
g. Perform minimum pickup voltage tests on shunt trip and close coils in accordance with manufacturer's published data. Minimum pickup voltage of the shunt trip and close coils shall be as indicated by manufacturer.
h. Verify correct operation of auxiliary features such as trip and pickup indicators; zone interlocking; electrical close and trip operation; trip-free, anti-pump function; and trip unit

battery condition. Reset all trip logs and indicators. Investigate units that do not function as designed.

i. Verify operation of charging mechanism. Investigate units that do not function as designed.

3. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
4. Test and adjust controls, remote monitoring, and safeties. Replace damaged and malfunctioning controls and equipment.

D. Enclosed switches and circuit breakers will be considered defective if they do not pass tests and inspections.

E. Prepare test and inspection reports.

1. Test procedures used.
2. Include identification of each enclosed switch and circuit breaker tested and describe test results.
3. List deficiencies detected, remedial action taken, and observations after remedial action.

END OF SECTION

SECTION 27 1000
STRUCTURED CABLING FOR VOICE AND DATA

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SECTION INCLUDES

A. Communications pathways.

B. Copper cable and terminations.

C. Communications and Data equipment room fittings.

D. Communications and Data outlets.

E. Communications and Data identification.

1.3 RELATED REQUIREMENTS

A. Section 07 8400 - Firestopping.

B. Section 26 0535 - Surface Raceways

C. Section 26 0533 - Raceway and Boxes for Electrical Systems

1.4 REFERENCE STANDARDS

A. BICSI N1 - Installation Practices for Telecommunications and ICT Cabling and Related Cabling Infrastructure, 1st Edition; 2019.

B. EIA/ECA-310 - Cabinets, Racks, Panels, and Associated Equipment; Revision E, 2005.

C. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

D. TIA-568 (SET) - Commercial Building Telecommunications Cabling Standard Set; 2018.

E. TIA-568.2 - Balanced Twisted-Pair Telecommunications Cabling and Components Standards; 2009c, with Addendum (2016).

F. TIA-569 - Telecommunications Pathways and Spaces; 2015d, with Addendum (2016).

G. TIA-606 - Administration Standard for Telecommunications Infrastructure; 2017c.

H. TIA-607 - Generic Telecommunications Bonding and Grounding (Earthing) for Customer Premises; 2015c, with Addendum (2017).

I. UL 444 - Communications Cables; Current Edition, Including All Revisions.

1.5 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate the work with other trades to avoid placement of other utilities or obstructions within the spaces dedicated for communications equipment.
2. Coordinate arrangement of communications equipment with the dimensions and clearance requirements of the actual equipment to be installed.
3. Notify Fuller and D'Angelo, P.C. of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

B. Preinstallation Meeting: Convene one week prior to commencing work of this section to review connection requirements and details with Owner's representative.

1.6 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for each product.

C. Evidence of qualifications for installer.

D. Field Test Reports.

1.7 QUALITY ASSURANCE

A. Manufacturer Qualifications: At least 3 years experience manufacturing products of the type specified.

B. Installer Qualifications: A company having at least 3 years experience in the installation and testing of the type of system specified, and:
   1. Supervisors and installers factory certified by manufacturers of products to be installed.
   2. Employing BICSI Registered Cabling Installation Technicians (RCIT) for supervision of all work.

C. Products: Listed, classified, and labeled as suitable for the purpose intended.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

B. Keep stored products clean and dry.

1.9 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for warranty requirements.

B. Correct defective Work within a 2 year period after Date of Substantial Completion.

PART 2 PRODUCTS

2.1 SYSTEM DESIGN

A. Provide a complete permanent system of cabling and pathways for voice and data communications, including cables, conduits and wireways, pull wires, support structures, enclosures and cabinets, and outlets.
   1. Provide fixed cables and pathways that comply with NFPA 70 and TIA-607 and are UL listed or third party independent testing laboratory certified.
   2. Provide connection devices that are rated for operation under conditions of 32 to 140 degrees F at relative humidity of 0 to 95 percent, noncondensing.
   3. In this project, the term plenum is defined as spaces above ceilings, inside ducts, under raised floors, and other air-handling spaces.

B. System Description:
   1. Provide outlets and terminations where indicated on drawings.

C. Intermediate Distribution Frames (IDF): Support structures for terminating horizontal cables that extend to telecommunications and data outlets.
   1. Locate intermediate distribution frames as indicated on the drawings.

D. Cabling to Outlets: Specified horizontal cabling, wired to IDF location indicated on the plan.

2.2 PATHWAYS

A. Conduit: See section 27 0533.13.

2.3 COPPER CABLE AND TERMINATIONS

A. Copper Horizontal Cable:
   1. Cable Type - Camera, Access Control, Voice and Data: TIA-568.2 Category 6 UTP (unshielded twisted pair); 23 AWG.
   2. Cable Capacity: 4-pair.
   3. Cable Applications: Use listed NFPA 70 Type CMP plenum cable unless otherwise indicated.
   4. Cable Jacket Color - As Noted Below:.
      a. Data: Blue
      b. Phone: White
      c. Camera: Orange

d. Access Control: Green
e. Public Adress/Clock: Purple
f. WAP: Yellow

B. Copper Cable Terminations: Insulation displacement connection (IDC) type using appropriate tool; use screw connections only where specifically indicated.

C. Jacks and Connectors: Modular RJ-45, non-keyed, terminated with 110-style insulation displacement connectors (IDC); high impact thermoplastic housing; suitable for and complying with same standard as specified horizontal cable; UL 1863 listed.
1. Performance: 500 mating cycles.
2. Voice and Data Jacks: 8-position modular jack, color-coded for both T568A and T568B wiring configurations.

D. Copper Patch Cords:
1. Description: Factory-fabricated 4-pair cable assemblies with 8-position modular connectors terminated at each end.
2. Patch Cords for Patch Panels:
a. Quantity: One for each pair of patch panel ports. Color to match cable convension
b. Length: 1 feet.

2.4 COMMUNICATIONS EQUIPMENT ROOM FITTINGS

A. Copper Cross-Connection Equipment:
1. Patch Panels for Copper Cabling: Sized to fit EIA/ECA-310 standard 19 inch wide equipment racks; 0.09 inch thick aluminum; cabling terminated on Type 110 insulation displacement connectors; printed circuit board interface.
a. Jacks: Non-keyed RJ-45, suitable for and complying with same standard as cable to be terminated; maximum 48 ports per standard width panel.
b. Capacity: Provide ports sufficient for cables to be terminated plus 25 percent spare.
c. Labels: Factory installed laminated plastic nameplates above each port, numbered consecutively; comply with TIA-606.
d. Provide incoming cable strain relief and routing guides on back of panel.
e. Mount in new rack.
f. Provide seperate patch panel for each wire category. (ie; data, phone, etc..)

B. Equipment Frames, Racks and Cabinets:
1. Component Racks: EIA/ECA-310 standard 19 inch wide.
2. Floor Mounted Racks: Aluminum or steel construction with corrosion resistant finish; vertical and horizontal cable management channels, top and bottom cable troughs, and grounding lug.

C. Cable Tray:
1. Aliminum Ladder Type
2. Provide at each data closet from cable entry location to top of data racks.

2.5 COMMUNICATIONS OUTLETS

A. Mounting Brackets: Provide at all recessed installations in gypsum board walls.
1. Flush mounting with screw set clamping ears. Size to match faceplates/

B. Outlet Boxes: Comply with Section 26 0535. for surface mounted installations in finished spaces
1. Provide depth as required to accommodate cable manufacturer's recommended minimum conductor bend radius.
2. Minimum Size, Unless Otherwise Indicated:
a. Voice / Data Outlets: 4 inch by 2 inch by 2-1/8 inch deep (100 by 50 by 54 mm) trade size.

C. Wall Plates:
1. Comply with system design standards and UL 514C.

2. Accepts modular jacks/inserts.
3. Capacity: As shown on drawings.
4. Wall Plate Material/Finish - Flush-Mounted Outlets: Match wiring device and wall plate finishes specified in Section 26 2726.

2.6 IDENTIFICATION PRODUCTS

A. Provide labeling of each end of all cable runs to comply with TIA-606.

B. Coordinate with district to match existing labeling requirements.

2.7 SOURCE QUALITY CONTROL

A. Factory test cables according to TIA-568 (SET).

PART 3 EXECUTION

3.1 INSTALLATION - GENERAL

A. Comply with latest editions and addenda of TIA-568 (SET) (cabling), TIA-569 (pathways), TIA-607 (grounding and bonding), BICSI N1, NFPA 70, and SYSTEM DESIGN as specified in PART 2.

B. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07 8400.

3.2 INSTALLATION OF PATHWAYS

A. Install pathways with the following minimum clearances:
1. 12 inches from power conduits and cables and panelboards.
2. 5 inches from fluorescent and high frequency lighting fixtures.
3. 6 inches from flues, hot water pipes, and steam pipes.

B. Outlet Boxes:
1. Coordinate locations of outlet boxes provided under Section 26 0533.16as required for installation of telecommunications outlets provided under this section.
2. Coordinate location of all outlet boxes, brackets and devices with Owner's representative.
   a. Mounting Heights: Unless otherwise indicated, as follows:
      a) Data Outlets: 18 inches above finished floor.
      b) Telephone Outlets for Wall-Mounted Telephones: 54 inches above finished floor to top of telephone.
   b. Orient outlet boxes for vertical installation of wiring devices unless otherwise indicated.

3.3 INSTALLATION OF EQUIPMENT AND CABLING

A. Cabling:
1. Do not bend cable at radius less than manufacturer's recommended bend radius; for unshielded twisted pair use bend radius of not less than 4 times cable diameter.
2. Do not over-cinch or crush cables.
3. Do not exceed manufacturer's recommended cable pull tension.
4. When installing in conduit, use only lubricants approved by cable manufacturer and do not chafe or damage outer jacket.

B. Cable Supports:
1. Properly support all cables. Do not allow cables to lay on existing ceiling. Do not use ceiling structure for support.
2. Provide spring clips, attached to building structure for individual cable support.
3. Provide J-Hook, attached to building structure or adjacent wall above suspended ceilings for support of ware bundles.
4. Provide support devices every 10' maximum.

C. Service Loops (Slack or Excess Length): Provide the following minimum extra length of cable, looped neatly:

1. At Outlets - Copper: 12 inches.

D. Copper Cabling:
1. Category 5e and Above: Maintain cable geometry; do not untwist more than 1/2 inch from point of termination.
2. For 4-pair cables in conduit, do not exceed 25 pounds pull tension.
3. Use T568A wiring configuration.

E. Floor-Mounted Racks and Enclosures: Permanently anchor to floor in accordance with manufacturer's recommendations.

F. Identification:
1. Use wire and cable markers to identify cables at each end.
2. Use manufacturer-furnished label inserts, identification labels, or engraved wallplate to identify each jack at communications outlets with unique identifier.
3. Use identification nameplate to identify cross-connection equipment, equipment racks, and cabinets.
4. Coordinate all labeling with Owner's representative to match existing labeling convention.

3.4 FIELD QUALITY CONTROL

A. Comply with inspection and testing requirements of specified installation standards.

B. Visual Inspection:
1. Inspect cable jackets for certification markings.
2. Inspect cable terminations for color coded labels of proper type.
3. Inspect outlet plates and patch panels for complete labels.
4. Inspect patch cords for complete labels.

C. Testing - Copper Cabling and Associated Equipment:
1. Category 5e and Above Links: Perform tests for wire map, length, attenuation, NEXT, and propagation delay.

D. Final Testing: After all work is complete, including installation of telecommunications outlets, and telephone dial tone service is active, test each voice jack for dial tone.

END OF SECTION

SECTION 27 5313
INTEGRATED ELECTRONIC COMMUNICATIONS AND CLOCK NETWORK

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The drawings and general provisions of the Contract Documents apply to this Section.

B. Section 27 1000 - Structured Cabling for Voice and Data: Wiring and termination requirements.

1.2 SUMMARY

A. This section includes the installation of Classroom Speaker/Message Board Assembly, Dual Push-Button Call Switch, Corridor Message Boards and Corridor speakers.

1.3 SUBMITTALS

A. Product data for each component.

B. Field Test Reports: Indicate and interpret test results for compliance with performance requirements. Include record of final matching transformer-tap settings, and signal ground-resistance measurement certified by Installer.

C. Maintenance Data: For equipment to be included in maintenance manuals specified in Division 1.
   1. Record of Owners equipment-programming option decisions.
   2. All instructions necessary for proper operation and manufacturer's instructions.
   3. "Proof of Performance" information.
   4. Manufacturer's maintenance information.

D. A copy of the manufacturer's standard statement of warranty proving all equipment provided for the school communications network is covered with the required five-year warranty shall be included with the project submittal. This statement of warranty shall be provided on the manufacturer's stationary.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: An experienced Installer who is an authorized representative of equipment manufacturer for both installation and maintenance of equipment required for this Section.

B. Comply with NFPA 70

C. Comply with NEMA Standard SB-40 for Emergency Communications in K-12 schools.

D. Comply with UL 60950.

1.5 WARRANTY

A. Provide a manufacturer's five-year warranty of the equipment against defects in material and workmanship. This warranty will cover all electronic system components. Additional warranties cover clocks, speakers, and call in switches. If any defects are found within the warranty period, the defective equipment shall be replaced at no cost (equipment only); a one-year warranty shall be provided for labor.

1.6 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide devices from the following system:
   1. Telecenter manufactured by Rauland
      a. Authorized Rauland Distributor contact:
         a) Name: Open Systems Metro; Sean Werlau
         b) email: swerlau@osmetro.com

PART 2 PRODUCTS

2.1 EQUIPMENT AND MATERIAL

A. IP Addressable Modules:
   1. System shall provide multiple IP Addressable Modules for intercom, paging and relay activation.
      a. All Modules are POE 802.3af compliant

b. All Modules support DHCP.
c. All Modules connect to network with a single RJ45 connector

2. IP Addressable Classroom Speaker Module
   a. Shall interface to school's data network, a classroom speaker, and multiple call switches.
   b. The ability to belong to one or more of a minimum of 100 independent zones for zone paging, program/music distribution zones and class change tone zones; this assignment is a programmable function, changeable by time of day. Each IP Speaker Module's location shall be programmed in software to belong to any combination of software zones. IP Speaker Modules shall be designed to mount near ceiling and wall speakers and in the plenum space.
   c. Intercom and paging volume adjustable from Software interface.
   d. Module will support and power a status light that displays individual classroom information including call-ins placed, testing status and emergency check-in status.
   e. Model: TCC2011B
3. POE Combination Speaker/Clock/Message Board
   a. Shall be IP addressable
   b. Houses a message board IP speaker module, and speaker in single baffle.
   c. Include a high efficiency, full range 8" speaker and a small message board
   d. Transmits system audio and shows time on digital display
   e. Visually indicates condition changes and audio messaging
   f. Shall be flush or surface mount
   g. Connects to IP Classroom module for control, programming, and distributed audio and visual messaging.
   h. Model: ACC3011S

B. Emergency/Check-In Call Switch – Rauland Check-In Call In Switch
   1. Emergency/Check-In Call Switched indicated on the drawings shall provide the following functions and features:
      a. One (1) "Emergency" call switch that shall activate a distinctive "EMERGENCY" level call from single button activation. The button shall be red in color and shall be clearly marked "EMERGENCY" and will route the call-in to any one or more Administrative Consoles and/or Displays for quick and easy response from an Administrative Consoles.
      b. One (1) "CHECK-IN" call switch that shall activate a distinctive "CHECK-IN" level call from single button activation. The button shall be blue in color and shall be clearly marked "CHECK-IN" and will route the call-in to any one or more Administrative Consoles. This button will be used for emergency check-ins during school emergencies, notifying the front office of the classroom occupants' safety during an emergency.

C. Classroom Visual message boards.
   1. Can be powered by either POE or POE+ depending on size and features.
   2. 1 line 8 by 40 LED
   3. 3 color LEDs: Red, Amber and Green
   4. Installed in combination speaker/message board assembly.
   5. Telecenter U Model TCC3011S

D. Corridor Visual message boards.
   1. Can be powered by either POE or POE+ depending on size and features.
   2. 2 lines 16 by 80 LED display
   3. 3 color LEDs: Red, Amber and Green
   4. Dual faced back to back mounting bracket. Model: TCC30DFM
   5. Telecenter U Model TCC3012L

E. Interior Corridor Ceiling Speakers
   1. Provide Ceiling Speaker Assembly consisting of 8 Ohm, 8" speaker mounted in a 2 foot by 2 foot, or 2 foot by 1 foot, lay-in baffle, with an integrated back box that covers the full area of the baffle.
   2. The speaker shall be connected by inserting an 8-pin RJ45 terminated CAT 5e or Cat 6 cable.
   3. The speaker shall include provisions to allow attachment of a safety cable if required.
   4. Model: BAFKIT2X2L8RJ

F. EQUIPMENT AND MATERIALS

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine conditions for compliance with requirements and other conditions affecting the performance of the School Communications and School Safety Network.

B. Do not proceed until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Install system in accordance with NFPA 70 and other applicable codes. Install equipment in accordance with manufacturer's written instructions.

B. Furnish and install all material, devices, components and equipment specified for connections to campus wide network system.

C. All housings are to be located as indicated.

D. Wiring within Enclosures: Provide adequate length of conductors. Bundle, lace, and train the conductors to terminal points with no excess. Provide and use lacing bars.

E. Provide physical isolation from speaker-microphone, telephone, line-level wiring, and power wiring. Run in separate raceways, or where exposed or in same enclosure, provide 12-inch minimum separation between conductors to speaker-microphones, telephone wiring and adjacent parallel power. Provide physical separation as recommended by equipment manufacturer for other system conductors.

F. Identification of Conductors and Cables: Use color coding of conductors and apply wire and cable marking tape to designate wires and cables so all media are identified in coordination with system wiring diagrams. See section 27 1000 for requirements.

3.3 GROUNDING

A. Ground equipment, conductor, and cable shields to eliminate shock hazard and to minimize to the greatest extent possible, ground loops, common mode returns, noise pickup, cross talk, and other impairments. Provide 5-ohm ground at main equipment location. Measure, record, and report ground resistance.

3.4 FIELD QUALITY CONTROL

A. Inspection: Make observations to verify that units and controls are properly labeled, and interconnecting wires and terminals are identified. Provide a list of final tap settings of paging speaker line matching transformers.

B. Testing: Rectify deficiencies indicated by tests and completely re-test work affected by such deficiencies at Contractor's expense. Verify by the system test that the total system meets the Specifications and complies with applicable standards.

3.5 CLEANING AND PROTECTION

A. Prior to final acceptance, the contractor shall vacuum and clean all system components and protect them from damage and deterioration. All blank spaces in equipment cabinets will be covered with blank panels. Top and side panels, and all cabinet doors will be installed. All general areas within and around all equipment rack/cabinets in the facility will be swept, vacuumed, and cleaned up. No cabinets will be left unlocked and all cabinet keys will be turned over to the owner or designated owner's representative.

END OF SECTION

SECTION 28 2000
VIDEO SURVEILLANCE

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Cameras.

1.2 RELATED REQUIREMENTS

A. Section 07 8400 - Firestopping.

B. Section 26 0526 - Grounding and Bonding for Electrical Systems.

C. Section 26 0529 - Hangers and Supports for Electrical Systems.

D. Section 26 0553 - Identification for Electrical Systems: Identification products and requirements.

E. Section 27 1000 - Structured Cabling for Voice and Data: Data cables for IP video surveillance system network connections.

1.3 REFERENCE STANDARDS

A. 47 CFR 15 - Radio Frequency Devices; current edition.

B. IEEE 802.3 - IEEE Standard for Ethernet; 2018.

C. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

D. NECA 303 - Standard for Installing Closed-Circuit Television (CCTV) Systems; 2005.

E. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate the placement of cameras with structural members, ductwork, piping, equipment, luminaires, diffusers, fire suppression system components, and other potential conflicts installed under other sections or by others.
2. Notify Fuller and D'Angelo, P.C. of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

B. Preinstallation Meetings:

1. Conduct meeting with facility representative to review camera and equipment locations and camera field of view objectives.

1.5 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for each system component. Include ratings, configurations, standard wiring diagrams, dimensions, finishes, service condition requirements, and installed features.

C. Warranty: Submit sample of manufacturer's warranty and documentation of final executed warranty completed in Edgemont Union Free School District's name and registered with manufacturer.

1.6 QUALITY ASSURANCE

A. Comply with the following:

1. NFPA 70.
2. Applicable TIA/EIA standards.

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

C. Installer Qualifications: Company specializing in performing the work of this section with minimum three years documented experience with video surveillance systems of similar size, type, and complexity and

providing contract maintenance service as a regular part of their business; authorized manufacturer's representative.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions and NECA 303.

B. Store products in manufacturer's unopened packaging, keep dry and protect from damage until ready for installation.

1.8 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Provide minimum one year manufacturer warranty covering repair or replacement due to defective materials or workmanship.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Cameras: Basis of Design
   1. Indoor: Johnson Controls Illustra Flex Gen4
   2. Outdoor: Tyco Illustra 600 IP
   3. Outdoor Multi-View: Tyco Flex Multi Sensor
   4. Substitutions: See Section 01 6000 - Product Requirements. Any substitutions must verify compatibility with district system.

B. Source Limitations: Where possible, furnish system components and accessories produced by single manufacturer and obtained from single supplier.

2.2 CAMERAS

A. Provide cameras and associated accessories suitable for operation under the service conditions at the installed location. Provide additional components (e.g. enclosures, heaters, blowers, etc.) as required.

B. Where not factory-installed, provide additional components (e.g. lenses, mounting accessories, etc.) as necessary for complete installation.

C. Network (IP) Cameras:
   1. Signal-to-Noise Ratio: Not less than 50 dB.
   2. Provide the following standard features:
      a. Automatic electronic shutter.
      b. Automatic gain control.
      c. Automatic white balance.
      d. Web-based interface for remote viewing and setup.
      e. Password protected security access.
   3. Indoor Network (IP) Indoor Fixed Dome Camera:
      a. Camera Type: True day/night with IR cut filter.
      b. Image Sensor: 1/2" .8" Progressive Scan CMOS imager.
      c. Resolution: Up to 5 megapixel (2560 x 1920).
      d. Frame Rate: Up to 30 frames per second (fps) at all available resolutions.
      e. Minimum Illumination: 0.1 lux color, 0.01 lux black and white.
      f. Lens: 2.7-13.5 mm varifocal; auto iris, manual focus and zoom; f_____.
      g. Power: Power over Ethernet (IEEE 802.3af).
   4. Outdoor Network (IP) Outdoor Fixed Dome Camera:
      a. Camera Type: Auto True day/night with IR cut filter.
      b. Image Sensor: 1/2" .7" Progressive Scan CMOS imager.
      c. Resolution: Up to 4 megapixel (1920 x 1080).

d. Frame Rate: Up to 30 frames per second (fps) at all available resolutions.
e. Minimum Illumination: 0.1 lux color, 0.03 lux black and white.
f. Lens: 2.7-13.5 mm varifocal; auto iris, manual focus and zoom; f_____.
g. Power: Power over Ethernet (IEEE 802.3af).

5. Outdoor Multi-View Network (IP) Outdoor Fixed Dome Camera:
a. Camera Type: True day/night with IR cut filter.
b. Image Sensor: 1/2" .8" Progressive Scan CMOS imager.
c. Resolution: Up to 4 megapixel (2560 x 1440).
d. Frame Rate: Up to 30 frames per second (fps) at all available resolutions.
e. Minimum Illumination: 0.41 lux color, 0.022 lux black and white.
f. Lens: Fixed f/2; 2.8mm.
g. Power: Power over Ethernet (IEEE 802.3af).

2.3 ACCESSORIES

A. Camera Enclosures: Where not factory-installed, provide camera enclosures suitable for operation under service conditions at installed location.

B. Camera Mounting Supports: Where not factory installed, provide mounting supports necessary for installation and as shown on contract documents..

C. Provide cables as indicated or as required for connections between system components.
1. Data Cables for IP Network Connections: Unshielded twisted pair (UTP) complying with Section 27 1000.

D. All camera wiring shall be punched down to patch panels, mounted in racks as per specification section 27 1000.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that mounting surfaces are ready to receive system components.

C. Verify that conditions are satisfactory for installation prior to starting work.

3.2 INSTALLATION

A. Install video surveillance devices in accordance with NECA 1 (general workmanship) and NECA 303.

B. Install products in accordance with manufacturer's instructions.

C. Provide required support and attachment in accordance with Section 26 0529.

D. Wiring Method: Unless otherwise indicated, use cables (not in conduit) for concealed locations, in conduit for any exposed or exterior locations.
1. Use suitable listed cables in wet locations, including underground raceways.
2. Conduit: Comply with Section 260533.
3. Conceal all cables unless specifically indicated to be exposed.
4. Route exposed cables parallel or perpendicular to building structural members and surfaces.

E. Provide grounding and bonding in accordance with Section 26 0526.

F. Identify system wiring and components in accordance with Section 26 0553 and 27 1000.

3.3 CLEANING

A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

3.4 PROTECTION

A. Protect installed system components from subsequent construction operations.

END OF SECTION

SECTION 31 2316.13
TRENCHING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SECTION INCLUDES

A. Trench excavation.

B. Backfill and compaction.

C. Backfilling and compacting for utilities outside the building to utility main connections.

1.3 RELATED REQUIREMENTS

A. Section 31 2200 - Grading: Site grading.

B. Section 31 2316 - Excavation: Building and foundation excavating.

1.4 DEFINITIONS

A. Finish Grade Elevations: Indicated on drawings.

1.5 REFERENCE STANDARDS

A. AASHTO T 180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18 in.) Drop; 2018.

B. ASTM D698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)); 2012, with Editorial Revision (2015).

C. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3 (2,700 kN m/m3)); 2012, with Editorial Revision (2015).

D. ASTM D698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)); 2012, with Editorial Revision (2015).

E. ASTM D1556/D1556M - Standard Test Method for Density and Unit Weight of Soil in Place by Sand-Cone Method; 2015, with Editorial Revision (2016).

F. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3 (2,700 kN m/m3)); 2012, with Editorial Revision (2015).

G. ASTM D2167 - Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method; 2015.

H. ASTM D 2922 - Standard Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth); 2005.

I. ASTM D3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth); 2005.

J. ASTM D6938 - Standard Test Methods for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth); 2017.

1.6 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Materials Sources: Submit name of imported materials source.

C. Compaction Density Test Reports.

1.7 DELIVERY, STORAGE, AND HANDLING

A. When necessary, store materials on site in advance of need.

B. When fill materials need to be stored on site, locate stockpiles where indicated.

1. Separate differing materials with dividers or stockpile separately to prevent intermixing.
2. Prevent contamination.
3. Protect stockpiles from erosion and deterioration of materials.

PART 2 PRODUCTS

2.1 FILL MATERIALS

A. Refer to Section 32 1123 - Aggregate Base Courses

2.2 ACCESSORIES

A. Geotextile: Non-biodegradable, woven.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that survey bench marks and intended elevations for the work are as indicated.

3.2 PREPARATION

A. Identify required lines, levels, contours, and datum locations.

B. Locate, identify, and protect utilities that remain and protect from damage.

C. Protect bench marks, existing structures, fences, sidewalks, paving, and curbs from excavating equipment and vehicular traffic.

D. Protect plants, lawns, rock outcroppings, and other features to remain.

E. Grade top perimeter of trenching area to prevent surface water from draining into trench. Provide temporary means and methods, as required, to maintain surface water diversion until no longer needed, or as directed by the Fuller and D'Angelo, P.C. .

3.3 TRENCHING

A. Grade top perimeter of excavation to prevent surface water collection.

B. Notify Fuller and D'Angelo, P.C. of unexpected subsurface conditions and discontinue affected work in area until notified to resume.

C. General: Cut trenches neat and clean.
   1. Slope banks of excavations deeper than 4 feet to angle of repose or less until shored.

D. Utility Preparation: Rake trench bottom to uniform grade.
   1. Remove unsuitable subgrade and backfill.
   2. Compact subgrade to density equal to or greater than subsequent fill material requirements.

E. Maintain trenches and prevent loose soil or rocks from entering.

F. Notify Construction Manager and Fuller and D'Angelo, P.C. of unexpected subsurface conditions and discontinue affected Work in area until notified to resume work.

G. Slope banks of excavations deeper than 4 feet to angle of repose or less until shored.

H. Do not interfere with 45 degree bearing splay of foundations.

I. Cut trenches wide enough to allow inspection of installed utilities.

J. Hand trim excavations. Remove loose matter.

K. Remove large stones and other hard matter that could damage piping or impede consistent backfilling or compaction.

L. Remove lumped subsoil, boulders, and rock up to 1/3 cubic yard measured by volume. See Section 31 2316.26 for removal of larger material.

M. Remove excavated material that is unsuitable for re-use from site.

N. Remove excess excavated material from site.

O. Provide temporary means and methods, as required, to remove all water from trenching until directed by the Fuller and D'Angelo, P.C. . Remove and replace soils deemed unsuitable by classification and which are excessively moist due to lack of dewatering or surface water control.

P. Determine the prevailing groundwater level prior to trenching. If the proposed trench extends less than 1 foot into the prevailing groundwater, control groundwater intrusion with perimeter drains routed to sump pumps, or as directed by the Fuller and D'Angelo, P.C. .

3.4 PREPARATION FOR UTILITY PLACEMENT

A. Cut out soft areas of subgrade not capable of compaction in place. Backfill with general fill.

B. Compact subgrade to density equal to or greater than requirements for subsequent fill material.

C. Until ready to backfill, maintain excavations and prevent loose soil from falling into excavation.

3.5 BACKFILLING

A. Backfill to contours and elevations indicated using unfrozen materials.

B. Employ a placement method that does not disturb or damage other work.

C. Systematically fill to allow maximum time for natural settlement. Do not fill over porous, wet, frozen or spongy subgrade surfaces.

D. Maintain optimum moisture content of fill materials to attain required compaction density.

E. Slope grade away from building minimum 2 inches in 10 feet, unless noted otherwise. Make gradual grade changes. Blend slope into level areas.

F. Correct areas that are over-excavated.
   1. Other areas: Use general fill, flush to required elevation, compacted to minimum 97 percent of maximum dry density.

G. Compaction Density Unless Otherwise Specified or Indicated:
   1. Under paving, slabs-on-grade, and similar construction: 97 percent of maximum dry density.

H. Reshape and re-compact fills subjected to vehicular traffic.

3.6 BEDDING AND FILL AT SPECIFIC LOCATIONS

A. Over Subdrainage Piping at drainage piping:
   1. Cover drainage fill with general fill.
   2. Compact to 98 percent of maximum dry density.

3.7 TOLERANCES

A. Top Surface of General Backfilling: Plus or minus 1 inch from required elevations.

3.8 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for general requirements for field inspection and testing.

B. Perform compaction density testing on compacted fill in accordance with ASTM D1556/D1556M, ASTM D2167, or ASTM D6938.

C. Perform compaction density testing on compacted fill in accordance with ASTM D1556, ASTM D2167, ASTM D2922, or ASTM D3017.

D. Evaluate results in relation to compaction curve determined by testing uncompacted material in accordance with ASTM D1557 ("modified Proctor"), AASHTO T 180, or ASTM D698 ("standard Proctor").

E. If tests indicate work does not meet specified requirements, remove work, replace and retest.

F. Frequency of Tests: _____.

3.9 CLEANING

A. Remove unused stockpiled materials, leave area in a clean and neat condition. Grade stockpile area to prevent standing surface water.

B. Remove all unused matrial from site.

END OF SECTION

SECTION 31 2316.26
ROCK REMOVAL

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SECTION INCLUDES

A. Removal of identified rock during excavation.

1.3 PRICE AND PAYMENT PROCEDURES

A. Section 01 2100 - Allowances for additional unit price requirements.

B. Rock Removal: By the cubic yard measured before disintegration. Includes preparation of rock for removal, mechanical disintegration of rock, removal from position, loading and removing from site. For over excavation, payment will not be made for over excavated work nor for replacement materials.

C. Trench Rock Removal: By the cubic yard measured before disintegration. Includes preparation of rock for removal, mechanical disintegration of rock, removal from position, loading and removing from site. For over excavation, payment will not be made for over excavated work nor for replacement materials.

1.4 DEFINITIONS

A. Site Rock: Rock material in beds, ledges, unstratified masses, conglomerate deposits, and boulders of rock material in volume listed above, that exceed a standard penetration resistance of 100 blows/2 inches when tested by an independent geotechnical testing agency, according to ASTM D 1586.

1.5 REFERENCE STANDARDS

A. NFPA 495 - Explosive Materials Code; 2018.

1.6 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate the proposed method of blasting, delay pattern, explosive types, type of blasting mat or cover, and intended rock removal method.

1.7 QUALITY ASSURANCE

A. Seismic Survey Firm: Company specializing in seismic surveys with five years documented experience.

PART 2 PRODUCTS

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify site conditions and note subsurface irregularities affecting work of this section.

3.2 PREPARATION

A. Identify required lines, levels, contours, and datum.

B. If the project excavation is classified as "Unclasified" and rock is encountered the following shall apply:

3.3 ROCK REMOVAL

A. Use of Explosives: Obtain permits from authorities having jurisdiction before explosives are brought to site or drilling is started.

1. Comply with NFPA 495 and applicable state and local codes.
2. Prior to blasting, obtain a seismographic survey to determine maximum charges that can be used at each location in area of excavation without damaging adjacent properties or other work.
3. Prior to executing seismographic survey, advise owners of adjacent buildings and structures in writing; explain planned survey and blasting operations.

4. Prior to blasting, document conditions of buildings near locations of intended blasting and photograph existing conditions identifying existing irregularities.
5. Schedule work to avoid working hours of occupied buildings nearby.

B. Form level bearing at bottom of excavations.
1. Bottom of excavations shall be provided with 12” of compacted drainage fill for footings and piers and 6” for manholes to eliminate differential settlement..

C. Remove shaled layers to provide sound and unshattered base for footings.

D. In utility trenches, excavate to 6 inches below invert elevation of pipe and 24 inches wider than pipe diameter.
1. Pipes and conduits shall be provided with 6” of Pipe Zone Bedding material to eliminate differential settlement

E. Remove excavated materials from site.

F. Correct unauthorized rock removal in accordance with backfilling and compacting requirements of Section 31 2323.

END OF SECTION

SECTION 31 2319
DEWATERING

PART 3 EXECUTION

1.1 Installation

A. Prevent fine sands from entering system or discharge.

1.2 Operation

A. Operate system continuously or as directed by Fuller and D'Angelo, P.C. .

B. Maintain excavations free of water until foundations, underground tanks, and underground utilities are constructed.

C. Prevent damages or disturbances to work areas from discharge water.

1.3 Water Disposal

A. Dispose of discharge water and collected sediment as directed by Fuller and D'Angelo, P.C. .

B. Maintain water disposal system in operating order.

C. Prevent damages or disturbances to work areas from water disposal.

1.4 Closeout Activities

A. Dewatering System Removal: Remove upon completion of dewatering activities.

END OF SECTION

SECTION 31 2323
FILL

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SECTION INCLUDES

A. Filling, backfilling, and compacting for building volume below grade.

B. Backfilling and compacting for utilities outside the building to utility main connections.

C. Drainage course for slabs-on-grade.

D. Subbase course for concrete walks pavements.

E. Subbase and base course for asphalt paving.

F. Subsurface drainage for backfill for walls and trenches.

1.3 RELATED REQUIREMENTS

A. Section 31 0519 - Geosynthetics for Earthwork.

B. Section 31 2200 - Grading: Removal and handling of soil to be re-used.

C. Section 31 2200 - Grading: Site grading.

D. Section 31 2316 - Excavation: Removal and handling of soil to be re-used.

1.4 DEFINITIONS

A. Finish Grade Elevations: Indicated on drawings.

B. Subgrade: Surface or elevation remaining after completing excavation, or top surface of a fill or backfill immediately below subbase, drainage fill, or topsoil materials.

C. Subgrade Elevations: Indicated on drawings.

D. Backfill: Soil material or controlled low-strength material used to fill an excavation.
   1. Initial Backfill: Backfill placed beside and over pipe in a trench, including haunches to support sides of pipe.
   2. Final Backfill: Backfill placed over initial backfill to fill a trench.

E. Bedding Course: Course placed over the excavated subgrade in a trench before laying pipe.

F. Borrow: Satisfactory on site soil or soil imported from off-site for use as fill or backfill.

1.5 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. 12-by-12-inch (300-by-300-mm) Sample of subdrainage geotextile.

C. Product Data: For the following:
   1. Each type of plastic warning tape.
   2. Geotextile.
   3. Controlled low-strength material, including design mixture.
   4. Geofoam.

D. Material Test Reports: From a qualified testing agency indicating and interpreting test results for compliance of the following with requirements indicated:

E. Omit classification and compaction curve of on-site soil if geotechnical report will suffice.

F. Classification according to ASTM D 2487 of each on-site or borrow soil material proposed for fill and backfill.

1. Laboratory compaction curves according to ASTM D 1557 for each on-site or borrow soil material proposed for fill and backfill.
2. Test Reports: Submit the following reports from the Soil Laboratory, in accordance with paragraph "Quality Control" and paragraph 3.23.
3. Test reports on borrow materials as follows:
   a. Mechanical Analysis.
   b. Moisture-density curve determination.

PART 2 PRODUCTS

2.1 FILL MATERIALS

A. General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations

B. Unsatisfactory Soils: ASTM D 2487 soil classification groups GC, SC, ML, MH, CL, CH, OL, OH, and PT, or a combination of these group symbols.
   1. Unsatisfactory soils also include satisfactory soils not maintained within 2 percent of optimum moisture content at time of compaction.

C. General Fill: Soil Excavated from site or borrowed fill.
   1. Graded.
   2. Free of lumps larger than 3 inches, rocks larger than 2 inches, and debris, waste, frozen materials, vegetation, and other deleterious matter
   3. Complying with ASTM D2487 Group Symbol CL.

D. Bedding Course:
   1. Select mixture of graded crushed stone free from organic, frozen or other deleterious materials, conforming to the requirements of NYS DOT Section 703-02 paragraph 21 Gradation Size 6 and meeting the following gradation requirements (except material from trenching operations may be used if meeting the following:

      SievePercent Passing
      1" 100
      1/2" 90-100
      1/4" 0-15

E. Filter Material: Narrowly graded mixture of natural or crushed gravel, or crushed stone and natural sand; ASTM D 448; coarse-aggregate grading Size 67; with 100 percent passing a 1-inch sieve and 0 to 5 percent passing a No. 4 sieve

F. Drainage Fill: Washed crushed stone; with 100 percent passing a 1-1/2-inch sieve and 0 to 5 percent passing a No. 8 sieve.

G. Impervious Fill: Clayey gravel and sand mixture capable of compacting to a very stiff state.

H. Structural Fill - Fill Type Select fill: subsoil excavated on site or borrowed fill.
   1. Graded.
   2. Free of lumps larger than 3 inches, rocks larger than 2 inches, and debris.
   3. Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand free of debris and organic matter; with maximum particle size of two (2") inches and between ten (10%) and seventy (70%) percent, by weight, passing the standard No. 40 sieve size and less than ten (10%) percent passing a No. 200 sieve

I. Sand: ASTM C 33; fine aggregate, natural, or manufactured sand.

J. Topsoil: Topsoil excavated on-site.
   1. Graded.
   2. Free of roots, rocks larger than 1/2 inch, subsoil, debris, large weeds and foreign matter.
   3. Acidity range (pH) of 5.4 to 7.0.

4. Containing a minimum of 4 percent and a maximum of 25 percent inorganic matter.
5. Furnish a certified analysis, made by a recognized authority, of any topsoil furnished to complete the work of planting. Test reports shall match the format listed below:

PassingRetained OnPercentage
l" screen l00%
l" screen1/4" screen (gravel)Not more than 3%
l/4" screenNo. l00 USS mesh sieve (sand)40% - 60%
No. l00 USS(Very fine sand, silt and clay) 40% - 60%

2.2 GEOTEXTILES

A. Subsurface Drainage and Separation Geotextile: Nonwoven needle-punched geotextile, manufactured for subsurface drainage applications, made from polyolefins or polyesters; with elongation greater than 50 percent; complying with AASHTO M 288 and the following, measured per test methods referenced:
   1. Survivability: Class 2; AASHTO M 288.
   2. Grab Tensile Strength: 157 lbf (700 N); ASTM D 4632.
   3. Sewn Seam Strength: 142 lbf (630 N); ASTM D 4632.
   4. Tear Strength: 56 lbf (250 N); ASTM D 4533.
   5. Puncture Strength: 56 lbf (250 N); ASTM D 4833.
   6. Apparent Opening Size: No. 70 (0.212-mm) sieve, maximum; ASTM D 4751.
   7. Permittivity: 0.5 per second, minimum; ASTM D 4491.
   8. UV Stability: 50 percent after 500 hours' exposure; ASTM D 4355.

B. Separation Geotextile: Woven geotextile fabric, manufactured for separation applications, made from polyolefins or polyesters with elongation less than 50 percent; complying with AASHTO M 288 and the following, measured per test methods referenced:
   1. Survivability: Class 2; AASHTO M 288.
   2. Grab Tensile Strength: 247 lbf ; ASTM D 4632.
   3. Sewn Seam Strength: 222 lbf ; ASTM D 4632.
   4. Tear Strength: 90 lbf ; ASTM D 4533.
   5. Puncture Strength: 90 lbf ; ASTM D 4833.
   6. Apparent Opening Size: No. 60 sieve, maximum; ASTM D 4751.
   7. Permittivity: 0.02 per second, minimum; ASTM D 4491.
   8. UV Stability: 50 percent after 500 hours' exposure; ASTM D 4355.

2.3 ACCESSORIES

A. GEOTEXTILES
   1. Subsurface Drainage and Separation Geotextile: Nonwoven needle-punched geotextile, manufactured for subsurface drainage applications, made from polyolefins or polyesters; with elongation greater than 50 percent; complying with AASHTO M 288 and the following, measured per test methods referenced:
      a. Survivability: Class 2; AASHTO M 288.
      b. Grab Tensile Strength: 157 lbf (700 N); ASTM D 4632.
      c. Sewn Seam Strength: 142 lbf (630 N); ASTM D 4632.
      d. Tear Strength: 56 lbf (250 N); ASTM D 4533.
      e. Puncture Strength: 56 lbf (250 N); ASTM D 4833.
      f. Apparent Opening Size: No. 70 (0.212-mm) sieve, maximum; ASTM D 4751.
      g. Permittivity: 0.5 per second, minimum; ASTM D 4491.
      h. UV Stability: 50 percent after 500 hours' exposure; ASTM D 4355.
   2. Separation Geotextile: Woven geotextile fabric, manufactured for separation applications, made from polyolefins or polyesters with elongation less than 50 percent; complying with AASHTO M 288 and the following, measured per test methods referenced:

a. Survivability: Class 2; AASHTO M 288.
b. Grab Tensile Strength: 247 lbf ; ASTM D 4632.
c. Sewn Seam Strength: 222 lbf ; ASTM D 4632.
d. Tear Strength: 90 lbf ; ASTM D 4533.
e. Puncture Strength: 90 lbf ; ASTM D 4833.
f. Apparent Opening Size: No. 60 sieve, maximum; ASTM D 4751.
g. Permittivity: 0.02 per second, minimum; ASTM D 4491.
h. UV Stability: 50 percent after 500 hours' exposure; ASTM D 4355.

B. Geotextile: Non-biodegradable, woven.

C. Vapor Retarder: 10 mil thick, polyethylene.

D. Warning Tape: Acid- and alkali-resistant polyethylene film warning tape manufactured for marking and identifying underground utilities, 6 inches wide and 4 mils thick, continuously inscribed with a description of the utility; colored as follows:
1. Red: Electric.
2. Yellow: Gas, oil, steam, and dangerous materials.
3. Orange: Telephone and other communications.
4. Blue: Water systems.
5. Green: Sewer systems.

PART 3 EXECUTION

3.1 EXAMINATION

A. Identify required lines, levels, contours, and datum locations.

B. Verify areas to be filled are not compromised with surface or ground water.

3.2 PREPARATION

A. Scarify and proof roll subgrade surface to a depth of 6 inches to identify soft spots.

B. Cut out soft areas of subgrade not capable of compaction in place. Backfill with general fill.

C. Compact subgrade to density equal to or greater than requirements for subsequent fill material.

D. Until ready to fill, maintain excavations and prevent loose soil from falling into excavation.

3.3 FILLING

A. Fill to contours and elevations indicated using unfrozen materials.

B. Employ a placement method that does not disturb or damage other work.

C. Systematically fill to allow maximum time for natural settlement. Do not fill over porous, wet, frozen or spongy subgrade surfaces.

D. Maintain optimum moisture content of fill materials to attain required compaction density.

E. Slope grade away from building minimum 2 inches in 10 feet, unless noted otherwise. Make gradual grade changes. Blend slope into level areas.

F. Correct areas that are over-excavated.
1. Other areas: Use general fill, flush to required elevation, compacted to minimum 97 percent of maximum dry density.

G. Compaction Density Unless Otherwise Specified or Indicated:

H. Reshape and re-compact fills subjected to vehicular traffic.

I. Maintain temporary means and methods, as required, to remove all water while fill is being placed as required, or until directed by the Fuller and D'Angelo, P.C. . Remove and replace soils deemed unsuitable by classification and which are excessively moist due to lack of dewatering or surface water control.

3.4 SOIL MOISTURE CONTROL

A. Uniformly moisten or aerate subgrade and each subsequent fill or backfill layer before compaction to within 2 percent of optimum moisture content.
   1. Do not place backfill or fill material on surfaces that are muddy, frozen, or contain frost or ice.
   2. Remove and replace, or scarify and air-dry, otherwise satisfactory soil material that exceeds optimum moisture content by 2 percent and is too wet to compact to specified dry unit weight.

3.5 FILL AT SPECIFIC LOCATIONS

A. Structural Fill at _____:
   1. Maximum depth per lift: 6 inches, compacted.
   2. Compact to minimum 95 percent of maximum dry density.

B. Under Interior Slabs-On-Grade:
   1. Use Drainage Fill.
   2. Depth: 4 inches deep.
   3. Compact to 95 percent of maximum dry density.

C. At Foundation Walls, Footings, and _____:
   1. Use general fill.
   2. Fill up to subgrade elevation.
   3. Compact each lift to 90 percent of maximum dry density.
   4. Do not backfill against unsupported foundation walls.
   5. Backfill simultaneously on each side of unsupported foundation walls until supports are in place.

D. Over Subdrainage Piping at Foundation Perimeter and Under Slabs:
   1. Drainage fill and geotextile: Section 31 0519.
   2. Fill up to subgrade elevation.
   3. Compact to 95 percent of maximum dry density.

E. Over Buried Utility Piping, Conduits, and Duct Bank in Trenches and _____:
   1. Bedding: Use general fill.
   2. Cover with general fill.
   3. Fill up to subgrade elevation.
   4. Compact in maximum 8 inch lifts to 95 percent of maximum dry density.
   5. Backfill trenches excavated under footings and within 18 inches of bottom of footings with satisfactory soil; fill with concrete to elevation of bottom of footings. Concrete is specified in Division 3 Section Cast-in-Place Concrete

F. Provide 4-inch- thick, concrete-base slab support for piping or conduit less than 30 inches below surface of roadways. After installing and testing, completely encase piping or conduit in a minimum of 4 inches (100 mm) of concrete before backfilling or placing roadway subbase.

G. At Interior Crawl Spaces:
   1. Use general fill.
   2. Depth: ____ inches.
   3. Compact to 90 percent of maximum dry density.

H. At Lawn Areas:
   1. Use general fill.
   2. Fill up to 6 inches below finish grade elevations.
   3. Compact to 95 percent of maximum dry density.
   4. See Section 31 2200 for topsoil placement.

I. At Planting Areas Other Than Lawns and _____:
   1. Use general fill.

2. Fill up to 12 inches below finish grade elevations.
3. Compact to 95 percent of maximum dry density.

J. At French Drains:
1. Use drainage fill.
2. Fill up to 8 inches below finish grade.
3. Compact to 95 percent of maximum dry density.

K. Under Pavers Set on Sand Leveling Bed:
1. Use Fill Type Drainage fill.
2. Fill up to bottom of sand leveling bed.
3. Compact to 95 percent of maximum dry density.
4. See unit pavers section for leveling bed placement.

3.6 CLEANING

A. See Section 01 7419 - Construction Waste Management and Disposal, for additional requirements.

B. Leave unused materials in a neat, compact stockpile.

C. Remove unused stockpiled materials, leave area in a clean and neat condition. Grade stockpile area to prevent standing surface water.

END OF SECTION

SECTION 32 9220
RESTORATION OF TURF AREAS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. The contractor shall supply all materials, equipment, labor, incidentals and maintenance required in order to provide an acceptable stand of turf by topsoiling and seeding of all disturbed areas including stripping topsoil, grading, placing topsoil, fertilizing and seeding, in accordance with the drawings and as specified.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Topsoil: From site stockpiles or friable loam, typical of cultivated topsoils available locally, containing at least 3 percent of decayed organic matter (humus), taken from a well-drained, arable site. Topsoil shall be reasonably free of subsoil, stones, earth, clods, sticks, roots, or other objectionable extraneous matter or debris. It shall contain no toxic materials. Only the finest, most organic topsoil shall be used. No topsoil shall be spread or delivered in a frozen or muddy condition

B. Fertilizer: Recommended for grass, with fifty percent of the elements derived from organic sources; of proportion necessary to eliminate any deficiencies of topsoil, as indicated by analysis.
   1. Manufacturers:
      a. Profile Products; BioPrime: www.profileevs.com/#sle.
      b. Jonathan Green “New Seeding Lawn Fertilizer.

C. The seed used shall be fresh, re-cleaned seed of the latest crop containing a blend of those listed below and shall be harvested from one field to ensure a uniform color and texture. Percentages of each grass type are to be within the given range for that type:
   1. Devine Perennial Ryegrass
   2. America Kentucky Bluegrass
   3. Apollo Kentucky Bluegrass
   4. Limousine Kentucky Bluegrass
   5. Midnight Kentucky Bluegrass
   6. Manufacturer:
      a. Chas. C. Hart Seed Company, Wethersfield, Ct. 1-800-326-HART

D. Mulch: Mulch shall be approved salt hay or weed free straw and stabilized with a binder.

PART 3 - CONSTRUCTION

3.1 SEEDBED PREPARATION

A. Seasonal and weather limitations - All operations including seedbed preparation shall be performed only when the soil is in proper condition to permit satisfactory work. Continuation of work at other than specified times or conditions shall proceed only with consent of the Architect.

B. Leveling - Any undulations or irregularities in the surface resulting from fertilization, tillage or any other causes shall be leveled prior to seeding. Flooded, washed out, or otherwise damaged areas shall be reconstructed and all grades reestablished in conformance with the drawings and specifications.

C. Cleanup - Prior to seeding, the surface shall be cleared of all trash, debris and stone larger than 1-1/2 diameter and of all roots, brush, wire, grade stakes and other objects that could be a hindrance to maintenance operations and use.

D. Fertilizing - After final seedbed preparation, apply fertilizer at the manufacturer's recommended rate indicated on the bag. Fertilizer shall be distributed evenly over all areas to be seeded by machine, or as

otherwise approved by the Architect, and shall be worked lightly into the top 1 inch of the rootzone mixture.

3.2 SEEDING

A. The contractor shall furnish and place all materials required for seeding in all top soiled areas.

B. All areas to be seeded shall be thoroughly disked or otherwise loosened to a depth of 4 inches and shall be raked to true lines free from all unsightly variations, bumps, ridges, or depressions. All sticks, stones, roots or other objectionable material which might interfere with the formation of a finely pulverized seed bed shall be removed from the soil. Ground limestone and commercial fertilizer shall be applied as specified above.

C. The soil shall then be raked to a smooth, even draining surface and compacted with an approved roller as directed by the Architect. Any depressions which occur shall be regraded and rerolled until a satisfactory grade is obtained.

D. The rate of seeding shall be 10 lbs. per 1000 sq. ft. of area. Grass seed shall be sown by approved machine in such manner that a uniform stand will result and as indicated on the drawings for the upper field.

E. Grass seed shall be sown preferably in the fall between August 25 and October 1, in the spring between March 15 and May 1, or at such other times as are approved by the Architect. All seeding is to be done in dry or moderately dry soil and at times when the wind does not exceed a velocity of 5 miles per hour.

3.3 MULCHING

A. All seeded areas shall be mulched not later than three (3) days following seeding. Ground surfaces shall be completely covered at a rate of at least two (2) tons per acre.

B. Mulch shall be anchored using jute or other approved netting properly fastened in place.

C. Subsequent watering - Seed shall be watered as required to maintain adequate moisture in the soil. In the absence of rainfall, seed shall be watered at frequencies dictated by need.

3.4 ACCEPTANCE

A. Inspection of the work of seeding to determine provisional acceptance will be made by the Architect upon written notice requesting such inspection submitted by the contractor at least seven (7) days prior to the anticipated date of inspection. Request may be made subsequent to the second mowing of the turf.

B. After inspection the contractor will be notified in writing by the Architect of provisional acceptance of all work, or if there are any deficiencies of the requirements for completion of the work.

C. All seeded areas shall be guaranteed for one (l) growing season commencing with the date of provisional acceptance.

APPENDIX

- LIMITED ASBESTOS SURVEY
- GEO-TECHNICAL RTEPORT

Eisenbach & Ruhnke
ENGINEERING, P.C.

LIMITED ASBESTOS SURVEY

Edgemont Central School District
Edgemont High School
Building A
200 White Oak Lane
Scarsdale, NY 10583

Project Name: *Edgemont School District Bond Phase 2*
Additions to Administration Building, Building A & Site Work

Issued : March 16, 2022

Prepared For:

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Matthew Inman
Manager of Environmental Services AH97-21978

E&R Project # 14-22-01

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1.0 TESTING SUMMARY

Eisenbach and Ruhnke Engineering, P.C. (E&R) was retained by Fuller and D'Angelo (F&D) to perform a Limited Asbestos Survey at the Edgemont High School, located in Scarsdale, NY. The survey was performed on February 24, 2022 and March 2, 2022 by Matthew Inman (New York State Accredited Inspector, Number 97-21978). All work was completed in compliance with New York State Department of Labor 12 NYCRR Part 56, 40 CFR part 763, Subpart –E requirements, and U.S.E.P.A. 40 CFR 61 NESHAP, Subpart-M requirements.

The survey was completed for the project titled "Edgemont School District Bond Phase 2 Additions to Administration Building, Building A & Site Work" dated March 4, 2022. The project involves renovations to the Kitchen and Cafeteria areas. The survey included the renovation areas and all associated materials that would be impacted by the scope of work. All other areas of the building were not inspected as part of this survey.

The survey limitations, methods, analysis, findings, and list of asbestos containing materials with locations and quantities are included herein.

2.0 LIMITATIONS/METHODS AND ANALYSIS

The purpose of the survey is to identify approximate locations and quantities of asbestos containing materials. The inspection did not include destructive testing to determine if any materials were buried behind walls or above fixed ceilings. The inspection included all materials that were accessible during the time of the inspection. This survey is not intended for the purposes of planning the scope, timing, phasing, and/or remediation methods on any asbestos containing materials identified herein. The Owner and/or their representatives are responsible for verifying exact quantities, types, and locations prior to any renovation or demolition work.

All samples were analyzed per New York State Environmental Laboratory Protocol (NYS ELAP). Friable bulk samples were analyzed using the Polarized Light Microscopy (PLM) NYS ELAP Method 198.1. Non-friable organically bound samples were analyzed utilizing gravimetric reduction with PLM analysis (NYS ELAP Method 198.6) and Transmission Electron Microscopy (TEM) confirmation of all PLM negatives (NYS ELAP Method 198.4).

3.0 FINDINGS

A. Asbestos-Containing Materials (ACM)

The following materials were tested and found to be asbestos containing. Asbestos-containing materials are materials that contain more than 1% asbestos.

1. Thermal System Insulation

   Aircell Pipe Insulation (Assumed)

2. Surfacing Materials

   None.

3. Miscellaneous Materials

   Floor Tile/Mastic (Regulatory Compliance – Report #EDG.1044.21.ASB)

   Countertop/Mastic (Regulatory Compliance – Report #EDG.1046.18.ASB)

   1x1 Wall Tile (3 Varieties)

   1x1 Wall Tile Mastic

   Vibration Cloth

4.0 LOCATIONS AND QUANTITES OF ACM

All quantities listed are estimated; see Appendix B for location of Spaces

Material	Location	Quantity
Aircell Pipe Insulation	Hallway, Janitor Closet, Mechanical Room	109 Linear Feet
1x1 Wall Tile/Mastic	Classrooms, Hallway	4,159 Square Feet
Floor Tile/Mastic	Room A3, A4, A5, A6, A7, A8, A9, A10, A17, Janitor Cl.	6,157 Square Feet
Countertop/Mastic	Room A4, A-5, A-7, A-8, A-9, A-17	192 Square Feet
Vibration Cloth	Tunnel	10 Square Feet

APPENDIX A

SAMPLE LOG/HOMOGENEOUS MATERIAL LIST

Eisenbach & Ruhnke
ENGINEERING, P.C.

AmeriSci Job # 222031037

Edgemont CSD
Building A
White Oak Lane,
Scarsdale, NY 10583

Project No. 14-22-01

SAMPLE #	PLM RESULTS	TEM RESULTS	HOMO ID#	MATERIAL SAMPLED	SAMPLE LOCATION
001	**2.1% ACM**	**NA**	**1**	**1x1 Wall Tile Mastic - Brown**	**Classroom**
002	**NA/PS**	**NA**	**1**	**1x1 Wall Tile Mastic - Brown**	**Classroom**
003	**NA/PS**	**NA**	**2**	**1x1 Wall Tile - Perforated**	**Classroom**
004	**NA/PS**	**NA**	**2**	**1x1 Wall Tile - Perforated**	**Classroom**
005	NAD	NA	3	Concrete Block Filler	Storage Room
006	NAD	NA	3	Concrete Block Filler	Storage Room
007	NAD	NAD	4	2x2 Ceiling Tile	Hallway
008	NAD	NAD	4	2x2 Ceiling Tile	Hallway
009	NAD	NA	5	Ceramic Floor Mudset	Slop Sink Room
010	NAD	NA	5	Ceramic Floor Mudset	Slop Sink Room
011	NAD	NA	6	Ceramic Floor Grout	Slop Sink Room
012	NAD	NA	6	Ceramic Floor Grout	Slop Sink Room
013	NAD	NAD	7	1x1 Ceiling Tile Mastic - White	Girls BR
014	NAD	NAD	7	1x1 Ceiling Tile Mastic - White	Boys BR
015	NAD	NAD	8	1x1 Ceiling Tile	Girls BR
016	NAD	NAD	8	1x1 Ceiling Tile	Boys BR
017	NAD	NAD	9	2x4 Ceiling Tile - Microfissure	Classroom
018	NAD	NAD	9	2x4 Ceiling Tile - Microfissure	Classroom
019	NAD	NAD	10	Interior Door Caulk	Hallway
020	NAD	NAD	10	Interior Door Caulk	Hallway
021	NAD	NAD	11	Interior Window Caulk	Classroom
022	NAD	NAD	11	Interior Window Caulk	Classroom
023	NAD	NA	12	Joint Compound	Storage Room
024	NAD	NA	12	Joint Compound	Storage Room
025	NAD	NA	13	Sheetrock	Hallway
026	NAD	NA	13	Sheetrock	Hallway

LEGEND

ACM = Asbestos Containing Material - Contains Greater than 1% asbestos by weight.
Trace = Asbestos was NOT detected above the regulatory limit of 1% by weight.
NAD = No Asbestos Detected
NA/PS = Sample was not analyzed, but is grouped with another that tested positive for asbestos.
NA = Sample was not analyzed. Either a NOB sample that tested positive under PLM, or a friable sample that is not analyzed by TEM.

Samples Collected: 02.24.22
Samples Collected by: Matt Inman
NYS Accredited Inspector #: 97-21978

AmeriSci Job # 222031037

Edgemont CSD
Building A
White Oak Lane,
Scarsdale, NY 10583

Project No. 14-22-01

SAMPLE #	PLM RESULTS	TEM RESULTS	HOMO ID#	MATERIAL SAMPLED	SAMPLE LOCATION
027	1.5% ACM	NA	14	1x1 Wall Tile - Pinhole Fissure Type 2	Hallway
028	NA/PS	NA	14	1x1 Wall Tile - Pinhole Fissure Type 2	Hallway
029	1.6% ACM	NA	15	1x1 Wall Tile - Pinhole Fissure Type 3	Hallway
030	NA/PS	NA	15	1x1 Wall Tile - Pinhole Fissure Type 3	Hallway
031	NAD	NAD	16	Exterior Window Caulk	Exterior
032	NAD	NAD	16	Exterior Window Caulk	Exterior

LEGEND

ACM = Asbestos Containing Material - Contains Greater than 1% asbestos by weight.
Trace = Asbestos was NOT detected above the regulatory limit of 1% by weight.
NAD = No Asbestos Detected
NA/PS = Sample was not analyzed, but is grouped with another that tested positive for asbestos.
NA = Sample was not analyzed. Either a NOB sample that tested positive under PLM, or a friable sample that is not analyzed by TEM.

Samples Collected: 02.24.22
Samples Collected by: Matt Inman
NYS Accredited Inspector #: 97-21978

AmeriSci Job # 222031651

Edgemont CSD
Building A
White Oak Lane,
Scarsdale, NY 10583

Project No. 14-22-01

SAMPLE #	PLM RESULTS	TEM RESULTS	HOMO ID#	MATERIAL SAMPLED	SAMPLE LOCATION
033	NAD	NAD		Homosote Mastic	Classroom
034	NAD	NAD		Homosote Mastic	Classroom
035	NAD	NA		Homosote	Classroom
036	NAD	NA		Homosote	Classroom
037	NAD	NAD		1x1 Floor Tile - White	Rm A16
038	NAD	NAD		1x1 Floor Tile - White	Rm A16
039	NAD	NAD		1x1 Floor Tile - Blue	Rm A11
040	NAD	NAD		1x1 Floor Tile - Blue	Rm A11
041	NAD	NAD		Cabinet Sheet Vinyl - Green	Classroom
042	NAD	NAD		Cabinet Sheet Vinyl - Green	Classroom
043	NAD	NAD		Covebase Mastic	Classroom
044	NAD	NAD		Covebase Mastic	Classroom
045	Trace	Trace		Ceramic Wall Tile Mastic	Boys Bathroom
046	Trace	Trace		Ceramic Wall Tile Mastic	Boys Bathroom
047	NAD	NA		Ceramic Wall Tile Grout	Boys Bathroom
048	NAD	NA		Ceramic Wall Tile Grout	Boys Bathroom
049	NAD	NA		Cold Air Return Tube	Tunnel
050	NAD	NA		Cold Air Return Tube	Tunnel
051	NAD	NAD		AHU Door Seal	Tunnel
052	NAD	NAD		AHU Door Seal	Tunnel

LEGEND

ACM = Asbestos Containing Material - Contains Greater than 1% asbestos by weight.
Trace = Asbestos was NOT detected above the regulatory limit of 1% by weight.
NAD = No Asbestos Detected
NA/PS = Sample was not analyzed, but is grouped with another that tested positive for asbestos.
NA = Sample was not analyzed. Either a NOB sample that tested positive under PLM, or a friable sample that is not analyzed by TEM.

Samples Collected: 03.02.22
Samples Collected by: Matt Inman
NYS Accredited Inspector #: 97-21978

AmeriSci Job # 222033161

Edgemont CSD
Building A
White Oak Lane,
Scarsdale, NY 10583

Project No. 14-22-01

SAMPLE #	*PLM RESULTS*	*TEM RESULTS*	*HOMO ID#*	*MATERIAL SAMPLED*	*SAMPLE LOCATION*
053	NAD	NAD	1	Duct Mastic	Mechanical Room
054	NAD	NAD	1	Duct Mastic	Mechanical Room

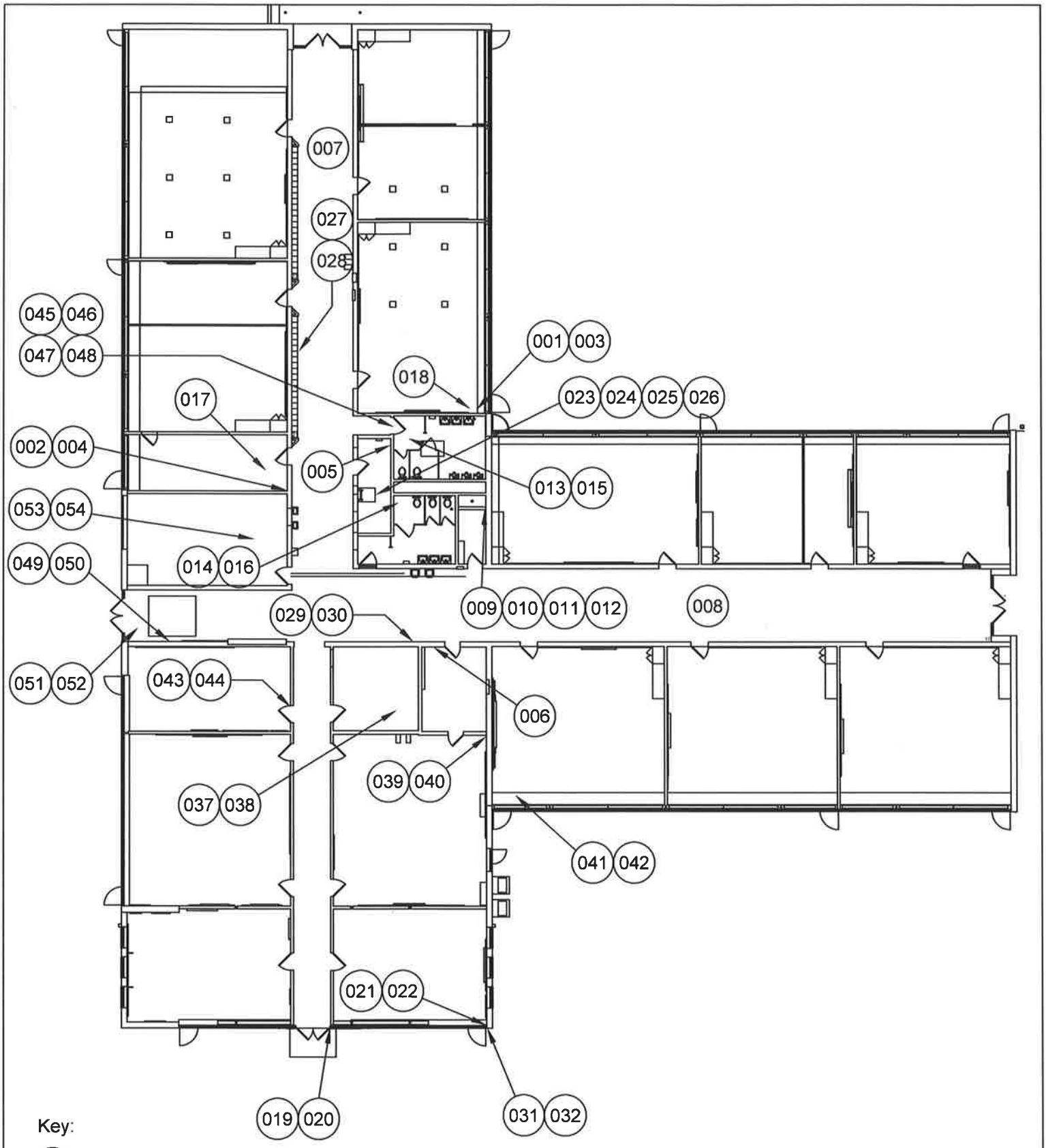
LEGEND

ACM = Asbestos Containing Material - Contains Greater than 1% asbestos by weight.
Trace = Asbestos was NOT detected above the regulatory limit of 1% by weight.
NAD = No Asbestos Detected
NA/PS = Sample was not analyzed, but is grouped with another that tested positive for asbestos.
NA = Sample was not analyzed. Either a NOB sample that tested positive under PLM, or a friable sample that is not analyzed by TEM.

Samples Collected: 03.24.22
Samples Collected by: Matt Inman
NYS Accredited Inspector #: 97-21978

APPENDIX B

DRAWINGS SHOWING SAMPLE LOCATIONS



Key:

(###) BULK SAMPLE LOCATION

* SAMPLES 49-52 COLLECTED IN AHU LOCATED IN TUNNEL BELOW MECHANICAL ROOM

FILE PATH – N:\1 – PROJECT DIRECTORIES\1– E & R Projects\14– Edgemont CSD\14–22–01 Building A & Admin Cafeteria\2022–02–10\Bulk Sample Locaton Plan – Bldg A.dwg

Eisenbach & Ruhnke Engineering, P.C.
291 Genesee Street – Utica, NY 13501 Ph: 315–735–1916
Fax: 315–735–6365 www.erengpc.com

DATE: 3/9/22
SCALE: NTS
PROJECT NO: 14–22–01 DRAWN BY: MCI

EDGEMONT CSD
BUILDING A
BULK SAMPLE LOCATION PLAN

SHEET NO: Figure 1

APPENDIX C

LABORATORY ANALYSIS RESULTS

Please Reply To:

AmeriSci New York
117 EAST 30TH ST.
NEW YORK, NY 10016
TEL: (212) 679-8600 • FAX: (212) 679-3114

LABORATORY ELECTRONIC TRANSMITTAL

To: Jack Eisenbach
Eisenbach & Ruhnke Engineering, P.C.
Fax #: (315) 735-6365

Email: acorrell@erengpc.com, minman@erengpc.com

From: John P. Koubiadis
AmeriSci Job #: 222031037
Subject: ELAP-PLM/TEM 3 day Results
Client Project: 14-21-05; Fuller & D'Angelo; Building A

Date: Friday, March 4, 2022
Time: 15:40:38
Comments:

Number of Pages: _____
(including cover sheet)

NOTE: Attached report is to be considered preliminary until final review with accompanying analysis summary letter is issued.

CONFIDENTIALITY NOTICE: Unless otherwise indicated, the information contained in this communication is confidential information intended for use of the individual named above. If the reader of this communication is not the intended recipient, you are hereby notified that any dissemination, distribution or copying of this communication is prohibited. If you have received this communication in error, please immediately notify the sender by telephone and return the original message to the above address via the US Postal Service at our expense. Samples are disposed of in 60 days or unless otherwise instructed by the protocol or special instructions in writing. Thank you.

AmeriSci New York
117 EAST 30TH ST.
NEW YORK, NY 10016
TEL: (212) 679-8600 • FAX: (212) 679-3114

PLM Bulk Asbestos Report

Eisenbach & Ruhnke Engineering, P.C.
Attn: Jack Eisenbach
291 Genesee Street

Utica, NY 13501

Date Received 03/01/22
Date Examined 03/04/22
ELAP # 11480
AmeriSci Job # 222031037
P.O. #
Page 1 **of** 6
RE: 14-21-05; Fuller & D'Angelo; Building A

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
001 1	222031037-01 **Location:** Classroom - 1 x 1 Wall Tile Mastic (Brown)	Yes	2.2% (by NYS ELAP 198.6) by John P. Koubiadis on 03/04/22
	Analyst Description: Brown, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** Anthophyllite 2.1 % **Other Material:** Fibrous Talc 5%, Non-fibrous 32.2%		
002 1	222031037-02 **Location:** Classroom - 1 x 1 Wall Tile Mastic (Brown)		NA/PS
	Analyst Description: Bulk Material **Asbestos Types:** **Other Material:**		
003 2	222031037-03 **Location:** Classroom - 1 x 1 Wall Tile (Perforated)		NA
	Analyst Description: Bulk Material **Asbestos Types:** **Other Material:**		
004 2	222031037-04 **Location:** Classroom - 1 x 1 Wall Tile (Perforated)		NA
	Analyst Description: Bulk Material **Asbestos Types:** **Other Material:**		
005 3	222031037-05 **Location:** Storage Rm. - Concrete Block Filler	No	NAD (by NYS ELAP 198.1) by John P. Koubiadis on 03/04/22
	Analyst Description: White, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 100%		

See Reporting notes on last page

PLM Bulk Asbestos Report

14-21-05; Fuller & D'Angelo; Building A

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
006 3	222031037-06 **Location:** Storage Rm. - Concrete Block Filler	No	NAD (by NYS ELAP 198.1) by John P. Koubiadis on 03/04/22
Analyst Description: White, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 100%			
007 4	222031037-07 **Location:** Hallway - 2 x 2 Ceiling Tile	No	NAD (by NYS ELAP 198.6) by John P. Koubiadis on 03/04/22
Analyst Description: Grey, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 38.6%			
008 4	222031037-08 **Location:** Hallway - 2 x 2 Ceiling Tile	No	NAD (by NYS ELAP 198.6) by John P. Koubiadis on 03/04/22
Analyst Description: Grey, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 36.2%			
009 5	222031037-09 **Location:** Slop Sink Rm. - Ceramic Floor Mudset	No	NAD (by NYS ELAP 198.1) by John P. Koubiadis on 03/04/22
Analyst Description: Off-White, Homogeneous, Non-Fibrous, Cementitious, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 100%			
010 5	222031037-10 **Location:** Slop Sink Rm. - Ceramic Floor Mudset	No	NAD (by NYS ELAP 198.1) by John P. Koubiadis on 03/04/22
Analyst Description: Off-White, Homogeneous, Non-Fibrous, Cementitious, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 100%			
011 6	222031037-11 **Location:** Slop Sink Rm. - Ceramic Floor Grout	No	NAD (by NYS ELAP 198.1) by John P. Koubiadis on 03/04/22
Analyst Description: Grey, Homogeneous, Non-Fibrous, Cementitious, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 100%			

See Reporting notes on last page

PLM Bulk Asbestos Report

14-21-05; Fuller & D'Angelo; Building A

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
012 6	222031037-12 **Location:** Slop Sink Rm. - Ceramic Floor Grout	No	NAD (by NYS ELAP 198.1) by John P. Koubiadis on 03/04/22
Analyst Description: Grey, Homogeneous, Non-Fibrous, Cementitious, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 100%			
013 7	222031037-13 **Location:** Girls BR - 1 x 1 Ceiling Tile Mastic (White)	No	NAD (by NYS ELAP 198.6) by John P. Koubiadis on 03/04/22
Analyst Description: Off-White, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 2%			
014 7	222031037-14 **Location:** Boys BR - 1 x 1 Ceiling Tile Mastic (White)	No	NAD (by NYS ELAP 198.6) by John P. Koubiadis on 03/04/22
Analyst Description: Off-White, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 2.6%			
015 8	222031037-15 **Location:** Girls BR - 1 x 1 Ceiling Tile	No	NAD (by NYS ELAP 198.6) by John P. Koubiadis on 03/04/22
Analyst Description: Grey, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 48.5%			
016 8	222031037-16 **Location:** Boys BR - 1 x 1 Ceiling Tile	No	NAD (by NYS ELAP 198.6) by John P. Koubiadis on 03/04/22
Analyst Description: Grey, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 41%			
017 9	222031037-17 **Location:** Classroom - 2 x 4 Ceiling Tile (Microfissure)	No	NAD (by NYS ELAP 198.6) by John P. Koubiadis on 03/04/22
Analyst Description: Grey, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 33%			

See Reporting notes on last page

PLM Bulk Asbestos Report

14-21-05; Fuller & D'Angelo; Building A

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
018 9	222031037-18 **Location:** Classroom - 2 x 4 Ceiling Tile (Microfissure)	No	NAD (by NYS ELAP 198.6) by John P. Koubiadis on 03/04/22
Analyst Description: Grey, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 37.5%			
019 10	222031037-19 **Location:** Hallway - Interior Door Caulk	No	NAD (by NYS ELAP 198.6) by John P. Koubiadis on 03/04/22
Analyst Description: White, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 2.6%			
020 10	222031037-20 **Location:** Hallway - Interior Door Caulk	No	NAD (by NYS ELAP 198.6) by John P. Koubiadis on 03/04/22
Analyst Description: White, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 3%			
021 11	222031037-21 **Location:** Classroom - Interior Window Caulk	No	NAD (by NYS ELAP 198.6) by John P. Koubiadis on 03/04/22
Analyst Description: Grey, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 2.7%			
022 11	222031037-22 **Location:** Classroom - Interior Window Caulk	No	NAD (by NYS ELAP 198.6) by John P. Koubiadis on 03/04/22
Analyst Description: Grey, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 1.1%			
023 12	222031037-23 **Location:** Storage Room - Joint Compound	No	NAD (by NYS ELAP 198.1) by John P. Koubiadis on 03/04/22
Analyst Description: White, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 100%			

See Reporting notes on last page

PLM Bulk Asbestos Report

14-21-05; Fuller & D'Angelo; Building A

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
024 12	222031037-24 **Location:** Storage Room - Joint Compound	***No***	NAD (by NYS ELAP 198.1) by John P. Koubiadis on 03/04/22
Analyst Description: Off-White, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 100%			
025 13	222031037-25 **Location:** Storage Room - Sheetrock	***No***	NAD (by NYS ELAP 198.1) by John P. Koubiadis on 03/04/22
Analyst Description: Off-White, Homogeneous, Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Cellulose 30%, Non-fibrous 70%			
026 13	222031037-26 **Location:** Storage Room - Sheetrock	***No***	NAD (by NYS ELAP 198.1) by John P. Koubiadis on 03/04/22
Analyst Description: Off-White, Homogeneous, Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Cellulose 40%, Non-fibrous 60%			
027 14	222031037-27 **Location:** Hallway - 1 x 1 Wall Tile (Pinhole Fissure, Type 2)	***Yes***	1.5% (by NYS ELAP 198.6) by John P. Koubiadis on 03/04/22
Analyst Description: Grey, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** Chrysotile 1.5 % **Other Material:** Non-fibrous 25.3%			
028 14	222031037-28 **Location:** Hallway - 1 x 1 Wall Tile (Pinhole Fissure, Type 2)		NA/PS
Analyst Description: Bulk Material **Asbestos Types:** **Other Material:**			
029 15	222031037-29 **Location:** Hallway - 1 x 1 Wall Tile (Pinhole Fissure, Type 3)	***Yes***	1.6% (by NYS ELAP 198.6) by John P. Koubiadis on 03/04/22
Analyst Description: Grey, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** Chrysotile 1.6 % **Other Material:** Non-fibrous 17.6%			

See Reporting notes on last page

PLM Bulk Asbestos Report

14-21-05; Fuller & D'Angelo; Building A

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
030 15	222031037-30 **Location:** Hallway - 1 x 1 Wall Tile (Pinhole Fissure, Type 3)		NA/PS
	Analyst Description: Bulk Material **Asbestos Types:** **Other Material:**		
031 16	222031037-31 **Location:** Exterior - Ext. Window Caulk	No	NAD (by NYS ELAP 198.6) by John P. Koubiadis on 03/04/22
	Analyst Description: Grey, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 2.1%		
032 16	222031037-32 **Location:** Exterior - Ext. Window Caulk	No	NAD (by NYS ELAP 198.6) by John P. Koubiadis on 03/04/22
	Analyst Description: Grey, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 3.1%		

Reporting Notes:

Analyzed by: John P. Koubiadis
Date: 3/4/2022

Reviewed by: Gabriella Morozov

*NAD/NSD =no asbestos detected; NA =not analyzed; NA/PS=not analyzed/positive stop, (SOF-V) = Sprayed On Fireproofing containing Vermiculite; (SM-V) = Surfacing Material containing Vermiculite; PLM Bulk Asbestos Analysis using Olympus, Model BH-2 Pol Scope, Microscope, Serial #: 223705, by Appd E to Subpt E, 40 CFR 763 quantified by either CVES or 400 pt ct as noted for each analysis (NVLAP 200546-0), ELAP PLM Method 198.1 for NY friable samples, which includes the identification and quantitation of vermiculite, or ELAP 198.6 for NOB samples, or EPA 400 pt ct by EPA 600-M4-82-020 (NY ELAP Lab 11480); Note:PLM is not consistently reliable in detecting asbestos in floor coverings and similar non-friable organically bound materials. NAD or Trace results by PLM are inconclusive, TEM is currently the only method that can be used to determine if this material can be considered or treated as non asbestos-containing in NY State (also see EPA Advisory for floor tile, FR 59,146,38970,8/1/94) National Institute of Standards and Technology Accreditation requirements mandate that this report must not be reproduced except in full without the approval of the lab.This PLM report relates ONLY to the items tested. RI Cert AAL-094, CT Cert PH-0186, Mass Cert AA000054, NJ Lab ID #NY031.

_____END OF REPORT_____

Client Name: Eisenbach & Ruhnke Engineering, P.C.

Table I
Summary of Bulk Asbestos Analysis Results
14-21-05; Fuller & D'Angelo; Building A

AmeriSci Sample #	Client Sample#	HG Area	Sample Weight (gram)	Heat Sensitive Organic %	Acid Soluble Inorganic %	Insoluble Non-Asbestos Inorganic %	** Asbestos % by PLM/DS	** Asbestos % by TEM
01	001	1	0.228	56.0	4.7	37.2	Anthophyllite 2.1	NA
Location: Classroom - 1 x 1 Wall Tile Mastic (Brown)								
02	002	1	0.205	56.7	5.3	38.0	NA/PS	NA
Location: Classroom - 1 x 1 Wall Tile Mastic (Brown)								
03	003	2	0.160	72.4	6.0	21.6	NA	NA
Location: Classroom - 1 x 1 Wall Tile (Perforated)								
04	004	2	0.196	55.8	14.6	29.7	NA	NA
Location: Classroom - 1 x 1 Wall Tile (Perforated)								
05	005	3	----	----	----	----	NAD	NA
Location: Storage Rm. - Concrete Block Filler								
06	006	3	----	----	----	----	NAD	NA
Location: Storage Rm. - Concrete Block Filler								
07	007	4	0.158	23.9	37.6	38.6	NAD	NAD
Location: Hallway - 2 x 2 Ceiling Tile								
08	008	4	0.201	21.8	42.1	36.2	NAD	NAD
Location: Hallway - 2 x 2 Ceiling Tile								
09	009	5	----	----	----	----	NAD	NA
Location: Slop Sink Rm. - Ceramic Floor Mudset								
10	010	5	----	----	----	----	NAD	NA
Location: Slop Sink Rm. - Ceramic Floor Mudset								
11	011	6	----	----	----	----	NAD	NA
Location: Slop Sink Rm. - Ceramic Floor Grout								
12	012	6	----	----	----	----	NAD	NA
Location: Slop Sink Rm. - Ceramic Floor Grout								
13	013	7	0.154	15.1	82.9	2.0	NAD	NAD
Location: Girls BR - 1 x 1 Ceiling Tile Mastic (White)								
14	014	7	0.187	15.3	82.1	2.6	NAD	NAD
Location: Boys BR - 1 x 1 Ceiling Tile Mastic (White)								
15	015	8	0.193	23.6	27.9	48.5	NAD	NAD
Location: Girls BR - 1 x 1 Ceiling Tile								
16	016	8	0.225	21.5	37.5	41.0	NAD	NAD
Location: Boys BR - 1 x 1 Ceiling Tile								

See Reporting notes on last page

Client Name: Eisenbach & Ruhnke Engineering, P.C.

Table I
Summary of Bulk Asbestos Analysis Results
14-21-05; Fuller & D'Angelo; Building A

AmeriSci Sample #	Client Sample#	HG Area	Sample Weight (gram)	Heat Sensitive Organic %	Acid Soluble Inorganic %	Insoluble Non-Asbestos Inorganic %	** Asbestos % by PLM/DS	** Asbestos % by TEM
17	017	9	0.185	22.4	44.6	33.0	NAD	NAD
Location: Classroom - 2 x 4 Ceiling Tile (Microfissure)								
18	018	9	0.348	13.8	48.7	37.5	NAD	NAD
Location: Classroom - 2 x 4 Ceiling Tile (Microfissure)								
19	019	10	0.271	80.2	17.3	2.6	NAD	NAD
Location: Hallway - Interior Door Caulk								
20	020	10	0.209	45.0	52.0	3.0	NAD	NAD
Location: Hallway - Interior Door Caulk								
21	021	11	0.207	46.0	51.3	2.7	NAD	NAD
Location: Classroom - Interior Window Caulk								
22	022	11	0.161	45.5	53.4	1.1	NAD	NAD
Location: Classroom - Interior Window Caulk								
23	023	12	----	----	----	----	NAD	NA
Location: Storage Room - Joint Compound								
24	024	12	----	----	----	----	NAD	NA
Location: Storage Room - Joint Compound								
25	025	13	----	----	----	----	NAD	NA
Location: Storage Room - Sheetrock								
26	026	13	----	----	----	----	NAD	NA
Location: Storage Room - Sheetrock								
27	027	14	0.207	12.5	60.7	25.3	Chrysotile 1.5	NA
Location: Hallway - 1 x 1 Wall Tile (Pinhole Fissure, Type 2)								
28	028	14	0.250	15.0	54.4	30.6	NA/PS	NA
Location: Hallway - 1 x 1 Wall Tile (Pinhole Fissure, Type 2)								
29	029	15	0.119	13.8	67.0	17.6	Chrysotile 1.6	NA
Location: Hallway - 1 x 1 Wall Tile (Pinhole Fissure, Type 3)								
30	030	15	0.105	14.2	70.0	15.8	NA/PS	NA
Location: Hallway - 1 x 1 Wall Tile (Pinhole Fissure, Type 3)								
31	031	16	0.170	45.2	52.7	2.1	NAD	NAD
Location: Exterior - Ext. Window Caulk								
32	032	16	0.246	45.1	51.8	3.1	NAD	NAD
Location: Exterior - Ext. Window Caulk								

See Reporting notes on last page

Table I
Summary of Bulk Asbestos Analysis Results
14-21-05; Fuller & D'Angelo; Building A

AmeriSci Sample #	Client Sample#	HG Area	Sample Weight (gram)	Heat Sensitive Organic %	Acid Soluble Inorganic %	Insoluble Non-Asbestos Inorganic %	** Asbestos % by PLM/DS	** Asbestos % by TEM
17	017	9	0.185	22.4	44.6	33.0	NAD	NAD
Location: Classroom - 2 x 4 Ceiling Tile (Microfissure)								
18	018	9	0.348	13.8	48.7	37.5	NAD	NAD
Location: Classroom - 2 x 4 Ceiling Tile (Microfissure)								
19	019	10	0.271	80.2	17.3	2.6	NAD	NAD
Location: Hallway - Interior Door Caulk								
20	020	10	0.209	45.0	52.0	3.0	NAD	NAD
Location: Hallway - Interior Door Caulk								
21	021	11	0.207	46.0	51.3	2.7	NAD	NAD
Location: Classroom - Interior Window Caulk								
22	022	11	0.161	45.5	53.4	1.1	NAD	NAD
Location: Classroom - Interior Window Caulk								
23	023	12	----	----	----	----	NAD	NA
Location: Storage Room - Joint Compound								
24	024	12	----	----	----	----	NAD	NA
Location: Storage Room - Joint Compound								
25	025	13	----	----	----	----	NAD	NA
Location: Storage Room - Sheetrock								
26	026	13	----	----	----	----	NAD	NA
Location: Storage Room - Sheetrock								
27	027	14	0.207	12.5	60.7	25.3	Chrysotile 1.5	NA
Location: Hallway - 1 x 1 Wall Tile (Pinhole Fissure, Type 2)								
28	028	14	0.250	15.0	54.4	30.6	NA/PS	NA
Location: Hallway - 1 x 1 Wall Tile (Pinhole Fissure, Type 2)								
29	029	15	0.119	13.8	67.0	17.6	Chrysotile 1.6	NA
Location: Hallway - 1 x 1 Wall Tile (Pinhole Fissure, Type 3)								
30	030	15	0.105	14.2	70.0	15.8	NA/PS	NA
Location: Hallway - 1 x 1 Wall Tile (Pinhole Fissure, Type 3)								
31	031	16	0.170	45.2	52.7	2.1	NAD	NAD
Location: Exterior - Ext. Window Caulk								
32	032	16	0.246	45.1	51.8	3.1	NAD	NAD
Location: Exterior - Ext. Window Caulk								

See Reporting notes on last page

Client Name: Eisenbach & Ruhnke Engineering, P.C.

Table I
Summary of Bulk Asbestos Analysis Results

14-21-05; Fuller & D'Angelo; Building A

AmeriSci Sample #	Client Sample#	HG Area	Sample Weight (gram)	Heat Sensitive Organic %	Acid Soluble Inorganic %	Insoluble Non-Asbestos Inorganic %	** Asbestos % by PLM/DS	** Asbestos % by TEM

Analyzed by: Gabriella Morozov
Date: 3/4/2022

Reviewed by: Gabriella Morozov

**Quantitative Analysis (Semi/Full); Bulk Asbestos Analysis - PLM by Appd E to Subpt E, 40 CFR 763 or NYSDOH ELAP 198.1 for New York friable samples or NYSDOH ELAP 198.6 for New York NOB samples; TEM (Semi/Full) by EPA 600/R-93/116 (or NYSDOH ELAP 198.4; for New York samples). Analysis using Hitachi, Model H7000-Noran 7 System, Microscope, Serial #: 747-05-06. NAD = no asbestos detected during a quantitative analysis; NA = not analyzed; Trace = <1%; (SOF-V) = Sprayed On Fireproofing containing Vermiculite; (SM-V) = Surfacing Material containing Vermiculite; Quantitation for beginning weights of <0.1 grams should be considered as qualitative only; Qualitative Analysis: Asbestos analysis results of "Present" or "NVA = No Visible Asbestos" represents results for Qualitative PLM or TEM Analysis only (no accreditation coverage available from any regulatory agency for qualitative analyses): NVLAP (PLM) 200546-0, NYSDOH ELAP Lab 11480, NJ Lab ID #NY031.

Warning Note: PLM limitation, only TEM will resolve fibers <0.25 micrometers in diameter. TEM bulk analysis is representative of the fine grained matrix material and may not be representative of non-uniformly dispersed debris for which PLM evaluation is recommended (i.e. soils and other heterogenous materials).

Client Name: Eisenbach & Ruhnke Engineering, P.C.

Table I
Summary of Bulk Asbestos Analysis Results

14-21-05; Fuller & D'Angelo; Building A

AmeriSci Sample #	Client Sample#	HG Area	Sample Weight (gram)	Heat Sensitive Organic %	Acid Soluble Inorganic %	Insoluble Non-Asbestos Inorganic %	** Asbestos % by PLM/DS	** Asbestos % by TEM

Analyzed by: Gabriella Morozov
Date: 3/4/2022

Reviewed by: Gabriella Morozov

**Quantitative Analysis (Semi/Full); Bulk Asbestos Analysis - PLM by Appd E to Subpt E, 40 CFR 763 or NYSDOH ELAP 198.1 for New York friable samples or NYSDOH ELAP 198.6 for New York NOB samples; TEM (Semi/Full) by EPA 600/R-93/116 (or NYSDOH ELAP 198.4; for New York samples). Analysis using Hitachi, Model H7000-Noran 7 System, Microscope, Serial #: 747-05-06. NAD = no asbestos detected during a quantitative analysis; NA = not analyzed; Trace = <1%; (SOF-V) = Sprayed On Fireproofing containing Vermiculite; (SM-V) = Surfacing Material containing Vermiculite; Quantitation for beginning weights of <0.1 grams should be considered as qualitative only; Qualitative Analysis: Asbestos analysis results of "Present" or "NVA = No Visible Asbestos" represents results for Qualitative PLM or TEM Analysis only (no accreditation coverage available from any regulatory agency for qualitative analyses): NVLAP (PLM) 200546-0, NYSDOH ELAP Lab 11480, NJ Lab ID #NY031.

Warning Note: PLM limitation, only TEM will resolve fibers <0.25 micrometers in diameter. TEM bulk analysis is representative of the fine grained matrix material and may not be representative of non-uniformly dispersed debris for which PLM evaluation is recommended (i.e. soils and other heterogenous materials).

EISENBACH & RUHNKE ENGINEERING, P.C.
291 GENESEE STREET, UTICA, NEW YORK 13501
315·735·1916 · FAX 315·735·6365 · E-MAIL info@ereng.com

BULK SAMPLE LOG
ASBESTOS
Log No: ____of____

CLIENT: Fuller & D'Angelo
PROJECT NAME/LOCATION: Building A
SAMPLES COLLECTED BY: Matt Inman
NYS DEPT OF LABOR CERTIFICATE NO.: 97-21978
DATE SAMPLED: 2/24/22 | PROJECT#: 14-21-05

ANALYSIS: ☐ PLM Only ☐ TEM Only ☒ PLM/TEM as required by ELAP ☐ Other _____

TURNAROUND TIME: ☐ **RUSH** ☐ 12 Hour ☐ 24 HOUR ☐ 48 Hour ☒ 72 Hour ☐ Other_____

NOTES:

SAMPLE NUMBER	HOMO ID #	MATERIAL SAMPLED	LOCATION	ANALYZE ONLY IF SAMPLE TO THE LEFT IS NEGATIVE BY PLM/TEM
001	1	1X1 Wall Tile mastic - BROWN	Classroom	002-004
002	1	↓ ↓ ↓	↓ ↓	003-004
003	2	1X1 Wall Tile – Perforated	↓ ↓	004
004	2	↓ ↓ ↓ ↓	↓ ↓	
005	3	Concrete Block Filler	Storage Rm	006
006	3	↓ ↓ ↓	↓ ↓	
007	4	2x2 ceiling Tile	Hallway	008
008	4	↓ ↓ ↓	↓	
009	5	Ceramic floor mudset	Slop sink Rm	010-012
010	5	↓ ↓ ↓	↓ ↓	011-012
011	6	Ceramic floor grout	↓ ↓	012
012	6	↓ ↓ ↓	↓ ↓	
013	7	1X1 ceiling Tile mastic white	Girls BR	014-016
014	7	↓ ↓	Boys BR	015, 016
015	8	1X1 ceiling Tile	Girls BR	016
016	8	↓ ↓ ↓	Boys BR	
017	9	2x4 ceiling Tile - MICRO FISSURE	~~Hallway~~ classroom	018
018	9	↓ ↓ ↓	classroom	
019	10	Interior Door Caulk	Hallway	020

	PRINTED NAME	SIGNATURE	COMPANY	DATE	# OF SAMPLES
Remitted by:	Matt Inman	Matt Inman	ERE	2/24/22	19
Received by:	Kathleen Byrne	KByrne	AmeriSci	3/1/22	1130

PLEASE EMAIL RESULTS TO MInman@erengpc.com ATTN: Matt

PLEASE FAX RESULTS TO ( ) - ATTN: 222031037

EISENBACH & RUHNKE ENGINEERING, P.C.
291 GENESEE STREET, UTICA, NEW YORK 13501
315-735-1916 · FAX 315-735-6365 · E-MAIL info@ereng.com

BULK SAMPLE LOG
ASBESTOS
Log No: ____of____

CLIENT: Fuller & D'Angelo	ANALYSIS: ☐ PLM Only ☐ TEM Only ☒ PLM/TEM as required by ELAP ☐ Other _____
PROJECT NAME/LOCATION: Edgemont @ Building A	
SAMPLES COLLECTED BY: Matt Inman	
NYS DEPT OF LABOR CERTIFICATE NO. 97-21978	TURNAROUND TIME: ☐ RUSH ☐ 12 Hour ☐ 24 HOUR ☐ 48 Hour ☒ 72 Hour ☐ Other_____
DATE SAMPLED: 2/24/22 PROJECT#: 14-21-05	

NOTES:

SAMPLE NUMBER	HOMO ID #	MATERIAL SAMPLED	LOCATION	ANALYZE ONLY IF SAMPLE TO THE LEFT IS NEGATIVE BY PLM/TEM
020	10	Interior Door Caulk	Hallway	
021	11	Interior Window Caulk	Classroom	022
022	11	↓ ↓ ↓	↓	
023	12	Joint Compound	Storage Room	024-026
024	12	↓ ↓	↓ ↓	025, 026
025	13	Sheet rock		026
026	13	↓	↓ ↓	
027	14	1X1 Wall Tile - Pinhole Fissure	Hallway	028
028	14	↓ ↓ ↓ Type 2	↓	
029	15	1X1 Wall Tile - Pinhole		030
030	15	↓ ↓ Type 3	↓	
031	16	Ext. Window Caulk	Exterior	032
032	16	↓ ↓	↓	
			22203 1037	

	PRINTED NAME	SIGNATURE	COMPANY	DATE	# OF SAMPLES
Remitted by:	Matt Inman		E&R	2/24/22	
Received by:	Katelyn Rapone		Amerisu	3/1/22	1130

PLEASE EMAIL RESULTS TO minman @ erengpc.com **ATTN:** Matt

PLEASE FAX RESULTS TO ( ) - ATTN:

Please Reply To:

AmeriSci New York
117 EAST 30TH ST.
NEW YORK, NY 10016
TEL: (212) 679-8600 • FAX: (212) 679-3114

LABORATORY ELECTRONIC TRANSMITTAL

To: Jack Eisenbach
Eisenbach & Ruhnke Engineering, P.C.
Fax #: (315) 735-6365

Email: acorrell@erengpc.com, minman@erengpc.com

From: Gabriella Morozov
AmeriSci Job #: 222031651
Subject: ELAP-PLM/TEM 3 day Results
Client Project: 14-21-05; Fuller And D'Angelo; Building A

Date: Friday, March 11, 2022
Time: 12:17:57
Comments:

Number of Pages: _____
(including cover sheet)

NOTE: Attached report is to be considered preliminary until final review with accompanying analysis summary letter is issued.

CONFIDENTIALITY NOTICE: Unless otherwise indicated, the information contained in this communication is confidential information intended for use of the individual named above. If the reader of this communication is not the intended recipient, you are hereby notified that any dissemination, distribution or copying of this communication is prohibited. If you have received this communication in error, please immediately notify the sender by telephone and return the original message to the above address via the US Postal Service at our expense. Samples are disposed of in 60 days or unless otherwise instructed by the protocol or special instructions in writing. Thank you.

AmeriSci New York
117 EAST 30TH ST.
NEW YORK, NY 10016
TEL: (212) 679-8600 • FAX: (212) 679-3114

PLM Bulk Asbestos Report

Eisenbach & Ruhnke Engineering, P.C.
Attn: Jack Eisenbach
291 Genesee Street

Utica, NY 13501

Date Received 03/08/22
Date Examined 03/11/22
ELAP # 11480
AmeriSci Job # 222031651
P.O. #
Page 1 **of** 4
RE: 14-21-05; Fuller And D'Angelo; Building A

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
033 17	222031651-01 **Location:** Classroom - Homasote Mastic	*No*	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 03/11/22
Analyst Description: Brown, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 42.5%			
034 17	222031651-02 **Location:** Classroom - Homasote Mastic	*No*	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 03/11/22
Analyst Description: Brown, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 33.5%			
035 18	222031651-03 **Location:** Classroom - Homasote	*No*	NAD (by NYS ELAP 198.1) by Valeriu Voicu on 03/11/22
Analyst Description: White/Brown, Homogeneous, Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Cellulose 60%, Non-fibrous 40%			
036 18	222031651-04 **Location:** Classroom - Homasote	*No*	NAD (by NYS ELAP 198.1) by Valeriu Voicu on 03/11/22
Analyst Description: White/Brown, Homogeneous, Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Cellulose 65%, Non-fibrous 35%			
037 19	222031651-05 **Location:** Rm. A16 - 1 x 1 Floor Tile (White)	*No*	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 03/11/22
Analyst Description: Off-White, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 2.4%			

See Reporting notes on last page

PLM Bulk Asbestos Report

14-21-05; Fuller And D'Angelo; Building A

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
038 19	222031651-06 **Location:** Rm. A16 - 1 x 1 Floor Tile (White)	No	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 03/11/22
Analyst Description: Off-White, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 3.1%			
039 20	222031651-07 **Location:** Rm. A11 - 1 x 1 Floor Tile (Blue)	No	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 03/11/22
Analyst Description: Blue, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 5.1%			
040 20	222031651-08 **Location:** Rm. A11 - 1 x 1 Floor Tile (Blue)	No	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 03/11/22
Analyst Description: Blue, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 4%			
041 21	222031651-09 **Location:** Classroom - Cabinet Sheet Vinyl (Green)	No	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 03/11/22
Analyst Description: Green, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 2%			
042 21	222031651-10 **Location:** Classroom - Cabinet Sheet Vinyl (Green)	No	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 03/11/22
Analyst Description: Green, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 2.6%			
043 22	222031651-11 **Location:** Classroom - Cove Base Mastic	No	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 03/11/22
Analyst Description: Beige, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 13.3%			

See Reporting notes on last page

PLM Bulk Asbestos Report

14-21-05; Fuller And D'Angelo; Building A

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
044 22	222031651-12 **Location:** Classroom - Cove Base Mastic	*No*	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 03/11/22
Analyst Description: Beige, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 5.6%			
045 23	222031651-13 **Location:** Boys BR - Ceramic Wall Tile Mastic	*Yes*	Trace (<0.25 % pc) [1] (ELAP 400 PC) by Valeriu Voicu on 03/11/22
Analyst Description: Tan, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** Chrysotile <0.25 % pc **Other Material:** Non-fibrous 32.1%			
046 23	222031651-14 **Location:** Boys BR - Ceramic Wall Tile Mastic	*Yes*	Trace (<0.25 % pc) [1] (ELAP 400 PC) by Valeriu Voicu on 03/11/22
Analyst Description: Tan, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** Chrysotile <0.25 % pc **Other Material:** Non-fibrous 36.7%			
047 24	222031651-15 **Location:** Boys BR - Ceramic Wall Tile Grout	*No*	NAD (by NYS ELAP 198.1) by Valeriu Voicu on 03/11/22
Analyst Description: White, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Cellulose Trace, Non-fibrous 100%			
048 24	222031651-16 **Location:** Boys BR - Ceramic Wall Tile Grout	*No*	NAD (by NYS ELAP 198.1) by Valeriu Voicu on 03/11/22
Analyst Description: White, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Cellulose Trace, Non-fibrous 100%			
049 25	222031651-17 **Location:** Tunnel - Cold Air Return Tube	*No*	NAD (by NYS ELAP 198.1) by Valeriu Voicu on 03/11/22
Analyst Description: Brown/Gray, Heterogeneous, Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Cellulose 90%, Non-fibrous 10%			

See Reporting notes on last page

PLM Bulk Asbestos Report

14-21-05; Fuller And D'Angelo; Building A

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
050 25	222031651-18 **Location:** Tunnel - Cold Air Return Tube	***No***	NAD (by NYS ELAP 198.1) by Valeriu Voicu on 03/11/22
Analyst Description: Brown/Gray, Heterogeneous, Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Cellulose 80%, Non-fibrous 20%			
051 26	222031651-19 **Location:** Tunnel - AHU Door Seal	***No***	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 03/11/22
Analyst Description: Black, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 2%			
052 26	222031651-20 **Location:** Tunnel - AHU Door Seal	***No***	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 03/11/22
Analyst Description: Black, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 2.2%			

Reporting Notes:

(1) Sample prepared for analysis by ELAP 198.6 method

Analyzed by: Valeriu Voicu
Date: 3/11/2022

Reviewed by: Gabriella Morozov

*NAD/NSD =no asbestos detected; NA =not analyzed; NA/PS=not analyzed/positive stop, (SOF-V) = Sprayed On Fireproofing containing Vermiculite; (SM-V) = Surfacing Material containing Vermiculite; PLM Bulk Asbestos Analysis using Olympus, Model BH-2 Pol Scope, Microscope, Serial #: 229915, by Appd E to Subpt E, 40 CFR 763 quantified by either CVES or 400 pt ct as noted for each analysis (NVLAP 200546-0), ELAP PLM Method 198.1 for NY friable samples, which includes the identification and quantitation of vermiculite, or ELAP 198.6 for NOB samples, or EPA 400 pt ct by EPA 600-M4-82-020 (NY ELAP Lab 11480); Note:PLM is not consistently reliable in detecting asbestos in floor coverings and similar non-friable organically bound materials. NAD or Trace results by PLM are inconclusive, TEM is currently the only method that can be used to determine if this material can be considered or treated as non asbestos-containing in NY State (also see EPA Advisory for floor tile, FR 59,146,38970,8/1/94) National Institute of Standards and Technology Accreditation requirements mandate that this report must not be reproduced except in full without the approval of the lab.This PLM report relates ONLY to the items tested. RI Cert AAL-094, CT Cert PH-0186, Mass Cert AA000054, NJ Lab ID #NY031.

_____END OF REPORT_____

Client Name: Eisenbach & Ruhnke Engineering, P.C.

Table I
Summary of Bulk Asbestos Analysis Results

14-21-05; Fuller And D'Angelo; Building A

AmeriSci Sample #	Client Sample#	HG Area	Sample Weight (gram)	Heat Sensitive Organic %	Acid Soluble Inorganic %	Insoluble Non-Asbestos Inorganic %	** Asbestos % by PLM/DS	** Asbestos % by TEM
01	033	17	0.261	37.8	19.7	42.5	NAD	NAD
Location: Classroom - Homasote Mastic								
02	034	17	0.162	41.9	24.6	33.5	NAD	NAD
Location: Classroom - Homasote Mastic								
03	035	18	----	----	----	----	NAD	NA
Location: Classroom - Homasote								
04	036	18	----	----	----	----	NAD	NA
Location: Classroom - Homasote								
05	037	19	0.199	13.5	84.1	2.4	NAD	NAD
Location: Rm. A16 - 1 x 1 Floor Tile (White)								
06	038	19	0.251	14.0	82.9	3.1	NAD	NAD
Location: Rm. A16 - 1 x 1 Floor Tile (White)								
07	039	20	0.273	14.2	80.7	5.1	NAD	NAD
Location: Rm. A11 - 1 x 1 Floor Tile (Blue)								
08	040	20	0.240	14.6	81.4	4.0	NAD	NAD
Location: Rm. A11 - 1 x 1 Floor Tile (Blue)								
09	041	21	0.162	94.5	3.5	2.0	NAD	NAD
Location: Classroom - Cabinet Sheet Vinyl (Green)								
10	042	21	0.133	97.2	0.2	2.6	NAD	NAD
Location: Classroom - Cabinet Sheet Vinyl (Green)								
11	043	22	0.309	39.8	46.9	13.3	NAD	NAD
Location: Classroom - Cove Base Mastic								
12	044	22	0.221	46.2	48.3	5.6	NAD	NAD
Location: Classroom - Cove Base Mastic								
13	045	23	0.225	47.0	20.9	31.9	Chrysotile <0.25	Chrysotile <1.0
Location: Boys BR - Ceramic Wall Tile Mastic								
14	046	23	0.313	45.4	17.9	36.5	Chrysotile <0.25	Chrysotile <1.0
Location: Boys BR - Ceramic Wall Tile Mastic								
15	047	24	----	----	----	----	NAD	NA
Location: Boys BR - Ceramic Wall Tile Grout								
16	048	24	----	----	----	----	NAD	NA
Location: Boys BR - Ceramic Wall Tile Grout								

See Reporting notes on last page

Client Name: Eisenbach & Ruhnke Engineering, P.C.

Table I
Summary of Bulk Asbestos Analysis Results

14-21-05; Fuller And D'Angelo; Building A

AmeriSci Sample #	Client Sample#	HG Area	Sample Weight (gram)	Heat Sensitive Organic %	Acid Soluble Inorganic %	Insoluble Non-Asbestos Inorganic %	** Asbestos % by PLM/DS	** Asbestos % by TEM
17	049	25	----	----	----	----	NAD	NA
Location: Tunnel - Cold Air Return Tube								
18	050	25	----	----	----	----	NAD	NA
Location: Tunnel - Cold Air Return Tube								
19	051	26	0.252	56.0	42.1	2.0	NAD	NAD
Location: Tunnel - AHU Door Seal								
20	052	26	0.134	55.9	41.9	2.2	NAD	NAD
Location: Tunnel - AHU Door Seal								

Analyzed by: Gabriella Morozov
Date: 3/11/2022

Reviewed by: Gabriella Morozov

**Quantitative Analysis (Semi/Full); Bulk Asbestos Analysis - PLM by Appd E to Subpt E, 40 CFR 763 or NYSDOH ELAP 198.1 for New York friable samples or NYSDOH ELAP 198.6 for New York NOB samples; TEM (Semi/Full) by EPA 600/R-93/116 (or NYSDOH ELAP 198.4; for New York samples). Analysis using Hitachi, Model H600-Noran 7 System, Microscope, Serial #: 542-26-10. NAD = no asbestos detected during a quantitative analysis; NA = not analyzed; Trace = <1%; (SOF-V) = Sprayed On Fireproofing containing Vermiculite; (SM-V) = Surfacing Material containing Vermiculite; Quantitation for beginning weights of <0.1 grams should be considered as qualitative only; Qualitative Analysis: Asbestos analysis results of "Present" or "NVA = No Visible Asbestos" represents results for Qualitative PLM or TEM Analysis only (no accreditation coverage available from any regulatory agency for qualitative analyses): NVLAP (PLM) 200546-0, NYSDOH ELAP Lab 11480, NJ Lab ID #NY031.

Warning Note: PLM limitation, only TEM will resolve fibers <0.25 micrometers in diameter. TEM bulk analysis is representative of the fine grained matrix material and may not be representative of non-uniformly dispersed debris for which PLM evaluation is recommended (i.e. soils and other heterogenous materials).

EISENBACH & RUHNKE ENGINEERING, P.C.
291 GENESEE STREET, UTICA, NEW YORK 13501
315·735·1916 · FAX 315·735·6365 · E-MAIL info@ereng.com

BULK SAMPLE LOG
ASBESTOS
Log No: ____of____

CLIENT: Fuller and D'Angelo	ANALYSIS: ☐ PLM Only ☐ TEM Only
PROJECT NAME/LOCATION: Building A	☒ PLM/TEM as required by ELAP
SAMPLES COLLECTED BY: Matt Inman	☐ Other _____
NYS DEPT OF LABOR CERTIFICATE NO. 97-21928	TURNAROUND TIME:
DATE SAMPLED: 3/2/22 — PROJECT#: 14-21-05	☐ RUSH ☐ 12 Hour ☐ 24 HOUR
	☐ 48 Hour ☒ 72 Hour ☐ Other_____

NOTES:

SAMPLE NUMBER	HOMO ID #	MATERIAL SAMPLED	LOCATION	ANALYZE ONLY IF SAMPLE TO THE LEFT IS NEGATIVE BY PLM/TEM
033	17	Homosote Mastic	Classroom	034-036
034	17	↓ ↓	↓	035, 036
035	18	Homosote	↓	036
036	18	↓	↓	
037	19	1X1 Floor Tile - white	Rm A16	038-040
038	19	↓ ↓	↓	039, 040
039	20	1X1 Floor Tile - Blue	Rm A11	040
040	20	↓ ↓	↓	
041	21	Cabinet Sheet Vinyl	Classroom	042
042	21	↓ ↓ GREEN	↓	
043	22	Coveback Mastic	Classroom	044
044	22	↓ ↓	↓	
045	23	Ceramic Wall Tile Mastic	Boys BR	046-048
046	23	↓ ↓	↓	047, 048
047	24	Ceramic Wall Tile Grout	↓	048
048	24	↓ ↓ ↓	↓	
049	25	Cold Air Return Tube	Tunnel	050
050	25	↓ ↓	↓	
051	26	AHU Door Seal	↓	051
052	26	↓ ↓	↓	

	PRINTED NAME	SIGNATURE	COMPANY	DATE	# OF SAMPLES
Remitted by:	Matt Inman	Matthew Inman	ER	3/3/22	20
Received by:	Kaileigh Bylone	KBylone	Ameresco	3/8/22	1200

PLEASE EMAIL RESULTS TO MInman@ereng.com **ATTN:** Matt

PLEASE FAX RESULTS TO ( ) - ATTN:

222031651

Please Reply To:

AmeriSci New York
117 EAST 30TH ST.
NEW YORK, NY 10016
TEL: (212) 679-8600 • FAX: (212) 679-3114

LABORATORY ELECTRONIC TRANSMITTAL

To:	Jack Eisenbach Eisenbach & Ruhnke Engineering, P.C.	**From:**	Marik Peysakhov
		AmeriSci Job #:	222033161
Fax #:		**Subject:**	ELAP-PLM/TEM 3 day Results
		Client Project:	14-22-01; Fuller D'Angelo; Edgemont Bldg. A
Email:	acorrell@erengpc.com, minman@erengpc.com		

Date: Monday, March 28, 2022
Time: 09:53:33
Comments:

Number of Pages: _____
(including cover sheet)

NOTE: Attached report is to be considered preliminary until final review with accompanying analysis summary letter is issued.

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NEW YORK, NY 10016
TEL: (212) 679-8600 • FAX: (212) 679-3114

PLM Bulk Asbestos Report

Eisenbach & Ruhnke Engineering, P.C.
Attn: Jack Eisenbach
291 Genesee Street

Utica, NY 13501

Date Received 03/25/22
Date Examined 03/27/22
ELAP # 11480
AmeriSci Job # 222033161
P.O. #
Page 1 **of** 1
RE: 14-22-01; Fuller D'Angelo; Edgemont Bldg. A

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
053	222033161-01	No	NAD (by NYS ELAP 198.6) by John P. Koubiadis on 03/27/22
Location: Mech. Rm. - Duct Mastic			
Analyst Description: Black, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 30.1%			
054	222033161-02	No	NAD (by NYS ELAP 198.6) by John P. Koubiadis on 03/27/22
Location: Mech. Rm. - Duct Mastic			
Analyst Description: Black, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 29.1%			

Reporting Notes:

Analyzed by: John P. Koubiadis
Date: 3/27/2022

Reviewed by: Marik Peysakhov

*NAD/NSD =no asbestos detected; NA =not analyzed; NA/PS=not analyzed/positive stop, (SOF-V) = Sprayed On Fireproofing containing Vermiculite; (SM-V) = Surfacing Material containing Vermiculite; PLM Bulk Asbestos Analysis using Olympus, Model BH-2 Pol Scope, Microscope, Serial #: 223705, by Appd E to Subpt E, 40 CFR 763 quantified by either CVES or 400 pt ct as noted for each analysis (NVLAP 200546-0), ELAP PLM Method 198.1 for NY friable samples, which includes the identification and quantitation of vermiculite, or ELAP 198.6 for NOB samples, or EPA 400 pt ct by EPA 600-M4-82-020 (NY ELAP Lab 11480); Note:PLM is not consistently reliable in detecting asbestos in floor coverings and similar non-friable organically bound materials. NAD or Trace results by PLM are inconclusive, TEM is currently the only method that can be used to determine if this material can be considered or treated as non asbestos-containing in NY State (also see EPA Advisory for floor tile, FR 59,146,38970,8/1/94) National Institute of Standards and Technology Accreditation requirements mandate that this report must not be reproduced except in full without the approval of the lab.This PLM report relates ONLY to the items tested. RI Cert AAL-094, CT Cert PH-0186, Mass Cert AA000054, NJ Lab ID #NY031.

END OF REPORT

Client Name: Eisenbach & Ruhnke Engineering, P.C.

Table I
Summary of Bulk Asbestos Analysis Results
14-22-01; Fuller D'Angelo; Edgemont Bldg. A

AmeriSci Sample #	Client Sample#	HG Area	Sample Weight (gram)	Heat Sensitive Organic %	Acid Soluble Inorganic %	Insoluble Non-Asbestos Inorganic %	** Asbestos % by PLM/DS	** Asbestos % by TEM
01	053		0.284	66.3	3.6	30.1	NAD	NAD
Location: Mech. Rm. - Duct Mastic								
02	054		0.149	65.6	5.3	29.1	NAD	NAD
Location: Mech. Rm. - Duct Mastic								

Analyzed by: Marik Peysakhov
Date: 3/28/2022

Reviewed by: Marik Peysakhov

**Quantitative Analysis (Semi/Full); Bulk Asbestos Analysis - PLM by Appd E to Subpt E, 40 CFR 763 or NYSDOH ELAP 198.1 for New York friable samples or NYSDOH ELAP 198.6 for New York NOB samples; TEM (Semi/Full) by EPA 600/R-93/116 (or NYSDOH ELAP 198.4; for New York samples). Analysis using Hitachi, Model H7000-Noran 7 System, Microscope, Serial #: 747-05-06. NAD = no asbestos detected during a quantitative analysis; NA = not analyzed; Trace = <1%; (SOF-V) = Sprayed On Fireproofing containing Vermiculite; (SM-V) = Surfacing Material containing Vermiculite; Quantitation for beginning weights of <0.1 grams should be considered as qualitative only; Qualitative Analysis: Asbestos analysis results of "Present" or "NVA = No Visible Asbestos" represents results for Qualitative PLM or TEM Analysis only (no accreditation coverage available from any regulatory agency for qualitative analyses): NVLAP (PLM) 200546-0, NYSDOH ELAP Lab 11480, NJ Lab ID #NY031.

Warning Note: PLM limitation, only TEM will resolve fibers <0.25 micrometers in diameter. TEM bulk analysis is representative of the fine grained matrix material and may not be representative of non-uniformly dispersed debris for which PLM evaluation is recommended (i.e. soils and other heterogenous materials).

EISENBACH & RUHNKE ENGINEERING, P.C.
291 GENESEE STREET, UTICA, NEW YORK 13501
315-735-1916 · FAX 315-735-6365 · E-MAIL info@ereng.com

BULK SAMPLE LOG
ASBESTOS
Log No: ____of____

CLIENT: Fulker D'Angelo	ANALYSIS: ☐ PLM Only ☐ TEM Only
PROJECT NAME/LOCATION: Edgemont Bldg. A	☒ PLM/TEM as required by ELAP
SAMPLES COLLECTED BY: Matt Inman	☐ Other _____
NYS DEPT OF LABOR CERTIFICATE NO. 97-21978	TURNAROUND TIME:
DATE SAMPLED: 3/24/22 PROJECT#: M-22-01	☐ **RUSH** ☐ 12 Hour ☐ 24 HOUR
	☐ 48 Hour ☒ 72 Hour ☐ Other_____

NOTES:

222033161

SAMPLE NUMBER	HOMO ID #	MATERIAL SAMPLED	LOCATION	ANALYZE ONLY IF SAMPLE TO THE LEFT IS NEGATIVE BY PLM/TEM
053		Duct Mastic	Mech Rm	
054		↓ ↓	↓	

	PRINTED NAME	SIGNATURE	COMPANY	DATE	# OF SAMPLES
Remitted by:	Matt Inman	Matt	E&R	3/24/22	2
Received by:	Alexander Velez	Velez	Amesci	3-25-22 1027	

PLEASE EMAIL RESULTS TO minman @ ereng pc.com **ATTN:** Matt

PLEASE FAX RESULTS TO ( ) - ATTN:

APPENDIX D

ACCREDITATIONS

New York State – Department of Labor
Division of Safety and Health
License and Certificate Unit
State Campus, Building 12
Albany, NY 12240

ASBESTOS HANDLING LICENSE

Eisenbach and Ruhnke Engineering, P.C.

291 Genesee Street

Utica, NY 13501

FILE NUMBER: 99-0709
LICENSE NUMBER: 29318
LICENSE CLASS: RESTRICTED
DATE OF ISSUE: 11/22/2021
EXPIRATION DATE: 11/30/2022

Duly Authorized Representative – Jack Eisenbach:

This license has been issued in accordance with applicable provisions of Article 30 of the Labor Law of New York State and of the New York State Codes, Rules and Regulations (12 NYCRR Part 56). It is subject to suspension or revocation for a (1) serious violation of state, federal or local laws with regard to the conduct of an asbestos project, or (2) demonstrated lack of responsibility in the conduct of any job involving asbestos or asbestos material.

This license is valid only for the contractor named above and this license or a photocopy must be prominently displayed at the asbestos project worksite. This license verifies that all persons employed by the licensee on an asbestos project in New York State have been issued an Asbestos Certificate, appropriate for the type of work they perform, by the New York State Department of Labor.

Amy Phillips, Director
For the Commissioner of Labor

SH 432 (8/12)

NEW YORK STATE DEPARTMENT OF HEALTH
WADSWORTH CENTER

Expires 12:01 AM April 01, 2022
Issued April 01, 2021

CERTIFICATE OF APPROVAL FOR LABORATORY SERVICE

Issued in accordance with and pursuant to section 502 Public Health Law of New York State

MR. PAUL J. MUCHA
AMERICA SCIENCE TEAM NEW YORK, INC
117 EAST 30TH ST
NEW YORK, NY 10016

NY Lab Id No: 11480

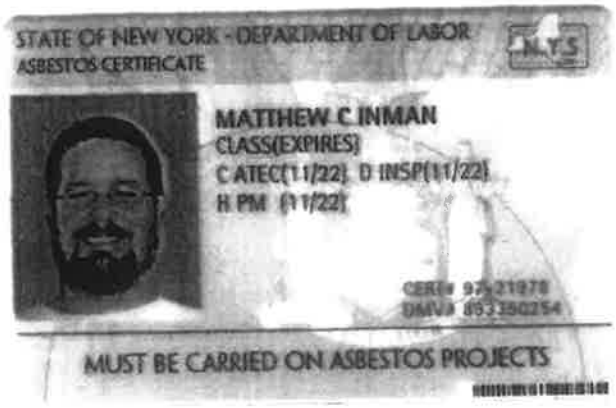
is hereby APPROVED as an Environmental Laboratory for the category
ENVIRONMENTAL ANALYSES SOLID AND HAZARDOUS WASTE
All approved subcategories and/or analytes are listed below:

Miscellaneous

Asbestos In Friable Material	Item 198.1 of Manual
	EPA 600/M4/82/020
Asbestos In Non-Friable Material-PLM	Item 198.6 of Manual (NOB by PLM)
Asbestos In Non-Friable Material-TEM	Item 198.4 of Manual

Serial No.: 63000

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Geotechnical Report

Edgemont School District Improvements
Improvements at Three Schools

Edgemont Jr./Sr. High School
200 White Oak Lane

Greenville Elementary School
100 Glendale Road

Seely Place Elementary School
51 Seely Place

Scarsdale, New York

February 2, 2022

Prepared for:

Fuller & D'Angelo, P.C.
45 Knollwood Road, Suite 401
Elmsford, NY 10523

Prepared by:

SKYLANDS ENGINEERING, LLC
124 Milton Road
Sparta, NJ 07871

Geotechnical Report

Edgemont School District Improvements
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Elmsford, NY 10523

Prepared by:

SKYLANDS ENGINEERING, LLC
124 Milton Road
Sparta, NJ 07871
Certificate of Authorization No. 0013604



2-2-2022

Eugene J. Schwarzrock, Treasurer/Principal Engineer — Date
New York License No. 077091

Note: it is a violation of NY Education Law Section 7209 for any person to alter any item in this report in any way, unless they are acting under the direction of a Professional Engineer registered in New York. The altering engineer shall affix to this page their seal, the notation "altered by" followed by their signature and date of alteration, and a specific description of the alteration(s) made.

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- **EDGEMONT JR./SR. HIGH SCHOOL** **4**
- **GREENVILLE ELEMENTARY SCHOOL** **6**
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APPENDIX (one section per each site)

- Subsurface Investigation Plan(s)
- Boring Logs

INTRODUCTION

This project consists of the design and construction of building additions and/or site improvements at each of the three (3) Edgemont School District facilities: Edgemont Jr./Sr. High School located at 200 White Oak Lane, Greenville Elementary School located at 100 Glendale Road, and Seely Place Elementary School located at 51 Seely Place, all located in the Town/Village of Scarsdale, Westchester County, New York. Improvements at Edgemont Jr./Sr. High School consist of two (2) building additions, and the addition of two (2) new parking lots and a new ±850 LF driveway. The Building A addition will be ±21,700 SF x 1 sty tall (with possible future expansion to 2 sty), and with a utilities basement beneath the southwest corner. The Cafeteria addition will be ±3,800 SF x 1 sty, and without a basement. Improvements at Greenville Elementary School include a new building addition ±8,200 SF x 1 sty tall (with possible future expansion to 2 sty) without basement, and construction of two new parking areas and a new ±850 LF driveway. Improvements at Seely Place Elementary School include as construction of a new ±11,000 SF parking lot adjacent to Ardsley Road, and a ±280 LF walking path connecting the lot to the existing school driveway.

This report presents the findings of a subsurface investigation prepared and conducted by others, as well as recommendations for design and construction of the proposed improvements. Note that complete survey data was not available at the time of this report, so some elevations in this report are based on Google Earth Pro data.

GEOLOGY

Based on our review of topographic maps and published geologic data for this area of Scarsdale, including the *Surficial Geologic Map of New York - Lower Hudson Sheet*, 1989, by Caldwell, Connally, et. al., all three (3) sites are expected to be underlain by glacial till consisting of a mixture of grain sizes ranging from clay and silt, to sand, cobbles and boulders. Underlying bedrock is expected to consist of Fordham gneiss at Greenville ES, and Yonkers gneiss based on the *(Bedrock) Geologic Map of New York - Lower Hudson Sheet*, 1970, by Rickard, Isachsen, and Fisher.

SUBSURFACE INVESTIGATION

Soiltesting, Inc. of Oxford, CT performed borings at each of the three (3) sites between December 27 and 31, 2021 to identify the subsurface conditions present beneath portions of each site.

At Edgemont Jr./Sr. High School twenty-three (23) borings were performed, including borings WO-1 through WO-4, WO-6, WO-6A through WO-22, and WO-22A. Borings WO-1 through WO-8 and WO-19 were performed within the footprint of the proposed Building A addition, borings WO-21 and WO-22 were performed at the proposed Cafeteria addition, and the remainder of the borings were performed in the areas of proposed parking lots and roadways. Most borings were sampled continuously from the ground surface to a depth of 10 ft. to 12 ft., or the the bottom of the boring if terminated above that depth, then at 5 ft. intervals to the bottom of the boring. Borings beneath the proposed Building A addition were terminated at depths of 1.6 ft. to 15 ft. Borings beneath the proposed Cafeteria addition were terminated at depths of 1 ft. to 22 ft.

At Greenville Elementary School eleven (11) borings were performed, including borings GB-1 through GB-4 within the footprint of the proposed building addition, and borings GB-5 through GB-11 in the areas of the proposed driveway and parking lot. The borings were sampled continuously from the

ground surface to a depth of 10 ft. to 12 ft., or the the bottom of the boring if terminated above that depth, then at 5 ft. intervals to the bottom of the boring. Borings beneath the proposed building addition were terminated at depths of 5 ft. to 17 ft.

At Seely Place Elementary School borings SP-1 and SP-2 were both performed within the proposed parking lot, and sampled continuously from the ground surface to the bottom of the boring at a depth of 8 ft.

All borings were drilled using a 4-¼ in. hollow stem auger to advance and maintain the hole. Sampling was performed using a 2 in. O.D. split spoon sampler driven by a 140 lb. safety hammer with a 30 in. drop and the number of blows for each 6 in. increment was recorded, in accordance with procedures outlined in ASTM D1586, Standard Test Method for Standard Penetration Test (SPT) and Split-Barrel Sampling of Soils. Soil samples were classified by an experienced geologist from Soiltesting, Inc., in general agreement with D.M. Burmister's "Suggested Test Methods for Identification of Soils" (ASTM, 1958).

Groundwater was recorded at each boring when it was first encountered since all the borings were performed without the introduction of water.

Boring Location Plans and typed boring logs are presented in the Appendix. The boring logs were amended by Skylands Engineering to include the approximate elevations at each boring based on provided site plans.

SUBSURFACE CONDITIONS

The subsurface conditions encountered beneath the three (3) sites are generally consistent with the published geologic literature; the following sections describe those conditions encountered.

EDGEMONT JR./SR. HIGH SCHOOL

In the area of the Building A addition, between 1 in. and 6 in. of topsoil was encountered at the surface. Below the topsoil, mostly medium dense to dense, brown fine sand with significant proportions of coarse to fine gravel and lesser amounts of silt are present to the top of weathered bedrock. Significant cobbles and boulders are also present in the soil overburden. Standard penetration test (SPT) N-values, discounting any values considered influenced by cobbles, boulders, etc., ranged from 3 blows per foot (bpf) to 80 bpf, with an N_{ave}=±33 bpf. Auger refusal, indicative of possible fractured, weathered, or unweathered bedrock, was encountered at depths ranging from 0 ft. (El. ±310) at boring WO-5, to 15 ft. (El. ±284) at boring WO-2.

At the proposed Cafeteria addition, boring WO-21 near the existing building encountered 6 in. of topsoil, then medium dense to dense, brown fine sand with significant proportions of coarse to fine gravel and lesser amounts of silt, to the top of suspected fractured, weathered or unweathered bedrock. Significant cobbles and boulders were also present at this location. SPT N-values, discounting any values considered influenced by cobbles, boulders, etc., ranged from 10 bpf to 50 bpf, with an N_{ave}=±28 bpf. Auger refusal, indicative of possible weathered or unweathered bedrock, was encountered at a depth of 12 ft. (El. ±289) at boring WO-21, and ≤2 ft. (El. ±297.5) at borings WO-22 and WO-22A.

Within the areas of the proposed parking lots and driveway, sands similar to those described above are present above relatively shallow bedrock, with the depth to bedrock varying from 3 ft. to 3.5 ft. beneath the proposed northern parking lot, to 2 ft. to 8 ft. deep beneath the proposed southern parking lot, to 3 ft. to >8 ft. deep along the proposed south entry driveway.

Groundwater was not encountered in any of the borings at the Edgemont Jr./Sr. High School.

GREENVILLE ELEMENTARY SCHOOL

In the area of the proposed building addition, between 4 in. and 6 in. of topsoil was encountered at the surface. Below the topsoil, medium dense to mostly very dense, brown medium to fine sand with significant proportions of coarse to fine gravel and lesser amounts of silt are present to the top of weathered bedrock. Similar to above, significant cobbles and boulders are also present in the soil overburden. Standard penetration test (SPT) N-values, discounting any values considered influenced by cobbles, boulders, etc., ranged from 13 bpf to >100 bpf, with an N_{ave}=±56 bpf. Suspected fractured or weathered bedrock was encountered at depths ranging from 5 ft. to 6.5 ft. and auger refusal on likely unweathered bedrock was encountered at depths ranging from 5 ft. to 17 ft.

Along the areas of the proposed parking lots and driveway, sands similar to those described above, as well as more silty sands, are present, also above relatively shallow bedrock. SPT N-values, discounting any values considered influenced by cobbles, boulders, etc., ranged from 5 bpf to 70 bpf, with an N_{ave}=±19 bpf. The depth to bedrock varies from 4 ft. to >8 ft., with undulating rock surface expected based on the general inconsistency in depths.

Groundwater was not encountered in any of the borings at the Greenville Elementary School.

SEELY PLACE ELEMENTARY SCHOOL

The borings at the proposed parking lot at Seely Place Elementary School encountered between 4 in. and 6 in. of topsoil, underlain by brown, loose to dense, medium to fine sand with significant amounts of silt and coarse to fine gravel. Cobbles were encountered only sporadically, i.e., significantly less vs. those reported at the two (2) other school sites. Standard penetration test (SPT) N-values, discounting any values considered influenced by cobbles, boulders, etc., ranged from 8 bpf to 55 bpf, with an N_{ave}=±12 bpf within the uppermost 2 ft.

Groundwater was not encountered in either of the borings at the Seely Place Elementary School.

DESIGN RECOMMENDATIONS

Based on the findings of this subsurface investigation program we recommend that conventional spread footings are suitable for support of the proposed building additions, and possible retaining walls that may be required for site grading. The recommended frost depth for Scarsdale is 42 in. therefore all footings along exterior walls should be founded at least this deep below finish exterior grades to protect against possible damage from frost heave. Footings within continuously-heated space and below basements may be founded at shallower depth, with a minimum embedment of 2 ft. recommended. Where unweathered bedrock is present at shallow depth, i.e. <48 in. below finish exterior grade, footings may be founded directly on the unweathered bedrock at shallow depth since bedrock not be susceptible to frost heave.

Roadway and parking lot construction is expected to be able to be carried out in typical fashion, with cuts and fills performed in stable, granular soils, without encountering bedrock. This assumes only moderate changes to the existing contours, <±5 ft. Note proposed grades for the new pavements were not provided at the time of this report.

The following additional recommendations are made for each of the three (3) project sites.

EDGEMONT JR./SR. HIGH SCHOOL

As mentioned earlier, improvements at Edgemont Jr./Sr. High School will consist of two (2) building additions, and the addition of two (2) new parking lots and a new ±850 LF driveway. The Building A addition will be ±21,700 SF x 1 sty tall, with possible future expansion to 2 sty. A basement-level utilities room will be constructed beneath the southwest corner. The finish floor of Building A is currently at El. 298.78 and the proposed addition will be constructed at El. 301.28. The south-eastern portion of the addition will be in cut, with existing grades here ranging to El. ±315, while the south-central portion will be in fill since grades here range as low as El. ±294.5. The utility basement is estimated to be 10 ft. below the proposed finish floor, or at El. 291.28; existing grades here range between El. ±293 and El. ±295 therefore ±5 ft. deep cuts will be required here to reach bottom of footing elevations.

In general, after stripping the surficial topsoil and reaching the bottom of slab and bottom of footing elevations, either by excavating the excess material or placing structural fill, the addition is expected to be underlain by stable granular soils and or/bedrock, both of which are suitable for support of the new addition. In cut areas, maximum cuts of up to 10 ft. below the apparent bedrock surface will be required (see boring WO-5). No bedrock cores were performed here, however based on the thickness of bedrock above auger refusal, it is expected that some line drilling and hammering will be required to removed some of the bedrock. Blasting is not recommended to the proximity of other buildings. Where bedrock will be present below footings, it should be removed and a minimum 8 in. thick layer of structural fill placed so that all building footings are founded on similar materials (i.e., soil) and differential settlements are minimized. In fill areas, after the topsoil is removed the subgrade should be proof-rolled and compacted using a 10 T vibratory roller or double-drum walk-behind vibratory padfoot roller (ex. Rammax) prior to placing new structural fill. The smaller compactor should also be used adjacent to the existing structure to prevent damage to the existing structure.

The Cafeteria addition will be ±3,800 SF x 1 sty, without a basement, and will match the existing finish floor at El. 301.85. Existing grades here vary from El. ±298.5 to El. ±302.5, with the more than half the footprint in use as a patio at El. ±302.5 supported by a retaining wall. Following removal of the existing patio, retaining walls, sidewalks, and topsoil, the underlying soils are expected to consist of suitably dense, granular soils, and possibly bedrock. Based on the anticipated minimum amount of bedrock which may need to be removed here, line drilling is not expected to be necessary, and rock removal using an excavator-mounted hoe-ram is recommended here. Similar to above, bedrock should be removed to a minimum depth of 12 in. below all footings and structural fill placed here so differential settlements are minimized. Otherwise, following removal of all topsoil, etc. the underlying subgrade should be proof-rolled and compacted using a 10 T vibratory roller or double-drum walk-behind vibratory padfoot roller prior to placing new structural fill.

Following the above treatments, an allowable bearing capacity of 2 tsf and a coefficient of base sliding of 0.45 is recommended for design of both building additions. Minimum footing widths of 24 in. for wall footings and 30 in. for column footings are recommended to limit differential settlements. Proposed exterior grades around the south side of Building A are expected to drop, therefore footings should be stepped to accommodate the sloping ground while maintaining minimum frost embedment requirements.

The following in situ soil properties are recommended for design of retaining wall portions of either building, and possible other nearby retaining walls:

Moist unit weight of retained soil,	γ_t = 120 pcf
Angle of internal friction,	ϕ = 34°
Lateral earth pressure coefficients:	
Active,	K_a = 0.28
At-rest,	K_o = 0.44 (restrained/basement walls)
Passive,	K_p = 3.54
Coeff. of friction (sliding),	tan δ = 0.45 (CIP concrete on compacted subgrade)

Following the above recommendations, it is estimated that maximum post construction foundation settlement will be no more than ½ in., with no more than ¼ in. differential settlement between adjacent columns. These values are within generally accepted tolerance limits for this type of structure/use; however, this differential movement needs to be accounted for in design and construction so that trip hazards are eliminated, especially where the new addition meets the existing building. Final floor finishes should not be installed until the structure is completed, including roofing, glazing, etc. Settlement is expected to be elastic (instantaneous), with no long-term consolidation settlement occurring.

The basement and first floor slabs may be constructed as a slab-on-grade following removal of the surficial topsoil, proof rolling and compaction of the subgrade, and placement and compaction of structural fill and/or capillary break material. The in situ subgrade materials should be compacted using a 10 T vibratory roller away from building walls and a double-drum, walk-behind vibratory roller adjacent to the walls in order to provide uniform support beneath the slab. A minimum of four (4) passes should be made with the compactor, and until no further settlement is visible. A modulus of subgrade 200 pci is recommended for design of these slabs.

Waterproofing and underslab drainage is not recommend since groundwater was not measured within 6 ft. of the proposed basement slab elevation.

In accordance with the provisions of Section 1613.3.2 of the New York 2020 Building Code, and ASCE 7-16 Chapter 20, a seismic site class of C, very dense soil, is recommended for design of both building additions based on the findings of this subsurface investigation and/or default or assumed conditions. Note that a site class of B may be possible at the Cafeteria addition, however since we cannot be certain that all footings will be within 10 ft. of the top of bedrock, site class C is recommended. Based on the project location, in conjunction with the above site class, the following seismic parameters follow from the Code:

S_s = 0.294	S_1 = 0.062
F_a = 1.3	F_v = 1.5

S_{MS} = 0.383 S_{M1} = 0.092

S_{DS} = 0.255 S_{D1} = 0.061

Seismic Design Category Based on Short Period Response Accelerations = B*†

Seismic Design Category Based on 1-sec Period Response Accelerations = A*

* based on assumed Risk Category III

† governs

There is no evidence of past slope instability and none is expected under static or seismic loading.

Liquefaction is not a concern due to the high relative density of the in situ soils and lack of groundwater.

Along the proposed roadways and parking lots, possible bedrock, as evidenced by auger refusal, is expected to be present at a depth of ±3 ft. beneath the new northern parking lot, ±3 ft. to ±5 ft. beneath the new northern roadway and cul-de-sac, ±2 ft. to ±6 ft. beneath the new southern parking lot, and deeper than 4 ft. along the new southern roadway to Digby Lane. Roadway design should consider the depth to the "Auger Refusal" notes on the borings and keep the pavement box above these elevations as much as possible to economize roadway construction. Should a small amount (thickness) of rock need to be removed, it is expected that the top few feet may be able to be peeled or ripped apart, or hammered out using a hoe-ram.

GREENVILLE ELEMENTARY SCHOOL

Improvements at Greenville Elementary School will include a new building addition ±8,200 SF x 1 sty tall, with possible future expansion to 2 sty, without a basement. Existing grades across the proposed building footprint vary from El. ±356 to El. ±357 across the majority of the footprint, to El. ±353.5 to the north. The building addition will match the existing finish floor at El. ±354.85.

After stripping the surficial topsoil and excavating to the bottom of slab and bottom of footing elevations, the addition is expected to be underlain by stable granular soils and possibly bedrock, both of which are suitable for support of the addition. It is possible bedrock may be encountered within the interior footings; similar to the recommendations for Building A above, if bedrock is present at the bottom of footing elevation, it should be removed and replaced with a minimum 8 in. thick layer of structural fill placed so that differential settlements are minimized. Where fills are required in the north end of the building, after the topsoil is removed the subgrade should be proof-rolled and compacted using a 10 T vibratory roller and/or double-drum walk-behind vibratory padfoot roller prior to placing new structural fill.

Following the above treatments, an allowable bearing capacity of 2 tsf and a coefficient of base sliding of 0.45 is recommended for design. Minimum footing widths of 24 in. for wall footings and 30 in. for column footings are recommended to limit differential settlements.

The following in situ soil properties are recommended for design of retaining wall portions of either building, and possible other nearby retaining walls:

Moist unit weight of retained soil, γ_t = 120 pcf

Angle of internal friction, ϕ = 36°

Lateral earth pressure coefficients:

Active, K_a = 0.26

Passive, K_p = 3.85

Coeff. of friction (sliding), $\tan \delta = 0.45$ (CIP concrete on compacted subgrade)

Following the above recommendations, it is estimated that maximum post construction foundation settlement will be no more than ½ in., with no more than ¼ in. differential settlement between adjacent columns. These values are within generally accepted tolerance limits for this type of structure/use; however, this differential movement needs to be accounted for in design and construction so that trip hazards are eliminated, especially where the new addition meets the existing building. Final floor finishes should not be installed until the structure is completed, including roofing, glazing, etc. Settlement is expected to be elastic (instantaneous), with no long-term consolidation settlement occurring.

The first floor slab may be constructed as a slab-on-grade following removal of the surficial topsoil, proof rolling and compaction of the subgrade, and placement and compaction of structural fill and/or capillary break material. The in situ subgrade soils should be compacted using a 10 T vibratory roller and a double-drum, walk-behind vibratory roller closer to the existing building to provide uniform support beneath the slab. A minimum of four (4) passes should be made with the compactor, and until no further settlement is visible. A modulus of subgrade 200 pci is recommended for design of these slabs.

Waterproofing and underslab drainage is not required since groundwater is expected to be at least 2 ft. below the bottom of slab elevation.

In accordance with the provisions of Section 1613.3.2 of the New York 2020 Building Code, and ASCE 7-16 Chapter 20, a seismic site class of C, very dense soil, is recommended for design based on the findings of this subsurface investigation and/or default or assumed conditions. Based on the project location, in conjunction with the above site class, the following seismic parameters follow from the Code (identical to the High School):

$S_s = 0.295$	$S_1 = 0.061$
$F_a = 1.3$	$F_v = 1.5$
$S_{MS} = 0.384$	$S_{M1} = 0.092$
$S_{DS} = 0.256$	$S_{D1} = 0.061$

Seismic Design Category Based on Short Period Response Accelerations = B*†

Seismic Design Category Based on 1-sec Period Response Accelerations = A*

* based on assumed Risk Category III

† governs

There is no evidence of past slope instability and none is expected under static or seismic loading.

Liquefaction is not a concern due to the high relative density of the in situ soils and lack of groundwater.

Also proposed are a new ±60 ft. x ±115 ft. parking lot adjacent to Ardsley Road and an ±25 ft. wide x ±850 LF driveway leading from an existing parking lot on the east side of the school to the new parking lot at Ardsley Road. A retaining wall may also be required for grading purposes around the northwest corner of existing tennis courts immediately downhill from the proposed driveway. Along the proposed roadway and within the proposed lower parking lot, possible bedrock, as evidenced by auger refusal, is not expected to be at least ±5 ft. below existing grade except in the west corner of the new parking lot where it may be as shallow as 2 ft. Roadway design should consider the depth to the "Auger Refusal" notes, or very high SPT blow counts, e.g. 100/4", on the borings and keep the pavement box above

these elevations as much as possible to economize roadway construction. Should a small amount (thickness) of rock need to be removed, it is expected that the top few feet may be able to be peeled or ripped apart, or hammered out using a hoe-ram.

Should a retaining wall be required along the northern edge of the tennis court to support the new driveway, the following properties are recommended for design.

Moist unit weight of retained soil,	γ_t	= 115 pcf
Angle of internal friction,	ϕ	= 30°
Lateral earth pressure coefficients:		
Active,	K_a	= 0.33
Passive,	K_p	= 3.00
Coeff. of friction (sliding),	tan δ	= 0.45 (CIP concrete on compacted subgrade)

SEELY PLACE ELEMENTARY SCHOOL

Improvements at Seely Place Elementary School include construction of a new ±11,000 SF (approx. 110 ft. x 120 ft.) parking lot adjacent to Ardsley Road. Following removal of the surficial topsoil and organics, suitable granular soils are expected to be present to suitable depth and bedrock is not expected to be encountered here. Typical parking lot construction techniques are recommended here.

CONSTRUCTION RECOMMENDATIONS

Building and retaining wall footings and slabs on grade should not be constructed on frozen or wet subgrade materials. All frozen or saturated subgrade soil should be removed and replaced with compacted structural fill, clean crushed stone, or recycled concrete aggregate (RCA), as required.

All loosened soil present at the bottoms of footing excavations should be compacted using a jumping jack, vibratory trench compactor (ex. Rammax) , or other suitable equipment. Such compaction should continue until all visible settlement is complete.

While not encountered in any of the borings, should organic soils or organic matter be encountered during excavations, it should be removed completely from beneath new structures, driveways, and parking lots and be replaced with compacted structural fill. Organic soils should not be used as structural backfill, but may be used as general site fill/topsoil.

Any cobbles or boulders encountered during construction should be removed so that no part protrudes into the bottom or sides of slab or footing excavations.

Dewatering is not expected to be required during construction since groundwater was not encountered in any of the borings. Otherwise, standard construction trash pumps are expected to be sufficient to handle the anticipated inflows due to precipitation.

Structural fill material should consist of predominately well-graded, coarse to fine sand and/or gravel with a maximum 15% non-plastic fines (material passing a No. 200 sieve) and be free of organics and other deleterious materials. Aggregate size should be limited to no bigger than 1 in. in the largest dimension. Based on the findings of this subsurface investigation, it is estimated that less than half the in situ materials may be suitable for reuse as structural fill at Building A, and the Greenville addition.

Representative samples of all fill materials should be tested for gradation and moisture-density relationship prior to use to confirm its suitability.

Structural fill should be placed in maximum 12 in. loose lifts and compacted to 95% of its maximum dry density at optimum moisture content as determined by the Modified Proctor Density Test (ASTM D 1557). These operations should be performed under full-time geotechnical inspection and testing by either the Sand Cone Method (ASTM D 1556), Nuclear Density Gauge (ASTM D6938), or other moisture/density test methods. These density tests should be performed by an experienced geotechnical inspector at sufficient frequency and spacing to ensure proper compaction.

Excavations that extend deeper than 5 ft. require sheeting, shoring, sloping, or benching of the excavation sidewalls per OSHA standards. Depending on the space available for construction at each site, all the above-mentioned means may be suitable for use across the three (3) project sites. While an OSHA-competent person has to confirm and assign soil type(s) during construction, for estimating and scheduling purposes the soils present on site may be assumed to be Type C and therefore would need to be sloped back at a 1.5H:1V (34°), per OSHA requirements. The attached borings should be reviewed by the designer responsible for this design. All sheeting, shoring and bracing shall be designed by a professional engineer licensed in the State of New York.

It is recommended that all subgrade preparation procedures, as well as foundation and pavement construction, be inspected by a qualified geotechnical or civil engineer experienced with these types of construction. Full time inspection is recommended during subgrade preparation, compaction, placement of any structural fill, and paving to ensure adequate testing is performed, moisture contents are maintained at suitable levels, and materials and techniques are acceptable.

APPENDIX

Edgemont Jr./Sr. High School

BORING LOCATION PLAN
EDGEMONT JR./SR. HIGH SCHOOL

PROPOSED CAFETERIA ADDITION

PROPOSED BUILDING A ADDITION

PROPOSED DRIVEWAY

DIGBEY LANE

177'-0"

B1 B2 B3 B4 B5 B6 B7 B8 B9 B10 B11 B12 B13 B14 B15 B16 B17 B18 B19 B20 B21 B22

NOTES:
1. BASE PLAN ALTERED BY EUGENE J. SCHWARZROCK, P.E. 0077007-1 OF SKYLANDS ENGINEERING, LLC, 124 MILTON ROAD, SPARTA, NJ 07871, CERTIFICATE OF AUTHORIZATION NO. 0013524 ON FEB. 1, 2022 TO SHOW BORING LOCATIONS AND/OR REMOVE EXTRANEOUS INFORMATION NOT RELEVANT TO THIS BORING LOCATION PLAN.
2. BASE PLAN AND BORING LOCATIONS PROVIDED BY SOILTESTING, INC.

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WWW.FULLERDANGELO.COM
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PROJECT TITLE
EDGEMONT SCHOOL DISTRICT
BOND PHASE 2 ADDITIONS TO ADMINISTRATION BUILDING, BUILDING A & SITE WORK
300 WHITE OAK LANE, SCARSDALE, NY 10583

DRAWING TITLE
SITE PLAN

DATE	ISSUED TO

SHEET SIZE	DRAWING NO.
30"x42"	A10
SCALE: AS NOTED	
DRAWN BY: F & D	FILE NO. 21434.00

PLOT DATE: December 08, 2021 - 8:25am

FILE: I:\21434.03 Edgemont MS-HS Add. Bldg. A Cafe. and Renov. HVAC\DRAWINGS\CURRENT\1-F&D\21434.03-A10.dwg

SOILTESTING, INC. 90 DONOVAN RD. OXFORD, CT 06478 CT (203) 262-9328 NY (914) 946-4850	CLIENT: Fuller & D'Angelo Architects	SHEET 1 OF 1 HOLE NO. WO-1
	PROJECT NO. G259-1984-21	
	PROJECT NAME Edgemont School District Jr./Sr. High School	BORING LOCATIONS Per Plan
FOREMAN - DRILLER AO/jm	LOCATION 200 White Oak Lane Scarsdale, NY	
INSPECTOR	CASING / SAMPLER / CORE BAR	OFFSET
	TYPE: HSA / SS *	DATE START 12/29/21
GROUND WATER OBSERVATIONS	SIZE I.D.: 4 ¼" / 1 3/8"	DATE FINISH 12/29/21
AT none FT AFTER 0 HOURS	HAMMER WT.: 140# BIT	SURFACE ELEV. El. ±299
AT FT AFTER HOURS	HAMMER FALL: 30"	GROUND WATER ELEV.

DEPTH	CASING BLOWS PER FOOT	SAMPLE NO	Type	PEN	REC	DEPTH @ BOT	BLOWS PER 6 IN ON SAMPLER (FORCE ON TUBE) 0 - 6 / 6 - 12 / 12 - 18			CORE TIME PER FT (MIN)	DENSITY OR CONSIST / MOIST	STRATA CHANGE DEPTH / ELEV	FIELD IDENTIFICATION OF SOIL REMARKS INCL. COLOR, LOSS OF WASH WATER, SEAMS IN ROCK, ETC.
		1	ss	24"	22"	2'0"	3	19			dense	6"	Topsoil
							20	24			dry		Brn F sand, F-C gravel, trace silt
		2	ss	24"	16"	4'0"	19	21			dense		
							28	41			dry		Brn/lt brn F sand, F-C gravel, some silt
5													Boulders from 4' to 5'
		3	ss	24"	18"	7'0"	38	34			v dense		
							32	43			dry		Brn F sand, F-C gravel, trace silt
		4	ss	24"	14"	9'0"	39	37			v dense		
							43	48			dry		Same
10		5	ss	1"	1"	10'1"	50/1"				dense/dry		Same, cobbles
												14'	Auger refusal
15													EOB 14'
20													
25													
30													
35													
40													* Cathead & Rope

NOTE: Subsoil conditions revealed by this investigation represent conditions at specific locations and may not represent conditions at other locations or times.

GROUND SURFACE TO _____FT. USED _____CASING THEN _____ CASING TO _____FT. **HOLE NO. WO-1**

A = AUGER UP = UNDISTURBED PISTON T = THINWALL V = VANE TEST

WOR = WEIGHT OF RODS WOH = WEIGHT OF HAMMER & RODS

SS = SPLIT TUBE SAMPLER H.S.A. = HOLLOW STEM AUGER

PROPORTIONS USED: TRACE = 0 - 10% LITTLE = 10 - 20% SOME = 20 - 35% AND =35 - 50%

C = COARSE
M = MEDIUM
F = FINE

SOILTESTING, INC. 90 DONOVAN RD. OXFORD, CT 06478 CT (203) 262-9328 NY (914) 946-4850	CLIENT: Fuller & D'Angelo Architects	SHEET 1 OF 1 HOLE NO. WO-2
	PROJECT NO. G259-1984-21	
	PROJECT NAME Edgemont School District Jr./Sr. High School	BORING LOCATIONS Per Plan
FOREMAN - DRILLER AO/jm	LOCATION 200 White Oak Lane Scarsdale, NY	
INSPECTOR	CASING / SAMPLER / CORE BAR	OFFSET
	TYPE: HSA / SS *	DATE START 12/29/21
GROUND WATER OBSERVATIONS AT none_FT AFTER_0_HOURS AT__FT AFTER___HOURS	SIZE I.D.: 4 ¼" / 1 3/8"	DATE FINISH 12/29/21
	HAMMER WT.: 140# / BIT	SURFACE ELEV. El. ±299
	HAMMER FALL: 30"	GROUND WATER ELEV.

DEPTH	CASING BLOWS PER FOOT	SAMPLE NO	Type	PEN	REC	DEPTH @ BOT	BLOWS PER 6 IN ON SAMPLER (FORCE ON TUBE) 0 - 6 / 6 - 12 / 12 - 18	CORE TIME PER FT (MIN)	DENSITY OR CONSIST / MOIST	STRATA CHANGE DEPTH / ELEV	FIELD IDENTIFICATION OF SOIL REMARKS INCL. COLOR, LOSS OF WASH WATER, SEAMS IN ROCK, ETC.
		1	ss	24"	18"	2'0"	10 / 14		dense dry	4"	Topsoil Gry/brn F sand, F-C gravel, trace silt, trace cobble
							17 / 32				
		2	ss	24"	0"	2'1"	50/1"		dense		No recovery Cobbles from 2' to 4'
5		3	ss	24"	14"	6'0"	14 / 31		dense		
							14 / 10		dry		Brn F sand, F-C gravel, trace silt, trace cobble
		4	ss	24"	14"	8'0"	10 / 7		compact		
							6 / 5		dry		Same
10											
		5	ss	16"	10"	11'4"	9 / 27		v dense	11'	Brn F sand, F-C gravel, trace silt, cobbles, boulders
							50/4"		dry		Partly weathered bedrock
15		6	ss	2"	2"	15'2"	50/2"		dense/dry	15'	Auger refusal
											EOB 15'
20											
25											
30											
35											
40											* Cathead & Rope

NOTE: Subsoil conditions revealed by this investigation represent conditions at specific locations and may not represent conditions at other locations or times.

GROUND SURFACE TO _____FT. USED _____CASING THEN _____ CASING TO _____FT. **HOLE NO. WO-2**

A = AUGER UP = UNDISTURBED PISTON T = THINWALL V = VANE TEST

WOR = WEIGHT OF RODS WOH = WEIGHT OF HAMMER & RODS C = COARSE

SS = SPLIT TUBE SAMPLER H.S.A. = HOLLOW STEM AUGER M = MEDIUM

PROPORTIONS USED: TRACE = 0 - 10% LITTLE = 10 - 20% SOME = 20 - 35% AND =35 - 50% F = FINE

SOILTESTING, INC. 90 DONOVAN RD. OXFORD, CT 06478 CT (203) 262-9328 NY (914) 946-4850	CLIENT: Fuller & D'Angelo Architects	SHEET 1 OF 1 HOLE NO. WO-3
	PROJECT NO. G259-1984-21	
	PROJECT NAME Edgemont School District Jr./Sr. High School	BORING LOCATIONS Per Plan
FOREMAN - DRILLER PD/pd	LOCATION 200 White Oak Lane Scarsdale, NY	
INSPECTOR	CASING / SAMPLER / CORE BAR TYPE: None / SS *	OFFSET
GROUND WATER OBSERVATIONS AT none_FT AFTER_0_HOURS AT__FT AFTER___HOURS	SIZE I.D.: 1 3/8" HAMMER WT.: 140# BIT HAMMER FALL: 30"	DATE START 12/31/21 DATE FINISH 12/31/21 SURFACE ELEV. El. ±306 GROUND WATER ELEV.

DEPTH	CASING BLOWS PER FOOT	SAMPLE NO	SAMPLE Type	SAMPLE PEN	SAMPLE REC	SAMPLE DEPTH @ BOT	BLOWS PER 6 IN ON SAMPLER (FORCE ON TUBE) 0 - 6 / 6 - 12 / 12 - 18	CORE TIME PER FT (MIN)	DENSITY OR CONSIST / MOIST	STRATA CHANGE DEPTH / ELEV	FIELD IDENTIFICATION OF SOIL REMARKS INCL. COLOR, LOSS OF WASH WATER, SEAMS IN ROCK, ETC.
		1	ss	19"	14"	1'7"	1 / 3		stiff / dry/moist	1' / 1'6"	Dk brn organics & silt
							12 / 100/1"				Brn silt, lit F-C gravel, rock fragments
											Rock fragments, cobbles
											EOB 1'7" Refusal
5											
10											
15											
20											
25											
30											
35											
40											* Cathead & Rope

NOTE: Subsoil conditions revealed by this investigation represent conditions at specific locations and may not represent conditions at other locations or times.

GROUND SURFACE TO _____FT. USED _____CASING THEN _____ CASING TO _____FT. **HOLE NO. WO-3**

A = AUGER UP = UNDISTURBED PISTON T = THINWALL V = VANE TEST

WOR = WEIGHT OF RODS WOH = WEIGHT OF HAMMER & RODS

SS = SPLIT TUBE SAMPLER H.S.A. = HOLLOW STEM AUGER

PROPORTIONS USED: TRACE = 0 - 10% LITTLE = 10 - 20% SOME = 20 - 35% AND =35 - 50%

C = COARSE
M = MEDIUM
F = FINE

SOILTESTING, INC. 90 DONOVAN RD. OXFORD, CT 06478 CT (203) 262-9328 NY (914) 946-4850	CLIENT: Fuller & D'Angelo Architects	SHEET 1 OF 1 HOLE NO. WO-4
	PROJECT NO. G259-1984-21	
	PROJECT NAME Edgemont School District Jr./Sr. High School	BORING LOCATIONS Per Plan
FOREMAN - DRILLER PD/pd	LOCATION 200 White Oak Lane Scarsdale, NY	
INSPECTOR	CASING / SAMPLER / CORE BAR TYPE: HSA / SS * / SIZE I.D.: 4 ¼" / 1 3/8" / HAMMER WT.: / 140# / BIT HAMMER FALL: / 30" /	OFFSET DATE START 12/31/21 DATE FINISH 12/31/21 SURFACE ELEV. El. ±308 GROUND WATER ELEV.
GROUND WATER OBSERVATIONS AT none FT AFTER 0 HOURS AT FT AFTER HOURS		

DEPTH	CASING BLOWS PER FOOT	SAMPLE NO	Type	PEN	REC	DEPTH @ BOT	BLOWS PER 6 IN ON SAMPLER (FORCE ON TUBE) 0 - 6 / 6 - 12 / 12- 18	CORE TIME PER FT (MIN)	DENSITY OR CONSIST / MOIST	STRATA CHANGE DEPTH / ELEV	FIELD IDENTIFICATION OF SOIL REMARKS INCL. COLOR, LOSS OF WASH WATER, SEAMS IN ROCK, ETC.
		1	ss	24"	14"	2'0"	1 / 1		soft / dry	1"	Topsoil (dk brn silt, lit F sand)
							2 / 2			2'6"	Organge/brn silt, some F-M sand, lit F gravel
		2	ss	24"	18"	4'0"	4 / 8		compact / dry		
							20 / 29				Lt brn/lt gry VF-M sand, silt, some F-C gravel
5		3	ss	24"	20"	6'0"	24 / 29		v dense / moist	6'	Lt gry/brn VF-C sand, some F-C gravel
							38 / 41				EOB 6'
10											
15											
20											
25											
30											
35											
40											* Cathead & Rope

NOTE: Subsoil conditions revealed by this investigation represent conditions at specific locations and may not represent conditions at other locations or times.

GROUND SURFACE TO _____FT. USED _____CASING THEN _____ CASING TO _____FT. **HOLE NO. WO-4**

A = AUGER UP = UNDISTURBED PISTON T = THINWALL V = VANE TEST

WOR = WEIGHT OF RODS WOH = WEIGHT OF HAMMER & RODS

SS = SPLIT TUBE SAMPLER H.S.A. = HOLLOW STEM AUGER

PROPORTIONS USED: TRACE = 0 - 10% LITTLE = 10 - 20% SOME = 20 - 35% AND =35 - 50%

C = COARSE

M = MEDIUM

F = FINE

SOILTESTING, INC. 90 DONOVAN RD. OXFORD, CT 06478 CT (203) 262-9328 NY (914) 946-4850	CLIENT: Fuller & D'Angelo Architects	SHEET 1 OF 1 HOLE NO. WO-5
	PROJECT NO. G259-1984-21	
	PROJECT NAME Edgemont School District Jr./Sr. High School	BORING LOCATIONS Per Plan
FOREMAN - DRILLER AO/jm	LOCATION 200 White Oak Lane Scarsdale, NY	
INSPECTOR	CASING / SAMPLER / CORE BAR	OFFSET
	TYPE: HSA / SS *	DATE START 12/31/21
GROUND WATER OBSERVATIONS	SIZE I.D.: 4 ¼" / 1 3/8"	DATE FINISH 12/31/21
AT none FT AFTER 0 HOURS	HAMMER WT.: 140# BIT	SURFACE ELEV. El. ±310
AT FT AFTER HOURS	HAMMER FALL: 30"	GROUND WATER ELEV.

DEPTH	CASING BLOWS PER FOOT	SAMPLE NO	SAMPLE Type	SAMPLE PEN	SAMPLE REC	SAMPLE DEPTH @ BOT	BLOWS PER 6 IN ON SAMPLER (FORCE ON TUBE) 0 - 6 6 - 12 12- 18	CORE TIME PER FT (MIN)	DENSITY OR CONSIST / MOIST	STRATA CHANGE DEPTH / ELEV	FIELD IDENTIFICATION OF SOIL REMARKS INCL. COLOR, LOSS OF WASH WATER, SEAMS IN ROCK, ETC.
											ON TOP OF BEDROCK OUTCROP
5											
10											
15											
20											
25											
30											
35											
40											* Cathead & Rope

NOTE: Subsoil conditions revealed by this investigation represent conditions at specific locations and may not represent conditions at other locations or times.

GROUND SURFACE TO _____FT. USED _____CASING THEN _____ CASING TO _____FT. **HOLE NO. WO-5**

A = AUGER UP = UNDISTURBED PISTON T = THINWALL V = VANE TEST

WOR = WEIGHT OF RODS WOH = WEIGHT OF HAMMER & RODS

SS = SPLIT TUBE SAMPLER H.S.A. = HOLLOW STEM AUGER

PROPORTIONS USED: TRACE = 0 - 10% LITTLE = 10 - 20% SOME = 20 - 35% AND =35 - 50%

C = COARSE

M = MEDIUM

F = FINE

SOILTESTING, INC. 90 DONOVAN RD. OXFORD, CT 06478 CT (203) 262-9328 NY (914) 946-4850	CLIENT: Fuller & D'Angelo Architects	SHEET 1 OF 1 HOLE NO. WO-6
	PROJECT NO. G259-1984-21	
	PROJECT NAME Edgemont School District Jr./Sr. High School	BORING LOCATIONS Per Plan
FOREMAN - DRILLER AO/jm	LOCATION 200 White Oak Lane Scarsdale, NY	
INSPECTOR	CASING / SAMPLER / CORE BAR	OFFSET
	TYPE: HSA / SS *	DATE START 12/29/21
GROUND WATER OBSERVATIONS	SIZE I.D.: 4 ¼" / 1 3/8"	DATE FINISH 12/29/21
AT none FT AFTER 0 HOURS	HAMMER WT.: 140# / BIT	SURFACE ELEV. El. ±296.5
AT FT AFTER HOURS	HAMMER FALL: 30"	GROUND WATER ELEV.

DEPTH	CASING BLOWS PER FOOT	SAMPLE NO	Type	PEN	REC.	DEPTH @ BOT	BLOWS PER 6 IN ON SAMPLER (FORCE ON TUBE) 0 - 6 / 6 - 12 / 12 - 18	CORE TIME PER FT (MIN)	DENSITY OR CONSIST / MOIST	STRATA CHANGE DEPTH / ELEV	FIELD IDENTIFICATION OF SOIL REMARKS INCL. COLOR, LOSS OF WASH WATER, SEAMS IN ROCK, ETC.
		1	ss	24"	18"	2'0"	3 / 5		compact / dry		Brn F sand, F-C gravel, some silt
							5 / 8				
		2	ss	8"	6"	2'8"	9 / 50/2"		dense/dry		Gry/brn F sand, lit silt, trace cobbles
											Boulders from 2'6" to 5'
5		3	ss	0"	0"	5'0"	50/0"		dense		No recovery
										6'	Auger refusal
											EOB 6'
10											
	WO-6A										Offset 5' North to WO-6A
0											
5										6'	Auger refusal
											EOB 6'
10											
15											
20											
25											* Cathead & Rope

NOTE: Subsoil conditions revealed by this investigation represent conditions at specific locations and may not represent conditions at other locations or times.

GROUND SURFACE TO _____FT. USED _____CASING THEN _____ CASING TO _____FT. **HOLE NO. WO-6**

A = AUGER UP = UNDISTURBED PISTON T = THINWALL V = VANE TEST

WOR = WEIGHT OF RODS WOH = WEIGHT OF HAMMER & RODS C = COARSE

SS = SPLIT TUBE SAMPLER H.S.A. = HOLLOW STEM AUGER M = MEDIUM

PROPORTIONS USED: TRACE = 0 - 10% LITTLE = 10 - 20% SOME = 20 - 35% AND =35 - 50% F = FINE

SOILTESTING, INC. 90 DONOVAN RD. OXFORD, CT 06478 CT (203) 262-9328 NY (914) 946-4850	CLIENT: Fuller & D'Angelo Architects	SHEET 1 OF 1 HOLE NO. WO-7
	PROJECT NO. G259-1984-21	
	PROJECT NAME Edgemont School District Jr./Sr. High School	BORING LOCATIONS Per Plan
FOREMAN - DRILLER AO/jm	LOCATION 200 White Oak Lane Scarsdale, NY	
INSPECTOR	CASING / SAMPLER / CORE BAR	OFFSET
	TYPE: HSA / SS *	DATE START 12/29/21
	SIZE I.D.: 4 ¼" / 1 3/8"	DATE FINISH 12/29/21
GROUND WATER OBSERVATIONS AT none FT AFTER 0 HOURS AT FT AFTER HOURS	HAMMER WT.: 140# / BIT	SURFACE ELEV. El. ±294
	HAMMER FALL: 30"	GROUND WATER ELEV.

DEPTH	CASING BLOWS PER FOOT	SAMPLE NO	Type	PEN	REC	DEPTH @ BOT	BLOWS PER 6 IN ON SAMPLER (FORCE ON TUBE) 0 - 6	6 - 12	12 - 18	CORE TIME PER FT (MIN)	DENSITY OR CONSIST / MOIST	STRATA CHANGE DEPTH / ELEV	FIELD IDENTIFICATION OF SOIL REMARKS INCL. COLOR, LOSS OF WASH WATER, SEAMS IN ROCK, ETC.
		1	ss	24"	14"	2'0"	8	19			dense		
							14	13			dry		Brn F sand, F-C gravel, trace silt, cobbles
		2	ss	24"	12"	4'0"	11	11			compact		
							18	16			dry		Same
5		3	ss	24"	16"	6'0"	14	8			compact		
							6	7			dry		Brn F sand, F-C gravel, trace silt, cobbles
		4	ss	9"	8"	6'9"	11	50/3"			dense/dry	6'6"	Same
													Fractured bedrock or boulder
10		5	ss	0"	0"	10'0"	50/0"				dense		No recovery
												11'	Auger refusal
													EOB 11'
15													
20													
25													
30													
35													
40													* Cathead & Rope

NOTE: Subsoil conditions revealed by this investigation represent conditions at specific locations and may not represent conditions at other locations or times.

GROUND SURFACE TO _____FT. USED _____CASING THEN _____ CASING TO _____FT. **HOLE NO. WO-7**

A = AUGER UP = UNDISTURBED PISTON T = THINWALL V = VANE TEST

WOR = WEIGHT OF RODS WOH = WEIGHT OF HAMMER & RODS

SS = SPLIT TUBE SAMPLER H.S.A. = HOLLOW STEM AUGER

PROPORTIONS USED: TRACE = 0 - 10% LITTLE = 10 - 20% SOME = 20 - 35% AND =35 - 50%

C = COARSE

M = MEDIUM

F = FINE

SOILTESTING, INC. 90 DONOVAN RD. OXFORD, CT 06478 CT (203) 262-9328 NY (914) 946-4850	CLIENT: Fuller & D'Angelo Architects	SHEET 1 OF 1 HOLE NO. WO-8
	PROJECT NO. G259-1984-21	
	PROJECT NAME Edgemont School District Jr./Sr. High School	BORING LOCATIONS Per Plan
FOREMAN - DRILLER AO/jm	LOCATION 200 White Oak Lane Scarsdale, NY	
INSPECTOR	CASING / SAMPLER / CORE BAR TYPE: HSA / SS * / SIZE I.D.: 4 ¼" / 1 3/8" / HAMMER WT.: / 140# / BIT HAMMER FALL: / 30" /	OFFSET DATE START 12/29/21 DATE FINISH 12/29/21 SURFACE ELEV. El. ±294 GROUND WATER ELEV.
GROUND WATER OBSERVATIONS AT none FT AFTER 0 HOURS AT FT AFTER HOURS		

DEPTH	CASING BLOWS PER FOOT	SAMPLE NO	Type	PEN	REC	DEPTH @ BOT	BLOWS PER 6 IN ON SAMPLER (FORCE ON TUBE) 0 - 6 / 6 - 12 / 12 - 18	CORE TIME PER FT (MIN)	DENSITY OR CONSIST / MOIST	STRATA CHANGE DEPTH / ELEV	FIELD IDENTIFICATION OF SOIL REMARKS INCL. COLOR, LOSS OF WASH WATER, SEAMS IN ROCK, ETC.
		1	ss	24"	10"	2'0"	3 / 4		loose / dry	4"	Topsoil
							4 / 7		loose / dry		Dk brn F sand, some F gravel, some silt, trace roots
		2	ss	24"	14"	4'0"	5 / 5		loose / dry		
							3 / 4		dry/moist / v dense		Lt brn F sand, some silt with F gravel
5		3	ss	17"	14"	5'5"	14 / 21		v dense / dry		
							50/5"		dry	5'5"	Gry/brn F sand, trace silt, trace F gravel
											Partly weathered/fractured bedrock
										9'	Auger refusal
10											EOB 9'
15											
20											
25											
30											
35											
40											* Cathead & Rope

NOTE: Subsoil conditions revealed by this investigation represent conditions at specific locations and may not represent conditions at other locations or times.

GROUND SURFACE TO _____FT. USED _____CASING THEN _____ CASING TO _____FT. **HOLE NO. WO-8**

A = AUGER UP = UNDISTURBED PISTON T = THINWALL V = VANE TEST

WOR = WEIGHT OF RODS WOH = WEIGHT OF HAMMER & RODS

SS = SPLIT TUBE SAMPLER H.S.A. = HOLLOW STEM AUGER

PROPORTIONS USED: TRACE = 0 - 10% LITTLE = 10 - 20% SOME = 20 - 35% AND =35 - 50%

C = COARSE

M = MEDIUM

F = FINE

SOILTESTING, INC. 90 DONOVAN RD. OXFORD, CT 06478 CT (203) 262-9328 NY (914) 946-4850	CLIENT: Fuller & D'Angelo Architects	SHEET 1 OF 1 HOLE NO. WO-9
	PROJECT NO. G259-1984-21	
	PROJECT NAME Edgemont School District Jr./Sr. High School	BORING LOCATIONS Per Plan
FOREMAN - DRILLER AO/jm	LOCATION 200 White Oak Lane Scarsdale, NY	
INSPECTOR	CASING / SAMPLER / CORE BAR TYPE: HSA / SS * / SIZE I.D.: 4 ¼" / 1 3/8" / HAMMER WT.: / 140# / BIT HAMMER FALL: / 30" /	OFFSET DATE START 12/29/21 DATE FINISH 12/29/21 SURFACE ELEV. El. ±310† GROUND WATER ELEV.
GROUND WATER OBSERVATIONS AT none FT AFTER 0 HOURS AT FT AFTER HOURS		

DEPTH	CASING BLOWS PER FOOT	SAMPLE NO	Type	PEN	REC	DEPTH @ BOT	BLOWS PER 6 IN ON SAMPLER (FORCE ON TUBE) 0 - 6 / 6 - 12 / 12 - 18	CORE TIME PER FT (MIN)	DENSITY OR CONSIST / MOIST	STRATA CHANGE DEPTH / ELEV	FIELD IDENTIFICATION OF SOIL REMARKS INCL. COLOR, LOSS OF WASH WATER, SEAMS IN ROCK, ETC.
		1	ss	24"	16"	2'0"	3 / 9		v dense		
							42 / 100/6"		dry	2'	Brn/lt brn VF-M sand & silt, F-C gravel, cobbles
		2	ss	2"	1"	2'1"	100/2"		v dense/mois	3'	Fractured partly decomposed bedrock, Auger refusal
											EOB 3'
5											
10											
15											
20											
25											
30											
35											
40											* Cathead & Rope

NOTE: Subsoil conditions revealed by this investigation represent conditions at specific locations and may not represent conditions at other locations or times.

† - Based on Google Earth Pro 2-2-2022

GROUND SURFACE TO _____FT. USED _____CASING THEN _____ CASING TO _____FT. **HOLE NO. WO-9**

A = AUGER UP = UNDISTURBED PISTON T = THINWALL V = VANE TEST

WOR = WEIGHT OF RODS WOH = WEIGHT OF HAMMER & RODS

SS = SPLIT TUBE SAMPLER H.S.A. = HOLLOW STEM AUGER

PROPORTIONS USED: TRACE = 0 - 10% LITTLE = 10 - 20% SOME = 20 - 35% AND =35 - 50%

C = COARSE

M = MEDIUM

F = FINE

SOILTESTING, INC. 90 DONOVAN RD. OXFORD, CT 06478 CT (203) 262-9328 NY (914) 946-4850	CLIENT: Fuller & D'Angelo Architects	SHEET 1 OF 1 HOLE NO. WO-10
	PROJECT NO. G259-1984-21	
	PROJECT NAME Edgemont School District Jr./Sr. High School	BORING LOCATIONS Per Plan
FOREMAN - DRILLER PD/pd	LOCATION 200 White Oak Lane Scarsdale, NY	
INSPECTOR	CASING / SAMPLER / CORE BAR TYPE: HSA / SS * / SIZE I.D.: 4 ¼" / 1 3/8" / HAMMER WT.: / 140# / BIT HAMMER FALL: / 30" /	OFFSET DATE START 12/29/21 DATE FINISH 12/29/21 SURFACE ELEV. El. ±306† GROUND WATER ELEV.
GROUND WATER OBSERVATIONS AT none FT AFTER 0 HOURS AT FT AFTER HOURS		

DEPTH	CASING BLOWS PER FOOT	SAMPLE NO	Type	PEN	REC	DEPTH @ BOT	BLOWS PER 6 IN ON SAMPLER (FORCE ON TUBE) 0 - 6 / 6 - 12 / 12 - 18	CORE TIME PER FT (MIN)	DENSITY OR CONSIST / MOIST	STRATA CHANGE DEPTH / ELEV	FIELD IDENTIFICATION OF SOIL REMARKS INCL. COLOR, LOSS OF WASH WATER, SEAMS IN ROCK, ETC.
		1	ss	24"	18"	2'0"	26 / 23		dense	0'9" - 3"	Asphalt / 6" gravel
							24 / 31		dry/moist		
		2	ss	11"	8"	3'3"	26 / 100/6"		hard	3'	Dk brn/blk/gry silt, F-C sand, F-C gravel
							100/3"		dry/moist		Fractured partly decomposed bedrock
5										5'	Auger refusal
											EOB 5'
10											
15											
20											
25											
30											
35											
40											* Cathead & Rope

NOTE: Subsoil conditions revealed by this investigation represent conditions at specific locations and may not represent conditions at other locations or times.

† - Based on Google Earth Pro 2-2-2022

GROUND SURFACE TO _____FT. USED _____CASING THEN _____ CASING TO _____FT. **HOLE NO. WO-10**

A = AUGER UP = UNDISTURBED PISTON T = THINWALL V = VANE TEST

WOR = WEIGHT OF RODS WOH = WEIGHT OF HAMMER & RODS C = COARSE

SS = SPLIT TUBE SAMPLER H.S.A. = HOLLOW STEM AUGER M = MEDIUM

PROPORTIONS USED: TRACE = 0 - 10% LITTLE = 10 - 20% SOME = 20 - 35% AND =35 - 50% F = FINE

SOILTESTING, INC. 90 DONOVAN RD. OXFORD, CT 06478 CT (203) 262-9328 NY (914) 946-4850	CLIENT: Fuller & D'Angelo Architects	SHEET 1 OF 1 HOLE NO. WO-11
	PROJECT NO. G259-1984-21	
	PROJECT NAME Edgemont School District Jr./Sr. High School	BORING LOCATIONS Per Plan
FOREMAN - DRILLER PD/pd	LOCATION 200 White Oak Lane Scarsdale, NY	
INSPECTOR	CASING / SAMPLER / CORE BAR TYPE: HSA / SS * / SIZE I.D.: 4 ¼" / 1 3/8" / HAMMER WT.: / 140# / BIT HAMMER FALL: / 30" /	OFFSET DATE START 12/31/21 DATE FINISH 12/31/21 SURFACE ELEV. El. ±304 GROUND WATER ELEV.
GROUND WATER OBSERVATIONS AT none FT AFTER 0 HOURS AT FT AFTER HOURS		

DEPTH	CASING BLOWS PER FOOT	SAMPLE NO	Type	PEN	REC	DEPTH @ BOT	BLOWS PER 6 IN ON SAMPLER (FORCE ON TUBE) 0 - 6	6 - 12	12 - 18	CORE TIME PER FT (MIN)	DENSITY OR CONSIST / MOIST	STRATA CHANGE DEPTH / ELEV	FIELD IDENTIFICATION OF SOIL REMARKS INCL. COLOR, LOSS OF WASH WATER, SEAMS IN ROCK, ETC.
		1	ss	24"	14"	2'0"	1	1			stiff	1'	Topsoil (dk brn silt, lit organics)
							7	30			moist		
		2	ss	24"	18"	4'0"	38	10			compact		Lt brn/gry VF-M sand & silt, some F-C gravel, cobbles
							10	11			moist/dry		
5		3	ss	15"	14"	5'3"	12	98			v dense		Lt gry/lt brn VF-C sand, F-C gravel, some silt, lit cobbles
							100/3"				moist/dry	5'3"	
													EOB 5'3"
10													
15													
20													
25													
30													
35													
40													* Cathead & Rope

NOTE: Subsoil conditions revealed by this investigation represent conditions at specific locations and may not represent conditions at other locations or times.

GROUND SURFACE TO _____FT. USED _____CASING THEN _____ CASING TO _____FT. **HOLE NO. WO-11**

A = AUGER UP = UNDISTURBED PISTON T = THINWALL V = VANE TEST

WOR = WEIGHT OF RODS WOH = WEIGHT OF HAMMER & RODS

SS = SPLIT TUBE SAMPLER H.S.A. = HOLLOW STEM AUGER

PROPORTIONS USED: TRACE = 0 - 10% LITTLE = 10 - 20% SOME = 20 - 35% AND =35 - 50%

C = COARSE
M = MEDIUM
F = FINE

SOILTESTING, INC. 90 DONOVAN RD. OXFORD, CT 06478 CT (203) 262-9328 NY (914) 946-4850	CLIENT: Fuller & D'Angelo Architects	SHEET 1 OF 1 HOLE NO. WO-12
	PROJECT NO. G259-1984-21	
	PROJECT NAME Edgemont School District Jr./Sr. High School	BORING LOCATIONS Per Plan
FOREMAN - DRILLER PD/pd	LOCATION 200 White Oak Lane Scarsdale, NY	
INSPECTOR	CASING / SAMPLER / CORE BAR TYPE: HSA / SS * / SIZE I.D.: 4 ¼" / 1 3/8" / HAMMER WT.: / 140# / BIT HAMMER FALL: / 30" /	OFFSET DATE START 12/31/21 DATE FINISH 12/31/21 SURFACE ELEV. El. ±305 GROUND WATER ELEV.
GROUND WATER OBSERVATIONS AT none FT AFTER 0 HOURS AT FT AFTER HOURS		

DEPTH	CASING BLOWS PER FOOT	SAMPLE NO	Type	PEN	REC	DEPTH @ BOT	BLOWS PER 6 IN ON SAMPLER (FORCE ON TUBE) 0 - 6	6 - 12	12- 18	CORE TIME PER FT (MIN)	DENSITY OR CONSIST / MOIST	STRATA CHANGE DEPTH / ELEV	FIELD IDENTIFICATION OF SOIL REMARKS INCL. COLOR, LOSS OF WASH WATER, SEAMS IN ROCK, ETC.
		1	ss	24"	20"	2'0"	2	4			stiff	6"	Topsoil, dk brn silt, lit F sand
							4	4			moist	2'3"	Orange/brn silt, some F-M sand, lit F-C gravel
		2	ss	24"	19"	4'0"	5	7			compact		
							14	26			dry/moist		Lt gry/brn F-C sand, some silt, lit F-C gravel
5		3	ss	24"	20"	6'0"	30	27			v dense		
							29	24					Lt brn F-C sand, some F-C gravel
		4	ss	24"	17"	8'0"	14	19			dense		
							12	19			moist/dry	8'	Lt gry/lt brn F-C sand, some F-C gravel, lit silt
													EOB 8'
10													
15													
20													
25													
30													
35													
40													* Cathead & Rope

NOTE: Subsoil conditions revealed by this investigation represent conditions at specific locations and may not represent conditions at other locations or times.

GROUND SURFACE TO _____FT. USED _____CASING THEN _____ CASING TO _____FT. **HOLE NO. WO-12**

A = AUGER UP = UNDISTURBED PISTON T = THINWALL V = VANE TEST

WOR = WEIGHT OF RODS WOH = WEIGHT OF HAMMER & RODS

SS = SPLIT TUBE SAMPLER H.S.A. = HOLLOW STEM AUGER

PROPORTIONS USED: TRACE = 0 - 10% LITTLE = 10 - 20% SOME = 20 - 35% AND =35 - 50%

C = COARSE

M = MEDIUM

F = FINE

SOILTESTING, INC. 90 DONOVAN RD. OXFORD, CT 06478 CT (203) 262-9328 NY (914) 946-4850	CLIENT: Fuller & D'Angelo Architects	SHEET 1 OF 1 HOLE NO. WO-13
	PROJECT NO. G259-1984-21	
	PROJECT NAME Edgemont School District Jr./Sr. High School	BORING LOCATIONS Per Plan
FOREMAN - DRILLER PD/pd	LOCATION 200 White Oak Lane Scarsdale, NY	
INSPECTOR	CASING / SAMPLER / CORE BAR TYPE: HSA / SS * / SIZE I.D.: 4 ¼" / 1 3/8" / HAMMER WT.: / 140# / BIT HAMMER FALL: / 30" /	OFFSET DATE START 12/31/21 DATE FINISH 12/31/21 SURFACE ELEV. El. ±306.5 GROUND WATER ELEV.
GROUND WATER OBSERVATIONS AT none FT AFTER 0 HOURS AT FT AFTER HOURS		

DEPTH	CASING BLOWS PER FOOT	SAMPLE NO	Type	PEN	REC	DEPTH @ BOT	BLOWS PER 6 IN ON SAMPLER (FORCE ON TUBE) 0 - 6	6 - 12	12 - 18	CORE TIME PER FT (MIN)	DENSITY OR CONSIST / MOIST	STRATA CHANGE DEPTH / ELEV	FIELD IDENTIFICATION OF SOIL REMARKS INCL. COLOR, LOSS OF WASH WATER, SEAMS IN ROCK, ETC.
		1	ss	24"	12"	2'0"	1	1			soft	1'	Topsoil (dk brn silt organics)
							2	1			moist/dry		
		2	ss	24"	14"	4'0"	2	4			stiff	3'	Orange/brn silt, some F-M sand, bedrock fragments
							5	10			moist		
5		3	ss	24"	18"	6'0"	14	19			dense		
							28	41			moist/dry	6'	Brn/lt brn/gry VF-M sand & silt, some F-C gravel
												8'	Partly decomposed bedrock
10													EOB 8'
15													
20													
25													
30													
35													
40													* Cathead & Rope

NOTE: Subsoil conditions revealed by this investigation represent conditions at specific locations and may not represent conditions at other locations or times.

GROUND SURFACE TO _____FT. USED _____CASING THEN _____ CASING TO _____FT. **HOLE NO. WO-13**

A = AUGER UP = UNDISTURBED PISTON T = THINWALL V = VANE TEST

WOR = WEIGHT OF RODS WOH = WEIGHT OF HAMMER & RODS C = COARSE

SS = SPLIT TUBE SAMPLER H.S.A. = HOLLOW STEM AUGER M = MEDIUM

PROPORTIONS USED: TRACE = 0 - 10% LITTLE = 10 - 20% SOME = 20 - 35% AND =35 - 50% F = FINE

SOILTESTING, INC. 90 DONOVAN RD. OXFORD, CT 06478 CT (203) 262-9328 NY (914) 946-4850	CLIENT: Fuller & D'Angelo Architects	SHEET 1 OF 1 HOLE NO. WO-14
	PROJECT NO. G259-1984-21	
	PROJECT NAME Edgemont School District Jr./Sr. High School	BORING LOCATIONS Per Plan
FOREMAN - DRILLER PD/pd	LOCATION 200 White Oak Lane Scarsdale, NY	
INSPECTOR	CASING / SAMPLER / CORE BAR TYPE: HSA / SS * / SIZE I.D.: 4 ¼" / 1 3/8" / HAMMER WT.: / 140# / BIT HAMMER FALL: / 30" /	OFFSET DATE START 12/30/21 DATE FINISH 12/30/21 SURFACE ELEV. El. ±306† GROUND WATER ELEV.
GROUND WATER OBSERVATIONS AT none FT AFTER 0 HOURS AT FT AFTER HOURS		

DEPTH	CASING BLOWS PER FOOT	SAMPLE NO	Type	PEN	REC	DEPTH @ BOT	BLOWS PER 6 IN ON SAMPLER (FORCE ON TUBE) 0 - 6 / 6 - 12 / 12 - 18			CORE TIME PER FT (MIN)	DENSITY OR CONSIST / MOIST	STRATA CHANGE DEPTH / ELEV	FIELD IDENTIFICATION OF SOIL REMARKS INCL. COLOR, LOSS OF WASH WATER, SEAMS IN ROCK, ETC.
		1	ss	24"	20"	2'0"	12	1			compact		Brn/orange/brn F-M sand & silt, F-C gravel, lit cobbles
							18	100/6"			dry/moist	1'6"	Partly decomposed bedrock
		2	ss	3"	3"	2'3"	100/3"				v dense	3'6"	Same Auger refusal
													EOB 3'6"
5													
10													
15													
20													
25													
30													
35													
40													* Cathead & Rope

NOTE: Subsoil conditions revealed by this investigation represent conditions at specific locations and may not represent conditions at other locations or times.

† - Based on Google Earth Pro 2-2-2022

GROUND SURFACE TO _____FT. USED _____CASING THEN _____ CASING TO _____FT. **HOLE NO. WO-14**

A = AUGER UP = UNDISTURBED PISTON T = THINWALL V = VANE TEST

WOR = WEIGHT OF RODS WOH = WEIGHT OF HAMMER & RODS

SS = SPLIT TUBE SAMPLER H.S.A. = HOLLOW STEM AUGER

PROPORTIONS USED: TRACE = 0 - 10% LITTLE = 10 - 20% SOME = 20 - 35% AND =35 - 50%

C = COARSE

M = MEDIUM

F = FINE

SOILTESTING, INC. 90 DONOVAN RD. OXFORD, CT 06478 CT (203) 262-9328 NY (914) 946-4850	CLIENT: Fuller & D'Angelo Architects	SHEET 1 OF 1 HOLE NO. WO-15
	PROJECT NO. G259-1984-21	
	PROJECT NAME Edgemont School District Jr./Sr. High School	BORING LOCATIONS Per Plan
FOREMAN - DRILLER AO/jm	LOCATION 200 White Oak Lane Scarsdale, NY	
INSPECTOR	CASING / SAMPLER / CORE BAR TYPE: HSA / SS * / SIZE I.D.: 4 ¼" / 1 3/8" / HAMMER WT.: / 140# / BIT HAMMER FALL: / 30" /	OFFSET DATE START 12/30/21 DATE FINISH 12/30/21 SURFACE ELEV. El. ±291.5 GROUND WATER ELEV.
GROUND WATER OBSERVATIONS AT none FT AFTER 0 HOURS AT FT AFTER HOURS		

DEPTH	CASING BLOWS PER FOOT	SAMPLE NO	Type	PEN	REC	DEPTH @ BOT	BLOWS PER 6 IN ON SAMPLER (FORCE ON TUBE) 0 - 6	6 - 12	12 - 18	CORE TIME PER FT (MIN)	DENSITY OR CONSIST / MOIST	STRATA CHANGE DEPTH / ELEV	FIELD IDENTIFICATION OF SOIL REMARKS INCL. COLOR, LOSS OF WASH WATER, SEAMS IN ROCK, ETC.
		1	ss	24"	14"	2'0"	14	13			dense	2"	Asphalt
							23	12			dry		Brn F sand, F-C gravel, trace silt, trace cobble
		2	ss	24"	18"	4'0"	14	7			compact		
							12	10			dry		Brn F sand, F-C gravel, trace silt
5		3	ss	24"	14"	6'0"	11	12			compact		
							11	17			dry	6'	Same
													EOB 6'
10													
15													
20													
25													
30													
35													
40													* Cathead & Rope

NOTE: Subsoil conditions revealed by this investigation represent conditions at specific locations and may not represent conditions at other locations or times.

GROUND SURFACE TO _____FT. USED _____CASING THEN _____ CASING TO _____FT. **HOLE NO. WO-15**

A = AUGER UP = UNDISTURBED PISTON T = THINWALL V = VANE TEST

WOR = WEIGHT OF RODS WOH = WEIGHT OF HAMMER & RODS C = COARSE

SS = SPLIT TUBE SAMPLER H.S.A. = HOLLOW STEM AUGER M = MEDIUM

PROPORTIONS USED: TRACE = 0 - 10% LITTLE = 10 - 20% SOME = 20 - 35% AND =35 - 50% F = FINE

SOILTESTING, INC. 90 DONOVAN RD. OXFORD, CT 06478 CT (203) 262-9328 NY (914) 946-4850	CLIENT: Fuller & D'Angelo Architects	SHEET 1 OF 1 HOLE NO. WO-16
	PROJECT NO. G259-1984-21	
	PROJECT NAME Edgemont School District Jr./Sr. High School	BORING LOCATIONS Per Plan
FOREMAN - DRILLER PD/pd	LOCATION 200 White Oak Lane Scarsdale, NY	
INSPECTOR	CASING / SAMPLER / CORE BAR	OFFSET
	TYPE: HSA / SS *	DATE START 12/30/21
GROUND WATER OBSERVATIONS	SIZE I.D.: 4 ¼" / 1 3/8"	DATE FINISH 12/30/21
AT none FT AFTER 0 HOURS	HAMMER WT.: 140# / BIT	SURFACE ELEV. El. ±285
AT FT AFTER HOURS	HAMMER FALL: 30"	GROUND WATER ELEV.

DEPTH	CASING BLOWS PER FOOT	SAMPLE NO	SAMPLE Type	SAMPLE PEN	SAMPLE REC	SAMPLE DEPTH @ BOT	BLOWS PER 6 IN ON SAMPLER (FORCE ON TUBE) 0 - 6 / 6 - 12 / 12 - 18	CORE TIME PER FT (MIN)	DENSITY OR CONSIST / MOIST	STRATA CHANGE DEPTH / ELEV	FIELD IDENTIFICATION OF SOIL REMARKS INCL. COLOR, LOSS OF WASH WATER, SEAMS IN ROCK, ETC.
		1	ss	24"	17"	2'0"	3 / 10		hard	6"	Topsoil
							34 / 41		dry	1'6"	Brn/orange/brn silt, some F-M sand, F-C gravel
		2	ss	24"	19"	4'0"	17 / 13		compact		
							14 / 26		moist	4'	Lt brn/lt gry F-C sand, F-C gravel, silt
5											EOB 4'
10											
15											
20											
25											
30											
35											
40											* Cathead & Rope

NOTE: Subsoil conditions revealed by this investigation represent conditions at specific locations and may not represent conditions at other locations or times.

GROUND SURFACE TO _____FT. USED _____CASING THEN _____ CASING TO _____FT. **HOLE NO. WO-16**

A = AUGER UP = UNDISTURBED PISTON T = THINWALL V = VANE TEST

WOR = WEIGHT OF RODS WOH = WEIGHT OF HAMMER & RODS

SS = SPLIT TUBE SAMPLER H.S.A. = HOLLOW STEM AUGER

PROPORTIONS USED: TRACE = 0 - 10% LITTLE = 10 - 20% SOME = 20 - 35% AND =35 - 50%

C = COARSE M = MEDIUM F = FINE

SOILTESTING, INC.	CLIENT: Fuller & D'Angelo Architects	SHEET 1 OF 1
90 DONOVAN RD.		HOLE NO. WO-17
OXFORD, CT 06478	PROJECT NO. G259-1984-21	
CT (203) 262-9328	PROJECT NAME Edgemont School District	BORING LOCATIONS
NY (914) 946-4850	Jr./Sr. High School	Per Plan
FOREMAN - DRILLER	LOCATION 200 White Oak Lane	
PD/pd	Scarsdale, NY	
INSPECTOR	CASING / SAMPLER / CORE BAR	OFFSET
	TYPE HSA / SS *	DATE START 12/30/21
GROUND WATER OBSERVATIONS	SIZE I.D. 4 ¼" / 1 3/8"	DATE FINISH 12/30/21
AT none FT AFTER 0 HOURS	HAMMER WT. 140# / BIT	SURFACE ELEV. El. ±265†
AT FT AFTER HOURS	HAMMER FALL 30"	GROUND WATER ELEV.

DEPTH	CASING BLOWS PER FOOT	SAMPLE NO	Type	PEN	REC.	DEPTH @ BOT	BLOWS PER 6 IN ON SAMPLER (FORCE ON TUBE) 0 - 6	6 - 12	12- 18	CORE TIME PER FT (MIN)	DENSITY OR CONSIST / MOIST	STRATA CHANGE DEPTH / ELEV	FIELD IDENTIFICATION OF SOIL REMARKS INCL. COLOR, LOSS OF WASH WATER, SEAMS IN ROCK, ETC.
		1	ss	24"	18"	2'0"	7	7				2"	Asphalt
							17	6			compact	8"	Wht F-M sand & F-C gravel
		2	ss	24"	20"	4'0"	5	8			hard	2'6"	Orange/brn silt, some F-M sand, F-C gravel
							35	32			dry		Gry VF-M sand, some F-C gravel, lit cobbles, silt
5		3	ss	10"	7"	4'10"	28	100/4"			v dense/moist		Lt brn/gry F-C gravel & lit silt, decomposed bedrock fragments
												5'6"	Auger refusal
													EOB 5'6"
10													
15													
20													
25													
30													
35													
40													* Cathead & Rope

NOTE: Subsoil conditions revealed by this investigation represent conditions at specific locations and may not represent conditions at other locations or times.

† - Based on Google Earth Pro 2-2-2022

GROUND SURFACE TO _____FT. USED _____CASING THEN _____ CASING TO _____FT. **HOLE NO. WO-17**

A = AUGER UP = UNDISTURBED PISTON T = THINWALL V = VANE TEST

WOR = WEIGHT OF RODS WOH = WEIGHT OF HAMMER & RODS C = COARSE

SS = SPLIT TUBE SAMPLER H.S.A. = HOLLOW STEM AUGER M = MEDIUM

PROPORTIONS USED: TRACE = 0 - 10% LITTLE = 10 - 20% SOME = 20 - 35% AND =35 - 50% F = FINE

SOILTESTING, INC. 90 DONOVAN RD. OXFORD, CT 06478 CT (203) 262-9328 NY (914) 946-4850	CLIENT: Fuller & D'Angelo Architects	SHEET 1 OF 1 HOLE NO. WO-18
	PROJECT NO. G259-1984-21	
	PROJECT NAME Edgemont School District Jr./Sr. High School	BORING LOCATIONS Per Plan
FOREMAN - DRILLER PD/pd	LOCATION 200 White Oak Lane Scarsdale, NY	
INSPECTOR	CASING / SAMPLER / CORE BAR TYPE: HSA / SS * / SIZE I.D.: 4 ¼" / 1 3/8" / HAMMER WT.: / 140# / BIT HAMMER FALL: / 30" /	OFFSET DATE START 12/30/21 DATE FINISH 12/30/21 SURFACE ELEV. El. ±256† GROUND WATER ELEV.
GROUND WATER OBSERVATIONS AT none FT AFTER 0 HOURS AT FT AFTER HOURS		

DEPTH	CASING BLOWS PER FOOT	SAMPLE NO	Type	PEN	REC	DEPTH @ BOT	BLOWS PER 6 IN ON SAMPLER (FORCE ON TUBE) 0 - 6 / 6 - 12 / 12 - 18	CORE TIME PER FT (MIN)	DENSITY OR CONSIST / MOIST	STRATA CHANGE DEPTH / ELEV	FIELD IDENTIFICATION OF SOIL REMARKS INCL. COLOR, LOSS OF WASH WATER, SEAMS IN ROCK, ETC.
		1	ss	16"	12"	1'4"	11 / 11		v dense / dry / hard/moist	1"	Asphalt
							100/4"			1'	Wht F-M sand & F-C gravel
		2	ss	2"	0"	2'2"	100/2"			2'6"	Dk brn/gry silt, some F-M sand, F gravel, cobbles, boulders
										3'	Possible decomposed bedrock or boulder, Auger refusal
5											EOB 3'
10											
15											
20											
25											
30											
35											
40											* Cathead & Rope

NOTE: Subsoil conditions revealed by this investigation represent conditions at specific locations and may not represent conditions at other locations or times.

† - Based on Google Earth Pro 2-2-2022

GROUND SURFACE TO _____FT. USED _____CASING THEN _____ CASING TO _____FT. **HOLE NO. WO-18**

A = AUGER UP = UNDISTURBED PISTON T = THINWALL V = VANE TEST

WOR = WEIGHT OF RODS WOH = WEIGHT OF HAMMER & RODS

SS = SPLIT TUBE SAMPLER H.S.A. = HOLLOW STEM AUGER

PROPORTIONS USED: TRACE = 0 - 10% LITTLE = 10 - 20% SOME = 20 - 35% AND =35 - 50%

C = COARSE

M = MEDIUM

F = FINE

SOILTESTING, INC. 90 DONOVAN RD. OXFORD, CT 06478 CT (203) 262-9328 NY (914) 946-4850	CLIENT: Fuller & D'Angelo Architects	SHEET 1 OF 1 HOLE NO. WO-19
	PROJECT NO. G259-1984-21	
	PROJECT NAME Edgemont School District Jr./Sr. High School	BORING LOCATIONS Per Plan
FOREMAN - DRILLER AO/jm	LOCATION 200 White Oak Lane Scarsdale, NY	
INSPECTOR	CASING / SAMPLER / CORE BAR	OFFSET
	TYPE: HSA / SS *	DATE START 12/30/21
GROUND WATER OBSERVATIONS AT none FT AFTER 0 HOURS AT FT AFTER HOURS	SIZE I.D.: 4 ¼" / 1 3/8"	DATE FINISH 12/30/21
	HAMMER WT.: 140# / BIT	SURFACE ELEV. El. ±296.5
	HAMMER FALL: 30"	GROUND WATER ELEV.

DEPTH	CASING BLOWS PER FOOT	SAMPLE NO	Type	PEN	REC	DEPTH @ BOT	BLOWS PER 6 IN ON SAMPLER (FORCE ON TUBE) 0 - 6 / 6 - 12 / 12 - 18	CORE TIME PER FT (MIN)	DENSITY OR CONSIST / MOIST	STRATA CHANGE DEPTH / ELEV	FIELD IDENTIFICATION OF SOIL REMARKS INCL. COLOR, LOSS OF WASH WATER, SEAMS IN ROCK, ETC.
		1	ss	24"	18"	2'0"	6 / 11		compact / dry	6"	Topsoil
							11 / 14				Brn F sand, some F-C gravel, trace roots, cobbles
		2	ss	24"	16"	4'0"	11 / 10		compact		
							11 / 14		dry		Lt brn F sand, F-C gravel, trace silt
5											
		3	ss	17"	14"	5'5"	28 / 26		v dense		
							50/5"		dry/moist		Brn F sand, F-C gravel, trace silt, trace cobbles
										9'	Auger refusal
10											EOB 9'
15											
20											
25											
30											
35											
40											* Cathead & Rope

NOTE: Subsoil conditions revealed by this investigation represent conditions at specific locations and may not represent conditions at other locations or times.

GROUND SURFACE TO _____FT. USED _____CASING THEN _____ CASING TO _____FT. **HOLE NO. WO-19**

A = AUGER UP = UNDISTURBED PISTON T = THINWALL V = VANE TEST

WOR = WEIGHT OF RODS WOH = WEIGHT OF HAMMER & RODS C = COARSE

SS = SPLIT TUBE SAMPLER H.S.A. = HOLLOW STEM AUGER M = MEDIUM

PROPORTIONS USED: TRACE = 0 - 10% LITTLE = 10 - 20% SOME = 20 - 35% AND =35 - 50% F = FINE

SOILTESTING, INC. 90 DONOVAN RD. OXFORD, CT 06478 CT (203) 262-9328 NY (914) 946-4850	CLIENT: Fuller & D'Angelo Architects	SHEET 1 OF 1 HOLE NO. WO-20
	PROJECT NO. G259-1984-21	
	PROJECT NAME Edgemont School District Jr./Sr. High School	BORING LOCATIONS Per Plan
FOREMAN - DRILLER PD/pd	LOCATION 200 White Oak Lane Scarsdale, NY	
INSPECTOR	CASING / SAMPLER / CORE BAR	OFFSET
	TYPE: HSA / SS *	DATE START 12/31/21
	SIZE I.D.: 4 ¼" / 1 3/8"	DATE FINISH 12/31/21
GROUND WATER OBSERVATIONS AT none FT AFTER 0 HOURS AT FT AFTER HOURS	HAMMER WT.: 140# / BIT	SURFACE ELEV. El. ±305.5
	HAMMER FALL: 30"	GROUND WATER ELEV.

DEPTH	CASING BLOWS PER FOOT	SAMPLE NO	Type	PEN	REC	DEPTH @ BOT	BLOWS PER 6 IN ON SAMPLER (FORCE ON TUBE) 0 - 6 / 6 - 12 / 12 - 18	CORE TIME PER FT (MIN)	DENSITY OR CONSIST / MOIST	STRATA CHANGE DEPTH / ELEV	FIELD IDENTIFICATION OF SOIL REMARKS INCL. COLOR, LOSS OF WASH WATER, SEAMS IN ROCK, ETC.
		1	ss	24"	14"	2'0"	2 / 8		hard	0'9"	Blk/dk brn silt, root fragments
							25 / 76		moist/dry	1'2"	Gry/brn F-M sand & silt, F-C gravel
										2'	Partly decomposed fractured bedrock
											EOB 2'
5											
10											
15											
20											
25											
30											
35											
40											* Cathead & Rope

NOTE: Subsoil conditions revealed by this investigation represent conditions at specific locations and may not represent conditions at other locations or times.

GROUND SURFACE TO _____FT. USED _____CASING THEN _____ CASING TO _____FT. **HOLE NO. WO-20**

A = AUGER UP = UNDISTURBED PISTON T = THINWALL V = VANE TEST

WOR = WEIGHT OF RODS WOH = WEIGHT OF HAMMER & RODS C = COARSE

SS = SPLIT TUBE SAMPLER H.S.A. = HOLLOW STEM AUGER M = MEDIUM

PROPORTIONS USED: TRACE = 0 - 10% LITTLE = 10 - 20% SOME = 20 - 35% AND =35 - 50% F = FINE

SOILTESTING, INC. 90 DONOVAN RD. OXFORD, CT 06478 CT (203) 262-9328 NY (914) 946-4850	CLIENT: Fuller & D'Angelo Architects	SHEET 1 OF 1 HOLE NO. WO-21
	PROJECT NO. G259-1984-21	
	PROJECT NAME Edgemont School District Jr./Sr. High School	BORING LOCATIONS Per Plan
FOREMAN - DRILLER AO/jm	LOCATION 200 White Oak Lane Scarsdale, NY	
INSPECTOR	CASING / SAMPLER / CORE BAR TYPE: HSA / SS * / SIZE I.D.: 4 ¼" / 1 3/8" / HAMMER WT.: / 140# / BIT HAMMER FALL: / 30" /	OFFSET DATE START 12/30/21 DATE FINISH 12/30/21 SURFACE ELEV. El. ±301 GROUND WATER ELEV.
GROUND WATER OBSERVATIONS AT none FT AFTER 0 HOURS AT FT AFTER HOURS		

DEPTH	CASING BLOWS PER FOOT	SAMPLE NO	Type	PEN	REC.	DEPTH @ BOT	BLOWS PER 6 IN ON SAMPLER (FORCE ON TUBE) 0 - 6 / 6 - 12 / 12 - 18	CORE TIME PER FT (MIN)	DENSITY OR CONSIST / MOIST	STRATA CHANGE DEPTH / ELEV	FIELD IDENTIFICATION OF SOIL REMARKS INCL. COLOR, LOSS OF WASH WATER, SEAMS IN ROCK, ETC.
		1	ss	24"	16"	2'0"	4 / 4		compact / moist	6"	Topsoil Brn F sand, F-C gravel, trace silt, trace roots
							6 / 7				
		2	ss	3"	2"	2'3"	50/3		dense/dry		Cobble
5		3	ss	24"	16"	6'0"	14 / 10		compact		
							14 / 16		dry		Brn F-M sand, F-C gravel, trace silt, trace cobble
		4	ss	24"	14"	8'0"	20 / 27		dense		
							23 / 29		dry		Gry/brn F-M sand, F-C gravel, Trace silt
10		5	ss	2"	0"	10'2"	50/2"		dense		No recovery - fractured bedrock or boulder
										12'	Auger refusal
											EOB 12'
15											
20											
25											
30											
35											
40											* Cathead & Rope

NOTE: Subsoil conditions revealed by this investigation represent conditions at specific locations and may not represent conditions at other locations or times.

GROUND SURFACE TO _____FT. USED _____CASING THEN _____ CASING TO _____FT. **HOLE NO. WO-21**

A = AUGER UP = UNDISTURBED PISTON T = THINWALL V = VANE TEST

WOR = WEIGHT OF RODS WOH = WEIGHT OF HAMMER & RODS C = COARSE

SS = SPLIT TUBE SAMPLER H.S.A. = HOLLOW STEM AUGER M = MEDIUM

PROPORTIONS USED: TRACE = 0 - 10% LITTLE = 10 - 20% SOME = 20 - 35% AND =35 - 50% F = FINE

SOILTESTING, INC. 90 DONOVAN RD. OXFORD, CT 06478 CT (203) 262-9328 NY (914) 946-4850	CLIENT: Fuller & D'Angelo Architects	SHEET 1 OF 1 HOLE NO. WO-22
	PROJECT NO. G259-1984-21	
	PROJECT NAME Edgemont School District Jr./Sr. High School	BORING LOCATIONS Per Plan
FOREMAN - DRILLER AO/jm	LOCATION 200 White Oak Lane Scarsdale, NY	
INSPECTOR	CASING / SAMPLER / CORE BAR TYPE: HSA / SS * / SIZE I.D.: 4 ¼" / 1 3/8" / HAMMER WT.: / 140# / BIT HAMMER FALL: / 30" /	OFFSET DATE START 12/30/21 DATE FINISH 12/30/21 SURFACE ELEV. El. ±299.5 GROUND WATER ELEV.
GROUND WATER OBSERVATIONS AT none FT AFTER 0 HOURS AT FT AFTER HOURS		

DEPTH	CASING BLOWS PER FOOT	SAMPLE NO	Type	PEN	REC	DEPTH @ BOT	BLOWS PER 6 IN ON SAMPLER (FORCE ON TUBE) 0 - 6 / 6 - 12 / 12 - 18	CORE TIME PER FT (MIN)	DENSITY OR CONSIST / MOIST	STRATA CHANGE DEPTH / ELEV	FIELD IDENTIFICATION OF SOIL REMARKS INCL. COLOR, LOSS OF WASH WATER, SEAMS IN ROCK, ETC.
		1	ss	2"	0"	0'2"	50/2"			2"	Asphalt No recovery
										1'	Auger refusal
5											EOB 1' Bedrock or boulder
	WO-22A										Offset 3' North to WO-22A
0										2'	Auger refusal
											EOB 2'
5											
10											
15											
20											
25											
30											* Cathead & Rope

NOTE: Subsoil conditions revealed by this investigation represent conditions at specific locations and may not represent conditions at other locations or times.

GROUND SURFACE TO _____FT. USED _____CASING THEN _____ CASING TO _____FT. **HOLE NO. WO-22**

A = AUGER UP = UNDISTURBED PISTON T = THINWALL V = VANE TEST

WOR = WEIGHT OF RODS WOH = WEIGHT OF HAMMER & RODS C = COARSE

SS = SPLIT TUBE SAMPLER H.S.A. = HOLLOW STEM AUGER M = MEDIUM

PROPORTIONS USED: TRACE = 0 - 10% LITTLE = 10 - 20% SOME = 20 - 35% AND =35 - 50% F = FINE